BOSS Engineering

3121 E. Grand River Howell, MI 48843
517.546.4836 fax 517.548.1670
www.bosseng.com

February 24th, 2022

Ms. Kelly VanMarter, AICP
Genoa Township Planning Commission
2911 Dorr Road
Brighton, Michigan 48116

Re: Bible Baptist Church-Special Land Use and Site Plan Review

Dear Ms. VanMarter,

We have received the review letters from the Brighton Area Fire Authority, Tetra Tech, and SAFEbuilt dated February 16th, 2022 and February 17th, 2022 respectively, for the Bible Baptist Church site and offer the following comments:

Tetra Tech

General

1. Acknowledged. The plans are currently being reviewed by the Brighton Area Fire Authority.
2. We anticipate the traffic study being completed the week of February 28th through March 4th. It will be forwarded to the Township at that time.

Private Road

1. We acknowledge approval is needed by LCRC for the drive approach on Golf Club Road. We request approval by LCRC not needed prior to site plan, but rather prior to construction plan approval. Should the LCRC review result in significant changes to the drive approach or relocation of the drive approach, that results in changes to the proposed site then the site plan will be revised as necessary and reapproval of the site plan by the Planning Commission be obtained.
2. The proposed project is single ownership and thus is a commercial drive, not a private drive, although the drive has been designed to meet the private road standards.

Sanitary and Water Services

1. Acknowledged. Construction plans will be submitted to MHOG for review and approval after the Site Plan approval process.
2. Acknowledged. No action needed on the plans.
3. Acknowledged. More detail will be provided on the proposed lift station and forcemain during the construction plan review process by MHOG.

Drainage and Grading

1. Acknowledged. The plans have been revised to meet the updated LCDC design Standards.
2. The pond currently and historically has had an adjustable height outlet that is operated by the two homeowners abutting the pond. Meetings have been had with the adjacent landowner to determine the continue maintainability and adjustability of the pond while utilizing it for detention for the proposed project. Additional detail will be provided during the construction plan review process. An MDEGLE permit is obtained allowing the use of the pond/wetland for detention. Additional detail will be provided during the construction plan review process.
3. Proposed forebay sizing and storm sewer calculations are located on sheet 12. Sizing of each structure (catch basin/manhole) will be done during the construction plan review process and shown in the storm profiles at that time. The previously proposed central forebay has been revised to be treated via a mechanical pretreatment unit. A standard detail for the mechanical pretreatment unit is included on sheet 12.

SAFEbuilt

Summary

1. Special Land Use Standards of Section 19.03:
   a. Acknowledged.
   b. See exhibit 'A' at the end of this letter for sample pictures at the south property line that shows the existing vegetation.
   c. The traffic study is anticipated to be completed the week of February 28th – March 4th and will be sent to the Township once received. A drive is only proposed on Golf Club Road at this time. It is anticipated that the existing center left turn lane at Latson is to be extended through the proposed site approach to facilitate left turn movements for the church. The plans reflect such. Ultimately the traffic study will need to be approved by the LCRC along with the geometrics for the drive approach and any necessary Golf Club Road improvements in order to adequately service the church. The grading within the wetland setback at the north wetland is necessary simply given the existing site constraints between either the two wetlands or the wetland and the existing barn structure. The land within the natural features setback in this area is currently unvegetated so impact is negligible. The upland wetland that contains grading within the 25' natural features setback is a low-quality wetland with minimal hydrology. The wetland is within a large natural topographical draw, that send water to the western (of the two) upland wetland pockets. Ultimately, this wetland is proposed to be filled for the construction of the phase 2 parking lot and will require an MDEGLE permit.
   d. The two upland wetland pockets are approximately 400 feet from the regulated wetlands on the north half of the site, which presumably makes the pockets regulated. MDEGLE has not verified the wetlands at this time and will not be able to do so until summer time. There is no grading activity within the wetland, which meets MDEGLE requirements. This wetland is within the anticipated future parking lot for phase 2 of the church and thus the owner will be pursuing an MDEGLE wetland fill permit for this activity. Lastly, the upland wetland pocket is a low-quality wetland. Any notable plants are dead and the topography is gently sloping towards the wetland pocket to the west. A few pictures were taken of the wetland to show its low quality.
   e. Acknowledged. The project is currently under review by the Township Engineer and BAFA.

2. Use Requirements of Section 3.03.02(I):
   a. A row of arborvitaes has been added to the south side of the western parking lot to supplement the existing vegetation that is to remain (between 30 feet and 45 feet of vegetation to remain south of the parking lot). The entire 60' rear yard setback behind the church building is left untouched. There is a minimum of 60 feet of vegetative buffer on the south side of the church. Refer to attached Exhibit 'A' for pictures of the existing vegetation.
   b. The classrooms indicated on the floor plan are for Sunday school use which is in conjunction with the Sunday church services. No private school is planned at this time.
   c. A private school is not proposed as a part of this project. See response 'b' above.

3. Site Plan Review:
   a. There are multiple reasons the building materials were chosen as shown. One reason is that this is the first phase of the Bible Baptist Church building. Subsequent phases will expand the building to the east, west and north. Thus, much of the proposed metal siding will be removed. Additionally, the building is surrounded by existing vegetation and thus not seen by the general public. The north face of the building is 1,300 feet from Golf Club Road, the west face approximately 750 feet from the western property line, the south face of the building approximately 118 feet from the south property line, and the east face is approximately 300 feet from Latson Road. The remaining existing vegetation (outside the limits of disturbance) has been added on sheet 4 to show the extent of existing vegetative buffers.
   b. Proposed building materials will be provided/displayed at the Planning Commission meeting as requested.

c. An LCRC evaluation of Latson Road has Road improvements slated for the future. Road improvements, at this time, are expected to include additional lanes as well as vertical road adjustment. Both of these items affect the subject property and specifically the feasibility to install a bike path along Latson Road at this time. In addition to anticipated Latson Road improvements, the existing topography along Latson Road does not lend itself to contain a bike path until Road improvements are done. Lastly, this sidewalk would be a dead end on both sides at this time as the north end of the site is the Township limits and to the south there is approximately 600 feet to the existing sidewalk, much of which contains wetlands and is not feasible to cross at this time. The bike path along Latson Road shall be constructed at a more feasible time upon completion of any Latson Road improvements.
d. A few of the curb radii have been enlarged to soften turning movements for the fire trucks. There are two curb drops on the project, one at the gravel fire access drive and one at the dumpster pad. The curb drop allows for drivable access by the fire truck or refuse truck as necessary and also maintains the perimeter curb around the parking lot.
e. Acknowledged. The existing pond which is being utilized for detention has existing vegetation around its perimeter and the perimeter of the site also contains existing vegetative buffer. Thus minimal plantings are required for the parking lot landscaping and stormwater forebay plantings
f. Sheet 4 includes the remaining existing vegetation(what is not included within the limits of disturbance).
g. The landscape count discrepancies have been resolved.
h. Shielding on light fixtures will be done to prevent light spilling
i. The soccer field will not be illuminated.
j. The Impact Assessment has been revised accordingly.

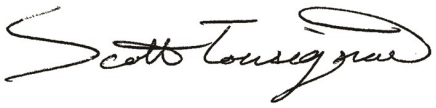
Brighton Area Fire Authority

1. The FDC connection has been relocated to the north face of the building at the northwest corner.
2. Hydrant WTH 02 has been relocated further south to be within 100 feet of the FDC on the north face of the church. When the future church building is constructed, the FDC will need to be relocated on the new north face of the church and the hydrant WTH02, will need to be relocated along its currently proposed hydrant lead alignment.
3. Note 4 on the Church Campus Site Plan sheet 5, calls for the minimum 6” high address letters in contrasting color.
4. The east drive aisle in the north parking lot has been widened to 26 feet. All site drives on the fire access route are a minimum 26’ face of curb to face of curb. Note 7 on sheet 5 indicates the 84,000 pound loading from the fire apparatus.
5. Multiple radii around the access route have been adjusted (or drive aisles widened) to accommodate the fire truck turning movements more cleanly within the lane of travel.
6. Note 8 on sheet 5 indicates the vertical clearance height along access routes.
7. The secondary emergency access drive has been relocated to the east side of the church where the elevation is more easily accommodating of the fire drive. The width is 20 feet and the overall length is just under the 150 foot threshold for a turnaround to be required. A cross section of the gravel drive is provided on sheet 13 along with a gate with knox box detail.
8. Notes indicating knox box locations at the main entry and fire riser room at the rear have been added to the site plan sheet 5.
9. Note 9 on sheet 5 has been added indicating the process for verifying the radio signal strength as outlined in the review letter.

Feel free to contact us should you have any questions, or if you are in need of any additional information.

Sincerely,

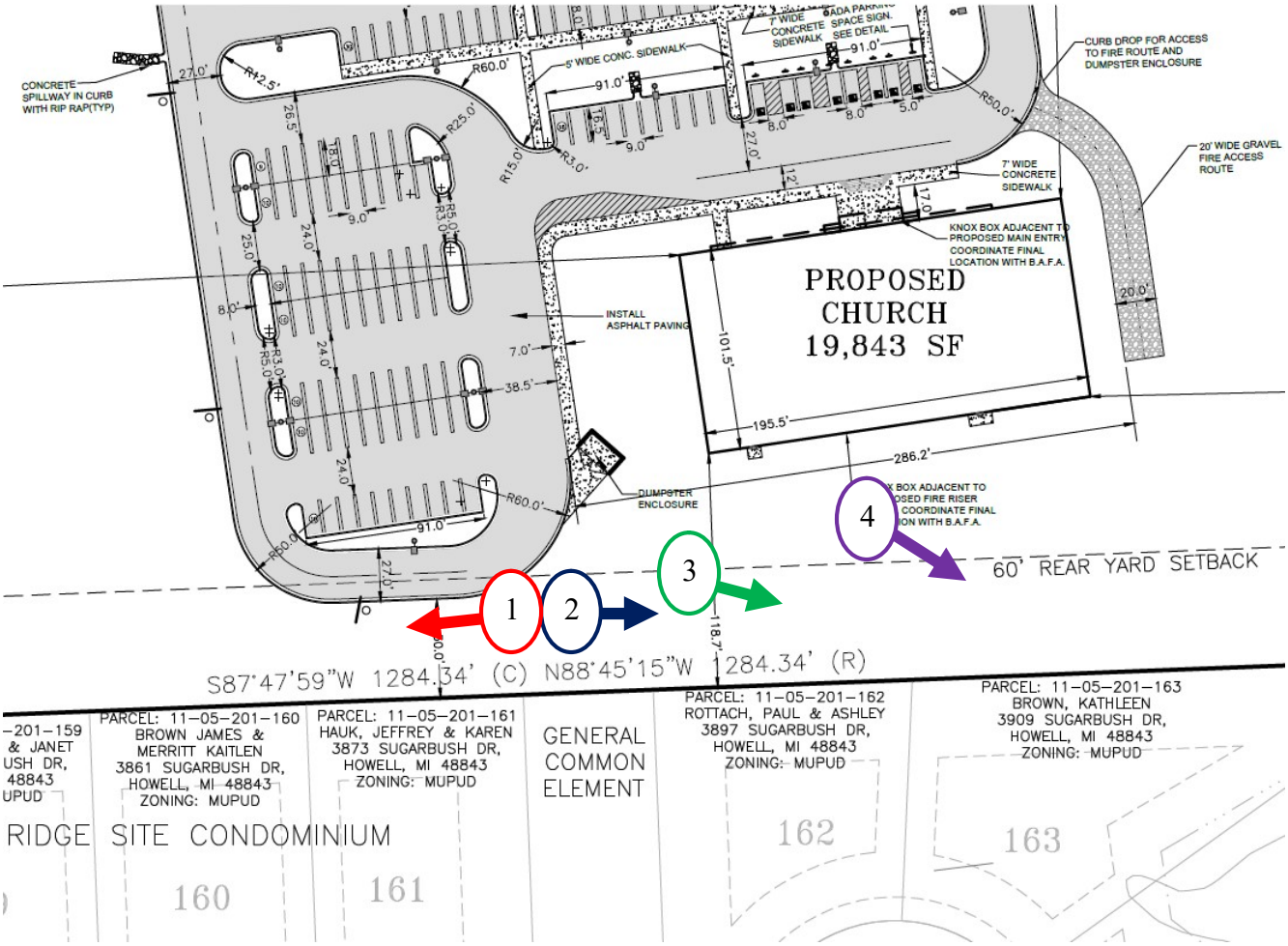
BOSS ENGINEERING COMPANY



_____
Scott Tousignant, PE
Project Manager

EXHIBIT A

Existing Vegetative Buffer on South Property Line



Picture 1 – looking westerly

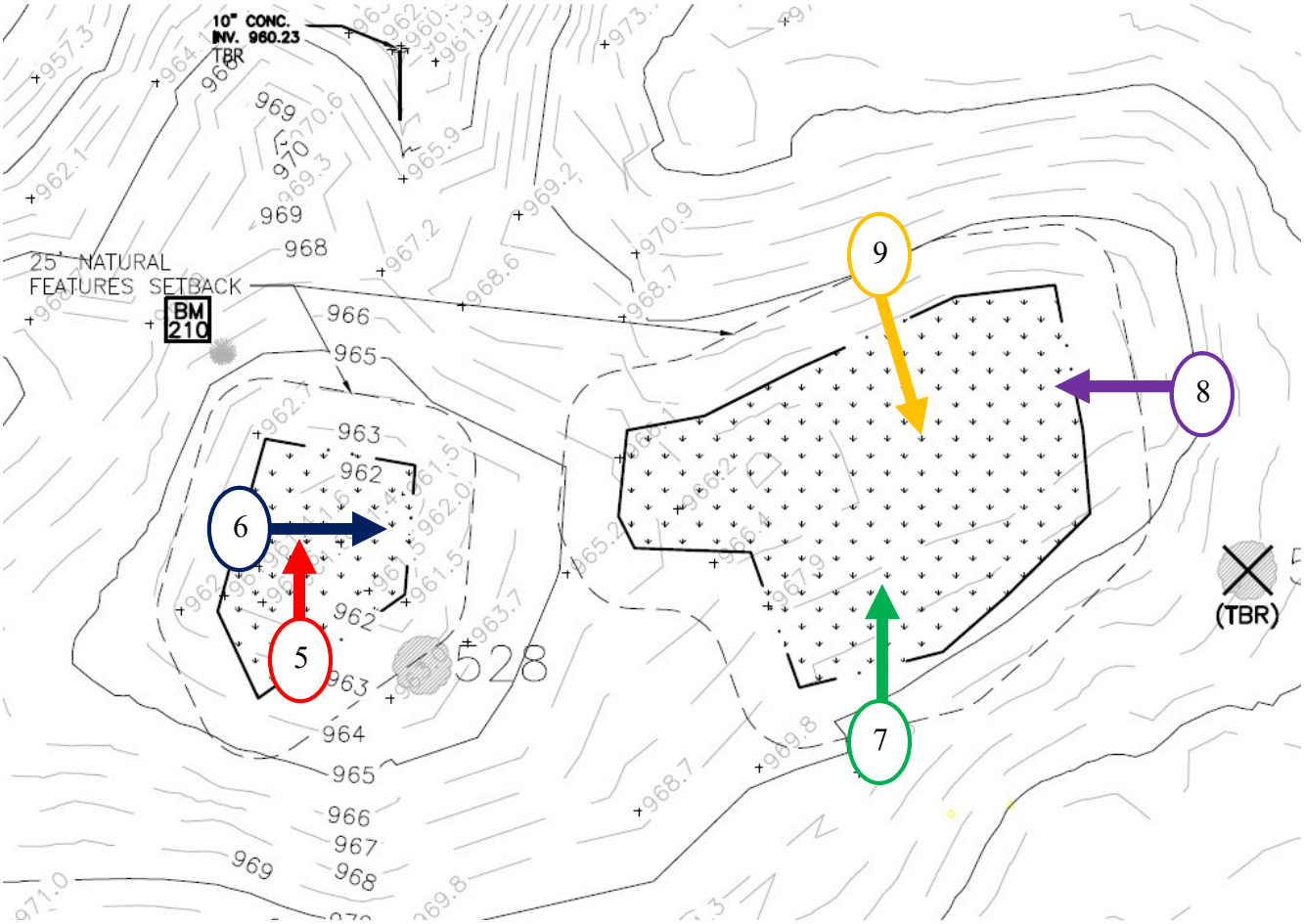
Picture 2 – looking easterly

Picture 3 – looking easterly

Picture 4 – looking southeasterly

EXHIBIT B

Upland Wetland Pockets



Picture 5 – West Upland wetland pocket - looking northerly

Picture 6 – West Upland wetland pocket - looking easterly

Picture 7 – East Upland wetland pocket - looking northerly

Picture 8 – East Upland wetland pocket - looking westerly

Picture 9 – East Upland wetland pocket – dead vegetation

GENOA TOWNSHIP IMPACT ASSESSMENT

Prepared for:

Owner / Applicant
Bible Baptist Church
2258 E. Highland Rd.
Howell, Michigan 48843

Prepared by:

Jennifer M. Austin, PLA

BOSS BE Engineering

3121 E. Grand River Howell, MI 48843
517.546.4836 fax 517.548.1670
www.bosseng.com

February 1, 2022

Revised: February 23, 2022

INTRODUCTION

The purpose of this Impact Assessment (IA) Report is to show the effect that the proposed church campus development has on various factors in the general vicinity of the use. The format used for presentation of this report conforms to the Submittal Requirements for Impact Assessment/Impact Statement Guidelines in accordance with Section 13.05 of the published Zoning Ordinance for Genoa Township, Livingston County, Michigan.

DISCUSSION ITEMS

A. Name(s) and address(es) of person(s) responsible for preparation of the Impact Assessment and a brief statement of their qualifications.

Prepared by:

Jennifer M. Austin, PLA
Professional Landscape Architect and Project Manager
Boss Engineering
3121 E Grand River
Howell, MI 48843

Prepared for:

Owner/Applicant:
Bible Baptist Church
2258 E. Highland Rd.
Howell, MI 48843

B. Description of the site, including existing structures, man-made facilities, and natural features, all-inclusive to within 10' of the property boundary.

The project site is on parcel # 4711-05-200-002 in the NE ¼ of Section 5, Genoa Township, Livingston County, MI, and which the parcel at the southwest corner of Golf Club Road and Latson Road.

The subject site is bordered:

- To the north is the Genoa Township-Oceola Township line along Golf Club Road. The northern half of the subject property contains a 3+/- acre pond, a wetland and single family residence.
- To the east are RR and RPUD zoning on the opposite side of Latson Road.
- To the south is MUPUD zoning which contains the Rolling Ridge site condominium.
- To the west is RR zoning with single family residences.

Current zoning of the subject site is Low Density Residential (LDR),1 unit/acre. This new zoning designation was approved by the Genoa Township Planning Commission at the July 20, 2020 meeting. Sewer and Water are along entire the Easterly line (Latson Road) of the subject parcel and accessible at the Southerly property line at Sugarbush Drive.

C. Impact on natural features: A written description of the environmental characteristics of the site prior to development, i.e., topography, soils, vegetative cover, drainage, streams, creeks or ponds.

GENERAL OVERVIEW

AREA 1

The Northwesterly 10 acres of the site are the location of the existing residence. This area consists of two parts: The House, located on the top of a gently rolling hill, and the pond adjacent to the house along the southerly and westerly portions. The private entrance road to the proposed church campus will cross the easterly portion of this area.

AREA 2

The Northeasterly 10 acres of the site are relatively flat of which approximately 5 acres is a wetland. There are 2 man-made ditches within this wetland that flow northerly under Golf Club Road into a small wetland in Oceola Township. Stormwater management for this project will mostly be managed in this area by forebays to filter stormwater before discharge into the wetlands and/or pond.

AREA 3

The Southerly 26+ acres are gently sloped to moderately steep slopes. The entire area is heavily wooded with a mixture of evergreens and hardwoods. The northerly portion of Area 3 flows naturally north to the existing lake and/or the existing wetland. The southerly portion of Area 3 flows generally southeast into an existing drainage area along Latson Road.

The church campus and a portion of the driveway will be located in this area. Clearing of trees will be kept to a minimum by use of curb and gutter for the commercial drive.

WETLAND SETBACKS

The regulated wetlands on-site contain a 25 foot wetland setback per Township Ordinance. The proposed development includes grading within the 25 foot wetland setback at the east wetland, the open water pond as well as for the eastern of the two upland wetland pockets. The areas of disturbance within the setback on the east wetland and the open water pond will have no impact on the wetlands. Currently, the land is maintained up to the wetland limits in these areas with grass, in which the 25' is open. The disturbance will not disrupt crucial vegetation in this instance. Given the location of the wetlands and their proximity to each other, as well as their proximity to other existing structures on site, in order for the commercial drive to run southerly to access the developable portion of the parcel, work within the setback will be required.

There are two upland pocket wetlands near the proposed church and parking lots. No disturbance is proposed within the western upland pocket wetland. Disturbance is proposed to occur within the 25' wetland setback on the eastern upland wetland. Based on the topography and visual inspection, this wetland has very minimal water ponding as water typically flows through this area to ultimately pond at the western upland wetland pocket. The wetland vegetation quality is low, and the minimal trees within the wetland limits are dead. The wetland is of low quality and grading within the setback of this wetland does not impact the overall stormwater management on the site. Water is continuing to be directed to the western of the two wetland pockets.

SPECIFIC OVERVIEW
The soils and natural features throughout the site are specified on the Existing Conditions and Natural Features Sheets 2 and 3.

D. Impact on storm water management: description of soil erosion control measures during construction.

The preliminary site plan indicates stormwater management forebays and mechanical pretreatment units to be constructed during the infrastructure construction. These forebays and mechanical pretreatment units will pre-treat the stormwater prior to discharge to the pond and wetland at the north half of the site. The discharges and pond storage is permitted in MDEGLE permit WRP026826. The detailed construction plans will be reviewed by the Township Engineer and the Soil Erosion Control permit will be reviewed and issued by the Livingston County Drain Commissioner.

E. Impact on surrounding land use: Description of proposed usage and other man-made facilities; how it conforms to existing and potential development patterns. Effects of added lighting, noise or air pollution which could negatively impact adjacent properties.

Phase I of this project will include a commercial drive approach on Golf Club Road, proceeding southerly to the church campus at the southeast corner of the parcel. This development will have little, if any, impact on the northerly 15 acres of the site. The development will require maintaining a significant portion of the existing forested property along the west, east and south property lines. These natural buffers will minimize lighting and noise to existing developed, adjacent properties. The low-density residential development will have no air pollution impact.

F. Impact on public facilities and services: Description of number of residents, employees, patrons, and impact on general services, i.e., schools, police, fire.

The Site Plan for this phased development is for a 506-seat church sanctuary and associated parking, a new commercial driveway, a soccer field, and stormwater forebay in Phase I. Phase II will allow for an expansion of the church with approximately 500 more seats and associated parking, a potential new access drive off Latson Road, and potentially five single-family low-density residential lots.

The church will require connecting to water and sewer along Latson Road. Police and fire protection services, and schools should not be impacted by this church project.

G. Impact on public utilities: description of public utilities serving the project, i.e., water, sanitary sewer, and storm drainage system. Expected flows projected in residential units.

As noted above, the church will need to connect to the public sanitary and MHOG water along Latson Road for Phase I. A watermain easement will be provided to the southern property line for potential future looping with the existing Rolling Ridge development.

The stormwater management plan utilizes enclosed pipe and open swales to transmit water to either a mechanical pretreatment unit (for the primary stormwater management treating the majority of the developed site) and a forebay for the remainder of the storm water runoff on the north end of the site. The forebay and mechanical pretreatment unit filter runoff prior to release into the existing pond and wetlands that are on site.

H. Storage or handling of any hazardous materials: Description of any hazardous materials used, stored, or disposed of on-site.

No storing or handling of any hazardous materials is expected for this church campus.

I. Impact on traffic and pedestrians: Description of traffic volumes to be generated and their effect on the area.

A traffic study has been initiated. It will be prepared under separate cover and submitted to the Township and Livingston County Road Commission once completed.

The Livingston County Road Commission will be required to review and approve the commercial driveway approach at Golf Club Road as it relates to their standards and findings within the traffic study. At this time, it is anticipated that the traffic study may warrant the center left turn lane to be extended through the proposed Golf Club Road approach to serve the left hand turns to the church. The proposed plan currently shows this center turn lane extension. Ultimately, the traffic study will need to be reviewed and considered as part of the approval for the proposed drive approach. The Livingston County Road Commission will require any necessary Golf Club Road improvements be done as part of the approval and permitting.

J. Special provisions: Deed restrictions, protective covenants, etc.

There is a document addressing shared maintenance and access to the existing pond on the subject property between Bible Baptist Church and the adjacent owner to the northwest.

K. Description of all sources:

- Genoa Township Zoning Ordinance
- “Soil Survey of Livingston County Michigan” Soil Conservation Services, USDA

BERGMANN
ARCHITECTS ENGINEERS PLANNERS

BIBLE BAPTIST CHURCH

TRAFFIC IMPACT STUDY

Genoa Township, Michigan

Bergmann

Office: Midwest (Southfield)
29777 Telegraph Road, Suite 1640
Southfield, MI 48034

Phone: 248.663.1289

Email: srusso@bergmannpc.com
www.bergmannpc.com

March, 2022

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 Executive Summary

This report presents the methodologies, analyses, results, and recommendations of a Traffic Impact Study (TIS) for the proposed Bible Baptist Church in Genoa Township, Livingston County, Michigan. The project site is located in the southwest quadrant of the Latson Road & Golf Cub Road intersection and is currently vacant. The proposed development plans include construction of a new church over two phases. Phase I would construct a 506-seat church with site access provided via a single driveway to Golf Club Road. Phase II would include an approximately 500-seat expansion with potential for a new right-in-right-out driveway to Latson Road.

The purpose of this study is to identify the traffic related impacts, if any, of the proposed project on the adjacent road network. This study was conducted in accordance with accepted traffic engineering practice and guidelines published by the Institute of Transportation Engineers (ITE) and applicable agency standards. Analysis of existing conditions indicate that all approaches and movements at the signalized intersection of Latson Road & Golf Club Road currently operate acceptably at a LOS D or better during the peak hours and will continue to operate acceptably in 2023 and 2026 no-build conditions.

Traffic volumes that are expected to be generated by the development for Phase I and Phase II were forecast based on the rates and equations published by ITE in *Trip Generation* as summarized in the table below. These trips were assigned to the study road network based on existing peak hour traffic patterns, zip code data provided by the Church for existing members, and ITE methodologies. These trips were added to the no-build traffic volumes to calculate the future build traffic volumes with the proposed development for each Phase.

Phase	ITE Code	Amount	Units	Average Daily Traffic	AM Peak Hour			PM Peak Hour			SUN IN Peak			SUN OUT Peak		
					In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
Phase I	560	506	Seats	454	21	14	35	23	28	51	121	25	146	24	125	149
Phase II	560	1,000	Seats	913	42	28	70	45	55	100	249	52	301	50	259	309

The Conclusions related to this Traffic Impact Study and relative analyses are as follows:

1. At the time of this study, traffic volumes throughout the State of Michigan were impacted by restrictions in place associated with the COVID pandemic. Therefore, historic turning movement count data collected in April, 2019 was utilized to validate baseline traffic volumes for this study.
2. All approaches and movements at the study intersection of Latson Road & Golf Club Road currently operate acceptably at a LOS D or better during all peak hours.
3. Church time-of-day patterns and traffic volumes indicate approximately 80% of outbound traffic occurs in the first 30-minutes after service ends while approximately 85% of inbound traffic occurs in the 30-minutes prior to the service start time. Therefore, separate inbound and outbound analysis scenarios were completed as there will be minimal overlap between inbound and outbound traffic based on the one-hour separation between services.
4. All approaches and movements at the study intersection of Latson Road & Golf Club Road would continue to operate acceptably in the 2023 and 2026 no-build scenarios during all peak hours.
5. In accordance with LCRC standards, a left-turn lane and right-turn taper are warranted at the proposed site driveway to Golf Club Road under Phase I build conditions.
6. The 2023 Phase I build conditions analysis indicate that the proposed development will not have a significant impact on the adjacent road network. All approaches and movements at the intersection of Latson Road & Golf Club Road will continue to operate at a LOS D or better during all peak hours and minor increases in delay will not be discernable. Additionally, all approaches and movements at the proposed site driveway to Golf Club Road will operate acceptably. Therefore, the proposed development does not require any off-site roadway or traffic control improvements under Phase I build conditions.

7. In accordance with LCRC standards, a right-turn lane would be warranted at the proposed site driveway to Golf Club Road under Phase II build conditions.
8. The 2026 Phase II Alternative A build conditions analysis indicate the EB through/right-turn movement and WB left-turn movement at the signalized intersection of Latson Road & Golf Club Road would be reduced to a LOS F during the Sunday outbound peak 15-minute period. Additionally, the STOP controlled egress site driveway approach to Golf Club Road will operate at a LOS E or F during both the Sunday inbound and outbound peak 15-minute periods.
9. In order to improve traffic operations in the 2026 Phase II Alternative A build conditions, special Sunday timing plans during service times should be provided at the intersection of Latson Road & Golf Club Road.
10. In accordance with LCRC standards, a right-turn taper would be warranted at the proposed site driveway to Latson Road under Phase II Alternative B build conditions.
11. The 2026 Phase II Alternative B build conditions analysis indicate all approaches and movements at the intersection of Latson Road & Golf Club Road will continue to operate at a LOS D or better during all peak hours. At the proposed site driveways to Golf Club Road and Latson Road all approaches, and movements will operate acceptably at a LOS C or better during the weekday peak hours; however, the STOP controlled egress site driveway approaches to Golf Club Road and Latson Road will operate at a LOS F during the outbound peak 15-minute period.
12. Review of network simulations indicate a long vehicle queue on the site driveway approach to Golf Club Road during the outbound peak 15-minute period; however, the duration and length of this queue is reduced as compared to Alternative A. On the site driveway approach to Latson Road, the 95th percentile queue length is calculated to be 152 feet (six vehicles), which is not significant given the intensity of traffic utilizing this approach over a short duration of time. Therefore, the proposed development does not require any off-site roadway or traffic control improvements under Phase II Alternative B build conditions.
13. Queues from the signalized intersection of Latson Road & Golf Club Road would not block the site driveways to Golf Club Road or Latson Road under either Phase I or Phase II build conditions. Additionally, there will be no left-turn conflict along Golf Club Road between EB left turns at Latson Road and WB left turns at the proposed site driveway.
14. Site access Alternative B is recommended under Phase II build conditions as it would provide improved traffic operations for egress traffic from the site and reduce traffic impacts to the Latson Road & Golf Club Road intersection.

Based on the results of this study, the following improvements are recommended:

2023 Phase I Conditions

1. Construct left-turn lane and right-turn taper at proposed driveway to Golf Club Road.

2026 Phase II Alternative A Conditions

1. Construct right-turn lane at proposed driveway to Golf Club Road.
2. Install special timing plans at intersection of Latson Road & Golf Club Road associated with Sunday service times.

2026 Phase II Alternative B Conditions

1. Construct right-turn lane at proposed driveway to Golf Club Road.
2. Construct right-turn taper at proposed driveway to Latson Road.

2.0 Project Overview

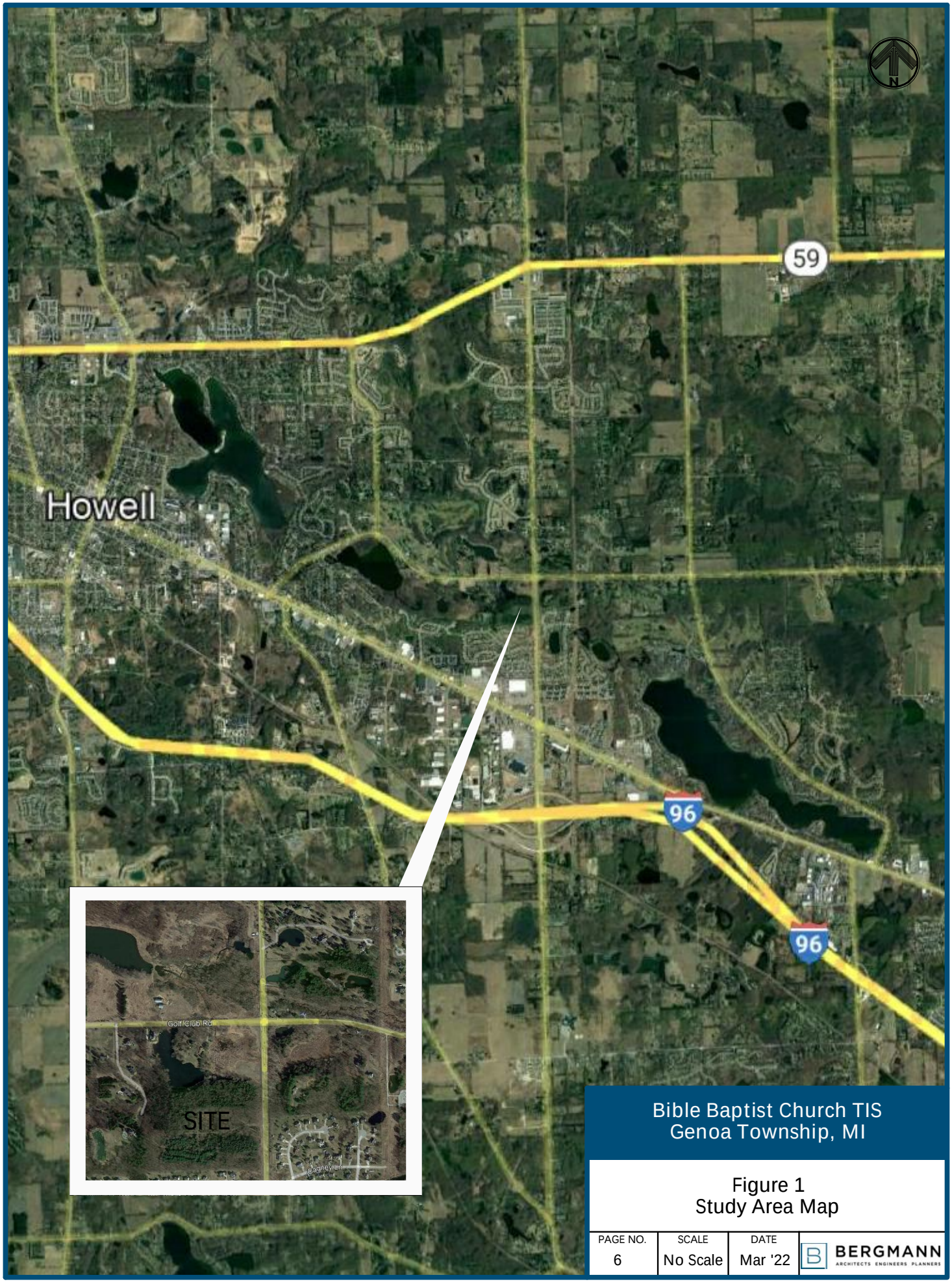
This report presents the methodologies, analyses, results, and recommendations of a Traffic Impact Study (TIS) for the proposed Bible Baptist Church in Genoa Township, Livingston County, Michigan. The project site is located in the southwest quadrant of the Latson Road & Golf Cub Road intersection as shown on **Figure 1,** and is currently vacant. The proposed development plans include construction of a new church over two phases. Phase I would construct a 506-seat church with site access provided via a single driveway to Golf Club Road. Phase II would include an approximately 500-seat expansion with potential for a new right-in-right-out driveway to Latson Road.

Proposed Phase I site operations will include Sunday Church services beginning at 9:00 AM and 11:00 AM in addition to children's activities, small groups, youth ministry, and other meetings occurring during the week. Upon completion of Phase II only one Sunday service is planned to be held at 10:30 AM with no changes to weekday activities. No weekday childcare or school is planned as part of the proposed Church. This TIS will address existing and future traffic conditions during the weekday AM (7:00 AM to 9:00 AM) and PM (4:00 PM to 6:00 PM) peak hours as well as the peak hour during Sunday service times.

Latson Road and Golf Club Road are under jurisdiction of the Livingston County Road Commission (LCRC); whereby access permitting will be subject to LCRC review and standards. Additionally, the project is subject to Township review and standards through the site plan approval process. In accordance with Township and LCRC standards a Traffic Impact Study (TIS) has been required for the project.

The purpose of this study is to identify the traffic related impacts, if any, of the proposed project on the adjacent road network. This study therefore includes analysis of the site access points as well as key off-site intersections surrounding the site. Analysis of the site access points will determine appropriate lane configurations as well as traffic control to process site traffic safely and efficiently. Key off-site intersections are analyzed to determine if new site-generated traffic passing through these locations would require improvements to mitigate any impacted traffic operations.

The scope of this study was developed based on Bergmann's knowledge of the study area, understanding of the development program, accepted traffic engineering practice and information published by the Institute of Transportation Engineers (ITE). Additionally, Bergmann solicited input regarding the proposed scope of work from LCRC. The study analyses were completed using Synchro and SimTraffic, Version 11 traffic analysis software and in accordance with the methodologies and practices published by ITE and the applicable requirements of LCRC. This report is intended for use by LCRC and the Township to guide decisions related to development project approvals, access permitting, and identifying future roadway improvement needs.



Bible Baptist Church TIS
Genoa Township, MI

Figure 1
Study Area Map

PAGE NO.	SCALE	DATE	
6	No Scale	Mar '22	BERGMANN ARCHITECTS ENGINEERS PLANNERS

3.0 Roadway Data

3.1 EXISTING ROAD NETWORK

The study intersections are identified below, and the existing lane use, and traffic control is shown on **Figure 2**. Further details on the study roadways are summarized in **Table 1**.

3.1.1 Study Intersections

- Latson Road & Golf Club Road (signalized); and
- The proposed site access drive(s) (unsignalized).

Table 1: Roadway Summary

Roadway Data	Latson Road	Golf Club Road
Functional Class	Minor Arterial	Major Collector
Direction	N - S	E - W
Speed Limit (mph)	55	55
Jurisdiction	LCRC	LCRC
Cross Section	2-Lane	2-Lane
AADT	22,300	7,400
AM Peak Hour Volume	1,400	555
PM Peak Hour Volume	1,915	820

At the intersection of Latson Road & Golf Club Road, a left-turn lane, through lane, and right-turn lane are provided on the NB and SB Latson Road approaches. On the EB and WB Golf Cub Road approaches a left-turn lane and shared through / right-turn lane are provided. The intersection is traffic signal controlled with permissive-protected left-turn phasing provided for the NB approach. Vehicle actuation is provided for all movements at the intersection. No marked crosswalks or pedestrian signals are provided for any legs of the intersection.

3.1.2 Existing Traffic Data

Historic 24-hour turning movement volumes at the intersection of Latson Road & Golf Club Road were obtained from LCRC for all days between November 11th and December 9th, 2021. During this time period, traffic volumes throughout the State of Michigan were impacted by restrictions in place associated with the COVID pandemic. Therefore, historic turning movement count data collected at the intersection on April 2nd, 2019 was also provided by LCRC. Traffic volume data are included in **Appendix A** and baseline traffic volumes were established as detailed in the subsequent sections.

Peak Hour Factors

All data were aggregated in 15-minute intervals to establish the current peak hour traffic volumes and peak hour factors (PHFs). Weekday PHFs at the study intersections were calculated by approach based on the requirements of MDOT's *Electronic Traffic Control Device Guidelines*. However, given the strong peaking characteristics of churches associated with service start and end times, PHFs were calculated by movement during the Sunday analysis periods. In order to determine the PHFs at the proposed site driveways, traffic volumes collected at three existing churches in southeast Michigan were reviewed and indicate an average PHF of 0.45 and 0.40 for entering and exiting traffic, respectively. Therefore, these PHFs were utilized for entering and exiting traffic movements at the site driveways for the Sunday analysis periods. For the weekday analysis periods, a PHF of 0.92 was utilized as traffic associated with weekday uses is less concentrated and more spread-out throughout the hour. For the Sunday build analysis scenarios, PHFs at the intersection of Latson Road & Golf Club Road were recalculated for movements to

and from the site by conservatively assuming the peak 15-minutes associated with Church traffic would coincide with the existing peak 15-minutes at the intersection.

Heavy Vehicle Percentage

Commercial truck percentages from the April, 2019 turning movement count were utilized during the weekday AM and PM peak hour and calculated by approach. For the Sunday analysis periods a default commercial truck percentage of 2% was utilized as truck data was not available.

Weekday Volumes

Weekday (Monday – Friday) AM and PM peak hour volumes were calculated for all days between November 11th and December 9th. This data was reviewed and any days which did not represent normal travel volumes and conditions were removed. The remaining days were averaged together to establish 2021 peak hour volumes. The 2021 peak hour volume was than compared to the pre-COVID 2019 turning movement count to determine if any volume adjustments were necessary. This comparison indicates similar overall traffic volumes at the intersection; however, some of the turning movement patterns have changed, particularly along the NB approach during the PM peak hour.

Commuting patterns through this area favor traffic traveling to the south and east during the morning peak hour and traffic traveling to the north and west during the afternoon peak hour. In mid to late 2019 improvements were made at the M-59 & Eager Road intersection which included widening of the Eager Road approaches to provide left turn lanes and installation of a traffic signal. This improved operations and safety for left turns at the intersection and made the shorter route of Golf Club Road to Eager Road more viable for traffic traveling from Latson Road south of Golf Club Road wishing to travel west on M-59. As such the shift in traffic patterns along the NB approach during the PM peak hour is likely attributed to these improvements.

Therefore, baseline traffic volumes for this study were established by taking the higher of the two volumes between the 2021 average and April, 2019 count for all turning movements during the peak hours with the exception of the NB approach during the PM peak hour. For this approach, the higher 2019 total approach volume was utilized and applied to the 2021 turning movement proportions along the approach. The resulting baseline weekday peak hour volumes are summarized on **Figure 3.**

Sunday Volumes

For Phase I, the peak hour will occur between services from 10:00 AM to 11:00 AM when vehicles from the first service are leaving and vehicles for the second service are arriving. For Phase II, the peak hour will occur after the lone service from 11:30 AM to 12:30 PM. Therefore, Sunday traffic volume data between 9:45 AM and 11:45 AM was utilized to establish Phase I peak hour volumes and traffic volume data between 11:30 AM and 1:00 PM was utilized to establish Phase II peak hour volumes and account for any potential shifts of service times in the future.

Peak hour volumes for each phase were calculated for all Sundays between November 11th and December 9th. Data was reviewed and any days which did not represent normal travel volumes and conditions were removed. Baseline traffic volumes were then conservatively established by taking the highest volume amongst all Sundays for each turning movement at the intersection. The resulting baseline Sunday peak hour volumes are summarized on **Figure 4.**

3.1.3 Analysis Methodologies

The performance of the study intersections was evaluated through a qualitative measure of operating conditions called Levels of Service (LOS). Six LOS are defined with letter designations from A to F with LOS A representing minimal delay, and LOS F indicating failing conditions. Typically, LOS D is considered acceptable in suburban/urban areas.

The LOS measurement for both signalized and unsignalized intersections is average control delay, which is quantified in terms of seconds of delay per vehicle. Control delay includes deceleration delay, stopped delay, queue move-up delay, and acceleration delay. The LOS criteria for unsignalized and signalized intersections taken from the HCM are included in **Appendix B**.

The operational analyses of all study intersections were performed using Synchro, Version 11 traffic analysis software. Synchro 11 is a software package used for modeling, optimizing, and simulating traffic systems. The LOS and delay calculations are based on the procedures and methodologies outlined in the Transportation Research Board's *Highway Capacity Manual, 6th Edition* (HCM6) which sets forth nationally accepted standards regarding traffic operations and capacity analysis.

In accordance with the HCM6, the capacity analysis is based on an evaluation of the peak 15-min period during the hour. Church time-of-day patterns and traffic volumes from three churches in southeast Michigan are summarized in **Chart 1** and indicate approximately 80% of outbound traffic occurs in the first 30-minutes after service has ended while approximately 85% of inbound traffic occurs in the 30-minutes prior to the service start time. Based on the proposed one-hour separation between the end of the first service and beginning of the second service, there will be minimal overlap between entering and exiting traffic volumes in the peak 15-minutes associated with each service. As such, analysis of a single time period with all forecast inbound and outbound traffic and application of PHFs previously identified would provide an overprediction of demand and delay.

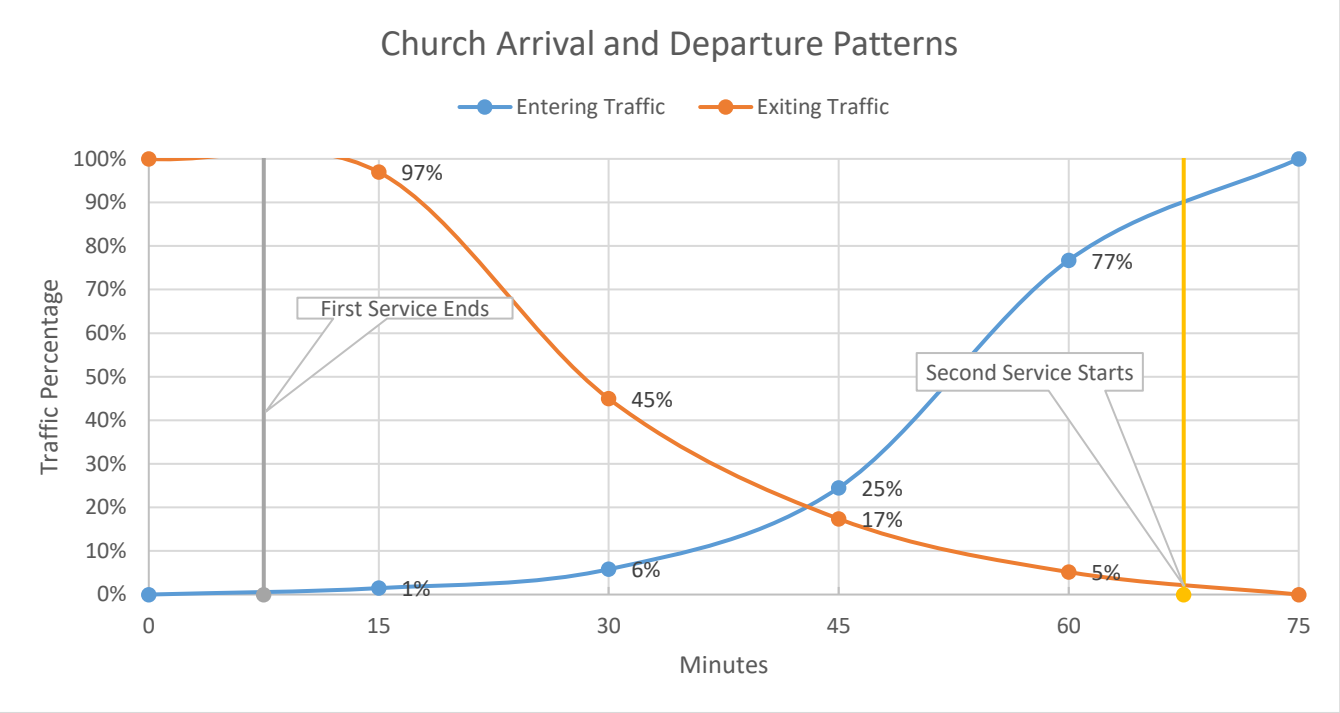
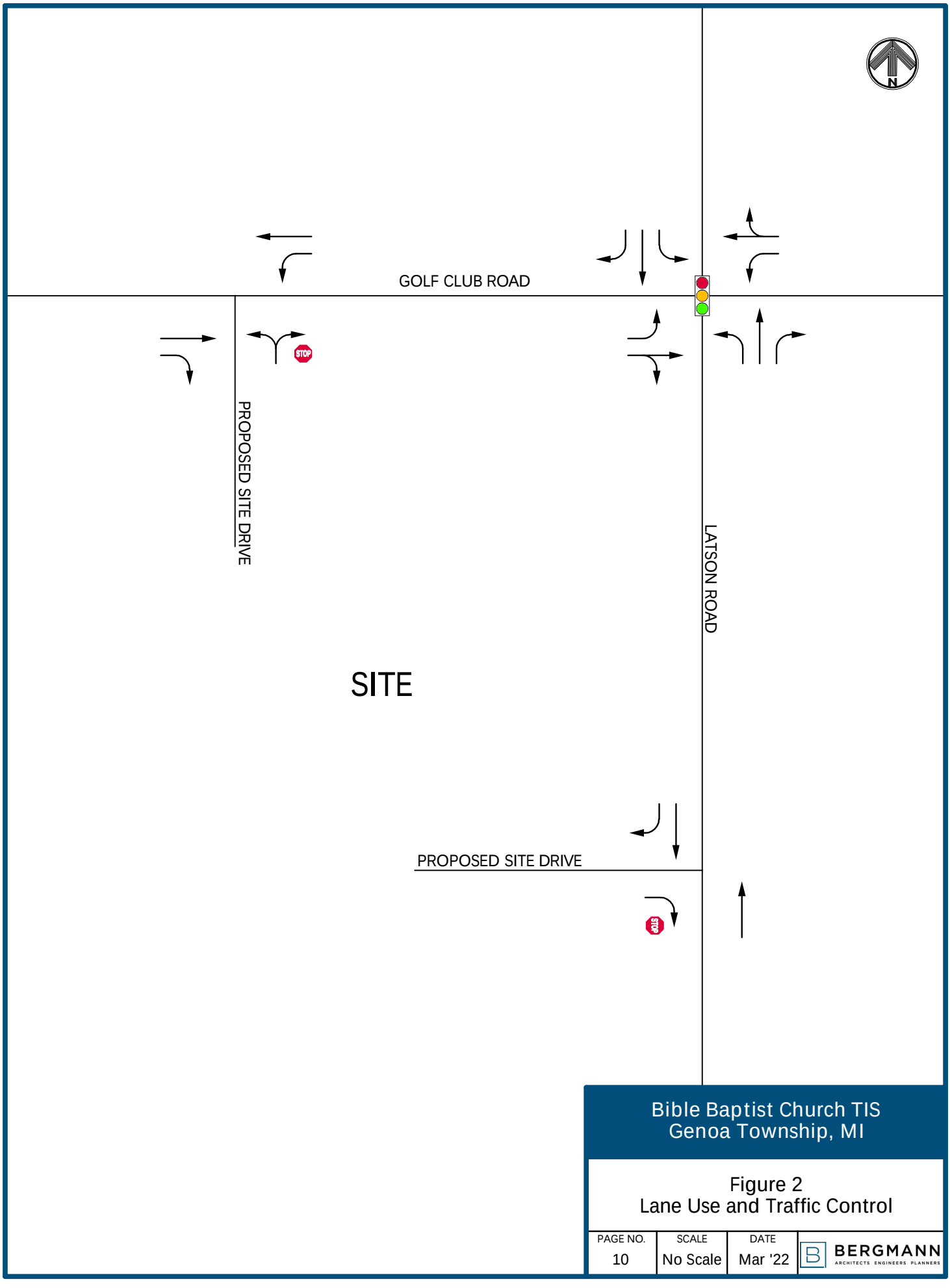


Chart 1: Church Arrival and Departure Patterns

In order to analyze two different 15-minute intervals, a separate inbound and outbound analysis scenario was completed for Phase I. For each scenario, only 20% of traffic in the non-peak direction was assumed to overlap with the peak direction being analyzed. This same approach was utilized for the Phase II analysis and accounts for a second Phase II service in the future should one ever be added.

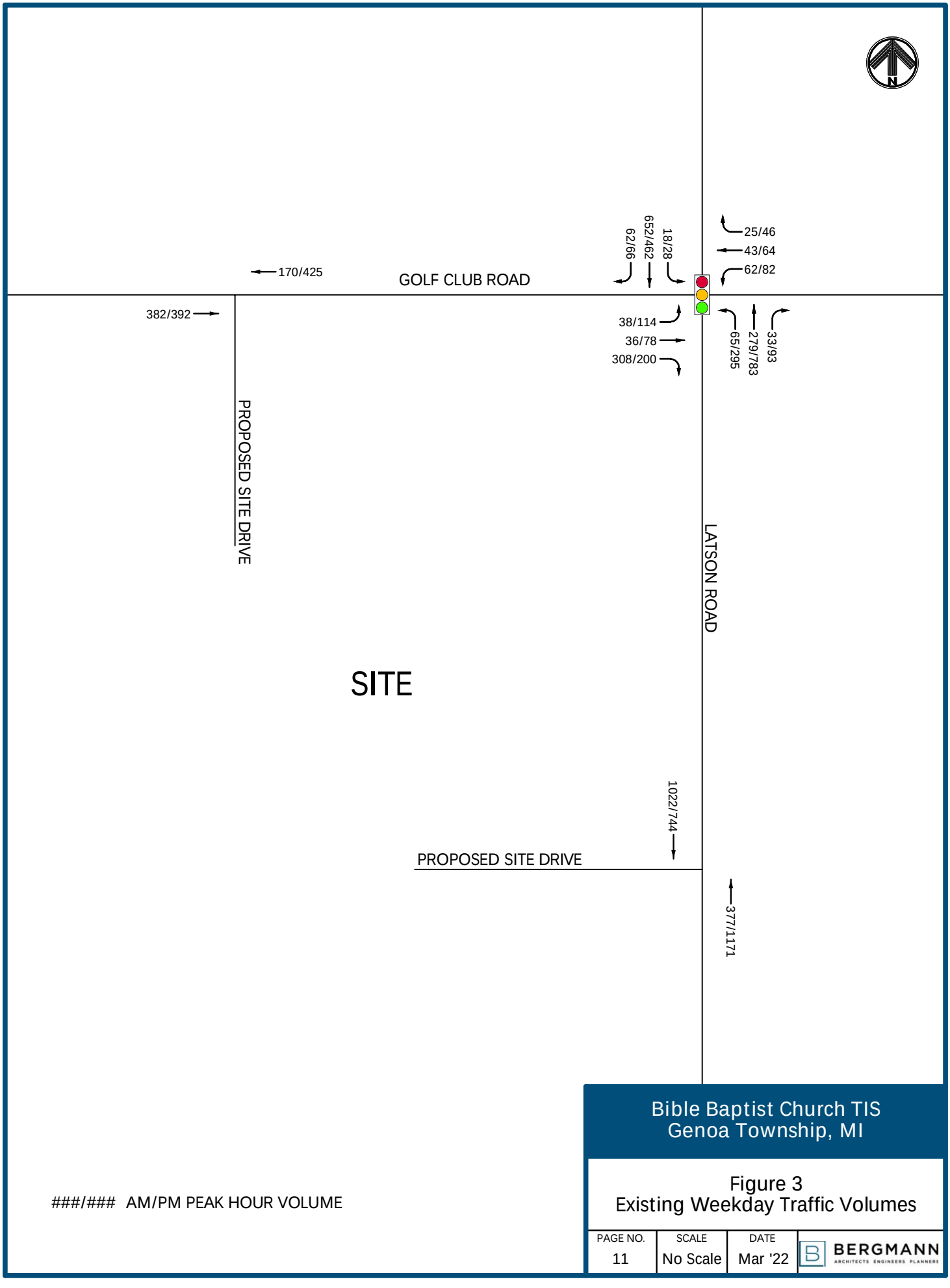
Queue length calculations were conducted using SimTraffic, Version 11 software. The existing conditions SimTraffic models were calibrated in accordance with the procedures outlined in the MDOT *Electronic Traffic Control Device Guidelines*.



Bible Baptist Church TIS
Genoa Township, MI

Figure 2
Lane Use and Traffic Control

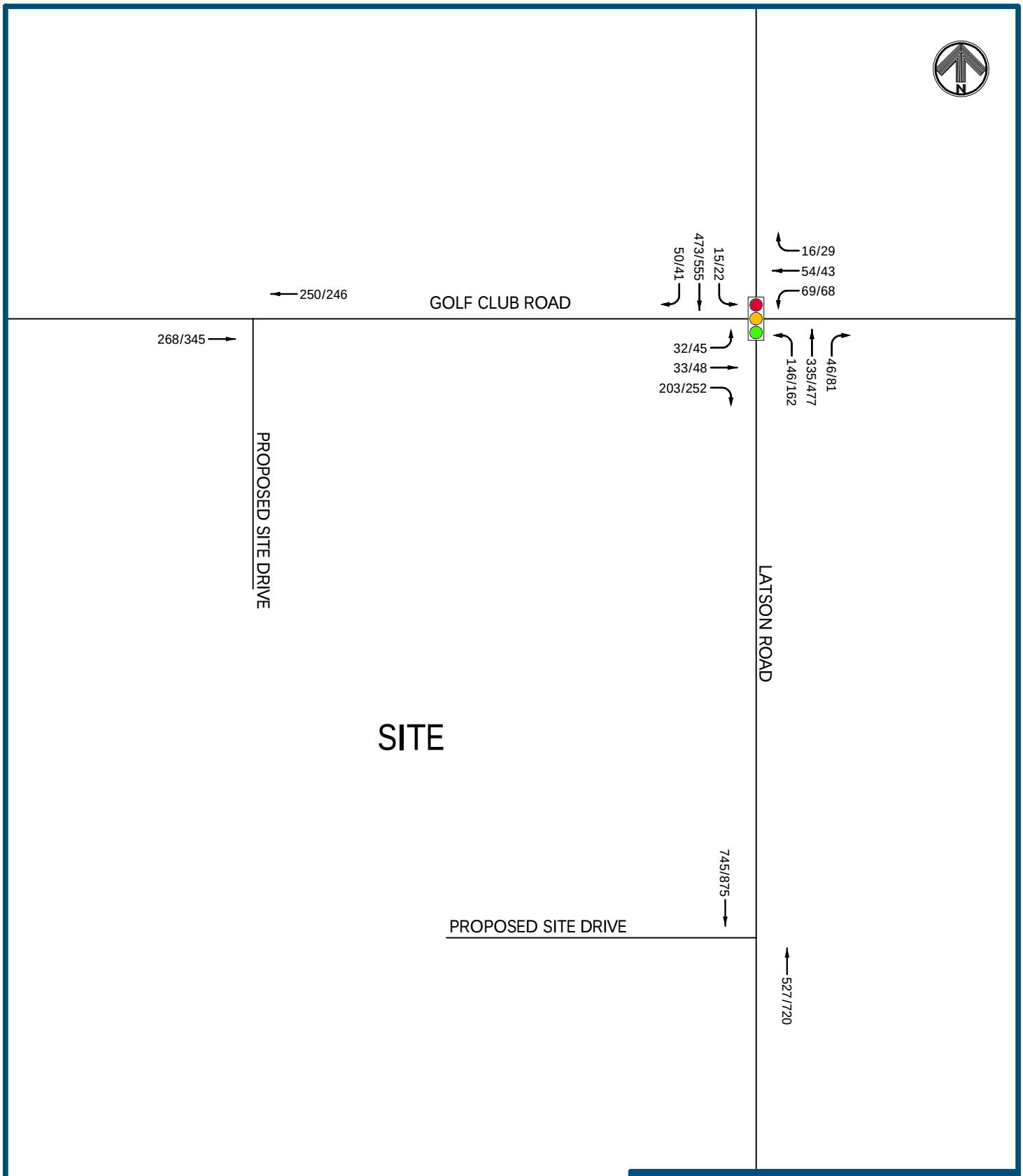
PAGE NO.	SCALE	DATE	
10	No Scale	Mar '22	BERGMANN ARCHITECTS ENGINEERS PLANNERS



Bible Baptist Church TIS
Genoa Township, MI

Figure 3
Existing Weekday Traffic Volumes

PAGE NO.	SCALE	DATE	
11	No Scale	Mar '22	BERGMANN ARCHITECTS ENGINEERS PLANNERS



###/### SUN PHASE I/SUN PHASE II PEAK HOUR VOLUME

Bible Baptist Church TIS
Genoa Township, MI

Figure 4
Existing Sunday Traffic Volumes

PAGE NO.	SCALE	DATE	
12	No Scale	Mar '22	BERGMANN ARCHITECTS ENGINEERS PLANNERS

4.0 Existing Traffic Conditions Analysis

4.1 EXISTING TRAFFIC CONDITIONS

Existing peak hour vehicle delays and LOS were calculated at the study intersections based on the existing lane configurations and traffic control shown on **Figure 2**, the existing traffic volumes shown on **Figure 3,** and the methodologies presented in the HCM6.

The HCM6 methodology conservatively assumes a right-turn-on-red flow rate of zero vehicles in cases where it is not explicitly known from field data. As the EB Golf Club Road approach has a high-volume of right-turning vehicles and low volume of through vehicles, field reviews were conducted to determine a right-turn-on-red flow rate. During field reviews, between two and three vehicles per cycle were observed turning right on red for this approach during the AM and SUN peak hour and between one and two vehicles per cycle were observed turning right on red during the PM peak hour. Therefore, based on the field observations and the intersection cycle length currently in operation during the peak periods, a right-turn-on-red flow rate of 75 vehicles per hour was utilized for the AM and SUN peak hour and 50 vehicles per hour was utilized during the PM peak hour.

Simulations of the study network were also observed using SimTraffic, in order to identify potential issues related to vehicle queuing, traffic flow between intersections, and the overall study network. The results of the analysis of existing conditions are presented in **Appendix B**, summarized in **Table 2** and described in further detail below.

Table 2: Existing 2021 Traffic Conditions

Intersection	Control	Approach	Movement	Existing Conditions							
				AM Peak		PM Peak		SUN Phase I		SUN Phase II	
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Latson Road & Golf Club Road	Signal	EB	Left	23.0	C	26.4	C	20.9	C	22.6	C
			Thru/Right	30.2	C	26.4	C	21.1	C	23.5	C
		WB	Left	34.6	C	32.6	C	25.2	C	29.0	C
			Thru/Right	21.2	C	21.3	C	19.1	B	20.3	C
		NB	Left	16.0	B	22.4	C	12.8	B	15.1	B
			Thru	9.1	A	14.5	B	7.4	A	9.2	A
			Right	7.7	A	8.0	A	6.0	A	7.0	A
		SB	Left	13.3	B	24.7	C	12.6	B	14.1	B
			Thru	24.7	C	25.8	C	19.0	C	21.6	C
			Right	13.6	B	17.8	B	12.9	B	14.0	B
		Overall		**21.9**	**C**	**20.8**	**C**	**15.5**	**B**	**17.1**	**B**

The results of the existing conditions analysis indicate that all approaches and movements at the intersection of Latson Road & Golf Club Road currently operate acceptably at a LOS C or better during the peak hours. Observation of peak hour simulations also indicate acceptable traffic operations during the peak hours with vehicles processed during each signal cycle and significant vehicle queues are not observed. Furthermore, SimTraffic vehicle delays for the EB shared through/right-turn lane are calculated to be 20.6, 27.0, 13.1, and 17.9 seconds per vehicle during the AM, PM, SUN Phase I, and SUN Phase II peak hours, respectively, validating the field reviews and right-turn-on-red flow rates utilized for this approach.

5.0 No-Build Traffic Conditions Analysis

Traffic impact studies typically include an evaluation of traffic operations in the future as they would be without the proposed development. This no-build condition serves to identify any mitigation that may be required, regardless of the project, and as a baseline for comparison of future buildout conditions. This scenario is comprised of existing traffic conditions, plus ambient traffic growth, plus traffic from approved developments in the study area that have

yet to be constructed. At the time of the 2021 traffic counts the following developments were identified within the study area and immediate vicinity that have yet to be constructed or were currently under construction:

1. Versa Mixed-Use Development
2. Westbury Phase II Residential Development

The vehicle trips that would be generated by the background developments were assigned to the study intersections based on the respective traffic study completed for each development. Where a traffic study was not completed for the development or the traffic study did not include the same intersections as this study, the number of vehicle trips was forecast based on data published by ITE in *Trip Generation, 11th Edition* and assigned to the study road network based on existing traffic patterns.

In addition to background developments, an ambient growth factor is applied to existing traffic volumes to account for future projects in the study area and population increases, as well as growth in regular traffic volumes due to development projects outside the study area. The recent construction of the I-96 & Latson Road interchange has resulted in significant changes in traffic patterns throughout the study area. As a result, historical traffic volumes do not provide an accurate representation of traffic growth in the area. Therefore, publicly available data from the Southeast Michigan Council of Governments (SEMCOG), including population and employment forecasts for Genoa Township were referenced.

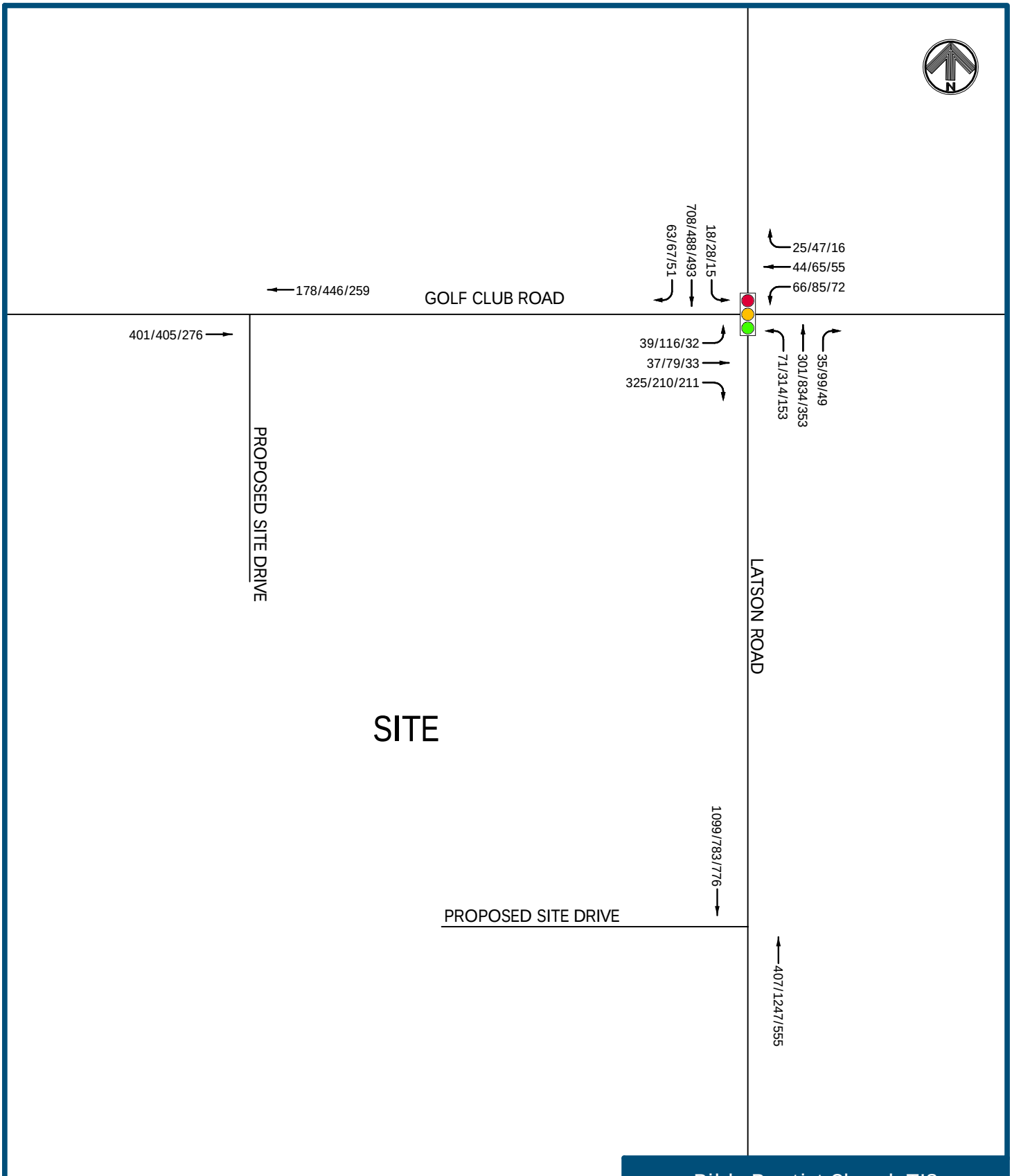
Table 3: SEMCOG Community Annual Growth Summary

Community	Measure	2015	2045	Growth
Genoa Township	Employment	12,072	13,534	0.38%
	Population	20,815	32,907	1.54%
Howell	Employment	10,365	11,527	0.35%
	Population	9,489	11,256	0.57%
Brighton	Employment	10,791	12,425	0.47%
	Population	17,791	21,883	0.69%
Brighton Township	Employment	10,772	12,986	0.63%
	Population	7,444	12,127	1.64%
AVERAGE				**0.78%**

The SEMCOG data indicates annual population and employment growths ranging from 0.35% to 1.64% between 2015 and 2045 as shown in **Table 3**. Therefore, an ambient background growth rate of 0.75% per year was utilized for this study. The ambient growth rate and trips from the background developments were applied to the existing 2021 traffic volumes to forecast the future 2023 and 2026 no-build traffic volumes ***without the proposed development.*** The resultant 2023 and 2026 no-build traffic volumes are summarized on **Figure 5** and **Figure 6**, respectively.

5.1 2023 NO-BUILD TRAFFIC CONDITIONS

2023 no-build peak hour vehicle delays and LOS were calculated at the study intersections based on the existing lane configurations and traffic control shown on **Figure 2**, the 2023 no-build traffic volumes shown on **Figure 5,** and the methodologies presented in the HCM6. The results of the analysis of 2023 no-build conditions are presented in **Appendix C**, summarized in **Table 4** and described in further detail below.

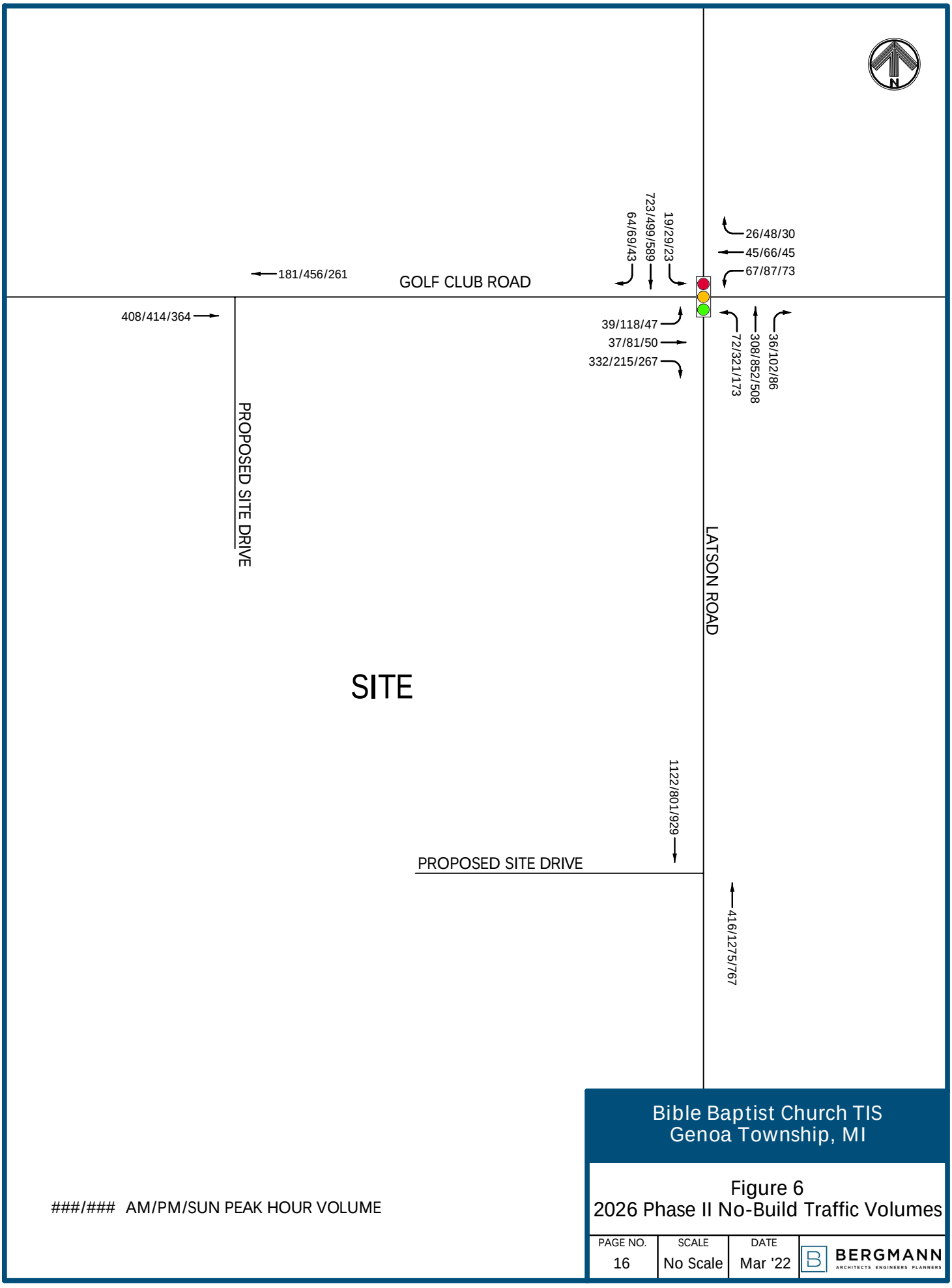


###/###/### AM/PM/SUN PEAK HOUR VOLUME

Bible Baptist Church TIS
Genoa Township, MI

Figure 5
2023 Phase I No-Build Traffic Volumes

PAGE NO.	SCALE	DATE	
15	No Scale	Mar '22	BERGMANN ARCHITECTS ENGINEERS PLANNERS



###/### AM/PM/SUN PEAK HOUR VOLUME

Bible Baptist Church TIS
Genoa Township, MI

Figure 6
2026 Phase II No-Build Traffic Volumes

PAGE NO.	SCALE	DATE	
16	No Scale	Mar '22	BERGMANN ARCHITECTS ENGINEERS PLANNERS

Table 4: 2023 No-Build Traffic Conditions

Intersection	Control	Approach	Movement	AM Peak				PM Peak				SUN Peak			
				Existing		No-Build		Existing		No-Build		Existing		No-Build	
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Latson Road & Golf Club Road	Signal	EB	Left	23.0	C	25.2	C	26.4	C	28.1	C	20.9	C	21.4	C
			Thru/Right	30.2	C	38.5	D	26.4	C	29.4	C	21.1	C	21.7	C
		WB	Left	34.6	C	41.6	D	32.6	C	35.8	D	25.2	C	26.2	C
			Thru/Right	21.2	C	23.1	C	21.3	C	22.5	C	19.1	B	19.6	B
		NB	Left	16.0	B	17.0	B	22.4	C	26.9	C	12.8	B	13.6	B
			Thru	9.1	A	8.8	A	14.5	B	15.7	B	7.4	A	7.8	A
			Right	7.7	A	7.3	A	8.0	A	7.9	A	6.0	A	6.2	A
		SB	Left	13.3	B	12.7	B	24.7	C	27.2	C	12.6	B	13.0	B
			Thru	24.7	C	27.0	C	25.8	C	26.5	C	19.0	C	20.0	C
			Right	13.6	B	13.0	B	17.8	B	17.9	B	12.9	B	13.2	B
		Overall		**21.9**	**C**	**24.8**	**C**	**20.8**	**C**	**22.5**	**C**	**15.5**	**B**	**16.2**	**B**

The results of the 2023 no-build conditions analysis indicate that all approaches and movements at the intersection of Latson Road & Golf Club Road will continue to operate acceptably at a LOS D or better during the peak hours. Observation of network simulations also indicate acceptable traffic operations during the peak hours with vehicles processed during each signal cycle and significant vehicle queues are not observed.

5.2 2026 NO-BUILD TRAFFIC CONDITIONS

2026 no-build peak hour vehicle delays and LOS were calculated at the study intersections based on the existing lane configurations and traffic control shown on **Figure 2**, the 2026 no-build traffic volumes shown on **Figure 6,** and the methodologies presented in the HCM6. The results of the analysis of 2026 no-build conditions are presented in **Appendix C**, summarized in **Table 5** and described in further detail below.

Table 5: 2026 No-Build Traffic Conditions

Intersection	Control	Approach	Movement	AM Peak				PM Peak				SUN Peak			
				Existing		No-Build		Existing		No-Build		Existing		No-Build	
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Latson Road & Golf Club Road	Signal	EB	Left	23.0	C	25.8	C	26.4	C	29.0	C	22.6	C	24.1	C
			Thru/Right	30.2	C	42.4	D	26.4	C	31.4	C	23.5	C	25.7	C
		WB	Left	34.6	C	45.6	D	32.6	C	38.5	D	29.0	C	32.0	C
			Thru/Right	21.2	C	23.7	C	21.3	C	23.1	C	20.3	C	21.6	C
		NB	Left	16.0	B	17.3	B	22.4	C	29.1	C	15.1	B	17.0	B
			Thru	9.1	A	8.7	A	14.5	B	16.1	B	9.2	A	10.0	B
			Right	7.7	A	7.2	A	8.0	A	7.8	A	7.0	A	7.5	A
		SB	Left	13.3	B	12.6	B	24.7	C	28.1	C	14.1	B	14.8	B
			Thru	24.7	C	27.6	C	25.8	C	26.6	C	21.6	C	23.4	C
			Right	13.6	B	12.9	B	17.8	B	17.8	B	14.0	B	14.7	B
		Overall		**21.9**	**C**	**26.0**	**C**	**20.8**	**C**	**23.4**	**C**	**17.1**	**B**	**18.6**	**B**

The results of the 2026 no-build conditions analysis indicate that all approaches and movements at the intersection of Latson Road & Golf Club Road will continue to operate acceptably at a LOS D or better during the peak hours. Observation of network simulations also indicate acceptable traffic operations during the peak hours with vehicles processed during each signal cycle and significant vehicle queues are not observed.

6.0 2023 Phase I Build Conditions Analysis

Phase I of the development plan is proposed to include a 506-seat church with site access provided via a single driveway to Golf Club Road.

6.1 SITE TRIP GENERATION

The number of AM, PM, and SUN peak hour vehicle trips that would be generated by the proposed development was forecast based on data published by ITE in *Trip Generation, 11th Edition*. The ITE land use that most closely matches the operations of the proposed development is *Land Use #560, Church*. The ITE trip generation forecast for the Sunday peak hour indicates an almost equal number of entering and exiting trips. This indicates that the data was likely collected at churches with multiple service times where the peak hour occurs between services. The ITE trip generation forecast for Phase I is summarized in **Table 6**.

Table 6: Phase I ITE Site Trip Generation

Land Use	ITE Code	Amount	Units	Average Daily Traffic	AM Peak Hour			PM Peak Hour			SUN Peak Hour		
					In	Out	Total	In	Out	Total	In	Out	Total
Church	560	506	Seats	454	21	14	35	23	28	51	121	125	246

As Phase I is proposed to include two services, this data provides a good forecast of Phase I operations; however, as previously discussed, there will be minimal overlap between entering and exiting traffic volumes in the peak 15-minutes based on the one-hour separation between the end of the first service and beginning of the second service. Analysis of a single time period with all forecast inbound and outbound traffic and application of PHFs previously identified would provide an overprediction of demand and delay. Therefore, separate inbound and outbound analysis scenarios were analyzed. For each scenario, only 20% of traffic in the non-peak direction was assumed to overlap with the peak direction being analyzed. The resulting Phase I site trip generation forecast utilized for each Sunday analysis scenario is summarized in **Table 7.**

Table 7: Phase I Sunday Site Trip Generation

Land Use	ITE Code	Amount	Units	SUN INBOUND Peak			SUN OUTBOUND PEAK		
				In	Out	Total	In	Out	Total
Church	560	506	Seats	121	25	146	24	125	149

6.2 TRAFFIC ASSIGNMENTS

The vehicle trips that would be generated by the proposed development were assigned to the study road network based on existing peak hour traffic patterns, zip code data provided by the Church for existing members, and ITE methodologies. These methods indicate that new trips will return to their direction of origin. The zip code data was reviewed in combination with available routes to/from the proposed site. The resulting trip distribution utilized in this study is summarized in **Table 8.**

Table 8: Site Trip Distribution

To/From	Via	AM/PM/SUN
North	Latson Road	15%
South	Latson Road	30%
East	Golf Club Road	5%
West	Golf Club Road	50%
TOTAL		**100%**

As only one driveway is proposed for Phase I, all trips were assigned to enter and exit the site via Golf Club Road. The site-generated vehicle trips were assigned to the study network as shown on **Figure 7**. These trips were added

to the 2023 no-build traffic volumes shown on **Figure 5** to calculate the future build traffic volumes shown on **Figure 8**.

6.3 AUXILIARY LANE ANALYSIS

In order to determine the configuration of the proposed site driveway with Golf Club Road, warrants for right and left-turn lanes were evaluated in accordance with the LCRC *Specifications and Administrative Rules Regulating Driveways, Road Approaches, Banners and Parades on and Over Highways*. LCRC does not publish warranting criteria for right-turn lanes, so the MDOT right-turn lane warrant outlined in Section 1.1.4 of the *Geometric Design Guidance* was utilized. Evaluation of the forecast site traffic volume assignments versus warranting criteria indicate a left turn lane and right-turn taper only is warranted at the proposed site driveway to Golf Club Road under Phase I. Due to the required length of storage and taper, the left turn lane for the site driveway should tie in full width to the existing left turn lane at the Latson Road intersection. The applicable warrant evaluations are included in **Appendix D**.

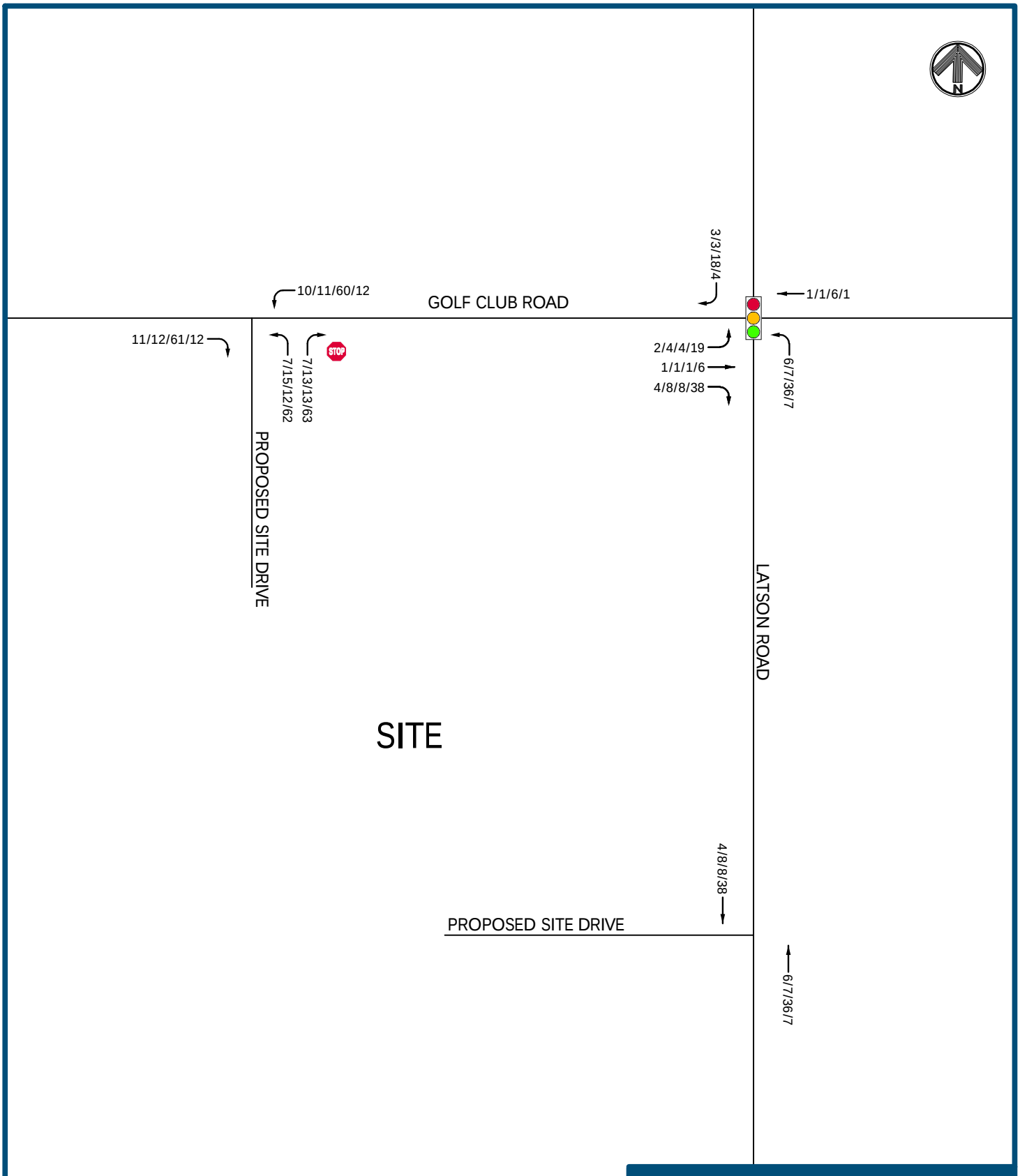
6.4 2023 PHASE I BUILD TRAFFIC CONDITIONS

Future 2023 phase I build peak hour vehicle delays and LOS ***with the proposed development*** were calculated based on existing lane configurations and traffic control shown on **Figure 2**, 2023 build traffic volumes shown on **Figure 8**, and HCM methodologies. SimTraffic simulations were also utilized to evaluate traffic flow and vehicle queues throughout the study network. The 2023 phase I build conditions results are included in **Appendix D** and summarized in **Table 9** and **Table 10**.

The results of the build conditions analysis indicate that the proposed development will not have a significant impact on the adjacent road network. All approaches and movements at the signalized intersection of Latson Road & Golf Club Road will continue to operate at a LOS D or better during all peak hour analysis scenarios and minor increases in delay will not be discernable. Additionally, all approaches and movements at the proposed site driveway to Golf Club Road will operate acceptably at a LOS C or better.

Table 9: 2023 Phase I Build Traffic Conditions - Weekday

Intersection	Control	Approach	Movement	AM Peak				PM Peak			
				No-Build		Phase I Build		No-Build		Phase I Build	
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Latson Road & Golf Club Road	Signal	EB	Left	25.2	C	25.7	C	28.1	C	28.6	C
			Thru/Right	38.5	D	40.1	D	29.4	C	31.0	C
		WB	Left	41.6	D	43.0	D	35.8	D	37.6	D
			Thru/Right	23.1	C	23.2	C	22.5	C	22.7	C
		NB	Left	17.0	B	17.2	B	26.9	C	28.2	C
			Thru	8.8	A	8.8	A	15.7	B	15.6	B
			Right	7.3	A	7.3	A	7.9	A	7.9	A
		SB	Left	12.7	B	12.8	B	27.2	C	27.1	C
			Thru	27.0	C	27.1	C	26.5	C	26.6	C
			Right	13.0	B	13.1	B	17.9	B	18.0	B
		Overall		**24.8**	**C**	**25.2**	**C**	**22.5**	**C**	**23.0**	**C**
Golf Club Road & Site Drive	STOP (Minor)	EB	Thru/Right	Free		Free		Free		Free	
		WB	Left			8.4	A			8.6	A
			Thru	Free		Free		Free		Free	
		NB	Left/Right			13.0	B			17.0	C

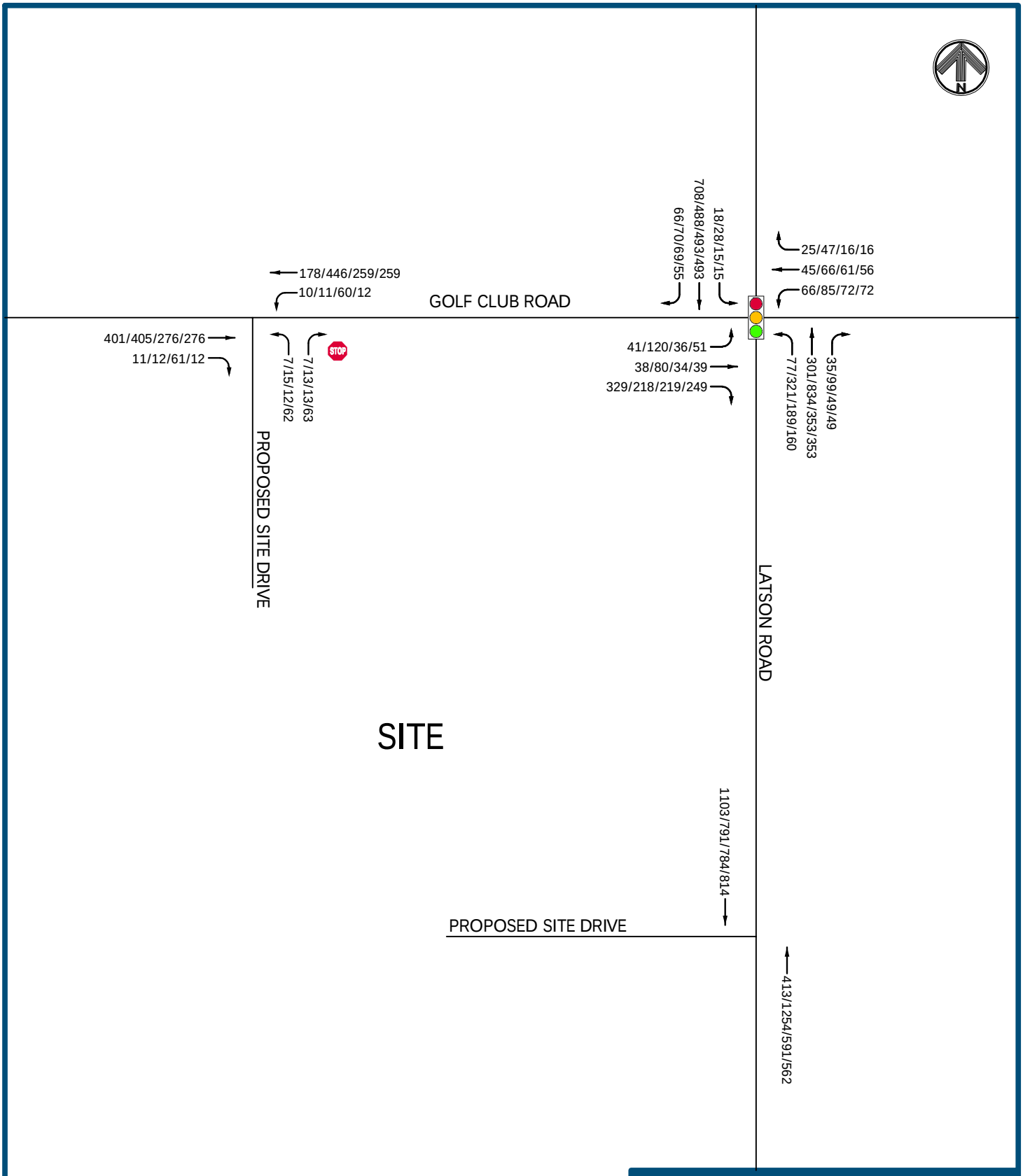


###/###/###/### AM/PM/SUN IN/SUN OUT PEAK HOUR VOLUME

Bible Baptist Church TIS
Genoa Township, MI

Figure 7
Phase I Site Generated Traffic Volumes

PAGE NO.	SCALE	DATE	
20	No Scale	Mar '22	BERGMANN ARCHITECTS ENGINEERS PLANNERS



###/###/###/### AM/PM/SUN IN/SUN OUT PEAK HOUR VOLUME

Bible Baptist Church TIS
Genoa Township, MI

Figure 8
2023 Phase I Build Traffic Volumes

PAGE NO.	SCALE	DATE	
21	No Scale	Mar '22	BERGMANN ARCHITECTS ENGINEERS PLANNERS

Table 10: 2023 Phase I Build Traffic Conditions - Sunday

Intersection	Control	Approach	Movement	SUN Peak					
				No-Build		Build INBOUND		Build OUTBOUND	
				Delay	LOS	Delay	LOS	Delay	LOS
Latson Road & Golf Club Road	Signal	EB	Left	21.4	C	24.9	C	24.1	C
			Thru/Right	21.7	C	24.7	C	26.6	C
		WB	Left	26.2	C	30.5	C	32.5	C
			Thru/Right	19.6	B	22.1	C	20.6	C
		NB	Left	13.6	B	19.5	B	18.2	B
			Thru	7.8	A	8.2	A	9.9	A
			Right	6.2	A	6.6	A	8.0	A
		SB	Left	13.0	B	15.2	B	16.3	B
			Thru	20.0	C	23.3	C	25.0	C
			Right	13.2	B	16.2	B	17.0	B
		Overall		**16.2**	**B**	**19.0**	**B**	**20.4**	**C**
Golf Club Road & Site Drive	STOP (Minor)	EB	Thru/Right	Free		Free		Free	
		WB	Left			8.8	A	8.1	A
			Thru	Free		Free		Free	
		NB	Left/Right			16.2	C	23.4	C

Review of peak hour simulations also indicate future build traffic operations which are similar to no-build conditions with significant vehicle queues not observed. Vehicle queue lengths from the signalized intersection of Latson Road & Golf Club Road were also calculated and evaluated with respect to the proposed driveway located approximately 650 feet west of Latson Road. The results of this evaluation indicate a 95th percentile queue length of 237 feet or less during all peak hours for the EB approach which would not extend back past the proposed site driveway. Additionally, the EB left-turn movement from Golf Club Road onto Latson Road and WB left-turn movement into the proposed site driveway would experience a combined 95th percentile queue length of 161 feet or less during the peak hours which would not result in any left-turn conflict. Therefore, the proposed development does not require any off-site roadway or traffic control improvements under Phase I build conditions.

7.0 2026 Phase II Build Conditions Analysis

Phase II of the development plan is proposed to expand the church to 1,000 seats. The following two site access alternatives were analyzed for Phase II:

1. Alternative A: Site access provided via a single driveway to Golf Club Road.
2. Alternative B: Site access provided via one driveway to Golf Club Road and a right-in-right-out driveway to Latson Road.

7.1 SITE TRIP GENERATION

The number of AM, PM, and SUN peak hour vehicle trips that would be generated by the proposed development was forecast utilizing the methodologies and assumptions discussed for Phase I. The ITE trip generation forecast for Phase II is summarized in **Table 11**.

Table 11: Phase II ITE Site Trip Generation

Land Use	ITE Code	Amount	Units	Average Daily Traffic	AM Peak Hour			PM Peak Hour			SUN Peak Hour		
					In	Out	Total	In	Out	Total	In	Out	Total
Church	560	1,000	Seats	913	42	28	70	45	55	100	249	259	508

Phase II is planned to only include one service at this time; however, a second service may be added at some point in the future. Therefore, separate inbound and outbound analysis scenarios were once again analyzed for Phase II. For each scenario, only 20% of traffic in the non-peak direction was assumed to overlap with the peak direction being analyzed. The resulting Phase II site trip generation forecast utilized for each Sunday analysis scenario is summarized in **Table 12.**

Table 12: Phase I Sunday Site Trip Generation

Land Use	ITE Code	Amount	Units	SUN IN Peak Hour			SUN OUT Peak Hour		
				In	Out	Total	In	Out	Total
Church	560	1,000	Seats	249	52	301	50	259	309

7.2 TRAFFIC ASSIGNMENTS

The vehicle trips that would be generated by the proposed development were assigned to the study road network based on the trip distribution methodologies and assumptions developed for Phase I and summarized in **Table 8.** For Phase II Alternative A, all trips were assigned to enter and exit the site via Golf Club Road. For Phase II Alternative B, all egress traffic to the south on Latson Road was assigned to utilize the RIRO driveway. All remaining outbound traffic was assigned to the Golf Club Road driveway. For inbound, all traffic from the north was assigned to the RIRO driveway while all traffic from the south, east, and west was assigned to the Golf Club Road driveway. The site-generated vehicle trips were assigned to the study network as shown on **Figure 9** and **Figure 10**. These trips were added to the 2026 no-build traffic volumes shown on **Figure 6** to calculate the future Phase II build traffic volumes shown on **Figure 11** and **Figure 12**.

7.3 AUXILIARY LANE ANALYSIS

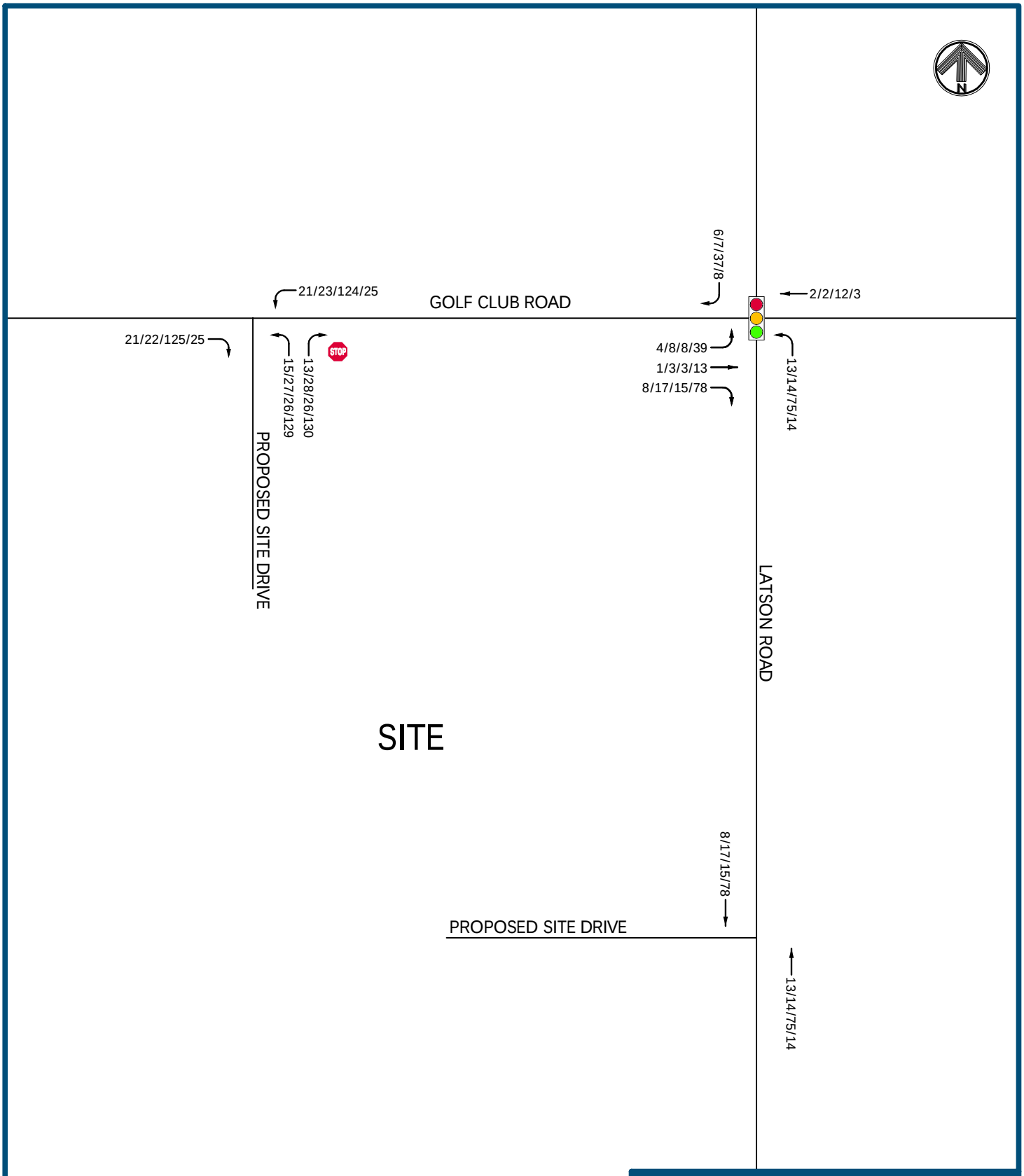
In order to determine the configuration of the proposed site driveway(s) with Golf Club Road and Latson Road, warrants for right-turn lanes were evaluated for each Phase II site access alternative in accordance with the LCRC *Specifications and Administrative Rules Regulating Driveways, Road Approaches, Banners and Parades on and Over Highways*. Evaluation of the forecast site traffic volume assignments versus warranting criteria indicate a right turn lane would be warranted at the Golf Club Road driveway under both site access alternatives. At the Latson Road driveway, a right-turn taper only would be warranted under Alternative B. The applicable warrant evaluations are included in **Appendix E**.

7.4 2026 PHASE II BUILD TRAFFIC CONDITIONS – ALTERNATIVE A

Future 2026 Phase II Alternative A build peak hour vehicle delays and LOS ***with the proposed development*** were calculated based on existing lane configurations and traffic control shown on **Figure 2**, 2026 build traffic volumes shown on **Figure 11**, and HCM methodologies. SimTraffic simulations were also utilized to evaluate traffic flow and vehicle queues throughout the study network. The 2026 Phase II Alternative A build conditions results are included in **Appendix E** and summarized in **Table 13** and **Table 14**.

The results of the build conditions analysis indicate that the proposed development will not have a significant impact on the adjacent road network during the weekday peak hours. All approaches and movements at the signalized intersection of Latson Road & Golf Club Road will continue to operate at a LOS D or better and minor increases in delay will not be discernable. Additionally, all approaches and movements at the proposed site driveway to Golf Club Road will operate acceptably at a LOS C or better during the weekday peak hours.

During the Sunday peak hours, the EB through/right-turn movement and WB left-turn movement at the signalized intersection of Latson Road & Golf Club Road would be reduced to a LOS F during the outbound peak 15-minute period. Additionally, the STOP controlled egress site driveway approach to Golf Club Road will operate at a LOS E or F during both the inbound and outbound peak 15-minute periods.

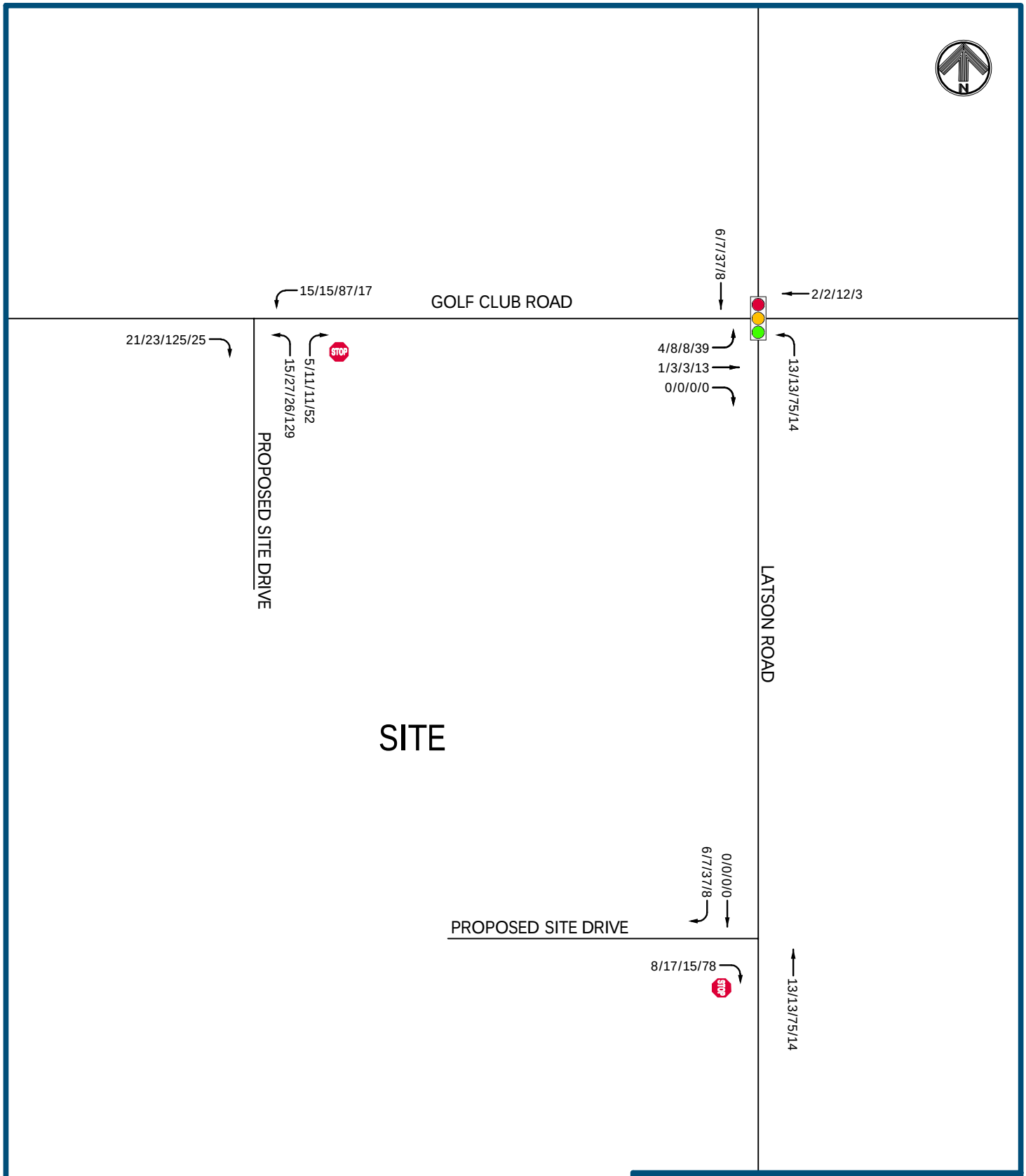


###/###/###/### AM/PM/SUN IN/SUN OUT PEAK HOUR VOLUME

Bible Baptist Church TIS
Genoa Township, MI

Figure 9
Phase II Site Generated Traffic Volumes - Alternative A

PAGE NO.	SCALE	DATE	
24	No Scale	Mar '22	BERGMANN ARCHITECTS ENGINEERS PLANNERS



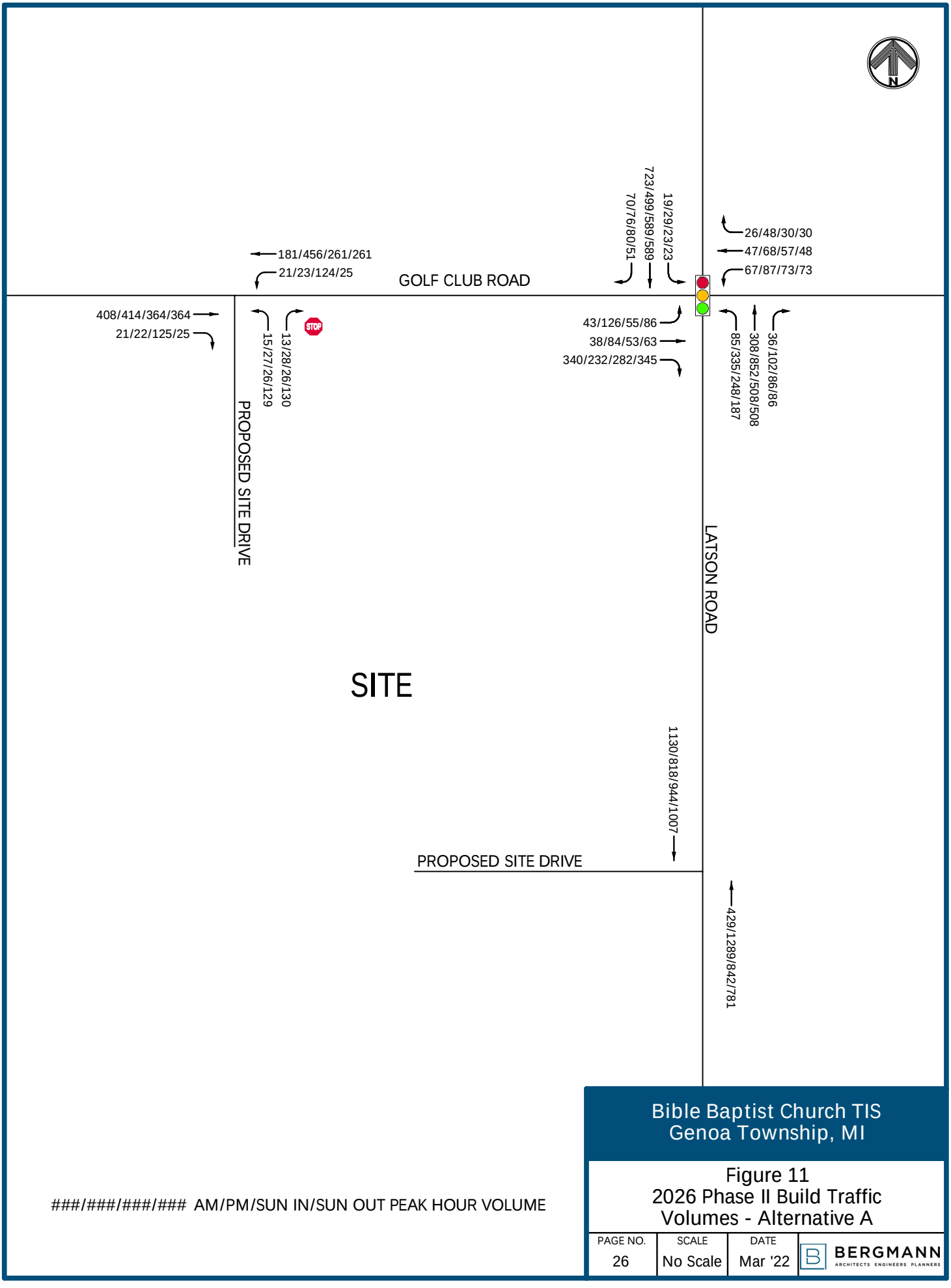
###/###/###/### AM/PM/SUN IN/SUN OUT PEAK HOUR VOLUME

Bible Baptist Church TIS
Genoa Township, MI

Figure 10
Phase II Site Generated Traffic Volumes - Alternative B

PAGE NO.	SCALE	DATE
25	No Scale	Mar '22

BERGMANN
ARCHITECTS ENGINEERS PLANNERS



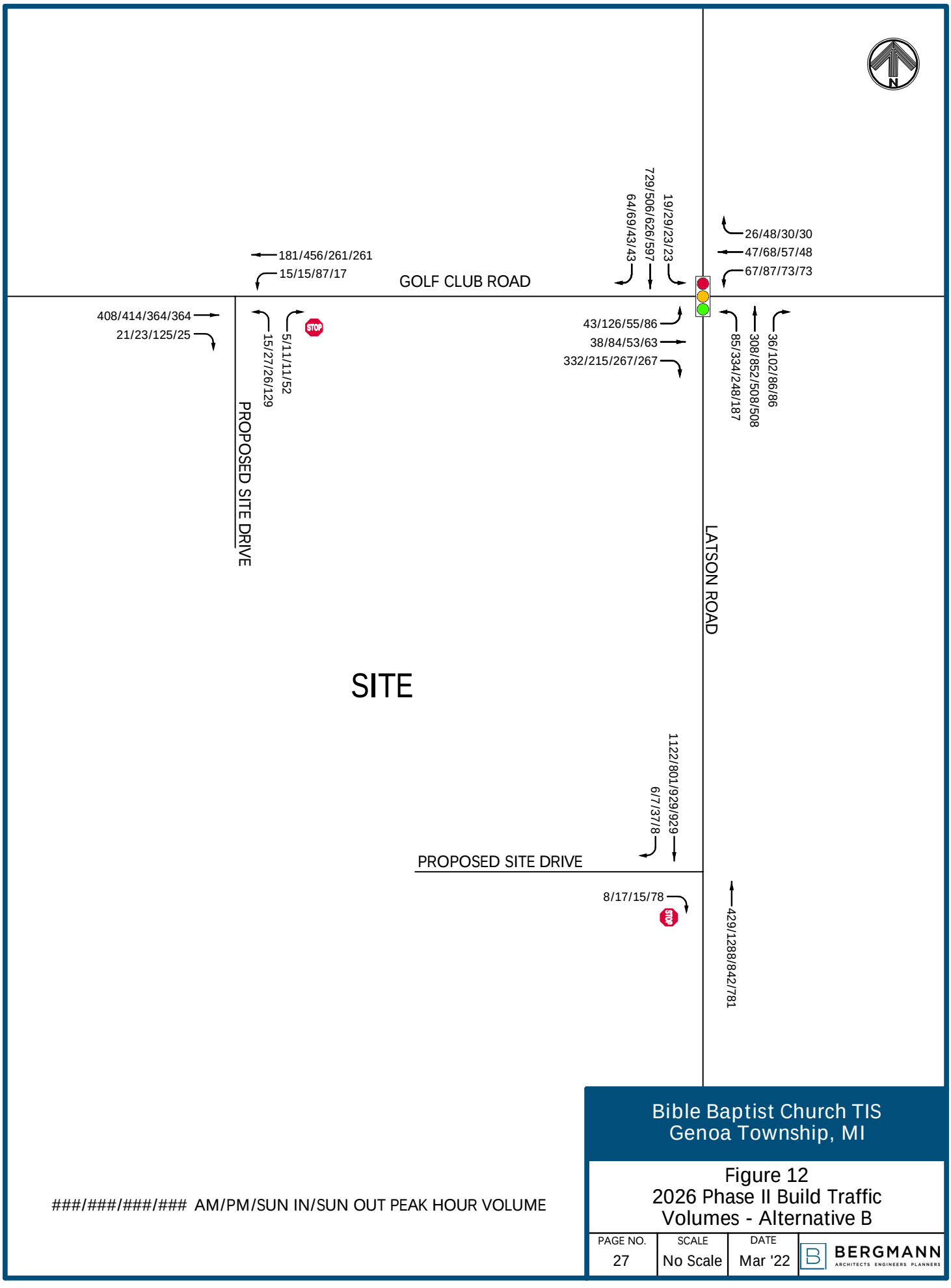
###/###/###/### AM/PM/SUN IN/SUN OUT PEAK HOUR VOLUME

Bible Baptist Church TIS
Genoa Township, MI

Figure 11
2026 Phase II Build Traffic Volumes - Alternative A

PAGE NO.	SCALE	DATE
26	No Scale	Mar '22

BERGMANN
ARCHITECTS ENGINEERS PLANNERS



Bible Baptist Church TIS
Genoa Township, MI

Figure 12
2026 Phase II Build Traffic Volumes - Alternative B

PAGE NO.	SCALE	DATE	
27	No Scale	Mar '22	BERGMANN ARCHITECTS ENGINEERS PLANNERS

Table 13: 2026 Phase II Build Traffic Conditions – Alternative A – Weekday

Intersection	Control	Approach	Movement	AM Peak				PM Peak			
				No-Build		Build – ALT A		No-Build		Build – ALT A	
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Latson Road & Golf Club Road	Signal	EB	Left	25.8	C	26.2	C	29.0	C	29.9	C
			Thru/Right	42.4	D	46.4	D	31.4	C	35.6	D
		WB	Left	45.6	D	50.0	D	38.5	D	43.9	D
			Thru/Right	23.7	C	23.9	C	23.1	C	23.5	C
		NB	Left	17.3	B	17.8	B	29.1	C	31.8	C
			Thru	8.7	A	8.7	A	16.1	B	16.0	B
			Right	7.2	A	7.2	A	7.8	A	7.7	A
		SB	Left	12.6	B	12.7	B	28.1	C	27.8	C
			Thru	27.6	C	27.8	C	26.6	C	26.8	C
			Right	12.9	B	13.0	B	17.8	B	18.1	B
		Overall		**26.0**	**C**	**27.0**	**C**	**23.4**	**C**	**24.6**	**C**
Golf Club Road & Site Drive	STOP (Minor)	EB	Thru/Right	Free		Free		Free		Free	
		WB	Left			8.5	A			8.7	A
			Thru	Free		Free		Free		Free	
		NB	Left/Right			13.8	B			18.8	C

Table 14: 2026 Phase II Build Traffic Conditions – Alternative A – Sunday

Intersection	Control	Approach	Movement	SUN Phase II – ALT A					
				No-Build		Build INBOUND		Build OUTBOUND	
				Delay	LOS	Delay	LOS	Delay	LOS
Latson Road & Golf Club Road	Signal	EB	Left	24.1	C	29.6	C	27.9	C
			Thru/Right	25.7	C	34.7	C	81.4	F
		WB	Left	32.0	C	41.5	D	134.7	F
			Thru/Right	21.6	C	25.5	C	22.4	C
		NB	Left	17.0	B	40.2	D	19.7	B
			Thru	10.0	B	9.9	A	10.6	B
			Right	7.5	A	7.4	A	7.9	A
		SB	Left	14.8	B	17.2	B	15.9	B
			Thru	23.4	C	28.3	C	25.6	C
			Right	14.7	B	18.1	B	16.0	B
		Overall		**18.6**	**B**	**25.4**	**C**	**35.1**	**D**
Golf Club Road & Site Drive	STOP (Minor)	EB	Thru/Right	Free		Free		Free	
		WB	Left			10.6	B	8.4	A
			Thru	Free		Free		Free	
		NB	Left/Right			48.3	E	284.6	F

Review of the peak hour simulations indicate future build traffic operations which are similar to no-build conditions during the weekday peak hours with vehicle queues processed during each signal cycle and significant vehicle queues not observed. During the Sunday peak hour, brief periods of moderate vehicle queues are observed at the signalized intersection of Latson Road & Golf Club Road for movements to and from the site; however, these queues dissipate quickly and are not present throughout the duration of the peak hour. Long delays and queues are also observed for the STOP controlled egress site driveway approach during the outbound peak 15-minute period which is typical of Churches. This queue also dissipates quickly and is not present throughout the duration of the peak hour.

Vehicle queue lengths from the signalized intersection of Latson Road & Golf Club Road were also calculated and evaluated with respect to the proposed driveway. The results of this evaluation indicate a 95th percentile queue length of 334 feet or less during all peak hours for the EB approach which would not extend back past the proposed site driveway. Additionally, the EB left-turn movement from Golf Club Road onto Latson Road and WB left-turn movement into the proposed site driveway would experience a combined 95th percentile queue length of 189 feet or less during the peak hours which would not result in any left turn conflict.

7.5 2026 PHASE II BUILD TRAFFIC CONDITIONS WITH IMPROVEMENTS – ALTERNATIVE A

In order to improve traffic operations in the Phase II Alternative A build conditions, signal cycle length and timing adjustments were investigated at the intersection of Latson Road & Golf Club Road. The results of this analysis indicate that with optimized timings at the intersection, all approaches and movements would operate acceptably at a LOS D or better during the outbound peak 15-minutes as shown in **Table 15**. Therefore, special Sunday timing plans during service times may be necessary with Phase II build conditions Alternative A and should be coordinated with LCRC.

Table 15: 2026 Phase II Build Traffic Conditions with Improvements– Alternative A

Intersection	Control	Approach	Movement	SUN Phase II – Alternative A					
				No-Build		Build Out		Build Out IMP	
				Delay	LOS	Delay	LOS	Delay	LOS
Latson Road & Golf Club Road	Signal	EB	Left	24.1	C	27.9	C	26.1	C
			Thru/Right	25.7	C	81.4	F	33.1	C
		WB	Left	32.0	C	134.7	F	44.6	D
			Thru/Right	21.6	C	22.4	C	21.1	C
		NB	Left	17.0	B	19.7	B	52.1	D
			Thru	10.0	B	10.6	B	16.9	B
			Right	7.5	A	7.9	A	12.6	B
		SB	Left	14.8	B	15.9	B	24.0	C
			Thru	23.4	C	25.6	C	44.3	D
			Right	14.7	B	16.0	B	21.3	C
		Overall		**18.6**	**B**	**35.1**	**D**	**32.1**	**C**

7.6 2026 PHASE II BUILD TRAFFIC CONDITIONS – ALTERNATIVE B

Future 2026 Phase II Alternative B build peak hour vehicle delays and LOS ***with the proposed development*** were calculated based on existing lane configurations and traffic control shown on **Figure 2**, 2026 build traffic volumes shown on **Figure 12**, and HCM methodologies. SimTraffic simulations were also utilized to evaluate traffic flow and vehicle queues throughout the study network. The 2026 Phase II Alternative B build conditions results are included in **Appendix F** and summarized in **Table 16** and **Table 17.**

The results of the Phase II Alternative B build conditions analysis indicate that the proposed development would not have a significant impact on the adjacent road network during the weekday or Sunday peak hours. All approaches and movements at the signalized intersection of Latson Road & Golf Club Road would continue to operate at a LOS D or better. At the proposed site driveways to Golf Club Road and Latson Road all approaches, and movements will operate acceptably at a LOS C or better during the weekday peak hours; however, the STOP controlled egress site driveway approaches to Golf Club Road and Latson Road will operate at a LOS F during the outbound peak 15-minute period.

Table 16: 2026 Phase II Build Traffic Conditions – Alternative B – Weekday

Intersection	Control	Approach	Movement	AM Peak				PM Peak			
				No-Build		Build – ALT B		No-Build		Build – ALT B	
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Latson Road & Golf Club Road	Signal	EB	Left	25.8	C	26.4	C	29.0	C	30.2	C
			Thru/Right	42.4	D	44.1	D	31.4	C	32.8	C
		WB	Left	45.6	D	47.7	D	38.5	D	40.4	D
			Thru/Right	23.7	C	24.1	C	23.1	C	23.7	C
		NB	Left	17.3	B	17.9	B	29.1	C	32.3	C
			Thru	8.7	A	8.6	A	16.1	B	15.9	B
			Right	7.2	A	7.1	A	7.8	A	7.7	A
		SB	Left	12.6	B	12.6	B	28.1	C	27.7	C
			Thru	27.6	C	28.1	C	26.6	C	26.8	C
			Right	12.9	B	12.9	B	17.8	B	17.9	B
		Overall		**26.0**	**C**	**26.6**	**C**	**23.4**	**C**	**24.2**	**C**
Golf Club Road & Site Drive	STOP (Minor)	EB	Thru/Right	Free		Free		Free		Free	
		WB	Left			8.5	A			8.7	A
			Thru	Free		Free		Free		Free	
		NB	Left/Right			14.2	B			20.0	C
Latson Road & Site Drive	STOP (Minor)	EB	Right			23.2	C			17.1	C
		NB	Thru	Free		Free		Free		Free	
		SB	Thru/Right	Free		Free		Free		Free	

Table 17: 2026 Phase II Build Traffic Conditions – Alternative B – Sunday

Intersection	Control	Approach	Movement	SUN Phase II – ALT B					
				No-Build		Build INBOUND		Build OUTBOUND	
				Delay	LOS	Delay	LOS	Delay	LOS
Latson Road & Golf Club Road	Signal	EB	Left	24.1	C	32.9	C	29.8	C
			Thru/Right	25.7	C	35.9	D	30.9	C
		WB	Left	32.0	C	43.6	D	37.2	D
			Thru/Right	21.6	C	28.3	C	23.9	C
		NB	Left	17.0	B	53.8	D	21.3	C
			Thru	10.0	B	9.3	A	10.2	B
			Right	7.5	A	6.9	A	7.6	A
		SB	Left	14.8	B	16.4	B	15.3	B
			Thru	23.4	C	32.1	C	27.2	C
			Right	14.7	B	16.2	B	15.2	B
		Overall		**18.6**	**B**	**29.0**	**C**	**22.0**	**C**
Golf Club Road & Site Drive	STOP (Minor)	EB	Thru/Right	Free		Free		Free	
		WB	Left			10.0	B	8.4	A
			Thru	Free		Free		Free	
		NB	Left/Right			31.9	D	136.9	F
Latson Road & Site Drive	STOP (Minor)	EB	Right			19.5	C	54.2	F
		NB	Thru	Free		Free		Free	
		SB	Thru/Right	Free		Free		Free	

Review of the peak hour simulations indicate future build traffic operations which are similar to no-build conditions during the weekday peak hours with vehicle queues processed during each signal cycle and significant vehicle queues not observed. During the Sunday peak hour, brief periods of moderate vehicle queues are observed at the

signalized intersection of Latson Road & Golf Club Road for the NB left-turn movement; however, this queue dissipates quickly and is not present throughout the duration of the peak hour. On the site driveway approach to Golf Club Road, a long vehicle queue is observed during the outbound peak 15-minute period; however, the duration and length of this queue is reduced as compared to Alternative A. On the site driveway approach to Latson Road, the 95th percentile queue length is calculated to be 152 feet (six vehicles), which is not significant given the intensity of traffic utilizing this approach over a short duration of time.

Vehicle queue lengths from the signalized intersection of Latson Road & Golf Club Road were also calculated and evaluated with respect to the proposed driveways. The results of this evaluation indicate a 95th percentile queue length of 357 feet and 477 feet or less during all peak hours for the EB and NB approaches, respectively, which would not extend back past the proposed site driveways. Additionally, the EB left-turn movement from Golf Club Road onto Latson Road and WB left-turn movement into the proposed site driveway would experience a combined 95th percentile queue length of 221 feet or less during the peak hours which would be adequately stored in the center lane for left turns. Therefore, the proposed development does not require any off-site roadway or traffic control improvements under Phase II Alternative B build conditions.

Based on the results of the two site access alternatives, Alternative B is recommended for Phase II of the development. This alternative would provide improved traffic operations for egress traffic from the site and reduce traffic impacts to the Latson Road & Golf Club Road intersection.

8.0 Conclusions and Recommendations

The Conclusions related to this Traffic Impact Study and relative analyses are as follows:

1. At the time of this study, traffic volumes throughout the State of Michigan were impacted by restrictions in place associated with the COVID pandemic. Therefore, historic turning movement count data collected in April, 2019 was utilized to validate baseline traffic volumes for this study.
2. All approaches and movements at the study intersection of Latson Road & Golf Club Road currently operate acceptably at a LOS D or better during all peak hours.
3. Church time-of-day patterns and traffic volumes indicate approximately 80% of outbound traffic occurs in the first 30-minutes after service ends while approximately 85% of inbound traffic occurs in the 30-minutes prior to the service start time. Therefore, separate inbound and outbound analysis scenarios were completed as there will be minimal overlap between inbound and outbound traffic based on the one-hour separation between services.
4. All approaches and movements at the study intersection of Latson Road & Golf Club Road would continue to operate acceptably in the 2023 and 2026 no-build scenarios during all peak hours.
5. In accordance with LCRC standards, a left-turn lane and right-turn taper are warranted at the proposed site driveway to Golf Club Road under Phase I build conditions.
6. The 2023 Phase I build conditions analysis indicate that the proposed development will not have a significant impact on the adjacent road network. All approaches and movements at the intersection of Latson Road & Golf Club Road will continue to operate at a LOS D or better during all peak hours and minor increases in delay will not be discernable. Additionally, all approaches and movements at the proposed site driveway to Golf Club Road will operate acceptably. Therefore, the proposed development does not require any off-site roadway or traffic control improvements under Phase I build conditions.
7. In accordance with LCRC standards, a right-turn lane would be warranted at the proposed site driveway to Golf Club Road under Phase II build conditions.

8. The 2026 Phase II Alternative A build conditions analysis indicate the EB through/right-turn movement and WB left-turn movement at the signalized intersection of Latson Road & Golf Club Road would be reduced to a LOS F during the Sunday outbound peak 15-minute period. Additionally, the STOP controlled egress site driveway approach to Golf Club Road will operate at a LOS E or F during both the Sunday inbound and outbound peak 15-minute periods.
9. In order to improve traffic operations in the 2026 Phase II Alternative A build conditions, special Sunday timing plans during service times should be provided at the intersection of Latson Road & Golf Club Road.
10. In accordance with LCRC standards, a right-turn taper would be warranted at the proposed site driveway to Latson Road under Phase II Alternative B build conditions.
11. The 2026 Phase II Alternative B build conditions analysis indicate all approaches and movements at the intersection of Latson Road & Golf Club Road will continue to operate at a LOS D or better during all peak hours. At the proposed site driveways to Golf Club Road and Latson Road all approaches, and movements will operate acceptably at a LOS C or better during the weekday peak hours; however, the STOP controlled egress site driveway approaches to Golf Club Road and Latson Road will operate at a LOS F during the outbound peak 15-minute period.
12. Review of network simulations indicate a long vehicle queue on the site driveway approach to Golf Club Road during the outbound peak 15-minute period; however, the duration and length of this queue is reduced as compared to Alternative A. On the site driveway approach to Latson Road, the 95th percentile queue length is calculated to be 152 feet (six vehicles), which is not significant given the intensity of traffic utilizing this approach over a short duration of time. Therefore, the proposed development does not require any off-site roadway or traffic control improvements under Phase II Alternative B build conditions.
13. Queues from the signalized intersection of Latson Road & Golf Club Road would not block the site driveways to Golf Club Road or Latson Road under either Phase I or Phase II build conditions. Additionally, there will be no left-turn conflict along Golf Club Road between EB left turns at Latson Road and WB left turns at the proposed site driveway.
14. Site access Alternative B is recommended under Phase II build conditions as it would provide improved traffic operations for egress traffic from the site and reduce traffic impacts to the Latson Road & Golf Club Road intersection.

Based on the results of this study, the following improvements are recommended:

2023 Phase I Conditions

1. Construct left-turn lane and right-turn taper at proposed driveway to Golf Club Road.

2026 Phase II Alternative A Conditions

1. Construct right-turn lane at proposed driveway to Golf Club Road.
2. Install special timing plans at intersection of Latson Road & Golf Club Road associated with Sunday service times.

2026 Phase II Alternative B Conditions

1. Construct right-turn lane at proposed driveway to Golf Club Road.
2. Construct right-turn taper at proposed driveway to Latson Road.

Appendix A – Traffic Count Data

Location: Latson Road & Golf Club Drive
City/Twp: Genoa Township, MI
Date: 04/02/2019 (Tuesday)
Weather:
Collected By: LCRC

	Eastbound Golf Club Dr					Northbound Latson Road					Westbound Golf Club Dr					Southbound Latson Road				
Start Time	Left	Thru	Right	Total	Peds	Left	Thru	Right	Total	Peds	Left	Thru	Right	Total	Peds	Left	Thru	Right	Total	Peds
6:30 AM	10	2	66	78	0	4	17	0	21	0	20	6	6	32	0	2	160	7	169	0
6:45 AM	9	1	84	94	0	5	37	2	44	0	21	17	5	43	0	2	144	6	152	0
7:00 AM	5	2	74	81	0	11	30	2	43	0	27	15	5	47	0	4	144	12	160	0
7:15 AM	6	7	59	72	0	14	44	1	59	0	18	9	3	30	0	2	182	12	196	0
7:30 AM	5	5	99	109	0	8	68	3	79	0	9	6	6	21	0	3	164	9	176	0
7:45 AM	6	5	71	82	0	16	76	4	96	0	20	12	3	35	0	4	171	16	191	0
8:00 AM	4	9	70	83	0	6	62	6	74	0	11	9	3	23	0	1	152	12	165	0
8:15 AM	6	7	68	81	0	10	73	5	88	0	21	8	3	32	0	2	165	11	178	0
8:30 AM	5	3	53	61	0	10	69	5	84	0	19	6	8	33	0	3	179	12	194	0
8:45 AM	6	2	54	62	0	17	73	7	97	0	18	7	3	28	0	1	177	10	188	0
AM Peak	21	26	308	355	0	40	279	18	337	0	61	35	15	111	0	10	652	48	710	0
PHF			0.81					0.88					0.79					0.93		
4:00 PM	18	13	28	59	0	44	238	16	298	0	25	9	6	40	0	6	117	5	128	0
4:15 PM	22	7	41	70	0	42	181	9	232	0	20	10	13	43	0	1	106	7	114	0
4:30 PM	27	13	35	75	0	28	199	20	247	0	11	12	9	32	0	2	85	6	93	0
4:45 PM	12	13	36	61	0	33	228	16	277	0	27	15	11	53	0	9	108	12	129	0
5:00 PM	40	12	33	85	0	24	213	14	251	0	31	11	9	51	0	7	102	15	124	0
5:15 PM	32	23	23	78	0	42	264	16	322	0	14	16	14	44	0	5	134	8	147	0
5:30 PM	30	30	51	111	0	48	257	16	321	0	10	11	12	33	0	3	109	11	123	0
5:45 PM	20	9	25	54	0	55	218	20	293	0	15	15	9	39	0	3	102	13	118	0
PM Peak	114	78	143	335	0	147	962	62	1171	0	82	53	46	181	0	24	453	46	523	0
PHF			0.75					0.91					0.85					0.89		

AM PEAK (7:00 AM to 9:00 AM)														
		SB			WB			NB			EB			
Day	Date	R	T	L	R	T	L	R	T	L	R	T	L	Total
Thursday	11/11/2021	65	580	17	15	39	71	36	292	33	278	40	47	1513
Friday	11/12/2021	62	574	32	25	52	61	40	247	71	245	39	37	1485
Saturday	11/13/2021	27	335	16	5	27	48	24	172	41	143	15	31	884
Sunday	11/14/2021	26	309	8	11	20	39	25	144	63	138	25	25	833
Monday	11/15/2021	53	528	23	25	39	54	25	249	59	261	32	35	1383
Tuesday	11/16/2021	62	611	18	25	44	59	28	180	78	280	35	44	1464
Wednesday	11/17/2021	62	528	24	31	40	62	31	251	68	279	39	34	1449
Thursday	11/18/2021	63	634	17	26	36	63	33	250	61	294	44	39	1560
Friday	11/19/2021	50	569	17	30	40	76	33	252	78	301	35	38	1519
Saturday	11/20/2021	31	323	5	7	27	41	20	133	40	159	12	14	812
Sunday	11/21/2021	22	329	3	13	34	57	33	173	72	153	20	17	926
Monday	11/22/2021	56	598	15	23	44	63	38	264	70	273	36	38	1518
Tuesday	11/23/2021	56	599	17	23	49	65	40	218	55	298	35	36	1491
Wednesday	11/24/2021	48	540	8	8	45	60	34	188	86	273	30	24	1344
Thursday	11/25/2021	13	134	2	7	5	24	16	99	41	57	7	15	420
Friday	11/26/2021	23	344	6	10	23	41	23	159	47	166	15	21	878
Saturday	11/27/2021	23	244	7	5	19	37	18	111	39	120	17	11	651
Sunday	11/28/2021	16	259	4	8	18	30	16	136	65	101	16	17	686
Monday	11/29/2021	59	570	16	26	32	49	18	236	74	266	27	32	1405
Tuesday	11/30/2021	67	534	18	26	48	48	27	247	71	271	30	33	1420
Wednesday	12/1/2021	58	546	16	25	48	59	19	170	86	287	35	54	1403
Thursday	12/2/2021	87	426	25	34	43	48	22	221	67	286	43	44	1346
Friday	12/3/2021	47	590	15	21	39	56	31	273	80	247	37	32	1468
Saturday	12/4/2021	36	236	8	7	27	35	19	93	48	138	21	22	690
Sunday	12/5/2021	39	264	7	11	26	43	27	157	56	178	12	19	839
Monday	12/6/2021	61	632	16	30	44	51	30	263	52	280	28	29	1516
Tuesday	12/7/2021	68	600	17	22	43	60	25	221	70	288	31	35	1480
Wednesday	12/8/2021	48	545	15	16	34	55	16	220	73	262	31	34	1349
Thursday	12/9/2021	74	592	12	27	45	54	29	234	77	303	37	41	1525
Average		**62**	**592**	**18**	**25**	**43**	**62**	**33**	**243**	**65**	**284**	**36**	**38**	**1502**
		4.1%	*39.4%*	*1.2%*	*1.7%*	*2.9%*	*4.1%*	*2.2%*	*16.2%*	*4.3%*	*18.9%*	*2.4%*	*2.5%*	*100.0%*
4/2/2019		**48**	**652**	**10**	**15**	**35**	**61**	**18**	**279**	**40**	**308**	**26**	**21**	**1513**
		3.2%	*43.1%*	*0.7%*	*1.0%*	*2.3%*	*4.0%*	*1.2%*	*18.4%*	*2.6%*	*20.4%*	*1.7%*	*1.4%*	*100.0%*
2022 BASELINE		**62**	**652**	**18**	**25**	**43**	**62**	**33**	**279**	**65**	**308**	**36**	**38**	**1622**
		3.8%	*40.2%*	*1.1%*	*1.6%*	*2.7%*	*3.8%*	*2.0%*	*17.2%*	*4.0%*	*19.0%*	*2.2%*	*2.3%*	*100.0%*

PM PEAK (4:00 PM to 6:00 PM)														
		SB			WB			NB			EB			
Day	Date	R	T	L	R	T	L	R	T	L	R	T	L	Total
Thursday	11/11/2021	47	541	24	25	57	76	90	713	247	197	65	63	2145
Friday	11/12/2021	69	492	22	41	73	73	89	778	253	198	63	98	2249
Saturday	11/13/2021	51	410	13	25	47	56	63	466	177	157	39	56	1560
Sunday	11/14/2021	41	429	15	16	33	48	39	335	146	159	19	30	1310
Monday	11/15/2021	44	407	22	35	64	65	92	736	303	192	63	76	2099
Tuesday	11/16/2021	63	455	22	36	58	69	90	755	291	172	63	87	2161
Wednesday	11/17/2021	61	450	27	41	53	69	86	756	274	196	61	59	2133
Thursday	11/18/2021	45	451	26	32	61	78	101	685	280	201	61	92	2113
Friday	11/19/2021	58	511	27	34	73	94	84	781	264	217	58	84	2285
Saturday	11/20/2021	40	410	21	26	37	63	77	505	189	198	44	76	1686
Sunday	11/21/2021	40	336	12	15	54	69	42	315	139	187	33	22	1264
Monday	11/22/2021	54	412	69	46	63	86	103	852	292	199	70	87	2333
Tuesday	11/23/2021	77	491	30	54	60	79	103	779	296	194	68	83	2314
Wednesday	11/24/2021	94	468	19	35	54	91	101	732	289	214	49	85	2231
Thursday	11/25/2021	17	221	14	23	22	37	34	247	87	81	19	19	821
Friday	11/26/2021	71	477	11	16	59	49	78	449	188	169	36	42	1645
Saturday	11/27/2021	33	331	9	16	29	56	49	390	118	135	24	49	1239
Sunday	11/28/2021	35	402	15	12	25	62	42	308	117	199	22	28	1267
Monday	11/29/2021	67	356	19	31	49	71	89	514	264	177	60	72	1769
Tuesday	11/30/2021	53	358	21	30	58	54	82	573	259	199	66	62	1815
Wednesday	12/1/2021	69	388	25	43	63	75	73	533	268	169	63	71	1840
Thursday	12/2/2021	70	394	33	38	69	61	79	736	299	194	47	96	2116
Friday	12/3/2021	72	501	21	34	59	74	73	754	271	217	46	82	2204
Saturday	12/4/2021	63	402	18	26	58	65	84	480	178	191	32	57	1654
Sunday	12/5/2021	50	473	11	16	31	57	46	302	107	203	26	32	1354
Monday	12/6/2021	59	479	28	20	62	60	88	740	261	172	53	66	2088
Tuesday	12/7/2021	61	454	21	33	62	71	82	756	299	186	65	75	2165
Wednesday	12/8/2021	68	388	27	28	67	64	77	746	298	207	61	86	2117
Thursday	12/9/2021	85	457	25	33	82	69	97	704	307	207	52	73	2191
Average		**66**	**462**	**28**	**36**	**64**	**75**	**90**	**752**	**283**	**200**	**59**	**82**	**2197**
		3.0%	*21.0%*	*1.3%*	*1.7%*	*2.9%*	*3.4%*	*4.1%*	*34.2%*	*12.9%*	*9.1%*	*2.7%*	*3.7%*	*100.0%*
4/2/2019		**46**	**453**	**24**	**46**	**53**	**82**	**62**	**962**	**147**	**143**	**78**	**114**	**2210**
		2.1%	*20.5%*	*1.1%*	*2.1%*	*2.4%*	*3.7%*	*2.8%*	*43.5%*	*6.7%*	*6.5%*	*3.5%*	*5.2%*	*100.0%*
2022 BASELINE		**66**	**462**	**28**	**46**	**64**	**82**	**93**	**783**	**295**	**200**	**78**	**114**	**2310**
		2.9%	*20.0%*	*1.2%*	*2.0%*	*2.8%*	*3.5%*	*4.0%*	*33.9%*	*12.7%*	*8.7%*	*3.4%*	*4.9%*	*100.0%*

PHASE I (9:45 AM to 11:45 AM)														
		SB			WB			NB			EB			
Day	Date	R	T	L	R	T	L	R	T	L	R	T	L	Total
Sunday	11/14/2021	41	429	15	16	33	48	39	335	146	159	19	30	1310
Sunday	11/21/2021	40	336	12	15	54	69	42	315	139	187	33	22	1264
Sunday	11/28/2021	35	402	15	12	25	62	42	308	117	199	22	28	1267
Sunday	12/5/2021	50	473	11	16	31	57	46	302	107	203	26	32	1354
Average		**42**	**410**	**13**	**15**	**36**	**59**	**42**	**315**	**127**	**187**	**25**	**28**	**1299**
		3.2%	*31.6%*	*1.0%*	*1.1%*	*2.8%*	*4.5%*	*3.3%*	*24.3%*	*9.8%*	*14.4%*	*1.9%*	*2.2%*	*100.0%*
2022 BASELINE		**50**	**473**	**15**	**16**	**54**	**69**	**46**	**335**	**146**	**203**	**33**	**32**	**1472**
		3.4%	*32.1%*	*1.0%*	*1.1%*	*3.7%*	*4.7%*	*3.1%*	*22.8%*	*9.9%*	*13.8%*	*2.2%*	*2.2%*	*100.0%*

PHASE II (11:30 AM to 1:00 PM)														
		SB			WB			NB			EB			
Day	Date	R	T	L	R	T	L	R	T	L	R	T	L	Total
Sunday	11/14/2021	35	547	22	29	34	68	81	442	148	252	34	45	1737
Sunday	11/21/2021	36	555	16	22	43	60	70	477	146	247	48	36	1756
Sunday	11/28/2021	23	489	21	17	24	62	59	384	159	221	38	37	1534
Sunday	12/5/2021	41	527	22	16	33	62	55	426	162	247	42	41	1674
Average		**37**	**543**	**20**	**22**	**37**	**63**	**69**	**448**	**152**	**249**	**41**	**41**	**1722**
		2.2%	*31.5%*	*1.2%*	*1.3%*	*2.1%*	*3.7%*	*4.0%*	*26.0%*	*8.8%*	*14.4%*	*2.4%*	*2.4%*	*100.0%*
2022 BASELINE		**41**	**555**	**22**	**29**	**43**	**68**	**81**	**477**	**162**	**252**	**48**	**45**	**1823**
		2.2%	*30.4%*	*1.2%*	*1.6%*	*2.4%*	*3.7%*	*4.4%*	*26.2%*	*8.9%*	*13.8%*	*2.6%*	*2.5%*	*100.0%*

Church Entering Traffic Volumes Prior to Start of Service

Site	Day	Service Start Time	0:00 - 0:15	0:15 - 0:30	0:30 - 0:45	0:45 - 1:00	1:00 - 1:15	Peak Hour Total	PHF	
2|42 Church - Brighton	Sunday	8:45 AM	-	8	36	126	47	217	0.43	
		10:15 AM	2	27	96	226	64	413	0.46	
		11:45 AM	5	9	70	190	176	445	0.59	Excluded
Kensington Church - Clinton Township	Sunday	9:00 AM	-	9	40	126	36	211	0.42	
		10:30 AM	6	12	69	162	68	311	0.48	
		12:00 PM	7	9	33	119	48	209	0.44	
Woodside Bible Church - White Lake	Sunday	8:30 AM	4	9	8	38	10	65	0.43	
		10:00 AM	4	8	29	77	18	132	0.43	
		11:30 AM	3	0	12	33	22	67	0.51	
TOTAL			31	91	393	1,097	489	2,070	0.45	
				4%	19%	53%	24%			

Church Exiting Traffic Volumes After End of Service

Site	Day	Service End Time	-0:00 - 0:15	0:00 - 0:15	0:15 - 0:30	0:30 - 0:45	0:45 - 1:00	Peak Hour Total	PHF	
2|42 Church - Brighton	Sunday	9:45 AM	14	159	38	30	11	238	0.37	
		11:15 AM	7	190	167	70	42	469	0.62	Excluded
		12:45 PM	15	232	153	72	28	485	0.52	
Kensington Church - Clinton Township	Sunday	10:00 AM	2	113	36	12	3	164	0.36	
		11:30 AM	4	159	88	24	7	278	0.44	
Woodside Bible Church - White Lake	Sunday	9:30 AM	0	11	4	2	0	17	0.39	
		11:00 AM	12	54	8	4	2	68	0.31	
		12:30 PM	2	40	14	11	2	67	0.42	
TOTAL			56	958	508	225	95	1,786	0.40	
				54%	28%	13%	5%			

Thick line represents service start/end time

Zip Code	Members	Direction			
		North	South	East	West
48843	103	10%	10%	10%	70%
48855	34	50%	0%	0%	50%
48836	15	0%	0%	0%	100%
48116	11	0%	100%	0%	0%
48169	13	0%	100%	0%	0%
48114	9	0%	75%	25%	0%
48137	4	0%	100%	0%	0%
48430	4	100%	0%	0%	0%
48353	2	100%	0%	0%	0%
Total:	195	33	45	12	104
		17%	23%	6%	53%

SEMCOG | Southeast Michigan Council of Governments

Community Profiles

YOU ARE VIEWING DATA FOR:

Brighton Township

4363 Buno Rd
Brighton, MI 48114-9269
http://www.brightontwp.com/

SEMCOG MEMBER

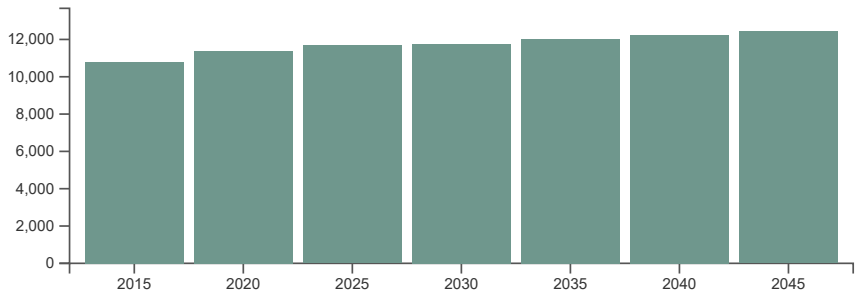
Census 2010 Population: 17,791
Area: 34.6 square miles

VIEW COMMUNITY EXPLORER MAP

Economy & Jobs

Link to American Community Survey (ACS) Profiles: **Select a Year** 2013-2017 ▾ **Economic**

Forecasted Jobs



Source: **SEMCOG 2045 Regional Development Forecast**

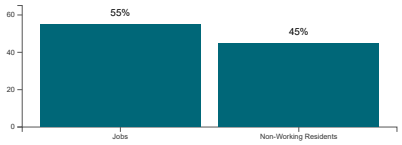
Forecasted Jobs by Industry Sector

Forecasted Jobs By Industry Sector	2015	2020	2025	2030	2035	2040	2045	Change 2015-2045	Pct Change 2015-2045
Natural Resources, Mining, & Construction	1,021	1,209	1,152	1,063	1,053	1,037	1,027	6	0.6%
Manufacturing	551	552	558	565	584	606	603	52	9.4%
Wholesale Trade	350	350	325	323	330	332	349	-1	-0.3%
Retail Trade	1,149	1,224	1,145	1,078	1,056	932	926	-223	-19.4%
Transportation, Warehousing, & Utilities	256	238	245	246	237	235	243	-13	-5.1%
Information & Financial Activities	1,195	1,312	1,339	1,380	1,418	1,496	1,540	345	28.9%
Professional and Technical Services & Corporate HQ	2,482	2,447	2,527	2,580	2,631	2,673	2,692	210	8.5%
Administrative, Support, & Waste Services	752	817	861	858	880	914	909	157	20.9%
Education Services	425	461	474	486	496	501	506	81	19.1%
Healthcare Services	907	924	1,083	1,158	1,207	1,280	1,369	462	50.9%
Leisure & Hospitality	709	806	849	886	955	1,010	1,032	323	45.6%
Other Services	838	891	956	972	1,008	1,055	1,055	217	25.9%
Public Administration	156	157	160	167	170	172	174	18	11.5%
Total Employment Numbers	10,791	11,388	11,674	11,762	12,025	12,243	12,425	1,634	15.1%

Source: **SEMCOG 2045 Regional Development Forecast**

Daytime Population

Daytime Population	SEMCOG and ACS 2015
Jobs	10,791
Non-Working Residents	8,809
Age 15 and under	3,428
Not in labor force	4,903
Unemployed	478
Daytime Population	19,600



Source: **SEMCOG 2045 Regional Development Forecast** and **2011-2015 American Community Survey 5-Year Estimates**

Note: The number of residents attending school outside Southeast Michigan is not available. Likewise, the number of students commuting into Southeast Michigan to attend school is also not known.

SEMCOG | Southeast Michigan Council of Governments

Community Profiles

YOU ARE VIEWING DATA FOR:

Brighton Township

4363 Buno Rd
Brighton, MI 48114-9269
http://www.brightontwp.com/

SEMCOG MEMBER

Census 2010 Population: 17,791
Area: 34.6 square miles

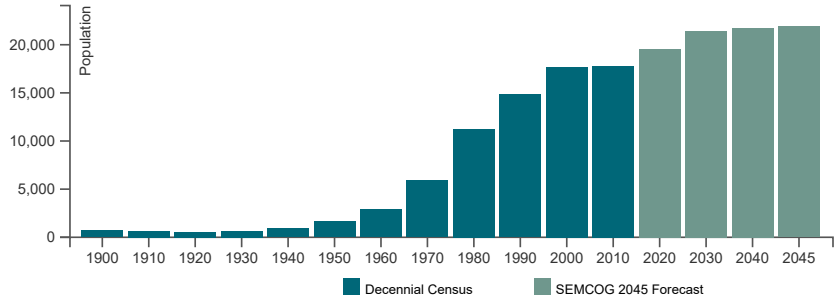
VIEW COMMUNITY EXPLORER MAP

Population and Households

Link to American Community Survey (ACS) Profiles: **Select a Year** 2013-2017 ▾ **Social** | **Demographic**

Population and Household Estimates for Southeast Michigan, 2019

Population Forecast



Population and Households

Population and Households	Census 2010	Change 2000-2010	Pct Change 2000-2010	SEMCOG Jul 2019	SEMCOG 2045
Total Population	17,791	118	0.7%	18,776	21,883
Group Quarters Population	111	54	94.7%	107	233
Household Population	17,680	64	0.4%	18,669	21,650
Housing Units	6,765	588	9.5%	7,139	-
Households (Occupied Units)	6,415	465	7.8%	6,833	8,300
Residential Vacancy Rate	5.2%	1.5%	-	4.3%	-
Average Household Size	2.76	-0.20	-	2.73	2.61

Source: **U.S. Census Bureau**, **SEMCOG Population and Household Estimates**, and **SEMCOG 2045 Regional Development Forecast**

Components of Population Change

Components of Population Change	2000-2005 Avg.	2006-2010 Avg.	2011-2015 Avg.
Natural Increase (Births - Deaths)	156	40	42
Births	248	130	147
Deaths	92	90	105
Net Migration (Movement In - Movement Out)	-63	-109	100
Population Change (Natural Increase + Net Migration)	93	-69	142

Source: **Michigan Department of Community Health Vital Statistics**, **U.S. Census Bureau**, and SEMCOG

SEMCOG | Southeast Michigan Council of Governments

Community Profiles

YOU ARE VIEWING DATA FOR:

Genoa Township

2911 Dorr Rd
Brighton, MI 48116-9436
http://www.genoa.org

SEMCOG MEMBER

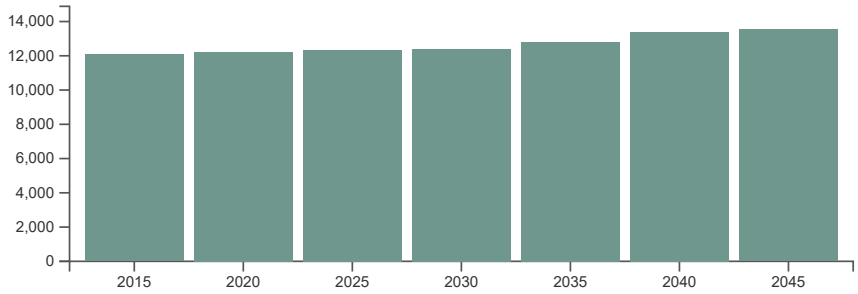
Census 2010 Population: 19,821
Area: 36.3 square miles

VIEW COMMUNITY EXPLORER MAP

Economy & Jobs

Link to American Community Survey (ACS) Profiles: **Select a Year** 2013-2017 ▾ **Economic**

Forecasted Jobs



Source: **SEMCOG 2045 Regional Development Forecast**

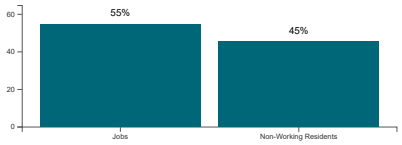
Forecasted Jobs by Industry Sector

Forecasted Jobs By Industry Sector	2015	2020	2025	2030	2035	2040	2045	Change 2015-2045	Pct Change 2015-2045
Natural Resources, Mining, & Construction	1,054	1,086	1,045	993	968	963	952	-102	-9.7%
Manufacturing	782	719	684	621	622	584	561	-221	-28.3%
Wholesale Trade	329	276	270	264	281	280	282	-47	-14.3%
Retail Trade	2,122	2,032	2,018	1,928	1,909	2,177	2,104	-18	-0.8%
Transportation, Warehousing, & Utilities	148	179	200	207	241	283	312	164	110.8%
Information & Financial Activities	1,457	1,531	1,561	1,608	1,723	1,754	1,783	326	22.4%
Professional and Technical Services & Corporate HQ	814	808	870	932	1,016	1,096	1,152	338	41.5%
Administrative, Support, & Waste Services	715	746	775	809	832	869	877	162	22.7%
Education Services	371	393	398	406	416	424	436	65	17.5%
Healthcare Services	1,200	1,261	1,287	1,282	1,348	1,455	1,523	323	26.9%
Leisure & Hospitality	1,615	1,642	1,673	1,772	1,822	1,888	1,951	336	20.8%
Other Services	925	967	977	996	1,027	1,000	983	58	6.3%
Public Administration	540	562	580	589	604	614	618	78	14.4%
Total Employment Numbers	12,072	12,202	12,338	12,407	12,809	13,387	13,534	1,462	12.1%

Source: **SEMCOG 2045 Regional Development Forecast**

Daytime Population

Daytime Population	SEMCOG and ACS 2015
Jobs	12,072
Non-Working Residents	10,009
Age 15 and under	3,738
Not in labor force	5,566
Unemployed	705
Daytime Population	22,081



Source: **SEMCOG 2045 Regional Development Forecast** and **2011-2015 American Community Survey 5-Year Estimates**

Note: The number of residents attending school outside Southeast Michigan is not available. Likewise, the number of students commuting into Southeast Michigan to attend school is also not known.

SEMCOG | Southeast Michigan Council of Governments

Community Profiles

YOU ARE VIEWING DATA FOR:

Genoa Township

2911 Dorr Rd
Brighton, MI 48116-9436
http://www.genoa.org

SEMCOG MEMBER

Census 2010 Population: 19,821
Area: 36.3 square miles

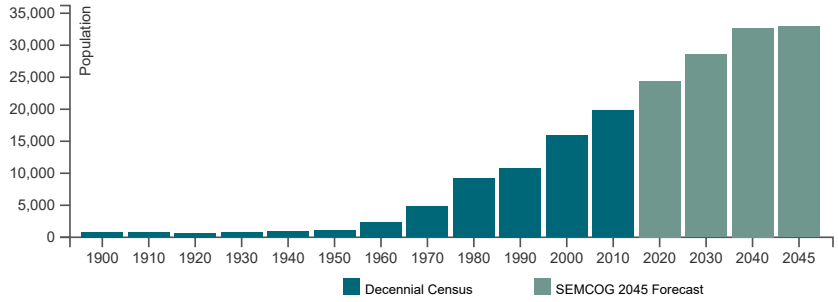
VIEW COMMUNITY EXPLORER MAP

Population and Households

Link to American Community Survey (ACS) Profiles: **Select a Year** 2013-2017 ▾ **Social** | **Demographic**

Population and Household Estimates for Southeast Michigan, 2019

Population Forecast



Population and Households

Population and Households	Census 2010	Change 2000-2010	Pct Change 2000-2010	SEMCOG Jul 2019	SEMCOG 2045
Total Population	19,821	3,920	24.7%	21,809	32,907
Group Quarters Population	21	-24	-53.3%	335	195
Household Population	19,800	3,944	24.9%	21,474	32,712
Housing Units	8,418	2,072	32.7%	8,943	-
Households (Occupied Units)	7,807	1,968	33.7%	8,650	14,124
Residential Vacancy Rate	7.3%	-0.7%	-	3.3%	-
Average Household Size	2.54	-0.18	-	2.48	2.32

Source: **U.S. Census Bureau**, **SEMCOG Population and Household Estimates**, and **SEMCOG 2045 Regional Development Forecast**

Components of Population Change

Components of Population Change	2000-2005 Avg.	2006-2010 Avg.	2011-2015 Avg.
Natural Increase (Births - Deaths)	60	3	9
Births	176	109	148
Deaths	116	106	139
Net Migration (Movement In - Movement Out)	666	55	110
Population Change (Natural Increase + Net Migration)	726	58	119

Source: **Michigan Department of Community Health Vital Statistics**, **U.S. Census Bureau**, and SEMCOG

SEMCOG | Southeast Michigan Council of Governments

Community Profiles

YOU ARE VIEWING DATA FOR:

City of Howell

611 E Grand River Ave Ste 201
Howell, MI 48843-2388
http://www.cityofhowell.org/

SEMCOG MEMBER

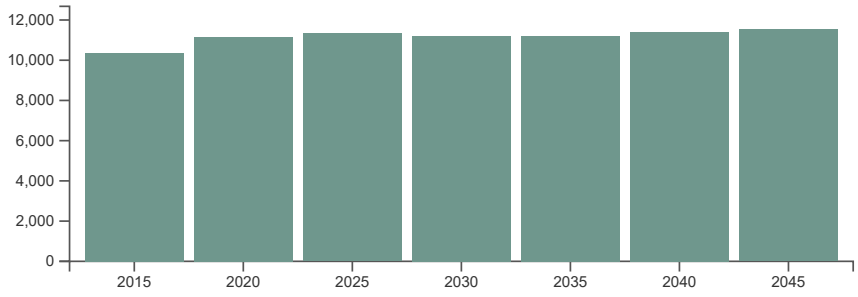
Census 2010 Population: 9,489
Area: 4.3 square miles

VIEW COMMUNITY EXPLORER MAP

Economy & Jobs

Link to American Community Survey (ACS) Profiles: **Select a Year** 2013-2017 ▾ **Economic**

Forecasted Jobs



Source: **SEMCOG 2045 Regional Development Forecast**

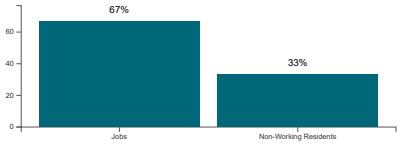
Forecasted Jobs by Industry Sector

Forecasted Jobs By Industry Sector	2015	2020	2025	2030	2035	2040	2045	Change 2015-2045	Pct Change 2015-2045
Natural Resources, Mining, & Construction	227	392	439	433	427	434	429	202	89%
Manufacturing	1,761	1,759	1,680	1,537	1,401	1,320	1,252	-509	-28.9%
Wholesale Trade	128	189	230	243	217	231	235	107	83.6%
Retail Trade	459	517	529	506	500	514	495	36	7.8%
Transportation, Warehousing, & Utilities	215	225	221	229	223	225	218	3	1.4%
Information & Financial Activities	1,761	1,769	1,801	1,748	1,758	1,801	1,809	48	2.7%
Professional and Technical Services & Corporate HQ	506	578	620	632	686	750	802	296	58.5%
Administrative, Support, & Waste Services	388	368	359	351	340	375	407	19	4.9%
Education Services	1,082	1,125	1,152	1,168	1,185	1,208	1,220	138	12.8%
Healthcare Services	1,614	1,633	1,687	1,727	1,807	1,913	1,980	366	22.7%
Leisure & Hospitality	804	1,119	1,140	1,143	1,165	1,127	1,168	364	45.3%
Other Services	504	502	484	477	473	467	456	-48	-9.5%
Public Administration	916	964	993	1,012	1,032	1,047	1,056	140	15.3%
Total Employment Numbers	10,365	11,140	11,335	11,206	11,214	11,412	11,527	1,162	11.2%

Source: **SEMCOG 2045 Regional Development Forecast**

Daytime Population

Daytime Population	SEMCOG and ACS 2015
Jobs	10,365
Non-Working Residents	5,157
Age 15 and under	2,225
Not in labor force	2,644
Unemployed	288
Daytime Population	15,522



Source: **SEMCOG 2045 Regional Development Forecast** and **2011-2015 American Community Survey 5-Year Estimates**

Note: The number of residents attending school outside Southeast Michigan is not available. Likewise, the number of students commuting into Southeast Michigan to attend school is also not known.

SEMCOG | Southeast Michigan Council of Governments

Community Profiles

YOU ARE VIEWING DATA FOR:

City of Howell

611 E Grand River Ave Ste 201
Howell, MI 48843-2388
http://www.cityofhowell.org/

SEMCOG MEMBER

Census 2010 Population: 9,489
Area: 4.3 square miles

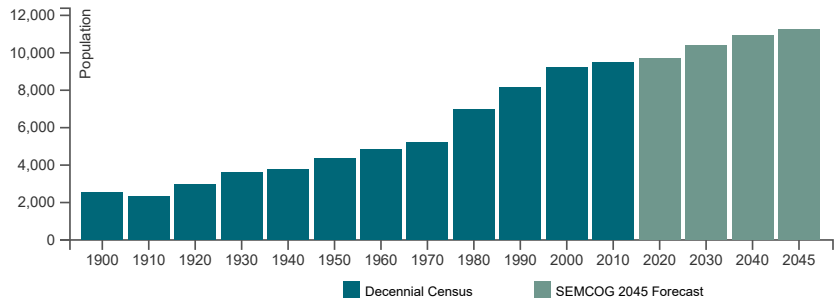
VIEW COMMUNITY EXPLORER MAP

Population and Households

Link to American Community Survey (ACS) Profiles: **Select a Year** 2013-2017 ▾ **Social** | **Demographic**

Population and Household Estimates for Southeast Michigan, 2019

Population Forecast



Note for City of Howell : Incorporated in 1910 from Village of Howell. Population numbers prior to 1910 are of the village.

Population and Households

Population and Households	Census 2010	Change 2000-2010	Pct Change 2000-2010	SEMCOG Jul 2019	SEMCOG 2045
Total Population	9,489	257	2.8%	9,459	11,256
Group Quarters Population	426	33	8.4%	430	689
Household Population	9,063	224	2.5%	9,029	10,567
Housing Units	4,551	463	11.3%	4,332	-
Households (Occupied Units)	4,028	171	4.4%	4,072	4,620
Residential Vacancy Rate	11.5%	5.8%	-	6.0%	-
Average Household Size	2.25	-0.04	-	2.22	2.29

Source: **U.S. Census Bureau**, **SEMCOG Population and Household Estimates**, and **SEMCOG 2045 Regional Development Forecast**

Components of Population Change

Components of Population Change	2000-2005 Avg.	2006-2010 Avg.	2011-2015 Avg.
Natural Increase (Births - Deaths)	190	156	82
Births	321	301	208
Deaths	131	145	126
Net Migration (Movement In - Movement Out)	-110	-184	-92
Population Change (Natural Increase + Net Migration)	80	-28	-10

Source: **Michigan Department of Community Health Vital Statistics**, **U.S. Census Bureau**, and SEMCOG

SEMCOG | Southeast Michigan Council of Governments

Community Profiles

YOU ARE VIEWING DATA FOR:

City of Brighton

200 N 1st St
Brighton, MI 48116-1593
http://www.brightoncity.org

SEMCOG MEMBER

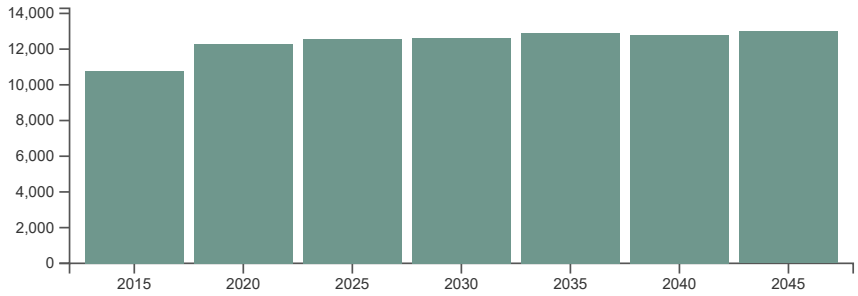
Census 2010 Population: 7,444
Area: 3.7 square miles

VIEW COMMUNITY EXPLORER MAP

Economy & Jobs

Link to American Community Survey (ACS) Profiles: **Select a Year** 2013-2017 ▾ **Economic**

Forecasted Jobs



Source: **SEMCOG 2045 Regional Development Forecast**

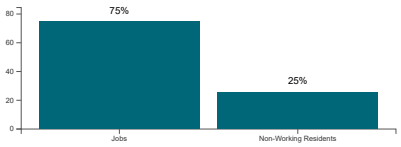
Forecasted Jobs by Industry Sector

Forecasted Jobs By Industry Sector	2015	2020	2025	2030	2035	2040	2045	Change 2015-2045	Pct Change 2015-2045
Natural Resources, Mining, & Construction	405	652	647	635	648	647	677	272	67.2%
Manufacturing	929	1,069	1,034	988	969	959	933	4	0.4%
Wholesale Trade	152	248	241	207	216	219	199	47	30.9%
Retail Trade	1,604	1,830	1,840	1,774	1,738	1,431	1,345	-259	-16.1%
Transportation, Warehousing, & Utilities	141	165	178	203	225	227	246	105	74.5%
Information & Financial Activities	1,476	1,577	1,651	1,736	1,782	1,845	1,930	454	30.8%
Professional and Technical Services & Corporate HQ	894	1,015	971	1,008	1,020	1,044	1,068	174	19.5%
Administrative, Support, & Waste Services	552	558	561	530	566	572	601	49	8.9%
Education Services	583	619	631	637	653	663	667	84	14.4%
Healthcare Services	1,239	1,657	1,804	1,833	1,913	1,936	2,006	767	61.9%
Leisure & Hospitality	1,924	1,926	2,067	2,138	2,226	2,251	2,308	384	20%
Other Services	584	664	642	614	644	671	676	92	15.8%
Public Administration	289	302	309	314	319	325	330	41	14.2%
Total Employment Numbers	10,772	12,282	12,576	12,617	12,919	12,790	12,986	2,214	20.6%

Source: **SEMCOG 2045 Regional Development Forecast**

Daytime Population

Daytime Population	SEMCOG and ACS 2015
Jobs	10,772
Non-Working Residents	3,684
Age 15 and under	1,146
Not in labor force	2,391
Unemployed	147
Daytime Population	14,456



Source: **SEMCOG 2045 Regional Development Forecast** and **2011-2015 American Community Survey 5-Year Estimates**

Note: The number of residents attending school outside Southeast Michigan is not available. Likewise, the number of students commuting into Southeast Michigan to attend school is also not known.

SEMCOG | Southeast Michigan Council of Governments

Community Profiles

YOU ARE VIEWING DATA FOR:

City of Brighton

200 N 1st St
Brighton, MI 48116-1593
http://www.brightoncity.org

SEMCOG MEMBER

Census 2010 Population: 7,444
Area: 3.7 square miles

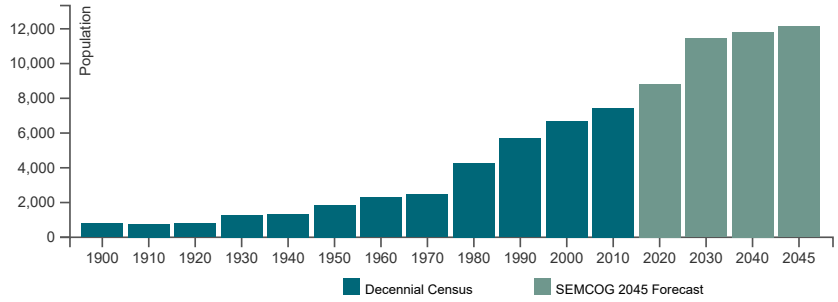
VIEW COMMUNITY EXPLORER MAP

Population and Households

Link to American Community Survey (ACS) Profiles: **Select a Year** 2013-2017 ▾ **Social** | **Demographic**

Population and Household Estimates for Southeast Michigan, 2019

Population Forecast



Note for City of Brighton : Incorporated in 1928 from Village of Brighton. Population numbers prior to 1928 are of the village.

Population and Households

Population and Households	Census 2010	Change 2000-2010	Pct Change 2000-2010	SEMCOG Jul 2019	SEMCOG 2045
Total Population	7,444	743	11.1%	7,895	12,127
Group Quarters Population	169	125	284.1%	181	283
Household Population	7,275	618	9.3%	7,714	11,844
Housing Units	3,905	664	20.5%	3,889	-
Households (Occupied Units)	3,603	500	16.1%	3,637	4,753
Residential Vacancy Rate	7.7%	3.5%	-	6.5%	-
Average Household Size	2.02	-0.13	-	2.12	2.49

Source: **U.S. Census Bureau**, **SEMCOG Population and Household Estimates**, and **SEMCOG 2045 Regional Development Forecast**

Components of Population Change

Components of Population Change	2000-2005 Avg.	2006-2010 Avg.	2011-2015 Avg.
Natural Increase (Births - Deaths)	32	49	-11
Births	149	169	125
Deaths	117	120	136
Net Migration (Movement In - Movement Out)	40	28	18
Population Change (Natural Increase + Net Migration)	72	77	7

Source: **Michigan Department of Community Health Vital Statistics**, **U.S. Census Bureau**, and SEMCOG

Appendix B – Existing Conditions Data

Level of Service Criteria for Signalized Intersections

Control Delay (s/veh)	LOS by Volume-to-Capacity Ratio	
	≤ 1.0	> 1.0
≤10	A	F
>10-20	B	F
>20-35	C	F
>35-55	D	F
>55-80	E	F
>80	F	F

LOS A describes operations with a control delay of 10 s/veh or less and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is low and either progression is exceptionally favorable or the cycle length is very short. If LOS A is the result of favorable progression, most vehicles arrive during the green indication and travel through the intersection without stopping.

LOS B describes operations with control delay between 10 and 20 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to capacity ratio is low and either progression is highly favorable or the cycle length is short. More vehicles stop than with LOS A.

LOS C describes operations with control delay between 20 and 35 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when progression is favorable or the cycle length is moderate. individual cycle failures (i.e., one or more queued vehicles are not able to depart as a result of insufficient capacity during the cycle) may begin to appear at this level. The number of vehicles stopping is significant, although many vehicles still pass through the intersection without stopping.

LOS D describes operations with control delay between 35 and 55 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is high and either progression is ineffective or the cycle length is long. Many vehicles stop and individual cycle failures are noticeable.

LOS E describes operations with control delay between 55 and 80 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is high, progression is unfavorable, and the cycle length is long. Individual cycle failures are frequent.

LOS F describes operations with control delay exceeding 80 s/veh or a volume-to-capacity ratio greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is very high, progression is very poor, and the cycle length is long. Most cycles fail to clear the queue.

A lane group can incur a delay less than 80 s/veh when the volume-to-capacity ratio exceeds 1.0. This condition typically occurs when the cycle length is short, the signal progression is favorable, or both. As a result, both the delay and volume-to-capacity ratio are considered when lane group LOS is established. A ratio of 1.0 or more indicates cycle capacity is fully utilized and represents failure from a capacity perspective (just as delay in excess of 80 s/veh represents failure from a delay perspective).

Source: Highway Capacity Manual, 6th Edition. Transportation Research Board, National Research Council.

Level of Service Criteria for Two-Way-Stop-Controlled Intersections

Control Delay (s/veh)	LOS by Volume-to-Capacity Ratio	
	≤ 1.0	> 1.0
≤10	A	F
>10-15	B	F
>15-25	C	F
>25-35	D	F
>35-50	E	F
>50	F	F

LOS for TWSC intersection is determined by the computed or measured control delay. For motor vehicles, LOS is determined for each minor-street movement (or shared movement), as well as the major-street left turns. LOS is not defined for the intersection as a whole or for major-street approaches for three primary reasons: (a) major street through vehicles are assumed to experience zero delay; (b) the disproportionate number of major-street through vehicles at a typical TWSC intersection skews the weighted average of all movements, resulting in very low overall average delay for all vehicles; and (c) the resulting low delay can mask LOS deficiencies of minor movements. LOS F is assigned to a movement if its volume-to-capacity ratio exceeds 1.0, regardless of the control delay.

The LOS criteria for TWSC intersections differ somewhat from the criteria used for signalized intersections, primarily because user perceptions differ among transportation facility types. The expectation is that a signalized intersection is designed to carry higher traffic volumes and will present greater delay than an unsignalized intersection. Unsignalized intersections are also associated with more uncertainty for users, as delays are less predictable than they are at signals.

Source: Highway Capacity Manual, 6th Edition. Transportation Research Board, National Research Council.

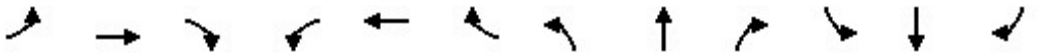
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	36	308	62	43	25	65	279	33	18	652	62
Future Volume (veh/h)	38	36	308	62	43	25	65	279	33	18	652	62
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1984	1984	1984	1953	1953	1953	1922	1922	1922	1969	1969	1969
Adj Flow Rate, veh/h	47	44	287	78	54	32	74	317	38	19	701	67
Peak Hour Factor	0.81	0.81	0.81	0.79	0.79	0.79	0.88	0.88	0.88	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	1	3	3	3	5	5	5	2	2	2
Cap, veh/h	403	61	399	193	308	182	250	1062	900	518	808	685
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.05	0.55	0.55	0.41	0.41	0.41
Sat Flow, veh/h	1322	228	1488	1041	1149	681	1830	1922	1629	1026	1969	1668
Grp Volume(v), veh/h	47	0	331	78	0	86	74	317	38	19	701	67
Grp Sat Flow(s),veh/h/ln	1322	0	1717	1041	0	1831	1830	1922	1629	1026	1969	1668
Q Serve(g_s), s	2.1	0.0	13.1	5.5	0.0	2.7	1.6	6.6	0.8	0.8	24.3	1.8
Cycle Q Clear(g_c), s	4.8	0.0	13.1	18.5	0.0	2.7	1.6	6.6	0.8	0.8	24.3	1.8
Prop In Lane	1.00		0.87	1.00		0.37	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	403	0	460	193	0	490	250	1062	900	518	808	685
V/C Ratio(X)	0.12	0.00	0.72	0.40	0.00	0.18	0.30	0.30	0.04	0.04	0.87	0.10
Avail Cap(c_a), veh/h	403	0	460	193	0	490	448	1666	1411	729	1213	1028
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.8	0.0	24.8	33.2	0.0	21.0	15.3	8.9	7.6	13.2	20.2	13.5
Incr Delay (d2), s/veh	0.1	0.0	5.4	1.4	0.0	0.2	0.7	0.2	0.0	0.0	4.6	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	5.3	1.3	0.0	1.0	0.5	2.0	0.2	0.2	10.0	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.0	0.0	30.2	34.6	0.0	21.2	16.0	9.1	7.7	13.3	24.7	13.6
LnGrp LOS	C	A	C	C	A	C	B	A	A	B	C	B
Approach Vol, veh/h		378			164			429			787	
Approach Delay, s/veh		29.3			27.5			10.2			23.5	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	10.6	37.3		26.7		48.0		26.7				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	3.6	26.3		15.1		8.6		20.5				
Green Ext Time (p_c), s	0.1	4.3		0.9		1.8		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	21.9
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	114	78	200	82	64	46	295	783	93	28	462	66
Future Volume (veh/h)	114	78	200	82	64	46	295	783	93	28	462	66
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1984	1984	1984	1969	1969	1969
Adj Flow Rate, veh/h	152	104	200	96	75	54	324	860	102	31	519	74
Peak Hour Factor	0.75	0.75	0.75	0.85	0.85	0.85	0.91	0.91	0.91	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	1	1	1	2	2	2
Cap, veh/h	367	161	310	223	285	205	420	1087	922	217	627	532
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.14	0.55	0.55	0.32	0.32	0.32
Sat Flow, veh/h	1261	602	1158	1075	1064	766	1890	1984	1682	584	1969	1668
Grp Volume(v), veh/h	152	0	304	96	0	129	324	860	102	31	519	74
Grp Sat Flow(s),veh/h/ln	1261	0	1760	1075	0	1831	1890	1984	1682	584	1969	1668
Q Serve(g_s), s	7.9	0.0	11.1	6.3	0.0	4.0	7.8	25.2	2.1	3.3	17.7	2.3
Cycle Q Clear(g_c), s	11.9	0.0	11.1	17.4	0.0	4.0	7.8	25.2	2.1	11.7	17.7	2.3
Prop In Lane	1.00		0.66	1.00		0.42	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	367	0	471	223	0	490	420	1087	922	217	627	532
V/C Ratio(X)	0.41	0.00	0.64	0.43	0.00	0.26	0.77	0.79	0.11	0.14	0.83	0.14
Avail Cap(c_a), veh/h	376	0	484	230	0	503	473	1765	1496	400	1245	1055
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.7	0.0	23.6	31.3	0.0	21.0	15.6	13.1	7.9	24.4	22.9	17.7
Incr Delay (d2), s/veh	0.7	0.0	2.8	1.3	0.0	0.3	6.8	1.3	0.1	0.3	2.9	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	0.0	4.3	1.5	0.0	1.5	3.3	8.2	0.6	0.4	7.4	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.4	0.0	26.4	32.6	0.0	21.3	22.4	14.5	8.0	24.7	25.8	17.8
LnGrp LOS	C	A	C	C	A	C	C	B	A	C	C	B
Approach Vol, veh/h		456			225			1286			624	
Approach Delay, s/veh		26.4			26.1			15.9			24.8	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	16.7	29.9		26.2		46.6		26.2				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	9.8	19.7		13.9		27.2		19.4				
Green Ext Time (p_c), s	0.2	3.4		1.1		6.7		0.1				

Intersection Summary	
HCM 6th Ctrl Delay	20.8
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

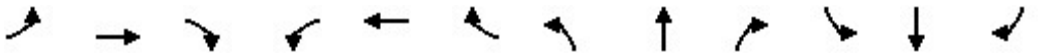
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	33	203	69	54	16	146	335	46	15	473	50
Future Volume (veh/h)	32	33	203	69	54	16	146	335	46	15	473	50
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969
Adj Flow Rate, veh/h	50	45	151	91	78	29	178	394	62	22	538	66
Peak Hour Factor	0.64	0.74	0.85	0.76	0.69	0.55	0.82	0.85	0.74	0.67	0.88	0.76
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	342	86	287	262	295	110	374	1086	921	449	683	579
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.22	0.09	0.55	0.55	0.35	0.35	0.35
Sat Flow, veh/h	1287	397	1332	1187	1368	509	1875	1969	1668	935	1969	1668
Grp Volume(v), veh/h	50	0	196	91	0	107	178	394	62	22	538	66
Grp Sat Flow(s),veh/h/ln	1287	0	1729	1187	0	1877	1875	1969	1668	935	1969	1668
Q Serve(g_s), s	1.9	0.0	5.8	4.2	0.0	2.7	3.2	6.5	1.0	0.9	14.2	1.6
Cycle Q Clear(g_c), s	4.7	0.0	5.8	10.0	0.0	2.7	3.2	6.5	1.0	0.9	14.2	1.6
Prop In Lane	1.00		0.77	1.00		0.27	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	342	0	373	262	0	405	374	1086	921	449	683	579
V/C Ratio(X)	0.15	0.00	0.53	0.35	0.00	0.26	0.48	0.36	0.07	0.05	0.79	0.11
Avail Cap(c_a), veh/h	510	0	600	417	0	651	598	2209	1872	871	1571	1331
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.7	0.0	20.0	24.4	0.0	18.8	11.8	7.2	6.0	12.6	16.9	12.8
Incr Delay (d2), s/veh	0.2	0.0	1.1	0.8	0.0	0.3	0.9	0.2	0.0	0.0	2.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	2.0	1.1	0.0	1.0	1.0	1.6	0.2	0.2	5.2	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.9	0.0	21.1	25.2	0.0	19.1	12.8	7.4	6.0	12.6	19.0	12.9
LnGrp LOS	C	A	C	C	A	B	B	A	A	B	B	B
Approach Vol, veh/h		246			198			634			626	
Approach Delay, s/veh		21.1			21.9			8.8			18.1	
Approach LOS		C			C			A			B	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	11.8	26.7		19.1		38.5		19.1				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	5.2	16.2		7.8		8.5		12.0				
Green Ext Time (p_c), s	0.2	3.4		0.9		2.3		0.4				

Intersection Summary	
HCM 6th Ctrl Delay	15.5
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	45	48	252	68	43	29	162	477	81	22	555	41
Future Volume (veh/h)	45	48	252	68	43	29	162	477	81	22	555	41
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969
Adj Flow Rate, veh/h	61	55	195	89	68	40	200	530	109	31	584	55
Peak Hour Factor	0.74	0.87	0.91	0.76	0.63	0.72	0.81	0.90	0.74	0.71	0.95	0.75
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	358	91	323	236	279	164	355	1092	926	393	706	598
Arrive On Green	0.24	0.24	0.24	0.24	0.24	0.24	0.09	0.55	0.55	0.36	0.36	0.36
Sat Flow, veh/h	1286	380	1347	1130	1162	684	1875	1969	1668	790	1969	1668
Grp Volume(v), veh/h	61	0	250	89	0	108	200	530	109	31	584	55
Grp Sat Flow(s),veh/h/ln	1286	0	1726	1130	0	1846	1875	1969	1668	790	1969	1668
Q Serve(g_s), s	2.6	0.0	8.4	5.0	0.0	3.1	4.0	10.7	2.0	1.7	17.7	1.4
Cycle Q Clear(g_c), s	5.7	0.0	8.4	13.4	0.0	3.1	4.0	10.7	2.0	1.7	17.7	1.4
Prop In Lane	1.00		0.78	1.00		0.37	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	358	0	414	236	0	443	355	1092	926	393	706	598
V/C Ratio(X)	0.17	0.00	0.60	0.38	0.00	0.24	0.56	0.49	0.12	0.08	0.83	0.09
Avail Cap(c_a), veh/h	443	0	529	311	0	565	524	1951	1654	667	1387	1176
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.3	0.0	22.1	28.0	0.0	20.0	13.7	8.9	6.9	14.0	19.1	13.9
Incr Delay (d2), s/veh	0.2	0.0	1.4	1.0	0.0	0.3	1.4	0.3	0.1	0.1	2.6	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	3.0	1.2	0.0	1.2	1.3	3.0	0.5	0.3	6.8	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.6	0.0	23.5	29.0	0.0	20.3	15.1	9.2	7.0	14.1	21.6	14.0
LnGrp LOS	C	A	C	C	A	C	B	A	A	B	C	B
Approach Vol, veh/h		311			197			839			670	
Approach Delay, s/veh		23.3			24.2			10.3			20.7	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	12.8	30.1		22.4		42.9		22.4				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	6.0	19.7		10.4		12.7		15.4				
Green Ext Time (p_c), s	0.2	3.7		1.0		3.5		0.3				

Intersection Summary	
HCM 6th Ctrl Delay	17.1
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

1: Latson Road & Golf Club Road Performance by lane

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	All
Movements Served	L	TR	L	TR	L	T	R	L	T	R	
Denied Del/Veh (s)											0.6
Total Del/Veh (s)	25.1	20.6	41.2	15.0	14.9	8.0	1.1	18.8	21.6	2.5	18.1
Vehicles Exited	41	355	57	68	60	286	34	18	664	63	1646
Hourly Exit Rate	41	355	57	68	60	286	34	18	664	63	1646

2: Site Drive & Golf Club Road Performance by lane

Lane	EB	WB	All
Movements Served	T	T	
Denied Del/Veh (s)			0.2
Total Del/Veh (s)	0.8	1.6	1.1
Vehicles Exited	393	165	558
Hourly Exit Rate	393	165	558

3: Latson Road & Site Drive Performance by lane

Lane	NB	SB	All
Movements Served	T	TR	
Denied Del/Veh (s)			0.1
Total Del/Veh (s)	0.4	4.7	3.6
Vehicles Exited	379	1041	1420
Hourly Exit Rate	379	1041	1420

Total Network Performance

Denied Del/Veh (s)	0.7
Total Del/Veh (s)	22.4
Vehicles Exited	1648
Hourly Exit Rate	1648
Input Volume	5199
% of Volume	32

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	67	254	98	74	81	153	46	102	356	249
Average Queue (ft)	21	112	38	20	34	60	10	14	186	31
95th Queue (ft)	54	210	81	51	65	115	34	64	300	117
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)		2							21	
Queuing Penalty (veh)		1							17	

Intersection: 2: Site Drive & Golf Club Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 3: Latson Road & Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 17

1: Latson Road & Golf Club Road Performance by lane

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	All
Movements Served	L	TR	L	TR	L	T	R	L	T	R	
Denied Del/Veh (s)											0.4
Total Del/Veh (s)	42.3	27.0	91.9	27.8	20.7	17.1	1.8	33.4	24.1	3.4	23.9
Vehicles Exited	109	284	87	104	293	799	95	25	460	64	2320
Hourly Exit Rate	109	284	87	104	293	799	95	25	460	64	2320

2: Site Drive & Golf Club Road Performance by lane

Lane	EB	WB	All
Movements Served	T	T	
Denied Del/Veh (s)			0.1
Total Del/Veh (s)	0.9	1.7	1.3
Vehicles Exited	392	415	807
Hourly Exit Rate	392	415	807

3: Latson Road & Site Drive Performance by lane

Lane	NB	SB	All
Movements Served	T	TR	
Denied Del/Veh (s)			0.8
Total Del/Veh (s)	1.4	4.1	2.5
Vehicles Exited	1183	755	1938
Hourly Exit Rate	1183	755	1938

Total Network Performance

Denied Del/Veh (s)	1.1
Total Del/Veh (s)	28.7
Vehicles Exited	2319
Hourly Exit Rate	2319
Input Volume	7354
% of Volume	32

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	187	304	241	219	229	330	55	57	264	97
Average Queue (ft)	67	120	84	57	106	166	19	22	155	26
95th Queue (ft)	145	241	203	145	186	268	46	52	239	67
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)	0	3	4	0	0	2			21	
Queuing Penalty (veh)	1	4	5	0	3	7			20	

Intersection: 2: Site Drive & Golf Club Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 3: Latson Road & Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 40

1: Latson Road & Golf Club Road Performance by lane

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	All
Movements Served	L	TR	L	TR	L	T	R	L	T	R	
Denied Del/Veh (s)											0.6
Total Del/Veh (s)	30.5	13.1	32.0	19.9	13.7	8.4	1.1	20.4	20.3	2.5	15.3
Vehicles Exited	26	239	75	69	144	336	50	14	481	50	1484
Hourly Exit Rate	26	239	75	69	144	336	50	14	481	50	1484

2: Site Drive & Golf Club Road Performance by lane

Lane	EB	WB	All
Movements Served	T	T	
Denied Del/Veh (s)			0.1
Total Del/Veh (s)	0.5	1.7	1.1
Vehicles Exited	262	248	510
Hourly Exit Rate	262	248	510

3: Latson Road & Site Drive Performance by lane

Lane	NB	SB	All
Movements Served	T	T	
Denied Del/Veh (s)			0.2
Total Del/Veh (s)	0.5	4.1	2.6
Vehicles Exited	530	761	1291
Hourly Exit Rate	530	761	1291

Total Network Performance

Denied Del/Veh (s)	0.7
Total Del/Veh (s)	19.0
Vehicles Exited	1484
Hourly Exit Rate	1484
Input Volume	4738
% of Volume	31

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	59	154	99	90	128	152	44	57	269	170
Average Queue (ft)	14	70	44	25	54	60	11	10	142	21
95th Queue (ft)	44	132	88	65	103	119	34	36	234	82
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)									16	
Queuing Penalty (veh)									11	

Intersection: 2: Site Drive & Golf Club Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 3: Latson Road & Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 11

1: Latson Road & Golf Club Road Performance by lane

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	All
Movements Served	L	TR	L	TR	L	T	R	L	T	R	
Denied Del/Veh (s)											0.4
Total Del/Veh (s)	30.1	17.9	29.9	18.4	17.1	10.3	1.2	23.1	22.9	2.7	17.9
Vehicles Exited	41	300	72	70	158	478	87	17	566	38	1827
Hourly Exit Rate	41	300	72	70	158	478	87	17	566	38	1827

2: Site Drive & Golf Club Road Performance by lane

Lane	EB	WB	All
Movements Served	T	T	
Denied Del/Veh (s)			0.1
Total Del/Veh (s)	0.7	1.6	1.1
Vehicles Exited	337	238	575
Hourly Exit Rate	337	238	575

3: Latson Road & Site Drive Performance by lane

Lane	NB	SB	All
Movements Served	T	T	
Denied Del/Veh (s)			0.3
Total Del/Veh (s)	0.6	4.7	2.9
Vehicles Exited	720	896	1616
Hourly Exit Rate	720	896	1616

Total Network Performance

Denied Del/Veh (s)	0.7
Total Del/Veh (s)	22.1
Vehicles Exited	1835
Hourly Exit Rate	1835
Input Volume	5834
% of Volume	31

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	80	200	121	118	138	171	44	165	363	138
Average Queue (ft)	24	94	47	26	63	88	17	17	176	24
95th Queue (ft)	63	167	102	73	110	153	40	83	294	99
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)		0				0			23	0
Queuing Penalty (veh)		0				0			15	0

Intersection: 2: Site Drive & Golf Club Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 3: Latson Road & Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 15

Appendix C – No-Build Conditions Data

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	37	325	66	44	25	71	301	35	18	708	63
Future Volume (veh/h)	39	37	325	66	44	25	71	301	35	18	708	63
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1984	1984	1984	1953	1953	1953	1922	1922	1922	1969	1969	1969
Adj Flow Rate, veh/h	48	46	308	84	56	32	81	342	40	19	761	68
Peak Hour Factor	0.81	0.81	0.81	0.79	0.79	0.79	0.88	0.88	0.88	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	1	3	3	3	5	5	5	2	2	2
Cap, veh/h	378	57	380	153	297	170	241	1105	937	529	860	729
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.25	0.05	0.57	0.57	0.44	0.44	0.44
Sat Flow, veh/h	1319	223	1493	1019	1167	667	1830	1922	1629	1001	1969	1668
Grp Volume(v), veh/h	48	0	354	84	0	88	81	342	40	19	761	68
Grp Sat Flow(s),veh/h/ln	1319	0	1716	1019	0	1833	1830	1922	1629	1001	1969	1668
Q Serve(g_s), s	2.3	0.0	15.2	4.8	0.0	3.0	1.8	7.2	0.8	0.9	27.9	1.9
Cycle Q Clear(g_c), s	5.3	0.0	15.2	20.0	0.0	3.0	1.8	7.2	0.8	0.9	27.9	1.9
Prop In Lane	1.00		0.87	1.00		0.36	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	378	0	437	153	0	467	241	1105	937	529	860	729
V/C Ratio(X)	0.13	0.00	0.81	0.55	0.00	0.19	0.34	0.31	0.04	0.04	0.88	0.09
Avail Cap(c_a), veh/h	378	0	437	153	0	467	424	1582	1341	678	1152	977
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.0	0.0	27.5	37.5	0.0	22.9	16.2	8.6	7.3	12.7	20.3	13.0
Incr Delay (d2), s/veh	0.1	0.0	11.0	4.0	0.0	0.2	0.8	0.2	0.0	0.0	6.6	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	6.8	1.7	0.0	1.2	0.6	2.2	0.2	0.2	11.9	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.2	0.0	38.5	41.6	0.0	23.1	17.0	8.8	7.3	12.7	27.0	13.0
LnGrp LOS	C	A	D	D	A	C	B	A	A	B	C	B
Approach Vol, veh/h		402			172			463			848	
Approach Delay, s/veh		36.9			32.1			10.1			25.5	
Approach LOS		D			C			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	10.8	41.0		26.7		51.9		26.7				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	3.8	29.9		17.2		9.2		22.0				
Green Ext Time (p_c), s	0.1	4.5		0.6		1.9		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		24.8	
HCM 6th LOS		C	

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	116	79	210	85	65	47	314	834	99	28	488	67
Future Volume (veh/h)	116	79	210	85	65	47	314	834	99	28	488	67
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1984	1984	1984	1969	1969	1969
Adj Flow Rate, veh/h	155	105	213	100	76	55	345	916	109	31	548	75
Peak Hour Factor	0.75	0.75	0.75	0.85	0.85	0.85	0.91	0.91	0.91	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	1	1	1	2	2	2
Cap, veh/h	355	153	310	201	280	202	420	1112	942	196	653	554
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.14	0.56	0.56	0.33	0.33	0.33
Sat Flow, veh/h	1259	580	1177	1062	1062	769	1890	1984	1682	550	1969	1668
Grp Volume(v), veh/h	155	0	318	100	0	131	345	916	109	31	548	75
Grp Sat Flow(s),veh/h/ln	1259	0	1757	1062	0	1830	1890	1984	1682	550	1969	1668
Q Serve(g_s), s	8.5	0.0	12.4	7.1	0.0	4.3	8.5	28.6	2.3	3.7	19.6	2.4
Cycle Q Clear(g_c), s	12.8	0.0	12.4	19.5	0.0	4.3	8.5	28.6	2.3	15.0	19.6	2.4
Prop In Lane	1.00		0.67	1.00		0.42	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	355	0	462	201	0	482	420	1112	942	196	653	554
V/C Ratio(X)	0.44	0.00	0.69	0.50	0.00	0.27	0.82	0.82	0.12	0.16	0.84	0.14
Avail Cap(c_a), veh/h	355	0	462	201	0	482	453	1690	1432	346	1192	1010
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.3	0.0	25.2	33.9	0.0	22.2	16.1	13.6	7.8	26.8	23.5	17.8
Incr Delay (d2), s/veh	0.8	0.0	4.2	1.9	0.0	0.3	10.9	2.1	0.1	0.4	3.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.3	0.0	5.0	1.8	0.0	1.7	4.0	9.6	0.6	0.5	8.2	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.1	0.0	29.4	35.8	0.0	22.5	26.9	15.7	7.9	27.2	26.5	17.9
LnGrp LOS	C	A	C	D	A	C	C	B	A	C	C	B
Approach Vol, veh/h		473			231			1370			654	
Approach Delay, s/veh		29.0			28.3			17.9			25.5	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	17.4	31.9		26.7		49.3		26.7				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	10.5	21.6		14.8		30.6		21.5				
Green Ext Time (p_c), s	0.2	3.6		1.0		7.4		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		22.5
HCM 6th LOS		C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	33	211	72	55	16	153	353	49	15	493	51
Future Volume (veh/h)	32	33	211	72	55	16	153	353	49	15	493	51
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969
Adj Flow Rate, veh/h	50	45	160	95	80	29	187	415	66	22	560	67
Peak Hour Factor	0.64	0.74	0.85	0.76	0.69	0.55	0.82	0.85	0.74	0.67	0.88	0.76
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	344	84	300	259	307	111	365	1090	924	441	691	585
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.22	0.09	0.55	0.55	0.35	0.35	0.35
Sat Flow, veh/h	1284	379	1347	1177	1379	500	1875	1969	1668	914	1969	1668
Grp Volume(v), veh/h	50	0	205	95	0	109	187	415	66	22	560	67
Grp Sat Flow(s),veh/h/ln	1284	0	1726	1177	0	1879	1875	1969	1668	914	1969	1668
Q Serve(g_s), s	2.0	0.0	6.3	4.6	0.0	2.9	3.5	7.1	1.1	1.0	15.5	1.6
Cycle Q Clear(g_c), s	4.9	0.0	6.3	10.9	0.0	2.9	3.5	7.1	1.1	1.0	15.5	1.6
Prop In Lane	1.00		0.78	1.00		0.27	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	344	0	384	259	0	418	365	1090	924	441	691	585
V/C Ratio(X)	0.15	0.00	0.53	0.37	0.00	0.26	0.51	0.38	0.07	0.05	0.81	0.11
Avail Cap(c_a), veh/h	487	0	576	390	0	627	570	2126	1802	822	1512	1281
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	21.2	0.0	20.5	25.4	0.0	19.2	12.5	7.6	6.2	12.9	17.6	13.2
Incr Delay (d2), s/veh	0.2	0.0	1.2	0.9	0.0	0.3	1.1	0.2	0.0	0.0	2.4	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	2.2	1.2	0.0	1.1	1.1	1.9	0.2	0.2	5.8	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.4	0.0	21.7	26.2	0.0	19.6	13.6	7.8	6.2	13.0	20.0	13.2
LnGrp LOS	C	A	C	C	A	B	B	A	A	B	B	B
Approach Vol, veh/h		255			204			668			649	
Approach Delay, s/veh		21.6			22.7			9.3			19.1	
Approach LOS		C			C			A			B	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	12.2	27.7		20.0		39.9		20.0				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	5.5	17.5		8.3		9.1		12.9				
Green Ext Time (p_c), s	0.2	3.6		0.9		2.5		0.4				

Intersection Summary		
HCM 6th Ctrl Delay		16.2
HCM 6th LOS		B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	71	364	150	130	91	158	51	161	456	247
Average Queue (ft)	21	150	53	28	38	57	10	18	218	35
95th Queue (ft)	54	292	116	79	73	108	34	84	379	134
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)		6	0			0			26	
Queuing Penalty (veh)		3	0			0			21	

Intersection: 2: Site Drive & Golf Club Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 3: Latson Road & Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 24

Intersection: 1: Latson Road & Golf Club Drive

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	171	310	208	204	243	309	125	121	311	247
Average Queue (ft)	64	115	77	58	108	162	22	23	163	32
95th Queue (ft)	129	240	183	143	195	267	86	75	269	117
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)	0	3	3	0	1	2			21	
Queuing Penalty (veh)	1	4	4	0	11	7			21	

Intersection: 2: Site Drive & Golf Club Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 3: Latson Road & Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 48

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	80	174	106	94	139	157	34	44	312	131
Average Queue (ft)	20	68	42	31	59	62	10	11	152	22
95th Queue (ft)	55	136	84	71	106	117	32	35	261	73
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)						0			18	
Queuing Penalty (veh)						0			13	

Intersection: 2: Site Drive & Golf Club Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 3: Latson Road & Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 13

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	37	332	67	45	26	72	308	36	19	723	64
Future Volume (veh/h)	39	37	332	67	45	26	72	308	36	19	723	64
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1984	1984	1984	1953	1953	1953	1922	1922	1922	1969	1969	1969
Adj Flow Rate, veh/h	48	46	317	85	57	33	82	350	41	20	777	69
Peak Hour Factor	0.81	0.81	0.81	0.79	0.79	0.79	0.88	0.88	0.88	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	1	3	3	3	5	5	5	2	2	2
Cap, veh/h	370	55	376	141	291	169	238	1116	946	531	874	740
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.25	0.05	0.58	0.58	0.44	0.44	0.44
Sat Flow, veh/h	1317	217	1498	1011	1160	672	1830	1922	1629	993	1969	1668
Grp Volume(v), veh/h	48	0	363	85	0	90	82	350	41	20	777	69
Grp Sat Flow(s),veh/h/ln	1317	0	1715	1011	0	1832	1830	1922	1629	993	1969	1668
Q Serve(g_s), s	2.4	0.0	16.0	4.0	0.0	3.1	1.8	7.4	0.9	0.9	28.9	1.9
Cycle Q Clear(g_c), s	5.5	0.0	16.0	20.0	0.0	3.1	1.8	7.4	0.9	0.9	28.9	1.9
Prop In Lane	1.00		0.87	1.00		0.37	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	370	0	431	141	0	460	238	1116	946	531	874	740
V/C Ratio(X)	0.13	0.00	0.84	0.60	0.00	0.20	0.34	0.31	0.04	0.04	0.89	0.09
Avail Cap(c_a), veh/h	370	0	431	141	0	460	418	1562	1324	664	1137	964
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.6	0.0	28.3	38.6	0.0	23.5	16.4	8.6	7.2	12.6	20.3	12.8
Incr Delay (d2), s/veh	0.2	0.0	14.1	7.0	0.0	0.2	0.9	0.2	0.0	0.0	7.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	7.5	1.8	0.0	1.2	0.6	2.3	0.2	0.2	12.4	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.8	0.0	42.4	45.6	0.0	23.7	17.3	8.7	7.2	12.6	27.6	12.9
LnGrp LOS	C	A	D	D	A	C	B	A	A	B	C	B
Approach Vol, veh/h		411			175			473			866	
Approach Delay, s/veh		40.4			34.3			10.1			26.1	
Approach LOS		D			C			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	10.9	42.0		26.7		52.9		26.7				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	3.8	30.9		18.0		9.4		22.0				
Green Ext Time (p_c), s	0.1	4.5		0.4		2.0		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		26.0
HCM 6th LOS		C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	118	81	215	87	66	48	321	852	102	29	499	69
Future Volume (veh/h)	118	81	215	87	66	48	321	852	102	29	499	69
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1984	1984	1984	1969	1969	1969
Adj Flow Rate, veh/h	157	108	220	102	78	56	353	936	112	33	561	78
Peak Hour Factor	0.75	0.75	0.75	0.85	0.85	0.85	0.91	0.91	0.91	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	1	1	1	2	2	2
Cap, veh/h	346	150	306	188	277	199	420	1124	953	190	666	564
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.14	0.57	0.57	0.34	0.34	0.34
Sat Flow, veh/h	1256	578	1178	1052	1066	765	1890	1984	1682	538	1969	1668
Grp Volume(v), veh/h	157	0	328	102	0	134	353	936	112	33	561	78
Grp Sat Flow(s),veh/h/ln	1256	0	1757	1052	0	1831	1890	1984	1682	538	1969	1668
Q Serve(g_s), s	8.8	0.0	13.1	6.9	0.0	4.5	8.8	29.8	2.4	4.1	20.3	2.5
Cycle Q Clear(g_c), s	13.3	0.0	13.1	20.0	0.0	4.5	8.8	29.8	2.4	16.4	20.3	2.5
Prop In Lane	1.00		0.67	1.00		0.42	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	346	0	456	188	0	475	420	1124	953	190	666	564
V/C Ratio(X)	0.45	0.00	0.72	0.54	0.00	0.28	0.84	0.83	0.12	0.17	0.84	0.14
Avail Cap(c_a), veh/h	346	0	456	188	0	475	447	1666	1412	329	1175	996
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.1	0.0	26.0	35.3	0.0	22.8	16.2	13.7	7.8	27.6	23.6	17.7
Incr Delay (d2), s/veh	0.9	0.0	5.4	3.2	0.0	0.3	12.8	2.4	0.1	0.4	3.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.0	5.5	1.9	0.0	1.8	4.3	10.1	0.6	0.5	8.5	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.0	0.0	31.4	38.5	0.0	23.1	29.1	16.1	7.8	28.1	26.6	17.8
LnGrp LOS	C	A	C	D	A	C	C	B	A	C	C	B
Approach Vol, veh/h		485			236			1401			672	
Approach Delay, s/veh		30.6			29.8			18.7			25.6	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	17.6	32.8		26.7		50.4		26.7				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	10.8	22.3		15.3		31.8		22.0				
Green Ext Time (p_c), s	0.1	3.7		1.0		7.7		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	23.4
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	47	50	267	73	45	30	173	508	86	23	589	43
Future Volume (veh/h)	47	50	267	73	45	30	173	508	86	23	589	43
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969
Adj Flow Rate, veh/h	64	57	211	96	71	42	214	564	116	32	620	57
Peak Hour Factor	0.74	0.87	0.91	0.76	0.63	0.72	0.81	0.90	0.74	0.71	0.95	0.75
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	360	92	342	227	292	173	343	1104	936	383	732	621
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.25	0.10	0.56	0.56	0.37	0.37	0.37
Sat Flow, veh/h	1280	367	1358	1111	1159	686	1875	1969	1668	760	1969	1668
Grp Volume(v), veh/h	64	0	268	96	0	113	214	564	116	32	620	57
Grp Sat Flow(s),veh/h/ln	1280	0	1724	1111	0	1845	1875	1969	1668	760	1969	1668
Q Serve(g_s), s	3.0	0.0	9.8	6.0	0.0	3.5	4.7	12.6	2.3	2.0	20.6	1.6
Cycle Q Clear(g_c), s	6.5	0.0	9.8	15.8	0.0	3.5	4.7	12.6	2.3	2.0	20.6	1.6
Prop In Lane	1.00		0.79	1.00		0.37	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	360	0	434	227	0	465	343	1104	936	383	732	621
V/C Ratio(X)	0.18	0.00	0.62	0.42	0.00	0.24	0.62	0.51	0.12	0.08	0.85	0.09
Avail Cap(c_a), veh/h	396	0	482	258	0	516	479	1781	1509	590	1266	1073
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.9	0.0	23.7	30.7	0.0	21.3	15.1	9.7	7.4	14.7	20.6	14.6
Incr Delay (d2), s/veh	0.2	0.0	2.0	1.2	0.0	0.3	1.9	0.4	0.1	0.1	2.8	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	3.7	1.5	0.0	1.3	1.6	3.8	0.6	0.3	8.2	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.1	0.0	25.7	32.0	0.0	21.6	17.0	10.0	7.5	14.8	23.4	14.7
LnGrp LOS	C	A	C	C	A	C	B	B	A	B	C	B
Approach Vol, veh/h		332			209			894			709	
Approach Delay, s/veh		25.4			26.4			11.4			22.3	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	13.5	33.3		24.7		46.8		24.7				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	6.7	22.6		11.8		14.6		17.8				
Green Ext Time (p_c), s	0.3	4.0		1.0		3.8		0.2				

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

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	69	330	155	124	98	148	53	165	481	249
Average Queue (ft)	22	146	55	27	38	59	10	20	223	41
95th Queue (ft)	58	270	123	78	77	119	35	98	391	151
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)		5	0						26	
Queuing Penalty (veh)		2	0						22	

Intersection: 2: Site Drive & Golf Club Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 3: Latson Road & Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 24

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	224	370	189	197	252	334	48	74	313	214
Average Queue (ft)	83	145	95	60	124	173	20	24	170	34
95th Queue (ft)	180	305	210	155	216	286	46	57	280	112
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)		0								
Queuing Penalty (veh)		0								
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)	2	6	4	0	1	2			22	
Queuing Penalty (veh)	7	9	5	0	9	11			22	

Intersection: 2: Site Drive & Golf Club Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 3: Latson Road & Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 63

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	94	265	149	124	162	193	55	52	345	168
Average Queue (ft)	26	107	56	28	69	92	17	15	192	22
95th Queue (ft)	63	200	113	76	126	161	42	43	309	91
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)		1				0			25	
Queuing Penalty (veh)		1				0			17	

Intersection: 2: Site Drive & Golf Club Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

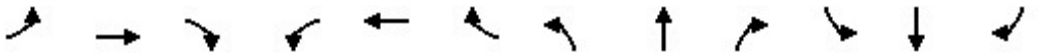
Intersection: 3: Latson Road & Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 18

Appendix D – Phase I Build Conditions Data



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	41	38	329	66	45	25	77	301	35	18	708	66
Future Volume (veh/h)	41	38	329	66	45	25	77	301	35	18	708	66
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1984	1984	1984	1953	1953	1953	1922	1922	1922	1969	1969	1969
Adj Flow Rate, veh/h	51	47	313	84	57	32	88	342	40	19	761	71
Peak Hour Factor	0.81	0.81	0.81	0.79	0.79	0.79	0.88	0.88	0.88	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	1	3	3	3	5	5	5	2	2	2
Cap, veh/h	376	57	379	148	298	167	243	1107	938	529	860	729
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.25	0.05	0.58	0.58	0.44	0.44	0.44
Sat Flow, veh/h	1318	224	1492	1013	1175	660	1830	1922	1629	1001	1969	1668
Grp Volume(v), veh/h	51	0	360	84	0	89	88	342	40	19	761	71
Grp Sat Flow(s),veh/h/ln	1318	0	1716	1013	0	1834	1830	1922	1629	1001	1969	1668
Q Serve(g_s), s	2.5	0.0	15.6	4.4	0.0	3.0	1.9	7.2	0.8	0.9	28.0	2.0
Cycle Q Clear(g_c), s	5.5	0.0	15.6	20.0	0.0	3.0	1.9	7.2	0.8	0.9	28.0	2.0
Prop In Lane	1.00		0.87	1.00		0.36	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	376	0	436	148	0	466	243	1107	938	529	860	729
V/C Ratio(X)	0.14	0.00	0.83	0.57	0.00	0.19	0.36	0.31	0.04	0.04	0.88	0.10
Avail Cap(c_a), veh/h	376	0	436	148	0	466	423	1578	1338	676	1150	974
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.2	0.0	27.8	37.9	0.0	23.0	16.3	8.6	7.3	12.7	20.4	13.0
Incr Delay (d2), s/veh	0.2	0.0	12.4	5.0	0.0	0.2	0.9	0.2	0.0	0.0	6.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	7.1	1.7	0.0	1.2	0.7	2.2	0.2	0.2	11.9	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.4	0.0	40.1	43.0	0.0	23.2	17.2	8.8	7.3	12.8	27.1	13.1
LnGrp LOS	C	A	D	D	A	C	B	A	A	B	C	B
Approach Vol, veh/h		411			173			470			851	
Approach Delay, s/veh		38.3			32.8			10.2			25.6	
Approach LOS		D			C			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	11.0	41.1		26.7		52.1		26.7				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	3.9	30.0		17.6		9.2		22.0				
Green Ext Time (p_c), s	0.1	4.5		0.5		1.9		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	25.2
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

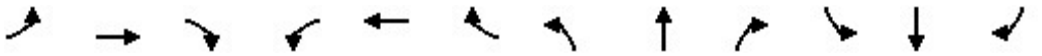
Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	401	11	10	178	7	7
Future Vol, veh/h	401	11	10	178	7	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	50	150	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	81	81	87	87	92	92
Heavy Vehicles, %	1	0	0	3	0	0
Mvmt Flow	495	14	11	205	8	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	509	0	722	495
Stage 1	-	-	-	-	495	-
Stage 2	-	-	-	-	227	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1066	-	397	579
Stage 1	-	-	-	-	617	-
Stage 2	-	-	-	-	815	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1066	-	393	579
Mov Cap-2 Maneuver	-	-	-	-	393	-
Stage 1	-	-	-	-	617	-
Stage 2	-	-	-	-	807	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	13
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	468	-	-	1066	-
HCM Lane V/C Ratio	0.033	-	-	0.011	-
HCM Control Delay (s)	13	-	-	8.4	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	120	80	218	85	66	47	321	834	99	28	488	70
Future Volume (veh/h)	120	80	218	85	66	47	321	834	99	28	488	70
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1984	1984	1984	1969	1969	1969
Adj Flow Rate, veh/h	160	107	224	100	78	55	353	916	109	31	548	79
Peak Hour Factor	0.75	0.75	0.75	0.85	0.85	0.85	0.91	0.91	0.91	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	1	1	1	2	2	2
Cap, veh/h	351	149	311	189	282	199	424	1116	946	197	653	553
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.14	0.56	0.56	0.33	0.33	0.33
Sat Flow, veh/h	1257	567	1188	1049	1075	758	1890	1984	1682	550	1969	1668
Grp Volume(v), veh/h	160	0	331	100	0	133	353	916	109	31	548	79
Grp Sat Flow(s),veh/h/ln	1257	0	1755	1049	0	1832	1890	1984	1682	550	1969	1668
Q Serve(g_s), s	8.9	0.0	13.1	6.9	0.0	4.4	8.8	28.6	2.3	3.7	19.7	2.5
Cycle Q Clear(g_c), s	13.3	0.0	13.1	20.0	0.0	4.4	8.8	28.6	2.3	14.7	19.7	2.5
Prop In Lane	1.00		0.68	1.00		0.41	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	351	0	460	189	0	480	424	1116	946	197	653	553
V/C Ratio(X)	0.46	0.00	0.72	0.53	0.00	0.28	0.83	0.82	0.12	0.16	0.84	0.14
Avail Cap(c_a), veh/h	351	0	460	189	0	480	451	1683	1426	346	1187	1006
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.7	0.0	25.6	34.9	0.0	22.4	16.1	13.6	7.8	26.7	23.6	17.9
Incr Delay (d2), s/veh	0.9	0.0	5.4	2.7	0.0	0.3	12.0	2.1	0.1	0.4	3.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.0	5.4	1.8	0.0	1.7	4.3	9.6	0.6	0.5	8.2	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.6	0.0	31.0	37.6	0.0	22.7	28.2	15.6	7.9	27.1	26.6	18.0
LnGrp LOS	C	A	C	D	A	C	C	B	A	C	C	B
Approach Vol, veh/h		491			233			1378			658	
Approach Delay, s/veh		30.2			29.1			18.2			25.6	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	17.6	32.0		26.7		49.6		26.7				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	10.8	21.7		15.3		30.6		22.0				
Green Ext Time (p_c), s	0.1	3.6		1.0		7.4		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	23.0
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

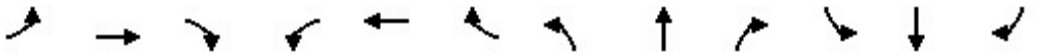
Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	405	12	11	446	15	13
Future Vol, veh/h	405	12	11	446	15	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	50	150	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	75	90	90	92	92
Heavy Vehicles, %	2	0	0	1	0	0
Mvmt Flow	540	16	12	496	16	14

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	556	0	1060	540
Stage 1	-	-	-	-	540	-
Stage 2	-	-	-	-	520	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1025	-	250	546
Stage 1	-	-	-	-	588	-
Stage 2	-	-	-	-	601	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1025	-	247	546
Mov Cap-2 Maneuver	-	-	-	-	247	-
Stage 1	-	-	-	-	588	-
Stage 2	-	-	-	-	594	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	17
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	331	-	-	1025	-
HCM Lane V/C Ratio	0.092	-	-	0.012	-
HCM Control Delay (s)	17	-	-	8.6	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.3	-	-	0	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	34	219	72	61	16	189	353	49	15	493	69
Future Volume (veh/h)	36	34	219	72	61	16	189	353	49	15	493	69
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969
Adj Flow Rate, veh/h	65	49	182	95	102	29	310	415	66	22	560	130
Peak Hour Factor	0.55	0.70	0.79	0.76	0.60	0.55	0.61	0.85	0.74	0.67	0.88	0.53
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	326	85	316	236	343	97	413	1127	955	419	677	574
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.13	0.57	0.57	0.34	0.34	0.34
Sat Flow, veh/h	1259	366	1359	1149	1474	419	1875	1969	1668	914	1969	1668
Grp Volume(v), veh/h	65	0	231	95	0	131	310	415	66	22	560	130
Grp Sat Flow(s),veh/h/ln	1259	0	1724	1149	0	1893	1875	1969	1668	914	1969	1668
Q Serve(g_s), s	3.1	0.0	8.2	5.5	0.0	3.9	6.8	7.8	1.2	1.1	17.9	3.8
Cycle Q Clear(g_c), s	7.0	0.0	8.2	13.7	0.0	3.9	6.8	7.8	1.2	1.1	17.9	3.8
Prop In Lane	1.00		0.79	1.00		0.22	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	326	0	401	236	0	440	413	1127	955	419	677	574
V/C Ratio(X)	0.20	0.00	0.58	0.40	0.00	0.30	0.75	0.37	0.07	0.05	0.83	0.23
Avail Cap(c_a), veh/h	399	0	502	303	0	551	495	1853	1570	716	1317	1116
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.6	0.0	23.4	29.4	0.0	21.7	14.3	8.0	6.5	15.2	20.7	16.0
Incr Delay (d2), s/veh	0.3	0.0	1.3	1.1	0.0	0.4	5.2	0.2	0.0	0.1	2.7	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	3.0	1.4	0.0	1.5	2.6	2.2	0.3	0.2	7.2	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.9	0.0	24.7	30.5	0.0	22.1	19.5	8.2	6.6	15.2	23.3	16.2
LnGrp LOS	C	A	C	C	A	C	B	A	A	B	C	B
Approach Vol, veh/h		296			226			791			712	
Approach Delay, s/veh		24.7			25.7			12.5			21.8	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	15.7	30.3		22.7		46.1		22.7				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	8.8	19.9		10.2		9.8		15.7				
Green Ext Time (p_c), s	0.3	3.7		1.0		2.5		0.3				

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

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

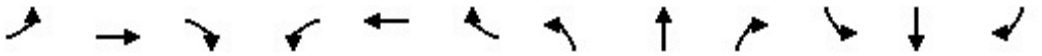
Intersection	
Int Delay, s/veh	2.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	276	61	60	259	12	13
Future Vol, veh/h	276	61	60	259	12	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	50	150	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	45	45	78	40	40
Heavy Vehicles, %	2	0	0	2	0	0
Mvmt Flow	345	136	133	332	30	33

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	481	0	943	345
Stage 1	-	-	-	-	345	-
Stage 2	-	-	-	-	598	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1092	-	294	702
Stage 1	-	-	-	-	722	-
Stage 2	-	-	-	-	553	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1092	-	258	702
Mov Cap-2 Maneuver	-	-	-	-	258	-
Stage 1	-	-	-	-	722	-
Stage 2	-	-	-	-	486	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.5	16.2
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	384	-	-	1092	-
HCM Lane V/C Ratio	0.163	-	-	0.122	-
HCM Control Delay (s)	16.2	-	-	8.8	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.6	-	-	0.4	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	51	39	249	72	56	16	160	353	49	15	493	55
Future Volume (veh/h)	51	39	249	72	56	16	160	353	49	15	493	55
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969
Adj Flow Rate, veh/h	104	61	249	95	90	29	246	415	66	22	560	100
Peak Hour Factor	0.49	0.64	0.70	0.76	0.62	0.55	0.65	0.85	0.74	0.67	0.88	0.55
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	386	93	378	221	391	126	364	1066	903	410	668	566
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.11	0.54	0.54	0.34	0.34	0.34
Sat Flow, veh/h	1273	338	1382	1069	1426	460	1875	1969	1668	914	1969	1668
Grp Volume(v), veh/h	104	0	310	95	0	119	246	415	66	22	560	100
Grp Sat Flow(s),veh/h/ln	1273	0	1720	1069	0	1886	1875	1969	1668	914	1969	1668
Q Serve(g_s), s	5.0	0.0	11.6	6.3	0.0	3.5	5.7	8.9	1.4	1.2	19.0	3.1
Cycle Q Clear(g_c), s	8.5	0.0	11.6	17.8	0.0	3.5	5.7	8.9	1.4	1.2	19.0	3.1
Prop In Lane	1.00		0.80	1.00		0.24	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	386	0	471	221	0	516	364	1066	903	410	668	566
V/C Ratio(X)	0.27	0.00	0.66	0.43	0.00	0.23	0.68	0.39	0.07	0.05	0.84	0.18
Avail Cap(c_a), veh/h	388	0	475	224	0	520	469	1757	1489	679	1249	1059
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.7	0.0	23.3	31.2	0.0	20.4	15.6	9.7	7.9	16.2	22.1	16.8
Incr Delay (d2), s/veh	0.4	0.0	3.3	1.3	0.0	0.2	2.6	0.2	0.0	0.1	2.9	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	4.5	1.5	0.0	1.4	2.1	2.8	0.4	0.2	7.8	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.1	0.0	26.6	32.5	0.0	20.6	18.2	9.9	8.0	16.3	25.0	17.0
LnGrp LOS	C	A	C	C	A	C	B	A	A	B	C	B
Approach Vol, veh/h		414			214			727			682	
Approach Delay, s/veh		26.0			25.9			12.5			23.5	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	14.6	31.3		26.6		45.9		26.6				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	7.7	21.0		13.6		10.9		19.8				
Green Ext Time (p_c), s	0.3	3.6		1.1		2.5		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	20.4
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	7.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	276	12	12	259	62	63
Future Vol, veh/h	276	12	12	259	62	63
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	50	150	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	45	45	90	40	40
Heavy Vehicles, %	2	0	0	1	0	0
Mvmt Flow	368	27	27	288	155	158

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	395	0	710	368
Stage 1	-	-	-	-	368	-
Stage 2	-	-	-	-	342	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1175	-	403	682
Stage 1	-	-	-	-	704	-
Stage 2	-	-	-	-	724	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1175	-	394	682
Mov Cap-2 Maneuver	-	-	-	-	394	-
Stage 1	-	-	-	-	704	-
Stage 2	-	-	-	-	707	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	23.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	501	-	-	1175	-
HCM Lane V/C Ratio	0.624	-	-	0.023	-
HCM Control Delay (s)	23.4	-	-	8.1	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	4.2	-	-	0.1	-

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	81	279	139	141	93	147	35	111	468	250
Average Queue (ft)	23	126	52	30	42	61	7	15	215	36
95th Queue (ft)	58	236	112	86	74	119	27	66	371	136
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)		2							26	0
Queuing Penalty (veh)		1							22	0

Intersection: 2: Site Drive & Golf Club Road

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	28	27
Average Queue (ft)	4	9
95th Queue (ft)	19	28
Link Distance (ft)		413
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Latson Road & Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 23

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	161	290	228	236	280	294	70	75	383	210
Average Queue (ft)	74	115	85	61	121	160	23	25	182	37
95th Queue (ft)	142	237	217	157	220	253	52	59	302	131
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)		3	8	0	2	2			26	
Queuing Penalty (veh)		4	9	0	20	7			25	

Intersection: 2: Site Drive & Golf Club Road

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	28	49
Average Queue (ft)	4	14
95th Queue (ft)	19	36
Link Distance (ft)		413
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Latson Road & Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 65

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	87	172	116	108	198	144	36	40	326	184
Average Queue (ft)	22	73	43	27	76	64	10	11	157	30
95th Queue (ft)	63	142	94	73	152	121	32	37	273	98
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)					0				19	0
Queuing Penalty (veh)					1				19	0

Intersection: 2: Site Drive & Golf Club Road

Movement	EB	WB	NB
Directions Served	R	L	LR
Maximum Queue (ft)	4	53	37
Average Queue (ft)	0	12	12
95th Queue (ft)	3	40	32
Link Distance (ft)			413
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	50	150	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Latson Road & Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 20

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	114	236	200	165	143	161	42	44	301	210
Average Queue (ft)	28	85	61	31	61	68	10	10	158	30
95th Queue (ft)	77	176	165	93	119	127	32	34	271	111
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)		1	4						19	
Queuing Penalty (veh)		1	4						14	

Intersection: 2: Site Drive & Golf Club Road

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	30	168
Average Queue (ft)	3	40
95th Queue (ft)	17	111
Link Distance (ft)		413
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

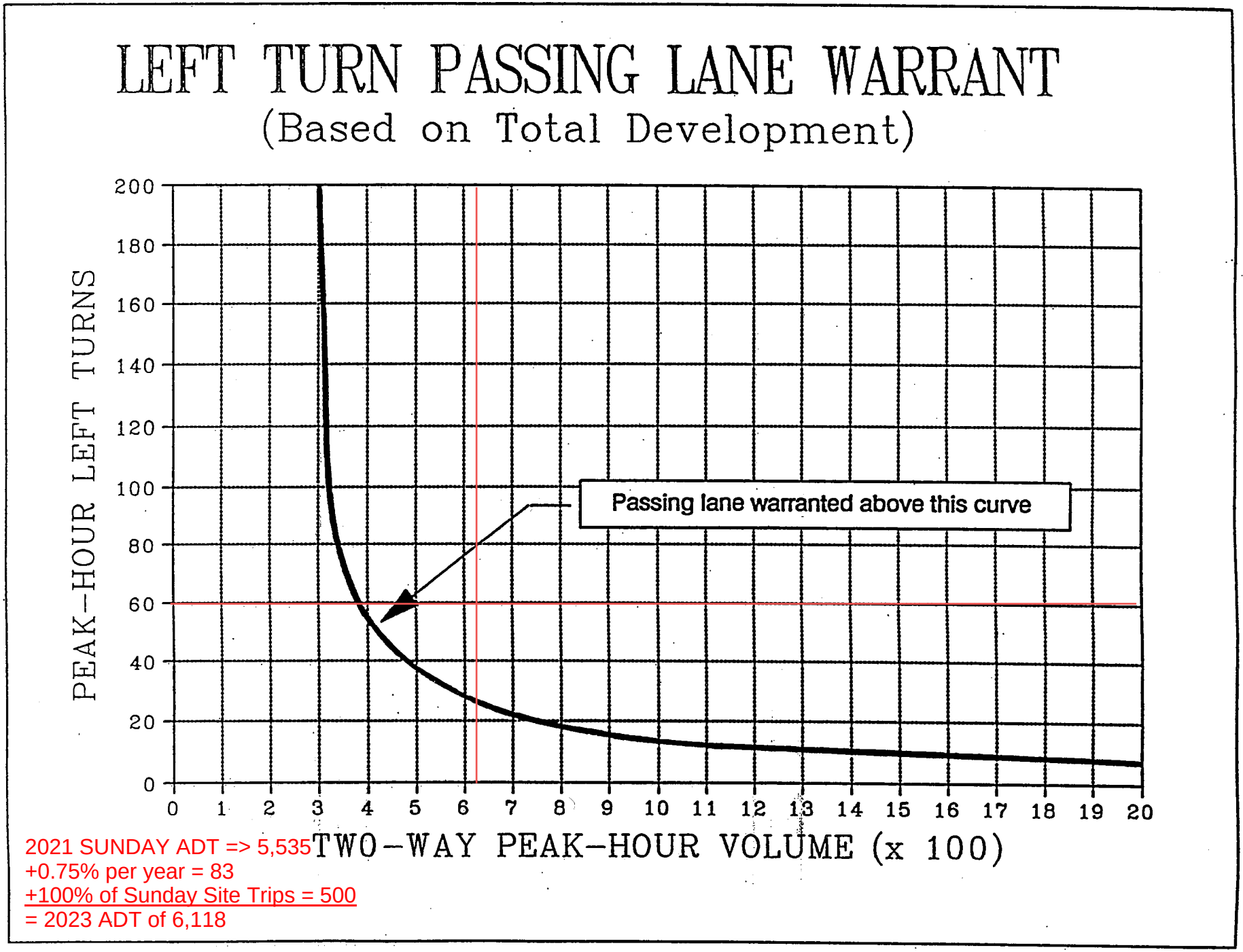
Intersection: 3: Latson Road & Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 19

GOLF CLUB ROAD & SITE DRIVE LEFT-TURN LANE WARRANT - PHASE I



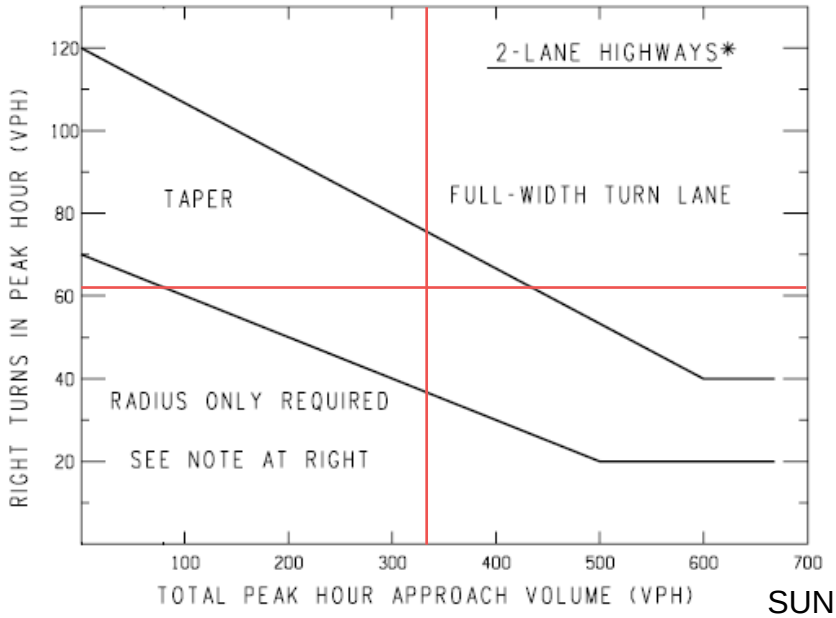
A.15

PM: 60

2021 SUNDAY ADT => 5,535
+0.75% per year = 83
+100% of Sunday Site Trips = 500
= 2023 ADT of 6,118

GOLF CLUB ROAD & SITE DRIVE RIGHT-TURN LANE WARRANT - PHASE I

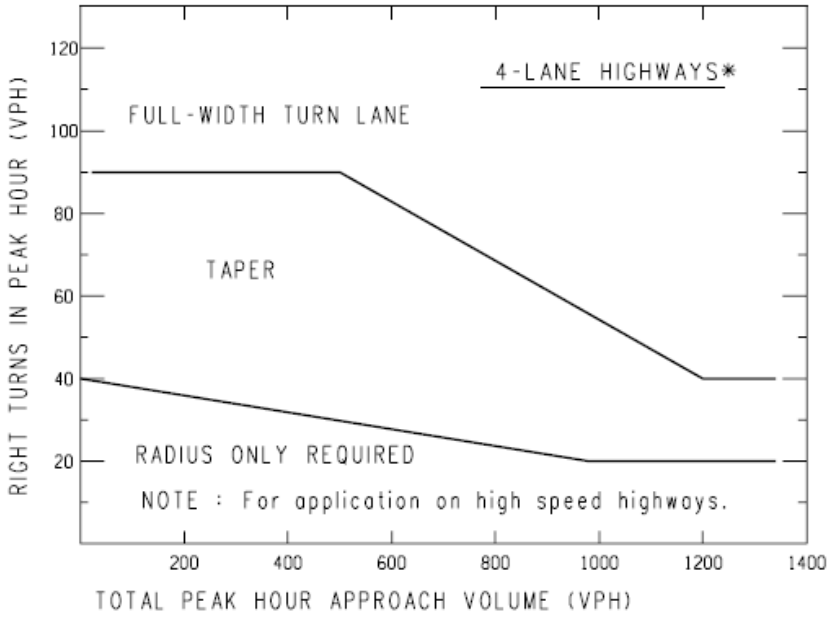
SUN: 61



SUN: 337

NOTE: For posted speeds at or under 45 mph, peak hour right turns greater than 40 vph, and total peak hour approach less than 300 vph, adjust right turn volumes.

Adjust peak hour Right turns = Peak hour Right turns – 20



*If a center left-turn lane exists (ie 3 or 5 lane roadway), subtract the number of left turns in approach volume form the total approach volume to get an adjusted total approach volume.

Sample Problem: The Design Speed is 55 mph. The Peak Hour Approach Volume is 300 vph. The Number of Right Turns in the Peak Hous is 100 vph. Determine if a right turn lane is recommended.

Solution: Figure indicates that the intersection of 300 vph and 100 vph is located above the upper trend line; thus, a right-turn lane may be recommended.

Appendix E – Phase II Alternative A Build Conditions Data

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	38	340	67	47	26	85	308	36	19	723	70
Future Volume (veh/h)	43	38	340	67	47	26	85	308	36	19	723	70
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1984	1984	1984	1953	1953	1953	1922	1922	1922	1969	1969	1969
Adj Flow Rate, veh/h	53	47	327	85	59	33	97	350	41	20	777	75
Peak Hour Factor	0.81	0.81	0.81	0.79	0.79	0.79	0.88	0.88	0.88	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	1	3	3	3	5	5	5	2	2	2
Cap, veh/h	367	54	375	131	294	165	242	1120	949	530	873	740
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.25	0.06	0.58	0.58	0.44	0.44	0.44
Sat Flow, veh/h	1315	215	1499	1001	1177	658	1830	1922	1629	993	1969	1668
Grp Volume(v), veh/h	53	0	374	85	0	92	97	350	41	20	777	75
Grp Sat Flow(s),veh/h/ln	1315	0	1715	1001	0	1835	1830	1922	1629	993	1969	1668
Q Serve(g_s), s	2.7	0.0	16.7	3.3	0.0	3.2	2.1	7.4	0.9	0.9	29.0	2.1
Cycle Q Clear(g_c), s	5.8	0.0	16.7	20.0	0.0	3.2	2.1	7.4	0.9	0.9	29.0	2.1
Prop In Lane	1.00		0.87	1.00		0.36	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	367	0	429	131	0	459	242	1120	949	530	873	740
V/C Ratio(X)	0.14	0.00	0.87	0.65	0.00	0.20	0.40	0.31	0.04	0.04	0.89	0.10
Avail Cap(c_a), veh/h	367	0	429	131	0	459	416	1554	1317	661	1132	959
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.0	0.0	28.8	39.2	0.0	23.7	16.7	8.5	7.2	12.6	20.5	13.0
Incr Delay (d2), s/veh	0.2	0.0	17.6	10.8	0.0	0.2	1.1	0.2	0.0	0.0	7.4	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	8.2	1.9	0.0	1.3	0.7	2.3	0.2	0.2	12.5	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.2	0.0	46.4	50.0	0.0	23.9	17.8	8.7	7.2	12.7	27.8	13.0
LnGrp LOS	C	A	D	D	A	C	B	A	A	B	C	B
Approach Vol, veh/h		427			177			488			872	
Approach Delay, s/veh		43.9			36.5			10.4			26.2	
Approach LOS		D			D			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	11.1	42.2		26.7		53.3		26.7				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	4.1	31.0		18.7		9.4		22.0				
Green Ext Time (p_c), s	0.1	4.5		0.3		2.0		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		27.0
HCM 6th LOS		C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	408	21	21	181	15	13
Future Vol, veh/h	408	21	21	181	15	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	50	150	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	81	81	87	87	92	92
Heavy Vehicles, %	1	0	0	3	0	0
Mvmt Flow	504	26	24	208	16	14

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	530	0	760	504
Stage 1	-	-	-	-	504	-
Stage 2	-	-	-	-	256	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1048	-	377	572
Stage 1	-	-	-	-	611	-
Stage 2	-	-	-	-	791	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1048	-	368	572
Mov Cap-2 Maneuver	-	-	-	-	368	-
Stage 1	-	-	-	-	611	-
Stage 2	-	-	-	-	773	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	13.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	441	-	-	1048	-
HCM Lane V/C Ratio	0.069	-	-	0.023	-
HCM Control Delay (s)	13.8	-	-	8.5	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	126	84	232	87	68	48	335	852	102	29	499	76
Future Volume (veh/h)	126	84	232	87	68	48	335	852	102	29	499	76
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1984	1984	1984	1969	1969	1969
Adj Flow Rate, veh/h	168	112	242	102	80	56	368	936	112	33	561	85
Peak Hour Factor	0.75	0.75	0.75	0.85	0.85	0.85	0.91	0.91	0.91	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	1	1	1	2	2	2
Cap, veh/h	341	143	309	164	278	194	427	1131	958	193	665	564
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.15	0.57	0.57	0.34	0.34	0.34
Sat Flow, veh/h	1253	555	1198	1027	1078	755	1890	1984	1682	538	1969	1668
Grp Volume(v), veh/h	168	0	354	102	0	136	368	936	112	33	561	85
Grp Sat Flow(s),veh/h/ln	1253	0	1753	1027	0	1833	1890	1984	1682	538	1969	1668
Q Serve(g_s), s	9.6	0.0	14.6	5.4	0.0	4.6	9.2	29.8	2.4	4.1	20.5	2.8
Cycle Q Clear(g_c), s	14.3	0.0	14.6	20.0	0.0	4.6	9.2	29.8	2.4	15.9	20.5	2.8
Prop In Lane	1.00		0.68	1.00		0.41	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	341	0	451	164	0	472	427	1131	958	193	665	564
V/C Ratio(X)	0.49	0.00	0.78	0.62	0.00	0.29	0.86	0.83	0.12	0.17	0.84	0.15
Avail Cap(c_a), veh/h	341	0	451	164	0	472	443	1653	1401	330	1166	988
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.8	0.0	26.8	36.9	0.0	23.1	16.3	13.6	7.7	27.4	23.8	17.9
Incr Delay (d2), s/veh	1.1	0.0	8.8	7.0	0.0	0.3	15.5	2.4	0.1	0.4	3.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	0.0	6.4	2.1	0.0	1.8	4.8	10.1	0.6	0.5	8.6	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.9	0.0	35.6	43.9	0.0	23.5	31.8	16.0	7.7	27.8	26.8	18.1
LnGrp LOS	C	A	D	D	A	C	C	B	A	C	C	B
Approach Vol, veh/h		522			238			1416			679	
Approach Delay, s/veh		33.8			32.2			19.4			25.8	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	18.0	33.0		26.7		51.0		26.7				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	11.2	22.5		16.6		31.8		22.0				
Green Ext Time (p_c), s	0.1	3.8		0.9		7.7		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		24.6
HCM 6th LOS		C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	1.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	414	22	23	456	27	28
Future Vol, veh/h	414	22	23	456	27	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	50	150	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	75	90	90	92	92
Heavy Vehicles, %	2	0	0	1	0	0
Mvmt Flow	552	29	26	507	29	30

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	581	0	1111	552
Stage 1	-	-	-	-	552	-
Stage 2	-	-	-	-	559	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1003	-	233	537
Stage 1	-	-	-	-	581	-
Stage 2	-	-	-	-	576	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1003	-	227	537
Mov Cap-2 Maneuver	-	-	-	-	227	-
Stage 1	-	-	-	-	581	-
Stage 2	-	-	-	-	561	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	18.8
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	321	-	-	1003	-
HCM Lane V/C Ratio	0.186	-	-	0.025	-
HCM Control Delay (s)	18.8	-	-	8.7	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.7	-	-	0.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	53	282	73	57	30	248	508	86	23	589	80
Future Volume (veh/h)	55	53	282	73	57	30	248	508	86	23	589	80
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969
Adj Flow Rate, veh/h	85	65	244	96	98	42	370	564	116	32	620	140
Peak Hour Factor	0.65	0.82	0.85	0.76	0.58	0.72	0.67	0.90	0.74	0.71	0.95	0.57
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	318	89	334	174	321	137	408	1163	985	367	721	611
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.25	0.14	0.59	0.59	0.37	0.37	0.37
Sat Flow, veh/h	1249	363	1361	1070	1308	560	1875	1969	1668	760	1969	1668
Grp Volume(v), veh/h	85	0	309	96	0	140	370	564	116	32	620	140
Grp Sat Flow(s),veh/h/ln	1249	0	1724	1070	0	1868	1875	1969	1668	760	1969	1668
Q Serve(g_s), s	4.9	0.0	13.4	6.6	0.0	5.0	9.6	13.4	2.5	2.3	23.8	4.7
Cycle Q Clear(g_c), s	9.9	0.0	13.4	20.0	0.0	5.0	9.6	13.4	2.5	2.3	23.8	4.7
Prop In Lane	1.00		0.79	1.00		0.30	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	318	0	423	174	0	458	408	1163	985	367	721	611
V/C Ratio(X)	0.27	0.00	0.73	0.55	0.00	0.31	0.91	0.49	0.12	0.09	0.86	0.23
Avail Cap(c_a), veh/h	318	0	423	174	0	458	417	1561	1323	517	1110	941
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.1	0.0	28.3	37.9	0.0	25.1	17.3	9.6	7.3	17.1	23.9	17.9
Incr Delay (d2), s/veh	0.4	0.0	6.4	3.7	0.0	0.4	22.9	0.3	0.1	0.1	4.4	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	5.7	2.0	0.0	2.0	5.7	4.3	0.7	0.4	10.3	1.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.6	0.0	34.7	41.5	0.0	25.5	40.2	9.9	7.4	17.2	28.3	18.1
LnGrp LOS	C	A	C	D	A	C	D	A	A	B	C	B
Approach Vol, veh/h		394			236			1050			792	
Approach Delay, s/veh		33.6			32.0			20.3			26.1	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	18.3	36.6		26.7		54.9		26.7				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	11.6	25.8		15.4		15.4		22.0				
Green Ext Time (p_c), s	0.1	4.1		0.8		3.8		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	25.4
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	6.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	364	125	124	261	26	26
Future Vol, veh/h	364	125	124	261	26	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	50	150	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	45	45	76	40	40
Heavy Vehicles, %	2	0	0	2	0	0
Mvmt Flow	414	278	276	343	65	65

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	692	0	1309	414
Stage 1	-	-	-	-	414	-
Stage 2	-	-	-	-	895	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	912	-	177	643
Stage 1	-	-	-	-	671	-
Stage 2	-	-	-	-	402	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	912	-	123	643
Mov Cap-2 Maneuver	-	-	-	-	123	-
Stage 1	-	-	-	-	671	-
Stage 2	-	-	-	-	280	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.7	48.3
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	206	-	-	912	-
HCM Lane V/C Ratio	0.631	-	-	0.302	-
HCM Control Delay (s)	48.3	-	-	10.6	-
HCM Lane LOS	E	-	-	B	-
HCM 95th %tile Q(veh)	3.7	-	-	1.3	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	86	63	345	73	48	30	187	508	86	23	589	51
Future Volume (veh/h)	86	63	345	73	48	30	187	508	86	23	589	51
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969
Adj Flow Rate, veh/h	162	90	380	96	77	42	246	564	116	32	620	75
Peak Hour Factor	0.53	0.70	0.71	0.76	0.62	0.72	0.76	0.90	0.74	0.71	0.95	0.68
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	365	86	365	95	315	172	350	1105	936	375	726	615
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.10	0.56	0.56	0.37	0.37	0.37
Sat Flow, veh/h	1273	329	1390	923	1198	653	1875	1969	1668	760	1969	1668
Grp Volume(v), veh/h	162	0	470	96	0	119	246	564	116	32	620	75
Grp Sat Flow(s),veh/h/ln	1273	0	1719	923	0	1851	1875	1969	1668	760	1969	1668
Q Serve(g_s), s	8.7	0.0	20.0	0.0	0.0	3.9	5.8	13.4	2.5	2.1	22.1	2.3
Cycle Q Clear(g_c), s	12.6	0.0	20.0	20.0	0.0	3.9	5.8	13.4	2.5	2.1	22.1	2.3
Prop In Lane	1.00		0.81	1.00		0.35	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	365	0	452	95	0	486	350	1105	936	375	726	615
V/C Ratio(X)	0.44	0.00	1.04	1.01	0.00	0.24	0.70	0.51	0.12	0.09	0.85	0.12
Avail Cap(c_a), veh/h	365	0	452	95	0	486	449	1673	1418	554	1190	1008
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.1	0.0	28.1	38.1	0.0	22.1	16.2	10.3	7.9	15.8	22.2	15.9
Incr Delay (d2), s/veh	0.9	0.0	53.4	96.6	0.0	0.3	3.5	0.4	0.1	0.1	3.4	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.0	13.8	4.2	0.0	1.5	2.2	4.3	0.7	0.3	9.1	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.9	0.0	81.4	134.7	0.0	22.4	19.7	10.6	7.9	15.9	25.6	16.0
LnGrp LOS	C	A	F	F	A	C	B	B	A	B	C	B
Approach Vol, veh/h		632			215			926			727	
Approach Delay, s/veh		67.7			72.5			12.7			24.2	
Approach LOS		E			E			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	14.7	34.8		26.7		49.4		26.7				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	7.8	24.1		22.0		15.4		22.0				
Green Ext Time (p_c), s	0.3	4.0		0.0		3.8		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	35.1
HCM 6th LOS	D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	121.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	364	25	25	261	129	130
Future Vol, veh/h	364	25	25	261	129	130
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	50	150	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	45	45	76	40	40
Heavy Vehicles, %	2	0	0	2	0	0
Mvmt Flow	414	56	56	343	323	325

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	470	0	869	414
Stage 1	-	-	-	-	414	-
Stage 2	-	-	-	-	455	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1102	-	325	643
Stage 1	-	-	-	-	671	-
Stage 2	-	-	-	-	643	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1102	-	~ 308	643
Mov Cap-2 Maneuver	-	-	-	-	~ 308	-
Stage 1	-	-	-	-	671	-
Stage 2	-	-	-	-	610	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.2	284.6
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	417	-	-	1102	-
HCM Lane V/C Ratio	1.553	-	-	0.05	-
HCM Control Delay (s)	284.6	-	-	8.4	-
HCM Lane LOS	F	-	-	A	-
HCM 95th %tile Q(veh)	35.6	-	-	0.2	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	154	385	140	120	90	175	40	103	450	248
Average Queue (ft)	28	159	55	29	44	62	10	14	232	36
95th Queue (ft)	99	338	114	77	79	133	33	64	401	134
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)		0								
Queuing Penalty (veh)		0								
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)		7				0			27	
Queuing Penalty (veh)		4				0			24	

Intersection: 2: Site Drive & Golf Club Road

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	38	46
Average Queue (ft)	5	15
95th Queue (ft)	24	36
Link Distance (ft)		413
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Latson Road & Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 28

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	199	337	386	357	302	411	133	70	326	171
Average Queue (ft)	85	139	154	83	143	186	23	25	183	39
95th Queue (ft)	163	280	359	249	278	333	86	60	291	126
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)	0	5	24	0	6	3			26	0
Queuing Penalty (veh)	1	7	29	0	63	11			28	0

Intersection: 2: Site Drive & Golf Club Road

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	35	53
Average Queue (ft)	6	21
95th Queue (ft)	26	42
Link Distance (ft)		413
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Latson Road & Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 139

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	103	301	107	148	314	358	138	165	486	250
Average Queue (ft)	32	132	47	38	126	114	23	22	233	55
95th Queue (ft)	82	235	99	96	290	269	88	88	385	185
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)		2		0	9	0			31	
Queuing Penalty (veh)		1		0	58	0			33	

Intersection: 2: Site Drive & Golf Club Road

Movement	EB	EB	WB	NB
Directions Served	T	R	L	LR
Maximum Queue (ft)	4	26	87	89
Average Queue (ft)	0	3	30	23
95th Queue (ft)	3	16	70	63
Link Distance (ft)	674			413
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		50	150	
Storage Blk Time (%)		0		
Queuing Penalty (veh)		0		

Intersection: 3: Latson Road & Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 93

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	201	391	236	214	194	213	40	157	389	248
Average Queue (ft)	55	170	96	45	80	92	18	17	213	32
95th Queue (ft)	136	334	249	158	157	168	40	68	339	133
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)		10	8	0	1	0			29	0
Queuing Penalty (veh)		11	7	0	4	1			23	0

Intersection: 2: Site Drive & Golf Club Road

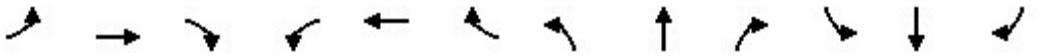
Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	48	428
Average Queue (ft)	7	161
95th Queue (ft)	29	452
Link Distance (ft)		413
Upstream Blk Time (%)		24
Queuing Penalty (veh)		0
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Latson Road & Site Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 45



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	86	63	345	73	48	30	187	508	86	23	589	51
Future Volume (veh/h)	86	63	345	73	48	30	187	508	86	23	589	51
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969
Adj Flow Rate, veh/h	162	90	380	96	77	42	246	564	116	32	620	75
Peak Hour Factor	0.53	0.70	0.71	0.76	0.62	0.72	0.76	0.90	0.74	0.71	0.95	0.68
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	471	117	493	179	425	232	274	991	840	307	678	574
Arrive On Green	0.35	0.35	0.35	0.35	0.35	0.35	0.09	0.50	0.50	0.34	0.34	0.34
Sat Flow, veh/h	1273	329	1390	923	1198	653	1875	1969	1668	760	1969	1668
Grp Volume(v), veh/h	162	0	470	96	0	119	246	564	116	32	620	75
Grp Sat Flow(s),veh/h/ln	1273	0	1719	923	0	1851	1875	1969	1668	760	1969	1668
Q Serve(g_s), s	9.5	0.0	22.9	9.7	0.0	4.2	7.8	18.8	3.5	2.9	28.4	2.9
Cycle Q Clear(g_c), s	13.7	0.0	22.9	32.6	0.0	4.2	7.8	18.8	3.5	6.7	28.4	2.9
Prop In Lane	1.00		0.81	1.00		0.35	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	471	0	609	179	0	656	274	991	840	307	678	574
V/C Ratio(X)	0.34	0.00	0.77	0.54	0.00	0.18	0.90	0.57	0.14	0.10	0.92	0.13
Avail Cap(c_a), veh/h	471	0	609	179	0	656	274	1072	908	339	758	643
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.7	0.0	27.0	41.5	0.0	21.0	22.2	16.3	12.5	23.8	29.6	21.2
Incr Delay (d2), s/veh	0.4	0.0	6.0	3.1	0.0	0.1	29.8	0.6	0.1	0.1	14.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	0.0	9.4	2.2	0.0	1.7	5.2	7.3	1.1	0.5	14.7	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.1	0.0	33.1	44.6	0.0	21.1	52.1	16.9	12.6	24.0	44.3	21.3
LnGrp LOS	C	A	C	D	A	C	D	B	B	C	D	C
Approach Vol, veh/h		632			215			926			727	
Approach Delay, s/veh		31.3			31.6			25.7			41.1	
Approach LOS		C			C			C			D	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	15.0	39.1		40.1		54.1		40.1				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 8.3	* 36		* 33		* 51		* 33				
Max Q Clear Time (g_c+I1), s	9.8	30.4		24.9		20.8		34.6				
Green Ext Time (p_c), s	0.0	2.0		2.2		3.7		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	32.1
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	120	277	207	178	229	269	50	216	580	250
Average Queue (ft)	44	135	65	35	95	122	18	26	300	57
95th Queue (ft)	99	237	170	117	187	220	41	123	590	200
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)									1	
Queuing Penalty (veh)									0	
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)		1	2	0	2	1			41	
Queuing Penalty (veh)		1	2	0	13	3			31	

Intersection: 2: Site Drive & Golf Club Road

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	39	428
Average Queue (ft)	7	159
95th Queue (ft)	28	448
Link Distance (ft)		413
Upstream Blk Time (%)		24
Queuing Penalty (veh)		0
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Latson Road & Site Drive

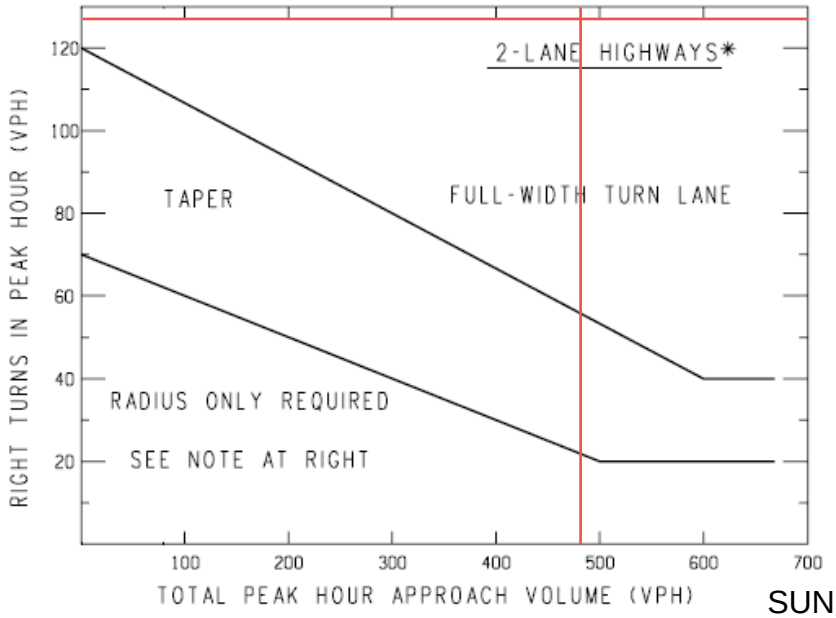
Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

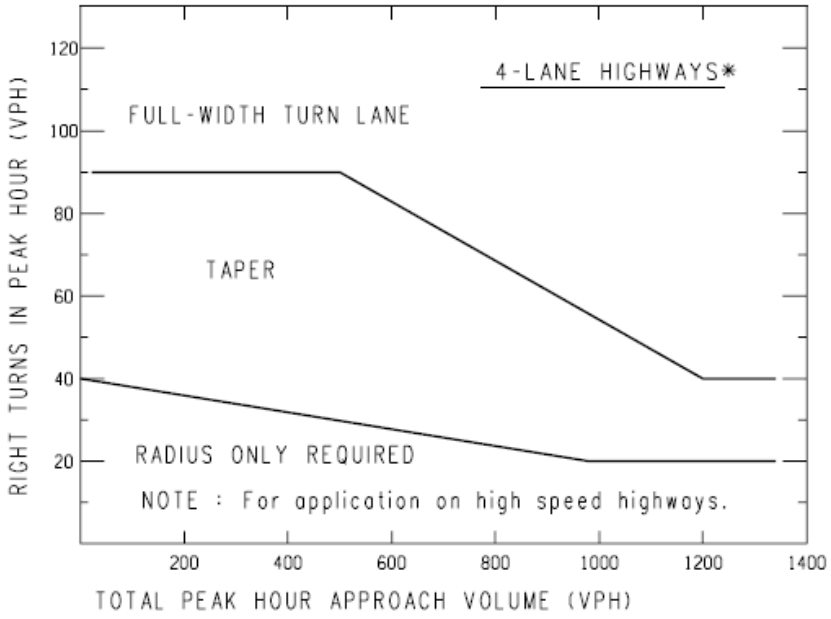
Network wide Queuing Penalty: 50

GOLF CLUB ROAD & SITE DRIVE RIGHT-TURN LANE WARRANT - PHASE II

SUN: 125



SUN: 489



NOTE: For posted speeds at or under 45 mph, peak hour right turns greater than 40 vph, and total peak hour approach less than 300 vph, adjust right turn volumes.

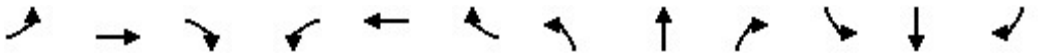
Adjust peak hour Right turns = Peak hour Right turns – 20

*If a center left-turn lane exists (ie 3 or 5 lane roadway), subtract the number of left turns in approach volume form the total approach volume to get an adjusted total approach volume.

Sample Problem: The Design Speed is 55 mph. The Peak Hour Approach Volume is 300 vph. The Number of Right Turns in the Peak Hous is 100 vph. Determine if a right turn lane is recommended.

Solution: Figure indicates that the intersection of 300 vph and 100 vph is located above the upper trend line; thus, a right-turn lane may be recommended.

Appendix F – Phase II Alternative B Build Conditions Data



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	38	332	67	47	26	85	308	36	19	729	64
Future Volume (veh/h)	43	38	332	67	47	26	85	308	36	19	729	64
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1984	1984	1984	1953	1953	1953	1922	1922	1922	1969	1969	1969
Adj Flow Rate, veh/h	53	47	317	85	59	33	97	350	41	20	784	69
Peak Hour Factor	0.81	0.81	0.81	0.79	0.79	0.79	0.88	0.88	0.88	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	1	3	3	3	5	5	5	2	2	2
Cap, veh/h	364	55	372	136	293	164	241	1124	952	533	879	745
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.25	0.06	0.58	0.58	0.45	0.45	0.45
Sat Flow, veh/h	1315	222	1494	1010	1177	658	1830	1922	1629	993	1969	1668
Grp Volume(v), veh/h	53	0	364	85	0	92	97	350	41	20	784	69
Grp Sat Flow(s),veh/h/ln	1315	0	1715	1010	0	1835	1830	1922	1629	993	1969	1668
Q Serve(g_s), s	2.7	0.0	16.3	3.7	0.0	3.2	2.1	7.4	0.9	0.9	29.5	1.9
Cycle Q Clear(g_c), s	5.9	0.0	16.3	20.0	0.0	3.2	2.1	7.4	0.9	0.9	29.5	1.9
Prop In Lane	1.00		0.87	1.00		0.36	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	364	0	427	136	0	456	241	1124	952	533	879	745
V/C Ratio(X)	0.15	0.00	0.85	0.62	0.00	0.20	0.40	0.31	0.04	0.04	0.89	0.09
Avail Cap(c_a), veh/h	364	0	427	136	0	456	413	1546	1310	657	1126	954
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.2	0.0	28.8	39.2	0.0	23.9	16.8	8.5	7.1	12.6	20.5	12.9
Incr Delay (d2), s/veh	0.2	0.0	15.3	8.5	0.0	0.2	1.1	0.2	0.0	0.0	7.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	7.7	1.9	0.0	1.3	0.7	2.3	0.2	0.2	12.8	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.4	0.0	44.1	47.7	0.0	24.1	17.9	8.6	7.1	12.6	28.1	12.9
LnGrp LOS	C	A	D	D	A	C	B	A	A	B	C	B
Approach Vol, veh/h		417			177			488			873	
Approach Delay, s/veh		41.9			35.5			10.3			26.6	
Approach LOS		D			D			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	11.1	42.6		26.7		53.7		26.7				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	4.1	31.5		18.3		9.4		22.0				
Green Ext Time (p_c), s	0.1	4.4		0.4		2.0		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		26.6
HCM 6th LOS		C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	408	21	15	181	15	5
Future Vol, veh/h	408	21	15	181	15	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	50	150	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	81	81	87	87	92	92
Heavy Vehicles, %	1	0	0	3	0	0
Mvmt Flow	504	26	17	208	16	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	530	0	746	504
Stage 1	-	-	-	-	504	-
Stage 2	-	-	-	-	242	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1048	-	384	572
Stage 1	-	-	-	-	611	-
Stage 2	-	-	-	-	803	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1048	-	378	572
Mov Cap-2 Maneuver	-	-	-	-	378	-
Stage 1	-	-	-	-	611	-
Stage 2	-	-	-	-	790	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	14.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	413	-	-	1048	-
HCM Lane V/C Ratio	0.053	-	-	0.016	-
HCM Control Delay (s)	14.2	-	-	8.5	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

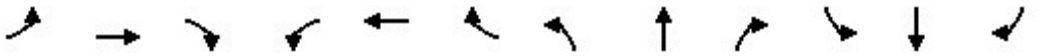
Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	8	0	429	1122	6
Future Vol, veh/h	0	8	0	429	1122	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	75
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	88	88	88	88
Heavy Vehicles, %	0	0	0	5	2	0
Mvmt Flow	0	9	0	488	1275	7

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	1275	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.2	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.3	-	-	-	-
Pot Cap-1 Maneuver	0	206	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	206	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	23.2	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	206	-	-
HCM Lane V/C Ratio	-	0.042	-	-
HCM Control Delay (s)	-	23.2	-	-
HCM Lane LOS	-	C	-	-
HCM 95th %tile Q(veh)	-	0.1	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	126	84	215	87	68	48	334	852	102	29	506	69
Future Volume (veh/h)	126	84	215	87	68	48	334	852	102	29	506	69
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1984	1984	1984	1969	1969	1969
Adj Flow Rate, veh/h	168	112	220	102	80	56	367	936	112	33	569	78
Peak Hour Factor	0.75	0.75	0.75	0.85	0.85	0.85	0.91	0.91	0.91	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	1	1	1	2	2	2
Cap, veh/h	339	152	299	179	276	193	424	1135	962	195	673	570
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.14	0.57	0.57	0.34	0.34	0.34
Sat Flow, veh/h	1253	593	1166	1048	1078	755	1890	1984	1682	538	1969	1668
Grp Volume(v), veh/h	168	0	332	102	0	136	367	936	112	33	569	78
Grp Sat Flow(s),veh/h/ln	1253	0	1759	1048	0	1833	1890	1984	1682	538	1969	1668
Q Serve(g_s), s	9.7	0.0	13.5	6.5	0.0	4.7	9.2	29.8	2.4	4.1	20.9	2.5
Cycle Q Clear(g_c), s	14.4	0.0	13.5	20.0	0.0	4.7	9.2	29.8	2.4	16.0	20.9	2.5
Prop In Lane	1.00		0.66	1.00		0.41	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	339	0	451	179	0	470	424	1135	962	195	673	570
V/C Ratio(X)	0.50	0.00	0.74	0.57	0.00	0.29	0.87	0.82	0.12	0.17	0.85	0.14
Avail Cap(c_a), veh/h	339	0	451	179	0	470	441	1645	1394	328	1160	983
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.1	0.0	26.6	36.3	0.0	23.3	16.3	13.5	7.7	27.3	23.8	17.7
Incr Delay (d2), s/veh	1.1	0.0	6.2	4.2	0.0	0.3	15.9	2.3	0.1	0.4	3.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	0.0	5.7	2.0	0.0	1.8	4.9	10.1	0.6	0.5	8.8	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.2	0.0	32.8	40.4	0.0	23.7	32.3	15.9	7.7	27.7	26.8	17.9
LnGrp LOS	C	A	C	D	A	C	C	B	A	C	C	B
Approach Vol, veh/h		500			238			1415			680	
Approach Delay, s/veh		32.0			30.8			19.5			25.8	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	18.0	33.4		26.7		51.4		26.7				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	11.2	22.9		16.4		31.8		22.0				
Green Ext Time (p_c), s	0.1	3.8		0.8		7.7		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	24.2
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	0.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	414	23	15	456	27	11
Future Vol, veh/h	414	23	15	456	27	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	50	150	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	75	90	90	92	92
Heavy Vehicles, %	2	0	0	1	0	0
Mvmt Flow	552	31	17	507	29	12

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	583	0	1093	552
Stage 1	-	-	-	-	552	-
Stage 2	-	-	-	-	541	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1001	-	239	537
Stage 1	-	-	-	-	581	-
Stage 2	-	-	-	-	588	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1001	-	235	537
Mov Cap-2 Maneuver	-	-	-	-	235	-
Stage 1	-	-	-	-	581	-
Stage 2	-	-	-	-	578	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	20
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	281	-	-	1001	-
HCM Lane V/C Ratio	0.147	-	-	0.017	-
HCM Control Delay (s)	20	-	-	8.7	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.5	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	17	0	1288	801	7
Future Vol, veh/h	0	17	0	1288	801	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	75
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	91	91	84	84
Heavy Vehicles, %	0	0	0	1	2	0
Mvmt Flow	0	18	0	1415	954	8

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	954	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.2	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.3	-	-	-	-
Pot Cap-1 Maneuver	0	317	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	317	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.1	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	317	-	-
HCM Lane V/C Ratio	-	0.058	-	-
HCM Control Delay (s)	-	17.1	-	-
HCM Lane LOS	-	C	-	-
HCM 95th %tile Q(veh)	-	0.2	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	53	267	73	57	30	248	508	86	23	626	43
Future Volume (veh/h)	55	53	267	73	57	30	248	508	86	23	626	43
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969
Adj Flow Rate, veh/h	85	65	211	96	98	42	370	564	116	32	703	57
Peak Hour Factor	0.65	0.82	0.91	0.76	0.58	0.72	0.67	0.90	0.74	0.71	0.89	0.75
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	292	94	304	175	300	129	390	1213	1028	388	790	670
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.14	0.62	0.62	0.40	0.40	0.40
Sat Flow, veh/h	1249	408	1323	1103	1308	560	1875	1969	1668	760	1969	1668
Grp Volume(v), veh/h	85	0	276	96	0	140	370	564	116	32	703	57
Grp Sat Flow(s),veh/h/ln	1249	0	1731	1103	0	1868	1875	1969	1668	760	1969	1668
Q Serve(g_s), s	5.3	0.0	12.7	7.3	0.0	5.4	10.9	13.4	2.5	2.3	28.9	1.8
Cycle Q Clear(g_c), s	10.7	0.0	12.7	20.0	0.0	5.4	10.9	13.4	2.5	2.3	28.9	1.8
Prop In Lane	1.00		0.76	1.00		0.30	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	292	0	398	175	0	429	390	1213	1028	388	790	670
V/C Ratio(X)	0.29	0.00	0.69	0.55	0.00	0.33	0.95	0.46	0.11	0.08	0.89	0.09
Avail Cap(c_a), veh/h	292	0	398	175	0	429	390	1464	1240	484	1041	882
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	32.4	0.0	30.7	40.0	0.0	27.9	21.2	9.0	6.9	16.3	24.3	16.1
Incr Delay (d2), s/veh	0.5	0.0	5.1	3.6	0.0	0.4	32.6	0.3	0.0	0.1	7.8	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	5.4	2.1	0.0	2.3	7.3	4.3	0.7	0.4	13.2	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	32.9	0.0	35.9	43.6	0.0	28.3	53.8	9.3	6.9	16.4	32.1	16.2
LnGrp LOS	C	A	D	D	A	C	D	A	A	B	C	B
Approach Vol, veh/h		361			236			1050			792	
Approach Delay, s/veh		35.2			34.6			24.7			30.3	
Approach LOS		D			C			C			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	18.7	41.6		26.7		60.3		26.7				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	12.9	30.9		14.7		15.4		22.0				
Green Ext Time (p_c), s	0.0	4.0		0.8		3.8		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	29.0
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	3.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	364	125	87	261	26	11
Future Vol, veh/h	364	125	87	261	26	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	50	150	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	45	45	76	40	40
Heavy Vehicles, %	2	0	0	2	0	0
Mvmt Flow	414	278	193	343	65	28

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	692	0	1143	414
Stage 1	-	-	-	-	414	-
Stage 2	-	-	-	-	729	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	912	-	223	643
Stage 1	-	-	-	-	671	-
Stage 2	-	-	-	-	481	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	912	-	176	643
Mov Cap-2 Maneuver	-	-	-	-	176	-
Stage 1	-	-	-	-	671	-
Stage 2	-	-	-	-	379	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.6	31.9
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	224	-	-	912	-
HCM Lane V/C Ratio	0.413	-	-	0.212	-
HCM Control Delay (s)	31.9	-	-	10	-
HCM Lane LOS	D	-	-	B	-
HCM 95th %tile Q(veh)	1.9	-	-	0.8	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	15	0	842	929	37
Future Vol, veh/h	0	15	0	842	929	37
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	75
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	40	40	45	79	90	45
Heavy Vehicles, %	0	0	0	2	2	0
Mvmt Flow	0	38	0	1066	1032	82

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	1032	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.2	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.3	-	-	-	-
Pot Cap-1 Maneuver	0	285	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	285	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	19.5	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	285	-	-
HCM Lane V/C Ratio	-	0.132	-	-
HCM Control Delay (s)	-	19.5	-	-
HCM Lane LOS	-	C	-	-
HCM 95th %tile Q(veh)	-	0.4	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	86	63	267	73	48	30	187	508	86	23	597	43
Future Volume (veh/h)	86	63	267	73	48	30	187	508	86	23	597	43
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969	1969
Adj Flow Rate, veh/h	162	90	211	96	77	42	246	564	116	32	671	57
Peak Hour Factor	0.53	0.70	0.91	0.76	0.62	0.72	0.76	0.90	0.74	0.71	0.89	0.75
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	348	132	310	196	303	165	337	1137	964	389	772	654
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.25	0.10	0.58	0.58	0.39	0.39	0.39
Sat Flow, veh/h	1273	523	1225	1078	1198	653	1875	1969	1668	760	1969	1668
Grp Volume(v), veh/h	162	0	301	96	0	119	246	564	116	32	671	57
Grp Sat Flow(s),veh/h/ln	1273	0	1748	1078	0	1851	1875	1969	1668	760	1969	1668
Q Serve(g_s), s	9.2	0.0	12.3	7.0	0.0	4.1	5.8	13.4	2.5	2.1	24.9	1.7
Cycle Q Clear(g_c), s	13.3	0.0	12.3	19.3	0.0	4.1	5.8	13.4	2.5	2.1	24.9	1.7
Prop In Lane	1.00		0.70	1.00		0.35	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	348	0	442	196	0	468	337	1137	964	389	772	654
V/C Ratio(X)	0.47	0.00	0.68	0.49	0.00	0.25	0.73	0.50	0.12	0.08	0.87	0.09
Avail Cap(c_a), veh/h	348	0	442	196	0	468	432	1611	1365	533	1145	971
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.9	0.0	26.7	35.3	0.0	23.6	16.7	9.9	7.6	15.3	22.2	15.1
Incr Delay (d2), s/veh	1.0	0.0	4.2	1.9	0.0	0.3	4.5	0.3	0.1	0.1	5.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	0.0	5.0	1.8	0.0	1.6	2.3	4.3	0.7	0.3	10.6	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.8	0.0	30.9	37.2	0.0	23.9	21.3	10.2	7.6	15.3	27.2	15.2
LnGrp LOS	C	A	C	D	A	C	C	B	A	B	C	B
Approach Vol, veh/h		463			215			926			760	
Approach Delay, s/veh		30.5			29.8			12.8			25.8	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	14.7	37.7		26.7		52.4		26.7				
Change Period (Y+Rc), s	* 6.7	* 6.7		* 6.7		* 6.7		* 6.7				
Max Green Setting (Gmax), s	* 12	* 46		* 20		* 65		* 20				
Max Q Clear Time (g_c+I1), s	7.8	26.9		15.3		15.4		21.3				
Green Ext Time (p_c), s	0.3	4.1		0.9		3.8		0.0				

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

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	47.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	364	25	17	261	129	52
Future Vol, veh/h	364	25	17	261	129	52
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	50	150	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	45	45	76	40	40
Heavy Vehicles, %	2	0	0	2	0	0
Mvmt Flow	414	56	38	343	323	130

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	470	0	833	414
Stage 1	-	-	-	-	414	-
Stage 2	-	-	-	-	419	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1102	-	341	643
Stage 1	-	-	-	-	671	-
Stage 2	-	-	-	-	668	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1102	-	329	643
Mov Cap-2 Maneuver	-	-	-	-	329	-
Stage 1	-	-	-	-	671	-
Stage 2	-	-	-	-	645	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	136.9
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	383	-	-	1102	-
HCM Lane V/C Ratio	1.181	-	-	0.034	-
HCM Control Delay (s)	136.9	-	-	8.4	-
HCM Lane LOS	F	-	-	A	-
HCM 95th %tile Q(veh)	18.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	78	0	781	929	8
Future Vol, veh/h	0	78	0	781	929	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	75
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	40	40	45	84	83	45
Heavy Vehicles, %	0	0	0	2	2	0
Mvmt Flow	0	195	0	930	1119	18

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	1119	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.2	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.3	-	-	-	-
Pot Cap-1 Maneuver	0	254	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	254	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	54.2	0	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	-	254	-	-
HCM Lane V/C Ratio	-	0.768	-	-
HCM Control Delay (s)	-	54.2	-	-
HCM Lane LOS	-	F	-	-
HCM 95th %tile Q(veh)	-	5.6	-	-

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	84	385	194	144	104	142	58	56	379	250
Average Queue (ft)	28	146	64	33	42	63	10	11	218	45
95th Queue (ft)	65	292	152	100	82	121	37	39	349	158
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)		5	1	0					27	0
Queuing Penalty (veh)		3	0	0					22	0

Intersection: 2: Site Drive & Golf Club Road

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	28	35
Average Queue (ft)	4	10
95th Queue (ft)	19	29
Link Distance (ft)		413
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Latson Road & Site Drive

Movement	EB
Directions Served	R
Maximum Queue (ft)	22
Average Queue (ft)	4
95th Queue (ft)	17
Link Distance (ft)	405
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 26

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	297	409	304	291	342	397	56	123	328	212
Average Queue (ft)	95	158	140	83	159	187	19	28	186	37
95th Queue (ft)	211	357	302	230	313	327	48	82	287	126
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)		0								
Queuing Penalty (veh)		1								
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)	2	10	14	0	10	3			26	
Queuing Penalty (veh)	7	15	17	0	101	13			26	

Intersection: 2: Site Drive & Golf Club Road

Movement	EB	WB	NB
Directions Served	T	L	LR
Maximum Queue (ft)	19	29	45
Average Queue (ft)	1	6	17
95th Queue (ft)	10	25	38
Link Distance (ft)	674		413
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		150	
Storage Blk Time (%)	0		
Queuing Penalty (veh)	0		

Intersection: 3: Latson Road & Site Drive

Movement	EB
Directions Served	R
Maximum Queue (ft)	26
Average Queue (ft)	10
95th Queue (ft)	27
Link Distance (ft)	405
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 181

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	115	278	143	131	298	427	140	211	546	250
Average Queue (ft)	36	127	58	36	131	148	23	26	244	39
95th Queue (ft)	88	244	123	99	295	477	88	123	432	151
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)						0				
Queuing Penalty (veh)						4				
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)		3			8	0			32	
Queuing Penalty (veh)		2			52	1			22	

Intersection: 2: Site Drive & Golf Club Road

Movement	EB	WB	NB
Directions Served	R	L	LR
Maximum Queue (ft)	22	100	56
Average Queue (ft)	2	21	17
95th Queue (ft)	12	58	43
Link Distance (ft)			413
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	50	150	
Storage Blk Time (%)		0	
Queuing Penalty (veh)		0	

Intersection: 3: Latson Road & Site Drive

Movement	EB	NB
Directions Served	R	T
Maximum Queue (ft)	26	137
Average Queue (ft)	6	14
95th Queue (ft)	22	167
Link Distance (ft)	405	670
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 80

Intersection: 1: Latson Road & Golf Club Road

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	165	325	202	197	180	212	44	125	429	249
Average Queue (ft)	47	123	72	35	79	93	16	19	208	26
95th Queue (ft)	116	247	169	106	145	160	41	73	348	107
Link Distance (ft)		606		891		1088			855	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	225		225		225		225	150		100
Storage Blk Time (%)	0	2	2	0	0	0			27	
Queuing Penalty (veh)	1	3	2	0	0	0			18	

Intersection: 2: Site Drive & Golf Club Road

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	35	399
Average Queue (ft)	7	102
95th Queue (ft)	27	316
Link Distance (ft)		413
Upstream Blk Time (%)		6
Queuing Penalty (veh)		0
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Latson Road & Site Drive

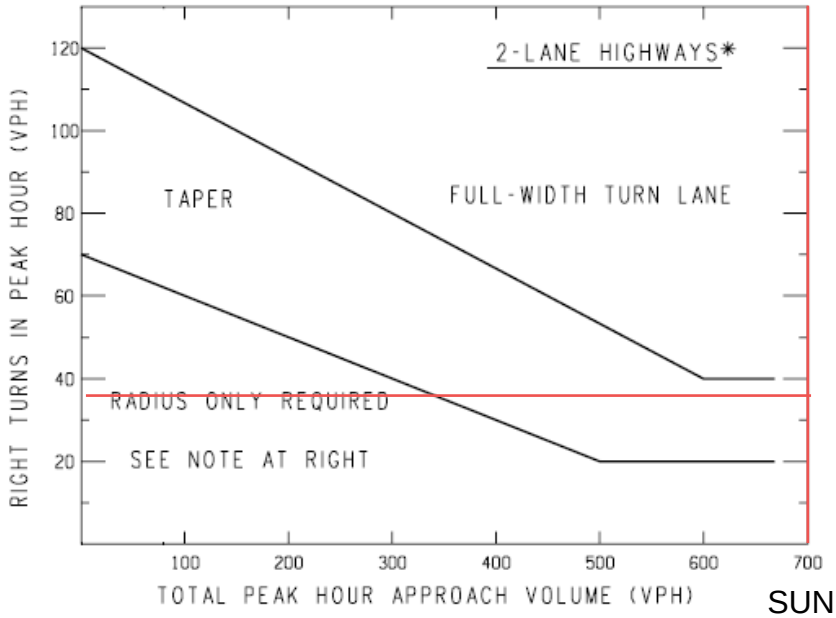
Movement	EB
Directions Served	R
Maximum Queue (ft)	217
Average Queue (ft)	47
95th Queue (ft)	152
Link Distance (ft)	405
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 24

LATSON ROAD & SITE DRIVE RIGHT-TURN LANE WARRANT - PHASE II

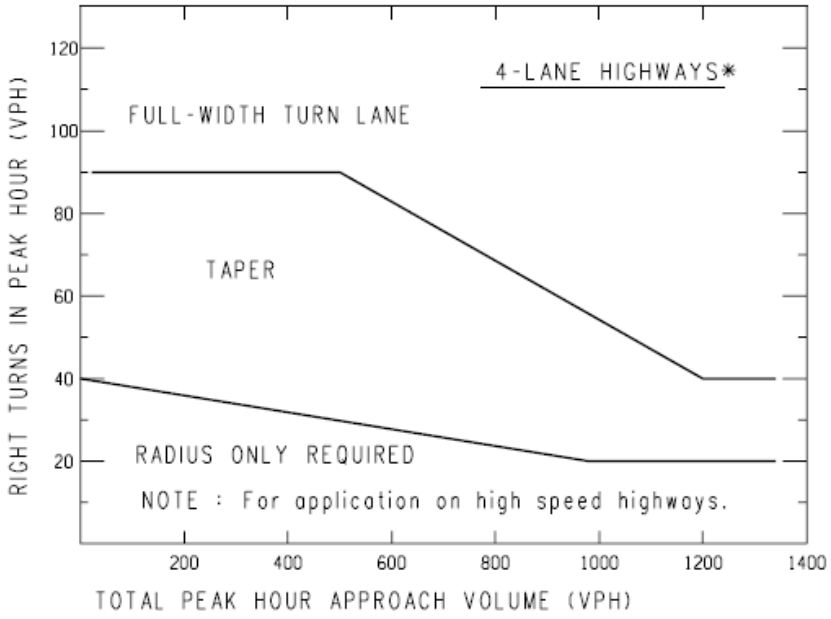
SUN: 37



SUN: 966

NOTE: For posted speeds at or under 45 mph, peak hour right turns greater than 40 vph, and total peak hour approach less than 300 vph, adjust right turn volumes.

Adjust peak hour Right turns = Peak hour Right turns – 20



*If a center left-turn lane exists (ie 3 or 5 lane roadway), subtract the number of left turns in approach volume form the total approach volume to get an adjusted total approach volume.

Sample Problem: The Design Speed is 55 mph. The Peak Hour Approach Volume is 300 vph. The Number of Right Turns in the Peak Hous is 100 vph. Determine if a right turn lane is recommended.

Solution: Figure indicates that the intersection of 300 vph and 100 vph is located above the upper trend line; thus, a right-turn lane may be recommended.

SITE PLAN
FOR
BIBLE BAPTIST CHURCH
PART OF NE QUARTER, SECTION 5
GENOA TOWNSHIP, LIVINGSTON COUNTY, MI

PROPERTY DESCRIPTION:

PARCEL: 4711-05-200-002

Part of the Northeast 1/4 of the Northeast Fractional 1/4 of Section 5, T2N-R5E, Genoa Township, Livingston County, Michigan, more particularly described as follows: BEGINNING at the Northeast corner of Section 5; thence along the centerline of Latson Road (33 foot wide 1/2 Right of Way) and the East line of Section 5, S 01°15'41" E, 1627.92 feet; thence along the North line of "ROLLING RIDGE I", Livingston County Condominium Subdivision Plan No. 134, as recorded in Livingston County Records and the South line of the Northeast 1/4 of the Northeast fractional 1/4 of Section 5, as previously surveyed and monumented, S 87°47'59" W, 1284.34 feet; thence along the common property line per Agreement recorded in Liber 1098, Page 22, Livingston County Records, N 02°36'49" W, 1107.42 feet; thence N 88°30'30" E (recorded as East), 200.00 feet; thence N 02°36'49" W (recorded as North), 536.70 feet; thence along the centerline of Golf Club Road (66 foot wide Right of Way) and the North line of Section 5, as previously surveyed and monumented, N 88°30'31" E, 1122.98 feet, to the POINT OF BEGINNING, containing 46.50 acres, more or less, and subject to the rights of the public over the existing Latson Road and Golf Club Road. Also subject to any other easements or restrictions of record.

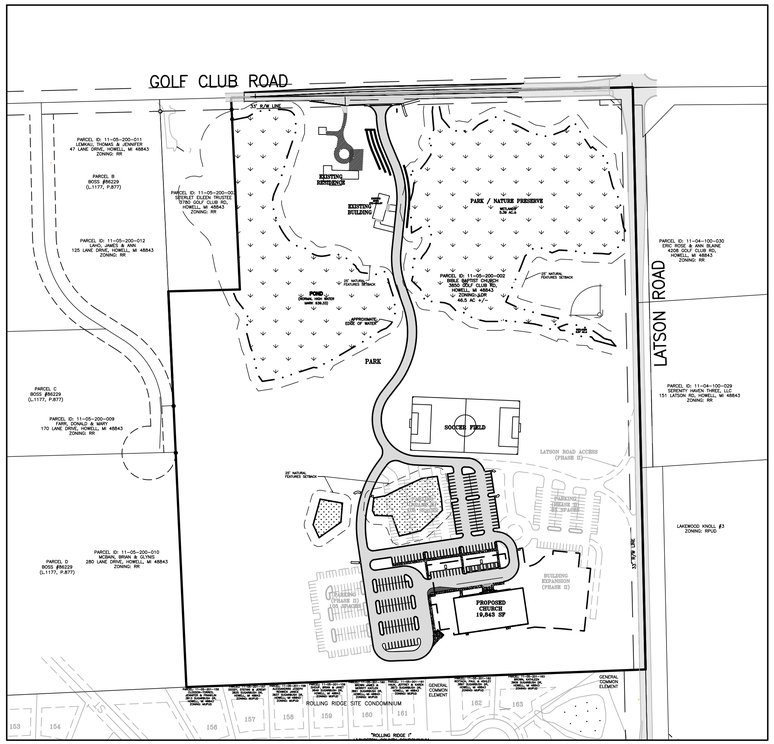
CONSTRUCTION NOTES

THE CONTRACTOR SHALL COMPLY WITH THE FOLLOWING NOTES AND ANY WORK INVOLVED SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT.

1. THE CONTRACTOR SHALL HOLD HARMLESS THE DESIGN PROFESSIONAL, MUNICIPALITY, COUNTY, STATE AND ALL OF ITS SUB CONSULTANTS, PUBLIC AND PRIVATE UTILITY COMPANIES, AND LANDOWNERS FOR DAMAGES TO INDIVIDUALS AND PROPERTY, REAL OR OTHERWISE, DUE TO THE OPERATIONS OF THE CONTRACTOR AND/OR THEIR SUBCONTRACTORS.
2. DO NOT SCALE THESE DRAWINGS AS IT IS A REPRODUCTION AND SUBJECT TO DISTORTION.
3. A GRADING PERMIT FOR SOIL EROSION-SEDIMENTATION CONTROL SHALL BE OBTAINED FROM THE GOVERNING AGENCY PRIOR TO THE START OF CONSTRUCTION.
4. IF DUST PROBLEM OCCURS DURING CONSTRUCTION, CONTROL WILL BE PROVIDED BY AN APPLICATION OF WATER, EITHER BY SPRINKLER OR TANK TRUCK.
5. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH LOCAL MUNICIPAL STANDARDS AND SPECIFICATIONS.
6. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL REQUIRED TOWNSHIP, COUNTY, AND STATE OF MICHIGAN PERMITS.
7. PAVED SURFACES, WALKWAYS, SIGNS, LIGHTING AND OTHER STRUCTURES SHALL BE MAINTAINED IN A SAFE, ATTRACTIVE CONDITION AS ORIGINALLY DESIGNED AND CONSTRUCTED.
8. ALL BARRIER-FREE FEATURES SHALL BE CONSTRUCTED TO MEET ALL LOCAL, STATE AND A.D.A. REQUIREMENTS.
9. ANY DISCREPANCY IN THIS PLAN AND ACTUAL FIELD CONDITIONS SHALL BE REPORTED TO THE DESIGN ENGINEER PRIOR TO THE START OF CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL SETBACKS, EASEMENTS AND DIMENSIONS SHOWN HEREON BEFORE BEGINNING CONSTRUCTION.
10. THE CONTRACTOR SHALL CONTACT ALL OWNERS OF EASEMENTS, UTILITIES AND RIGHTS-OF-WAY, PUBLIC OR PRIVATE, PRIOR TO THE START OF CONSTRUCTION.
11. THE CONTRACTOR SHALL COORDINATE WITH ALL OWNERS TO DETERMINE THE LOCATION OF EXISTING LANDSCAPING, IRRIGATION LINES & PRIVATE UTILITY LINES. THE CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGE TO EXISTING LANDSCAPING, IRRIGATION LINES, AND PRIVATE UTILITY LINES.
12. THE CONTRACTOR SHALL REMOVE ALL TRASH AND DEBRIS FROM THE SITE UPON COMPLETION OF THE PROJECT.
13. THE CONTRACTOR SHALL MAINTAIN THE SITE IN A MANNER SO THAT WORKMEN AND PUBLIC SHALL BE PROTECTED FROM INJURY, AND ADJOINING PROPERTY PROTECTED FROM DAMAGE.
14. THE CONTRACTOR SHALL KEEP THE AREA OUTSIDE THE "CONSTRUCTION LIMITS" BROOM CLEAN AT ALL TIMES.
15. THE CONTRACTOR SHALL CALL MISS DIG A MINIMUM OF 72 HOURS PRIOR TO THE START OF CONSTRUCTION.
16. ALL EXCAVATION UNDER OR WITHIN 3 FEET OF PUBLIC PAVEMENT, EXISTING OR PROPOSED SHALL BE BACKFILLED AND COMPACTED WITH SAND (MDOT CLASS II).
17. ALL PAVEMENT REPLACEMENT AND OTHER WORKS COVERED BY THESE PLANS SHALL BE DONE IN ACCORDANCE WITH THE REQUIREMENTS OF THE TOWNSHIP, INCLUDING THE LATEST MICHIGAN DEPARTMENT OF TRANSPORTATION (MDOT) SPECIFICATIONS FOR HIGHWAY CONSTRUCTION.
18. THE CONTRACTOR IS RESPONSIBLE FOR ALL DAMAGE TO EXISTING UTILITIES.
19. NO ADDITIONAL COMPENSATION WILL BE PAID TO THE CONTRACTOR FOR ANY DELAY OR INCONVENIENCE DUE TO THE MATERIAL SHORTAGES OR RESPONSIBLE DELAYS DUE TO THE OPERATIONS OF SUCH OTHER PARTIES DOING WORK INDICATED OR SHOWN ON THE PLANS OR IN THE SPECIFICATION OR FOR ANY REASONABLE DELAYS IN CONSTRUCTION DUE TO THE ENCOUNTERING OR EXISTING UTILITIES THAT MAY OR MAY NOT BE SHOWN ON THE PLANS.
20. DURING THE CONSTRUCTION OPERATIONS, THE CONTRACTOR SHALL NOT PERFORM WORK BY PRIVATE AGREEMENT WITH PROPERTY OWNERS ADJACENT TO THE PROJECT.
21. IF WORK EXTENDS BEYOND NOVEMBER 15, NO COMPENSATION WILL BE DUE TO THE CONTRACTOR FOR ANY WINTER PROTECTION MEASURES THAT MAY BE REQUIRED BY THE ENGINEER.
22. NO TREES ARE TO BE REMOVED UNTIL MARKED IN THE FIELD BY THE ENGINEER.
23. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO THE PROPERTY BEYOND THE CONSTRUCTION LIMITS INCLUDING BUT NOT LIMITED TO EXISTING FENCE, LAWN, TREES AND SHRUBBERY.
24. ALL AREAS DISTURBED BY THE CONTRACTOR BEYOND THE NORMAL CONSTRUCTION LIMITS OF THE PROJECT SHALL BE SODDED OR SEEDED AS SPECIFIED OR DIRECTED BY THE ENGINEER.
25. ALL ROOTS, STUMPS AND OTHER OBJECTIONABLE MATERIALS SHALL BE REMOVED AND THE HOLE BACKFILLED WITH SUITABLE MATERIAL. WHERE GRADE CORRECTION IS REQUIRED, THE SUBGRADE SHALL BE CUT TO CONFORM TO THE CROSS-SECTION AS SHOWN IN THE PLANS.
26. TRAFFIC SHALL BE MAINTAINED DURING CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL SIGNS AND TRAFFIC CONTROL DEVICES. FLAG PERSONS SHALL BE PROVIDED BY THE CONTRACTOR IF DETERMINED NECESSARY BY THE ENGINEER. ALL SIGNS SHALL CONFORM TO THE MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES AT NO COST TO THE TOWNSHIP. NO WORK SHALL BE DONE UNLESS THE APPROPRIATE TRAFFIC CONTROL DEVICES ARE IN PLACE.
27. ALL DEMOLISHED MATERIALS AND SOIL SPOILS SHALL BE REMOVED FROM THE SITE AT NO ADDITIONAL COST, AND DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.
28. AFTER REMOVAL OF TOPSOIL, THE SUBGRADE SHALL BE COMPACTED TO 95% OF ITS UNIT WEIGHT.
29. ALL GRADING IN THE PLANS SHALL BE DONE AS PART OF THIS CONTRACT. ALL DELETERIOUS MATERIAL SHALL BE REMOVED FROM THE SUBGRADE PRIOR TO COMPACTING.
30. NO SEEDING SHALL BE DONE AFTER OCTOBER 15 WITHOUT APPROVAL OF THE ENGINEER.
31. ANY EXISTING APPURTENANCES SUCH AS MANHOLES, GATE VALVES, ETC. SHALL BE ADJUSTED TO THE PROPOSED GRADE AND SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT.
32. SOIL EROSION MEASURES SHALL BE MAINTAINED BY THE CONTRACTOR UNTIL VEGETATION HAS BEEN RE-ESTABLISHED.
33. ALL PERMANENT SIGNS AND PAVEMENT MARKINGS SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST REVISION OF THE MICHIGAN MUTCD MANUAL AND SHALL BE INCIDENTAL TO THE CONTRACT.
34. ACCESS ROADS TO THE SITE SHALL BE MAINTAINED DURING CONSTRUCTION AND SHALL BE CONSTRUCTED TO BE CAPABLE OF SUPPORTING THE IMPOSED LOAD OF FIRE APPARATUS WEIGHING AT LEAST 75,000 POUNDS.

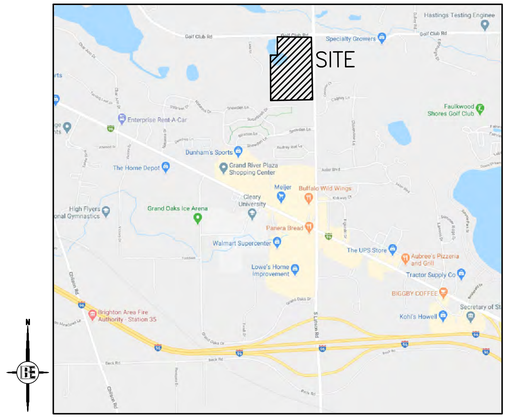
INDEMNIFICATION STATEMENT

THE CONTRACTOR SHALL HOLD HARMLESS THE DESIGN PROFESSIONAL, MUNICIPALITY, COUNTY, STATE AND ALL OF ITS SUB CONSULTANTS, PUBLIC AND PRIVATE UTILITY COMPANIES, AND LANDOWNERS FOR DAMAGES TO INDIVIDUALS AND PROPERTY, REAL OR OTHERWISE, DUE TO THE OPERATIONS OF THE CONTRACTOR AND/OR THEIR SUBCONTRACTORS.



OVERALL SITE MAP

NO SCALE



LOCATION MAP

NO SCALE

SHEET INDEX

SHEET NO.	DESCRIPTION
1	COVER SHEET
2	EXISTING CONDITIONS & DEMOLITION PLAN
3	NATURAL FEATURES PLAN
4	OVERALL SITE PLAN
5	CHURCH SITE PLAN
6	UTILITY PLAN
7	GRADING PLAN
8	DRAINAGE PLAN
9	SESC PLAN
10	LANDSCAPE PLAN
11	GOLF CLUB ROAD APPROACH
12	FOREBAY DETAILS
13	CONSTRUCTION DETAILS
14	MHOG STANDARD WATERMAIN DETAILS
15	MHOG STANDARD WATERMAIN DETAILS
	LIGHTING PLANS – GASSER BUSH
1	PHOTOMETRIC PLAN
2	PHOTOMETRIC PLAN
	ARCHITECTURAL PLANS – JEFFREY PARKER ARCHITECTS
A1.0	FLOOR PLAN
A3.0	EXTERIOR ELEVATIONS

APPLICANT/OWNER:

BIBLE BAPTIST CHURCH
2258 EAST HIGHLAND ROAD
HOWELL, MI 48843
CONTACT: MR. TIM CHRISTOSON
PHONE: 517-715-9223

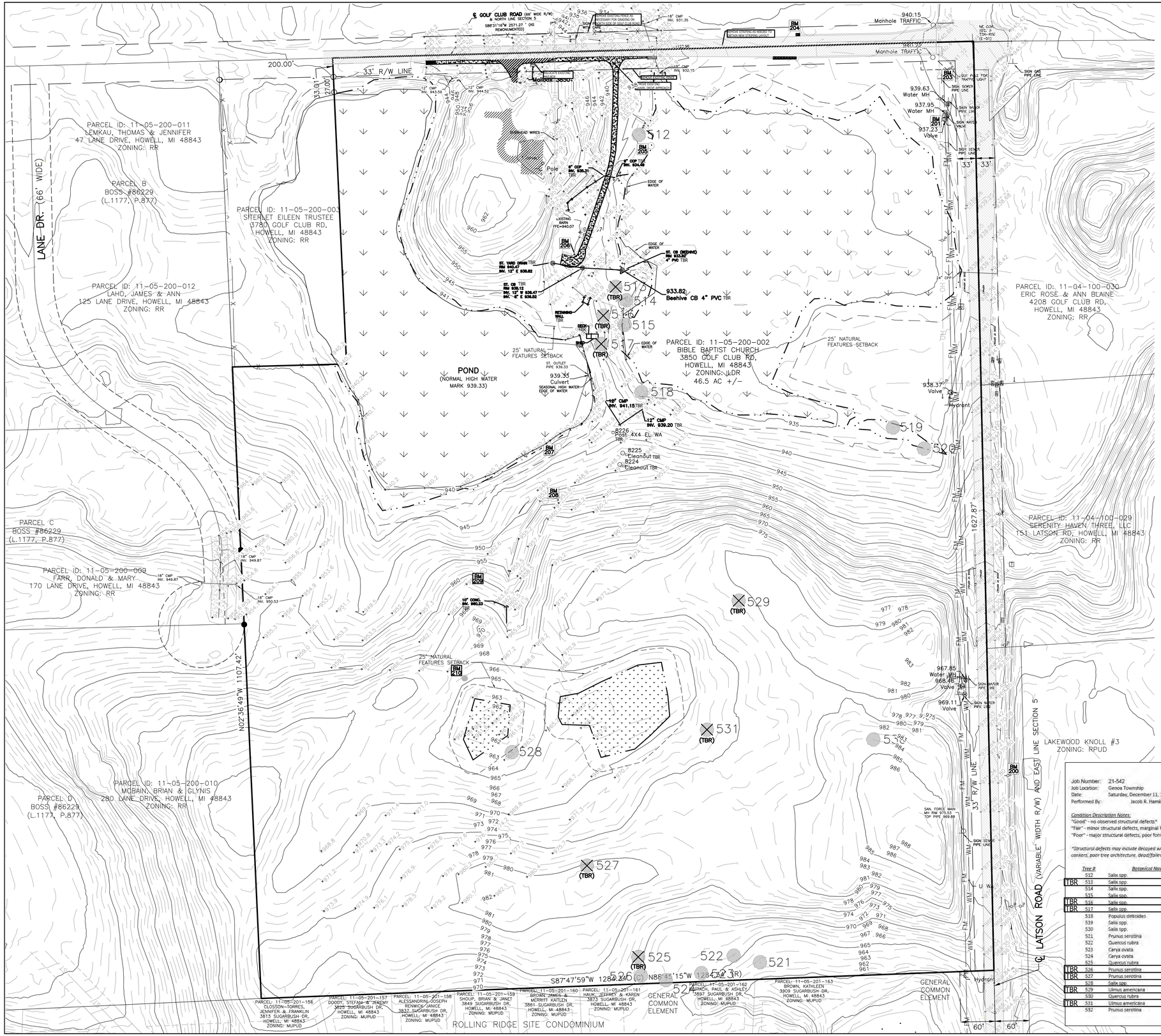
PREPARED BY:

BEBOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

FOR SITE PLAN APPROVAL ONLY!
NOT TO BE USED AS CONSTRUCTION DRAWINGS

NO	BY	CK	REVISION	DATE	JOB NO. 21-542
1	ST		PER TOWNSHIP REVIEW	2/23/22	ISSUE DATE: 2/1/2022

1



N

80 0 40 80

SCALE: 1 INCH = 80 FEET

LEGEND

900	EXISTING CONTOUR
922.00	EXISTING SPOT ELEVATION
P	POWER POLE
↓	GUY WIRE
☼	LIGHT POLE
	HYDRANT
⊗	WATER GATE VALVE
Ⓦ	WATER MANHOLE
○	MANHOLE
▤	STORM CATCH BASIN (SQUARE)
(	STORM INVERT
T	TELEPHONE RISER
CTV	CABLE TV RISER
CTV	U.G. CABLE TV MARKER
MB	MAILBOX
⊥	SIGN
	DECIDUOUS TREE
	CONIFEROUS TREE
●	STEEL ROD OR PIPE FOUND
☐	WOOD LATH SET
	SECTION CORNER
TBR	TO BE REMOVED

GENERAL SURVEY NOTES:

1. WETLANDS FLAGGED AND TIED OUT BY BOSS ENGINEERING SPRING 2019.
2. BEARINGS ARE BASED ON MICHIGAN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE.
3. SUBSURFACE UTILITIES NOT LOCATED FOR THIS SURVEY MAY EXIST. IT IS THE RESPONSIBILITY OF THE OWNER OF THE RESPECTIVE UTILITY TO ACCURATELY LOCATE SUCH UTILITIES.
4. EASEMENTS OR RESTRICTIONS OF RECORD NOT DEPICTED ON THIS DRAWING MAY EXIST.
5. ELEVATIONS WERE ESTABLISHED FROM GPS OBSERVATION, AND USING OPUS POST-PROCESS SYSTEM. (NAVD88 DATUM)
6. CONTOURS ARE SHOWN AT 1 FOOT INTERVALS.
7. THE LOCATIONS OF STORM SEWER, SANITARY SEWER & WATERMAIN, AS SHOWN ON THIS DRAWING ARE APPROXIMATE. THE LOCATIONS ARE BASED ON PHYSICAL FIELD LOCATIONS OF STRUCTURES.
8. ALL WORK SHALL BE IN ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS OF THE MUNICIPALITY, THE COUNTY, AND THE STATE OF MICHIGAN.
9. ALLOW THREE WORKING DAYS BEFORE YOU DIG, CALL MISS DIG TOLL FREE 1-800-482-7171.

SITE BENCHMARKS (NAVD88 DATUM):

- **BM #200** = NAIL/TAG W/S P.POLE E/S LASTON RD. 785'± NORTH OF CONOVER CT.. ELEV.=971.41
- **BM #201** = ARROW ON HYD W/S OF LASTON RD. 135'± SOUTH OF GOLF CLUB RD.. ELEV.=939.50
- **BM #203** = FD. R.R. E/S OF GUY POLE W/S OF LASTON RD. 44'± SOUTH OF GOLF CLUB RD.. ELEV.=942.12
- **BM #205** = PK NAIL/TAG W/S 40" WILLOW TREE 170'± SOUTH OF GOLF CLUB RD. & 160'± NORTH OF BARN. ELEV.=935.10
- **BM #206** = LANDSCAPE SPIKE SET S/E CORNER OF POLE BARN. ELEV.=940.32
- **BM #207** = PK NAIL/TAG S/S 12" MAPLE TREE S/S OF POND. ELEV.=945.31
- **BM #208** = PK NAIL/TAG SET 10" PINE TREE 50'± EAST OF TWO TRACK RUNNING N&S & 150'± SOUTH OF POND, N/S OF TWO TRACK RUNNING E&W. ELEV.=954.73
- **BM #209** = PK NAIL/TAG S/S 12" ELM TREE 142'± SOUTH OF POND. ELEV.=959.69
- **BM #210** = PK NAIL/TAG E/S 8" PINE TREE 330'± SOUTH OF POND. ELEV.=966.83

TOPOGRAPHIC SURVEY NOTE:

TOPOGRAPHIC SURVEY OF GOLF CLUB ROAD AND LATSON ROAD PREPARED BY BOSS ENGINEERING.
TOPOGRAPHY FOR THE SUBJECT SITE IS GENERATED FROM THE LIVINGSTON COUNTY GIS TOPO.

Inventory of Significant Trees within Project Area

Job Number: 21-542 Bible Baptist Church
Job Location: Genoa Township
Date: Saturday, December 11, 2021
Performed By: Jacob R. Hamilton Forestry Registration No. 46119

Condition Description Notes:
"Good" - no observed structural defects*
"Fair" - minor structural defects, marginal form, some insect activity noted*
"Poor" - major structural defects, poor form, insect infested*

**Structural defects may include decayed wood, cracks, root problems, weak branch unions cankers, poor tree architecture, dead/failed branches due to various causes.*

	Tree #	Botanical Name	Common Name	Dia.	Type	Other Dia.	Condition	Comments
	512	Salix spp.	Willow Sp.	53			Good	
TBR	513	Salix spp.	Willow Sp.	37			Poor	Major lean, cankers, epicormic branching
	514	Salix spp.	Willow Sp.	41			Fair	Leaning
	515	Salix spp.	Willow Sp.	36	Twin	20	Good	Leaning
TBR	516	Salix spp.	Willow Sp.	36			Good	
TBR	517	Salix spp.	Willow Sp.	37			Fair	Lost large twin, canker
	518	Populus deltoides	Eastern Cottonwood	24			Good	
	519	Salix spp.	Willow Sp.	28			Good	
	520	Salix spp.	Willow Sp.	25			Good	
	521	Prunus serotina	Black Cherry	35			Good	
	522	Quercus rubra	Red Oak	26			Good	
	523	Carya ovata	Shagbark Hickory	25			Good	
	524	Carya ovata	Shagbark Hickory	32			Good	
	525	Quercus rubra	Red Oak	24			Good	
TBR	526	Prunus serotina	Black Cherry	34			Poor	Major canker, dieback
TBR	527	Prunus serotina	Black Cherry	26			Good	
	528	Salix spp.	Willow Sp.	28			Good	
TBR	529	Ulmus americana	American Elm	24			Good	
	530	Quercus rubra	Red Oak	26			Good	
TBR	531	Ulmus americana	American Elm	27			Good	
	532	Prunus serotina	Black Cherry	31			Poor	Major dieback, canker rot, lost limbs

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITY CROSSINGS IN THE FIELD PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE APPARENT OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

MISS DIG
3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG
1-800-482-7171
(TOLL FREE)
FOR THE LOCATION OF UNDERGROUND FACILITIES

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT
BIBLE BAPTIST CHURCH

PREPARED FOR
BIBLE BAPTIST CHURCH
2258 EAST HIGHLAND ROAD
HOWELL, MI 48843
517-715-9223

TITLE
EXISTING CONDITIONS & DEMOLITION PLAN

NO	BY	REVISION PER	DATE
1	ST	PER TWP. REVIEW	2/23/22

DESIGNED BY: ST
DRAWN BY: JS
CHECKED BY:
SCALE 1" = 80'
JOB NO. 21-542
DATE 2/1/2022
SHEET NO.
2

BOSS Engineering

G:\21-542\DWG\SP\21-542 BaseSP.dwg, 2/24/2022 7:56:22 AM, AutoCAD PDF (General Documentation).pc3

NATURAL FEATURES NARRATIVE:

SEVERAL NATURAL FEATURES WERE IDENTIFIED DURING AN ON-SITE VISIT TO THE PROPERTY ON AUGUST 23, 2019 THAT INCLUDE WETLANDS AND A VARIETY OF WOODLAND STANDS. BELOW IS A BRIEF DESCRIPTION OF EACH NATURAL FEATURE, LABELED AS ZONES “A-V”. ALTHOUGH THE TOTAL SITE IS MEASURED AT 46.88 ACRES, THE ZONES DESCRIBED BELOW ARE APPROXIMATELY 41.11 ACRES WHEN ADDED TOGETHER. NOTE THAT EACH ZONE IS MEASURED TO AN APPROXIMATE SIZE AND THAT ZONES ARE SEPARATED BY A PATH THAT IS ROUGHLY 12' WIDE AND IS NOT ACCOUNTED FOR IN THE CALCULATIONS.

ZONE “A”

AN ESTIMATED 4.62 ACRE “FRESHWATER POND”, AS DESCRIBED BY THE NATIONAL WETLANDS INVENTORY, IS POSITIONED ON SITE AND CONTINUES ONTO THE NEIGHBORING LOT TO THE WEST. THE ON-SITE ACREAGE IS ESTIMATED TO BE 3.88 ACRES. THE POND EDGE IS MOWN LAWN AND HAS A SOUTHERN BORDER OF NORWAY MAPLE TREES, AND A WESTERN BORDER OF BLACK CHERRY, AMERICAN ELM, VARIOUS OAKS AND SPRUCE TREES, SIZES RANGING FROM 4-18” AT DBH WITH TREES BEING SPACED AN AVERAGE OF 12' APART. THE POND COLLECTS STORMWATER FROM ROUGHLY 9 ACRES OF LAND FROM THE WEST AND SOUTH, WITH SLOPES RANGING FROM 10-20%.

ZONE “B”

AT APPROXIMATELY 0.9 ACRES IN SIZE, THIS ZONE IS COMPOSED OF WAWASEE LOAM SOILS WITH SLOPES BETWEEN 6-12%. TREE SPECIES INCLUDE AN EQUAL MIX OF BLACK WALNUT, BLACK CHERRY, AMERICAN ELM, COTTONWOOD, AND BITTERNUT HICKORY SIZES RANGING FROM 6”-30” AND AVERAGING ABOUT 10” DBH. THE UNDERSTORY IS MOSTLY NON-EXISTENT BUT CONTAINS A SCATTERING OF HONEYSUCKLE AND VARIOUS PATCHES OF HERBACEOUS MATERIAL. AN ADDITIONAL AND APPROXIMATE 2.17 ACRES OF MANAGED PRIVATE PROPERTY IS FOUND TO THE WEST AND SOUTH OF THIS ZONE AND CONTAINS WAWASEE LOAM SOIL THAT SLOPES AT 6-12% TOWARDS THE POND IN ZONE "A." A PORTION OF VEGETATION IN THIS AREA WILL BE REMOVED FOR THE DRIVEWAY AND/OR RETAINING WALLS.

ZONE “C”

ZONE "C" IS A SMALL WOODLAND POCKET APPROXIMATELY 0.17 ACRES IS SIZE IS COMPOSED OF BLACK LOCUST, VARIOUS LARGE WILLOWS, AND BOXELDERS. TREES RANGE FROM 4-22” AT DBH. THIS POCKET IS IN A FLAT AREA THAT BORDERS FRESHATER EMERGENT WETLANDS TO THE EAST, AND CONTAINS CARLISLE MUCK SOILS, WHICH ARE HYDRIC IN NATURE.

ZONE “D”

ZONE "D" IS SET WITHIN A MANAGED SPACE NEXT TO AN OUTBUILDING, IS APPROXIMATELY 0.13 ACRES IN SIZE, AND HAS MOWN LAWN AS AN UNDERSTORY. SOILS ARE COMPOSED OF WAWASEE LOAMS AND THERE IS A STAND OF MATURE NORWAY SPRUCE TREES THAT ARE ROUGHLY 12” AT DBH AND SPACED OUT ABOUT 10-15' APART. A PORTION OF VEGETATION IN THIS AREA WILL BE REMOVED FOR THE DRIVEWAY AND/OR RETAINING WALLS.

ZONE “E”

A FRESHWATER EMERGENT WETLAND THAT IS APPROXIMATELY 5.45 ACRES IN SIZE WAS IDENTIFIED IN ZONE "E". THE AREA IS COMPOSED OF CARLISLE MUCK SOILS AND IS DOMINATED BY REED CANARY GRASS, PHRAGMITES, BROADLEAF CATTAIL, AND A VARIETY OF FORBES AND RUSHES. THIS WETLAND COLLECTS A LARGE AMOUNT OF STORMWATER RUNOFF FROM THE CONIFER STAND TO THE SOUTH, AND FROM THE ADJACENT ROAD SYSTEMS. MANICURED LAWN BORDERS THE NORTHERN AND EASTERN EDGES OF THIS ZONE AND MAKE UP APPROXIMATELY 1.22 ACRES.

ZONE “F”

ZONE "F" IS ANOTHER MANAGED AREA WITH MANICURED LAWN THAT IS APPROXIMATELY 0.43 ACRES IN SIZE AND HAS A SERIES OF NORWAY SPRUCE TREES PLANTED IN A DOUBLE ROW. THE TREES ARE ROUGHLY 12” AT DBH AND SPACED ROUGHLY 15' APART. SOILS ARE WAWASEE LOAMS AND SLOPING EAST TOWARDS THE WETLAND IN ZONE “E”. AT THE EASTERN EDGE OF THIS ZONE, THERE ARE SEVERAL LARGE WILLOW TREES AND BLACK WALNUTS, SOME OF WHICH MAY QUALIFY AS LANDMARK TREES. A PORTION OF VEGETATION IN THIS AREA WILL BE REMOVED FOR THE DRIVEWAY AND/OR RETAINING WALLS.

ZONE “G”

ZONE "G" IS A FILL AREA OF APPROXIMATELY 1.16 ACRES THAT WAS FORMERLY USED AS A SPORTS FIELD. IT HAS SINCE BECOME OVERGROWN WITH A VARIETY OF MEADOW FORBES AND GRASSES.

ZONE “H”

ZONE “H” IS AN APPROXIMATELY 0.07 ACRE FRESHWATER EMERGENT/FORESTED WETLAND. THERE ARE POCKETS OF LARGE COTTONWOOD TREES AND WILLOWS WITH SOME SEDGES AND WETLAND FORBES WITHIN THE DELINEATED AREA. THIS ZONE COLLECTS STORMWATER RUNOFF FROM THE SOUTHERN HILLSIDE OF THE PROPERTY AND SLOWLY DRAINS WATER TO THE WEST INTO THE LARGER WETLAND IN ZONE “E”.

ZONE “I”

ZONE “I” IS A LARGE AREA, APPROXIMATELY 7.63 ACRES IN SIZE, AND COMPOSED ALMOST ENTIRELY OF NORWAY SPRUCE TREES RANGING FROM 5-18” AT DBH, SPACED 10-15' APART, AND MAKE UP ROUGHLY 90% OF THE TREE POPULATION. THE REMAINING 10% OF TREE COVER IS COMPOSED OF BLACK CHERRY, BLACK LOCUST, RED OAK, AND AMERICAN ELM, ALL OF WHICH ARE BETWEEN 6-18” AT DBH. THE UNDERSTORY IS ALMOST NON-EXISTENT. THE EASTERN 75% OF THIS ZONE IS COMPOSED OF MIAMI LOAM SOILS WITH SLOPES RANGING FROM 25-35%, AND THE WESTERN 25% IS A FOX-BOYER COMPLEX WITH SLOPES RANGING FROM 12-18%. A PORTION OF VEGETATION IN THIS AREA WILL BE REMOVED FOR THE DRIVEWAY AND/OR SOCCER FIELD.

ZONE “J”

ZONE “J” IS APPROXIMATELY 2.38 ACRES IN SIZE AND IS A SLIGHT TRANSITION FROM THE ZONE “I” CONIFEROUS COMMUNITY TO A MORE DECIDUOUS FOREST STAND. THE DOMINANT SPECIES HERE ARE RED AND WHITE OAK, SHAGBARK AND BITTERNUT HICKORY, BLACK CHERRY, AND AMERICAN ELM. THERE ARE SEVERAL LARGE NORWAY SPRUCE TREES, BUT THEY ARE NO LONGER THE DOMINANT SPECIES. ALL OF THESE TREES ARE MATURE AND ARE 6-18” AT DBH AND SPACED ROUGHLY 10' APART. AN UNDERSTORY OF GREEN ASH, HICKORY, AND HONEYSUCKLE IS PRESENT, THOUGH NOT OVERBEARING. SOILS ARE A FOX-BOYER COMPLEX WITH 18-25% SLOPES THAT DRAIN TO THE LARGE POND IN ZONE “A”.

ZONE “K”

ZONE "K" IS APPROXIMATELY 2.85 ACRES IN SIZE AND BORDERS MUCH OF THE SOUTHERN AND WESTERN BOUNDARIES OF THE SITE. THIS FOREST STAND IS ALMOST ENTIRELY DECIDUOUS AND CONTAINS MATURE RED OAKS, BLACK CHERRY, AMERICAN ELM, HICKORY, AND VARIOUS MAPLE TREES RANGING FROM 5-18” AT DBH, THOUGH THERE ARE SEVERAL LANDMARK TREES IN THIS ZONE THAT MUST BE NOTED. THE TREES ARE SPACED ROUGHLY 15' APART. THE SOILS ARE MIAMI LOAMS WITH 18-25% SLOPES THAT SHED WATER TOWARDS THE SOUTHERN BOUNDARIES OF THE SITE.

ZONES “L”, “M”, “N”

THESE THREE ZONES MAKE UP A LARGER OPEN SPACE, APPROXIMATELY 1.68 ACRES IN SIZE AND IS ALMOST ENTIRELY FREE OF TREE SPECIES. INSTEAD, THE AREA IS POPULATED WITH A DOMINANCE OF GREY DOGWOOD SHRUBS, VARIOUS MEADOW FORBES, GRASSES, AND VINES. THERE ARE A FEW LARGE BUT DEAD ELM TREES AT THE EASTERN EDGE OF ZONE “N”, AND SEVERAL NORWAY MAPLE TREES AT THE NORTHERN PORTION OF ZONE “N”. THE LAND IS MUCH FLATTER IN THIS AREA WHERE SOILS ARE A FOX-BOYER COMPLEX WITH SLOPES AT 2-6% THAT GENTLY DRAIN TO THE WEST. A PORTION OF VEGETATION IN THIS AREA WILL BE REMOVED FOR THE DRIVEWAY AND/OR PARKING.

ZONES “O” AND “P”

THESE ZONES MAKE UP APPROXIMATELY 1.31 ACRES OF THE SITE AND ARE LARGE STANDS OF DECIDUOUS TREES THAT INCLUDE SHAGBARK AND BITTERNUT HICKORY, AMERICAN ELM, BLACK CHERRY, AND BLACK LOCUST. THE TREES ARE SPACED ROUGHLY 15' APART AND RANGE FROM 4-12” AT DBH, THOUGH THERE ARE SEVERAL LANDMARK TREES IN THIS AREA THAT MUST BE NOTED. THESE ZONES ARE AT ONE OF THE HIGHEST POINTS OF THE SITE WITH WAWASEE LOAMS SLOPING 2-6% TO THE WEST. A PORTION OF VEGETATION IN THIS AREA WILL BE REMOVED FOR PARKING.

ZONE “Q”

THIS ZONE IS APPROXIMATELY 1.57 ACRES IN SIZE AND HAS A DOMINANCE OF BLACK LOCUST TREES THAT MAKE UP 70% OF THE FOREST STAND. THE REMAINING TREE SPECIES ARE AMERICAN ELM, BLACK CHERRY, AND HICKORY. ALL TREES ARE MATURE RANGING FROM 5-18” AT DBH AND SPACED 15' APART ON AVERAGE. THE EASTERN EDGE OF THIS ZONE IS SLOPING STEEPLY AT 25-35% TO THE EAST TOWARDS LATSON ROAD AND TO THE NORTH TOWARDS ZONE “H”. THE WESTERN AND SOUTHERN PORTIONS OF ZONE “Q” ARE RELATIVELY FLAT. THE SOILS ARE A MIX OF WAWASEE LOAMS AND MIAMI LOAMS.

ZONE “R”

SIMILAR TO ZONE “Q”, ZONE “R”, WHICH IS APPROXIMATELY 2.60 ACRES IN SIZE, IS DOMINATED BY BLACK LOCUST TREES WHICH MAKE UP 70% OF THE FOREST STAND, WHILE THE REMAINING 30% COVER IS COMPOSED OF AMERICAN ELM, BLACK LOCUST, AND BLACK CHERRY TREES. ALL TREES RANGE FROM 4-18” AT DBH AND AVERAGE ABOUT 10” AT DBH SPACED ROUGHLY 15' APART. THE UNDERSTORY IS MADE UP OF SEVERAL DECIDUOUS SAPLINGS AND SOME HONEYSUCKLE, BUT OTHERWISE OPEN. STEEP SLOPES OF 25-35% RUN EAST TOWARDS LATSON ROAD, WHILE THE SOUTHERN EDGE OF THIS ZONE SLOPES MORE GENTLY TO THE SOUTH AT ROUGHLY 10%. THE SOILS ARE A MIX OF MIAMI LOAM AND WAWASEE LOAM. A PORTION OF VEGETATION IN THIS AREA WILL BE REMOVED FOR PARKING.

ZONE “S”

SIZED AT APPROXIMATELY 1.73 ACRES, ZONE “S” IS A LARGE CONIFER STAND COMPOSED MOSTLY OF NORWAY SPRUCE TREES. THE SOUTHERN PORTION OF THIS ZONE IS PLANTED WITH ROWS OF WHITE FIR TREES. ALL TREES IN THIS AREA ARE BETWEEN 4-18” AT DBH AND PLANTED BETWEEN 6-12' APART ON AVERAGE. THE LANDSCAPE SLOPES GENTLY TO THE WEST AT ROUGHLY 2-6%. THE SOILS ARE MOSTLY WAWASEE LOAMS, THOUGH THE SOUTHERN PORTION IS A FOX-BOYER COMPLEX SOIL. A PORTION OF VEGETATION IN THIS AREA WILL BE REMOVED FOR CHURCH BUILDING.

ZONE “T”

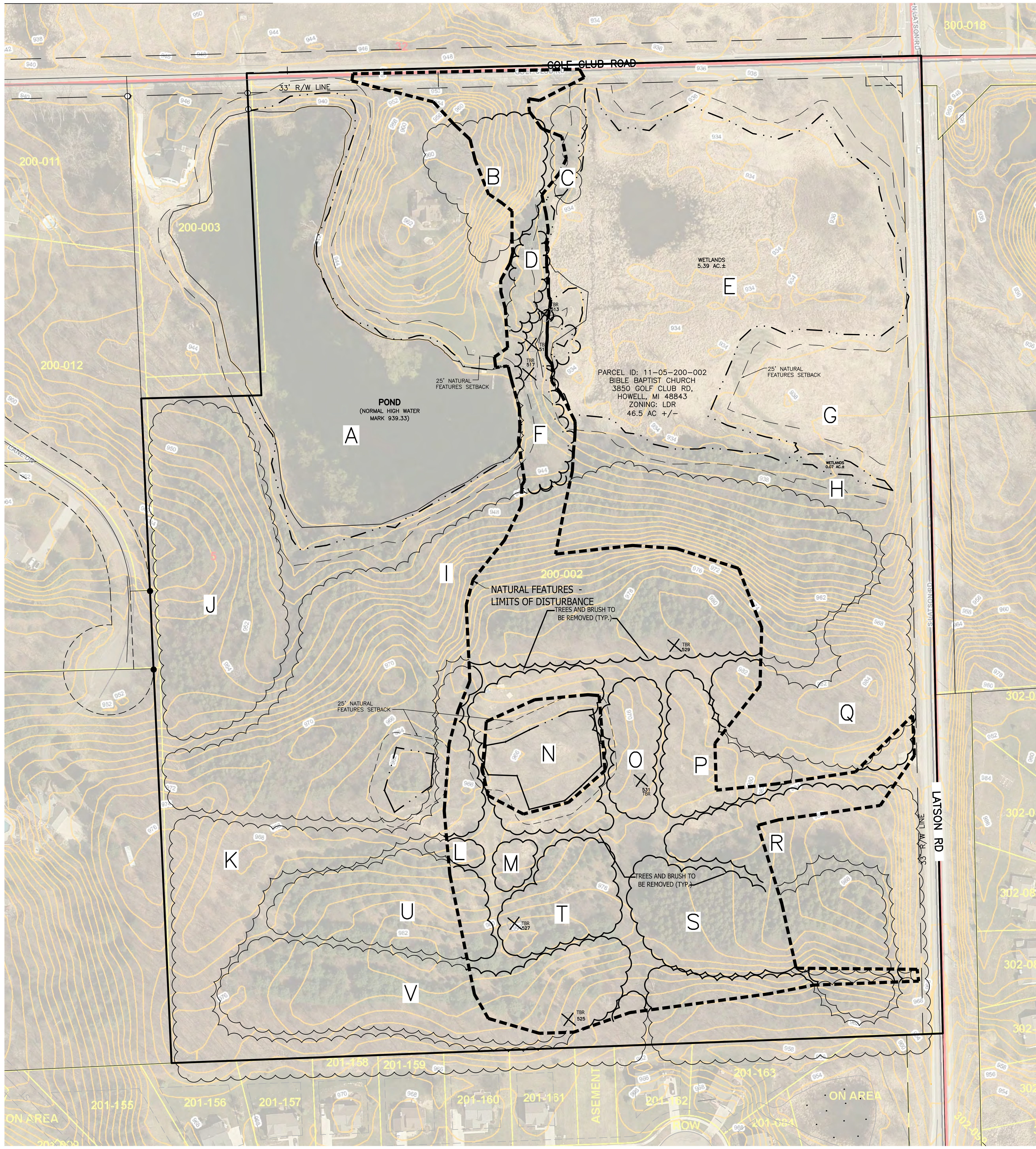
ZONE “T” IS A SMALLER AND MORE OPEN AREA THAT IS APPROXIMATELY 0.64 ACRES IN SIZE. IT IS POPULATED WITH YOUNGER FRASIER FIR AND SCOTCH PINE TREES THAT ARE NOT MUCH LARGER THAN 8” AT DBH. GRASSES AND FORBES OCCUPY THE SPACES IN BETWEEN. THIS ZONE HAS A MIX OF FOX-BOYER COMPLEX SOILS, AND WAWASEE LOAMS THAT SLOPE TO THE NORTHEAST AT ROUGHLY 2-6%. A PORTION OF VEGETATION IN THIS AREA WILL BE REMOVED FOR PARKING AND THE CHURCH BUILDING.

ZONE “U”

ZONE “U” IS APPROXIMATELY 1.10 ACRES IN SIZE AND POPULATED WITH SCOTCH PINE TREES AND SEVERAL NORWAY SPRUCE TREES THAT RANGE BETWEEN 6-12” AT DBH AND ARE SPACED ABOUT 15' APART. SOILS ARE MIAMI LOAMS AND FOX-BOYER COMPLEX SOILS THAT SLOPE TO THE NORTH AT ABOUT 12%. THE UNDERSTORY IS MINIMAL, THOUGH SOME SMALLER DECIDUOUS SPECIES ARE SPROUTING. A PORTION OF VEGETATION IN THIS AREA WILL BE REMOVED FOR PARKING.

ZONE “V”

ZONE "V" IS APPROXIMATELY 2.04 ACRES IN SIZE AND POPULATED WITH WHITE PINE TREES THAT ARE PLANTED IN ROWS ON THE SOUTHERN EDGE, WITH A MIX OF SCOTCH PINE AND WHITE PINE ON THE NORTHERN PORTION. THESE TREES ARE BETWEEN 6-18” AT DBH AND SPACED 15' APART WITH NO UNDERSTORY OBSERVED. THE TREES ARE PLANTED ON A RIDGE WITH MIAMI LOAM SOILS TO THE SOUTH, AND FOX-BOYER COMPLEX SOILS TO THE NORTH WITH SLOPES RANGING FROM 2-6%. A PORTION OF VEGETATION IN THIS AREA WILL BE REMOVED FOR PARKING.



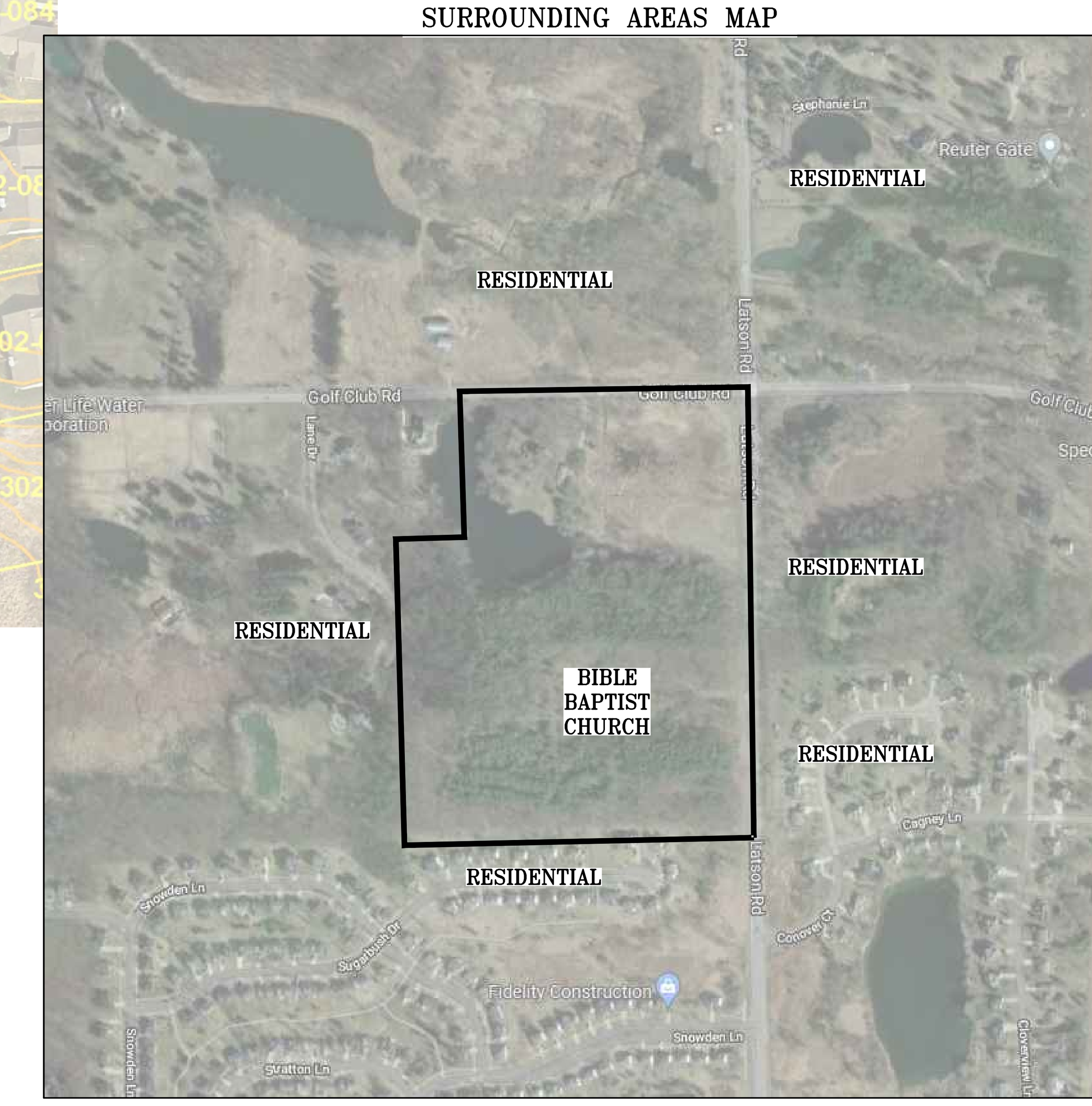
SCALE: 1 INCH = 100 FEET

SOIL CLASSIFICATION

ACCORDING TO USDA NRCS WEB SOIL SURVEY DATA:

Map Unit Symbol	Map Unit Name
Cc	Carlisle muck, 0 to 2 percent slopes
FrB	Fox-Boyer complex, 2 to 6 percent slopes
FrD	Fox-Boyer complex, 12 to 18 percent slopes
FrE	Fox-Boyer complex, 18 to 25 percent slopes
MoB	Wawasee loam, 2 to 6 percent slopes
MoC	Wawasee loam, 6 to 12 percent slopes
MoD	Miami loam, 12 to 18 percent slopes
MoF	Miami loam, 25 to 35 percent slopes
W	Water
Totals for Area of Interest	

SURROUNDING AREAS MAP



THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITY CROSSINGS IN THE FIELD PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE APPARENT OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171 (TOLL FREE) FOR THE LOCATION OF UNDERGROUND FACILITIES

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

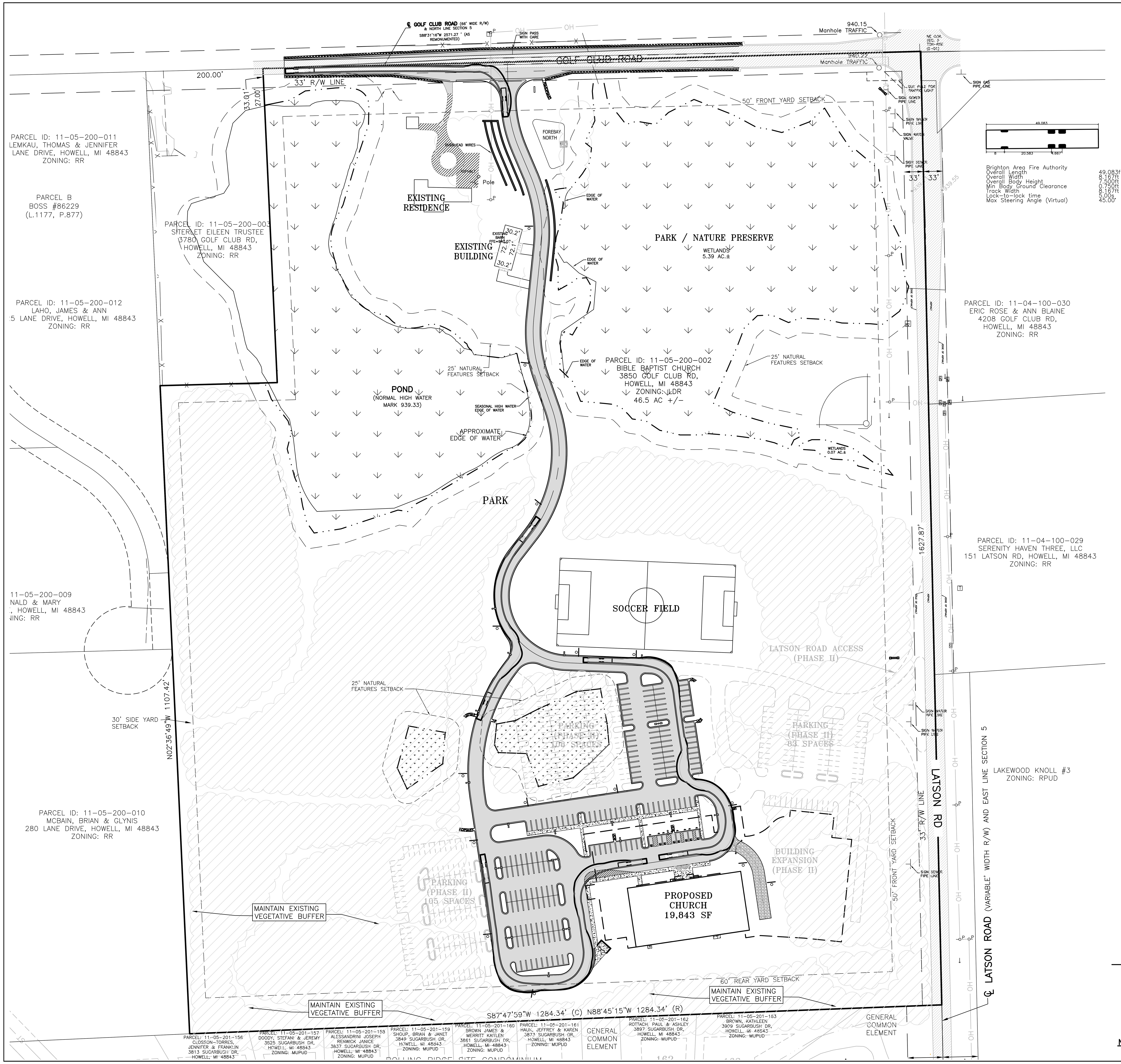
PROJECT: BIBLE BAPTIST CHURCH

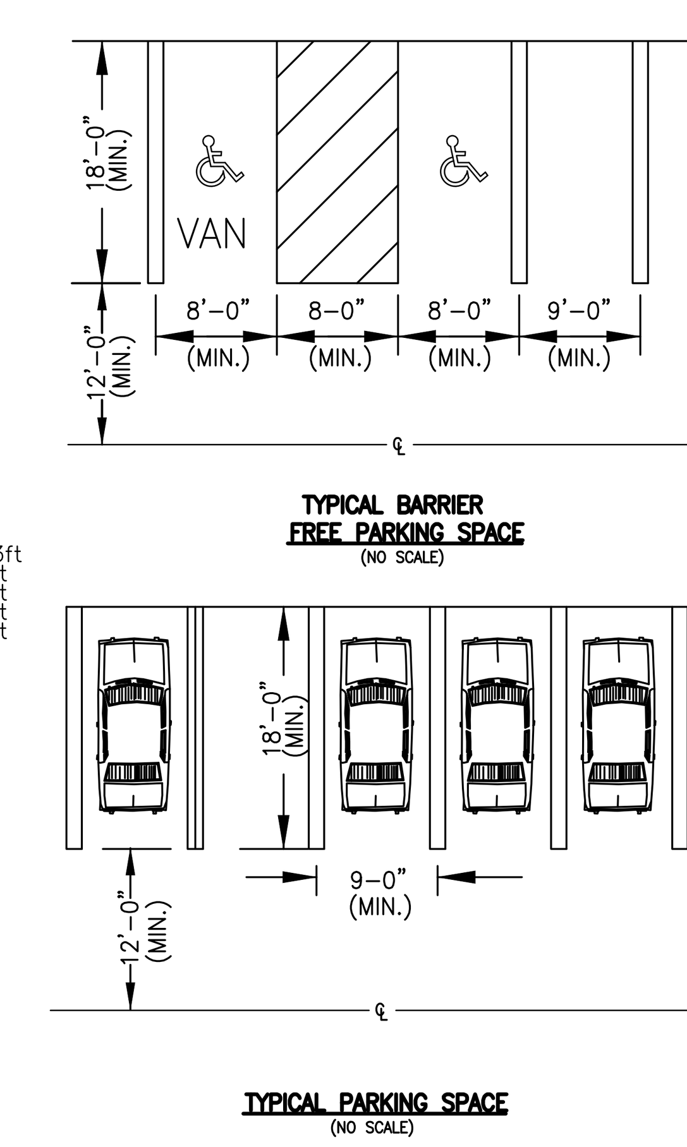
PREPARED FOR: BIBLE BAPTIST CHURCH, 2258 EAST HIGHLAND ROAD, HOWELL, MI 48843, 517-715-9223

TITLE: NATURAL FEATURES PLAN

NO	BY	REVISION PER	DATE
1	ST	PER TWP REVIEW	2/23/22

DESIGNED BY: JH
DRAWN BY: JS
CHECKED BY:
SCALE 1" = 100'
JOB NO. 21-542
DATE 2/1/2022
SHEET NO. 3





LEGEND

PROPOSED (PR)	EXISTING (EX)	
		CONTOUR
		STORM DRAINAGE FLOW
	+ 922.08	SPOT ELEVATION
FG	FG	FINISHED GRADE ELEVATION
T/A	T/A	TOP OF ASPHALT
T/C	T/C	TOP OF CURB / CONCRETE
T/W	T/W	TOP OF WALK
F/L	F/L	FLOW LINE
T/P	T/P	TOP OF PIPE
B/P	B/P	BOTTOM OF PIPE
RIM	RIM	RIM ELEVATION
INV	INV	INVERT ELEVATION
MH	MH	MANHOLE STRUCTURE
IN	IN	INLET STRUCTURE
CB	CB	CATCHBASIN STRUCTURE
RY	RY	REARYARD STRUCTURE
ES	ES	END-SECTION
GV	GV	GATEVALVE STRUCTURE
HY	HY	HYDRANT
UP	UP	UTILITY POLE
	SN	SANITARY SEWER
FM	FM	FORCE MAIN
ST	ST	STORM SEWER
WM	WM	WATER MAIN
WL	WL	WATER LEAD
OH	OH	OVERHEAD WIRE
	C	CABLE
	E	ELECTRIC
	G	GAS
	T	TELEPHONE
		MANHOLE
		INLET / CATCHBASIN
		FLARED END-SECTION
		GATE VALVE
		HYDRANT
		UTILITY POLE
X	X	FENCE
		SIGN
TBR		TO BE REMOVED
CB 1		STORM SEWER LABEL
GV 1		WATER MAIN LABEL
		LIMITS OF GRADING/CLEARING
		WETLAND BOUNDARY
		LIMITS OF CLEARANCE/DISTURBANCE

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITY CROSSINGS IN THE FIELD PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE APPARENT OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 FULL WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171

SCALE: 1 INCH = 80 FEET

N

SITE DETAILS

PARCEL # 4711-05-200-002
3850 GOLF CLUB RD.
HOWELL, MI 48843
46.5 AC +/-
GENOA TOWNSHIP

ZONING DISTRICT: LDR (LOW DENSITY RESIDENTIAL)

PROPOSED USE: CHURCH (SPECIAL USE REQUIRED)

MAX. LOT COVERAGE: N/A

MINIMUM LOT AREA FOR CHURCHES: 3 ACRES, PLUS 15,000 SF FOR EACH 100 PERSONS OF SEATING CAPACITY

MAX. BUILDING HEIGHT: 2 STORIES / 35 FEET; IF GREATER THEN FRONT, SIDE AND REAR YARDS ARE INCREASED ABOVE THE MINIMUM REQUIRED YARDS BY ONE FOOT FOR EACH FOOT OF BUILDING HEIGHT THAT EXCEEDS THE MAXIUM HEIGHT ALLOWED. THE MAX HEIGHT OF A STEEPLE SHALL BE 60 FEET.

SETBACKS FOR LDR

	REQUIRED	PROVIDED
FRONT:	50' (MEASURED FROM THE RIGHT OF WAY)	1358'
SIDE:	SMALLEST SIDE 30', 60' FOR BOTH	292.4'
REAR:	60'	118'

NATURAL FEATURES SETBACK: 25' FROM ALL REGULATED WETLANDS, PONDS, STREAMS SUBJECT TO SECTION 13.02

LANDSCAPE BUFFERS: GREENBELTS ALONG THE RIGHT-OF-WAY AND A LANDSCAPED BUFFER ZONE BASED ON ADJACENT ZONING SHALL BE PROVIDED AS REQUIRED IN SECTION 12.02. SEE SHEET 6.

PARKING SETBACK: WHEREVER AN OFF-STREET PARKING AREA IS ADJACENT TO A RESIDENTIAL DISTRICT, THERE SHALL BE A MINIMUM PARKING LOT SETBACK OF 50 FEET WITH A CONTINUOUS OBSCURING WALL, FENCE AND/OR LANDSCAPED AREA AT LEAST 4 FEET IN HEIGHT SHALL BE PROVIDED. THE TOWNSHIP BOARD MAY REDUCE THIS BUFFER BASED ON THE PROVISION OF LANDSCAPING. THE PRESENCE OF EXISTING TREES OR IN CONSIDERATION OF TOPOGRAPHIC CONDITIONS.

PARKING REQUIREMENTS:
CHURCHES
- 1 SPACE FOR EACH 3 SEATS OR 6 FEET OF PEWS IN THE MAIN UNIT OF WORSHIP
- DIMENSIONS FOR 90 DEGREE ARE 9 FT X 18 FT WITH 24 FOOT TWO-WAY DRIVE AISLE
- 506 SEATS / 3 SEATS = 168.66 PARKING SPACES REQUIRED
- 186 PROPOSED PARKING SPACES (8 ADA INCLUDED)

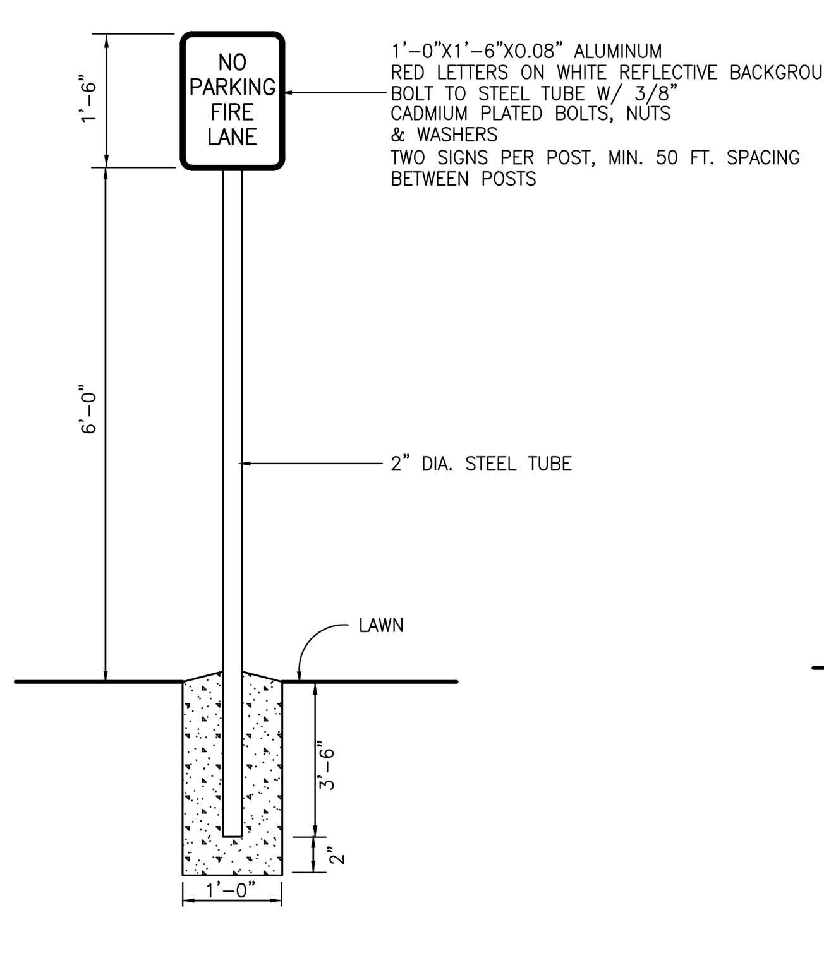
ACCORDING TO ORDINANCE RESIDENTIAL DISTRICTS ARTICLE 3.03.02 (L) --
CHURCHES, TEMPLES AND SIMILAR PLACES OF WORSHIP AND RELATED FACILITIES SHALL COMPLY WITH THE FOLLOWING REQUIREMENTS:

(1) MINIMUM LOT AREA SHALL BE THREE (3) ACRES PLUS AN ADDITIONAL FIFTEEN THOUSAND (15,000) SQUARE FEET FOR EACH ONE HUNDRED (100) PERSONS OF SEATING CAPACITY.

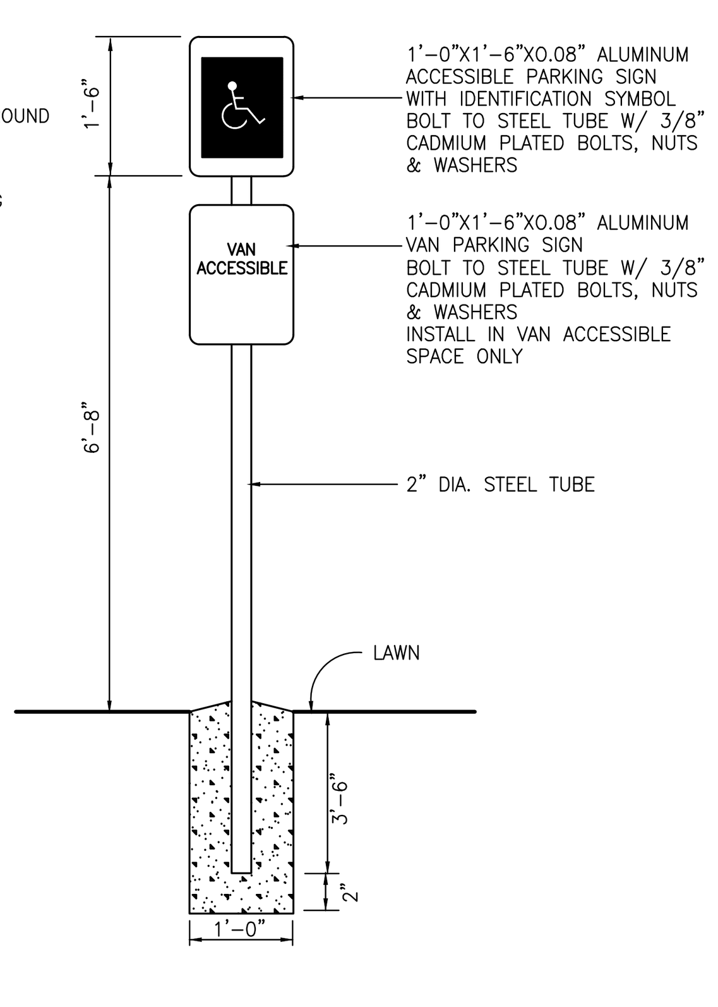
(2) BUILDINGS OF GREATER THAN THE MAXIMUM HEIGHT ALLOWED IN SECTION 3.04, DIMENSIONAL STANDARDS, MAY BE ALLOWED PROVIDED FRONT, SIDE AND REAR YARDS ARE INCREASED ABOVE THE MINIMUM REQUIRED YARDS BY ONE FOOT FOR EACH FOOT OF BUILDING HEIGHT THAT EXCEEDS THE MAXIMUM HEIGHT ALLOWED. THE MAXIMUM HEIGHT OF A STEEPLE SHALL BE SIXTY (60) FEET.

(3) WHEREVER AN OFF-STREET PARKING AREA IS ADJACENT TO A RESIDENTIAL DISTRICT, THERE SHALL BE A MINIMUM PARKING LOT SETBACK OF FIFTY (50) FEET WITH A CONTINUOUS OBSCURING WALL, FENCE AND/OR LANDSCAPED AREA AT LEAST FOUR (4) FEET IN HEIGHT SHALL BE PROVIDED. THE TOWNSHIP BOARD MAY REDUCE THIS BUFFER BASED ON THE PROVISION OF LANDSCAPING, THE PRESENCE OF EXISTING TREES OR IN CONSIDERATION OF TOPOGRAPHIC CONDITIONS.

(4) PRIVATE SCHOOLS AND CHILD DAY CARE CENTERS MAY BE ALLOWED AS AN ACCESSORY USE TO CHURCHES, TEMPLES AND SIMILAR PLACES OF WORSHIP WHERE THE SITE HAS ACCESS TO A PAVED PUBLIC ROADWAY.



NO PARKING SIGN DETAIL
(NO SCALE)



HANDICAP PARKING SIGN DETAIL
(NO SCALE)

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

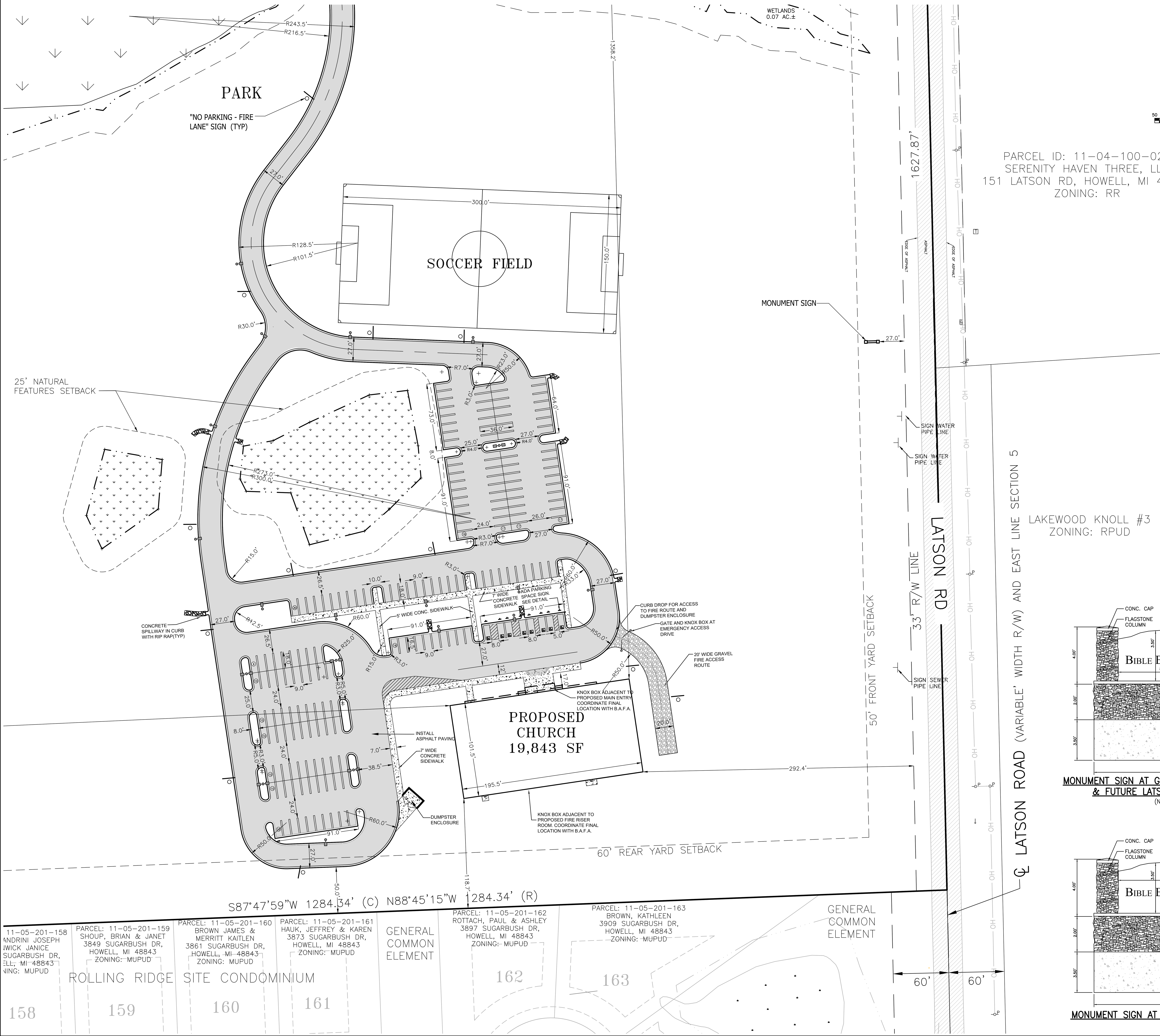
PROJECT: BIBLE BAPTIST CHURCH

PREPARED FOR: BIBLE BAPTIST CHURCH
2258 EAST HIGHLAND ROAD
HOWELL, MI 48843
517-715-9223

TITLE: OVERALL SITE PLAN

NO	BY	REVISION PER	DATE
1	ST	PER TWP REVIEW	2/23/22

DESIGNED BY: ST
DRAWN BY: JS
CHECKED BY:
SCALE 1" = 80'
JOB NO. 21-542
DATE 2/1/2022
SHEET NO. 4



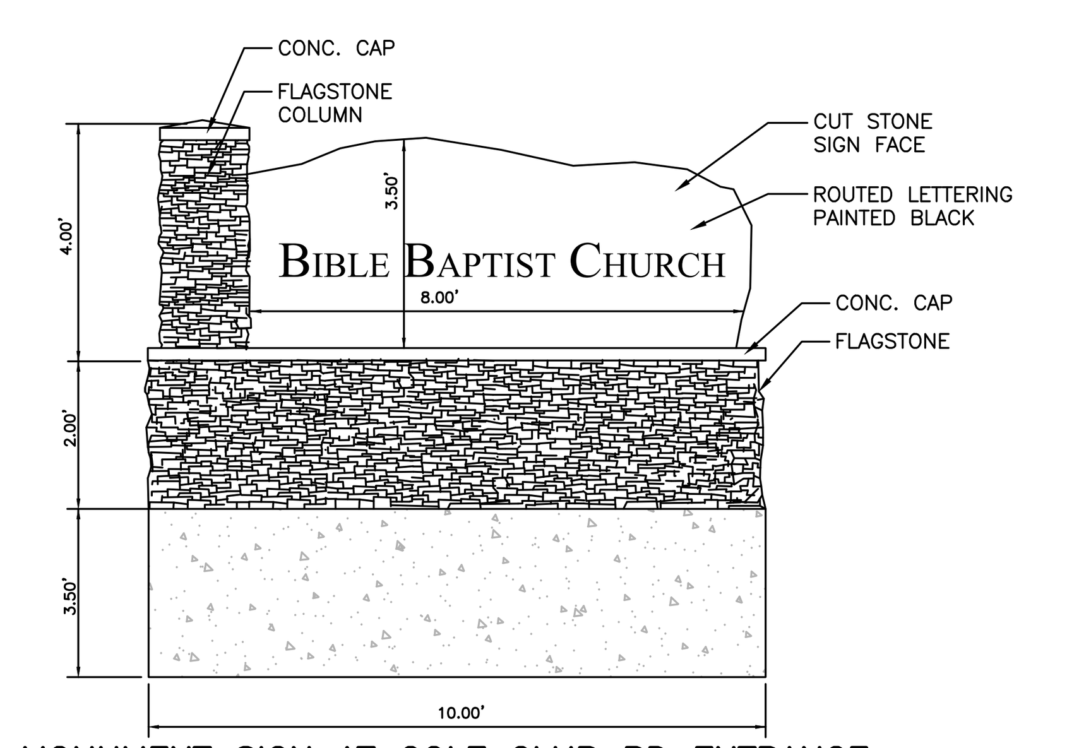
LEGEND

PROPOSED (PR) / EXISTING (EX)

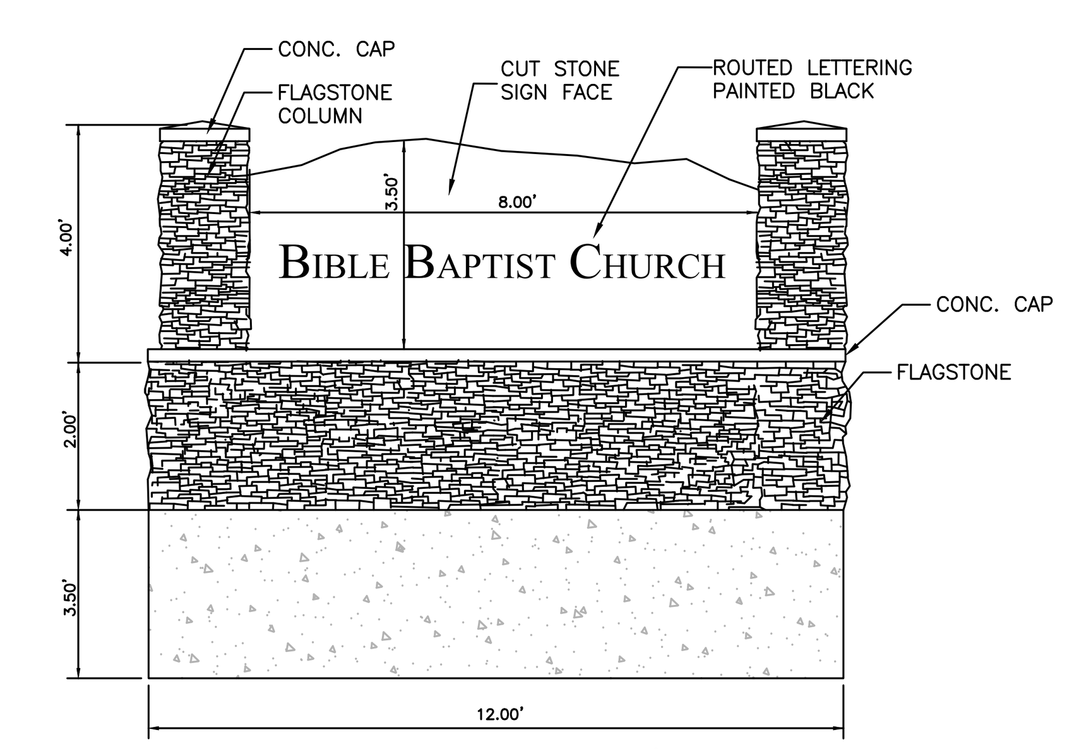
CONTOUR; STORM DRAINAGE FLOW; SPOT ELEVATION; FG FINISHED GRADE ELEVATION; T/A TOP OF ASPHALT; T/C TOP OF CURB / CONCRETE; T/W TOP OF WALK; F/L FLOW LINE; T/P TOP OF PIPE; B/P BOTTOM OF PIPE; RIM RIM ELEVATION; INV INVERT ELEVATION; MH MANHOLE STRUCTURE; IN INLET STRUCTURE; CB CATCHBASIN STRUCTURE; RY REARYARD STRUCTURE; ES END-SECTION; GV GATEVALVE STRUCTURE; HY HYDRANT; UP UTILITY POLE; SANITARY SEWER; FORCE MAIN; STORM SEWER; WATER MAIN; WATER LEAD; OVERHEAD WIRE; CABLE; ELECTRIC; GAS; TELEPHONE; MANHOLE; INLET / CATCHBASIN; FLARED END-SECTION; GATE VALVE; HYDRANT; UTILITY POLE; FENCE; SIGN; TBR TO BE REMOVED; STORM SEWER LABEL; WATER MAIN LABEL; LIMITS OF GRADING/CLEARING; WETLAND BOUNDARY; LIMITS OF CLEARANCE/DISTURBANCE

GENERAL NOTES

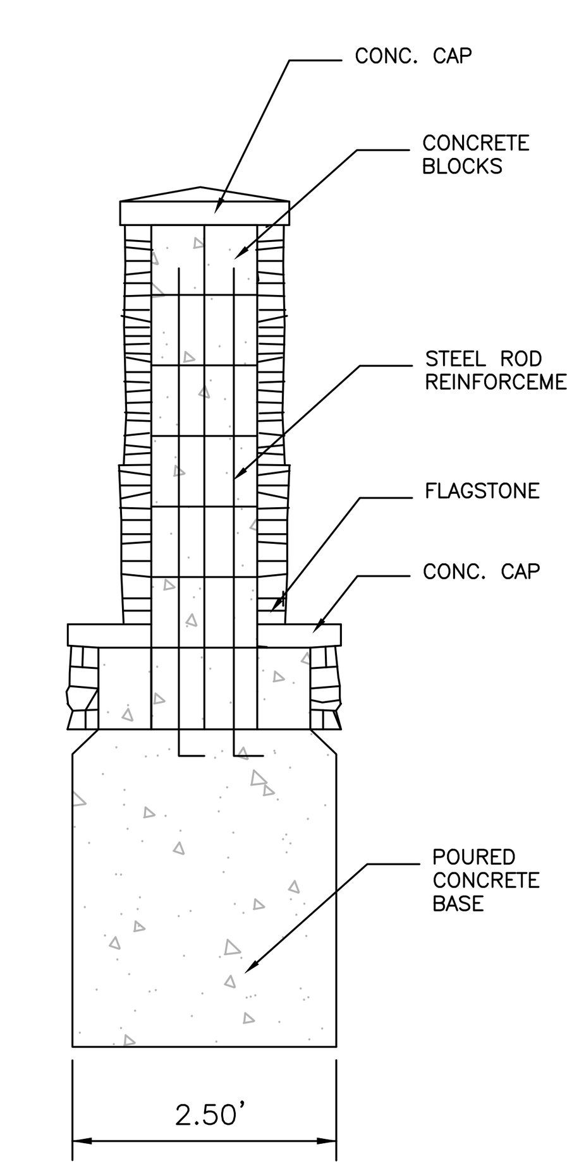
1. ALL OUTDOOR LIGHTS SHALL BE SHIELDED TO REDUCE GLARE AND SHALL BE ARRANGED TO NOT INTERFERE WITH THE VISION OF PERSONS ON ADJACENT ROADWAYS OR ADJACENT PROPERTY.
2. ALL SIGNS SHALL MEET LOCAL MUNICIPALITY ORDINANCE REQUIREMENTS.
3. FUTURE ACCESS DRIVE FROM LATSON ROAD TO CONFORM TO BAFA'S ACCESS STANDARDS.
4. THE CHURCH SHALL INCLUDE THE BUILDING ADDRESS A MINIMUM 6" HIGH LETTERS OF CONTRASTING COLORS AND BE CLEARLY VISIBLE FROM THE STREET. THE LOCATION AND SIZE SHALL BE VERIFIED PRIOR TO INSTALLATION.
5. ONE SIDE OF THE STREET SHALL BE MARKED AS A FIRE LANE AND SHALL HAVE APPROPRIATE SIGNAGE.
6. ACCESS ROADS TO THE SITE SHALL BE PROVIDED AND MAINTAINED DURING CONSTRUCTION.
7. ACCESS ROADS SHALL BE CONSTRUCTED TO BE CAPABLE OF SUPPORTING THE IMPOSED LOAD OF FIRE APPARATUS WEIGHING AT LEAST 84,000 POUNDS.
8. A MINIMUM VERTICAL CLEARANCE OF 13.5 FEET SHALL BE MAINTAINED THROUGHOUT THE SITE. THIS INCLUDES ENCROACHMENTS FROM LARGE TREE CANOPIES, LIGHTING, ETC.
9. DURING THE CONSTRUCTION PROCESS, THE BUILDING WILL BE EVALUATED FOR EMERGENCY RESPONDER RADIO SIGNAL STRENGTH. IF COVERAGE IS FOUND TO BE QUESTIONABLE OR INADEQUATE; AN APPROVED CONTRACTOR SHALL BE HIRED TO PERFORM A GRID TEST OF THE FACILITY. IF THE SIGNAL STRENGTH COVERAGE IS FOUND TO BE NON-COMPLIANT, AN APPROVED EMERGENCY RESPONDER RADIO COVERAGE SYSTEM SHALL BE PROVIDED IN THE BUILDING.



MONUMENT SIGN AT GOLF CLUB RD ENTRANCE & FUTURE LATSON RD ENTRANCE
(NO SCALE)



MONUMENT SIGN AT GOLF CLUB/LATSON INTERSECTION
(NO SCALE)



SECTION

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT UTILITY LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITY CROSSINGS IN THE FIELD PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE APPARENT OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT: BIBLE BAPTIST CHURCH

PREPARED FOR: BIBLE BAPTIST CHURCH, 2258 EAST HIGHLAND ROAD, HOWELL, MI 48843, 517-715-9223

TITLE: CHURCH CAMPUS SITE PLAN

NO	BY	REVISION PER	DATE
1	ST	PER TWP REVIEW	2/23/22

DESIGNED BY: ST
DRAWN BY: JS
CHECKED BY:
SCALE 1" = 50'
JOB NO. 21-542
DATE 2/01/2022
SHEET NO. 5

LEGEND

PROPOSED (PR)	EXISTING (EX)	
		CONTOUR
		STORM DRAINAGE FLOW
T/C XXX.XX	+ 922.08	SPOT ELEVATION
FG	FG	FINISHED GRADE ELEVATION
T/A	T/A	TOP OF ASPHALT
T/C	T/C	TOP OF CURB / CONCRETE
T/W	T/W	TOP OF WALK
F/L	F/L	FLOW LINE
T/P	T/P	TOP OF PIPE
B/P	B/P	BOTTOM OF PIPE
RIM	RIM	RIM ELEVATION
INV	INV	INVERT ELEVATION
MH	MH	MANHOLE STRUCTURE
IN	IN	INLET STRUCTURE
CB	CB	CATCHBASIN STRUCTURE
RY	RY	REARYARD STRUCTURE
ES	ES	END-SECTION
GV	GV	GATEVALVE STRUCTURE
HY	HY	HYDRANT
UP	UP	UTILITY POLE
SN	SN	SANITARY SEWER
FM	FM	FORCE MAIN
ST	ST	STORM SEWER
WM	WM	WATER MAIN
WL	WL	WATER LEAD
OH	OH	OVERHEAD WIRE
C	C	CABLE
E	E	ELECTRIC
G	G	GAS
T	T	TELEPHONE
		MANHOLE
		INLET / CATCHBASIN
		FLARED END-SECTION
		GATE VALVE
		HYDRANT
		UTILITY POLE
X	X	FENCE
		SIGN
TBR		TO BE REMOVED
CB 1		STORM SEWER LABEL
GV 1		WATER MAIN LABEL
		WETLAND BOUNDARY

NOTES

1. A WATERMAIN PERMIT (ACT 399) SHALL BE OBTAINED PRIOR TO CONSTRUCTION.
2. ALL WORK SHALL BE IN ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS OF GENOA TOWNSHIP, LIVINGSTON COUNTY, AND THE STATE OF MICHIGAN.
3. THREE WORKING DAYS BEFORE YOU DIG, CALL MISS DIG TOLL FREE 1-800-482-7171.
4. ALL LENGTHS SHOWN ARE FROM ℄ TO ℄ OF STRUCTURE OR FROM ℄ OF STRUCTURE TO DISCHARGE END OF FLARED END SECTION.
5. ALL STORM SEWER UNDER THE ROADBED AND WITHIN GREEN SPACE SHALL BE ADS HP WITH WATERTIGHT PREMIUM JOINTS, UNLESS OTHERWISE NOTED ON PLAN.
6. ALL OPEN INLET OR OUTLET END OF STORM SEWER AND CULVERTS SHALL INCLUDE PREFAB FLARED-END SECTION AND MINIMUM 15 SQ. YD. OF PLAIN COBBLESTONE RIP-RAP (6 INCH MIN. SIZE), UNLESS OTHERWISE SPECIFIED.
7. APPROPRIATE SOIL EROSION CONTROL MEASURES SHALL BE ESTABLISHED PRIOR TO BEGINNING CONSTRUCTION AND CONTINUOUSLY MAINTAINED BY CONTRACTOR UNTIL VEGETATION HAS BEEN RE-ESTABLISHED.
8. ALL CATCH BASIN RIM ELEVATIONS ARE AT FLOW LINE.
9. ALL CURB SHALL BE "HIGH BACK" CURB. ENTRANCE SHALL BE "B2" CURB, UNLESS OTHERWISE NOTED.
10. FOR ALL WORK WITHIN ROAD RIGHT-OF-WAY, SEE STANDARDS AND SPECIFICATIONS, LIVINGSTON COUNTY ROAD COMMISSION STANDARD DETAILS FOR RESIDENTIAL STREETS.
11. MINIMUM 10' HORIZONTAL SEPARATION AND 18" VERTICAL SEPARATION SHALL BE MAINTAINED BETWEEN UTILITIES AT ALL TIMES. A CONCRETE COLLAR SHALL BE USED WHEREVER THE MINIMUM 18" VERTICAL SEPARATION CANNOT BE MET BETWEEN STORM SEWER AND SANITARY MAIN. SEE STORM SEWER CONSTRUCTION DETAIL SHEET FOR CONCRETE COLLAR DETAIL.
12. SEE STANDARDS AND SPECIFICATIONS ON WATER MAIN STANDARD NOTES AND WATER MAIN STANDARD DETAILS SHEETS.
13. WATER MAIN SHALL BE 8" DUCTILE IRON PIPE CLASS 52.
14. WATER MAIN SHALL HAVE MINIMUM 5 1/2 FEET OF COVER AND MAX 8 1/2' COVER.
15. HYDRANTS AT CURB TO BE A MINIMUM OF 3' & MAXIMUM 10' OFF BACK OF CURB (TYP.)
16. PER MHOG STANDARDS, GATE VALVES AND BOXES ARE TO BE UTILIZED ON WATERMAIN 12 INCHES AND SMALLER.
17. A FULL PIPE LENGTH (20') IS TO BE INSTALLED AT ALL WATERMAIN PIPE CROSSINGS, CENTERED UNDER THE CONFLICTING PIPE.
18. ALL PIPE THAT IS TO BE INSTALLED ABOVE THE EXISTING GROUND SHALL BE BACKFILLED WITH ENGINEERING FILL COMPACTED TO 95% MAX DRY UNIT WEIGHT.

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITY CROSSINGS IN THE FIELD PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE APPARENT OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171 (TOLL FREE)

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

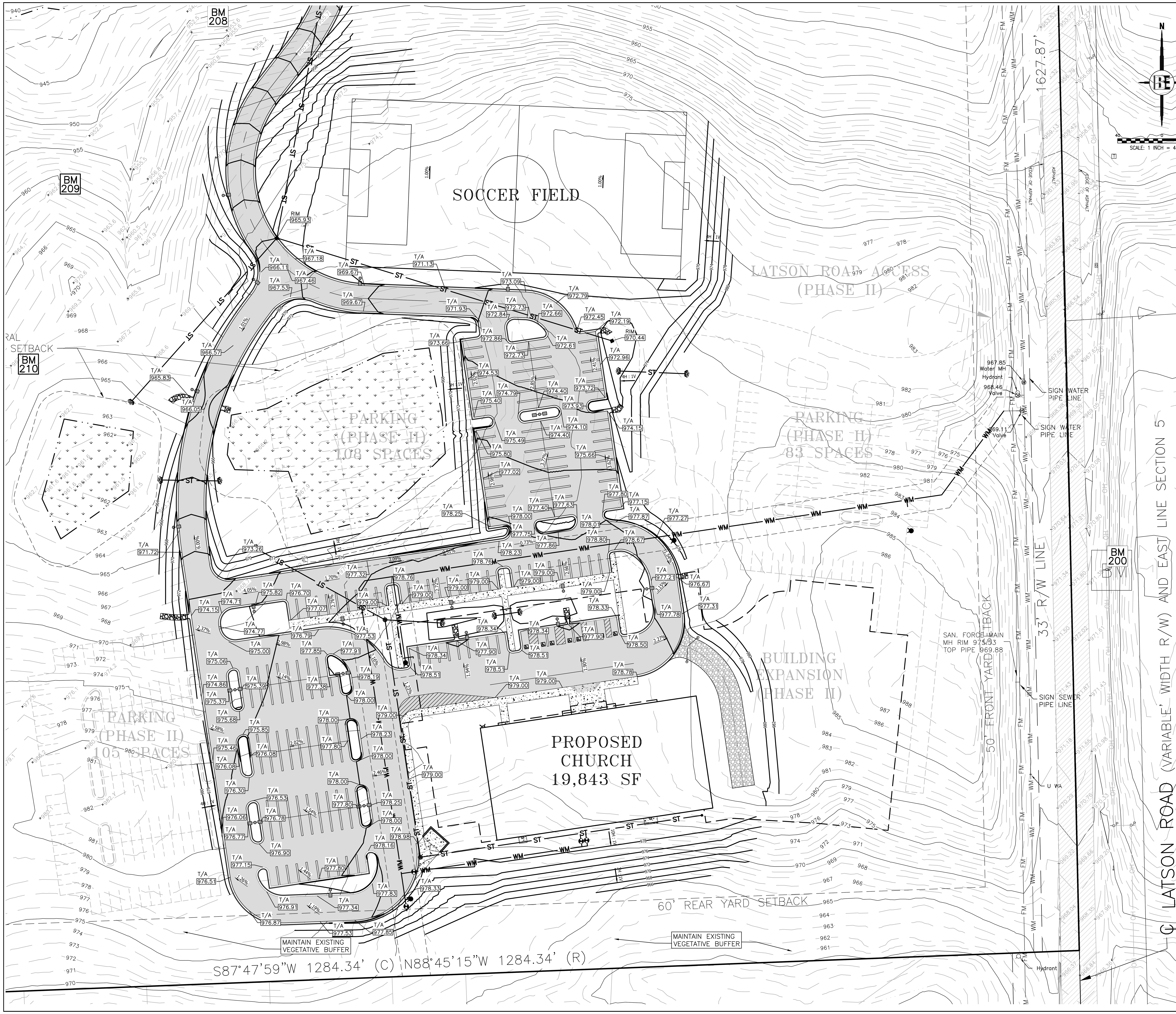
PROJECT: **BIBLE BAPTIST CHURCH**

PREPARED FOR: **BIBLE BAPTIST CHURCH**
2258 EAST HIGHLAND ROAD
HOWELL, MI 48843
517-715-9223

TITLE: **UTILITY PLAN**

NO	BY	REVISION PER	DATE
1	ST	PER TWP REVIEW	2/23/22

DESIGNED BY: ST
DRAWN BY: JS
CHECKED BY:
SCALE 1" = 80'
JOB NO. 21-542
DATE 2/1/2022
SHEET NO. 6



LEGEND

PROPOSED (PR)	EXISTING (EX)	
900	900	CONTOUR
		STORM DRAINAGE FLOW
T/C XXX.XX	+ 922.08	SPOT ELEVATION
FG	FG	FINISHED GRADE ELEVATION
T/A	T/A	TOP OF ASPHALT
T/C	T/C	TOP OF CURB / CONCRETE
T/W	T/W	TOP OF WALK
F/L	F/L	FLOW LINE
T/P	T/P	TOP OF PIPE
B/P	B/P	BOTTOM OF PIPE
RIM	RIM	RIM ELEVATION
INV	INV	INVERT ELEVATION
MH	MH	MANHOLE STRUCTURE
IN	IN	INLET STRUCTURE
CB	CB	CATCHBASIN STRUCTURE
RY	RY	REARYARD STRUCTURE
ES	ES	END-SECTION
GV	GV	GATEVALVE STRUCTURE
HY	HY	HYDRANT
UP	UP	UTILITY POLE
SN	SN	SANITARY SEWER
FM	FM	FORCE MAIN
ST	ST	STORM SEWER
WM	WM	WATER MAIN
WL	WL	WATER LEAD
OH	OH	OVERHEAD WIRE
C	C	CABLE
E	E	ELECTRIC
G	G	GAS
T	T	TELEPHONE
●	○	MANHOLE
■	□	INLET / CATCHBASIN
		FLARED END-SECTION
	⊗	GATE VALVE
		HYDRANT
		UTILITY POLE
X	X	FENCE
	⊥	SIGN
TBR		TO BE REMOVED
CB 1		STORM SEWER LABEL
GV 1		WATER MAIN LABEL
		WETLAND BOUNDARY
		LIMITS OF CLEARANCE/DISTURBANCE

SITE BENCHMARKS (NAVD88 DATUM):

-BM #200 = NAIL/TAG W/S P.POLE E/S LASTON RD. 785'± NORTH OF CONOVER CT.. ELEV.=971.41

-BM #201 = ARROW ON HYD W/S OF LASTON RD. 135'± SOUTH OF GOLF CLUB RD.. ELEV.=939.50

-BM #203 = FD. R.R. E/S OF GUY POLE W/S OF LASTON RD. 44'± SOUTH OF GOLF CLUB RD.. ELEV.=942.12

-BM #205 = PK NAIL/TAG W/S 40" WILLOW TREE 170'± SOUTH OF GOLF CLUB RD. & 160'± NORTH OF BARN. ELEV.=935.10

-BM #206 = LANDSCAPE SPIKE SET S/E CORNER OF POLE BARN. ELEV.=940.32

-BM #207 = PK NAIL/TAG S/S 12" MAPLE TREE S/S OF POND. ELEV.=945.31

-BM #208 = PK NAIL/TAG SET 10" PINE TREE 50'± EAST OF TWO TRACK RUNNING N&S & 150'± SOUTH OF POND, N/S OF TWO TRACK RUNNING E&W. ELEV.=954.73

-BM #209 = PK NAIL/TAG S/S 12" ELM TREE 142'± SOUTH OF POND. ELEV.=959.69

-BM #210 = PK NAIL/TAG E/S 8" PINE TREE 330'± SOUTH OF POND. ELEV.=966.83

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITY CROSSINGS IN THE FIELD PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE APPARENT OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171 (TOLL FREE) FOR THE LOCATION OF UNDERGROUND FACILITIES

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

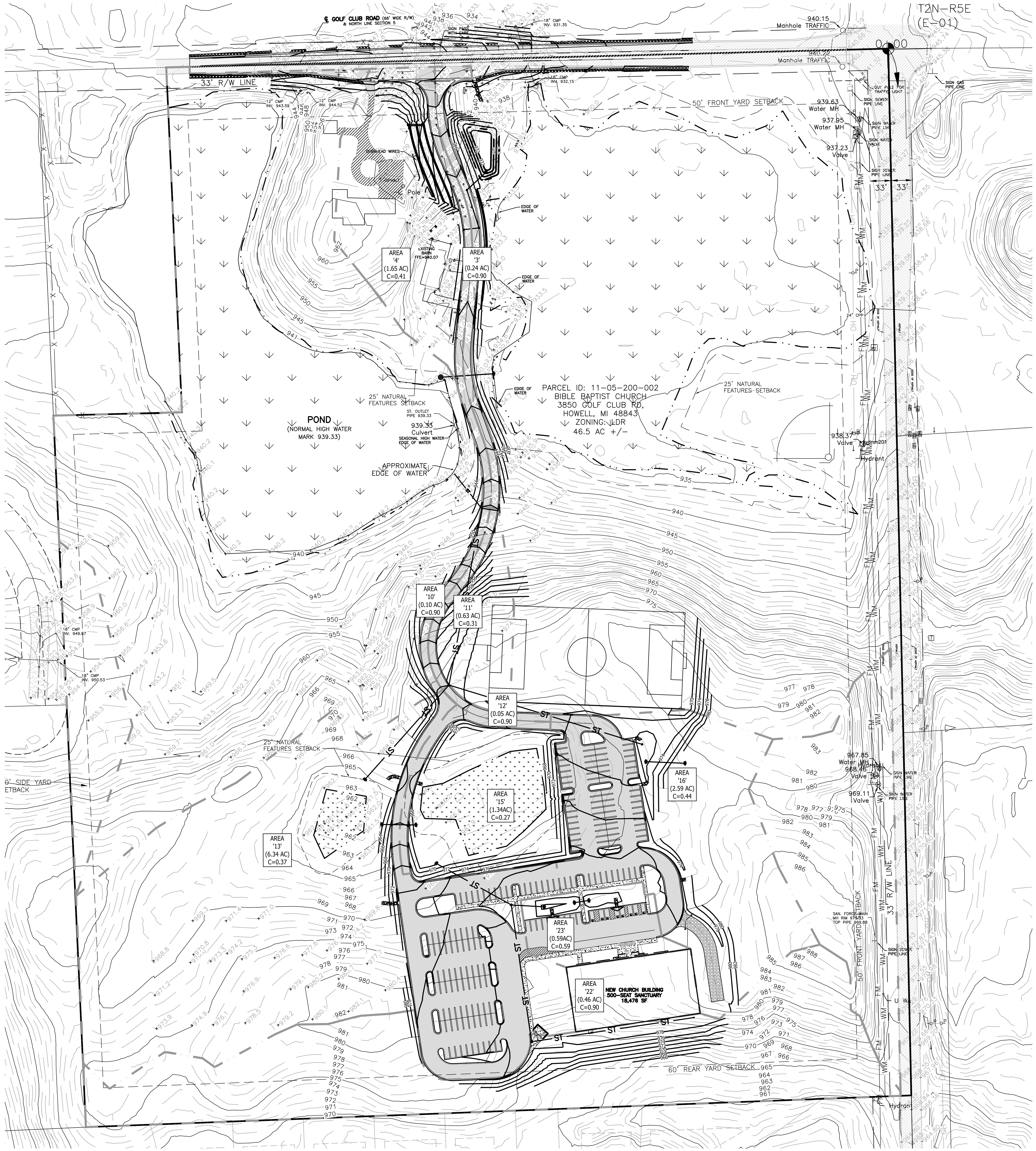
PROJECT: **BIBLE BAPTIST CHURCH**

PREPARED FOR: **BIBLE BAPTIST CHURCH**
2258 EAST HIGHLAND ROAD
HOWELL, MI 48843
517-715-9223

TITLE: **GRADING PLAN**

NO	BY	REVISION PER	DATE
1	ST	PER TWP REVIEW	2/23/22

DESIGNED BY: ST
DRAWN BY: JS
CHECKED BY:
SCALE 1" = 40'
JOB NO. 21-542
DATE 12/01/2021
SHEET NO. 7



N

SCALE: 1 INCH = 80 FEET

LEGEND

PROPOSED (PR)	EXISTING (EX)	
900	900	CONTOUR
		STORM DRAINAGE FLOW
T/C XXX.XX	+ 922.08	SPOT ELEVATION
FG	FG	FINISHED GRADE ELEVATION
T/A	T/A	TOP OF ASPHALT
T/C	T/C	TOP OF CURB / CONCRETE
T/W	T/W	TOP OF WALK
F/L	F/L	FLOW LINE
T/P	T/P	TOP OF PIPE
B/P	B/P	BOTTOM OF PIPE
RIM	RIM	RIM ELEVATION
INV	INV	INVERT ELEVATION
MH	MH	MANHOLE STRUCTURE
IN	IN	INLET STRUCTURE
CB	CB	CATCHBASIN STRUCTURE
RY	RY	REARYARD STRUCTURE
ES	ES	END–SECTION
GV	GV	GATEVALVE STRUCTURE
HY	HY	HYDRANT
UP	UP	UTILITY POLE
SN	SN	SANITARY SEWER
FM	FM	FORCE MAIN
ST	ST	STORM SEWER
WM	WM	WATER MAIN
WL	WL	WATER LEAD
OH	OH	OVERHEAD WIRE
C	C	CABLE
E	E	ELECTRIC
G	G	GAS
T	T	TELEPHONE
		MANHOLE
		INLET / CATCHBASIN
		FLARED END–SECTION
		GATE VALVE
		HYDRANT
		UTILITY POLE
X	X	FENCE
		SIGN
TBR		TO BE REMOVED
CB 1		STORM SEWER LABEL
GV 1		WATER MAIN LABEL
		WETLAND BOUNDARY
		PROPOSED DRAINAGE AREA

DRAINAGE NARRATIVE:

PRE–DEVELOPMENT:
IN GENERAL, THE SITE SLOPES NORTHERLY TOWARDS AN EXISTING OPEN WATER POND AND WETLAND AT THE NORTH PORTION OF THE PROPERTY. WATER FROM THE OPEN WATER POND DISCHARGES THROUGH AN EXISTING STANDPIPE EASTERLY TO THE EXISTING WETLAND AND THEN RUNS NORTHERLY UNDERNEATH GOLF CLUB ROAD. A SMALL PORTION OF THE PROPERTY SLOPES EASTERLY DIRECTLY TO LATSON ROAD RIGHT OF WAY AS WELL AS SOME AREA SLOPING DIRECTLY SOUTHERLY TO THE EXISTING ROLLING RIDGE SITE CONDO.

POST–DEVELOPMENT:
THE OVERALL DRAINAGE PATTERNS ON THE SITE AFTER DEVELOPMENT REMAIN GENERALLY THE SAME. THERE WILL A REDUCTION IN DRAINAGE AREA DIRECTLY DISCHARGING TO THE ROLLING RIDGE SITE CONDO TO THE SOUTH. THE DIRECT DRAINAGE TO LATSON ROAD RIGHT OF WAY WILL REMAIN UNCHANGED. THE PROPOSED CHURCH AND ALL IMPERVIOUS SURFACES WILL BE DIRECTED VIA A COMBINATION OF ENCLOSED STORM SEWER AS WELL AS OPEN SWALES NORTHERLY TO A MECHANICAL PRETREATMENT UNIT. THE MECHANICAL PRETREATMENT UNIT WILL TREAT THE STORMWATER FROM THE FIRST FLUSH PER NEW LCDC STANDARDS AND DISCHARGE TO THE EXISTING POND ON THE NORTHWEST PORTION OF THE PROPERTY. STORAGE IS WITHIN THE OPEN WATER POND PRIOR TO DISCHARGE INTO THE EAST WETLAND, WHICH IS PERMITTED UNDER MDEGLE PERMIT #WRP026826. THERE IS A NORTH FOREBAY WHOSE DRAINAGE AREAS IS LIMITED TO THE NORTHERN PORTION OF THE PROPOSED COMMERCIAL DRIVE. THIS NORTHERN FOREBAY DISCHARGES DIRECTLY TO THE EAST WETLAND AND IS PERMITTED UNDER MDEGLE PERMIT #WRP026826.

FUTURE DEVELOPMENT:
THE PLANS FOR A CHURCH EXPANSION ARE ANTICIPATED AT A LATER DATE, WITH A REASONABLE EXPECTED LAYOUT PROVIDED AT THIS TIME FOR THIS FUTURE EXPANSION. SINCE THIS FUTURE EXPANSION IS KNOWN, THE STORM SEWER CALCULATIONS AND FOREBAY/MECHANICAL PRETREATMENT UNITS HAVE BEEN SIZED ACCORDINGLY TO ACCOUNT FOR FUTURE CHURCH DEVELOPMENT, THUS MITIGATING UNNECESSARY DISTURBANCE DURING THE EXPANSION PROJECT. AS WAS THE CASE IN THE POST–DEVELOPED CONDITION, THE DRAINAGE AREA DISCHARGING DIRECTLY TO THE ROLLING RIDGE SITE CONDO TO THE SOUTH WILL BE REDUCED YET AGAIN IN THE FUTURE CONDITION. THE DRAINAGE TO THE LATSON ROAD RIGHT OF WAY WILL NEED TO BE APPROVED BY LCRC.

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITY CROSSINGS IN THE FIELD PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE APPARENT OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG
1–800–482–7171
(TOLL FREE)
FOR THE LOCATION OF UNDERGROUND FACILITIES

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

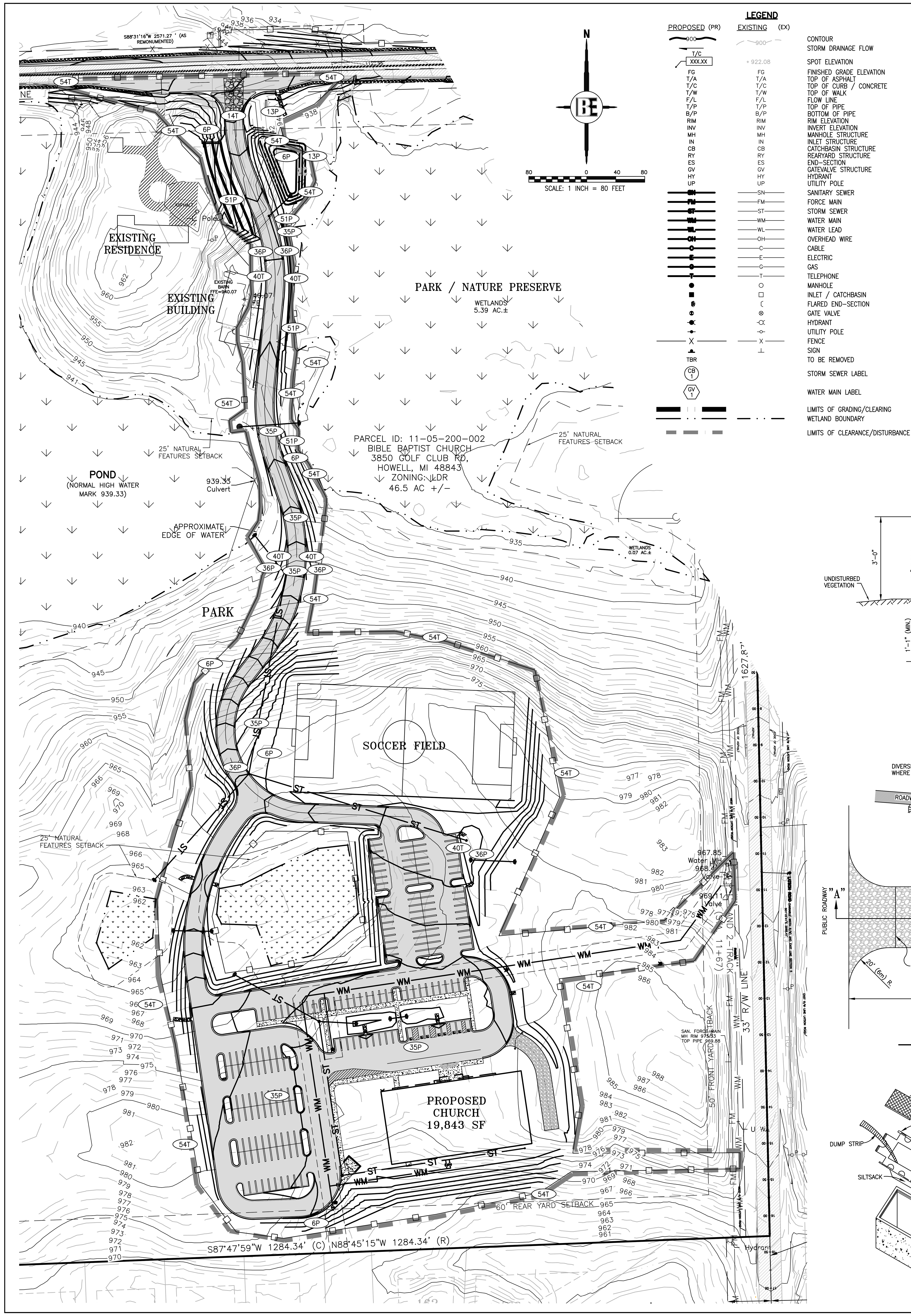
PROJECT
BIBLE BAPTIST CHURCH

PREPARED FOR
BIBLE BAPTIST CHURCH
2258 EAST HIGHLAND ROAD
HOWELL, MI 48843
517–715–9223

TITLE
DRAINAGE PLAN

NO	BY	REVISION PER	DATE
1	ST	PER TWP REVIEW	2/23/22

DESIGNED BY: ST
DRAWN BY: JS
CHECKED BY:
SCALE 1" = 80'
JOB NO. 21-542
DATE 2/1/2022
SHEET NO. 8



SOIL EROSION CONTROL MEASURES

No.	Measure	Description
1	STRIPPING & STOCKPILING TOPSOIL	TOPSOIL MAY BE STOCKPILED ABOVE BORROW AREAS TO ACT AS A DIVERSION STOCKPILE SHOULD BE TEMPORARILY SEEDED
6	SEEDING WITH MULCH AND/OR MATTING	FACILITATES ESTABLISHMENT OF VEGETATIVE COVER EFFECTIVE FOR DRAINAGEWAYS WITH LOW VELOCITY EASILY PLACED IN SMALL QUANTITIES BY INEXPERIENCED PERSONNEL SHOULD INCLUDE PREPARED TOPSOIL BED
13	RIP-RAP, RUBBLE, GABIONS	USED WHERE VEGETATION IS NOT EASILY ESTABLISHED EFFECTIVE FOR HIGH VELOCITIES OR HIGH CONCENTRATIONS PERMITS RUNOFF TO INFILTRATE SOIL DISSIPATES ENERGY FLOW AT SYSTEM OUTLETS
14	AGGREGATE COVER	STABILIZES SOIL SURFACE, THUS MINIMIZING EROSION PERMITS CONSTRUCTION TRAFFIC IN ADVERSE WEATHER MAY BE USED AS PART OF PERMANENT BASE CONSTRUCTION OF PAVED AREAS
34	SEDIMENT BASIN	TRAPS SEDIMENT RELEASES RUNOFF AT NON-EROSIVE RATES CONTROLS RUNOFF AT SYSTEM OUTLETS CAN BE VISUAL AMENITIES
35	STORM SEWER	SYSTEM REMOVES COLLECTED RUNOFF FROM SITE, PARTICULARLY FROM PAVED AREAS CAN ACCEPT LARGE CONCENTRATIONS OF RUNOFF CONDUCTS RUNOFF TO MUNICIPAL SEWER SYSTEM OR STABILIZED OUTFALL LOCATION USE CATCH BASINS TO COLLECT SEDIMENT
36	CATCH BASIN, DRAIN INLET	COLLECTS HIGH VELOCITY CONCENTRATED RUNOFF MAY USE FILTER CLOTH OVER INLET
40	INLET SEDIMENT FILTER	EASY TO SHAPE COLLECTS SEDIMENT MAY BE CLEANED AND EXPANDED AS NEEDED
51	RETAINING WALL	REDUCES GRADIENT WHERE SLOPES ARE EXTREMELY STEEP PERMITS RETENTION OF EXISTING VEGETATION, KEEPING SOIL STABLE IN CRITICAL AREAS MINIMIZES MAINTENANCE
54	SILT FENCE	USES GEOTEXTILE FABRIC AND POST OR POLES. EASY TO CONSTRUCT AND LOCATE AS NECESSARY. (SEE DETAIL THIS SHEET)

T=TEMPORARY, P=PERMANENT
TOTAL DISTURBED AREA = 11.65 AC

SURFACE WATER & COUNTY DRAINS

WETLAND – ON SITE
LAKES – APPROXIMATELY 5,710 FT SE TO LAKE CHEMUNG
STREAMS – APPROXIMATELY 660 FT N OF GOLF CLUB RD.
BASINS – APPROXIMATELY 1,872 FT W OF PARCEL
DRAINS – APPROXIMATELY 1,024 FT EAST TO GENOA NO. 5 DRAIN NO. X
PONDS – ON SITE

CONSTRUCTION SEQUENCE

THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT EROSION IS MINIMIZED AND THAT COMPLIANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL LAWS, REGULATIONS, AND ORDINANCES IS MAINTAINED THROUGHOUT EXECUTION OF THIS PROJECT.

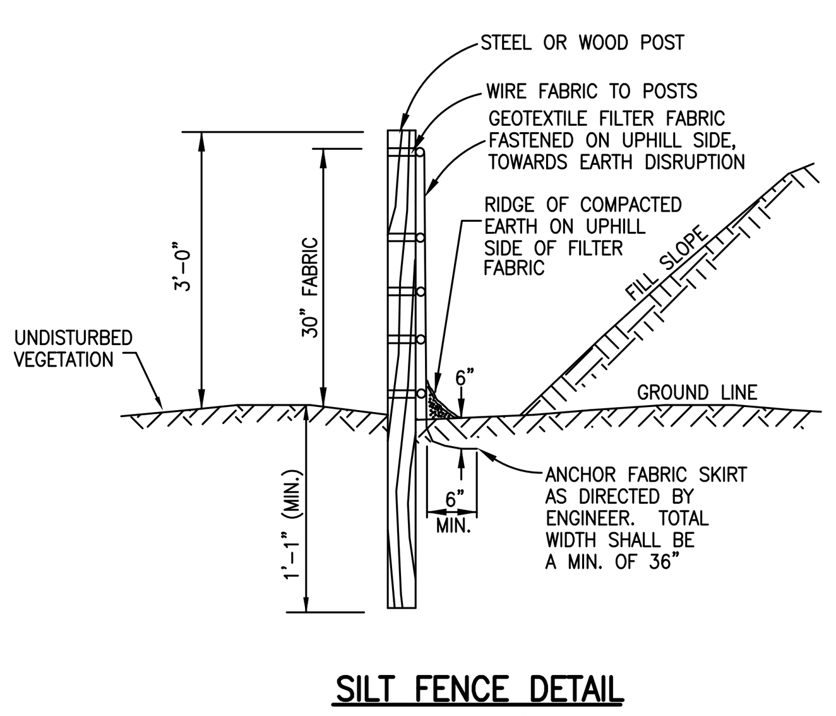
1 DAY	1.	INSTALL SILT FENCE AS SHOWN ON PLANS.
30 DAYS	2.	ROUGH GRADE AND INSTALL STORM DRAINAGE.
1 DAY	3.	INSTALL INLET PROTECTION ON STORM INLETS.
4 DAYS	5.	INSTALL PAVEMENT
5 DAYS	6.	FINE GRADE, SPREAD TOPSOIL, SEED OR SOD AS APPLICABLE.
1 DAY	7.	REMOVE ALL EROSION CONTROL STRUCTURES.
1 DAY	8.	REMOVE ACCUMULATED SILT FROM ALL EXISTING DRAINAGE.

CONTROLS & MEASURES POST CONSTRUCTION SEQUENCE

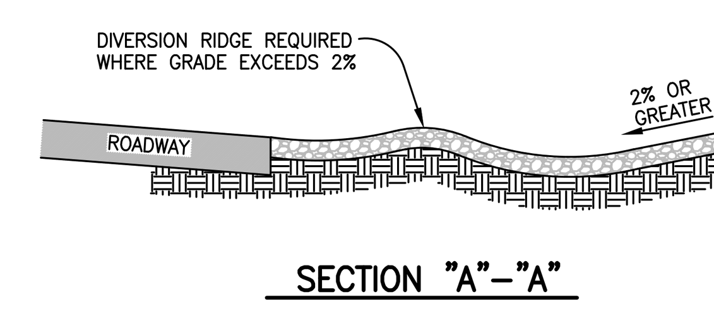
ACTIVITY	WEEKLY	MONTHLY	AS REQUIRED
MAINTAIN LANDSCAPING, REPLACE MULCH	X	X	X
CLEAN INLETS		X	X
COLLECT LITTER	X		X
SWEEP PARKING LOT		X	X

CONTROLS & MEASURES NARRATIVE

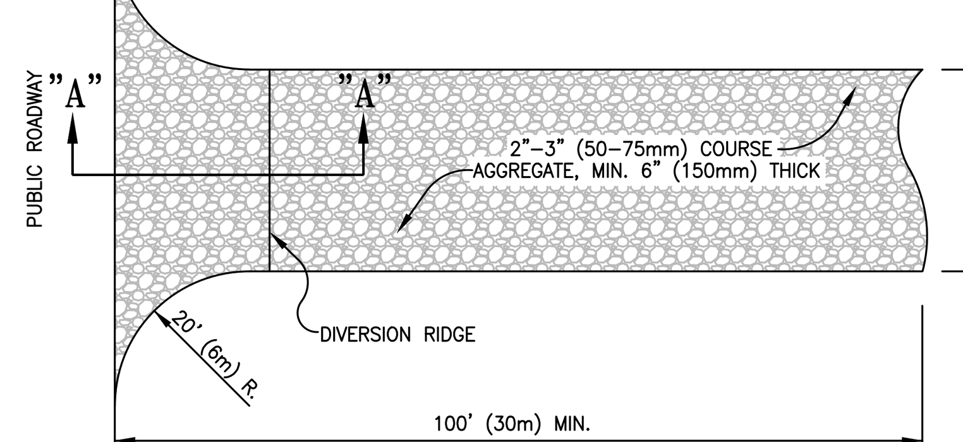
ACTIVITY	DESCRIPTION
MAINTAIN LANDSCAPING, REPLACE MULCH	COLLECT GRASS, TREE, AND SHRUB CLIPPINGS. DISPOSE IN APPROVED CONTAINER. REPLACE DEAD SOD, TREES AND SHRUBS.
CLEAN INLETS	REMOVE LITTER, SEDIMENT, AND DEBRIS. DISPOSE OF IN APPROVED LANDFILL.
COLLECT LITTER	DISPOSE OF WITH INLET DEBRIS.
SWEEP PARKING LOT	REMOVE MUD, DIRT, GREASE AND OIL WITH PERIODIC SWEEPING
DUST CONTROL	SPRINKLE WATER AS NEEDED



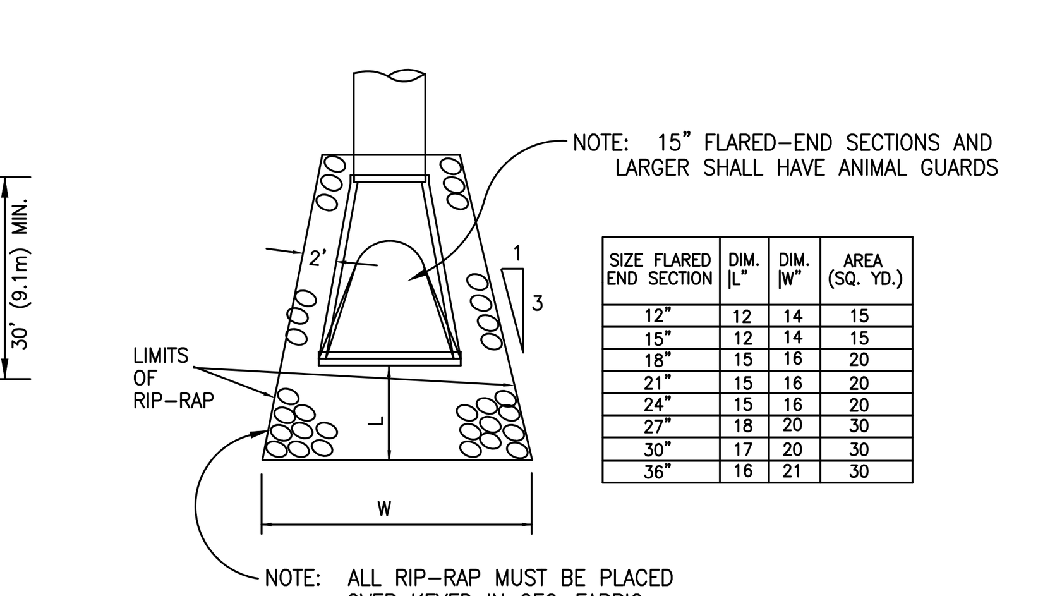
SILT FENCE DETAIL
NO SCALE



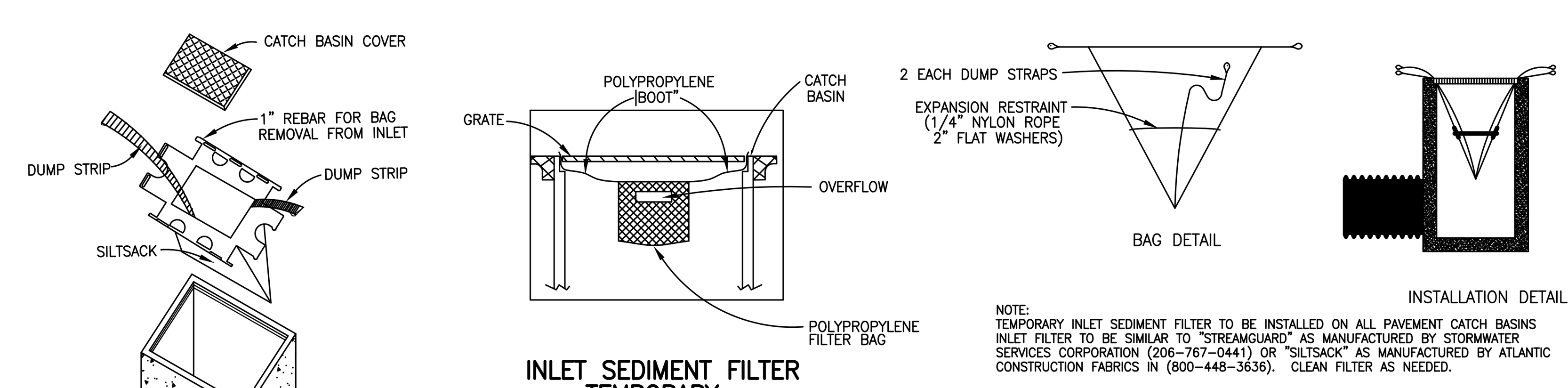
SECTION "A"-"A"



TEMPORARY GRAVEL CONSTRUCTION ENTRANCE/EXIT
NO SCALE



TYPICAL RIP-RAP DETAIL
(SCALE: NONE)



INLET SEDIMENT FILTER TEMPORARY
NO SCALE

LIVINGSTON COUNTY SOIL EROSION PERMIT TEMPLATE TEMPORARY CONTROLS AND SEQUENCE

1. NOTIFY LIVINGSTON COUNTY DRAIN COMMISSIONER'S OFFICE 24 HOURS PRIOR TO START OF GRADE WORK.
2. IN ACCORDANCE WITH PUBLIC ACT NO. 53, OF 1974 THE PERMIT HOLDER SHALL CALL MISS DIG FOR STAKING AND LOCATING OF UTILITIES, AT LEAST 72 HOURS IN ADVANCE OF THE START OF ANY WORK.

PERMITTING STANDARDS

3. (IMPORTANT NOTICE) RETENTION/DETENTION PONDS SHALL BE EXCAVATED, TOPSOILED, SEEDED, MULCHED AND TACKED PRIOR TO THE START OF MASSIVE EARTH DISRUPTION. INGRESS/EGRESS MUST HAVE LARGE CRUSHED ROCK TO REDUCE THE TRACKING OF SOIL ONTO THE PUBLIC TRAFFIC AREAS. SEE DETAIL ITEMS BELOW.
4. 36" M.D.O.T SPECIFICATION TYPE SILT FABRIC FENCE AS SHOWN ON PLANS SHALL BE PLACED AND MAINTAINED ALONG PERIMETER ON ALL LOW LYING AREAS OF THE CONSTRUCTION SITE TO FILTER RUNOFF BEFORE LEAVING PROJECT SITE.
5. ALL TEMPORARY EROSION CONTROL DEVICES AS NOTED ON PLANS SHALL BE INSTALLED PRIOR TO THE START OF MASSIVE EARTH DISTRIBUTION.
6. PLAN DOES DENOTE A DETAILED EROSION CONTROL DEVICE TO RESTRICT TRACKING OF MATERIAL ONTO THE HIGHWAY. STONE DIAPERS SHALL BE INSTALLED AT ALL INGRESS/EGRESS AREAS OF THE SITE PRIOR TO THE START OF MASSIVE EARTH DISRUPTION. DIAPERS SHALL BE OF CRUSHED STONE AND SHALL HAVE A MINIMUM LENGTH OF 100' LINEAL FEET.

RETENTION PONDS

7. RETENTION/DETENTION/SEDIMENTATION PONDS SHALL BE EXCAVATED, TOPSOILED, SEEDED, MULCHED AND TACKED PRIOR TO THE START OF MASSIVE EARTH DISRUPTION.
8. DETENTION POND OUTLETS SHALL BE OF THE STANDPIPE AND STONE FILTER SYSTEM, WITH TRASH SCREEN. OUTLET FLOW SHALL NOT EXCEED 0.20 CUBIC FEET OF WATER PER SECOND/PER ACRE. POND DIKES SHALL HAVE A MINIMUM OF ONE (1) FOOT OF FREEBOARD. AN EMERGENCY SPILLWAY SHALL BE CONSTRUCTED WITHIN THE FREEBOARD LEVEL.
9. THE EMERGENCY SPILLWAY FROM THE DETENTION POND SHALL BE SODDED AND PEGGED, OR RIP RAPPED, 15 FEET PAST THE TOE OF THE SLOPE OF THE BERM.
10. DIKES AND BERMS SHALL BE FREE OF ALL ORGANIC MATTER.
11. RETENTION/DETENTION PONDS SHALL BE FENCED WITH A 4' CHAIN LINK FENCE, INCLUDING A 12' ACCESS GATE FOR MAINTENANCE UNLESS MINIMUM 5 FT. HORIZONTAL TO 1 FT. VERTICAL SIDE SLOPES ARE PROVIDED. THE FENCE SHALL BE INSTALLED AT THE OUTER PORTION OF THE BERM, TO ALLOW FOR MAINTENANCE WORK TO BE DONE INSIDE THE FENCE.
12. ALL UNIMPROVED DISTURBED AREAS SHALL BE STRIPPED OF TOPSOIL WHICH WILL BE STORED ONSITE DURING THE EXCAVATING STAGE. TOPSOIL PILES SHALL BE SEEDED AND MULCHED, OR MATTED WITH STRAW IN THE NON-GROWING SEASON, IMMEDIATELY AFTER THE STRIPPING PROCESS IS COMPLETED, TO PREVENT WIND AND WATER EROSION.
13. SOIL EROSION CONTROLS SHALL BE MONITORED DAILY BY THE ON-SITE ENGINEER, OR CONTRACTOR, WHICHEVER CASE APPLIES.

SLOPES AND DITCHES

14. ON SITE DITCHES SHALL BE OF THE FLAT BOTTOM TYPE MINIMUM WIDTH OF 2' WITH A MINIMUM OF 3 HORIZONTAL TO 1 VERTICAL SIDE SLOPES, 3:1.
15. DITCHES WITH STEEP SLOPES WILL NEED FLOW CHECKS TO PREVENT SCOURING OF THE DITCH BOTTOM. THESE SHALL BE INSTALLED AS DIRECTED BY THE ENGINEER OR INSPECTOR.
16. SLOPES IN EXCESS OF 3 HORIZONTAL TO 1 VERTICAL SHALL NOT BE USED EXCEPT WITH A MECHANICAL DEVICE SUCH AS A RETAINING WALL, TERRACING, OR OTHER PRIOR APPROVED DEVICE. STORM DRAINS
17. ALL STORM WATER STRUCTURES, CATCH BASINS AND/OR MANHOLES, IF BLOCK, SHALL BE PLASTERED ON BOTH THE INSIDE AND OUTSIDE OF THE STRUCTURES. GROUTING AND POINTING WILL BE NECESSARY AT THE CASTING AND STRUCTURE JOINT TO PREVENT LEAKAGE AND THE RESULTING SOIL MOVEMENT, AROUND THE STRUCTURE.
18. STORM WATER INLETS SHALL HAVE AS A TEMPORARY CONTROL A STRAW BALE BARRIER AND STONE FILTER INSTALLED AROUND THE INLET DURING CONSTRUCTION. AS AN ALTERNATIVE TO THE STRAW BALE BARRIER, A BURLAP AND PEA STONE FILTER MAY BE USED. THREE LAYERS OF BURLAP FIBER AND A FILTER OF PEA STONE MINIMUM 1 FT. IN DEPTH CAN BE USED. DUE TO THE POROSITY OF THE BURLAP FILTER THE MINIMUM OF 1
FT. OF STONE IS VERY IMPORTANT. THE CONTROL SHALL BE INSTALLED AS SOON AS THE STRUCTURE IS BUILT AND INSPECTED DAILY.
19. BURLAP AND PEA STONE FILTERS WILL NEED TO BE CHANGED AFTER EACH RAINFALL.
20. COUNTY CODE REQUIRES A MINIMUM PIPE SIZE OF 12" IN DIAMETER. IF SMALLER PIPE IS NEEDED FOR OUTLET PURPOSES THE 12" CAN BE BAFFLED TO THE CORRECT SIZE. ALL PIPE SHALL MEET THE 12" DIAMETER CODE SIZE.
21. ALL STORM DRAIN OUTLETS 15" IN DIAMETER OR LARGER SHALL HAVE ANIMAL GUARDS INSTALLED TO PREVENT ENTRANCE TO THE SYSTEM.
22. ALL STORM DRAINAGE PIPE 30" IN DIAMETER OR LARGER SHALL BE POINTED, AT THE JOINTS ON THE INSIDE WITH MORTAR, AFTER BACKFILLING.
23. ALL STORM DRAIN OUTLETS THAT DO NOT EMPTY INTO THE RETENTION/DETENTION POND SHALL HAVE A TEMPORARY 5'X10'X3' SUMP INSTALLED AT THE TERMINATION OF THE STORM SEWER. UPON COMPLETION OF THE STABILIZATION WORK THE SUMP AREA SHALL BE FILLED AND RIP RAPPED WITH COBBLE STONE. SILT TRAPS SHALL BE INSPECTED AFTER EACH STORM.
24. STORM WATER OUTLETS DO DENOTE RIP RAP. ALL OUTLETS SHALL BE RIP RAPPED OVER KEYED FILTER FABRIC WITH A MINIMUM OF 15 SQ. YARDS OF 6" OR LARGER COBBLE STONE.
25. RIP RAP AS NOTED ON THE PLAN SHALL BE OF A FUNNEL SHAPE CONSTRUCTION, WIDTH SHALL INCREASE AS DISTANCE FROM THE OUTLET POINT INCREASES AT A 3:1 RATIO.
26. RIP RAP SHALL BE OF COBBLE STONE, 6" IN DIAMETER OR LARGER. GROUTING MAY BE NECESSARY, AND SHALL BE A MINIMUM OF 6" IN DEPTH WITH THE COBBLE SET IN THE CEMENT SLURRY.
27. STORM WATER OUTLET IS IN NEED OF A SPLASH BLOCK WHICH IS NOT NOTED ON THE PLAN. INSTALL SPLASH BLOCK IF SLOPE OF THE PIPE IS 4% OR GREATER.
28. IT WILL BE NECESSARY FOR THE DEVELOPER TO HAVE THE STORM DRAINAGE LINES CLEANED PRIOR TO FINAL INSPECTION BY THE LIVINGSTON COUNTY DRAIN COMMISSIONER'S OFFICE. IF REQUIRED, THIS WORK SHALL BE DONE BY A PROFESSIONAL SEWER CLEANING FIRM AND CERTIFIED IN WRITING BY THE PROJECT ENGINEER. ALL SUMPS AND TEMPORARY SILT TRAPS SHALL ALSO BE CLEANED AT THIS TIME.

STABILIZATION

29. ALL UNIMPROVED DISTURBED AREAS SHALL BE RE-TOP SOILED, WITH A MINIMUM OF 3" OF MATERIAL, SEEDED, MULCHED AND TACKED WITHIN 15 DAYS OF THE COMPLETION OF THE MASSIVE EARTH DISRUPTION. IN THE NON-GROWING SEASON STRAW MATTING WILL SUFFICE. HYDROSEEDING WILL BE AN ACCEPTABLE ALTERNATE FOR MULCHING. EXTREME CARE SHOULD BE EXERCISED IN SPRING AND FALL PERIODS AS A FROST WILL BREAK THE BIND OF THE HYDROSEEDING, WHICH WILL AFFECT THE EFFECTIVENESS OF THIS PROCEDURE.
30. IN THE NON-GROWING SEASON, TEMPORARY STABILIZATION OF MASSIVELY EXPOSED AREAS FOR WINTER STABILIZATION SHALL BE DONE WITH STRAW MATTING.
31. PERIODIC INSPECTIONS WILL BE MADE THROUGHOUT THE COURSE OF THE PROJECT. IT WILL BE THE RESPONSIBILITY OF THE MANAGERS OF THE PROJECT TO CONTACT THIS OFFICE FOR THE FINAL INSPECTION AT THE END OF THE PROJECT.
32. THIS COMMERCIAL PERMIT IS VALID FOR THE MASS EARTH MOVEMENT, THE INSTALLATION OF ROADS, DRAINS, AND UTILITIES AND IS NOT FOR ANY SINGLE FAMILY RESIDENCE. ALL RESIDENTIAL BUILDERS WILL NEED TO SECURE WAIVERS AND OR PERMITS AS NECESSARY FOR EACH LOT IN THIS DEVELOPMENT AT THE TIME APPLICATION FOR SINGLE FAMILY RESIDENCE IS MADE.
33. THE ISSUING BUILDING DEPARTMENT SHALL NOT ISSUE THE CERTIFICATE OF OCCUPANCY UNTIL THE FINAL INSPECTION LETTER FROM THE LIVINGSTON COUNTY DRAIN COMMISSIONER'S OFFICE HAS BEEN OBTAINED.
34. PER THE LIVINGSTON COUNTY DRAIN COMMISSIONER THE SEEDING, FERTILIZER AND MULCH MINIMUM QUANTITIES SHALL BE AS FOLLOWS:

TOP-SOIL	3" IN DEPTH
GRASS SEED	218 LBS. PER ACRE
FERTILIZER	150 LBS. PER ACRE
STRAW MULCH	3" IN DEPTH 1.5 TO 2 TONS PER ACRE (ALL MULCHING MUST HAVE A TIE DOWN, SUCH AS TACKIFIER, NET BINDING, ETC.)
HYDRO-SEEDING	HYDRO-SEEDING IS NOT ACCEPTABLE FOR SLOPES EXCEEDING 1%, IN SUCH CASES STABILIZATION SHALL BE DONE WITH SEED AND STRAW MULCH WITH A TACKIFIER.

MAINTENANCE SCHEDULE FOR SOIL EROSION CONTROLS

1. SILT FENCE SHALL BE INSPECTED WEEKLY AND AFTER EACH MAJOR STORM EVENT. MAINTENANCE SHALL INCLUDE REMOVAL OF ACCUMULATED SILT AND REPLACEMENT OF TORN SECTIONS. SILT FENCE SHALL BE REMOVED WHEN ALL CONTRIBUTING AREAS HAVE BEEN STABILIZED.
2. TRACKING PAD SHALL BE INSPECTED MONTHLY FOR ACCUMULATED DIRT. TRACKING PAD SHALL BE REPLACED WHEN THE STONES ARE CHOKED WITH DIRT. TRACKING PAD SHALL BE REMOVED IMMEDIATELY PRIOR TO THE FIRST COURSE OF ASPHALT BEING LAID.
3. DETENTION/RETENTION POND SHALL BE INSPECTED QUARTERLY ON A PERMANENT BASIS. MAINTENANCE SHALL INCLUDE SEDIMENT REMOVAL, EMBANKMENT STABILIZATION AND MAINTAINING THE OUTLET STRUCTURE IN GOOD CONDITION. NO TREES SHALL BE ALLOWED TO GROW ON THE EMBANKMENT.
4. CATCH BASINS SHALL BE INSPECTED ANNUALLY FOR ACCUMULATION OF SEDIMENT. ALL SEDIMENT MUST BE REMOVED AND DISPOSED OF PROPERLY WHEN THE SUMP IS FULL.
5. COMMON AREAS SHALL BE STABILIZED NO LATER THAN 15 DAYS AFTER GRADE WORK, PURSUANT TO RULE 1709 (5).

SILT FENCE SHALL BE A MINIMUM 36".

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITY CROSSINGS IN THE FIELD PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE APPARENT OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

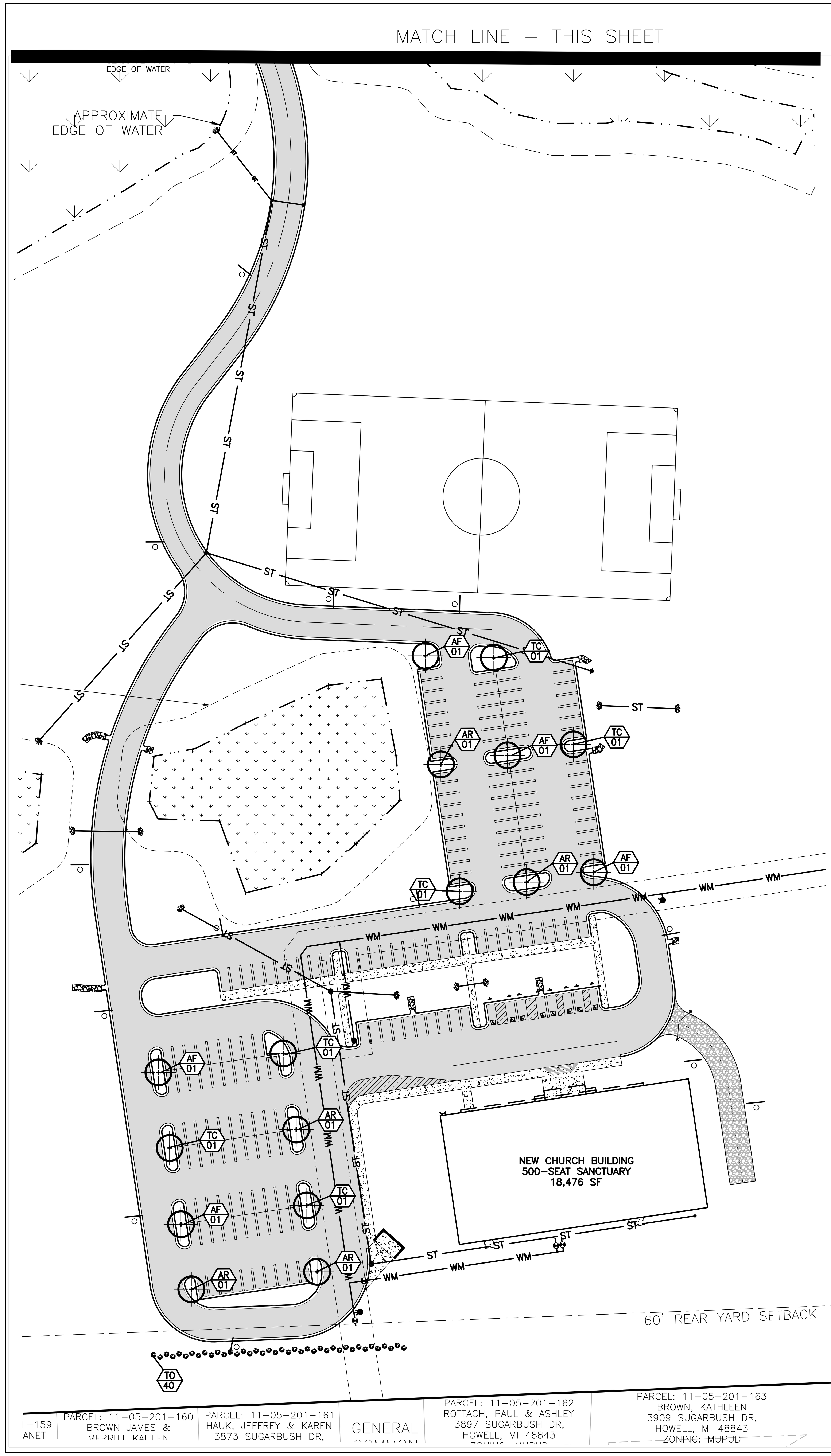
3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171

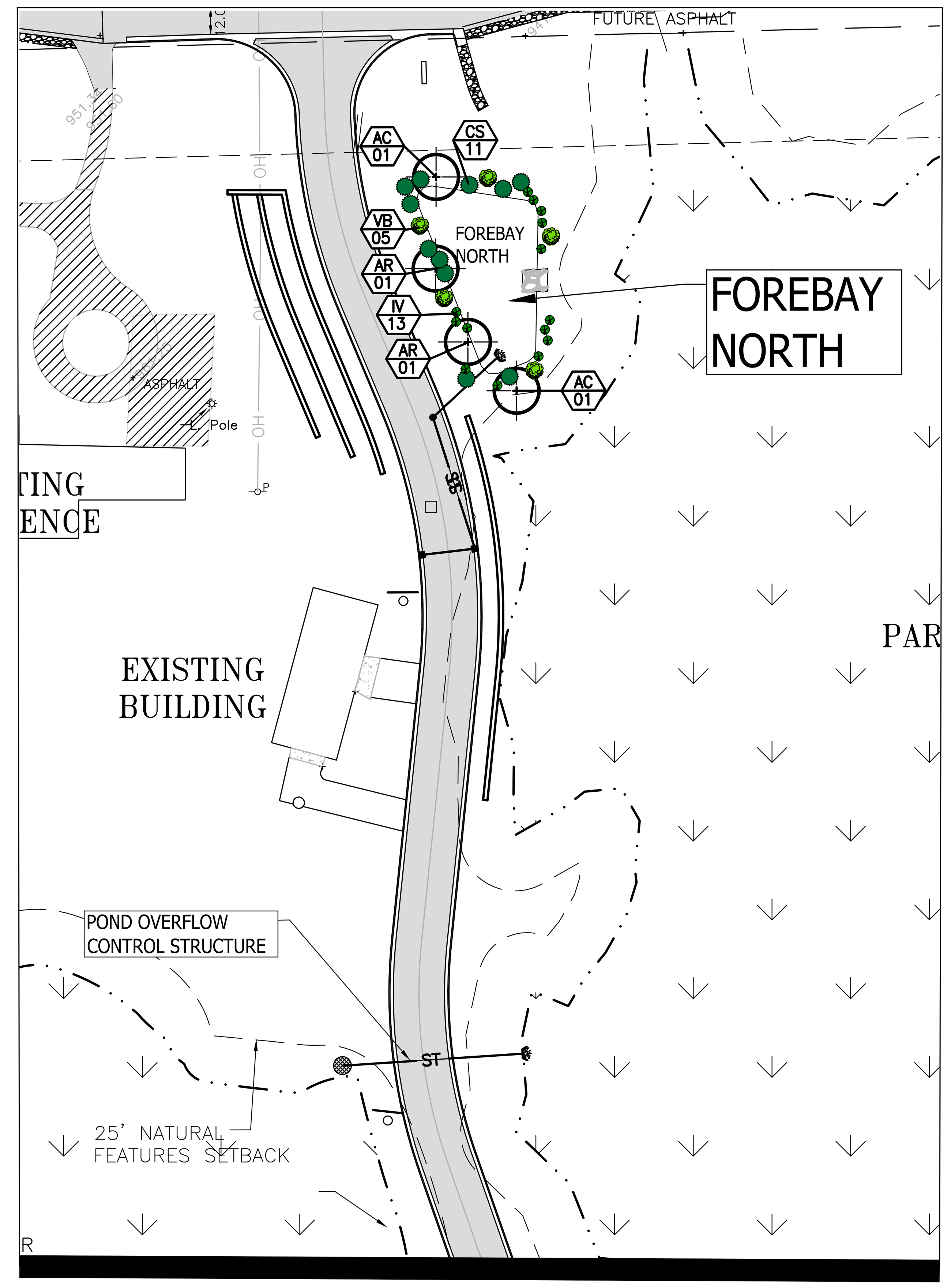
BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

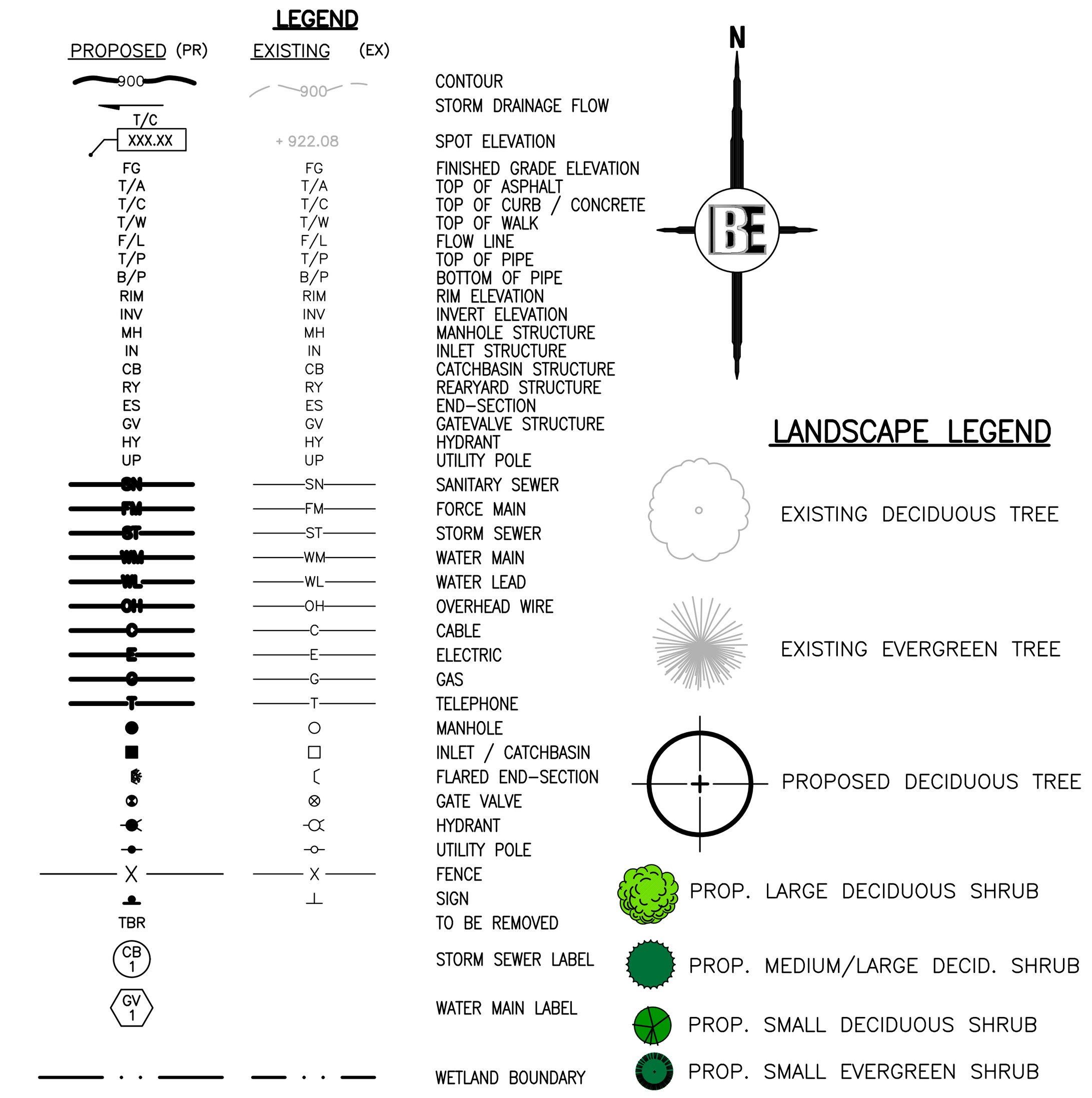
PROJECT: BIBLE BAPTIST CHURCH
PREPARED FOR: BIBLE BAPTIST CHURCH, 2258 EAST HIGHLAND ROAD, HOWELL, MI 48843, 517-715-9223
TITLE: SOIL EROSION & SEDIMENTATION CONTROL PLAN

NO	BY	REVISION PER	DATE
1	ST	PER TWP REVIEW	2/23/22

DESIGNED BY: ST
DRAWN BY: JS
CHECKED BY:
SCALE 1" = 80'
JOB NO. 21-542
DATE 2/1/2022
SHEET NO. 9







LANDSCAPE REQUIREMENTS PER ORDINANCE AND CALCULATIONS

1. MULTIPLE MATURE TREES OVER THREE (3) INCHES CALIPER AND IN GOOD CONDITION ALONG THE DRIVEWAY TO REMAIN.

2. DETENTION/RETENTION POND LANDSCAPING
   a. FREE FORM AS POSSIBLE, SIDE SLOPES NOT TO EXCEED 1 FOOT VERTICAL FOR EVERY THREE FEET HORIZONTAL
   b. 1 DECIDUOUS SHADE OR EVERGREEN TREE AND 10 SHRUBS FOR EVERY FIFTY LINEAL FEET OF POND PERIMETER AS MEASURED ALONG THE TOP OF THE BANK ELEVATION. LANDSCAPE TO BE LIMITED TO ABOVE FREEBOARD LEVEL.
   REQUIRED FOREBAY NORTH: 193 LF/50=3.86 TREES AND 3.86*10=38.6 SHRUBS
   PROVIDED FOREBAY NORTH: 4 TREES AND 39 SHRUBS

3. REQUIRED PARKING AREA LANDSCAPING
   a. AREAS CONTAINING TEN OR MORE PARKING SPACES SHALL BE PROVIDED WITH LANDSCAPING --101 THROUGH 200 SPACES: 1 CANOPY TREE AND 100 SF OF LANDSCAPED AREA PER 12 SPACES.
   REQUIRED: 186 SPACES / 12 = 15.5 TREES AND 1,550 SF LANDSCAPED AREA
   PROVIDED: 16 TREES, AND 5,145 SF LANDSCAPED AREA

4. PARKING SETBACK: WHEREVER AN OFF-STREET PARKING AREA IS ADJACENT TO A RESIDENTIAL DISTRICT, THERE SHALL BE A MINIMUM PARKING LOT SETBACK OF 50 FEET WITH A CONTINUOUS OBSCURING WALL, FENCE AND/OR LANDSCAPED AREA AT LEAST 4 FEET IN HEIGHT SHALL BE PROVIDED. THE TOWNSHIP BOARD MAY REDUCE THIS BUFFER BASED ON THE PROVISION OF LANDSCAPING. THE PRESENCE OF EXISTING TREES OR IN CONSIDERATION OF TOPOGRAPHIC CONDITIONS.
   PROVIDED: 36 SHRUBS PLANTED AT 4' TALL AT SOUTH EDGE OF PARKING LOT.

5. LANDSCAPE BUFFERS
   GREENBELTS ALONG THE RIGHT-OF-WAY AND A LANDSCAPED BUFFER ZONE BASED ON ADJACENT ZONING SHALL BE PROVIDED AS REQUIRED IN SECTION 12.02.
   REQUIRED: GREENBELT ALONG R.O.W. 20' WIDE, 1 CANOPY TREE FOR EVERY 40 LINEAR FEET OF FRONTAGE
   PROVIDED: LOCATION OF EXISTING WETLAND TO THE NORTH ALONG GOLF CLUB DR. PREVENTS PLANTING OF TREES ALONG R.O.W. EXISTING WOODLAND BUFFER ALONG LATSON ROAD R.O.W. TO REMAIN.

   REQUIRED: BUFFER TO MIXED USE PUD DISTRICT TO THE SOUTH
   PROVIDED: DENSE EXISTING 30'-60' WIDE BUFFER TO ADJACENT ZONING AT THE SOUTH WILL REMAIN. PLANTING ROW OF PLANTINGS ALONG THE SOUTHERN END OF THE SOUTHWEST PARKING LOT ADJACENT TO THE RESIDENTIAL TO THE SOUTH WHERE THE EXISTING VEGETATION REMAINING IS 30' WIDE.

   REQUIRED: BUFFER TO RURAL RESIDENTIAL DISTRICT TO THE WEST
   PROVIDED: ADJACENT ZONING TO WEST IS SCREENED BY EXISTING WOODLANDS THROUGHOUT THE SITE (SEE OVERALL SITE PLAN SHEET 4)

GENERAL LANDSCAPE NOTES:

1. ALL PLANT MATERIAL SHALL CONFORM TO THE REQUIREMENTS AND SPECIFICATIONS OF THE GOVERNING MUNICIPALITY AND SHALL BE NURSERY GROWN. ALL SIZES AND MEASUREMENTS SHALL CONFORM TO ANSI Z60 STANDARDS. ALL PLANT MATERIAL SHALL BE OF SELECTED SPECIMEN QUALITY AND HAVE A NORMAL HABIT OF GROWTH. ALL PLANT MATERIAL IS SUBJECT TO THE APPROVAL OF THE LANDSCAPE ARCHITECT.
2. ALL PLANT MATERIALS SHALL BE BALLED AND BURLAPPED STOCK OR CONTAINER STOCK. NO BARE ROOT STOCK IS PERMITTED. ALL PLANT BALLS SHALL BE FIRM, INTACT AND SECURELY WRAPPED AND BOUND.
3. ALL PLANT BEDS SHALL BE EXCAVATED OF ALL BUILDING MATERIALS AND OTHER EXTRANEOUS OBJECTS AND POOR SOILS TO A MINIMUM DEPTH OF 12 INCHES AND BACKFILLED TO GRADE WITH PLANTING MIX (SEE BELOW).
4. PLANTING MIXTURE SHALL CONSIST OF 4 PARTS TOPSOIL FROM ON SITE, 1 PART PEAT, AND 5 POUNDS OF SUPERPHOSPHATE PER CUBIC YARD OF MIX. INGREDIENTS SHALL BE THOROUGHLY BLENDED TO A UNIFORM CONSISTENCY.
5. ALL PLANT BEDS AND INDIVIDUAL PLANTS SHALL BE MULCHED WITH A 3 INCH LAYER OF SHREDDED BARK MULCH.
6. ALL PLANTS AND PLANT BEDS SHALL BE THOROUGHLY WATERED UPON COMPLETION OF PLANTING AND STAKING OPERATIONS.
7. THE CONTRACTOR SHALL GUARANTEE ALL PLANT MATERIALS FOR A PERIOD OF 1 YEAR FROM THE DATE THE WORK IS ACCEPTED, IN WRITING, BY THE LANDSCAPE ARCHITECT. THE CONTRACTOR SHALL REPLACE, WITHOUT COST TO THE OWNER, WITHIN A SPECIFIED PERIOD TIME, ALL DEAD PLANTS, AND ALL PLANTS NOT IN A VIGOROUS, THRIVING CONDITION, AS DETERMINED BY THE LANDSCAPE ARCHITECT DURING AND AT THE END OF THE GUARANTEE PERIOD. REPLACEMENT STOCK SHALL CONFORM TO THE ORIGINAL REQUIREMENTS.
8. ALL LANDSCAPE BEDS SHALL BE EDGED WITH BLACK ALUMINUM EDGING, 1/8" X 4". INSTALL PER MANUFACTURER'S INSTRUCTIONS. ALL EDGING SHALL BE INSTALLED IN STRAIGHT LINES OR SMOOTH CURVES WITHOUT IRREGULARITIES.
9. SOD SHALL BE DENSE, WELL ROOTED TURF, FREE OF WEEDS. IT SHALL BE COMPRISED OF A BLEND OF AT LEAST TWO KENTUCKY BLUEGRASSES AND ONE FESCUE. IT SHALL HAVE A UNIFORM THICKNESS OF 3/4 INCH, AND CUT IN UNIFORM STRIPS NOT LESS THAN 10 INCHES BY 18 INCHES. SOD SHALL BE KEPT MOIST AND LAID WITHIN 36 HOURS AFTER CUTTING.

   IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ESTABLISH A DENSE LAWN OF PERMANENT GRASSES, FREE OF LUMPS AND DEPRESSIONS. ALL SODDED AREAS THAT BROWN OUT OR HAVE NOT FIRMLY KNITTED TO THE SOIL BASE WITHIN A PERIOD OF ONE MONTH SHALL BE REPLACED BY THE CONTRACTOR, AT NO COST TO THE OWNER.
10. ALL AREAS OF THE SITE THAT BECOME DISTURBED DURING CONSTRUCTION AND ARE NOT TO BE PAVED, STONED, LANDSCAPED, OR SODDED SHALL BE SEEDED AND MULCHED.

   SEED MIXTURE SHALL BE AS FOLLOWS:

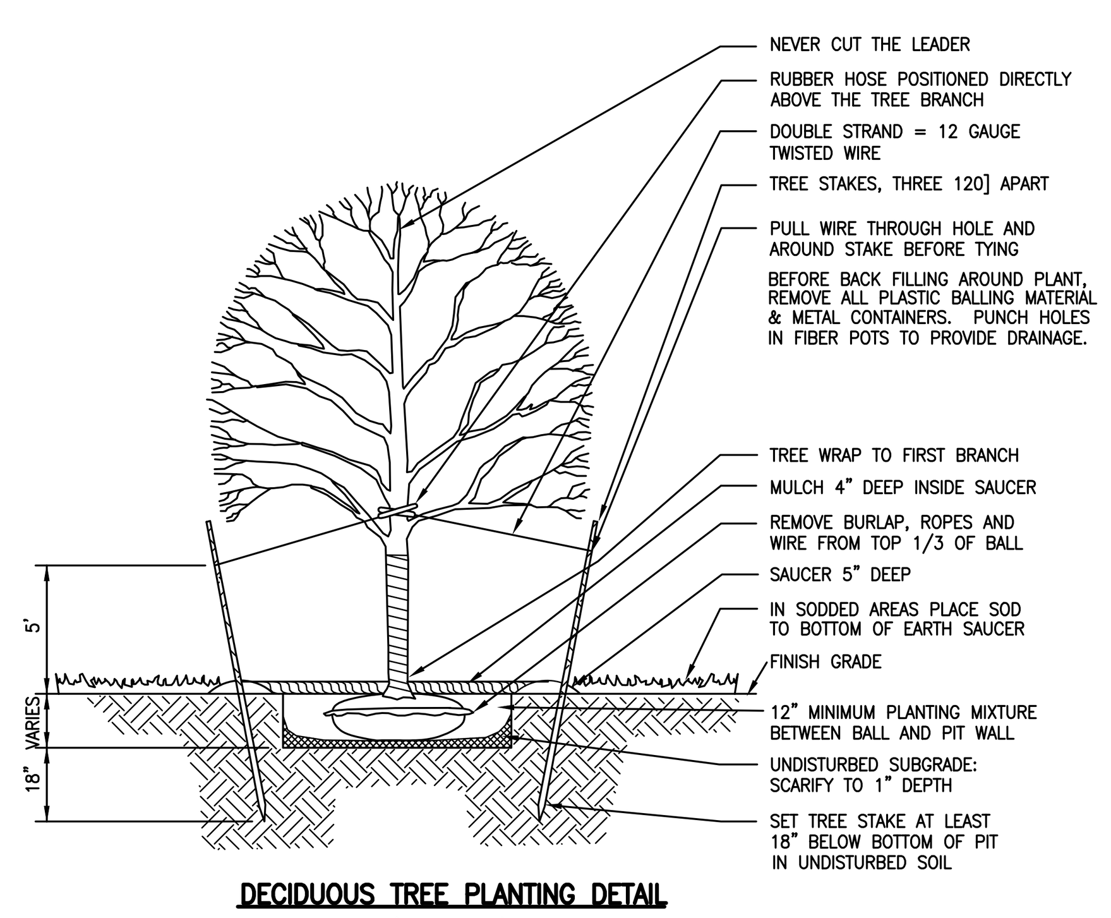
KENTUCKY BLUEGRASS (CHOOSE 3 VARIETIES: ADELPHI, RUGBY, GLADE OR PARADE)	30%
RUBY RED OR DAWSON RED FINE FESCUE	30%
ATLANTA RED FESCUE	20%
PENNFINE PERENNIAL RYE	20%

   THE ABOVE SEED MIXTURE SHALL BE SOWN AT A RATE OF 250 POUNDS PER ACRE. PRIOR TO SEEDING, THE TOPSOIL LAYER SHALL BE FERTILIZED WITH A COMMERCIAL FERTILIZER WITH A 10-0-10 ANALYSIS:

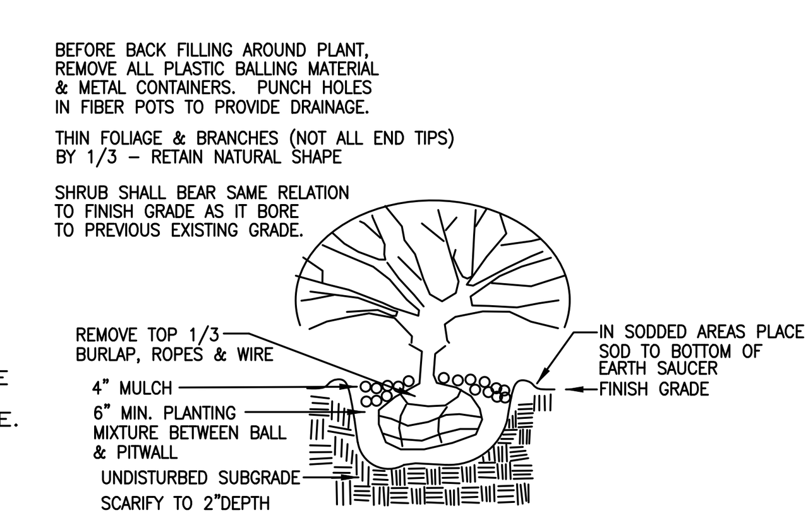
   10% NITROGEN: A MINIMUM OF 25% FROM A UREAFORMALDEHYDE SOURCE
   0% PHOSPHATE
   10% POTASH: SOURCE TO BE POTASSIUM SULFATE OR POTASSIUM NITRATE.

   THE FIRST FERTILIZER APPLICATION SHALL BE AT A RATE OF 10 POUNDS OF BULK FERTILIZER PER 1000 SQUARE FEET.

   IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ESTABLISH A DENSE LAWN OF PERMANENT GRASSES, FREE OF LUMPS AND DEPRESSIONS. ANY PART OF THE AREA THAT FAILS TO SHOW A UNIFORM GERMINATION SHALL BE RESEEDED AND SUCH RESEEDING SHALL CONTINUE UNTIL A DENSE LAWN IS ESTABLISHED. DAMAGE TO SEEDED AREAS RESULTING FROM EROSION SHALL BE REPAIRED BY THE CONTRACTOR.
11. ALL PLANT MATERIALS SHALL BE FREE OF WEEDS, INSECTS AND DISEASE.



DECIDUOUS TREE PLANTING DETAIL
(NO SCALE)



SHRUB PLANTING DETAIL
(NO SCALE)

FOREBAY NORTH PLANT LIST

KEY	QUAN.	BOTANICAL NAME	COMMON NAME	SIZE	REMARK
TREES					
AC	02	Amelanchier canadensis	Serviceberry	2.5" cal.	B-B
AR	02	Acer rubrum 'October Glory'	Red Maple 'October Glory'	2.5" cal.	B-B
SHRUBS					
CS	11	Cornus sericea	Red Osier Dogwood	30" ht.	B-B
IV	13	Ilex verticillata	Winterberry	24" ht.	B-B
VB	5	Viburnum trilobum	American cranberrybush viburnum	30" ht.	B-B

PLANT LIST

KEY	QUAN.	BOTANICAL NAME	COMMON NAME	SIZE	REMARK
TREES					
AF	05	Acer x freemanii	Autumn Blaze Maple	2.5" cal.	B-B
AR	05	Acer rubrum 'October Glory'	Red Maple 'October Glory'	2.5" cal.	B-B
TC	06	Tilia cordata	Little-leaf Linden	2.5" cal.	B-B
SHRUBS					
TO	40	Thuja Occidentalis 'Nigra'	Black Arborvitae	48" ht.	B-B

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

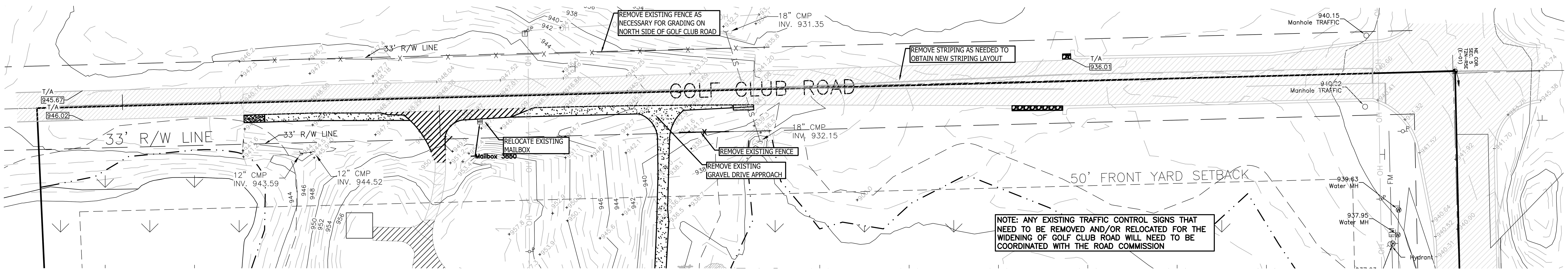
PROJECT: PHASE I BIBLE BAPTIST CHURCH CAMPUS

PREPARED FOR: BIBLE BAPTIST CHURCH, 2258 EAST HIGHLAND ROAD, HOWELL, MI 48843, 517-715-9223

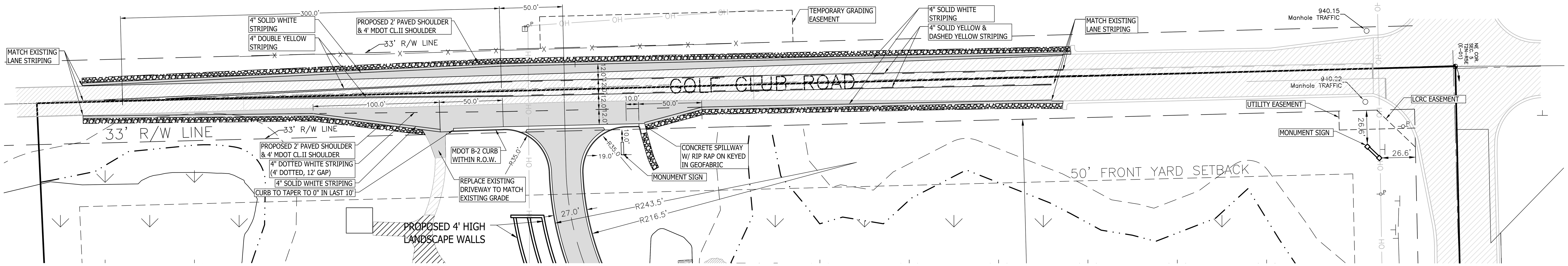
TITLE: LANDSCAPE PLAN

NO	BY	REVISION PER	DATE
1	ST	PER TWP REVIEW	2/23/22

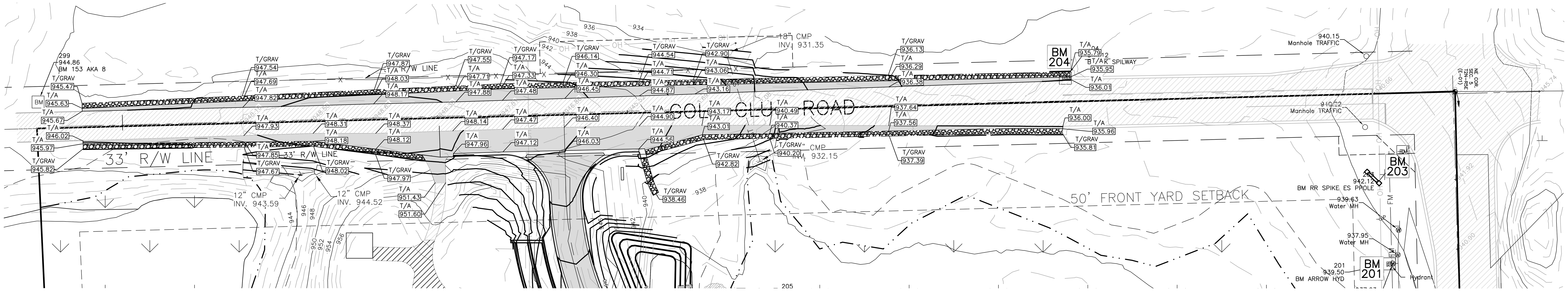
DESIGNED BY: JA
DRAWN BY: JA
CHECKED BY: ST
SCALE: 1" = 50'
JOB NO. 21-542
DATE: 2/1/2022
SHEET NO. 10



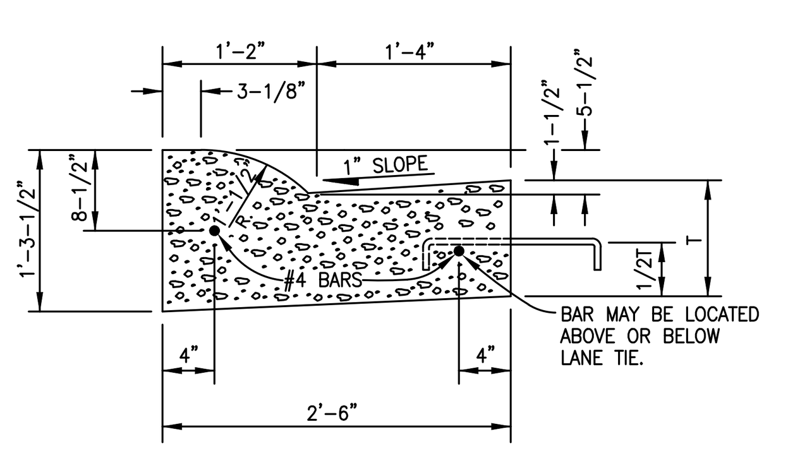
EXISTING CONDITIONS & DEMOLITION PLAN
SCALE: 1" = 40'



GOLF CLUB RD APPROACH PLAN
SCALE: 1" = 40'

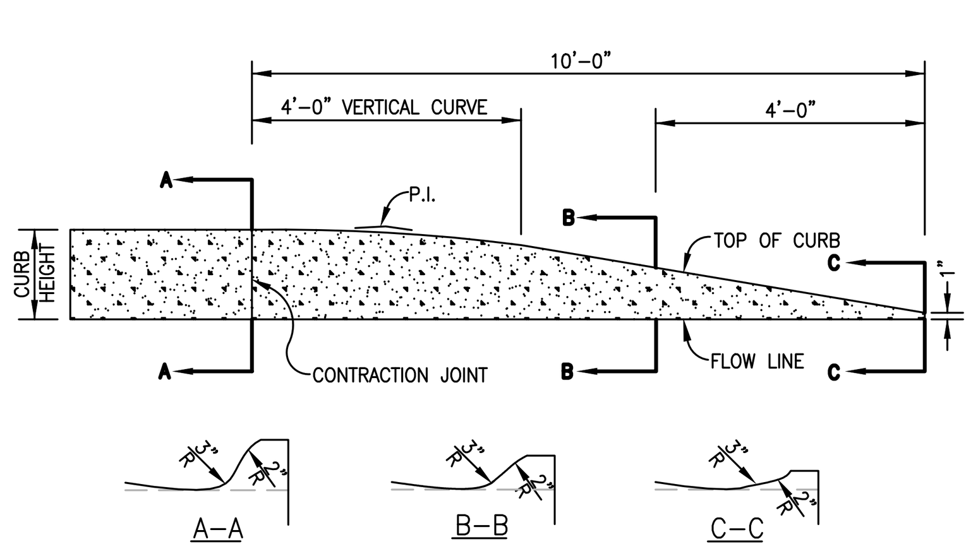


GOLF CLUB RD GRADING PLAN
SCALE: 1" = 40'

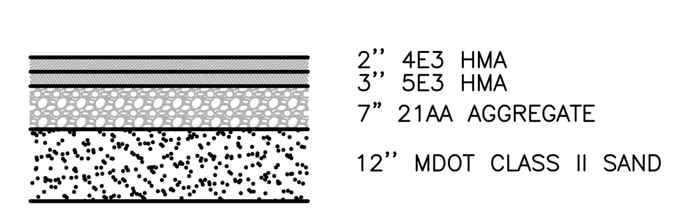


DETAIL	DIMEN. T	LANE TIES	CONCRETE CU.YD/LIN.FT.
B1	9"	AS SHOWN	0.0900
B2	9"	OMITTED	0.0900
B3	10"	AS SHOWN	0.0941

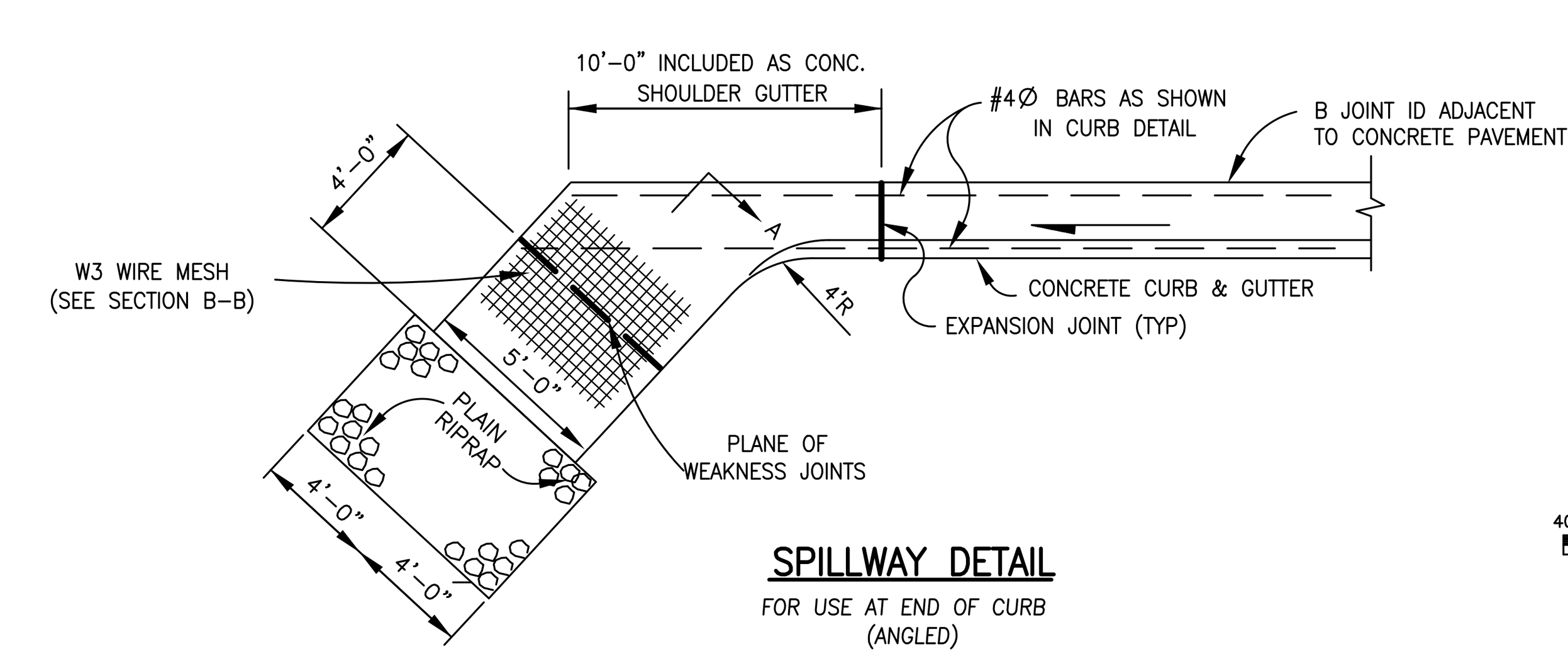
MDOT B-2 CURB DETAIL
(NO SCALE)
(GOLF CLUB RD. ROW)



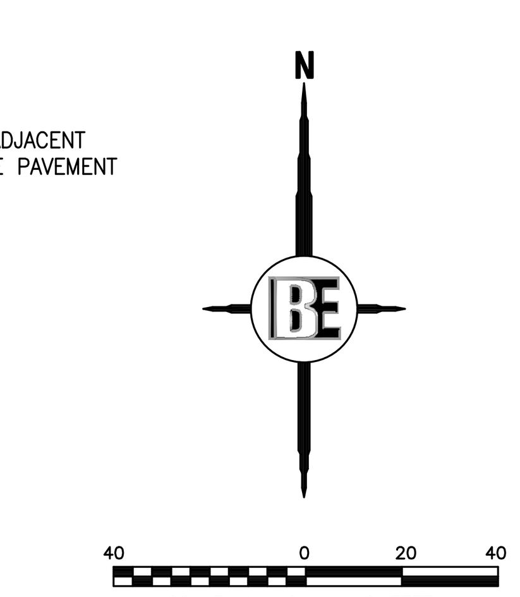
CONCRETE CURB AND GUTTER ENDINGS
(NO SCALE)



ASPHALT SECTION WITHIN GOLF CLUB ROAD R.O.W.
(NO SCALE)



SPILLWAY DETAIL
FOR USE AT END OF CURB
(ANGLED)



LEGEND

PROPOSED (PR)	EXISTING (EX)	
900	900	CONTOUR
		STORM DRAINAGE FLOW
T/C XXX.XX	+ 922.08	SPOT ELEVATION
FG	FG	FINISHED GRADE ELEVATION
T/A	T/A	TOP OF ASPHALT
T/C	T/C	TOP OF CURB / CONCRETE
UP	UP	UTILITY POLE
OH	OH	OVERHEAD WIRE
		UTILITY POLE
X	X	FENCE
		SIGN
TBR		TO BE REMOVED
		LIMITS OF GRADING/CLEARING
		WETLAND BOUNDARY
		GRAVEL
		ASPHALT

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITY CROSSINGS IN THE FIELD PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE APPARENT OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT
BIBLE BAPTIST CHURCH

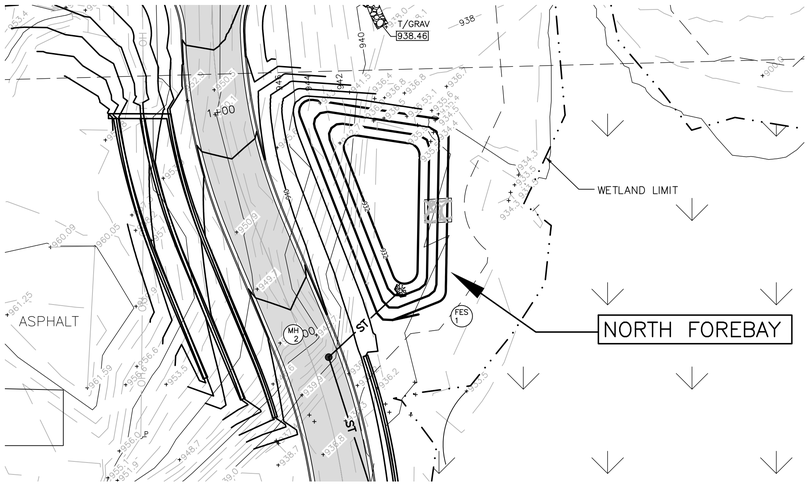
PREPARED FOR
BIBLE BAPTIST CHURCH
2258 EAST HIGHLAND ROAD
HOWELL, MI 48843
517-715-9223

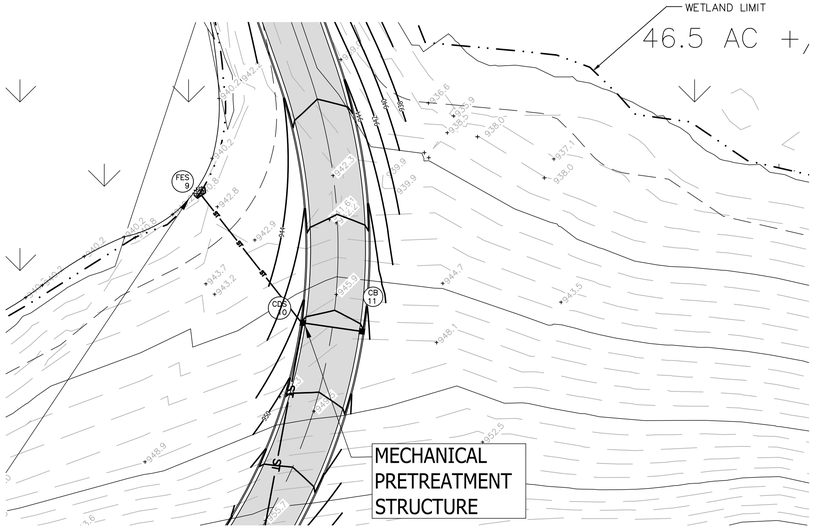
TITLE
GOLF CLUB ROAD APPROACH

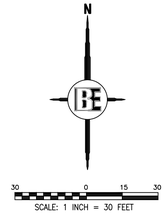
NO	BY	REVISION PER	DATE
1	ST	PER TWP REVIEW	2/23/22

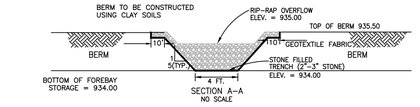
DESIGNED BY: ST
DRAWN BY: JS
CHECKED BY: ST
SCALE 1" = 40
JOB NO. 21-542
DATE 2/1/2022
SHEET NO. 11

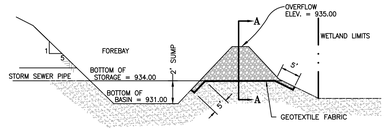
G:\21-542\DWG\SP\21-542 BaseSP.dwg, 2/24/2022 7:57:25 AM, AutoCAD PDF (General Documentation).pc3

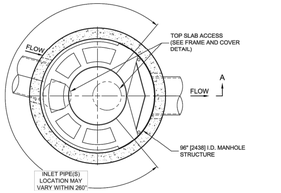


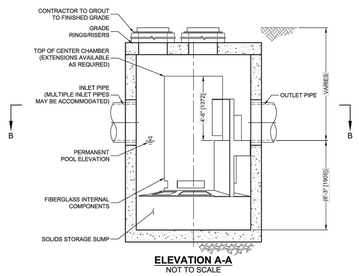












SCALE: 1 INCH = 30 FEET

SECTION A–A
NO SCALE

NORTH FOREBAY CROSS SECTION
NOT TO SCALE

LIVINGSTON COUNTY DETENTION BASIN CALCULATIONS - NORTH FOREBAY

AREA (ACRES)	IMPERVIOUS FACTOR	ACRE IMPERVIOUS
0.73	0.9	0.66
0.00	0.7	0.00
1.16	0.2	0.23

COMPOUND C: 0.47
TOTAL DRAINAGE AREA: 1.89 ACRES

WATER QUALITY VOLUME
V_{wq} = 3,630(C)(A) 3225 CF

FOREBAY STORAGE VOLUME PROVIDED:

ELEV	*AREA*	*VOLUME*	*CUMMULATIVE VOLUME*	
935	3913	**3401**	**3401**	
934	2888	**2446**		BOTTOM OF STORAGI
933	2003	1632		SUMP
932	1260			SUMP
931	0			SUMP

PLAN VIEW B-B
NOT TO SCALE

ELEVATION A-A
NOT TO SCALE

CASCADE
separator™

CASCADE SEPARATOR DESIGN NOTES

THE STANDARD CS-8 CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES

FRAME AND COVER
(DIAMETER VARIES)
NOT TO SCALE

SITE SPECIFIC DATA REQUIREMENTS			
STRUCTURE ID			
WATER QUALITY FLOW RATE (cfs [L/s])			
PEAK FLOW RATE (cfs [L/s])			
RETURN PERIOD OF PEAK FLOW (yrs)			
RIM ELEVATION			
PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
NOTES / SPECIAL REQUIREMENTS:			

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CASCADE SEPARATOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. CASCADE SEPARATOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. CASCADE SEPARATOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
6. ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CASCADE SEPARATOR MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH®
ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CS-8
CASCADE SEPARATOR
STANDARD DETAIL

LIVINGSTON COUNTY DETENTION BASIN CALCULATIONS

AREA (ACRES)	IMPERVIOUS FACTOR	ACRE IMPERVIOUS
3.60	0.9	3.24
3.50	0.9	3.15
5.72	0.2	1.14

COMPOUND C: 0.59
TOTAL DRAINAGE AREA: 12.83 ACRES

WATER QUALITY VOLUME
V_{wq} = 3,630(C)(A) 27478 CF

CHANNEL PROTECTION VOLUME
V_{CPVC} = 4,719(C)(A) 35721 CF

CHANNEL PROTECTION RATE CONTROL VOLUME
V_{CPRC} = 6,897 (C)(A) 52208 CF

EXTENDED DETENTION OUTLET RATE
V_{ED} = (1"/12")(43560)(C)(A)(P) = 52208 CF
Q_{ED} = V_{ED}/(48hr) 0.302 CFS
H_{ED} = $V_{ED}/4{,}800\ (H)^{1/2}$ 5.8 1" HOLES
H = 3.5 FT
$ELEV_{ED}$ = 945.49

100-YEAR POST CONSTRUCTION INLET RATE
Q_{100in} = $(C)(A)30.2033\times100^{0.2203}/(T_c+9.1747)^{0.8069}$ 48.25 CFS

100-YEAR ALLOWABLE OUTLET RATE
Q_{DRAIN} = 0.2 (A) 2.566 CFS
Q_{VRR} = 1.1055 - 0.206LN(A) 0.580 CFS
Q_{100ALL} = LESSER OF Q_{DRAIN} & Q_{VRR} 0.580 CFS

100-YEAR DETENTION VOLUME
R = $0.206-.15(\ln(Q_{100all}/Q_{100IN})$ 0.6461
V_{100in} = 18985 (C)(A) 143711 CF
V_{100det} = V_{100in}*R-V_{cp} 92853 CF

FROM	TO	ACRES A	RUNOFF COEFF C	EQUIV. AREA A * C	INTEN-SITY I	TIME OF CONC. T_C	ADD'L RUNOFF Q	RUNOFF (CFS) Q	PIPE LENGTH (LF)	PIPE DIA. (IN)	VELOCITY FLOWING FULL (FPS)	HYDRAULIC GRADIENT SLOPE %	ACTUAL SLOPE USED	MANNING FLOW CAPACITY	MANNING'S VELOCITY (FT/SEC)	TIME (MIN)	HG ELEV UPPER END	HG ELEV LOWER END	RIM ELEV UPPER END	INVERT UPPER END	INVERT LOWER END	DROP DISTANCE (FT)	RIM-INV	RIM-HG >1	PIPE COVER >2.667	FLOW THRU COVER
4	3	1.6535	0.41	0.6762	4.38	15.00		2.96	26	12	3.77	0.69%	2.00%	5.05	6.43	0.07	935.24	934.72	938.80	934.44	933.92		4.36	3.56	3.36	2.96
3	2	0.2401	0.90	0.2161	4.37	15.07		3.90	62	12	4.97	1.19%	1.50%	4.38	5.57	0.19	934.72	933.79	938.80	933.92	932.99		4.88	4.08	3.88	0.94
2	1	0	0.00	0	4.35	15.2524		3.90	39	12	4.97	1.19%	1.25%	3.99	5.09	0.13	933.79	933.30	939.42	932.99	932.50		6.43	5.63	5.43	0.00
6	5	0	0.00	0	4.38	15.00		0.00	81	24	0.00	0.00%	0.50%	16.04	5.11	0.26	936.87	936.46	940.50	935.27	934.86		5.23	3.63	3.23	0.00
22	21	0.4555	0.90	0.41	4.38	15.00		1.79	255	12	2.28	0.25%	1.00%	3.57	4.55	0.93	976.60	974.05	979.75	975.80	973.25		3.95	3.15	2.95	1.79
21	20	0	0.00	0	4.28	15.93		1.79	215	12	2.28	0.25%	1.50%	4.38	5.57	0.64	974.05	970.82	979.00	973.25	970.02	0.50	5.75	4.95	4.75	0.00
20	19	0	0.00	0	4.21	16.58	1.53	3.32	132	15	2.71	0.26%	1.00%	6.48	5.28	0.42	970.32	969.00	979.02	969.32	968.00		9.70	8.70	8.45	0.00
25	24	0.2975	0.59	0.1748	4.38	15.00		0.76	20	12	0.97	0.05%	1.20%	3.91	4.98	0.07	977.32	977.08	976.27	976.52	976.28		-0.25	-1.05	**-1.25**	0.76
23	20	0.5949	0.59	0.3496	4.38	15.00		1.53	50	12	1.95	0.18%	4.00%	7.14	9.10	0.09	976.07	974.07	975.27	975.27	973.27	3.75	0.00	-0.80	**-1.00**	1.53
15	14	1.3414	0.27	0.3576	4.38	15.00	3.32	4.89	50	15	3.98	0.57%	2.00%	9.16	7.46	0.11	966.00	965.00	968.00	965.00	964.00		3.00	2.00	**1.75**	1.56
13	12	6.3413	0.37	2.3322	4.38	15.00	4.89	15.09	195	18	8.54	2.05%	3.00%	18.24	10.32	0.31	966.53	960.68	964.33	965.33	959.48	6.00	-1.00	-2.20	**-2.50**	10.20
12	10	0.0548	0.90	0.0493	4.34	15.31	5.03	20.33	279	18	11.51	3.73%	3.00%	18.24	10.32	0.45	956.71	946.31	966.00	953.48	945.11	3.00	12.52	9.29	11.02	0.21
10	9	0.1024	0.90	0.0922	4.35	15.19	0.85	21.59	71	24	6.87	0.91%	1.00%	22.68	7.22	0.16	943.31	942.60	948.10	941.71	941.00		6.39	4.79	4.39	0.40
11	10	0.6251	0.31	0.195	4.38	15.00		0.85	26	12	1.09	0.06%	1.00%	3.57	4.55	0.10	943.57	943.31	948.10	942.77	942.51		5.33	4.53	4.33	0.85
18	17	0	0.00	0	4.38	15.00		0.00	60	15	0.00	0.00%	1.00%	6.48	5.28	0.19	972.60	972.00	971.60	971.60	971.00		0.00	-1.00	**-1.25**	0.00
16	12	2.5924	0.44	1.1497	4.38	15.00		5.03	314	15	4.10	0.60%	1.50%	7.93	6.46	0.81	965.89	961.18	970.00	964.89	960.18	6.50	5.11	4.11	3.86	5.03

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITY CROSSINGS IN THE FIELD PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE APPARENT OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG
1–800–482–7171
(TOLL FREE)
FOR THE LOCATION OF UNDERGROUND FACILITIES

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

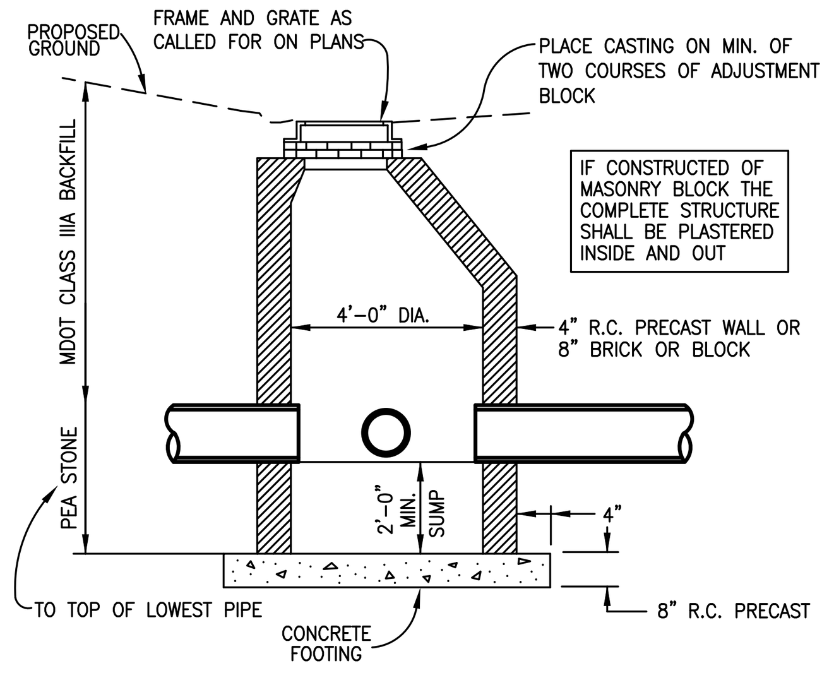
PROJECT
BIBLE BAPTIST CHURCH

PREPARED FOR
BIBLE BAPTIST CHURCH
2258 EAST HIGHLAND ROAD
HOWELL, MI 48843
517–715–9223

TITLE
FOREBAY DETAILS

NO	BY	REVISION PER	DATE
1	ST	PER TWP REVIEW	2/23/22

DESIGNED BY: ST
DRAWN BY: JS
CHECKED BY:
SCALE 1" = 30'
JOB NO. 21–542
DATE 2/1/2022
SHEET NO.
12



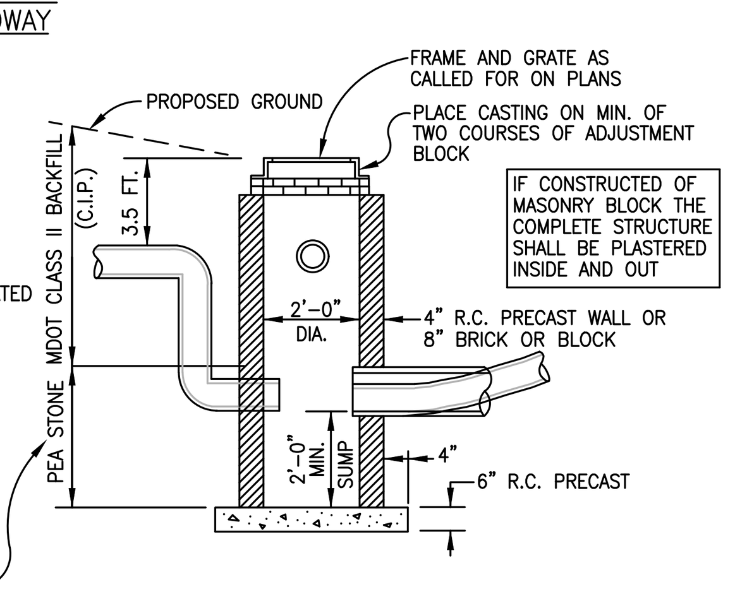
4 FT. DIA. CATCH BASIN W/SUMP

NO SCALE

INSTALL SUBDRAINS AT ALL CATCH BASINS LOCATED WITHIN ROADWAY

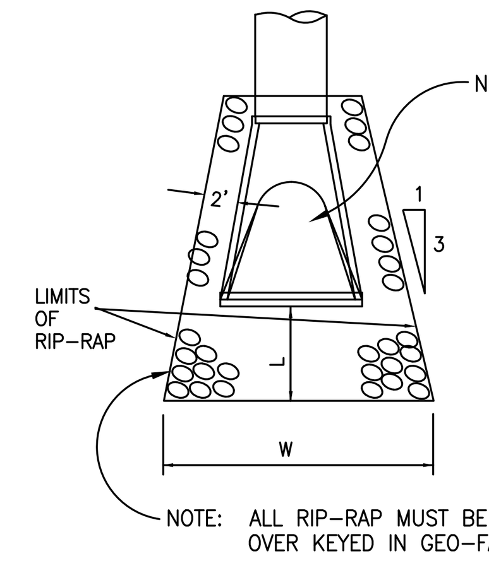
(1) 4 L.F. (MIN.) 6"ø PERFORATED P.V.C. PIPE WRAPPED WITH GEOTEXTILE FABRIC PLACED AT LOWEST INVERT PARALLEL TO ROAD OR LINE OF PIPE. BACK-FILLED WITH PEA STONE ONE FOOT ABOVE PIPE.

(2) AT LOWPOINT CATCH BASINS 20 L.F. (MIN.) OF 6"ø PERFORATED P.V.C. PIPE WRAPPED WITH GEOTEXTILE FABRIC, STARTING AT LOWEST INVERT AND CONTINUING AT 3.5 FT BELOW ROAD-WAY, PARALLEL TO ROAD. (BOTH DIRECTIONS) BACK-FILLED WITH PEA STONE TO THE SUBBASE.



2 FT. DIA. CATCH BASIN W/SUMP

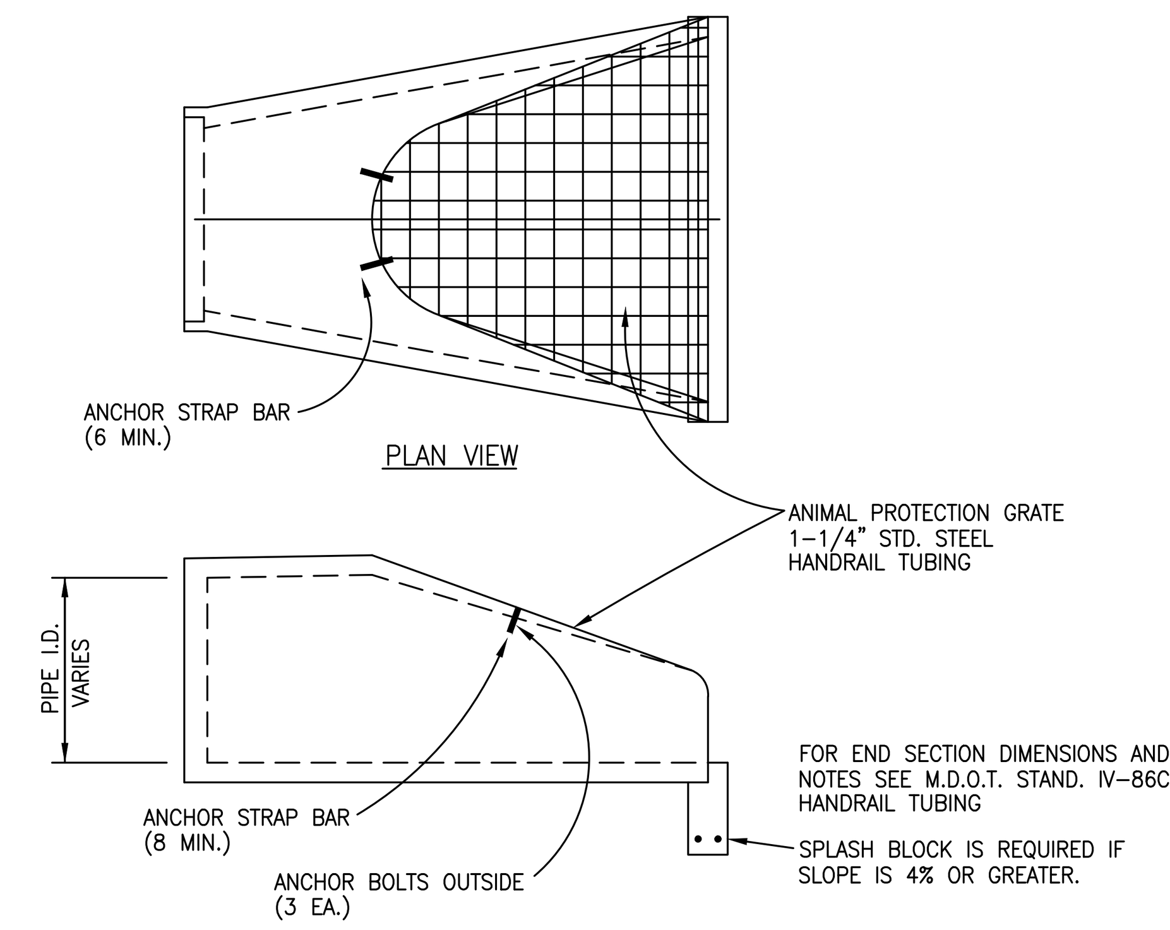
NO SCALE



SIZE FLARED END SECTION	DIM. "L"	DIM. "W"	AREA (SQ. YD.)
12"	12	14	15
15"	12	14	15
18"	15	16	20
21"	15	16	20
24"	15	16	20
27"	18	20	30
30"	17	20	30
36"	16	21	30

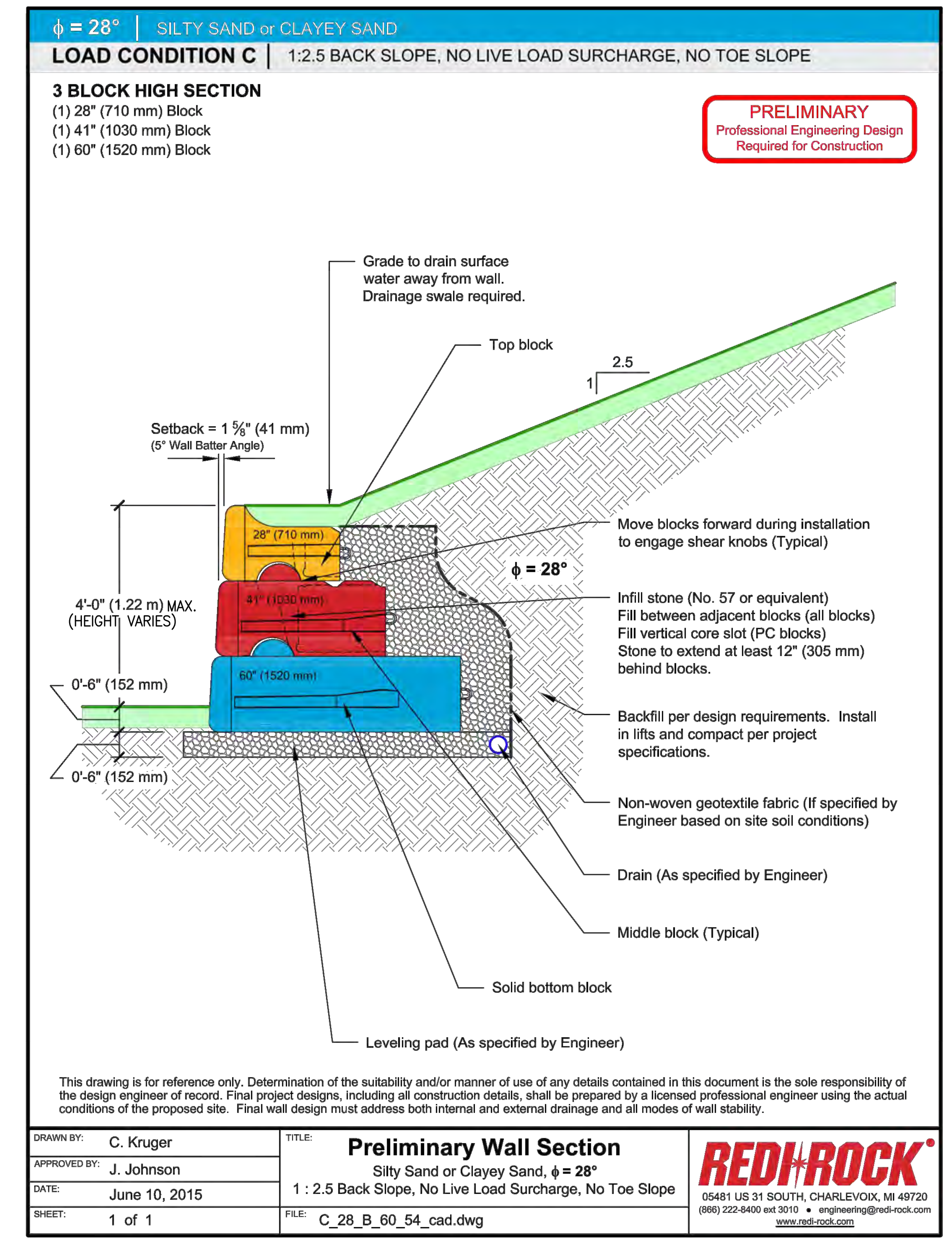
TYPICAL RIP-RAP DETAIL

(SCALE: NONE)



PRECAST CONCRETE END SECTION FOR PIPE CULVERT W/ ANIMAL GRATE

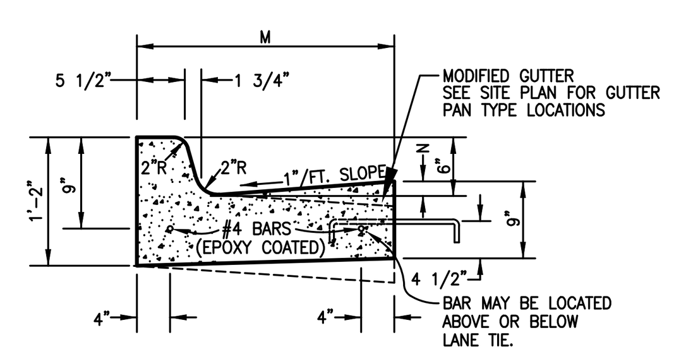
(NO SCALE)



LANDSCAPE WALL DETAIL

SCALE: NONE

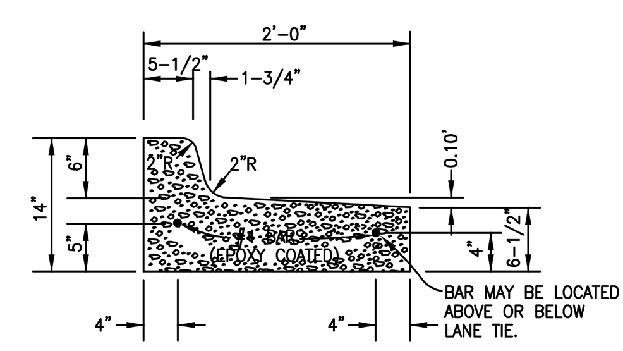
STRUCTURE FRAMES & COVERS					
COVER	TYPE	USE	MANUFACTURER OR EQUAL: EAST JORDAN	MANUFACTURER OR EQUAL: NEENAH	TYPE OF COVER OR GRATE
A	MH	ALL	1120	R-1415	VENTED
B	CB & INLET	TYPE B2 CURB	7085	R-3038-A	
K	CB & INLET	TYPE C & F CURB	7045	R-3031-B	FLAT GRATE WITH VERT. 4" OPEN THROAT
C	CB & INLET	VALLEY CURB	7065	R-3034-B	
D	CB & INLET	PARKING LOTS	1020-M1 5105-M1	R-2560-D	FLAT GRATE
E	CB & INLET	LAWN AREA OR DITCH	1020-01		BEEHIVE GRATE 4" HIGH



DETAIL	DIMENSIONS M	DIMENSIONS N	LANE TIES	CONCRETE CU.YD/LIN.FT.
F1	1'-6"	7/8"	AS SHOWN	0.0484
F2	1'-6"	7/8"	OMITTED	0.0484
F3	2'-0"	1 3/8"	AS SHOWN	0.0610
F4	2'-0"	1 3/8"	OMITTED	0.0610
F5	2'-6"	1 7/8"	AS SHOWN	0.0737
F6	2'-6"	1 7/8"	OMITTED	0.0737

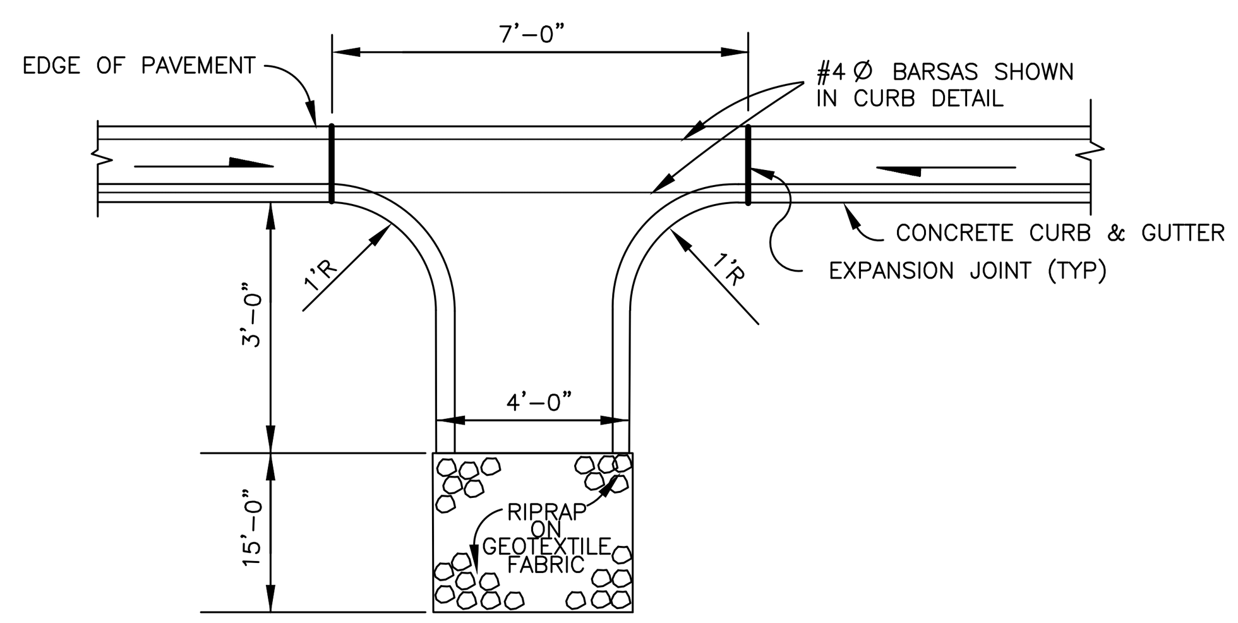
CONCRETE CURB & GUTTER TYPE F

(NO SCALE)



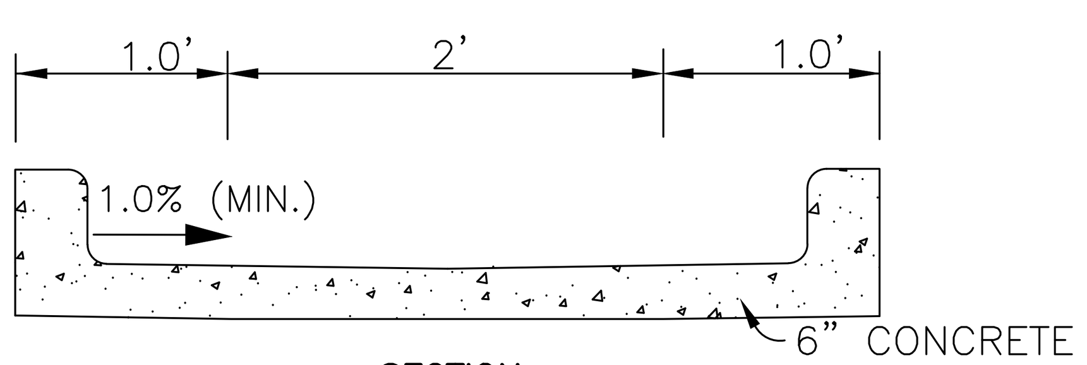
MODIFIED BARRIER (M.D.O.T. TYPE F4) (FOR ISLANDS ONLY)

(NO SCALE)

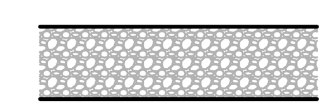


SPILLWAY DETAIL

NO SCALE

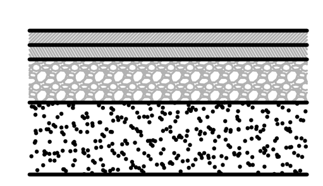


SECTION



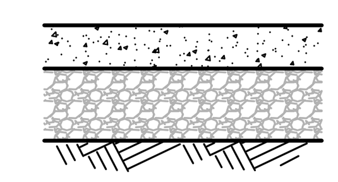
GRAVEL EMERGENCY FIRE ACCESS DRIVE

(NO SCALE)



COMMERCIAL DRIVE ASPHALT SECTION

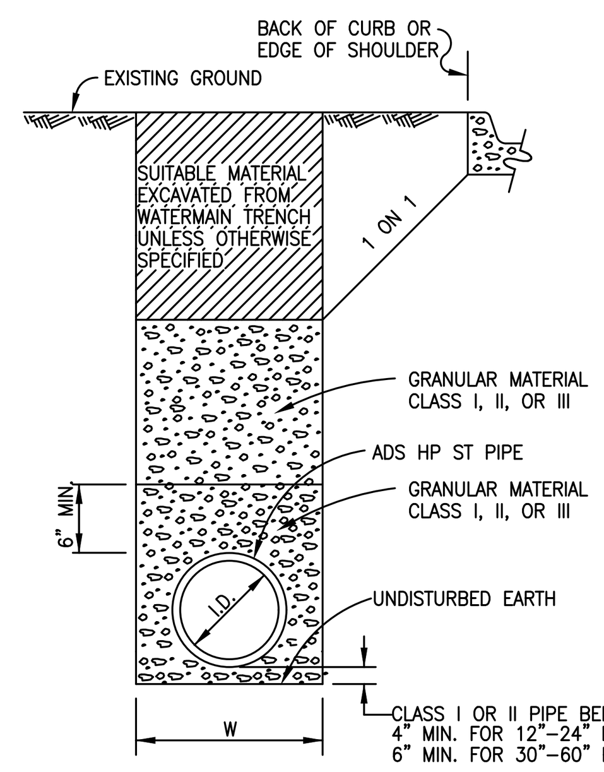
(NO SCALE)



CONCRETE PAVEMENT CROSS SECTION

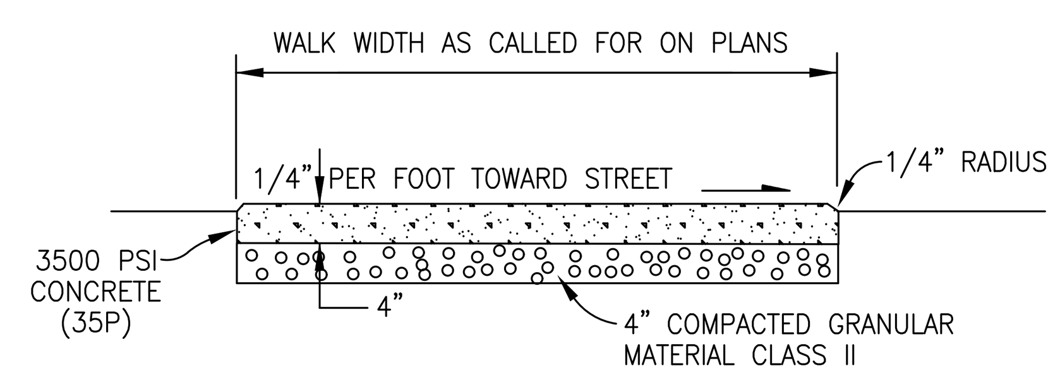
NOTE: FOR DUMPSTER PAD

(NO SCALE)



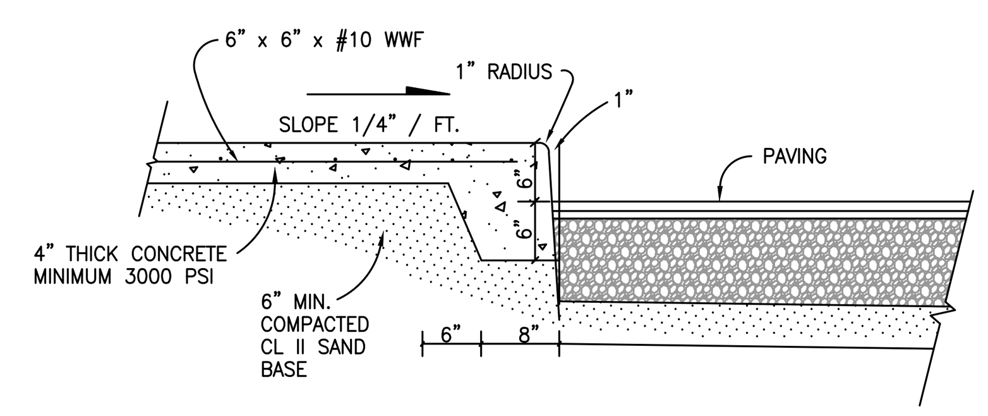
ADS HP ST PIPE TRENCH DETAIL OPEN SPACE/INFLUENCE OF ROADBED

NO SCALE



4" CONCRETE SIDEWALK

(NO SCALE)



INTEGRAL CONCRETE WALK / CURB DETAIL

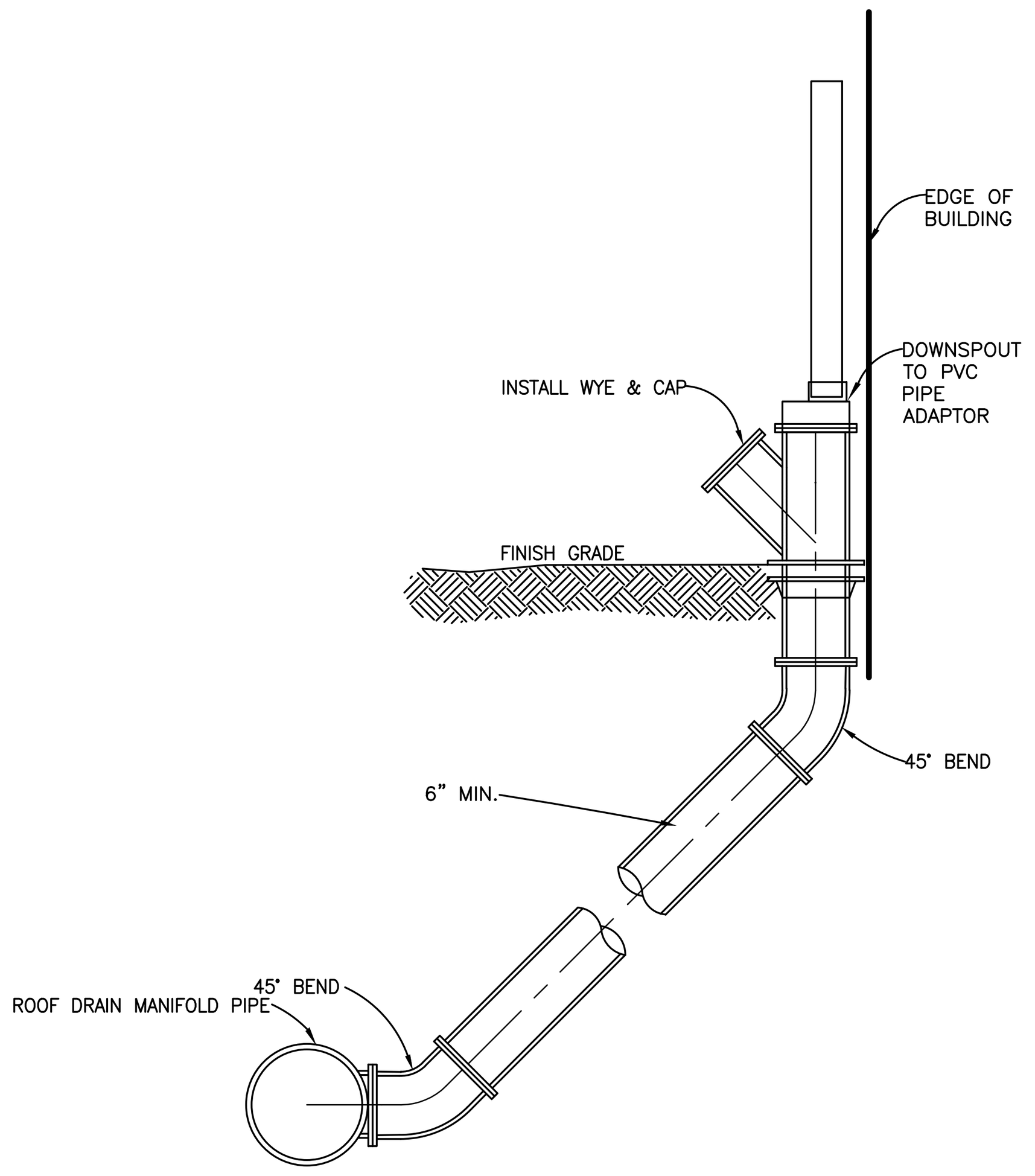
(NO SCALE)

DIA.	T(MIN.)	A(MIN.)	B*	C*	D*	E*	G	R1	R2	X	Y	APPROX. WT. LBS.
12"	2"	5"	23"	51"	74"	24"	2"	10-1/8"	9"	8"	18"	800
15"	2-1/4"	7"	27"	48"	75"	30"	2-1/4"	12-1/2"	11"	8"	18"	1100
18"	2-1/2"	11"	25"	49"	74"	36"	2-1/2"	15-1/2"	12"	8"	18"	1300
21"	2-3/4"	11"	33"	42"	75"	42"	2-3/4"	16-1/8"	13"	8"	18"	1500
24"	3"	12"	43"	32"	75"	48"	3"	16-3/16"	14"	8"	18"	1800
30"	3-1/2"	14"	53"	22"	75"	60"	3-1/2"	18-1/2"	15"	8"	18"	2400
36"	4"	17"	62"	37"	99"	72"	4"	24-5/16"	20"	8"	18"	4200
42"	4-1/2"	22"	62"	37"	99"	78"	4-1/2"	27-1/2"	22"	10"	24"	5600
48"	5"	24"	72"	26"	98"	84"	5"	28-1/2"	22"	10"	24"	7400
54"	5-1/2"	27"	65"	33-1/4"-35"	98-1/4"-100"	90"	5"	☐	☐	10"	24"	8040
60"	6"	30"	60"	39"	99"	96"	5"	☐	☐	12"	24"	8730
66"	6-1/2"	24"	72"-78"	21"-27"	99"	102"	5-1/2"	☐	☐	12"	24"	10,630
72"	7"	24"	78"	21"	99"	108"	6"	☐	☐	12"	24"	12,520
78"	7-1/2"	24"	78"	21"	99"	114"	6-1/2"	☐	☐	12"	24"	14,430
84"	8"	36"	90-1/2"	21"	111-1/2"	120"	6-1/2"	☐	☐	12"	24	18,160

* TOLERANCE ± 1"

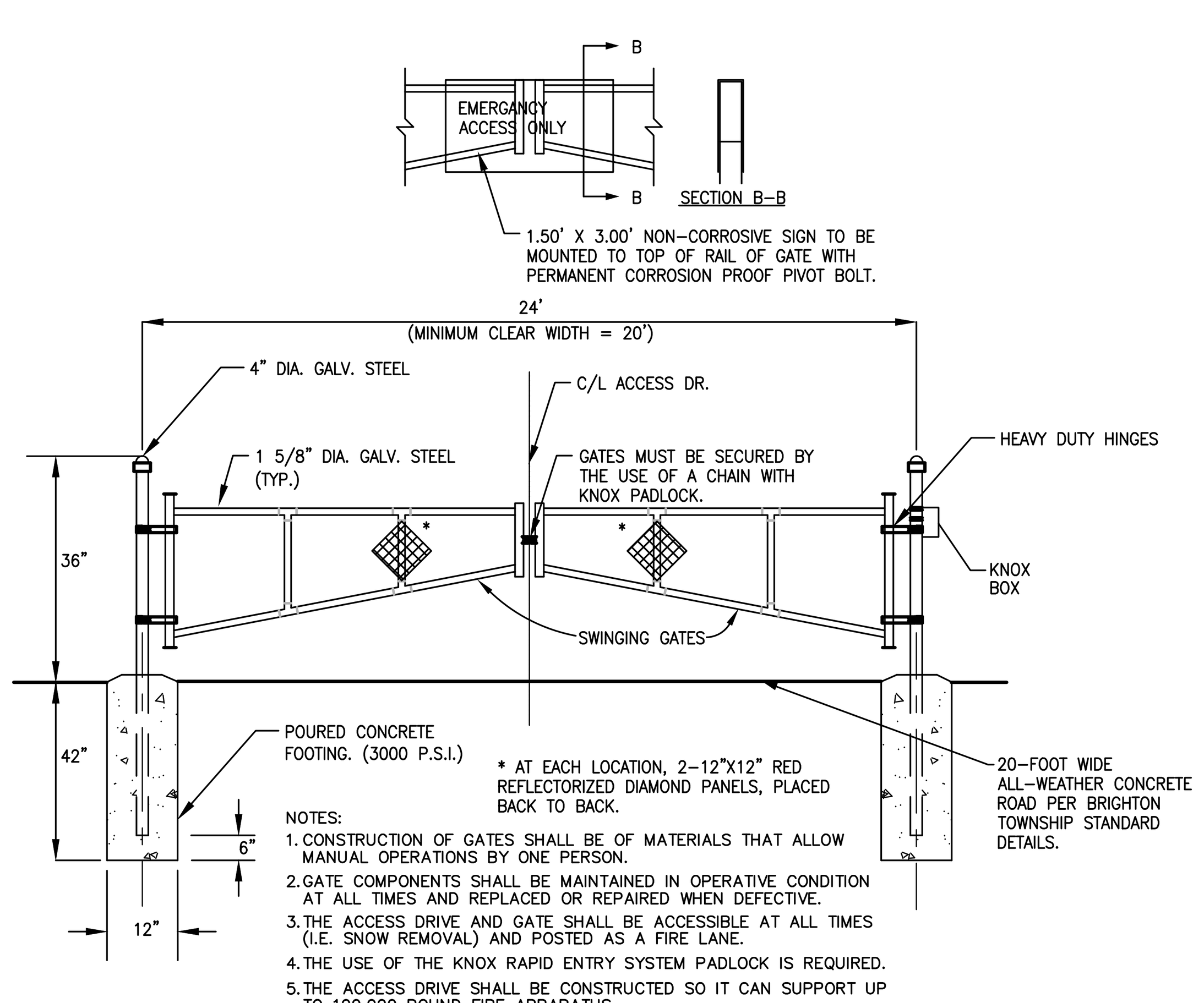
☐ RADIUS AS FURNISHED BY THE MANUFACTURER

WEIGHT SHOWN DOES NOT INCLUDE CONCRETE FOOTING



ROOF DRAIN CLEANOUT DETAIL

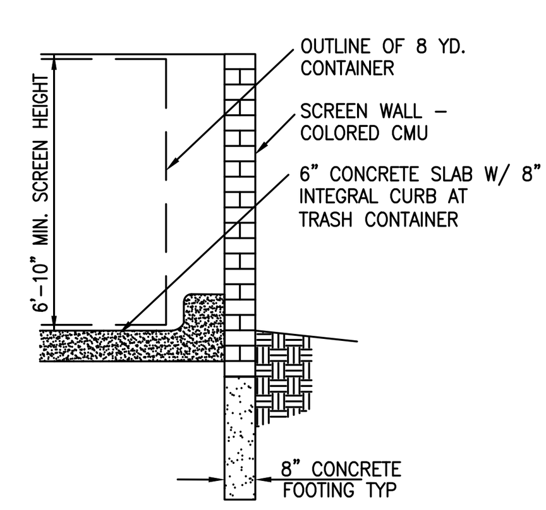
NO SCALE



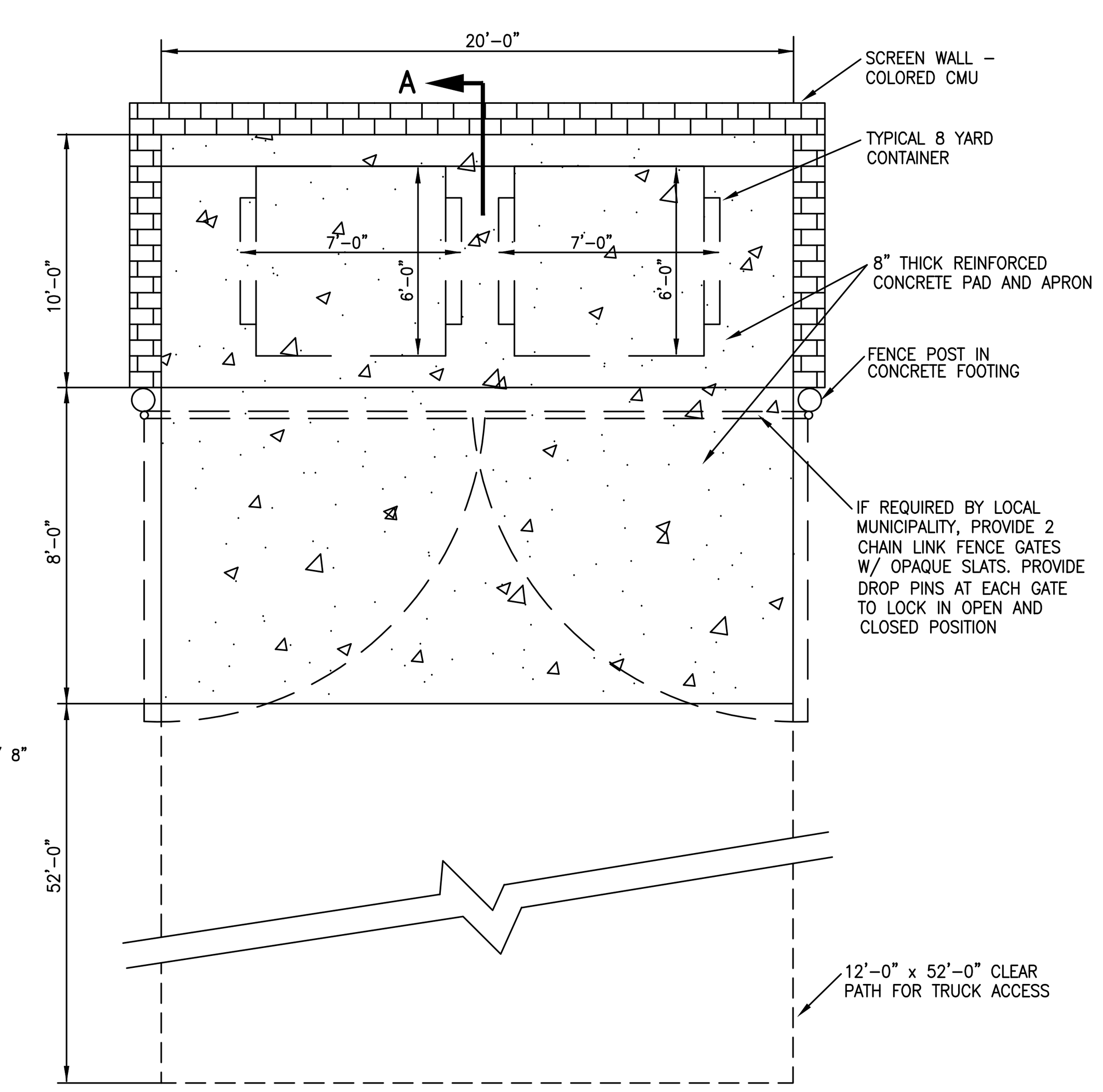
NOTES:
1. CONSTRUCTION OF GATES SHALL BE OF MATERIALS THAT ALLOW MANUAL OPERATIONS BY ONE PERSON.
2. GATE COMPONENTS SHALL BE MAINTAINED IN OPERATIVE CONDITION AT ALL TIMES AND REPLACED OR REPAIRED WHEN DEFECTIVE.
3. THE ACCESS DRIVE AND GATE SHALL BE ACCESSIBLE AT ALL TIMES (I.E. SNOW REMOVAL) AND POSTED AS A FIRE LANE.
4. THE USE OF THE KNOX RAPID ENTRY SYSTEM PADLOCK IS REQUIRED.
5. THE ACCESS DRIVE SHALL BE CONSTRUCTED SO IT CAN SUPPORT UP TO 100,000 POUND FIRE APPARATUS.

EMERGENCY FIRE ACCESS DRIVE GATE DETAIL

SCALE: NONE



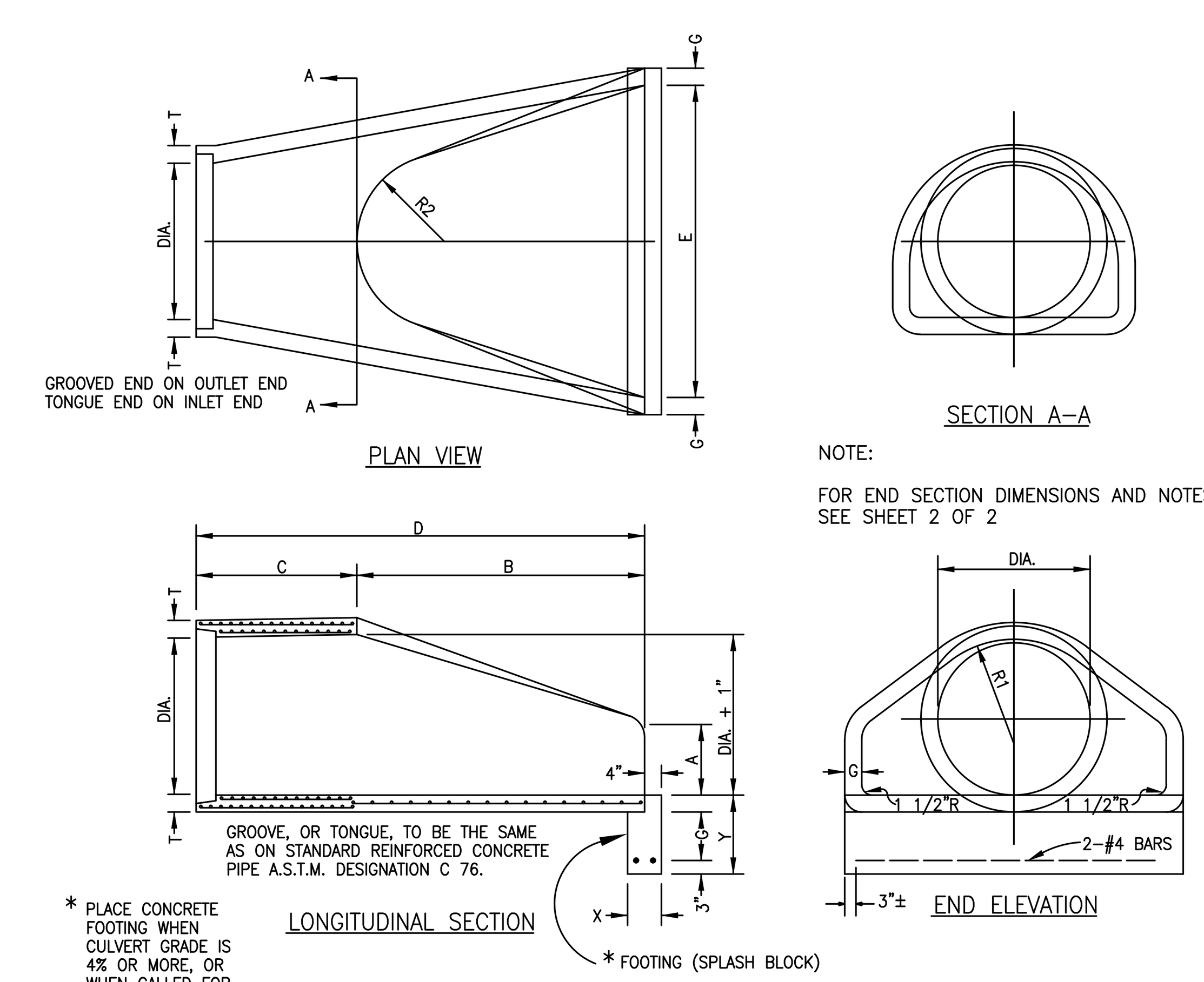
SECTION A



PLAN

DOUBLE CONTAINER CORRAL

(NO SCALE)



PRECAST CONCRETE END SECTION FOR PIPE CULVERT

(REF. MDOT DETAIL IV-86C)

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITY CROSSINGS IN THE FIELD PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE APPARENT OR IF THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171 (TOLL FREE) FOR THE LOCATION OF UNDERGROUND FACILITIES

BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT: BIBLE BAPTIST CHURCH

PREPARED FOR: BIBLE BAPTIST CHURCH, 2258 EAST HIGHLAND ROAD, HOWELL, MI 48843, 517-715-9223

TITLE: CONSTRUCTION DETAILS

NO	BY	REVISION PER	DATE
1	ST	PER TWP REVIEW	2/23/22

DESIGNED BY: ST
DRAWN BY: JS
CHECKED BY:
SCALE: NO SCALE
JOB NO. 21-542
DATE: 2/2/2022
SHEET NO. 13

PIPE RESTRAINT SCHEDULE

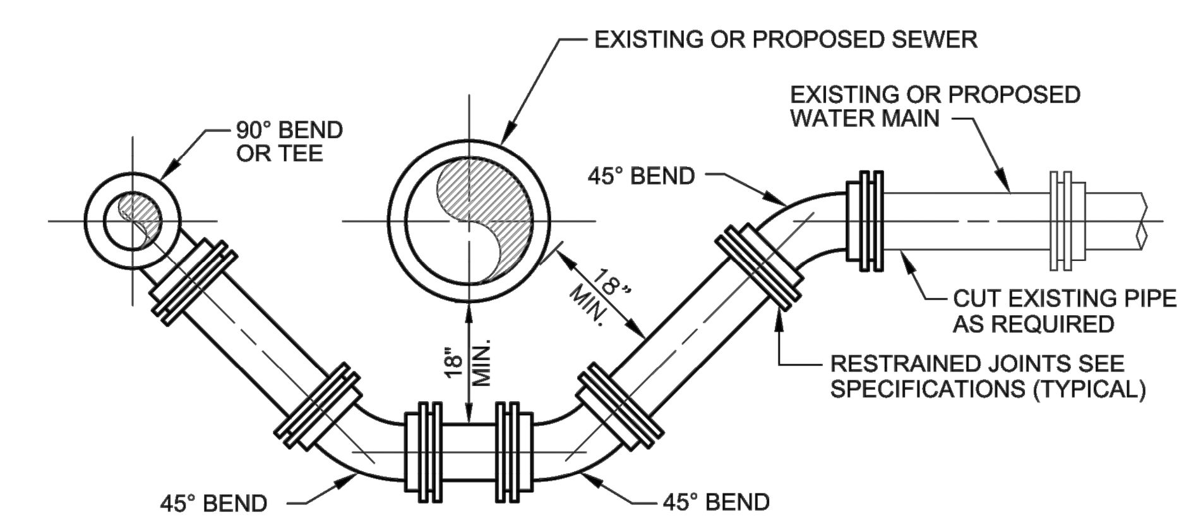
GROUND BURIED PRESSURE PIPE - POLYETHYLENE ENCASED DUCTILE IRON PIPE

PIPE DIAMETER	TEES, 90° BENDS	45° BENDS	22-1/2° BENDS	11-1/4° BENDS	DEAD ENDS	REDUCERS (ONE SIZE REDUCTION)*	REDUCERS (TWO SIZE REDUCTION)*
4	13	5	3	1	40	--	--
6	19	8	4	2	58	31	--
8	24	10	5	2	75	30	70
12	34	14	7	3	107	57	116
16	43	18	9	4	139	59	137
20	52	22	10	5	169	59	134
24	61	25	12	6	199	60	132
30	73	30	15	7	242	85	168
36	84	35	17	8	281	84	168

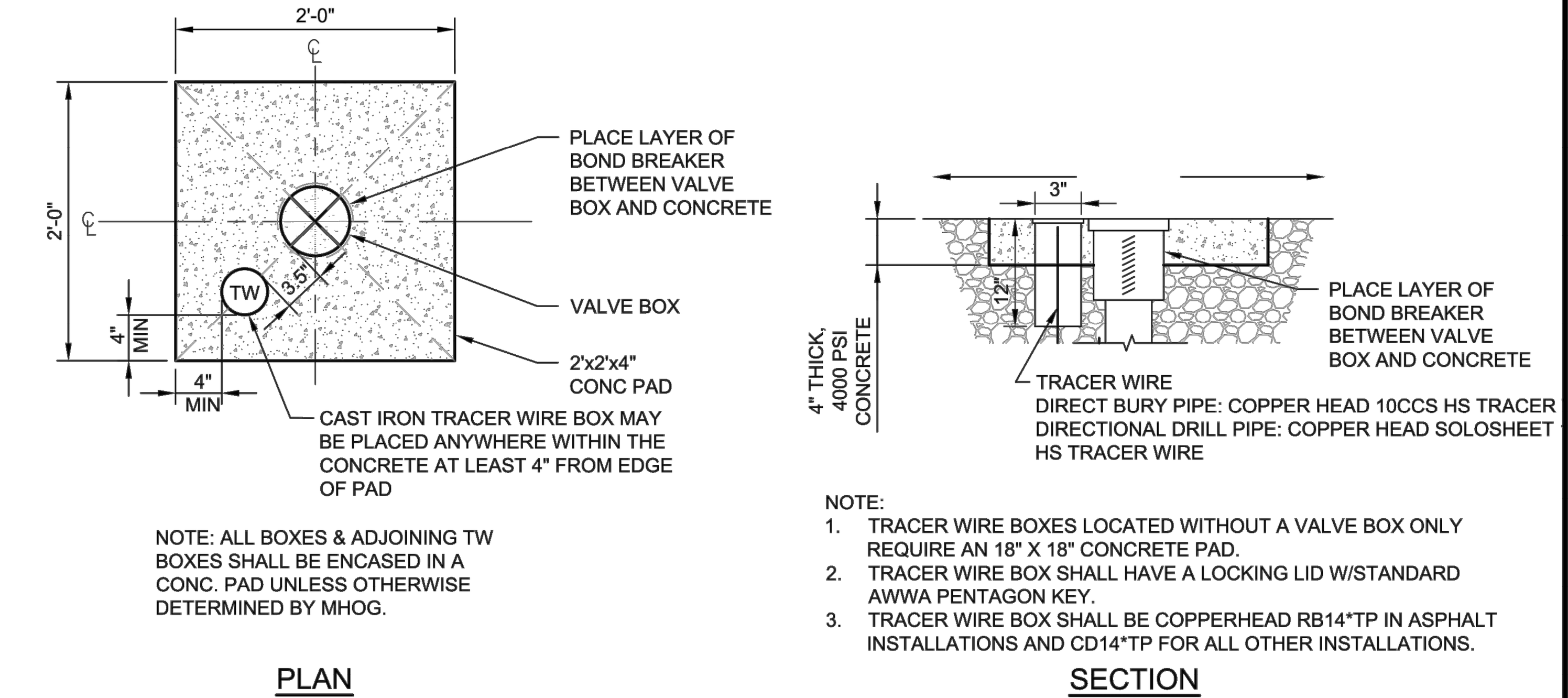
1. LENGTHS OF PIPE RESTRAINT ARE GIVEN IN FEET.
2. IF REQUIRED PIPE DIAMETER IS NOT LISTED IN THIS TABLE, THE NEXT LARGEST PIPE DIAMETER SHALL BE USED.
3. THIS TABLE IS BASED ON A TEST PRESSURE OF 180 PSI (OPERATING PRESSURE PLUS WATER HAMMER. FOR OTHER TEST PRESSURES, ALL VALUES TO BE INCREASED OR DECREASED PROPORTIONALLY.
4. THE VALUES PROVIDED OF RESTRAINT LENGTH ARE IN EACH DIRECTION FROM THE POINT OF DEFLECTION OR TERMINATION EXCEPT FOR TEES, AT WHICH ONLY THE BRANCH IN THE DIRECTION OF THE STEM.
5. IF TIE RODS ARE USED, USE FOUR RODS MINIMUM AND ADD 1/8-INCH TO BAR DIAMETER AS CORROSION ALLOWANCE.

* SIZE REDUCTION IS BASED UPON THE PIPE DIAMETER SHOWN IN THIS TABLE.

BASED UPON:
INTERNAL PRESSURE: 180
PIPE DEPTH: 5
BEDDING CLASS: TYPE 4
SOIL TYPE: GOOD SAND
SAFETY FACTOR: 2

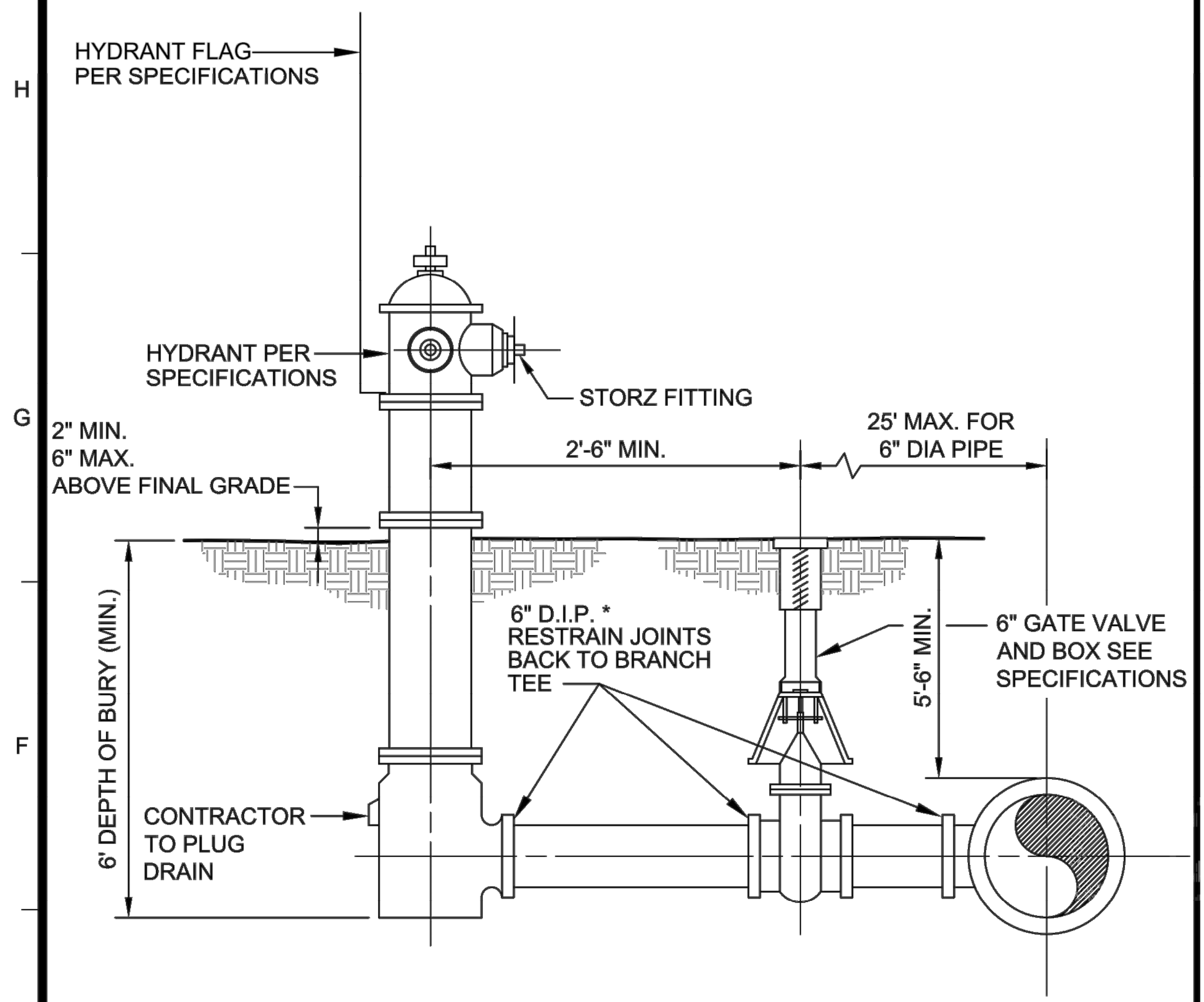


WATER MAIN UTILITY OFFSET



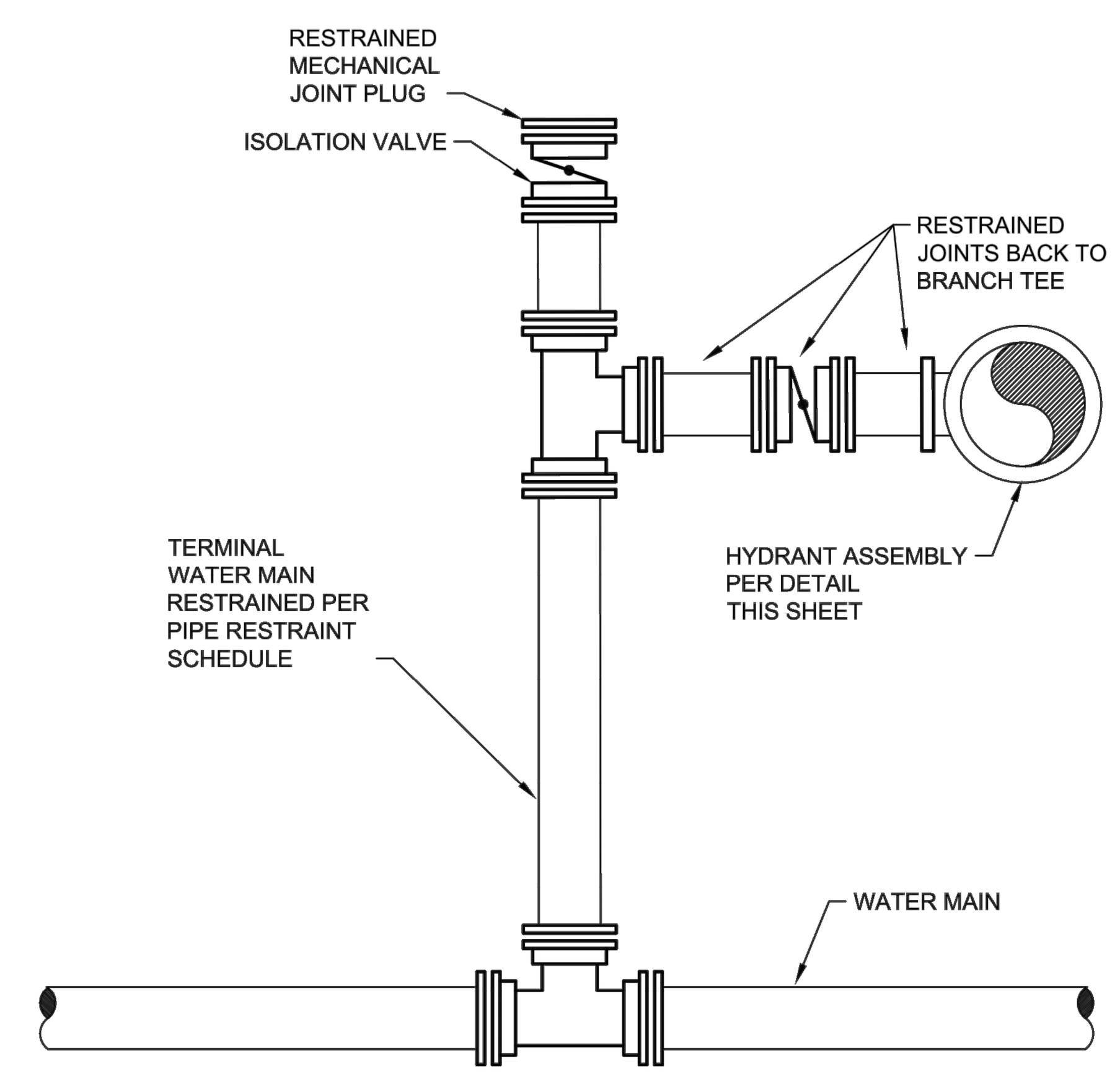
VALVE/TRACER WIRE BOX IN CONCRETE DETAIL

NO SCALE

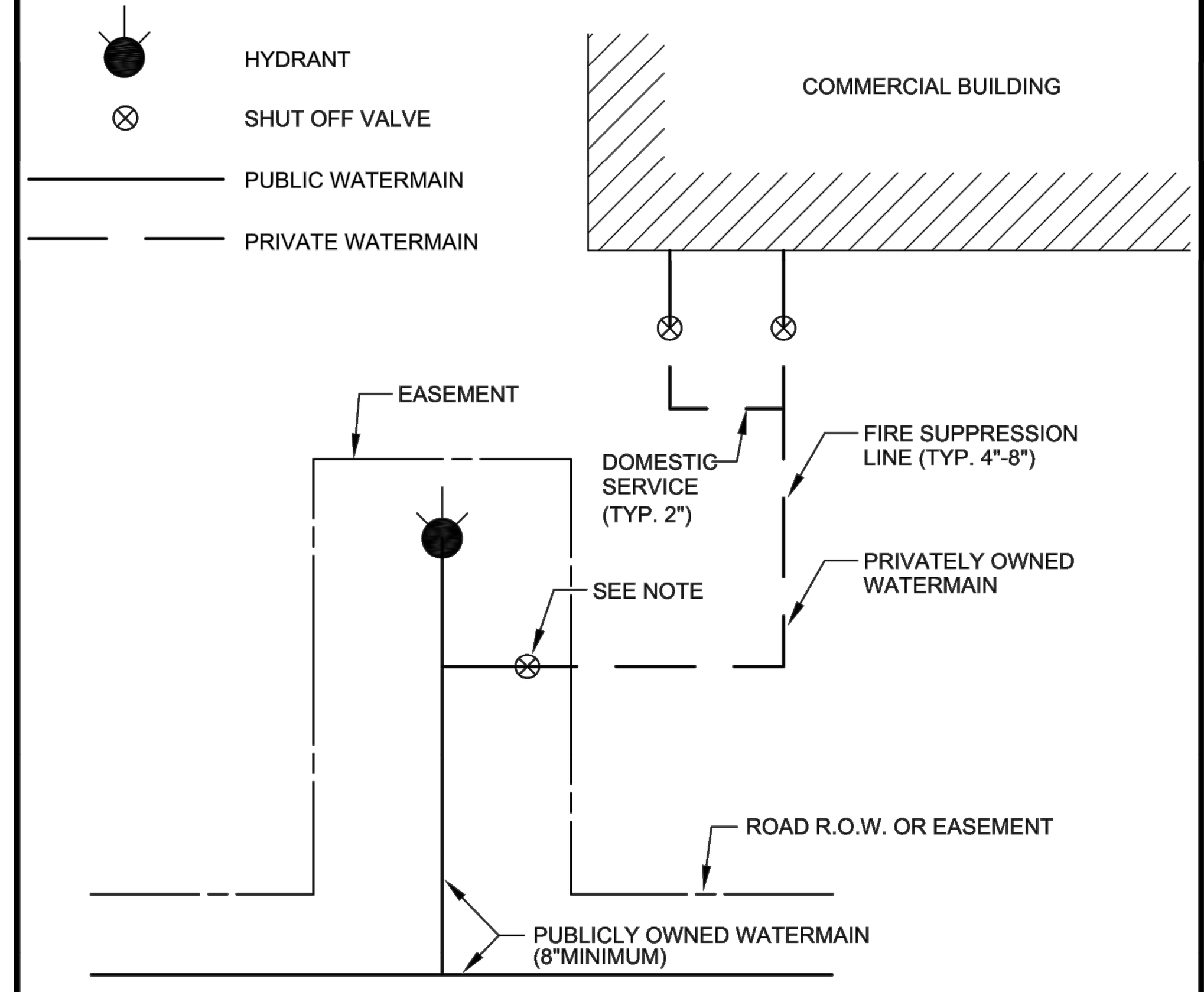


* THE LENGTH OF 6" PIPE FROM THE MAIN TO THE HYDRANT ASSEMBLY CANNOT EXCEED 25'. ANY PIPE OVER 25 FEET SHALL BE 8" DIAMETER MINIMUM AND DESIGNED PER MHOG SPECIFICATIONS.

FIRE HYDRANT ASSEMBLY

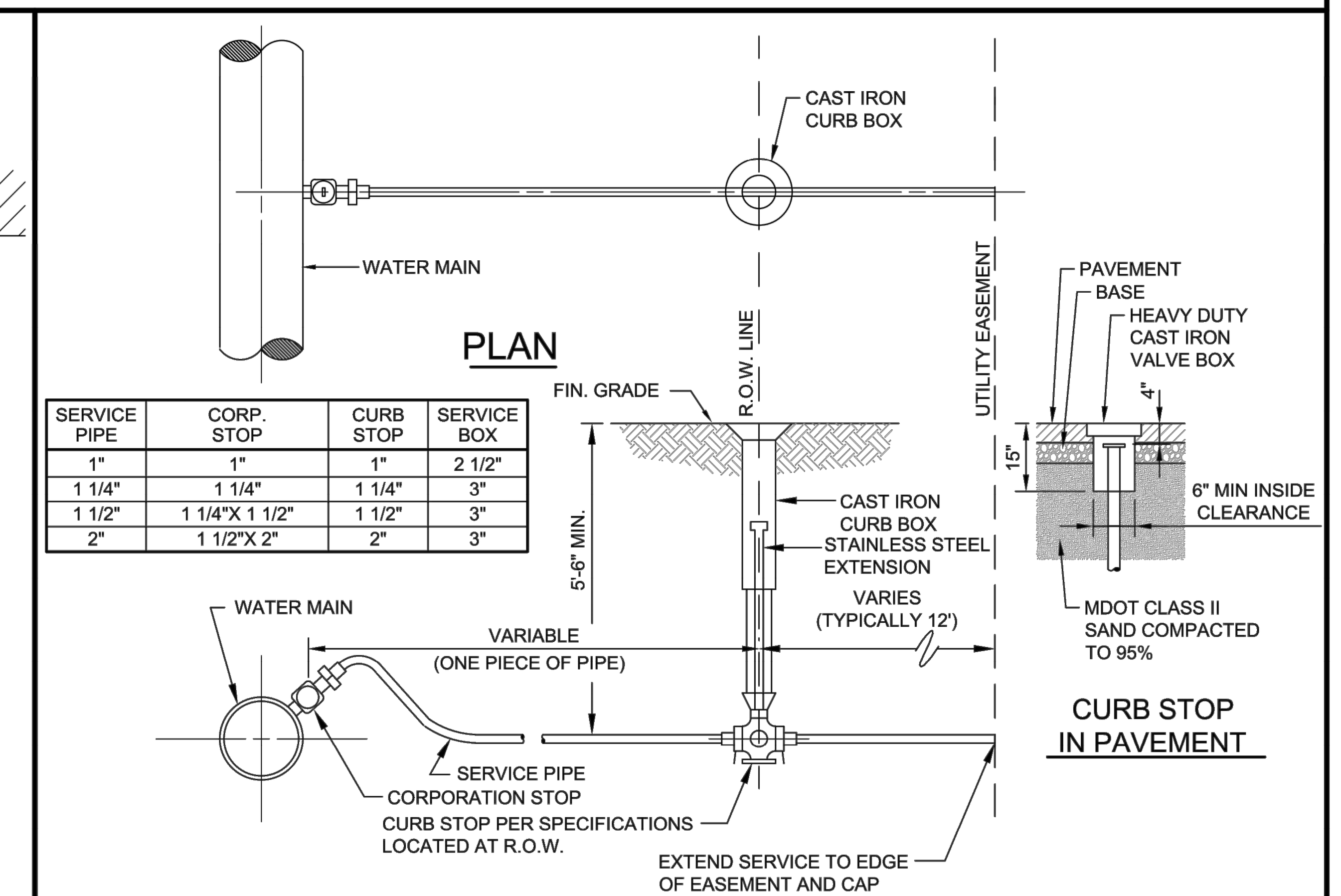


TERMINAL HYDRANT DETAIL



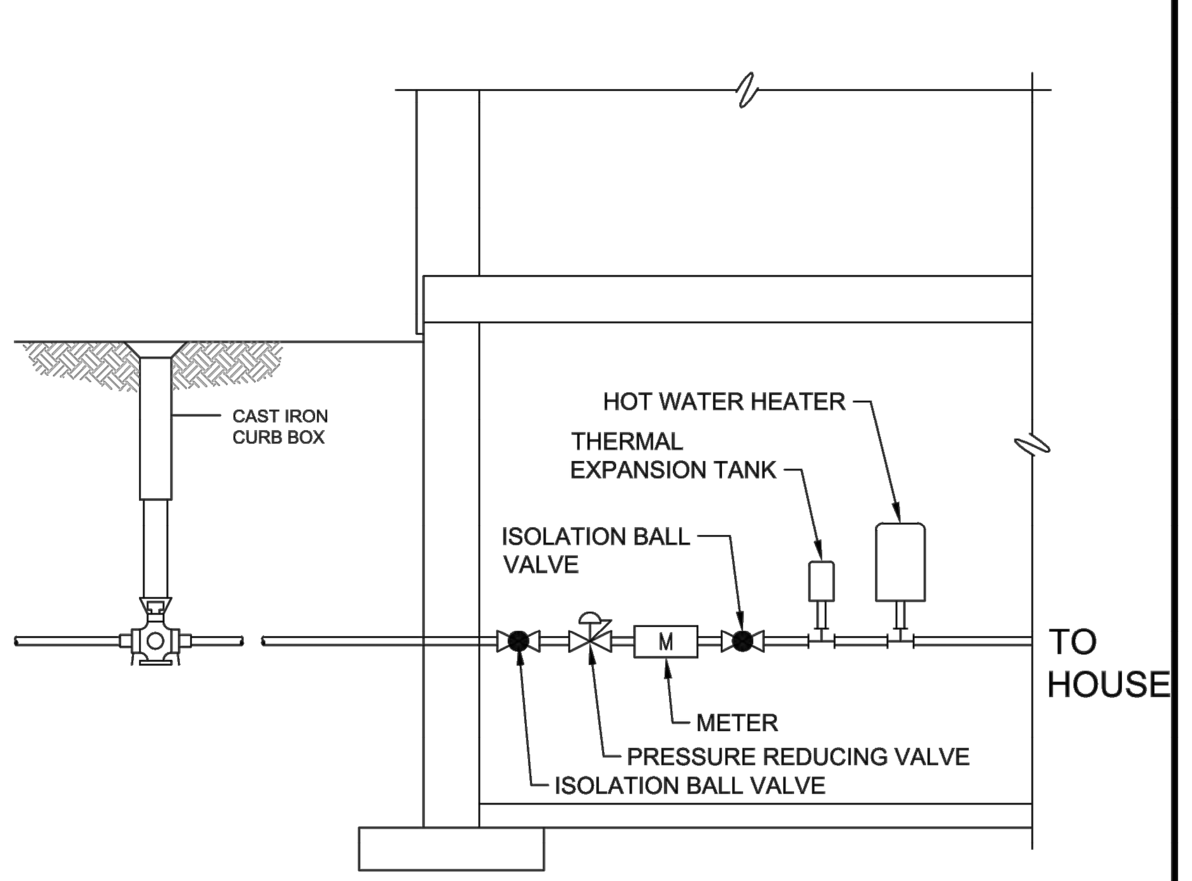
NOTE: PUBLICLY OWNED SHUT OFF VALVE TO BE LOCATED IN EASEMENT.

COMMERCIAL BUILDING WATER SERVICE LAYOUT

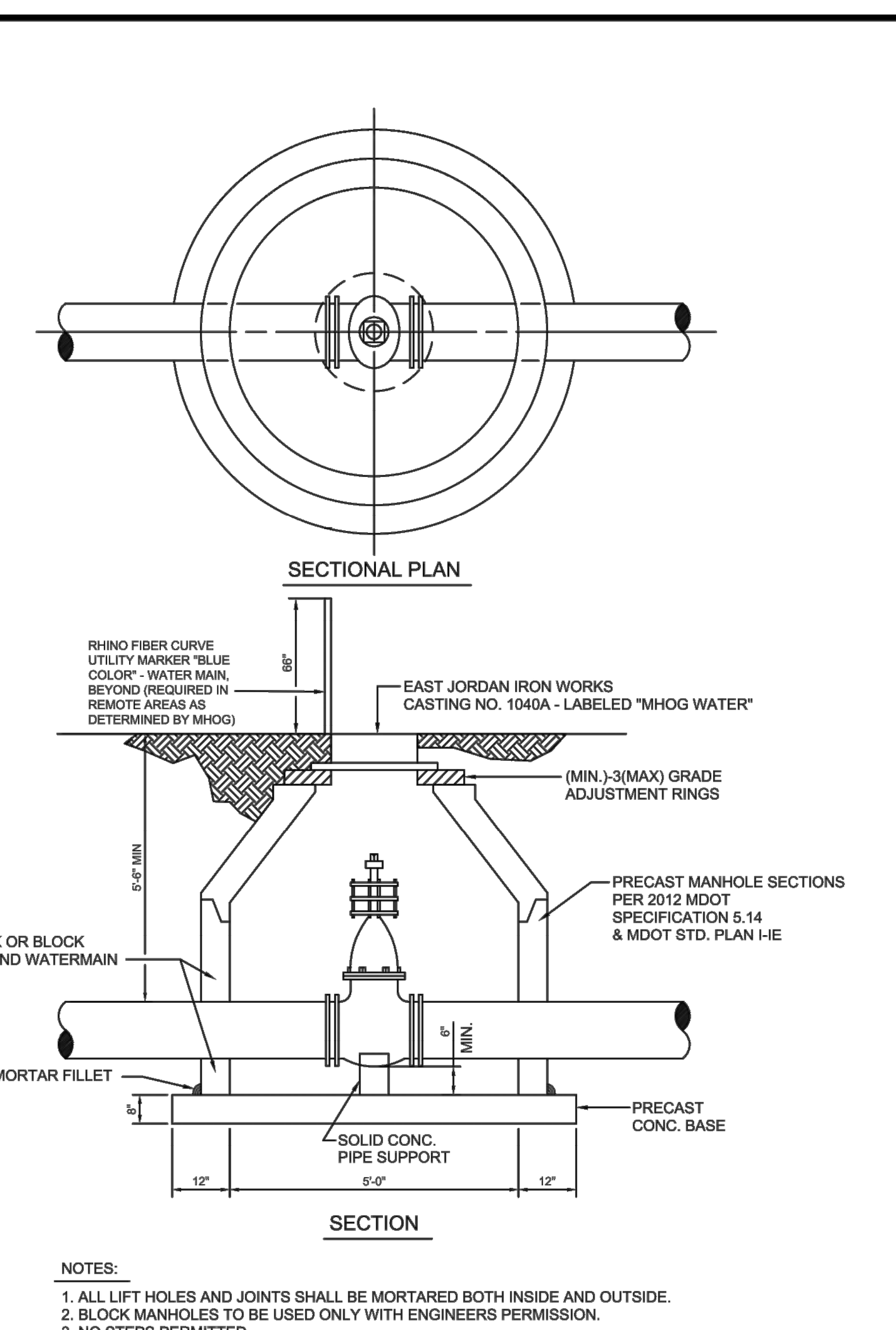


SERVICE PIPE	CORP. STOP	CURB STOP	SERVICE BOX
1"	1"	1"	2 1/2"
1 1/4"	1 1/4"	1 1/4"	3"
1 1/2"	1 1/4"X 1 1/2"	1 1/2"	3"
2"	1 1/2"X 2"	2"	3"

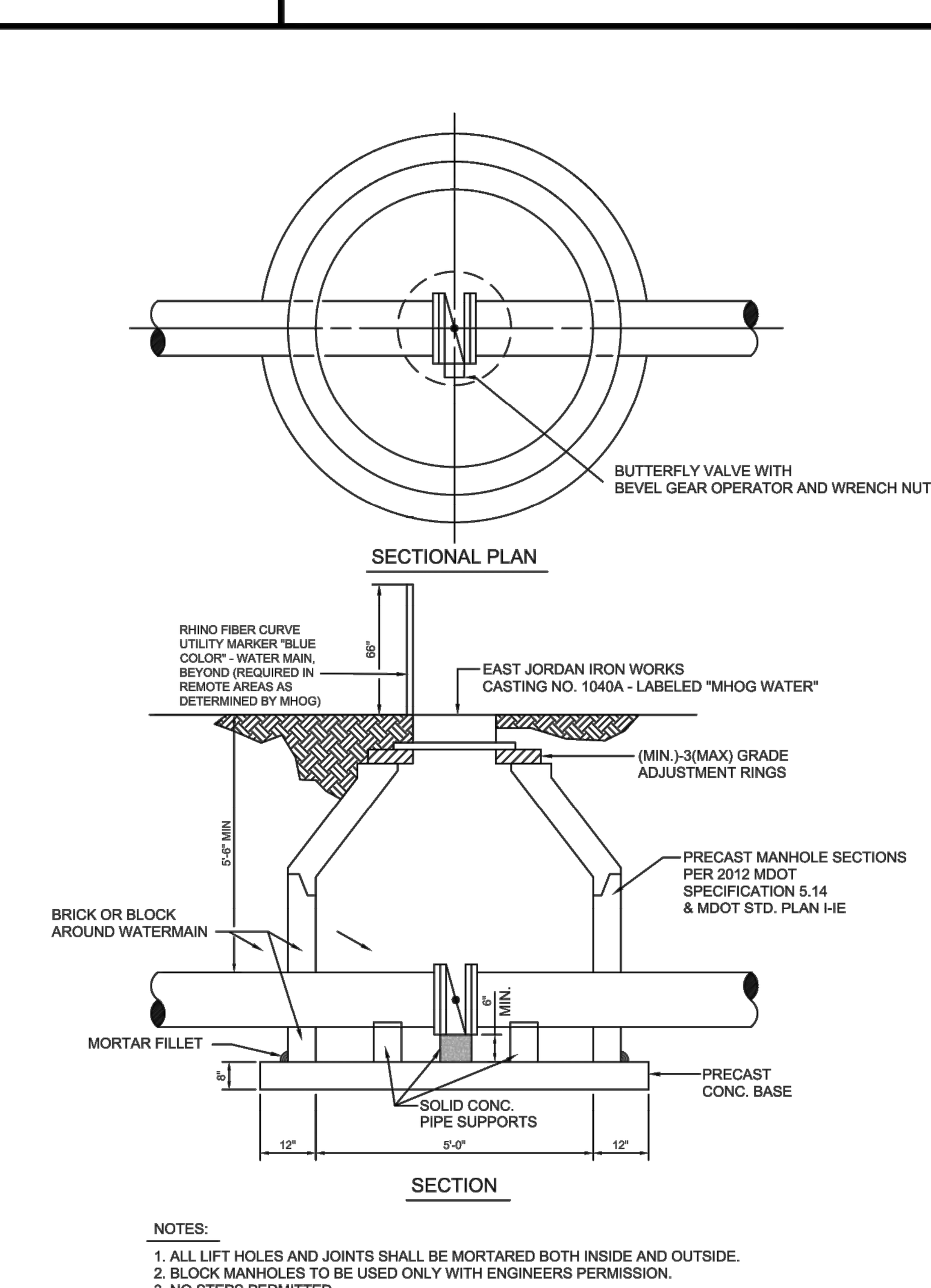
WATER SERVICE LATERAL



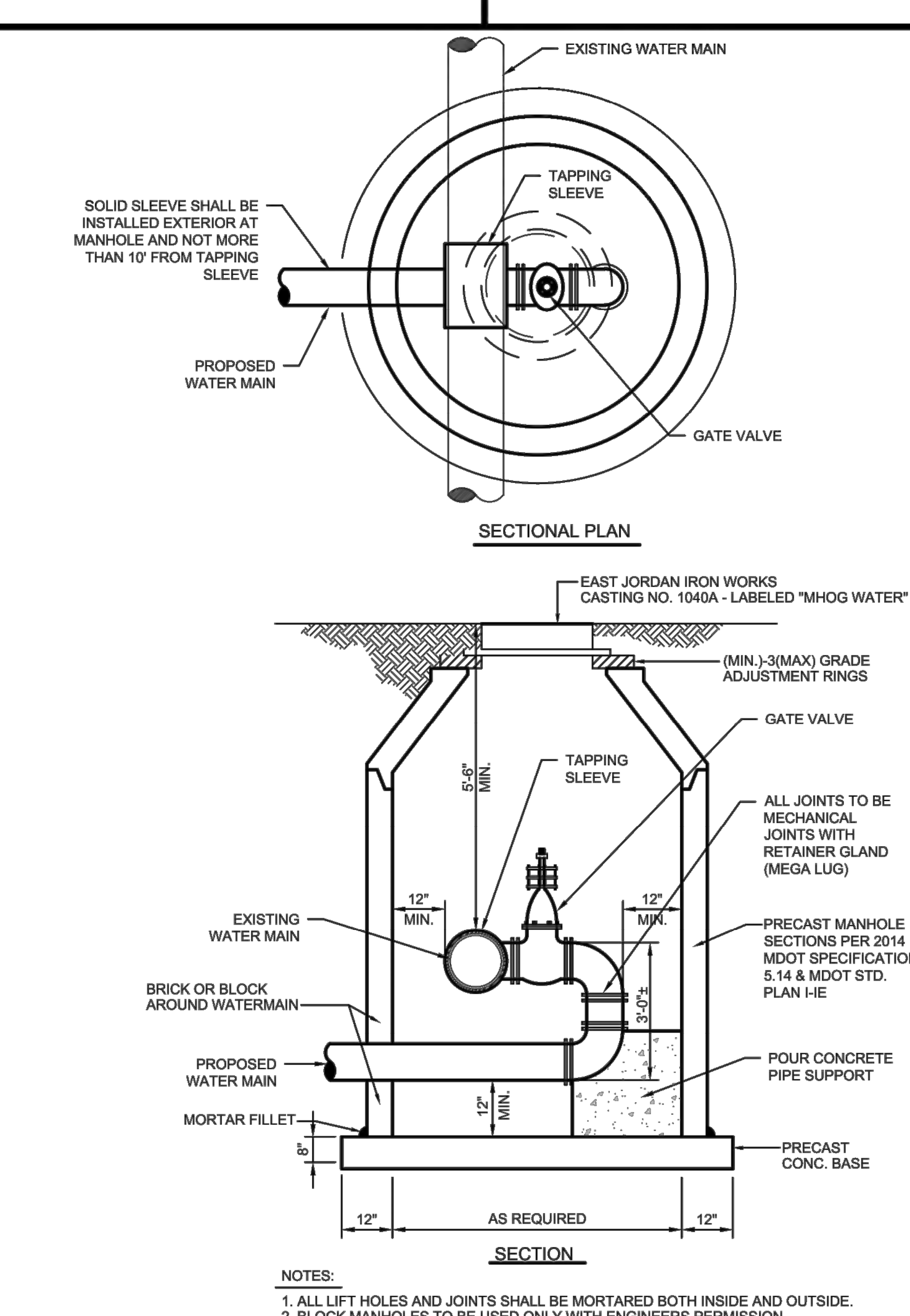
PRIVATE RESIDENCE PRESSURE REDUCING VALVE (PRV)



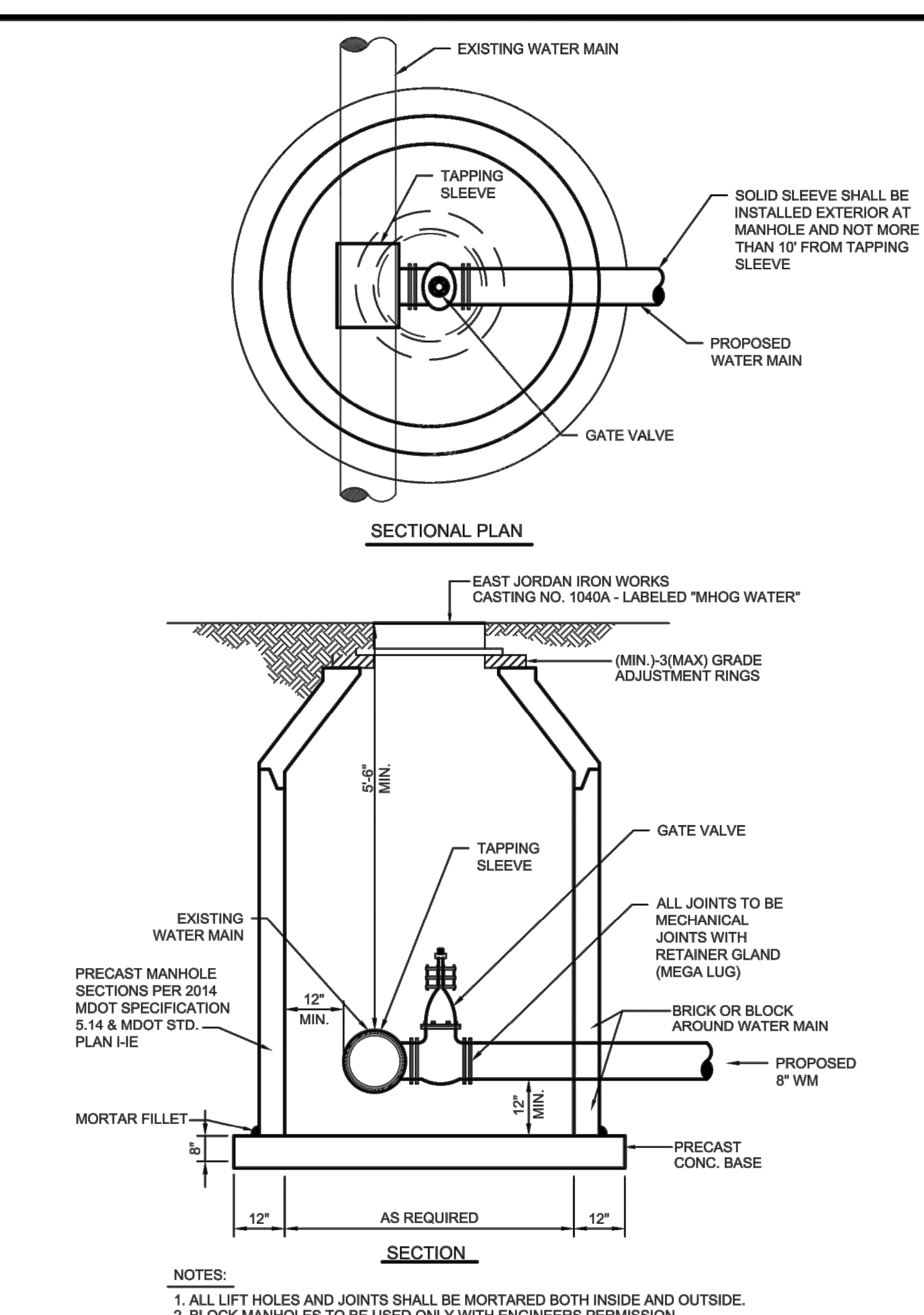
VALVE AND GATE WELL



BUTTERFLY VALVE AND WELL



REVERSE TAP GATE WELL



REGULAR TAP GATE WELL

MARION HOWELL OCEOLA GENOA
Sewer and Water Authority

STANDARD DETAILS

Scale: NONE
Issued Date JANUARY - 2014
UPDATED: MAY 2015
UPDATED: FEBRUARY 2016
UPDATED: APRIL 2016
UPDATED: OCTOBER 2017
UPDATED: FEBRUARY 2019

PROJECT: BIBLE BAPTIST CHURCH
PREPARED FOR: BIBLE BAPTIST CHURCH, 2258 EAST HIGHLAND ROAD, HOWELL, MI 48843, 517-715-9223
TITLE: MHOG STANDARD WATERMAIN DETAILS (1)

NO	BY	REVISION PER	DATE
1	ST	PER TWP REVIEW	2/23/22

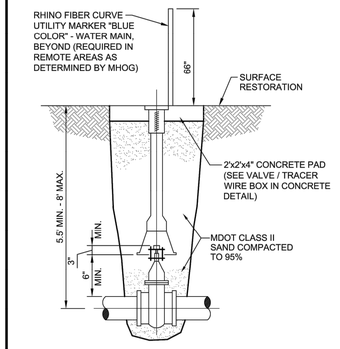
BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITY CROSSINGS IN THE FIELD PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE APPARENT OR THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171

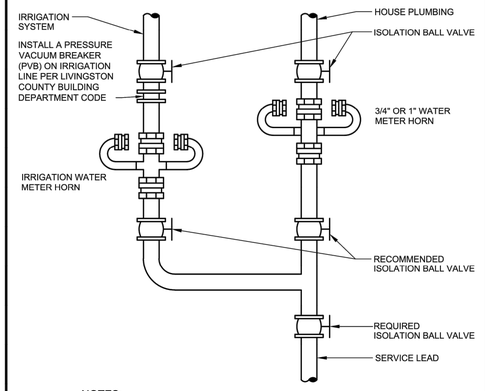
DESIGNED BY: ST
DRAWN BY: JS
CHECKED BY:
SCALE
JOB NO. 21-542
DATE 12/01/2021
SHEET NO. 14

Tuesday, February 26, 2019 4:02:14 PM DRAWING: P:\IER\12719\200-12719-00-000\CAD\SheetFiles\Mhog-std.DWG



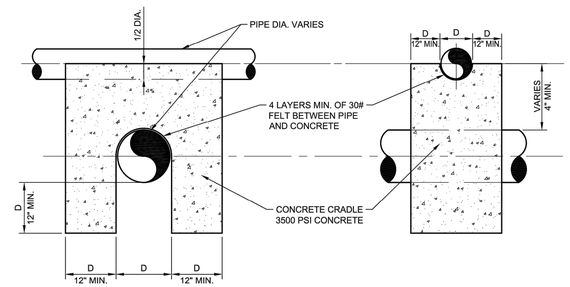
NOTES:
1. VALVE BOX SHALL NOT REST ON VALVE OR MAIN LINE PIPE.
2. A VALVE STEM EXTENSION WITH CENTERING RING IS REQUIRED FOR VALVES BURIED DEEPER THAN 6'.

GATE VALVE AND BOX



NOTES:
1. ALL METERS ARE TO BE INSTALLED HORIZONTALLY IN A DRY, CLEAN, SANITARY LOCATION THAT IS READILY ACCESSIBLE. THIS DRAWING IS NOT TO SCALE & IS ONLY A REPRESENTATION OF HOW THE METERS SHOULD BE INSTALLED. THE SECOND METER IS OPTIONAL FOR IRRIGATION USAGE. METERS SHOULD NOT BE INSTALLED IN LINE (ONE RIGHT AFTER THE OTHER).
2. PROPERTIES DESIGNATED "HIGH HAZARD" PER THE MHOG CROSS CONNECTION RULES MANUAL WILL REQUIRE THE INSTALLATION OF A REDUCED PRESSURE ZONE (RPZ) BACK FLOW PREVENTION DEVICE.

TYPICAL METER HORN INSTALLATION



CONCRETE CRADLE DETAIL

SCALE: NONE

MHOG CASTING DETAIL

NO SCALE

MARION HOWELL OCEOLA GENOA
Sewer and Water Authority

STANDARD DETAILS

Scale: NONE
Issued Date JANUARY - 2014

UPDATED: MAY 2015
UPDATED: FEBRUARY 2016
UPDATED: APRIL 2016
UPDATED: OCTOBER 2017
UPDATED: FEBRUARY 2019

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS MADE AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES AND PROPOSED UTILITIES CROSSING AND SHALL PROTECT THEM FROM DAMAGE. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF ANY CONFLICTS ARE FOUND TO EXIST BETWEEN THE LOCATION OR DEPTH OF EXISTING UTILITIES AS SHOWN ON THE PLANS AND FIELD CONDITIONS.

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171
It's a state of Michigan mandate

BE BOSS Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

PROJECT
BIBLE BAPTIST CHURCH

PREPARED FOR
BIBLE BAPTIST CHURCH
2258 EAST HIGHLAND ROAD
HOWELL, MI 48843
517-715-9223

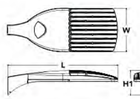
TITLE
MHOG STANDARD WATERMAIN DETAILS (2)

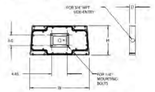
NO	BY	REVISION PER	DATE
1	ST	PER TWP REVIEW	2/23/22

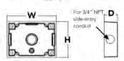
DESIGNED BY: ST
DRAWN BY: JS
CHECKED BY:
SCALE
JOB NO. 21-542
DATE 2/1/2022
SHEET NO. 15

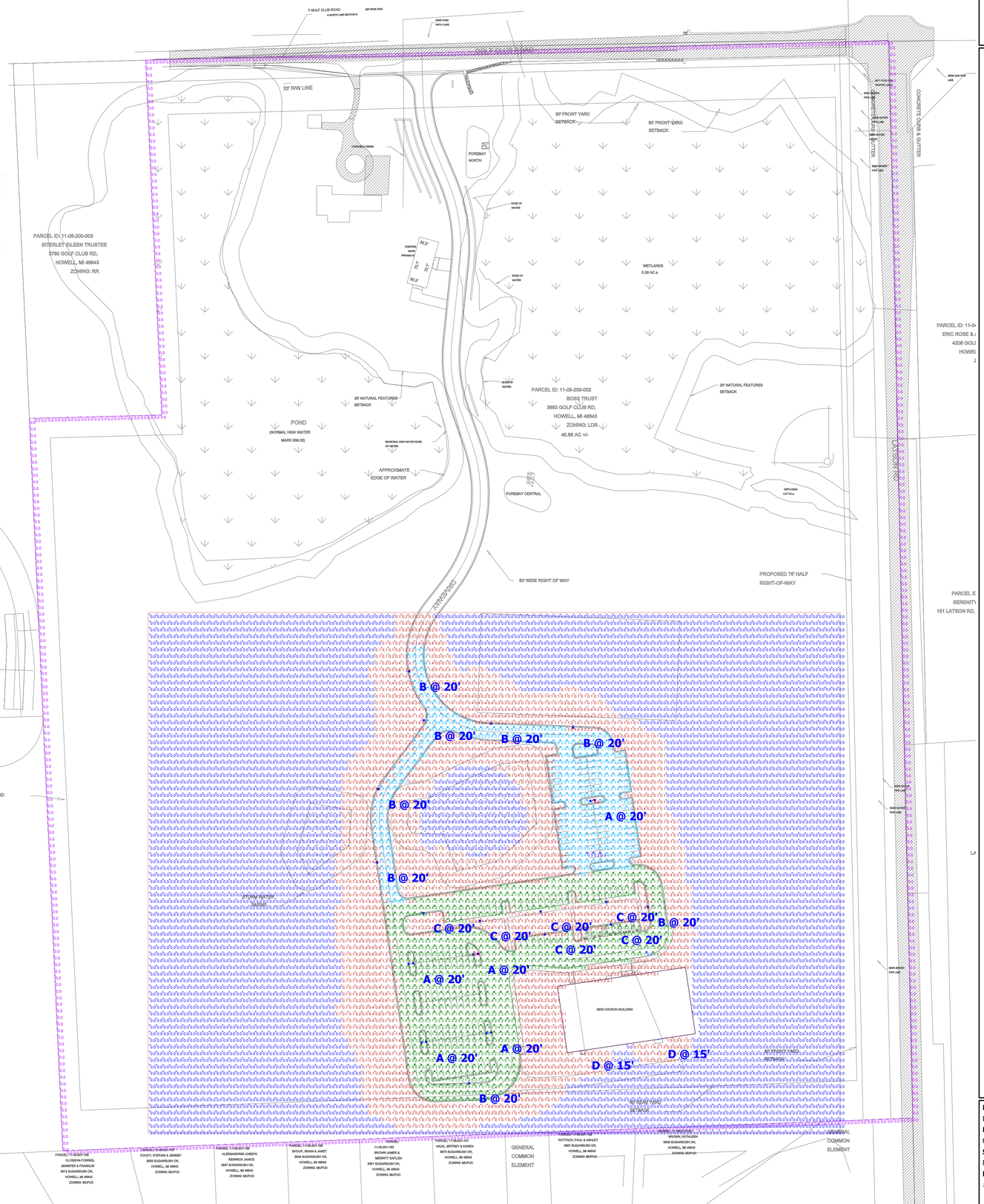
Friday, February 8, 2019 9:13:59 AM DRAWING: P:\IER\12719200-12719-00-000\CAD\SheetFiles\Mhog-std.DWG

G:\21-542\DWG\SP\21-542 BaseSP.dwg, 2/24/2022 7:57:54 AM, AutoCAD PDF (General Documentation).pc3









D-Series Size 1
LED Area Luminaire

d"series

Buy American

Catalog Number

Notes

Type

Specifications

EPA:	1.01 ft²
Length:	33"
Width:	13"
Height H1:	7-1/2"
Height H2:	3-1/2"
Weight (max):	27 lbs

Introduction

The modern styling of the D-Series is striking yet unobtrusive - making a bold, progressive statement even as it blends seamlessly with its environment. The D-Series distills the benefits of the latest in LED technology into a high performance, high efficacy, long-life luminaire.

The outstanding photometric performance results in sites with excellent uniformity, greater pole spacing and lower power density. It is ideal for replacing up to 750W metal halide in pedestrian and area lighting applications with typical energy savings of 65% and expected service life of over 100,000 hours.

Ordering Information **EXAMPLE:** DSX1 LED P7 40K T3M MVOLT SPA NLTAIR2 PIRHN DDBXD

DSX1 LED

Shipped separately
BS Bird spikes
EGS External glare shield

LITHONIA LIGHTING COMMERCIAL OUTDOOR
One Lithonia Way • Conyers, Georgia 30012 • Phone: 1-800-705-SERV (7378) •

DSX1-LED
Rev. 07/19/21
Page 1 of 6

WST LED
Architectural Wall Sconce

TITLE 20

Buy American

Catalog Number

Notes

Type

Specifications

Luminaire

Height:	8-1/2"
Width:	17"
Depth:	10-3/16"
Weight:	20 lbs

Optional Back Box (PBBW)

Height:	8.49"
Width:	17.01"
Depth:	1.70"

Optional Back Box (BBW)

Height:	4"
Width:	5-1/2"
Depth:	1-1/2"

A+ Capable Luminaire

This item is an A+ capable luminaire, which has been designed and tested to provide consistent color appearance and system-level interoperability.

- All configurations of this luminaire meet the Acuity Brands' specification for chromatic consistency
- This luminaire is A+ Certified when ordered with DTL® controls marked by a shaded background. DTL DLL equipped luminaires meet the A+ specification for luminaire to photocontrol interoperability1
- This luminaire is part of an A+ Certified solution for ROAM® or XPoint™ Wireless control networks, providing out-of-the-box control compatibility with simple commissioning, when ordered with drivers and control options marked by a shaded background

To learn more about A+, visit www.acuitybrands.com/aplus.

See ordering tree for details.

A+ Certified Solutions for ROAM require the order of one ROAM node per luminaire. Sold Separately: Link to Roam; Link to DTL DLL

LITHONIA LIGHTING COMMERCIAL OUTDOOR
One Lithonia Way • Conyers, Georgia 30012 • Phone: 800-705-SERV (7378) •

WST-LED
Rev. 11/22/21

Schedule

Symbol	Label	Quantity	Manufacturer	Catalog Number	Description	Lamp	Lumens Per Lamp	Light Loss Factor	Wattage
□	A	5	Lithonia Lighting	DSX1 LED P4 40K T5W MVOLT	DSX1 LED P4 40K T5W MVOLT	LED	14943	0.9	250
□	B	8	Lithonia Lighting	DSX1 LED P4 40K T2M MVOLT	DSX1 LED P4 40K T2M MVOLT	LED	14457	0.9	125
□	C	6	Lithonia Lighting	DSX1 LED P4 40K TFTM MVOLT	DSX1 LED P4 40K TFTM MVOLT	LED	14487	0.9	125
▭	D	2	Lithonia Lighting	WST LED P2 40K VW MVOLT	WST LED P2 40K VW MVOLT	LED	3511	0.9	25

Statistics

Description	Symbol	Avg	Max	Min	Avg/Min	Max/Min
Grade @ 0'	+	0.4 fc	7.3 fc	0.0 fc	N/A	N/A
North Parking and Drives	✳	1.7 fc	4.9 fc	0.3 fc	5.7:1	16.3:1
Property Line	+	0.0 fc	0.0 fc	0.0 fc	N/A	N/A
South Parking	✳	2.1 fc	5.3 fc	0.5 fc	4.2:1	10.6:1

General Note

1. SEE DRAWING FOR LUMINAIRE MOUNTING HEIGHT.
2. CALCULATIONS ARE SHOWN IN FOOTCANDLES AT: 0' - 0"
3. LIGHTING ALTERNATES REQUIRE NEW PHOTOMETRIC CALCULATION AND RESUBMISSION TO CITY FOR APPROVAL.

THE ENGINEER AND/OR ARCHITECT MUST DETERMINE APPLICABILITY OF THE LAYOUT TO EXISTING / FUTURE FIELD CONDITIONS. THIS LIGHTING LAYOUT REPRESENTS ILLUMINATION LEVELS CALCULATED FROM LABORATORY DATA TAKEN UNDER CONTROLLED CONDITIONS IN ACCORDANCE WITH ILLUMINATING ENGINEERING SOCIETY APPROVED METHODS. ACTUAL PERFORMANCE OF ANY MANUFACTURER'S LUMINAIRE MAY VARY DUE TO VARIATION IN ELECTRICAL VOLTAGE, TOLERANCE IN LAMPS, AND OTHER VARIABLE FIELD CONDITIONS. MOUNTING HEIGHTS INDICATED ARE FROM GRADE AND/OR FLOOR UP.

THESE LIGHTING CALCULATIONS ARE NOT A SUBSTITUTE FOR INDEPENDENT ENGINEERING ANALYSIS OF LIGHTING SYSTEM SUITABILITY AND SAFETY. THE ENGINEER AND/OR ARCHITECT IS RESPONSIBLE TO REVIEW FOR MICHIGAN ENERGY CODE AND LIGHTING QUALITY COMPLIANCE.

UNLESS EXEMPT, PROJECT MUST COMPLY WITH LIGHTING CONTROLS REQUIRMENTS DEFINED IN ASHRAE 90.1 2013. FOR SPECIFIC INFORMATION CONTACT GBA CONTROLS GROUP AT ASG@GASSERBUSH.COM OR 734-266-6705.

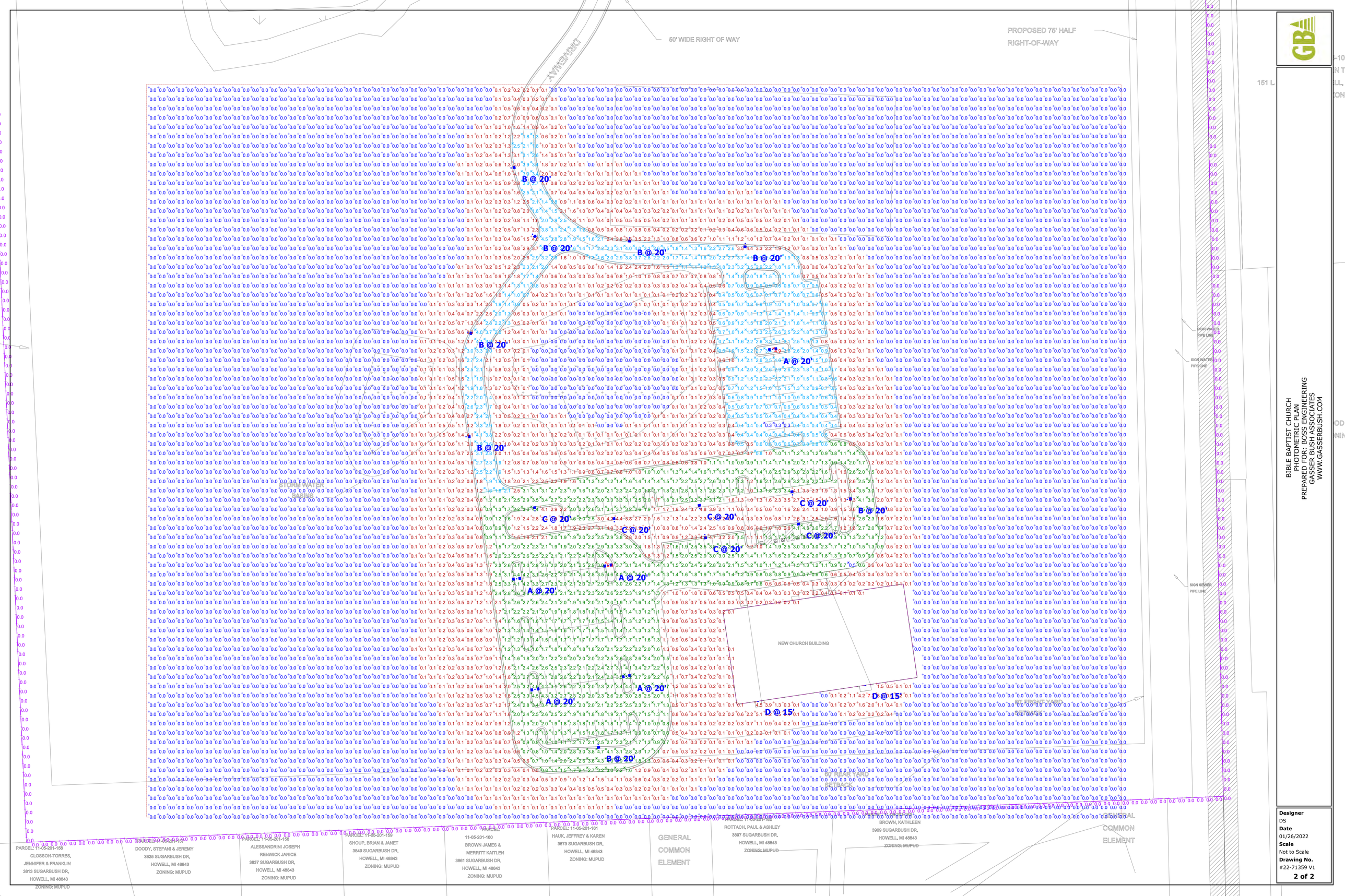
FOR ORDERING INQUIRIES CONTACT GASSER BUSH AT QUOTES@GASSERBUSH.COM OR 734-266-6705.

THIS DRAWING WAS GENERATED FROM AN ELECTRONIC IMAGE FOR ESTIMATION PURPOSE ONLY. LAYOUT TO BE VERIFIED IN FIELD BY OTHERS.

MOUNTING HEIGHT IS MEASURED FROM GRADE TO FACE OF FIXTURE. POLE HEIGHT SHOULD BE CALCULATED AS THE MOUNTING HEIGHT LESS BASE HEIGHT.

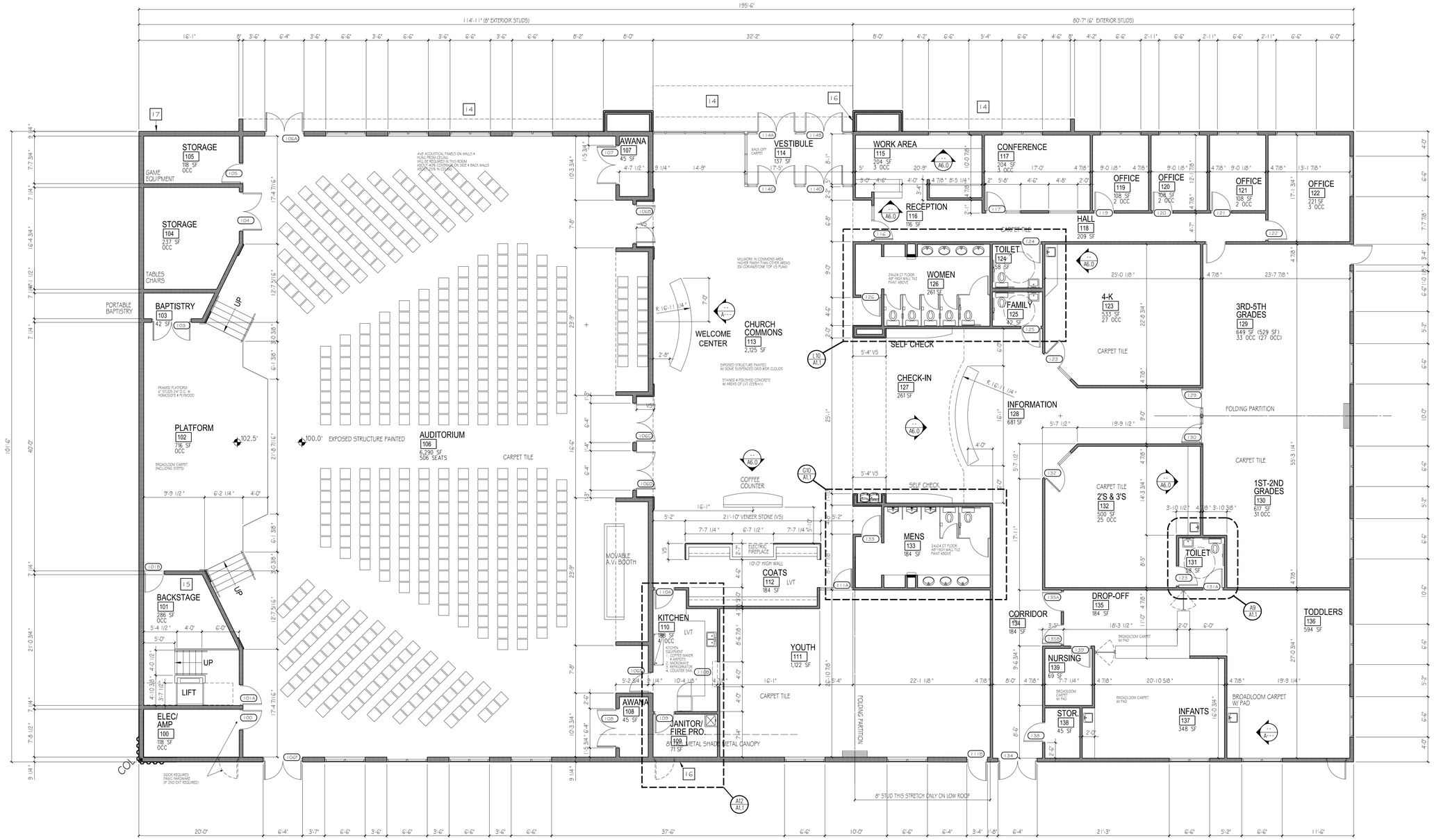
BIBLE BAPTIST CHURCH
PHOTOMETRIC PLAN
PREPARED FOR: BOSS ENGINEERING
GASSER BUSH ASSOCIATES
WWW.GASSERBUSH.COM

Designer
DS
Date
01/26/2022
Scale
Not to Scale
Drawing No.
#22-71359 V1
1 of 2



BIBLE BAPTIST CHURCH
PHOTOMETRIC PLAN
PREPARED FOR: BOSS ENGINEERING
GASSER BUSH ASSOCIATES
WWW.GASSERBUSH.COM

Designer
DS
Date
01/26/2022
Scale
Not to Scale
Drawing No.
#22-71359 V1
2 of 2



Floor Plan
Scale: 1/8" = 1'-0"

PROVIDE SHADES FOR ALL WINDOWS (WORSHIP SHADES TO HAVE CONTROLS)

GENERAL NOTES

1. ALL DIMENSIONS ARE TO FACE OF FINISHED SURFACE OR COLUMN CENTER LINE UNLESS NOTED OTHERWISE
2. COORDINATE w/ MECH. & ELEC DRAWINGS FOR ALL FLOOR/WALL/ROOF PENETRATIONS NOT SHOWN ON ARCHITECTURAL PLANS. COORDINATE WITH C.M.
3. FIELD PAINT ALL MECHANICAL GRILLES & CABINETS TO MATCH ADJACENT SURFACES
4. SITE DATUM: MAIN LEVEL FINISH FLOOR
   ASSUMED= 100'-0"
   ACTUAL = XXX'-X"
5. PROVIDE BLOCKING IN WALLS FOR ALL HANDRAILS CABINETS, BRACKETS, AVL EQUIPMENT AS REQUIRED (PROVIDE NON-COM WHERE REQUIRED)
6. PROVIDE FIRESTOPPING AS REQUIRED AT ALL PENETRATIONS OF RATED ASSEMBLIES
7. PROVIDE PROPER FLASHING AT ALL PENETRATIONS, DOORS, WINDOWS, & DISSIMILAR MATERIAL JOINTS

KEY NOTES

1. 36" GRAB BAR
2. 42" GRAB BAR
3. 18" VERTICAL GRAB BAR
4. TOILET PAPER DISPENSER
5. PAPER TOWEL DISPENSER
6. RECESSED PAPER TOWEL DISPENSER & DISPOSAL UNIT
7. FEMININE NAPKIN DISPOSAL
8. 2x3 FRAMED MIRROR
9. FRAMELESS MIRROR- SEE ELEVATION FOR SIZE
10. URINAL SCREEN W/ CONT BRACKET
11. BABY CHANGER
12. COAT ROD & SHELF- MOUNT ROD @ 54" AFF
13. BULKHEAD ABOVE- SEE REFLECTED CEILING PLAN
14. CANOPY ABOVE
15. FIRE EXTINGUISHER w/ BRACKET
16. KNOX BOX
17. FIRE DEPARTMENT CONNECTION

WALL TYPES

NOTE-REFER TO SECTIONS & DETAILS FOR EXTERIOR WALLS

- A — 6" STUDS @ A1: 5/8" GYPSUM WALLBOARD; 3 5/8" METAL STUDS @ 16" O.C.; 3" ACOUSTICAL BLANKETS; 5/8" GYPSUM WALLBOARD
- B — 6" STUDS @ b1: 5/8" GYPSUM WALLBOARD; 3 5/8" METAL STUDS @ 16" O.C.; 5/8" GYPSUM WALLBOARD
- C: 5/8" GYPSUM WALLBOARD; 3 5/8" METAL STUDS @ 16" O.C. (ALL SHAFT WALLS & BULKHEADS)
- D

NOTES:
1. REFER TO STRUCTURAL DRAWING FOR CROSS BRACING LOCATIONS
2. GYPSUM WALLBOARD TO EXTEND DECK ABOVE CEILING UNLESS NOTED OTHERWISE
3. ALL EXPOSED CMU CORNERS TO BE BULLNOSE CORNERS
4. ALL WALLS TO BE EXTENDED TIGHT TO STRUCTURE ABOVE W/ SLIP TRACK U.N.O.
5. ALL WOOD FRAMING & SHEATHING IN A IIB CONSTRUCTION IS REQUIRED TO BE NON-COMBUSTIBLE
6. PROVIDE DAMPERS AS REQUIRED IN ALL RATED ASSEMBLIES. COORDINATE WITH MECHANICAL CONTRACTOR
7. PROVIDE CONTROL JOINTS IN GYPSUM WALLBOARD 30'-0" O.C. MAX AT ALL WALLS
8. WATER RESISTANT GYPSUM WALLBOARD IN TOILET ROOMS & KITCHENS FROM FLOOR TO 4'-0" AFF MIN

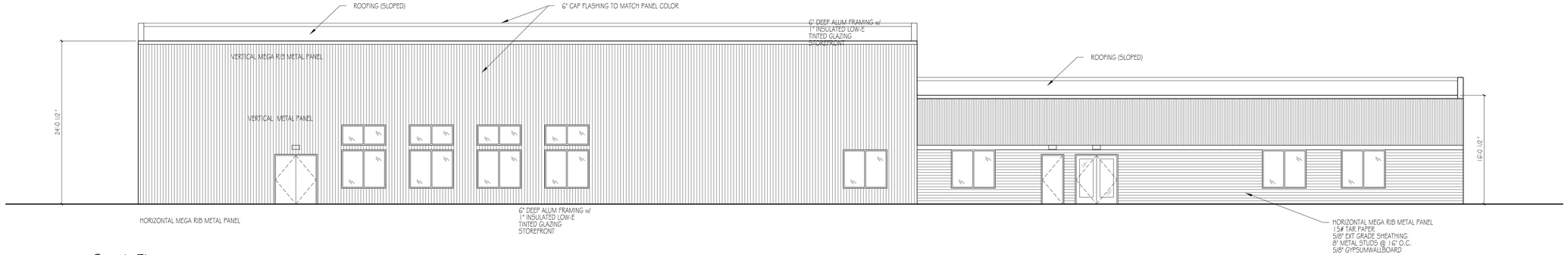
Mark	Description	Date
	FOR INITIAL BUDGETING	01/04/22
	SITE PLAN APPROVAL	01/24/22
	30% BUDGETTING	02/28/22

Jeffrey Parker architects
ARCHITECTURE PLANNING ENGINEERING
855 28th Street SE
Grand Rapids MI 49508
Phone: 616-241-0090
Fax: 616-241-0098

New Facility For:
Bible Baptist Church
Howell, Michigan

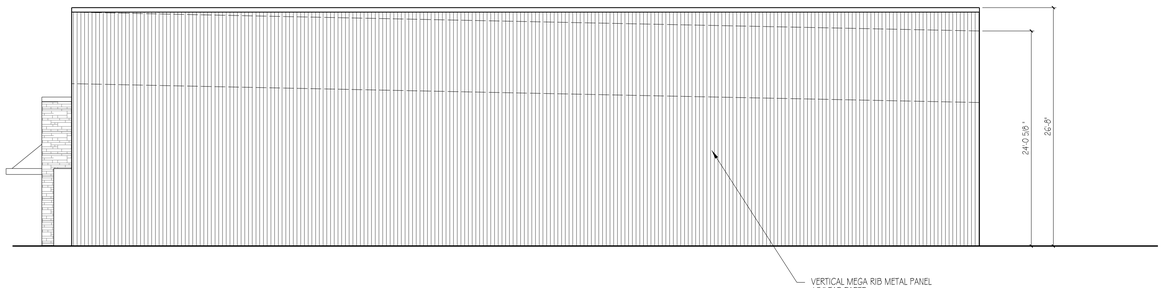
Floor Plan

Issued	Drawing No.
-	A1.0
Project No. 21111	



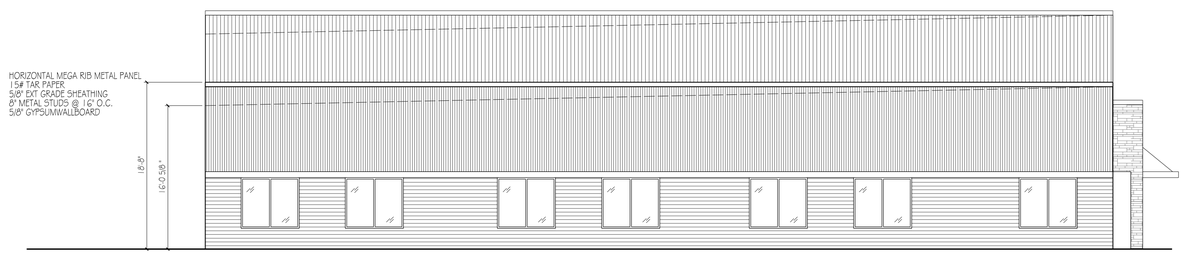
South Elevation

Scale: 1/8" = 1'-0"



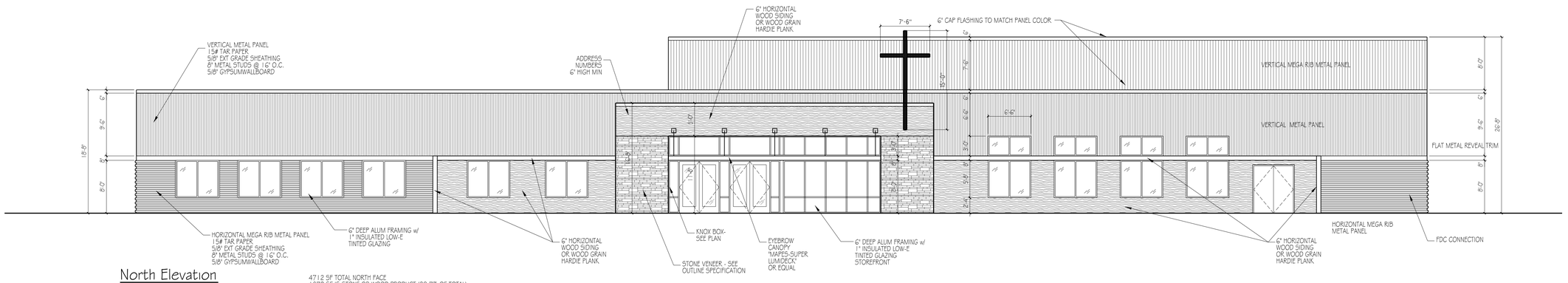
East Elevation

Scale: 1/8" = 1'-0"



West Elevation

Scale: 1/8" = 1'-0"



North Elevation

Scale: 1/8" = 1'-0"

4712 SF TOTAL NORTH FACE
1870 SF IS STONE OR WOOD PRODUCT (39.7% OF TOTAL)

Mark	Description	Date
	FOR INITIAL BUDGETING	01/04/22
	SITE PLAN APPROVAL	01/24/22
	30% BUDGETING	02/28/22

Jeffrey Parker architects

ARCHITECTURE PLANNING ENGINEERING

855 28th Street SE
Grand Rapids MI 49508

Phone: 616-241-0090
Fax: 616-241-0098

New Facility For:

Bible Baptist Church

Howell, Michigan

Exterior Elevations

Issued	Drawing No.
-	A3.0
Project No. 21111	


BIBLE BAPTIST CHURCH