 Charter Township of Garfield Planning Department Report No. 2023-5		
Prepared:	January 3, 2023	Pages: 6
Meeting:	January 10, 2023 Township Board	Attachments: <input checked="" type="checkbox"/>
Subject:	SPR 2022-16 Birmley Hills Site Condominium – Township Board Review	
File No.	SPR 2022-16	Parcel No. 05-026-020-30
Owner:	T&R Investments, Steve Zakrajsek	
Agent:	Boyne Engineering and Design	

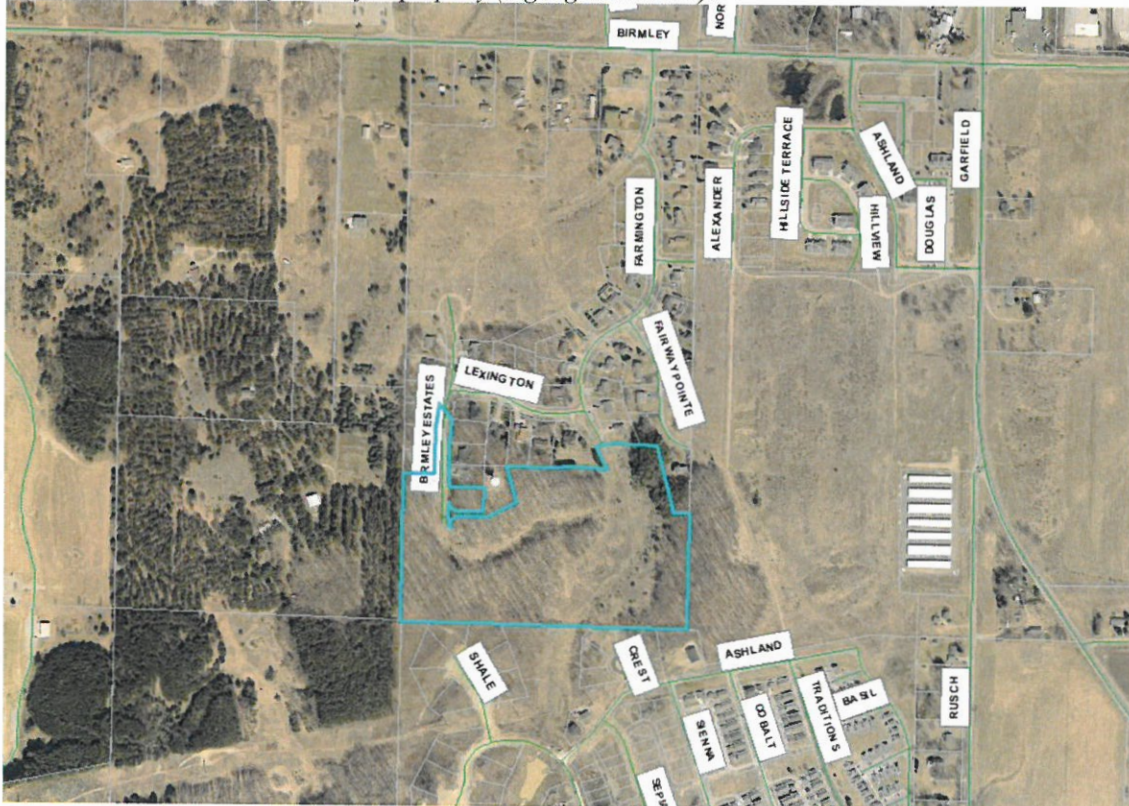
BACKGROUND:

Birmley Hills is a proposed 35-lot residential site condominium development immediately adjacent to the south of the existing Birmley Hills Estates subdivision. The Planning Commission reviewed the proposed development over three meetings: October 26, 2022 (Introduction), November 9, 2022 (Public Hearing), and December 14, 2022 (Findings of Fact).

PURPOSE OF APPLICATION:

This application is for a site condominium development of 35 single-family residential lots. According to the application, the lots will be between 15,000 and 38,000 square feet in area. About 14% of the site will be preserved as open space and is primarily forested hills. The proposed development would be served by the water and sewer extending from the existing Birmley Hills Estates subdivision. These extensions of nearby utilities are currently being reviewed by the Township Engineer.

Zoomed-out aerial view of the subject property (highlighted in blue):



Zoomed-in aerial view of subject property (highlighted in blue):



SUBJECT PROPERTY:

The property is approximately 21.3 acres and is zoned as R-1 One-Family Residential. The property is at the end of Farmington Drive and Birmley Estates Drive, which both provide access from Birmley Road.

STAFF COMMENT:

The Planning Commission held a public hearing at their November 9, 2022 meeting. There were several questions and concerns raised including the potential effects of the proposed project on water pressure in the area, impacts on traffic and maintenance of the existing subdivision roads, access through the existing subdivision and to neighboring sites, and tree preservation. Staff followed up by researching these topics which were then discussed again at the December 14, 2022 meeting. Many of the issues raised concerned the existing subdivision rather than the proposed site condominium in this application.

SITE CONDOMINIUM REVIEW CONSIDERATIONS:

Consultation

Section 429 B. of the Zoning Ordinance allows for the Planning Commission to consider input from the Township Attorney and Township Engineer as needed in its review of a condominium development plan, especially the master deed, deed restrictions, utility systems and streets, subdivision layout and design, and compliance with the Condominium Act. Other agencies will also review this application as needed. As noted above, the Township Engineer is reviewing the application for storm water, private roads, water, and sewer, and their letter dated November 1, 2022 is provided as an attachment.

FINDINGS OF FACT:

At its December 14, 2022 meeting, the Planning Commission adopted the following Findings of Fact for this site condominium application.

As described in the Site Condominium Review Criteria within Section 429.G of the Zoning Ordinance, “For purposes of making a decision to approve, approve with conditions or to deny a site condominium subdivision plan, the Township shall consider and make findings with respect to the following criteria:”

- (1) *That each condominium lot in a site condominium subdivision shall be considered as a single lot and shall comply with all regulations of the zoning district in which it is located. In a condominium development containing single-family detached dwelling units, not more than one (1) dwelling unit shall be located on a condominium lot, nor shall a dwelling unit be located on a condominium lot with any other principal structure or use. Required yards shall be measured from boundaries of a condominium lot. These requirements shall be made part of the bylaws and recorded as part of the master deed*

*The Planning Commission may find this standard to be **MET** for the following reasons:*

- The application proposes 35 single-family lots on a site with R-1 One-Family Residential zoning. The lots as depicted on the site plan meet the minimum lot area of 15,000 square feet and minimum lot width of 100 feet for lots in R-1 with public sewer. These include the lots along the curve of a road, where lot width is measured from the front setback line instead of at the front lot line.
- (2) *That there is a proper relationship between the existing streets and highways within the vicinity, and proposed deceleration lanes, service drives, entrance and exit driveways, and parking areas to assure the safety and convenience of pedestrian and vehicular traffic, and that the proposed streets and access plan conform to any street or access plan adopted by the Township or the County Road Commission*

*The Planning Commission may find this standard to be **MET** for the following reasons:*

- The two proposed roads are Birmley Hills Drive, an extension of Birmley Estates Drive, and an extension of Farmington Court. These two roads currently provide access to the subject site. This system of roads connects to Birmley Road.
 - Given that the total number of trips is anticipated to be under 500 per day and given the nature of the development as only single-family homes, Staff recommends the Planning Commission waive the requirement for a traffic impact report.
 - A stub road connection to the adjacent parcel to the west is provided.
 - The County Road Commission and Metro Fire have provided comments on the proposed site condominium, and no concerns with traffic levels have been cited.
 - The proposed streets for this project appear to be a logical extension of the street pattern for this area and are in line with previous anticipated build-out of the neighborhood.
- (3) *That as many natural features of the landscape shall be retained as possible, particularly where they furnish a barrier or buffer between the project and adjoining properties used for dissimilar purposes, and where they assist in preserving the general appearance of the neighborhood or help control erosion or the discharge of storm waters*

*The Planning Commission may find this standard to be **MET** for the following reasons:*

- The applicants propose to reserve about 14% of the property as a wooded area including a contiguous area of 1.94 acres in the southeast corner of the property. This is a hilly area which helps provide a natural buffer to portions of Ashland Park and Traditions.
 - Storm water management is subject to review by the Township Engineer.
- (4) *That any adverse effect of the proposed development and activities emanating therefrom upon adjoining residents or owners shall be minimized by appropriate screening, fencing or walls, or landscaping*

The Planning Commission may find this standard to be MET for the following reasons:

- The proposed development consists of single-family homes, which are compatible with the existing single-family homes to the north in the Birmley Hills Estates subdivision and to the south within Traditions.
 - The site is also compatible with the partially built Ashland Park site to the east.
 - The site to the west is currently vacant but designated as Low Density Residential on the Future Land Use Map; the proposed development is compatible with the site to the west with the stub connection for water, sewer, and street connection provided.
 - No major adverse effects are anticipated from the proposed development.
- (5) *That all provisions of this ordinance are complied with*

The Planning Commission may find this standard to be MET for the following reasons:

- Development standards such as fences, lighting, landscaping, and parking are handled as part of the design for each individual condominium lot. The site plan notes that no site lighting is proposed for this development and that parking will be located on individual lots. No additional parking areas are proposed.
 - As described above, Section 521.G(2) indicates that connecting streets are needed where “abutting areas are not subdivided,” and therefore a street stub connection to the west is provided to meet this standard. This street connection will also coincide with water and sewer connections to the west as indicated by the Township Engineer.
 - Given that the total number of trips is anticipated to be under 500 per day and given the nature of the development as only single-family homes, Staff recommends the Planning Commission waive the requirement for a traffic impact report.
 - Details for a proposed entrance sign are shown on Sheet C6.0. Signs require sign permit review and are not approved under the site plan review process.
- (6) *That all site condominium lots shall be provided access by either public or private roads in conformance with the requirements of this ordinance. All site condominium units shall be accessible to emergency vehicles*

The Planning Commission may find this standard to be MET for the following reasons:

- All lots are proposed to be accessed by an extension of Farmington Court and by Birmley Hills Drive, which are proposed to be private roads.
- A stub street connection to the adjacent parcel to the west is provided, which will also be a private road.
- Access for emergency vehicles should reflect any comments from the relevant agencies.

- (7) *That a plan for erosion control and storm water discharge has been approved by the appropriate public agency; and*

*The Planning Commission may find this standard to be **MET** for the following reasons:*

- Review of erosion control and storm water will be handled by the Grand Traverse County Soil Erosion and Sedimentation and the Township Engineer, respectively. Storm water retention areas are shown on the west side behind Lot 22 and in northeast part of the site.
- (8) *That the plan as approved is consistent with the intent and purpose of zoning to promote public health, safety and general welfare; to encourage the use of lands in accordance with their character and adaptability to avoid the overcrowding of population; to lessen congestion on the public roads and streets; to reduce hazards to life and property; to facilitate adequate provisions for a system of transportation, sewage disposal, safe and adequate water supply, education, recreation and other public requirements; and to conserve the expenditure of funds for public improvements and services to conform with the most advantageous uses of land, resources and properties; to preserve property values and natural resources; and to give reasonable consideration to character of a particular area, its suitability for particular uses and the general appropriate trend and character of land, building, and population development and is otherwise in compliance with law.*

*The Planning Commission may find this standard to be **MET** for the following reasons:*

- The proposal is consistent with the current zoning of R-1 One-Family Residential and the Future Land Use Map designation of Low Density Residential. Further, the proposal is consistent with the intent to promote the public health, safety, and welfare and with the provisions of this standard.

PROCESS:

Site condominiums are reviewed by both the Planning Commission and Township Board. The Planning Commission has held a public hearing on the application and made a recommendation on the application to the Township Board. According to Section 429.F.(5) of the Zoning Ordinance, The Township Board shall not review, approve or reject a site condominium subdivision plan until it has received from the Planning Commission its report and recommendation.

According to Section 429.F.(6) of the Zoning Ordinance, the Township Board shall approve the site condominium subdivision plan, with or without conditions, reject the plan and give its reasons, table the proceedings pending further review or pending changes to the plan to make it acceptable to the Board, or refer that application back to the Planning Commission for further review and report.

ACTION REQUESTED:

If the Board is prepared to adopt the Planning Commission's recommended Findings of Fact included in this report and approve the proposed project, the following two separate motions are suggested:

MOTION THAT the Findings of Fact for Application SPR 2022-16, submitted by T&R Investments for a site condominium at Parcel #05-026-020-30, as presented in Planning Department Report 2023-5 and as recommended for adoption by the Planning Commission, BE ADOPTED.

MOTION THAT application SPR 2022-16, submitted by T&R Investments for a site condominium at Parcel #05-026-020-30, BE APPROVED subject to the following conditions:

1. Final engineering review and approval by the Township Engineer is required including all infrastructure and stormwater.
2. All final reviews from agencies with jurisdiction shall be provided prior to any Land Use Permits being issued.
3. The applicant shall record promptly the Report and Decision Order (RDO) and any amendment to such order with the Grand Traverse County Register of Deeds in the chain of title for each parcel or portion thereof to which the RDO pertains. A copy of each recorded document shall be filed with the Township prior to any Land Use Permits being issued.
4. After recording the condominium plan, master deed, bylaws and deed restrictions, the developer shall file two (2) copies of each document, including all pertinent attachments, with the Township.
5. Condominium Protective Covenants and Deed Restrictions which hold harmless the Township for improvements within the site condominium subdivision and which require conformance with all conditions and requirements of condominium plan approval and this ordinance shall be required.
6. The Condominium Master Deed and Bylaws shall include the following statement: "Condominium Amendments which are recorded prior to the receipt of written Garfield Township Planning Department approval shall be considered null and void."
7. After the construction of all improvements, the developer shall file with the Township two (2) copies of the as-built condominium plan and a certification from the developer's engineer that the improvements have been installed in conformance with the approved construction drawings.

Any additional information the Township Board deems necessary should be added to this motion.

Attachments:

1. Application for Site Condominium Subdivision review dated September 22, 2022.
2. Birmley Hills Site Condominium Site Plan Set dated December 7, 2022.
3. Letter from Township Engineer dated November 1, 2022.
4. Letter from Metro Fire dated October 4, 2022.
5. Email from Grand Traverse County Road Commission dated November 8, 2022.



Charter Township of Garfield

Grand Traverse County

3848 VETERANS DRIVE
TRAVERSE CITY, MICHIGAN 49684
PH: (231) 941-1620 • FAX: (231) 941-1588

SITE CONDOMINIUM SUBDIVISION (SCSP) APPLICATION

ASSISTANCE

This application must be completed in full. An incomplete or improperly prepared application will not be accepted and will result in processing delays. Before submitting an application, it is recommended that you contact the Planning Department to arrange an appointment to discuss your proposed application. Time is often saved by these preliminary discussions. For additional information or assistance in completing this development application, please contact the Planning Department at (231) 941-1620.

ACTION REQUESTED

☒ Site Condominium Subdivision Plan Review

PROJECT / DEVELOPMENT NAME

BIRMLEY HILLS

APPLICANT INFORMATION

Name:

T & R INVESTMENTS

Address:

841 ASHLAND DRIVE, TC, MI 49696

Phone Number:

(231) 838-6004

Email:

zakrajseksteve@gmail.com

AGENT INFORMATION

Name:

BOYNE ENGINEERING AND DESIGN

Address:

PO BOX 94, BOYNE CITY, MI 49712

Phone Number:

(231) 499-8361

Email:

boyneeng@torchlake.com

OWNER INFORMATION

Name:

T & R

Address:

Phone Number:

Email:

CONTACT PERSON

Please select one person to be contact person for all correspondence and questions:

- ☒ Applicant: Steve Zakrajsek
☒ Agent: Carne May, P.E.
☐ Owner: _____

PROPERTY INFORMATION

Property Address: _____

Property Identification Number: _____

Legal Description: _____

Zoning District: _____

Master Plan Future Land Use Designation: _____

Area of Property (acres or square feet) _____

05-026-020-30
SHER CO.0
R-1

SITE CONDOMINIUM SUBDIVISION PLAN

The site condominium subdivision plan shall indicate specific unit dimensions with front, rear and side site condominium lot lines allocated to each condominium unit. Parcels shall be referred to as site condominium lots. The description, size, location, and arrangement of the site condominium lots shall conform to the requirements of the Zoning Ordinance. All site condominium subdivision lots shall be deeded as limited common elements for the exclusive use of the owners of the condominium subdivision units. Each condominium dwelling unit shall be located within a condominium lot.

1. Name of the project, name and address of preparer, and date. ✓
2. The plan shall be of a scale not less than one inch (1") equals fifty feet (50'). ✓
3. All plans are to be accurately sealed. ✓
4. Layout and dimensions of all condominium lots.
5. Layout and dimensions of all roadways and pedestrian pathways. ✓
6. Adequate drainage of surface water, stormwater disposal methods. .
7. Distribution of telephone, electric, television, and other similar services by underground wire or cable.
8. First floor elevation of buildings (if applicable).
9. Location of gas lines.
10. Location of water lines, and hydrants or other appurtenances.
11. Location of sanitary sewer lines including the location and size of the proposed service.
12. Location of existing and proposed fencing, landscaping, screening, or other buffers required.
13. Location of streetlights and light fixture details.

REQUIRED SUBMITTAL ITEMS

A complete application for a Site Condominium Subdivision Plan consists of the following:

Application Form:

- ☒ One original signed application
☒ One digital copy of the application (PDF only)

Application Fee:

Fees are established by resolution of the Garfield Township Board and are set out in the current Fee Schedule as listed on the Planning Department page of the Township website (<http://www.garfield-twp.com>). Please make check out to Charter Township of Garfield.

☒ Fee

Site Condominium Subdivision Plan:

☒ Ten complete stapled 11"x17" paper sets

☒ Two complete bound 24"x36" paper sets

☒ One digital set (PDF only)

Digital items to be delivered via email or USB flash drive

SUBMITTAL DEADLINE

Submittal deadlines are listed on the Planning Department page of the Township website (<http://www.garfield-twp.com>). Please note that the listed dates are the deadlines after which submittals will not be considered for the indicated meeting. Any errors or missing information on an application submitted at the deadline will result in a delay in the processing of the application. An earlier submittal is encouraged to avoid possible delays.

REVIEW PROCEDURE

Subject to the standards of § 429.G of the Zoning Ordinance, a proposed Site Condominium Subdivision shall be reviewed in accordance with § 429.H and generally summarized as follows:

1. Agency Submittal: The applicant shall provide copies of the proposed site condominium subdivision plan to the following Grand Traverse County Agencies: Health Department (or Department of Public Works if proposed on municipal water and/or sanitary sewer), Drain Commissioner (or Township designee), Soil Erosion-Sedimentation Control Director (or Township designee), Road Commission (or Michigan Department of Transportation if proposed on a state highway), and the Metro Fire Department.
2. Independent Review: An independent engineer or other consultant may be hired, at the applicant's expense, to review the project and make recommendations to the Township.
3. Public Hearing: The Planning Commission shall hold a public hearing on the proposed site condominium subdivision plan, for the purpose of reviewing and making a recommendation of approval, approval with conditions, or denial to the Township Board.
4. Planning Commission Determination: If the Planning Commission determines that the proposed plan meets all requirements of this ordinance and the Condominium Act, the Planning Commission shall recommend approval or approval with conditions of the site condominium subdivision plan and shall send notice of action taken with comments to the Township Board. If the Planning Commission determines that the site condominium subdivision plan does not meet all requirements, the Planning Commission shall state its reason in its official minutes, shall forward same to the Township Board, and shall recommend disapproval of the plan by the Township Board until the objections causing disapproval have been changed to meet the requirements of this ordinance and the Condominium Act.
5. Township Board Determination: The Township Board shall approve the site condominium subdivision plan, with or without conditions, reject the plan and give its reasons, table the proceedings pending further review or pending changes to the plan to make it acceptable to the Board, or refer that application back to the Planning Commission for further review and report.

OTHER INFORMATION

If there is any other information that you think may be useful in the review of this application, please attach it to this application or explain it on a separate page.

PERMISSION TO ENTER SUBJECT PROPERTY



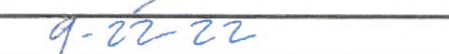
Permission is hereby granted to Garfield Township staff and Planning Commissioners to enter the premises subject to this application for the purposes of making inspections associated with this application, during normal and reasonable working hours.

Owner Signature:

Applicant Signature:

Agent Signature:

Date:

	
	
	
9-22-22	

OWNER'S AUTHORIZATION

If the applicant is not the registered owner of the lands that is the subject of this application, the owner(s) must complete the authorization set out below.

I/We _____ am/are the registered owner(s) of the lands that is the subject of this application for a site condominium subdivision.

Owner Signature:

Date:

I/We _____ authorize to make this application on my/our behalf and to provide any of my/our personal information necessary for the processing of this application.

Owner Signature:

Date:

AFFIDAVIT


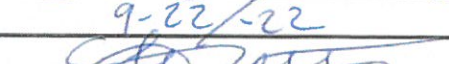
The undersigned affirms that he/she or they is (are) the owner, or authorized agent of the owner, involved in the application and all of the information submitted in this application, including any supplemental information, is in all respects true and correct. The undersigned further acknowledges that willful misrepresentation of information will terminate this permit application and any permit associated with this document.

Owner Signature:

Date:

Applicant Signature:

Date:

	
9-22-22	
	
9-22-22	



BOYNE ENGINEERING AND DESIGN, PLLC.
PO BOX 94 Boyne City, MI 49712 (231) 499-8361 boyneeng@torchlake.com

BIRMLEY HILLS
A SITE CONDOMINIUM PROPOSAL

September 22, 2022

Applicant / Owner: T & R Investments
841 Ashland Drive
Traverse City, MI 49696

Steve Zakrajsek (231) 838-6004

Meeting Date: October 26, 2022

Package Contents:

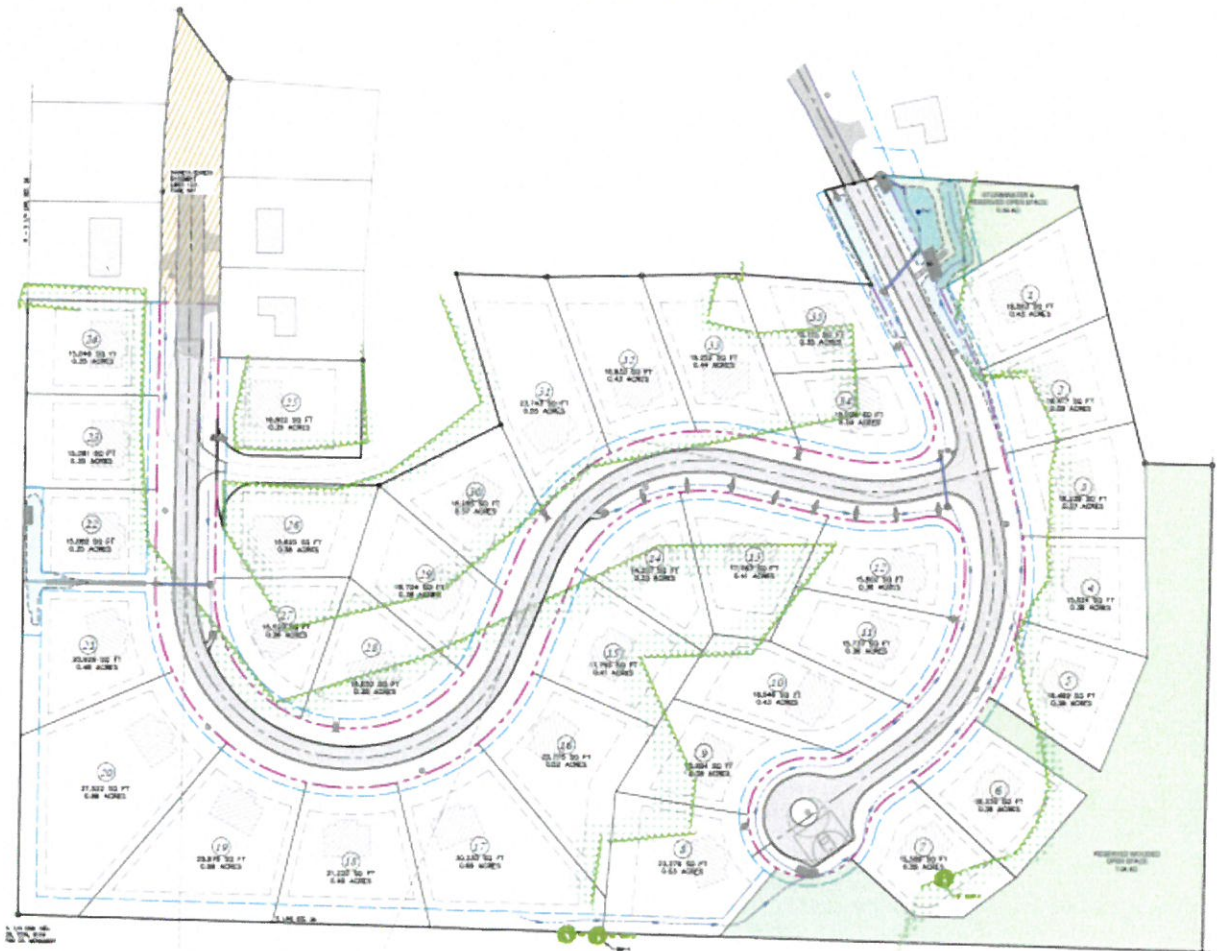
1. Statement of Proposed Use
2. Impact Statement & Traffic Assessment
3. Stormwater Control Plan
4. Engineered Plans 10 Sheets
Dated 9/21/22

STATEMENT OF PROPOSED USE

Birmley Hills is a proposed 35 lot residential site condominium development on 21.3 acres located in Garfield Township's R-1 Residential zoning district.

The property is part of Section 26, Township 27 North, Range 11 West and is located at the end of Birmley Estates Drive and Farmington Drive off of Birmley Road. The Tax ID for the property is 05-026-020-30.

The lots in this proposed development are between 1,500 sf and 3,800 sf. Approximately 14% of the net acreage in this development is being reserved as open space and consists primarily of forested hills. The development will include 2 new 24' wide private roads which intersect and connect in a loop to Birmley Estates Drive and Farmington Road. Both existing roads have partial extensions where additional roads have previously been planned. Birmley Hills Drive is approximately 1,469 ft long and will intersect with Farmington Court, which is approximately 822 ft long and ends in a cul-de-sac. The proposed development will be served by municipal water and sewer also extending from the same Birmley Estates roads. There is a Garfield Township elevated water storage tank at the top of this development. All utilities will be underground and there is a monument sign proposed for the entry at Farmington Court.



IMPACT STATEMENT

**T & R Investments
841 Ashland Drive
Traverse City, MI 49696**

Contact: Steve Zakrajsek (231) 838-6004

Proposed Birmley Hills 35 Lot Residential Site Condominium

Tax ID: 05-026-020-30

1.) PROJECT DESCRIPTION:

Birmley Hills is a proposed 35 lot residential site condominium development located on 21.3 acres in Garfield Township's R-1 Residential zoning district.

The property is part of Section 26, Township 27 North, Range 11 West and is located at the end of Birmley Estates Drive and Farmington Drive off of Birmley Road. The Tax ID for the property is 05-026-020-30.

The lots in this proposed development are between 1,500 sf and 3,800 sf. Approximately 14% of the net acreage in this development is being preserved as open space and consists primarily of forested hills. The development will include 2 new 24' wide private roads which intersect and connect in a loop to Birmley Estates Drive and Farmington Road. Both existing roads have partial extensions where additional roads have previously been planned. Birmley Hills Drive is approximately 1,469 ft long and will intersect with Farmington Court, which is approximately 822 ft long and ends in a cul-de-sac. The cul-de-sac includes an elongated edge which will accommodate a sports court. The proposed development will be served by municipal water and sewer also extending from the same Birmley Estates roads. There is a Garfield Township elevated water storage tank at the top of this development. All utilities will be underground and there is a monument sign proposed for the entry at Farmington Court. The private right-of-way is 66 feet wide and there is an additional 10 foot public easement on both sides for municipal utilities. The road grades in this development range between 1% and 8.5%. Homes in the development are expected to average 1,800 square feet with some larger homes. There are forested slopes throughout the property and the roadways are located in the middle of the property to minimize disruption of those forests and impact on the neighboring community. Stormwater will be handled with open ditches along the roadways and basins near the natural discharge locations in keeping with the character of the adjacent development. There is a break in the direction of the stormwater watershed midway through the property. A stormwater control plan has been engineered to meet Garfield Township stormwater regulations which includes detention and infiltration basins with sediment forebays.

2.) DEMAND ON COMMUNITY SERVICES:

- A.) The development will be served by municipal sewer which is expected to have capacity for these homes. The plans will be reviewed by the Grand Traverse County Department of Public Works
- B.) The development will be served by municipal water which is also expected to have capacity for these homes. There is an elevated storage tank feeding the system directly adjacent to the development. The plans will be reviewed by the Grand Traverse County Department of Public Works.
- C.) According to the Institute of Transportation Engineers (ITE) publication for Trip Generation, 10th Edition, a Single-Family Detached home generates an Average Daily Traffic rate of 9.44 trips per day divided between the two points of entry. The Peak Hour traffic for this use would occur typically between the hours of 7:00am and 9:00 am with a rate of 0.74 trips per hour with outbound traffic accounting for 75% of those trips. This would equate to approximately 26 trips in that hour divided by the two points of entry. It is unlikely that a formal traffic study would find that this number of trips would reduce the Level of Service on the adjoining public roads. The plans will be reviewed by the Grand Traverse County Road Commission.
- D.) According to 2000 census data, this development could add approximately 35 children to local schools.
- E.) The Grand Traverse Metro Fire Department will review the plans for this relatively simple residential development. Appropriate home spacing, road grades, paving, access routes, turning radii and fire hydrants are included in the design.

1.) ENVIRONMENTAL IMPACTS:

- A.) The Engineered Site Plan includes proposed grading and soil erosion control measures.
- B.) The Engineered Site Plan includes a Stormwater Runoff Control Plan which addresses stormwater runoff and control according to the Garfield Township requirements. A soil erosion and sediment control permit will be required for construction of the project.
- C.) This project does not border on the shoreline and there are no wetlands in the vicinity of the proposed development.
- D.) This project preserves forested areas and will not significantly disturb the existing forested areas of the property outside of homesites. It would not negatively affect wildlife habitats in those areas. Some tree clearing will be required to construct the improvements and create buildable lots but will be minimized to the extent possible.
- E.) This project will not significantly contribute to air pollution due to the fact that it is not a commercial type use and is replacing the same residential uses elsewhere.
- F.) It is not anticipated that water pollution will result from this development. Increased runoff due to impervious surfaces is mitigated according to the Stormwater Control Plan and infiltration is planned in what are well draining sandy soils.
- G.) The proposed development can be expected to generate noise typical of a residential development which is not considered a harmful noise producing use.

This completes the impact statement for this project. If there are any questions regarding this statement or the project, please contact:

Boyne Engineering and Design - Ms. Carrie May, P.E. at (231) 499-8361.



BOYNE ENGINEERING AND DESIGN, PLLC.

PO BOX 94 Boyne City, MI 49712 (231) 499-8361 boyneeng@torchlake.com

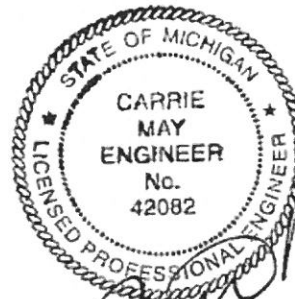
SUMMARY OF
STORMWATER RUNOFF CONTROL PLAN
FOR

BIRMLEY HILLS A SITE CONDOMINIUM

GARFIELD TOWNSHIP, MI

BED PROJECT NO: 22016

September 22, 2022



Carrie May
9/22/22

STORMWATER CONTROL PLAN

DESCRIPTION

Birmley Hills is a proposed 35 lot residential site condominium development located in Garfield Township's R-1 Residential zoning district.

The property is part of Section 26, Township 27 North, Range 11 West and is located at the end of Birmley Estates Drive and Farmington Drive off of Birmley Road. The Tax ID for the property is 05-026-020-30.

Hydrology modeling and runoff calculations were performed by Boyne Engineering and Design using SCS TR-20 Method and Hydrocad software. Detailed model calculations are attached which correspond to the stormwater summary and watershed maps included on the engineered plans (See Sheet C2.1). The following parameters describe the site conditions and modeling assumptions.

WATERSHED

The overall watershed containing this 21.3 acre development is approximately 116 acres. Much of that watershed is upstream of the property and includes forested hills and pasture and range land. These areas do not generate significant runoff because of their cover and well-draining soils. The developed areas are modeled as 1/3 ac residential, paved surfaces, and wooded open space.

SOILS AND TERRAIN

The USDA Soil Conservation maps of this area show that the soils can be expected to be sandy. A test hole was dug at the location of the lower detention basin and these expectations were confirmed. Historical soil borings in other parts of the property corroborate sandy soils. The slopes on the site vary between 1% and 28% with the steep areas being largely confined areas not planned for development. The proposed drives have been profiled to follow the existing contours to the extent possible and to balance earthwork.

SOIL EROSION

The engineered Grading and Drainage plan (See Sheet C2.1) specifies temporary and permanent soil erosion measures including construction entrances, silt fence, minimum earth disturbance requirements, slope stabilization requirements, 3:1 and 4:1 maximum ditch and basin side slopes, stabilized overflows and level spreader outlets, and seeding requirements.

STORMWATER

The following summarizes the stormwater control requirements of Garfield Township and the design components which satisfy those requirements (See the attached detailed calculations and Sheet C2.1 of the engineered plans for more information).

- RUNOFF GENERATED FROM SITE IMPROVEMENTS IS RETAINED ON SITE IN RETENTION/INFILTRATION BASINS DESIGNED TO LIMIT OUTFLOW < 0.13 CFS PER ACRE FOR A 25 YEAR, 24HR STORM EVENT:

DEVELOPED AREA: 21.10 ACRE * 0.13 =	2.743 CFS ALLOWED
DESIGN OUTFLOW 25 YR, 24 HR EVENT:	2.28 CFS

- THE STORAGE VOLUME PROVIDED EXCEEDS REQUIREMENTS:

PREDEVELOPED 2 YEAR RUNOFF: 0.005af

DEVELOPED 25 YEAR GENERATED RUNOFF:	2.156af
DEVELOPED 25 YEAR INFILTRATION:	-1.175af
	=0.981af

STORAGE REQUIRED(0.981-0.005):	0.967af
STORAGE PROVIDED:	1.55 af

- BASIN SLOPES DO NOT EXCEED 3:1, NO SLOPES EXCEEDING 2:1
- SNOW STORAGE AREAS ARE INDICATED ON PLAN
- CHECK DAMS ARE PROVIDED AT DITCH LOCATIONS WITH ANTICIPATED FLOWS > 4FT/S AND EROSION CONTROL BLANKETS ARE SPECIFIED
- THE STORMWATER FACILITIES ARE DESIGNED TO SAFELY PASS A 100 YEAR, 24HR STORM EVENT WITHOUT INCREASING DOWNSTREAM FLOODING.
- BASINS ARE DESIGNED TO DRAIN THROUGH INFILTRATION WITHIN 72 HOURS

ATTACHMENTS

1. NRCS soil report
2. Hydrocad modeling and runoff calculations
3. Engineered Site Plans

ATTACHMENTS



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

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

Custom Soil Resource Report for Grand Traverse County, Michigan

Birmley Estates



June 19, 2022











































[illegible]

Map Scale: 1:3,840 if printed on A landscape (11" x 15") sheet.



Map projection: Web Mercator Corner coordinates: NGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

	Area of Interest (AOI)		Spell Area
	Area of Interest (AOI)		Story Spot
	Soils		Very Story Spot
	Soil Map Unit Polygons		Web Spot
	Soil Map Unit Lines		Other
	Soil Map Unit Points		Special Line Features
	Special Point Features		Water Features
	Blowout		Streams and Canals
	Borrow Pit		Transportation
	Clay Spot		Rails
	Closed Depression		Interstate Highways
	Gravel Pit		US Routes
	Gravelly Spot		Major Roads
	Landfill		Local Roads
	Lava Flow		Background
	Marsh or swamp		Aerial Photography
	Mine or Quarry		
	Miscellaneous Water		
	Perennial Water		
	Rock Outcrop		
	Saline Spot		
	Sandy Spot		
	Severely Eroded Spot		
	Sinkhole		
	Slide or Slip		
	Sodic Spot		

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Grand Traverse County, Michigan
Survey Area Data: Version 15, Sep 1, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Jun 19, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EyD	Emmet sandy loam, 12 to 18 percent slopes	3.6	5.6%
LkA	Leelanau-Kalkaska loamy sands, 0 to 2 percent slopes	2.3	3.5%
LkB	Leelanau-Kalkaska loamy sands, 2 to 6 percent slopes	2.9	4.4%
LkB2	Leelanau-Kalkaska loamy sands, 2 to 6 percent slopes, moderately eroded	0.2	0.2%
LkC	Leelanau-Kalkaska loamy sands, 6 to 12 percent slopes	11.0	17.1%
LkC2	Leelanau-Kalkaska loamy sands, 6 to 12 percent slopes, moderately eroded	2.6	4.0%
LkD	Leelanau-Kalkaska loamy sands, 12 to 18 percent slopes	15.4	23.8%
LkD2	Leelanau-Kalkaska loamy sands, 12 to 18 percent slopes, moderately eroded	5.0	7.8%
LkE	Leelanau-Kalkaska loamy sands, 18 to 25 percent slopes	18.7	29.0%
LkE2	Leelanau-Kalkaska loamy sands, 18 to 25 percent slopes, moderately eroded	2.4	3.7%
RcA	Richter loams, 0 to 2 percent slopes, overwash	0.2	0.3%
WdC	Wind eroded land, sloping	0.4	0.5%
Totals for Area of Interest		64.6	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class.

Hydric soil rating: No

**LkB2—Leelanau-Kalkaska loamy sands, 2 to 6 percent slopes,
moderately eroded**

Map Unit Setting

National map unit symbol: 6c5z
Elevation: 600 to 1,900 feet
Mean annual precipitation: 27 to 34 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 70 to 150 days
Farmland classification: Farmland of local importance

Map Unit Composition

Leelanau, moderately eroded, and similar soils: 60 percent
Kalkaska, moderately eroded, and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Leelanau, Moderately Eroded

Setting

Landform: Moraines
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: 20 to 52 inches of sandy and loamy material over calcareous sandy glaciofluvial deposits

Typical profile

H1 - 0 to 7 inches: loamy sand
H2 - 7 to 28 inches: loamy sand
H3 - 28 to 36 inches: sandy loam
H4 - 36 to 60 inches: loamy sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Custom Soil Resource Report

Land capability classification (nonirrigated): 3s

Hydrologic Soil Group: A

Ecological site: F096XA006MI - Snowy Rich Sandy Drift

Hydric soil rating: No

Description of Kalkaska, Moderately Eroded

Setting

Landform: Moraines, outwash plains

Landform position (three-dimensional): Rise

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Sandy glaciofluvial deposits

Typical profile

H1 - 0 to 6 inches: loamy sand

H2 - 6 to 8 inches: sand

H3 - 8 to 36 inches: sand

H4 - 36 to 60 inches: sand

Properties and qualities

Slope: 2 to 6 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat excessively drained

Runoff class: Negligible

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4s

Hydrologic Soil Group: A

Ecological site: F096XA006MI - Snowy Rich Sandy Drift

Hydric soil rating: No

LkC—Leelanau-Kalkaska loamy sands, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: 6c6D

Elevation: 600 to 1,900 feet

Mean annual precipitation: 27 to 34 inches

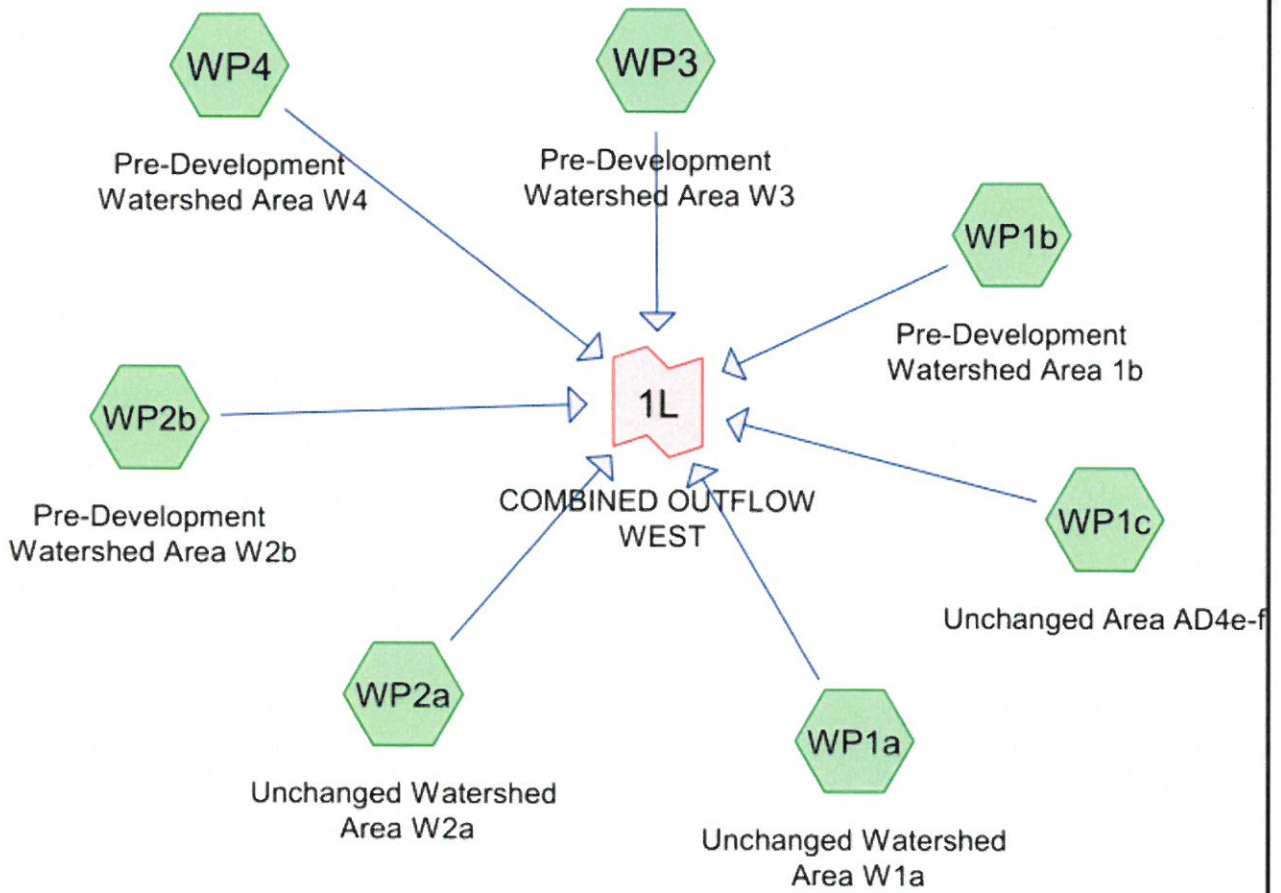
Mean annual air temperature: 39 to 46 degrees F

Frost-free period: 70 to 150 days

Farmland classification: Farmland of local importance

Map Unit Composition

Leelanau and similar soils: 55 percent



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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	25-Year	Type II 24-hr		Default	24.00	1	3.89	2

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Type II 24-hr 25-Year Rainfall=3.89"

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Time span=0.00-200.00 hrs, dt=0.05 hrs, 4001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment WP1a: Unchanged Runoff Area=3,964,046 sf 7.19% Impervious Runoff Depth=0.13"
Flow Length=5,546' Tc=111.9 min CN=44 Runoff=1.28 cfs 0.974 af

Subcatchment WP1b: Pre-Development Runoff Area=724,193 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=5,546' Tc=111.9 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment WP1c: Unchanged Area Runoff Area=139,558 sf 2.87% Impervious Runoff Depth=0.00"
Flow Length=823' Tc=49.5 min CN=33 Runoff=0.00 cfs 0.000 af

Subcatchment WP2a: Unchanged Runoff Area=30,019 sf 30.00% Impervious Runoff Depth=0.71"
Flow Length=300' Slope=0.0600 '/' Tc=39.8 min CN=60 Runoff=0.26 cfs 0.041 af

Subcatchment WP2b: Pre-Development Runoff Area=146,620 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=300' Slope=0.0600 '/' Tc=39.8 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment WP3: Pre-Development Runoff Area=24,099 sf 8.51% Impervious Runoff Depth=0.04"
Tc=15.0 min CN=39 Runoff=0.00 cfs 0.002 af

Subcatchment WP4: Pre-Development Runoff Area=25,056 sf 19.49% Impervious Runoff Depth=0.33"
Tc=15.0 min CN=51 Runoff=0.11 cfs 0.016 af

Link 1L: COMBINED OUTFLOW WEST

Inflow=1.33 cfs 1.033 af
Primary=1.33 cfs 1.033 af

Total Runoff Area = 116.014 ac Runoff Volume = 1.033 af Average Runoff Depth = 0.11"
93.97% Pervious = 109.016 ac 6.03% Impervious = 6.998 ac

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Type II 24-hr 25-Year Rainfall=3.89"

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Summary for Subcatchment WP1a: Unchanged Watershed Area W1a

Runoff = 1.28 cfs @ 15.05 hrs, Volume= 0.974 af, Depth= 0.13"
 Routed to Link 1L : COMBINED OUTFLOW WEST

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
1,216,417	36	Woods, Fair, HSG A
1,349,870	49	Pasture/grassland/range, Fair, HSG A
* 71,405	36	*Paved roads w/curbs & sewers, HSG A
* 779,709	36	*1/3 acre lots, 30% imp, HSG A
327,334	60	Woods, Fair, HSG B
49,414	69	Pasture/grassland/range, Fair, HSG B
* 169,897	60	*1/3 acre lots, 30% imp, HSG B
3,964,046	44	Weighted Average
3,679,164		92.81% Pervious Area
284,882		7.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.8	300	0.0600	0.13		Sheet Flow, DOWN FORESTED HILLSIDE
					Woods: Light underbrush n= 0.400 P2= 2.24"
72.1	5,246	0.0300	1.21		Shallow Concentrated Flow, WINDING THROUGH VALLEYS
					Short Grass Pasture Kv= 7.0 fps
111.9	5,546	Total			

Summary for Subcatchment WP1b: Pre-Development Watershed Area 1b

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
 Routed to Link 1L : COMBINED OUTFLOW WEST

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
407,380	30	Woods, Good, HSG A
313,744	30	Meadow, non-grazed, HSG A
3,069	55	Woods, Good, HSG B
724,193	30	Weighted Average
724,193		100.00% Pervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.8	300	0.0600	0.13		Sheet Flow, DOWN FORESTED HILLSIDE Woods: Light underbrush n= 0.400 P2= 2.24"
72.1	5,246	0.0300	1.21		Shallow Concentrated Flow, WINDING THROUGH VALLEYS Short Grass Pasture Kv= 7.0 fps
111.9	5,546	Total			

Summary for Subcatchment WP1c: Unchanged Area AD4e-f

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
 Routed to Link 1L : COMBINED OUTFLOW WEST

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
126,188	30	Woods, Good, HSG A
13,370	57	1/3 acre lots, 30% imp, HSG A
139,558	33	Weighted Average
135,547		97.13% Pervious Area
4,011		2.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
44.7	100	0.0200	0.04		Sheet Flow, FROM TOP OF WOODLAND Woods: Dense underbrush n= 0.800 P2= 2.24"
1.7	203	0.1500	1.94		Shallow Concentrated Flow, THROUGH WOODS Woodland Kv= 5.0 fps
1.3	123	0.0490	1.55		Shallow Concentrated Flow, THROUGH YARD Short Grass Pasture Kv= 7.0 fps
1.8	397	0.0153	3.67	6.89	Trap/Vee/Rect Channel Flow, DITCH Bot.W=2.00' D=0.50' Z= 4.0 & 3.0 ' Top.W=5.50' n= 0.024
49.5	823	Total			

Summary for Subcatchment WP2a: Unchanged Watershed Area W2a

Runoff = 0.26 cfs @ 12.45 hrs, Volume= 0.041 af, Depth= 0.71"
 Routed to Link 1L : COMBINED OUTFLOW WEST

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
* 30,019	60	*1/3 acre lots, 30% imp, HSG B
21,013		70.00% Pervious Area
9,006		30.00% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.8	300	0.0600	0.13		Sheet Flow, DOWN FORESTED HILLSIDE Woods: Light underbrush n= 0.400 P2= 2.24"

Summary for Subcatchment WP2b: Pre-Development Watershed Area W2b

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
 Routed to Link 1L : COMBINED OUTFLOW WEST

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
116,908	30	Woods, Good, HSG A
29,712	30	Meadow, non-grazed, HSG A
146,620	30	Weighted Average
146,620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.8	300	0.0600	0.13		Sheet Flow, across meadow/woods Woods: Light underbrush n= 0.400 P2= 2.24"

Summary for Subcatchment WP3: Pre-Development Watershed Area W3

Runoff = 0.00 cfs @ 18.39 hrs, Volume= 0.002 af, Depth= 0.04"
 Routed to Link 1L : COMBINED OUTFLOW WEST

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
19,999	30	Woods, Good, HSG A
4,100	83	Paved roads w/open ditches, 50% imp, HSG A
24,099	39	Weighted Average
22,049		91.49% Pervious Area
2,050		8.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry, Direct Entry

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Summary for Subcatchment WP4: Pre-Development Watershed Area W4

Runoff = 0.11 cfs @ 12.14 hrs, Volume= 0.016 af, Depth= 0.33"
 Routed to Link 1L : COMBINED OUTFLOW WEST

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
15,288	30	Woods, Good, HSG A
9,768	83	Paved roads w/open ditches, 50% imp, HSG A
25,056	51	Weighted Average
20,172		80.51% Pervious Area
4,884		19.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry, Direct Entry

Summary for Link 1L: COMBINED OUTFLOW WEST

Inflow Area = 116.014 ac, 6.03% Impervious, Inflow Depth = 0.11" for 25-Year event
 Inflow = 1.33 cfs @ 15.04 hrs, Volume= 1.033 af
 Primary = 1.33 cfs @ 15.04 hrs, Volume= 1.033 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

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BIRMLEY HILLS SITE CONDOMINIUM

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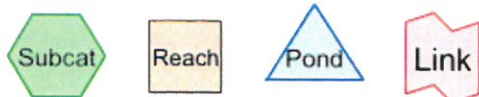
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- 5 Subcat WP1b: Pre-Development Watershed Area 1b
- 6 Subcat WP1c: Unchanged Area AD4e-f
- 6 Subcat WP2a: Unchanged Watershed Area W2a
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Routing Diagram for 22016 BIRMLEY HILLS DEVELOPED
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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	25-Year	Type II 24-hr		Default	24.00	1	3.89	2

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Type II 24-hr 25-Year Rainfall=3.89"

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Time span=0.00-200.00 hrs, dt=0.05 hrs, 4001 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment AD10:	Runoff Area=41,321 sf 20.00% Impervious Runoff Depth=0.33" Tc=15.0 min CN=51 Runoff=0.18 cfs 0.026 af
Subcatchment AD1a:	Runoff Area=91,393 sf 30.00% Impervious Runoff Depth=0.57" Tc=15.0 min CN=57 Runoff=1.11 cfs 0.100 af
Subcatchment AD1b:	Runoff Area=6,448 sf 100.00% Impervious Runoff Depth=3.66" Tc=15.0 min CN=98 Runoff=0.61 cfs 0.045 af
Subcatchment AD2a:	Runoff Area=86,887 sf 30.00% Impervious Runoff Depth=0.57" Tc=15.0 min CN=57 Runoff=1.05 cfs 0.095 af
Subcatchment AD2b:	Runoff Area=59,060 sf 30.00% Impervious Runoff Depth=0.57" Tc=15.0 min CN=57 Runoff=0.71 cfs 0.065 af
Subcatchment AD2c:	Runoff Area=19,495 sf 100.00% Impervious Runoff Depth=3.66" Tc=15.0 min CN=98 Runoff=1.85 cfs 0.136 af
Subcatchment AD3a:	Runoff Area=80,158 sf 30.00% Impervious Runoff Depth=0.57" Tc=15.0 min CN=57 Runoff=0.97 cfs 0.088 af
Subcatchment AD3b:	Runoff Area=9,125 sf 100.00% Impervious Runoff Depth=3.66" Tc=15.0 min CN=98 Runoff=0.87 cfs 0.064 af
Subcatchment AD4a-d: Area AD4a-d	Runoff Area=361,088 sf 25.31% Impervious Runoff Depth=0.33" Tc=15.0 min UI Adjusted CN=51 Runoff=1.56 cfs 0.231 af
Subcatchment AD5a-b: Area AD5a-b	Runoff Area=23,950 sf 35.37% Impervious Runoff Depth=0.71" Tc=15.0 min CN=60 Runoff=0.40 cfs 0.032 af
Subcatchment AD7+AD6: Area AD7, AD6	Runoff Area=26,325 sf 34.70% Impervious Runoff Depth=0.71" Tc=15.0 min CN=60 Runoff=0.44 cfs 0.036 af
Subcatchment AD8a-b: Area AD8a-b	Runoff Area=66,931 sf 31.50% Impervious Runoff Depth=0.62" Tc=15.0 min CN=58 Runoff=0.91 cfs 0.079 af
Subcatchment AD9:	Runoff Area=32,828 sf 30.00% Impervious Runoff Depth=0.57" Tc=15.0 min CN=57 Runoff=0.40 cfs 0.036 af
Subcatchment AD9b:	Runoff Area=15,425 sf 100.00% Impervious Runoff Depth=3.66" Tc=15.0 min CN=98 Runoff=1.47 cfs 0.108 af
Subcatchment WP1a: Unchanged	Runoff Area=3,964,046 sf 7.19% Impervious Runoff Depth=0.13" Flow Length=5,546' Tc=111.9 min CN=44 Runoff=1.28 cfs 0.974 af
Subcatchment WP1c: Unchanged Area	Runoff Area=139,558 sf 2.87% Impervious Runoff Depth=0.00" Flow Length=823' Tc=49.5 min CN=33 Runoff=0.00 cfs 0.000 af

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Subcatchment WP2a: UnchangedRunoff Area=30,019 sf 30.00% Impervious Runoff Depth=0.71"
Flow Length=300' Slope=0.0600 '/' Tc=39.8 min CN=60 Runoff=0.26 cfs 0.041 af**Reach R1: DITCH R1**Avg. Flow Depth=0.34' Max Vel=4.03 fps Inflow=4.29 cfs 0.401 af
n=0.024 L=145.0' S=0.0285 '/' Capacity=198.76 cfs Outflow=4.30 cfs 0.401 af**Reach R2: DITCH R2**Avg. Flow Depth=0.25' Max Vel=4.74 fps Inflow=3.53 cfs 0.296 af
n=0.024 L=344.0' S=0.0535 '/' Capacity=272.45 cfs Outflow=3.51 cfs 0.296 af**Reach R3: DITCH R3**Avg. Flow Depth=0.24' Max Vel=2.52 fps Inflow=1.80 cfs 0.151 af
n=0.024 L=325.0' S=0.0160 '/' Capacity=149.11 cfs Outflow=1.75 cfs 0.151 af**Reach R4: DITCH R4**Avg. Flow Depth=0.22' Max Vel=2.42 fps Inflow=1.56 cfs 1.205 af
n=0.024 L=640.0' S=0.0160 '/' Capacity=148.75 cfs Outflow=1.52 cfs 1.205 af**Reach R5: DITCH R5**Avg. Flow Depth=0.17' Max Vel=3.48 fps Inflow=1.47 cfs 0.210 af
n=0.024 L=82.0' S=0.0448 '/' Capacity=222.28 cfs Outflow=1.47 cfs 0.210 af**Reach T1: TIP-UP GUTTER**Avg. Flow Depth=0.15' Max Vel=4.90 fps Inflow=2.84 cfs 0.231 af
n=0.013 L=330.0' S=0.0604 '/' Capacity=10.64 cfs Outflow=2.82 cfs 0.231 af**Reach T2: TIP-UP GUTTER**Avg. Flow Depth=0.14' Max Vel=2.88 fps Inflow=1.47 cfs 0.108 af
n=0.013 L=296.0' S=0.0230 '/' Capacity=6.57 cfs Outflow=1.44 cfs 0.108 af**Pond B1: BASIN 1**Peak Elev=733.73' Storage=1,807 cf Inflow=4.30 cfs 0.401 af
Discarded=0.14 cfs 0.111 af Primary=3.82 cfs 0.291 af Secondary=0.00 cfs 0.000 af Outflow=3.96 cfs 0.401 af**Pond B2A: Forebay Basin B2A**Peak Elev=736.62' Storage=4,079 cf Inflow=1.52 cfs 1.205 af
Discarded=0.26 cfs 0.384 af Primary=1.26 cfs 0.822 af Outflow=1.52 cfs 1.205 af**Pond B2B: DETENTION BASIN 1**Peak Elev=733.00' Storage=5,207 cf Inflow=3.82 cfs 1.113 af
Discarded=0.19 cfs 0.295 af Primary=1.33 cfs 0.817 af Secondary=0.00 cfs 0.000 af Outflow=1.53 cfs 1.113 af**Pond B3: DITCH R3 END**Peak Elev=740.80' Storage=3,738 cf Inflow=5.26 cfs 0.447 af
Discarded=0.22 cfs 0.191 af Primary=3.18 cfs 0.256 af Outflow=3.40 cfs 0.447 af**Pond B4: BASIN B4**Peak Elev=768.29' Storage=2,894 cf Inflow=1.47 cfs 0.210 af
Discarded=0.17 cfs 0.182 af Primary=0.55 cfs 0.028 af Outflow=0.72 cfs 0.210 af**Pond B5: BASIN B5**Peak Elev=775.04' Storage=1,192 cf Inflow=1.83 cfs 0.144 af
Discarded=0.09 cfs 0.012 af Primary=0.61 cfs 0.131 af Outflow=0.70 cfs 0.144 af**Link 1L: COMBINED OUTFLOW WEST**Inflow=1.10 cfs 0.164 af
Primary=1.10 cfs 0.164 af**Link 2L: COMBINED OUTFLOW WHOLE WATERSHED**Inflow=2.25 cfs 0.981 af
Primary=2.25 cfs 0.981 afTotal Runoff Area = 116.025 ac Runoff Volume = 2.156 af Average Runoff Depth = 0.22"
88.29% Pervious = 102.439 ac 11.71% Impervious = 13.587 ac

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Summary for Subcatchment AD10:

Runoff = 0.18 cfs @ 12.14 hrs, Volume= 0.026 af, Depth= 0.33"
 Routed to Link 1L : COMBINED OUTFLOW WEST

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
41,321	51	1 acre lots, 20% imp, HSG A
33,057		80.00% Pervious Area
8,264		20.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry, MIN TC

Summary for Subcatchment AD1a:

Runoff = 1.11 cfs @ 12.11 hrs, Volume= 0.100 af, Depth= 0.57"
 Routed to Reach R1 : DITCH R1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
91,393	57	1/3 acre lots, 30% imp, HSG A
63,975		70.00% Pervious Area
27,418		30.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry, MINIMUM DURATION

Summary for Subcatchment AD1b:

Runoff = 0.61 cfs @ 12.06 hrs, Volume= 0.045 af, Depth= 3.66"
 Routed to Reach R1 : DITCH R1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
6,448	98	Paved roads w/curbs & sewers, HSG A
6,448		100.00% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry, MIN DURATION

Summary for Subcatchment AD2a:

Runoff = 1.05 cfs @ 12.11 hrs, Volume= 0.095 af, Depth= 0.57"
 Routed to Reach T1 : TIP-UP GUTTER

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
86,887	57	1/3 acre lots, 30% imp, HSG A
60,821		70.00% Pervious Area
26,066		30.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry, MINIMUM DURATION

Summary for Subcatchment AD2b:

Runoff = 0.71 cfs @ 12.11 hrs, Volume= 0.065 af, Depth= 0.57"
 Routed to Reach R2 : DITCH R2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
59,060	57	1/3 acre lots, 30% imp, HSG A
41,342		70.00% Pervious Area
17,718		30.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry, MINIMUM DURATION

Summary for Subcatchment AD2c:

Runoff = 1.85 cfs @ 12.06 hrs, Volume= 0.136 af, Depth= 3.66"
 Routed to Reach T1 : TIP-UP GUTTER

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

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Area (sf)	CN	Description
19,495	98	Paved roads w/curbs & sewers, HSG A
19,495		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry, MIN DURATION

Summary for Subcatchment AD3a:

Runoff = 0.97 cfs @ 12.11 hrs, Volume= 0.088 af, Depth= 0.57"
 Routed to Reach R3 : DITCH R3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
80,158	57	1/3 acre lots, 30% imp, HSG A
56,111		70.00% Pervious Area
24,047		30.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry, MINIMUM DURATION

Summary for Subcatchment AD3b:

Runoff = 0.87 cfs @ 12.06 hrs, Volume= 0.064 af, Depth= 3.66"
 Routed to Reach R3 : DITCH R3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
9,125	98	Paved roads w/curbs & sewers, HSG A
9,125		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry, MIN DURATION

Summary for Subcatchment AD4a-d: Area AD4a-d

Runoff = 1.56 cfs @ 12.14 hrs, Volume= 0.231 af, Depth= 0.33"
 Routed to Reach R4 : DITCH R4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
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Area (sf)	CN	Adj	Description
251,898	57		1/3 acre lots, 30% imp, HSG A
15,821	98		Unconnected pavement, HSG A
90,300	30		Woods, Good, HSG A
3,069	55		Woods, Good, HSG B
361,088	52	51	Weighted Average, UI Adjusted
269,698			74.69% Pervious Area
91,390			25.31% Impervious Area
15,821			17.31% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry, MIN TC

Summary for Subcatchment AD5a-b: Area AD5a-b

Runoff = 0.40 cfs @ 12.10 hrs, Volume= 0.032 af, Depth= 0.71"
 Routed to Link 1L : COMBINED OUTFLOW WEST

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
22,112	57	1/3 acre lots, 30% imp, HSG A
1,838	98	Unconnected pavement, HSG A
23,950	60	Weighted Average
15,478		64.63% Pervious Area
8,472		35.37% Impervious Area
1,838		21.70% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry, Direct Entry

Summary for Subcatchment AD7+AD6: Area AD7, AD6

Runoff = 0.44 cfs @ 12.10 hrs, Volume= 0.036 af, Depth= 0.71"
 Routed to Link 1L : COMBINED OUTFLOW WEST

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

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Area (sf)	CN	Description
19,768	57	1/3 acre lots, 30% imp, HSG A
1,766	98	Unconnected pavement, HSG A
4,791	57	1/3 acre lots, 30% imp, HSG A
26,325	60	Weighted Average
17,191		65.30% Pervious Area
9,134		34.70% Impervious Area
1,766		19.33% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry, Direct Entry

Summary for Subcatchment AD8a-b: Area AD8a-b

Runoff = 0.91 cfs @ 12.11 hrs, Volume= 0.079 af, Depth= 0.62"
 Routed to Reach R5 : DITCH R5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
65,496	57	1/3 acre lots, 30% imp, HSG A
1,435	98	Unconnected pavement, HSG A
66,931	58	Weighted Average
45,847		68.50% Pervious Area
21,084		31.50% Impervious Area
1,435		6.81% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry, MIN TC

Summary for Subcatchment AD9:

Runoff = 0.40 cfs @ 12.11 hrs, Volume= 0.036 af, Depth= 0.57"
 Routed to Pond B5 : BASIN B5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
32,828	57	1/3 acre lots, 30% imp, HSG A
22,980		70.00% Pervious Area
9,848		30.00% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry, MINIMUM DURATION

Summary for Subcatchment AD9b:

Runoff = 1.47 cfs @ 12.06 hrs, Volume= 0.108 af, Depth= 3.66"
 Routed to Reach T2 : TIP-UP GUTTER

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
15,425	98	Paved roads w/curbs & sewers, HSG A
15,425		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry, MIN DURATION

Summary for Subcatchment WP1a: Unchanged Watershed Area W1a

Runoff = 1.28 cfs @ 15.05 hrs, Volume= 0.974 af, Depth= 0.13"
 Routed to Reach R4 : DITCH R4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
1,216,417	36	Woods, Fair, HSG A
1,349,870	49	Pasture/grassland/range, Fair, HSG A
* 71,405	36	*Paved roads w/curbs & sewers, HSG A
* 779,709	36	*1/3 acre lots, 30% imp, HSG A
327,334	60	Woods, Fair, HSG B
49,414	69	Pasture/grassland/range, Fair, HSG B
* 169,897	60	*1/3 acre lots, 30% imp, HSG B
3,964,046	44	Weighted Average
3,679,164		92.81% Pervious Area
284,882		7.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.8	300	0.0600	0.13		Sheet Flow, DOWN FORESTED HILLSIDE
					Woods: Light underbrush n= 0.400 P2= 2.24"
72.1	5,246	0.0300	1.21		Shallow Concentrated Flow, WINDING THROUGH VALLEYS
					Short Grass Pasture Kv= 7.0 fps
111.9	5,546	Total			

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Summary for Subcatchment WP1c: Unchanged Area AD4e-f

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
 Routed to Reach R4 : DITCH R4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
126,188	30	Woods, Good, HSG A
13,370	57	1/3 acre lots, 30% imp, HSG A
139,558	33	Weighted Average
135,547		97.13% Pervious Area
4,011		2.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
44.7	100	0.0200	0.04		Sheet Flow, FROM TOP OF WOODLAND
					Woods: Dense underbrush n= 0.800 P2= 2.24"
1.7	203	0.1500	1.94		Shallow Concentrated Flow, THROUGH WOODS
					Woodland Kv= 5.0 fps
1.3	123	0.0490	1.55		Shallow Concentrated Flow, THROUGH YARD
					Short Grass Pasture Kv= 7.0 fps
1.8	397	0.0153	3.67	6.89	Trap/Vee/Rect Channel Flow, DITCH
					Bot.W=2.00' D=0.50' Z= 4.0 & 3.0 ' Top.W=5.50'
					n= 0.024
49.5	823	Total			

Summary for Subcatchment WP2a: Unchanged Watershed Area W2a

Runoff = 0.26 cfs @ 12.45 hrs, Volume= 0.041 af, Depth= 0.71"
 Routed to Link 1L : COMBINED OUTFLOW WEST

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-Year Rainfall=3.89"

Area (sf)	CN	Description
* 30,019	60	*1/3 acre lots, 30% imp, HSG B
21,013		70.00% Pervious Area
9,006		30.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.8	300	0.0600	0.13		Sheet Flow, DOWN FORESTED HILLSIDE
					Woods: Light underbrush n= 0.400 P2= 2.24"

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Summary for Reach R1: DITCH R1

Inflow Area = 8.094 ac, 36.96% Impervious, Inflow Depth = 0.60" for 25-Year event
Inflow = 4.29 cfs @ 12.19 hrs, Volume= 0.401 af
Outflow = 4.30 cfs @ 12.20 hrs, Volume= 0.401 af, Atten= 0%, Lag= 0.5 min
Routed to Pond B1 : BASIN 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.03 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.18 fps, Avg. Travel Time= 2.0 min

Peak Storage= 155 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.34', Surface Width= 4.35'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 198.76 cfs

2.00' x 2.00' deep channel, n= 0.024
Side Slope Z-value= 3.0 4.0 ' / ' Top Width= 16.00'
Length= 145.0' Slope= 0.0285 ' / '
Inlet Invert= 738.68', Outlet Invert= 734.55'



Summary for Reach R2: DITCH R2

Inflow Area = 3.798 ac, 38.25% Impervious, Inflow Depth = 0.93" for 25-Year event
Inflow = 3.53 cfs @ 12.10 hrs, Volume= 0.296 af
Outflow = 3.51 cfs @ 12.12 hrs, Volume= 0.296 af, Atten= 1%, Lag= 0.9 min
Routed to Pond B3 : DITCH R3 END

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.74 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.46 fps, Avg. Travel Time= 3.9 min

Peak Storage= 254 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.25', Surface Width= 3.78'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 272.45 cfs

2.00' x 2.00' deep channel, n= 0.024
Side Slope Z-value= 3.0 4.0 ' / ' Top Width= 16.00'
Length= 344.0' Slope= 0.0535 ' / '
Inlet Invert= 760.41', Outlet Invert= 742.00'

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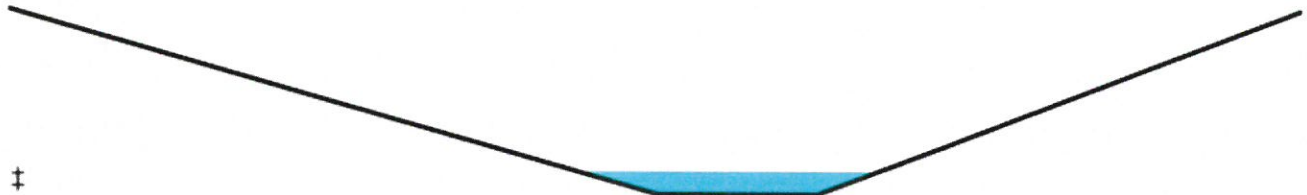
Summary for Reach R3: DITCH R3

Inflow Area = 2.050 ac, 37.15% Impervious, Inflow Depth = 0.89" for 25-Year event
Inflow = 1.80 cfs @ 12.09 hrs, Volume= 0.151 af
Outflow = 1.75 cfs @ 12.12 hrs, Volume= 0.151 af, Atten= 2%, Lag= 1.5 min
Routed to Pond B3 : DITCH R3 END

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.52 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.78 fps, Avg. Travel Time= 6.9 min

Peak Storage= 225 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.24', Surface Width= 3.70'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 149.11 cfs

2.00' x 2.00' deep channel, n= 0.024
Side Slope Z-value= 4.0 3.0 ' ' Top Width= 16.00'
Length= 325.0' Slope= 0.0160 ' '
Inlet Invert= 747.21', Outlet Invert= 742.00'



Summary for Reach R4: DITCH R4

Inflow Area = 102.495 ac, 8.52% Impervious, Inflow Depth = 0.14" for 25-Year event
Inflow = 1.56 cfs @ 12.14 hrs, Volume= 1.205 af
Outflow = 1.52 cfs @ 14.96 hrs, Volume= 1.205 af, Atten= 3%, Lag= 169.1 min
Routed to Pond B2A : Forebay Basin B2A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.42 fps, Min. Travel Time= 4.4 min
Avg. Velocity = 1.74 fps, Avg. Travel Time= 6.1 min

Peak Storage= 401 cf @ 14.96 hrs
Average Depth at Peak Storage= 0.22', Surface Width= 3.57'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 148.75 cfs

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2.00' x 2.00' deep channel, $n = 0.024$
Side Slope Z-value= 4.0 3.0 ' ' Top Width= 16.00'
Length= 640.0' Slope= 0.0160 ' '
Inlet Invert= 747.21', Outlet Invert= 737.00'



Summary for Reach R5: DITCH R5

Inflow Area = 2.644 ac, 40.25% Impervious, Inflow Depth = 0.95" for 25-Year event
Inflow = 1.47 cfs @ 12.12 hrs, Volume= 0.210 af
Outflow = 1.47 cfs @ 12.12 hrs, Volume= 0.210 af, Atten= 0%, Lag= 0.2 min
Routed to Pond B4 : BASIN B4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.48 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.30 fps, Avg. Travel Time= 1.0 min

Peak Storage= 35 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.17', Surface Width= 3.01'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 222.28 cfs

2.00' x 2.00' deep channel, $n = 0.024$
Side Slope Z-value= 3.0 ' ' Top Width= 14.00'
Length= 82.0' Slope= 0.0448 ' '
Inlet Invert= 772.42', Outlet Invert= 768.75'



Summary for Reach T1: TIP-UP GUTTER

Inflow Area = 2.442 ac, 42.83% Impervious, Inflow Depth = 1.14" for 25-Year event
Inflow = 2.84 cfs @ 12.08 hrs, Volume= 0.231 af
Outflow = 2.82 cfs @ 12.10 hrs, Volume= 0.231 af, Atten= 0%, Lag= 0.9 min
Routed to Reach R2 : DITCH R2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.90 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.86 fps, Avg. Travel Time= 3.0 min

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Peak Storage= 190 cf @ 12.10 hrs

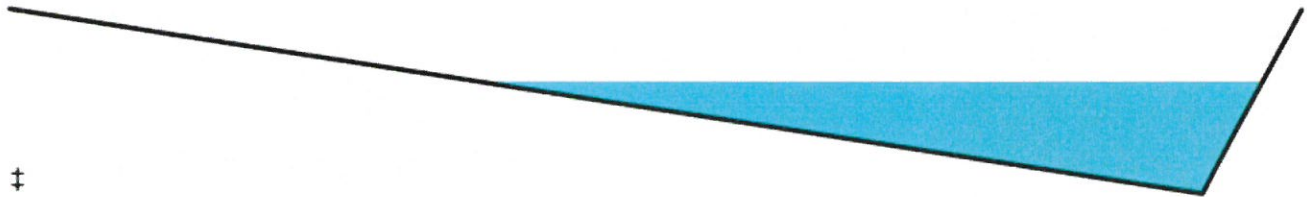
Average Depth at Peak Storage= 0.15' , Surface Width= 7.90'

Bank-Full Depth= 0.24' Flow Area= 1.6 sf, Capacity= 10.64 cfs

Custom cross-section, Length= 330.0' Slope= 0.0604 '/'

Constant n= 0.013

Inlet Invert= 782.91', Outlet Invert= 762.99'



‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	0.00	0.00
6.00	-0.12	0.12
12.00	-0.24	0.24
13.00	0.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Width (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0.0	0	0.00
0.12	0.4	6.5	6.5	129	1.68
0.24	1.6	13.0	13.0	515	10.64

Summary for Reach T2: TIP-UP GUTTER

Inflow Area = 0.354 ac, 100.00% Impervious, Inflow Depth = 3.66" for 25-Year event

Inflow = 1.47 cfs @ 12.06 hrs, Volume= 0.108 af

Outflow = 1.44 cfs @ 12.08 hrs, Volume= 0.108 af, Atten= 2%, Lag= 1.4 min

Routed to Pond B5 : BASIN B5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.88 fps, Min. Travel Time= 1.7 min

Avg. Velocity = 1.06 fps, Avg. Travel Time= 4.7 min

Peak Storage= 148 cf @ 12.08 hrs

Average Depth at Peak Storage= 0.14' , Surface Width= 7.36'

Bank-Full Depth= 0.24' Flow Area= 1.6 sf, Capacity= 6.57 cfs

Custom cross-section, Length= 296.0' Slope= 0.0230 '/'

Constant n= 0.013

Inlet Invert= 782.91', Outlet Invert= 776.10'

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‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	0.00	0.00
6.00	-0.12	0.12
12.00	-0.24	0.24
13.00	0.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Width (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0.0	0	0.00
0.12	0.4	6.5	6.5	115	1.03
0.24	1.6	13.0	13.0	462	6.57

Summary for Pond B1: BASIN 1

Inflow Area = 8.094 ac, 36.96% Impervious, Inflow Depth = 0.60" for 25-Year event
 Inflow = 4.30 cfs @ 12.20 hrs, Volume= 0.401 af
 Outflow = 3.96 cfs @ 12.29 hrs, Volume= 0.401 af, Atten= 8%, Lag= 5.5 min
 Discarded = 0.14 cfs @ 12.29 hrs, Volume= 0.111 af
 Primary = 3.82 cfs @ 12.29 hrs, Volume= 0.291 af
 Routed to Pond B2B : DETENTION BASIN 1
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Peak Elev= 733.73' @ 12.29 hrs Surf.Area= 1,972 sf Storage= 1,807 cf

Plug-Flow detention time= 33.3 min calculated for 0.401 af (100% of inflow)
 Center-of-Mass det. time= 33.3 min (872.3 - 838.9)

Volume	Invert	Avail.Storage	Storage Description
#1	732.00'	3,866 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
732.00	16	0	0
732.55	732	206	206
733.00	1,216	438	644
734.00	2,251	1,734	2,378
734.55	3,160	1,488	3,866

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Device	Routing	Invert	Outlet Devices
#1	Primary	732.90'	24.0" Round Culvert L= 50.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 732.90' / 732.00' S= 0.0180 ' S= 0.0180 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Discarded	732.00'	3.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 680.00'
#3	Secondary	734.05'	2.0' long + 3.0 ' SideZ (Profile 9) Broad-Crested Rectangular Weir Head (feet) 1.97 2.46 2.95 3.94 4.92 Coef. (English) 3.55 3.55 3.57 3.60 3.66

Discarded OutFlow Max=0.14 cfs @ 12.29 hrs HW=733.73' (Free Discharge)↳ **2=Exfiltration** (Controls 0.14 cfs)**Primary OutFlow** Max=3.80 cfs @ 12.29 hrs HW=733.73' TW=731.62' (Dynamic Tailwater)↳ **1=Culvert** (Inlet Controls 3.80 cfs @ 3.10 fps)**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=732.00' (Free Discharge)↳ **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)**Summary for Pond B2A: Forebay Basin B2A**

Inflow Area = 102.495 ac, 8.52% Impervious, Inflow Depth = 0.14" for 25-Year event
 Inflow = 1.52 cfs @ 14.96 hrs, Volume= 1.205 af
 Outflow = 1.52 cfs @ 15.04 hrs, Volume= 1.205 af, Atten= 0%, Lag= 4.8 min
 Discarded = 0.26 cfs @ 15.04 hrs, Volume= 0.384 af
 Primary = 1.26 cfs @ 15.04 hrs, Volume= 0.822 af
 Routed to Pond B2B : DETENTION BASIN 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Peak Elev= 736.62' @ 15.04 hrs Surf.Area= 3,685 sf Storage= 4,079 cf

Plug-Flow detention time= 75.7 min calculated for 1.205 af (100% of inflow)
 Center-of-Mass det. time= 75.8 min (1,179.6 - 1,103.9)

Volume	Invert	Avail.Storage	Storage Description
#1	734.00'	5,614 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
734.00	80	0	0
735.00	912	496	496
736.00	2,441	1,677	2,173
736.50	3,441	1,471	3,643
737.00	4,441	1,971	5,614

Device	Routing	Invert	Outlet Devices
#1	Primary	736.50'	8.0' long + 3.0 ' SideZ (Profile 9) Broad-Crested Rectangular Weir Head (feet) 1.97 2.46 2.95 3.94 4.92 Coef. (English) 3.55 3.55 3.57 3.60 3.66

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#2 Discarded 734.00' **3.000 in/hr Exfiltration over Surface area**
 Conductivity to Groundwater Elevation = 680.00'

Discarded OutFlow Max=0.26 cfs @ 15.04 hrs HW=736.62' (Free Discharge)

↳ **2=Exfiltration** (Controls 0.26 cfs)

Primary OutFlow Max=1.26 cfs @ 15.04 hrs HW=736.62' TW=732.98' (Dynamic Tailwater)

↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 1.26 cfs @ 1.23 fps)

Summary for Pond B2B: DETENTION BASIN 1

Inflow Area = 110.589 ac, 10.60% Impervious, Inflow Depth = 0.12" for 25-Year event
 Inflow = 3.82 cfs @ 12.29 hrs, Volume= 1.113 af
 Outflow = 1.53 cfs @ 12.74 hrs, Volume= 1.113 af, Atten= 60%, Lag= 27.2 min
 Discarded = 0.19 cfs @ 12.74 hrs, Volume= 0.295 af
 Primary = 1.33 cfs @ 12.74 hrs, Volume= 0.817 af
 Routed to Link 2L : COMBINED OUTFLOW WHOLE WATERSHED
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Link 2L : COMBINED OUTFLOW WHOLE WATERSHED

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Peak Elev= 733.00' @ 12.74 hrs Surf.Area= 2,696 sf Storage= 5,207 cf

Plug-Flow detention time= 97.8 min calculated for 1.112 af (100% of inflow)

Center-of-Mass det. time= 97.9 min (1,133.1 - 1,035.2)

Volume	Invert	Avail.Storage	Storage Description
#1	729.50'	10,364 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
729.50	10	0	0
730.00	696	177	177
731.00	1,308	1,002	1,179
732.00	2,030	1,669	2,848
733.00	2,697	2,364	5,211
734.55	3,952	5,153	10,364

Device	Routing	Invert	Outlet Devices
#1	Primary	732.29'	15.0" Round Culvert L= 24.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 732.29' / 732.05' S= 0.0100 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Secondary	733.55'	5.0' long + 3.0 ' SideZ x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Discarded	729.50'	3.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 680.00'

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#4 Device 1 732.32' **10.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
 #5 Device 1 733.30' **24.0" Horiz. Orifice/Grate** C= 0.600
 Limited to weir flow at low heads

Discarded OutFlow Max=0.19 cfs @ 12.74 hrs HW=733.00' (Free Discharge)↳ **3=Exfiltration** (Controls 0.19 cfs)**Primary OutFlow** Max=1.33 cfs @ 12.74 hrs HW=733.00' TW=0.00' (Dynamic Tailwater)↳ **1=Culvert** (Passes 1.33 cfs of 1.61 cfs potential flow)↳ **4=Orifice/Grate** (Orifice Controls 1.33 cfs @ 2.80 fps)↳ **5=Orifice/Grate** (Controls 0.00 cfs)**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=729.50' TW=0.00' (Dynamic Tailwater)↳ **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)**Summary for Pond B3: DITCH R3 END**

Inflow Area = 5.848 ac, 37.86% Impervious, Inflow Depth = 0.92" for 25-Year event
 Inflow = 5.26 cfs @ 12.12 hrs, Volume= 0.447 af
 Outflow = 3.40 cfs @ 12.25 hrs, Volume= 0.447 af, Atten= 35%, Lag= 7.9 min
 Discarded = 0.22 cfs @ 12.25 hrs, Volume= 0.191 af
 Primary = 3.18 cfs @ 12.25 hrs, Volume= 0.256 af
 Routed to Reach R1 : DITCH R1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Peak Elev= 740.80' @ 12.25 hrs Surf.Area= 3,094 sf Storage= 3,738 cf

Plug-Flow detention time= 75.8 min calculated for 0.447 af (100% of inflow)

Center-of-Mass det. time= 75.9 min (926.2 - 850.3)

Volume	Invert	Avail.Storage	Storage Description
#1	738.00'	8,597 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
738.00	10	0	0
739.00	769	390	390
740.00	1,926	1,348	1,737
741.00	3,390	2,658	4,395
742.00	5,013	4,202	8,597

Device	Routing	Invert	Outlet Devices
#1	Primary	739.71'	15.0" Round Culvert L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 739.71' / 739.21' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	738.00'	3.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 680.00'

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Discarded OutFlow Max=0.22 cfs @ 12.25 hrs HW=740.80' (Free Discharge)↳ **2=Exfiltration** (Controls 0.22 cfs)**Primary OutFlow** Max=3.17 cfs @ 12.25 hrs HW=740.80' TW=739.01' (Dynamic Tailwater)↳ **1=Culvert** (Inlet Controls 3.17 cfs @ 2.80 fps)**Summary for Pond B4: BASIN B4**

Inflow Area = 2.644 ac, 40.25% Impervious, Inflow Depth = 0.95" for 25-Year event
 Inflow = 1.47 cfs @ 12.12 hrs, Volume= 0.210 af
 Outflow = 0.72 cfs @ 12.77 hrs, Volume= 0.210 af, Atten= 51%, Lag= 39.1 min
 Discarded = 0.17 cfs @ 12.75 hrs, Volume= 0.182 af
 Primary = 0.55 cfs @ 12.77 hrs, Volume= 0.028 af
 Routed to Link 1L : COMBINED OUTFLOW WEST

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

Peak Elev= 768.29' @ 12.75 hrs Surf.Area= 2,464 sf Storage= 2,894 cf

Plug-Flow detention time= 179.9 min calculated for 0.210 af (100% of inflow)

Center-of-Mass det. time= 180.0 min (1,032.1 - 852.1)

Volume	Invert	Avail.Storage	Storage Description
#1	766.00'	3,442 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
766.00	214	0	0
767.00	1,064	639	639
768.00	2,123	1,594	2,233
768.50	2,713	1,209	3,442

Device	Routing	Invert	Outlet Devices
#1	Discarded	766.00'	3.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 680.00'
#2	Primary	768.25'	20.0' long + 3.0 ' SideZ (Profile 9) Broad-Crested Rectangular Weir Head (feet) 1.97 2.46 2.95 3.94 4.92 Coef. (English) 3.55 3.55 3.57 3.60 3.66

Discarded OutFlow Max=0.17 cfs @ 12.75 hrs HW=768.29' (Free Discharge)↳ **1=Exfiltration** (Controls 0.17 cfs)**Primary OutFlow** Max=0.54 cfs @ 12.77 hrs HW=768.29' TW=0.00' (Dynamic Tailwater)↳ **2=Broad-Crested Rectangular Weir** (Weir Controls 0.54 cfs @ 0.70 fps)

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Summary for Pond B5: BASIN B5

Inflow Area = 1.108 ac, 52.38% Impervious, Inflow Depth = 1.56" for 25-Year event
 Inflow = 1.83 cfs @ 12.09 hrs, Volume= 0.144 af
 Outflow = 0.70 cfs @ 12.32 hrs, Volume= 0.144 af, Atten= 62%, Lag= 13.5 min
 Discarded = 0.09 cfs @ 12.32 hrs, Volume= 0.012 af
 Primary = 0.61 cfs @ 12.32 hrs, Volume= 0.131 af
 Routed to Reach R5 : DITCH R5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs
 Peak Elev= 775.04' @ 12.32 hrs Surf.Area= 1,260 sf Storage= 1,192 cf

Plug-Flow detention time= 14.8 min calculated for 0.144 af (100% of inflow)
 Center-of-Mass det. time= 14.8 min (814.2 - 799.4)

Volume	Invert	Avail.Storage	Storage Description
#1	771.92'	2,846 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
771.92	16	0	0
773.00	33	26	26
774.00	487	260	286
775.00	1,219	853	1,139
776.00	2,195	1,707	2,846

Device	Routing	Invert	Outlet Devices
#1	Primary	772.92'	18.0" Round Culvert L= 50.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 772.92' / 772.42' S= 0.0100 ' S= 0.0100 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Discarded	771.92'	3.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 680.00'
#3	Device 1	771.92'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.09 cfs @ 12.32 hrs HW=775.04' (Free Discharge)

↳ **2=Exfiltration** (Controls 0.09 cfs)

Primary OutFlow Max=0.61 cfs @ 12.32 hrs HW=775.04' TW=772.56' (Dynamic Tailwater)

↳ **1=Culvert** (Passes 0.61 cfs of 9.65 cfs potential flow)

↳ **3=Orifice/Grate** (Orifice Controls 0.61 cfs @ 7.01 fps)

Summary for Link 1L: COMBINED OUTFLOW WEST

Inflow Area = 5.436 ac, 34.30% Impervious, Inflow Depth = 0.36" for 25-Year event
 Inflow = 1.10 cfs @ 12.12 hrs, Volume= 0.164 af
 Primary = 1.10 cfs @ 12.12 hrs, Volume= 0.164 af, Atten= 0%, Lag= 0.0 min
 Routed to Link 2L : COMBINED OUTFLOW WHOLE WATERSHED

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

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Summary for Link 2L: COMBINED OUTFLOW WHOLE WATERSHED

Inflow Area = 116.025 ac, 11.71% Impervious, Inflow Depth = 0.10" for 25-Year event

Inflow = 2.25 cfs @ 12.75 hrs, Volume= 0.981 af

Primary = 2.25 cfs @ 12.75 hrs, Volume= 0.981 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-200.00 hrs, dt= 0.05 hrs

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GENERAL NOTES

1. THIS CONSTRUCTION PROJECT SHALL AT ALL TIMES AND IN ALL SITUATIONS PROCEED IN A MANNER CONSISTENT WITH THE REQUIREMENTS OF THE GARFIELD TOWNSHIP ZONING ORDINANCE: PART 81. SOIL EROSION AND SEDIMENTATION CONTROL OF THE NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION ACT, 1994 PA 451, THE CURRENT GRAND TRAVERSE COUNTY CONSTRUCTION STANDARDS, AND ALL OTHER APPLICABLE RULES, REGULATIONS AND LAWS OF ANY OTHER AUTHORITY WITH JURISDICTION TO GOVERN SUCH CONSTRUCTION. THE CONTRACTOR SHALL KEEP A COPY OF THOSE REQUIREMENTS AND ALL CONSTRUCTION DOCUMENTS RELATED TO THIS PROJECT ON THE PROJECT AT ALL TIME AND REFERENCE SHALL BE MADE TO THEM FOR PROPER MATERIALS, METHODS, ETC. REGARDING CONSTRUCTION IMPROVEMENTS.
2. THE CONTRACTOR SHALL CHECK THESE PLANS AND FIELD VERIFY EXISTING CONDITIONS PRIOR TO STARTING WORK ON ANY SEGMENT OF THE PROJECT. IF THE CONTRACTOR HAS ANY QUESTIONS OR SUSPECTS THERE IS AN ERROR OR OMISSION WITHIN THE PLANS OR THE CONSTRUCTION STAKES, HE OR SHE SHALL NOT PROCEED UNTIL THE ENGINEER OR HIS OR HER REPRESENTATIVE HAS BEEN FULLY NOTIFIED, HAS RESPONDED, AND HAS SPECIFICALLY STATED THE CONTRACTOR MAY PROCEED.
3. EXISTING PUBLIC UTILITIES AND UNDERGROUND STRUCTURES SUCH AS PIPE LINES, ELECTRIC CONDUITS, SEWER AND WATER ARE IDENTIFIED BY THE BEST KNOWLEDGE OF THE SURVEYOR, HOWEVER, NEITHER THE CORRECTNESS NOR THE COMPLETENESS OF SUCH INFORMATION IS GUARANTEED. PRIOR TO THE START OF ANY WORK ON THE PROJECT, THE CONTRACTOR SHALL NOTIFY THE UTILITY COMPANIES AND MISS DIG.(800) 482-7171. THE CONTRACTOR SHALL ENSURE THAT THE LOCATIONS OF ALL UTILITIES WITHIN THE VICINITY OF THE PROJECT ARE STAKED AND IDENTIFIED PRIOR TO PROCEEDING WITH WORK IN ANY AREA OF THE PROJECT. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE PROTECTION OR RELOCATION OF EXISTING UTILITIES AND STRUCTURES AND SHALL SAVE THOSE UTILITIES AND STRUCTURES HARMLESS FROM DAMAGE, WHETHER PUBLICLY OR PRIVATELY OWNED. THE CONTRACTOR SHALL REPAIR, AT HIS OR HER COST, ANY DAMAGE TO THOSE UTILITIES AND STRUCTURES. UTILITY POLES, ANCHORING CABLES AND UTILITY FOUNDATIONS SHALL NOT BE DISTURBED OR UNDERMINED. CONTRACTOR SHALL COORDINATE WITH THE UTILITY COMPANY AND PROVIDE PROPER SUPPORT OF SUCH UTILITIES IN THE VICINITY OF THE WORK, AND IF NECESSARY, INSTALL TEMPORARY SHEETING OR TRENCH BOXES TO MINIMIZE EXCAVATION LIMITS.
4. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ANY DAMAGE CAUSED TO THIS OR ADJACENT PROPERTY, AND FOR INJURY TO ANY PERSON, OCCURRING DURING OR AS A RESULT OF THE CONSTRUCTION PROCESS, WHETHER SUCH DAMAGE OR INJURY RESULTS FROM ANY ACTION OR LACK OF ACTION BY PRINCIPALS OF THE COMPANY, EMPLOYEES, SUBCONTRACTORS, OR SUPPLIERS. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE LAWS AND REGULATIONS GOVERNING CONSTRUCTION SAFETY. THE CONTRACTOR SHALL ALSO FURNISH AND INSTALL ALL NECESSARY TEMPORARY SAFETY DEVICES, SAFEGUARDS, AND PROTECTIVE EQUIPMENT AND FOLLOW ALL ADVISABLE SAFETY PRACTICES NECESSARY TO PROTECT THE LIFE AND HEALTH OF EMPLOYEES AND THE PUBLIC DURING THE CONSTRUCTION PROCESS. NEITHER THE OWNER OR THE ENGINEER ASSUME ANY LIABILITY FOR MATTERS RELATING TO SAFETY AT THE CONSTRUCTION SITE.
5. ANY DAMAGE TO IMPROVEMENTS NOT CAUSED BY THE OWNER, PRIOR TO FINAL PROJECT ACCEPTANCE BY THE ZONING ADMINISTRATOR AND THE OWNER, SHALL BE REPAIRED OR REPLACED AS NECESSARY TO CONFORM WITH THE DESIGN AT THE EXPENSE OF THE CONTRACTOR.
6. THE CONTRACTOR SHALL NOTIFY THE GRAND TRAVERSE COUNTY CONSTRUCTION SUPERVISOR 3 DAYS PRIOR TO STARTING WORK AND SHALL FIRST PROVIDE ALL NECESSARY NOTICES, OBTAIN ALL REQUIRED PERMITS AND PAY ALL FEES ASSOCIATED WITH SUCCESSFULLY COMPLETING THE CONSTRUCTION PROCESS, INCLUDING ALL PUBLIC INSPECTION FEES.
7. ALL STUMPS, LARGE ROCKS, CONCRETE, SCRAP MATERIALS, TRASH AND OTHER DELETERIOUS MATERIAL SHALL BE REMOVED FROM THE SITE BY THE CONTRACTOR AT NO ADDITIONAL EXPENSE TO THE OWNER.
8. DURING CONSTRUCTION EXPOSE THE MINIMUM AREA OF SOIL FOR THE MINIMUM TIME POSSIBLE. SEE SOIL EROSION AND STORMWATER CONTROL NOTES.
9. THROUGH TRAFFIC ON ADJACENT ROADWAYS SHALL NOT BE INTERRUPTED WITHOUT EXPLICIT PERMISSION FROM, AND COORDINATION WITH THE GRAND TRAVERSE COUNTY ROAD COMMISSION. ALL WORK WITHIN THE COUNTY RIGHT-OF-WAY SHALL BE IN ACCORDANCE WITH THE COUNTY ROAD COMMISSION CONSTRUCTION SPECIFICATIONS AND PERMIT REQUIREMENTS. PAVEMENT CUTS ARE TO BE MADE WITH A SAW, IMMEDIATELY PRIOR TO PAVING.
10. ALL WORK IS TO BE PERFORMED WITHIN THE PROPERTY, WITHIN THE PUBLIC RIGHT-OF-WAY, OR WITHIN ESTABLISHED EASEMENTS. ALL WORK WITHIN EASEMENTS SHALL BE COORDINATED WITH THE EASEMENT HOLDER AND BE IN ACCORDANCE WITH THE LIMITATIONS AND RESTRICTIONS OF THOSE EASEMENTS. ANY WORK OUTSIDE OF THESE LIMITS SHALL BE COORDINATED AND APPROVED BY THE PROPERTY OWNER AFFECTED. DOCUMENTATION OF THIS ARRANGEMENT SHALL BE PROVIDED TO THE ZONING AUTHORITY. ANY DISRUPTION CAUSED TO ADJACENT PROPERTIES OR TO THE PUBLIC RIGHT-OF-WAY SHALL BE PROPERLY RESTORED INCLUDING LAWNS, SIDEWALKS, DRIVEWAYS, PLANTINGS, SIGNS, MAILBOXES, ETC., AT NO ADDITIONAL COST TO THE OWNER.
11. THE CONTRACTOR SHALL PROVIDE ADEQUATE ON-SITE SUPERVISION OF THE WORK AT ALL TIMES DURING THE CONSTRUCTION PROCESS. THERE SHALL BE ONE DESIGNATED ON-SITE SUPERVISOR AVAILABLE WHENEVER CONSTRUCTION IS UNDERWAY WHO HAS THE AUTHORITY TO ACT ON BEHALF OF THE CONTRACTOR.

** ALL ELEVATIONS ARE BASED ON:
NAVD 88 DATUM REFERENCED TO THE TRAVERSE CITY CORS

PUBLIC AUTHORITIES

GARFIELD TOWNSHIP
3848 VETERANS DRIVE
TRAVERSE CITY, MI 49684
Telephone: (231) 941-1620

GRAND TRAVERSE COUNTY D.P.W.
2650 LAFRANIER ROAD
TRAVERSE CITY, MI 49686
Telephone: (231) 995-6039

GRAND TRAVERSE COUNTY ROAD COMMISSION
1881 LAFRANIER ROAD
TRAVERSE CITY, MI 49684
Telephone: (231) 922.4848

GRAND TRAVERSE COUNTY DRAIN COMMISSIONER
2650 LAFRANIER ROAD
TRAVERSE CITY, MI 49686
Telephone: (231) 922.4807

GRAND TRAVERSE COUNTY SOIL EROSION & SEDIMENTATION CONTROL
2650 LAFRANIER ROAD
TRAVERSE CITY, MI 49686
Telephone: (231) 995-6051

GRAND TRAVERSE COUNTY ENVIRONMENTAL HEALTH DEPARTMENT
2650 LAFRANIER ROAD
TRAVERSE CITY, MI
Telephone: (231) 995-6051

EGLE - CADILLAC
120 W CHAPIN STREET
CADILLAC, MI 49601
Telephone: (231) 775-3960

UTILITY AGENCIES

CONSUMERS ENERGY ELECTRIC
Telephone: (231) 929-6242

DTE ENERGY NATURAL GAS
Telephone: (231) 932-2823

CHARTER COMMUNICATIONS CABLE
Telephone: (231) 929-7012

AT&T MICHIGAN TELEPHONE
Telephone: (231) 941-2707

EMERGENCY SERVICES

EMERGENCY CALLS

AMBULANCE SERVICE / POLICE / FIRE: 911

GRAND TRAVERSE METRO FIRE DEPARTMENT: 231.947-3000

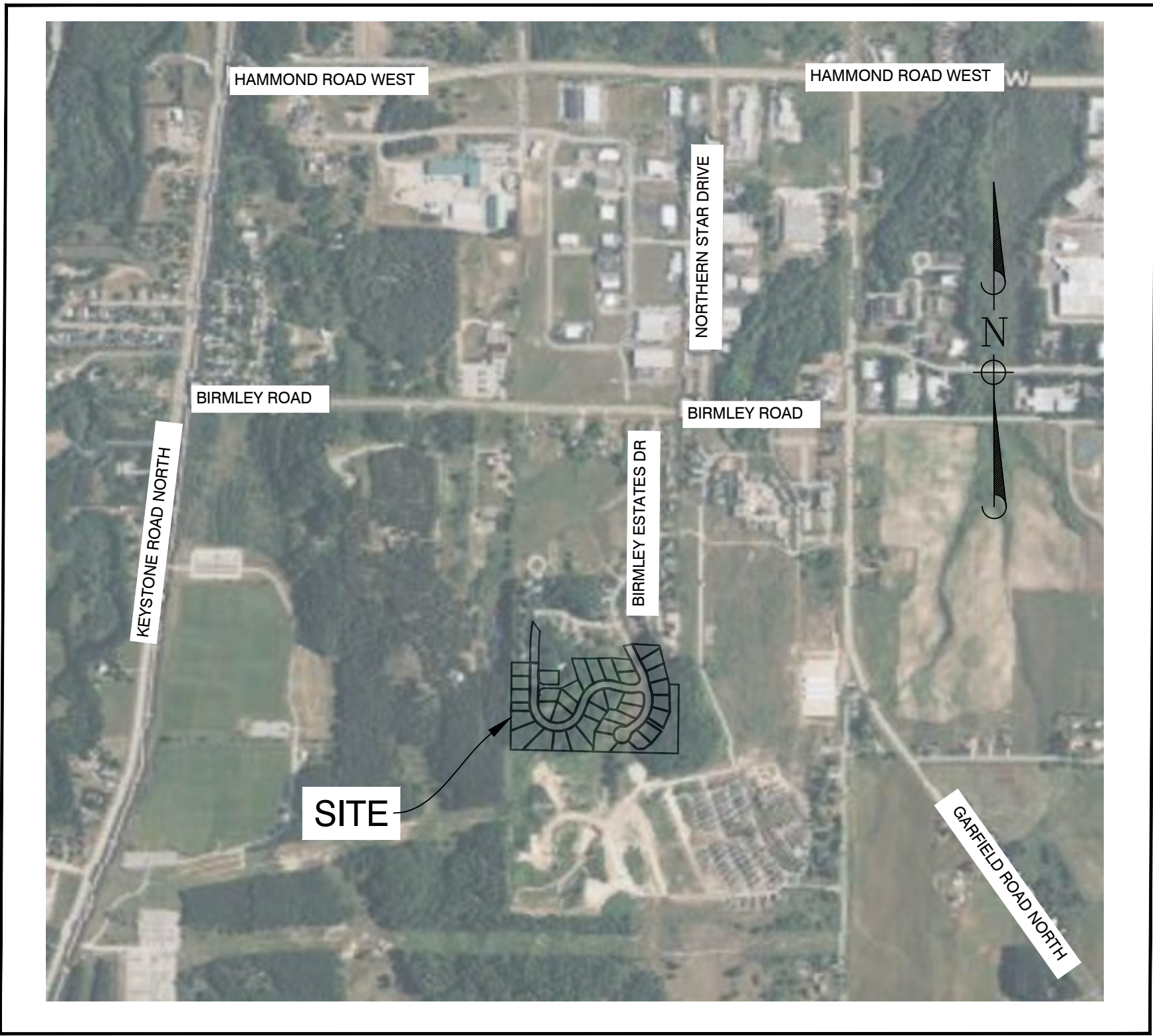
GRAND TRAVERSE COUNTY SHERIFF: 231.995-5000

MISS DIG: 1.800.482.7171



PLANS FOR:
BIRMLEY HILLS
SITE CONDOMINIUM

PART OF SECTION 26, TOWNSHIP 27 NORTH, RANGE 11 WEST, GARFIELD
TOWNSHIP, GRAND TRAVERSE COUNTY MICHIGAN



LOCATION MAP
NOT TO SCALE

LEGAL DESCRIPTION

PREPARED FOR STEVE ZAKRAJSAK

Total Parcel

Part of Section 26, Town 27 North, Range 11 West, Garfield Township, Grand Traverse County, Michigan more fully described as follows:

Beginning at the South one-quarter corner of said Section 26;
thence South 88°39'03" East, 1311.74 feet,
along the South line of said Section 26
thence North 00°51'35" East, 540.00 feet,
along the East one-eighth line of said Section 26
thence North 88°39'03" West, 75.00 feet.
thence North 14°19'07" West, 314.48 feet.
thence North 86°49'30" West, 214.48 feet.
thence South 75°27'05" West, 67.51 feet.
thence South 26°40'38" East, 116.61 feet.
thence North 85°43'06" West, 150.00 feet.
thence South 88°12'40" West, 104.89 feet.
thence South 88°46'29" West, 105.00 feet.
thence North 88°25'45" West, 100.00 feet.
thence South 16°38'02" East, 174.39 feet.
thence South 62°47'48" West, 149.46 feet.
thence North 89°15' 43" West, 132.95 feet.
thence Southwesterly, 76.79 feet, along said centerline on the arc of a 40.00 foot radius curve to the left, the central angle of which is 109°59'41" and the long chord of which bears South 35°44'33" West, 65.53 feet,
thence Northwesterly, 54.78 feet, along said centerline on the arc of a 157.00 foot radius curve to the right, the central angle of which is 19°59'26" and the long chord of which bears North 09°15'27" West, 54.50 feet,
thence North 00°44'17" East, 70.00 feet.
thence Southeasterly, 62.83 feet, along said centerline on the arc of a 40.00 foot radius curve to the left, the central angle of which is 90°00'11" and the long chord of which bears South 44°15'43" East, 56.57 feet,
thence South 89°15'43" East, 119.98 feet.
thence North 00°44'17" East, 107.92 feet.
thence North 89°15'43" West, 159.99 feet.
thence North 00°44'17" East, 182.33 feet.
thence Northeasterly, 126.78 feet, along said centerline on the arc of a 1233.86 foot radius curve to the right, the central angle of which is 05°53'13" and the long chord of which bears North 03°40'54" East, 126.72 feet,
thence North 36°27'22" West, 93.98 feet.
thence Southwesterly, 202.23 feet, along said centerline on the arc of a 1299.86 foot radius curve to the left, the central angle of which is 08°54'51" and the long chord of which bears South 05°11'42" West, 202.03 feet,
thence South 00°44'17" West, 122.58 feet.
thence North 89°15'43" West, 145.00 feet.
thence South 00°44'17" West, 682.00 feet,
along the North-South one-quarter line of said Section 26;
to the POINT OF BEGINNING of said Parcel.

Said described parcel contains 400,463.21 square feet (9.19 acres), more or less.

subject to any and all easements, reservations, restrictions and conveyances of record.

INDEX OF DRAWINGS:

- | | |
|------|--|
| C0.0 | COVER |
| C1.0 | EXISTING CONDITIONS SURVEY |
| C2.0 | OVERALL SITE ARRANGEMENT PLAN |
| C2.1 | OVERALL SITE GRADING AND DRAINAGE PLAN |
| C3.0 | SITE UTILITY PLAN |
| C4.0 | BIRMLEY HILL DRIVE PLAN AND PROFILE |
| C4.1 | FARMINGTON COURT PLAN AND PROFILE |
| C6.0 | SITE DETAILS |
| C6.1 | UTILITY DETAILS
*(BY GRAND TRAVERSE COUNTY DPW) |

OWNER / APPLICANT

T&R INVESTMENTS
841 ASHLAND DRIVE
TRAVERSE CITY, MI 49686

STEVE ZAKRAJSEK
(231) 838-3766

ENGINEER

BOYNE ENGINEERING AND DESIGN
PO BOX 94
BOYNE CITY, MI 49712
CONTACT CARRIE MAY, P.E.
PRINCIPAL ENGINEER
PHONE: (231) 499-8361

SURVEYOR

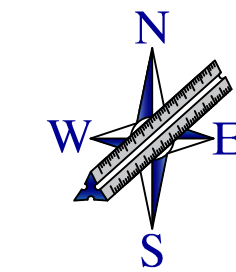
GOURDIE-FRASER
123 W FRONT ST
TRAVERSE CITY, MI 49684
PHONE: (231) 946-5874

PLAN APPROVAL

THESE CONSTRUCTION PLANS HAVE BEEN REVIEWED AND APPROVED BY THE GARFIELD TOWNSHIP WITH THE EXCEPTIONS, CONDITIONS AND MODIFICATIONS INDICATED BY ME ON THIS PLAN SET

GARFIELD TOWNSHIP PLANNER OR ZONING ADMINISTRATOR

DATE



BOYNE ENGINEERING
AND DESIGN
P.O. Box 94
Boyne City, MI 49727
(231) 499-8361
boyneengineering.com

BIRMLEY HILLS SITE CONDOMINIUM

PREPARED FOR:

T&R INVESTMENTS

841 Ashland Drive
Traverse City, MI

REVISIONS

NO:	DATE	APP'D	ISSUE / REVISION DESCRIPTION
1	11/17/22	CAM	AGENCY REVIEW MODIFICATIONS

COVER

ORIGINAL ISSUE DATE:
09/21/2022

SCALE:

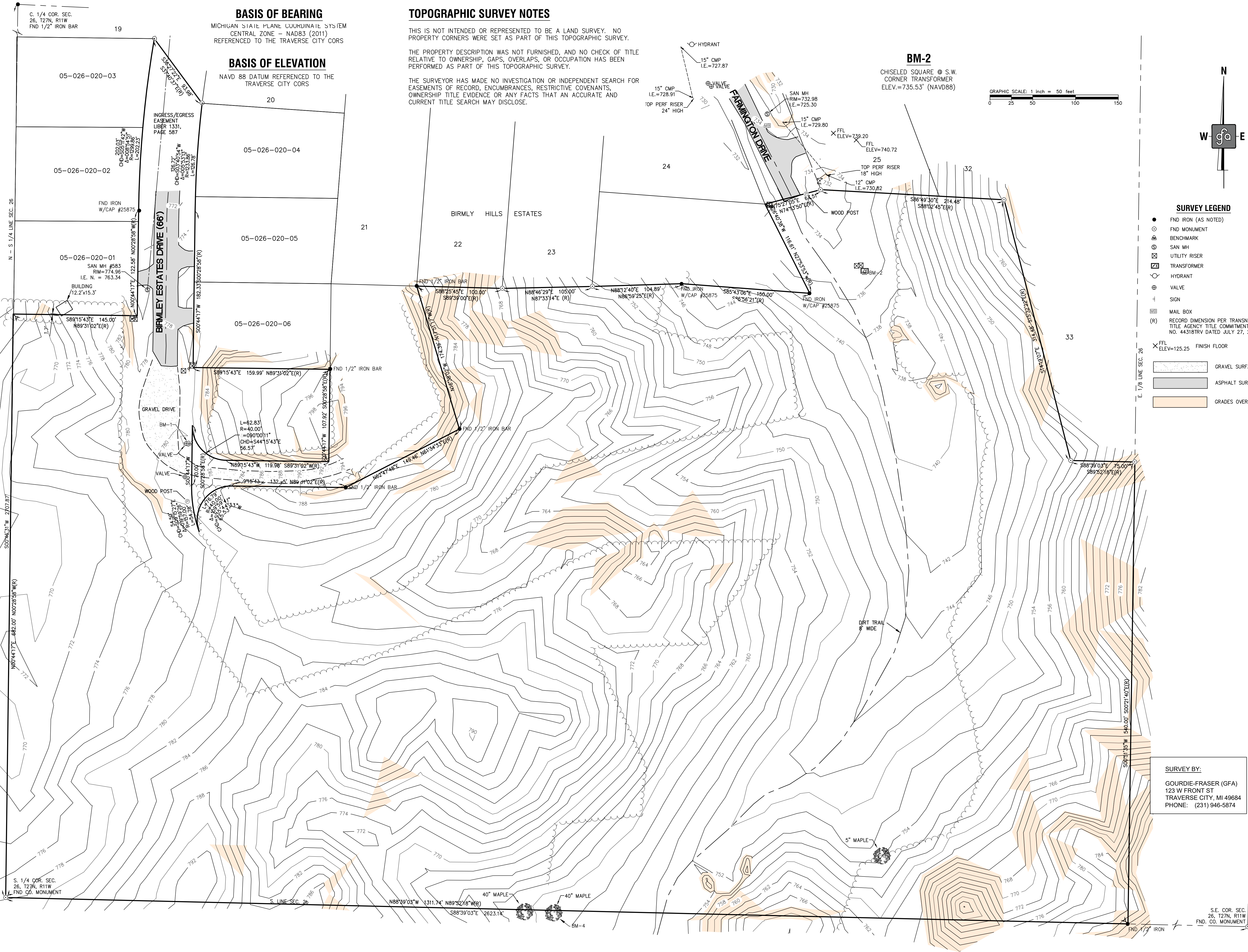
BED JOB NO. 22016

DRAWING NUMBER

C0.0

C:\USERS\CARHIE\MY DOCUMENTS\BOYNE ENGINEERING\2022\2022\BIRMLEY HILLS ESTATES\DWG\BIRMLEY.DWG (09/19/22 7:43 PM) CARHIE.MAY

BM-1
"x" IN FB HYDRANT
ELEV.=781.78' (NAVD88)



BASIS OF BEARING

MICHIGAN STATE PLANE COORDINATE SYSTEM
CENTRAL ZONE - NAD83 (2011)
REFERENCED TO THE TRAVERSE CITY CORNERS

BASIS OF ELEVATION

NAVD 88 DATUM REFERENCED TO THE
TRAVERSE CITY CORNERS

TOPOGRAPHIC SURVEY NOTES

THIS IS NOT INTENDED OR REPRESENTED TO BE A LAND SURVEY. NO
PROPERTY CORNERS WERE SET AS PART OF THIS TOPOGRAPHIC SURVEY.

THE PROPERTY DESCRIPTION WAS NOT FURNISHED, AND NO CHECK OF TITLE
RELATIVE TO OWNERSHIP, GAPS, OVERLAPS, OR OCCUPATION HAS BEEN
PERFORMED AS PART OF THIS TOPOGRAPHIC SURVEY.

THE SURVEYOR HAS MADE NO INVESTIGATION OR INDEPENDENT SEARCH FOR
EASEMENTS OF RECORD, ENCUMBRANCES, RESTRICTIVE COVENANTS,
OWNERSHIP TITLE EVIDENCE OR ANY FACTS THAT AN ACCURATE AND
CURRENT TITLE SEARCH MAY DISCLOSE.

SURVEY LEGEND

- FND IRON (AS NOTED)
- FND MONUMENT
- ⊙ BENCHMARK
- ⊕ SAN MH
- ⊕ UTILITY RISER
- ⊕ TRANSFORMER
- ⊕ HYDRANT
- ⊕ VALVE
- ⊕ SIGN
- ⊕ MAIL BOX
- (R) RECORD DIMENSION PER TRANSECTION
TITLE AGENCY TITLE COMMITMENT
NO. 44318TRV DATED JULY 27, 2021
- × FFL ELEV=125.25 FINISH FLOOR
- ▨ GRAVEL SURFACE
- ▨ ASPHALT SURFACE
- ▨ GRADES OVER 25%

REVISIONS

NO.	DATE	APP'D	ISSUE / REVISION DESCRIPTION

EXISTING CONDITIONS

ORIGINAL ISSUE DATE:
09/21/2022
SCALE: 1"=50'
BED JOB NO. 22016
DRAWING NUMBER

C1.0

**BOYNE ENGINEERING
AND DESIGN**
P.O. Box 94
Boyne City, MI 49727
(231) 499-8361
boyneengineering.com

BIRMLEY HILLS SITE CONDOMINIUM

PREPARED FOR:
T&R INVESTMENTS

Traverse City, MI

725 E. STATE STREET

SOILS

SOILS ON THIS PROPERTY HAVE BEEN OBSERVED TO BE SANDY - CONSISTENT WITH NRCS SOIL SURVEY MAPING

SEE SHEET C2.1 FOR TEST HOLES

LIGHTING

NO SITE LIGHTING IS PROPOSED FOR THIS DEVELOPMENT

PARKING

PARKING FOR THIS DEVELOPMENT WILL BE LOCATED ON INDIVIDUAL LOTS. NO ADDITIONAL PARKING AREAS ARE PROPOSED

COVERAGE AREAS

SITE ELEMENT	AREA	UNIT	% OF COVERAGE	NOTES
OVERALL SITE	21.3	AC		GROSS AREA (SEE CALCULATION THIS SHEET)
EX BUILDINGS	0	SF		VACANT
NEW BUILDINGS	0	SF		
PAVEMENT	63,647	SF	6.9%	
RESERVED WOODED OPEN SPACE	2.28	AC	10.7%	14.3% OF NET AREA

GROSS/NET AREA

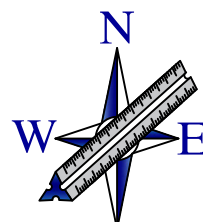
GROSS AREA: 21.33 AC
PUBLIC EASEMENTS: -2.09 AC
RIGHT-OF-WAYS: -3.88 AC
NET AREA: 15.36 AC

ZONING

GARFIELD TOWNSHIP ZONING INFORMATION					
CHARTER TOWNSHIP OF GARFIELD ORDINANCE 68 AMENDED THROUGH 9/26/21					
ZONING DISTRICT	MIN LOT PER UNIT	MAX HEIGHT/STORIES	YARD SETBACKS (FT)	MAX BUILDING COVERAGE	
R-1	15,000 SF	2-12 / 35'	30' 10' 30'	30%	
ONE FAMILY RESIDENTIAL					
* WITH PUBLIC SEWER					

LEGEND

---	PROPERTY LINE
---	LOT LINE
---	SETBACK
---	EASEMENT
---	RIGHT OF WAY
---	PROPOSED ROADWAY CENTER
---	EDGE OF PAVEMENT
---	STORMWATER FLOW
---	TREE LINE
---	EX PAVING / GRAVEL
---	STORMWATER BASIN
---	SOIL BORING
---	BENCHMARK



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BIRMLEY HILLS SITE CONDOMINIUM

PREPARED FOR:
T&R INVESTMENTS

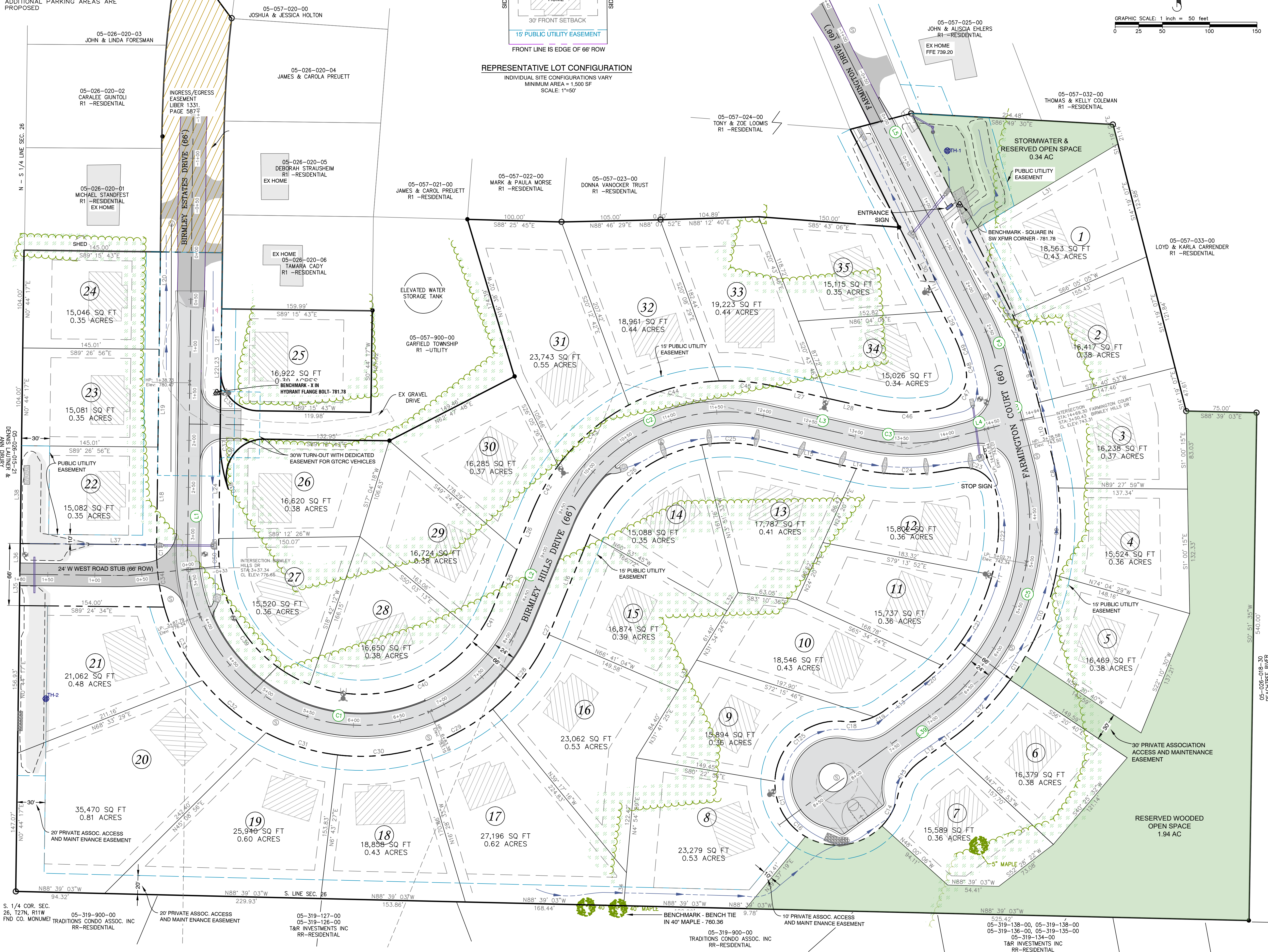
841 Ashtland Drive Traverse City, MI

Birmley Hills Drive					
Number	Radius	Length	Line/Chord Direction	Start Station	
C1		274.66	S0° 44' 17.26"W	0+41.00	
L1	185.00	511.71	S78° 30' 04.50"E	3+15.66	
L2		108.55	N22° 15' 33.74"E	8+27.36	
C2	190.00	267.03	N62° 31' 19.66"E	9+35.91	
L3		107.45	S77° 12' 54.41"E	12+02.94	
C3	200.00	94.61	N89° 13' 59.42"E	13+10.40	
L4		64.30	N75° 40' 53.26"E	14+05.00	

Farmington Court					
Number	Radius	Length	Line/Chord Direction	Start Station	
L5		236.80	S26° 40' 37.62"E	0+00.00	
C4	200.00	43.14	S20° 29' 52.18"E	2+36.80	
L6		117.75	S14° 19' 06.74"E	2+79.94	
C5	250.00	288.64	S19° 54' 26.80"W	3+97.69	
L39		125.17	S54° 08' 00.34"W	9+98.37	

Curve Table			Curve Table		
Curve #	Length	Radius	Curve #	Length	Radius
C6	11.23	233.00	C29	88.48	218.00
C7	39.03	233.00	C30	88.27	218.00
C8	32.61	283.00	C31	80.06	218.00
C9	93.41	283.00	C32	88.15	218.00
C10	92.15	283.00	C33	88.63	218.00
C11	30.02	283.00	C34	37.26	218.00
C12	89.92	283.00	C35	62.83	40.00
C13	42.03	60.37	C36	76.79	40.00
C14	37.58	66.00	C37	54.77	157.00
C15	88.58	66.00	C38	0.00	158.74
C16	27.22	66.00	C39	166.56	152.00
C17	43.18	66.00	C40	200.04	152.00
C18	31.72	60.37	C41	36.02	152.00
C19	10.31	60.37	C42	25.43	223.00
C20	38.52	217.00	C43	100.00	223.00
C21	11.32	217.00	C44	100.00	223.00
C22	84.48	217.00	C45	57.98	223.00
C23	58.33	35.00	C46	76.40	171.77
C24	105.98	233.00	C47	53.15	35.00
C25	61.67	157.00	C48	0.07	167.00
C26	158.98	157.00	C49	39.11	167.00
C27	6.57	218.00	C50	17.81	152.00
C28	100.00	218.00	C125	110.20	66.00

Parcel Line Table		
Line #	Length	Direction
L7	140.83	S26° 40' 37.74"E
L8	88.68	N26° 40' 37.74"W
L9	57.09	N14° 19' 06.74"W
L10	60.67	N14° 19' 06.74"W
L11	7.66	N54° 08' 05.99"E
L12	34.06	N54° 08' 05.99"E
L13	41.73	S54° 08' 05.99"W
L14	1.64	S77° 12' 54.41"E
L15	105.81	S77° 12' 54.41"E
L16	108.55	N22° 15' 33.74"E
L17	4.13	S0° 44' 17.26"W
L18	104.00	N0° 44' 17.26"E
L19	79.86	S0° 44' 17.26"W
L20	58.75	S0° 44' 17.26"E
L21	67.91	N0° 43' 50.02"E
L22	0.00	N0° 44' 17.09"E
L23	67.91	N0° 43' 50.02"E
L24	106.33	N0° 44' 17.25"E
L25	63.68	S22° 15' 33.74"W
L26	44.57	S22° 15' 33.74"W
L27	59.32	N77° 12' 54.41"W
L28	48.13	N77° 12' 54.41"W
L29	27.28	S26° 40' 37.74"E
L30	100.00	S26° 40' 37.74"E
L31	181.89	S59° 05' 36.35"W
L32	22.67	N31° 34' 23.85"E
L33	37.49	N31° 34' 23.85"E
L34	35.32	N4° 54' 58.66"E
L35	35.34	N0° 44' 17.26"E
L36	32.66	N0° 44' 17.26"E
L37	145.01	S89° 26' 56.26"E
L38	104.00	N0° 44' 17.26"E
L53	11.67	N0° 44' 17.25"E



REVISIONS

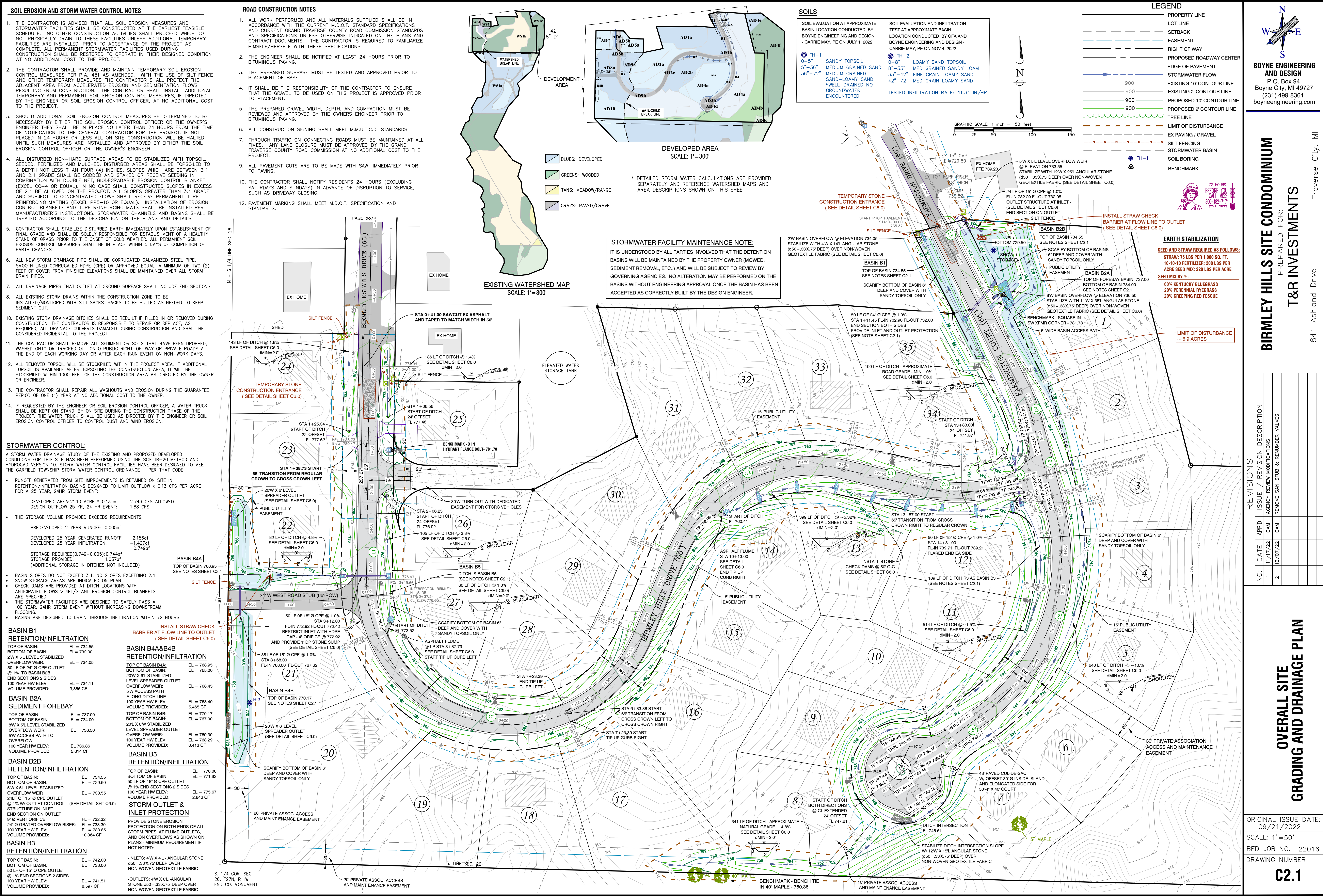
NO.	DATE	APP'D	ISSUE / REVISION DESCRIPTION
1	11/17/22	CAM	AGENCY REVIEW MODIFICATIONS
2	12/07/22	CAM	REMOVE SAN STUB & RENUMBER VALVES

OVERALL SITE
ARRANGEMENT PLAN

ORIGINAL ISSUE DATE:
09/21/2022
SCALE: 1"=50'
BED JOB NO. 22016
DRAWING NUMBER

C2.0





BOYNE ENGINEERING AND DESIGN

P.O. Box 94

Boyne City, MI 49727

(231) 499-8361

boyneengineering.com

841 Ashland Drive

Traverse City, MI

REVISIONS

NO.	DATE	APP'D	ISSUE / REVISION DESCRIPTION
1	11/17/22	CAM	AGENCY REVIEW MODIFICATIONS
2	12/07/22	CAM	REMOVE SAN STUB & REINBUR VALVES

ORIGINAL ISSUE DATE:

09/21/2022

SCALE: 1"=50'

BED JOB NO. 22016

DRAWING NUMBER

C2.1

WATERMAIN NOTES

- ALL CONSTRUCTION MATERIALS AND PROCEDURES MUST CONFORM WITH CURRENT DPW STANDARDS, SPECIFICATIONS AND DETAILS.
- THE CONTRACTOR SHALL NOTIFY THE ENGINEER 48 HOURS PRIOR TO THE START OF CONSTRUCTION OF THE WATER MAIN. CONTRACTOR SHALL ISSUE A WORK SCHEDULE TO THE ENGINEER PRIOR TO THE START OF WATER MAIN CONSTRUCTION.
- ALL WATER MAIN SHALL BE DR 18 C900 PVC MEETING CURRENT AWWA STANDARDS.
- WATER MAIN SHALL HAVE A MINIMUM OF SIX (6) FEET OF COVER BELOW EXISTING OR PROPOSED GRADE, UNLESS NOTED OTHERWISE ON THE PLANS.
- THE ALIGNMENT OF THE PROPOSED WATER MAIN IS PROVIDED FOR REFERENCE ONLY. CONTRACTOR MAY DEViate/DEFLECT AS NECESSARY TO AVOID CONFLICTS FOR EASIER CONSTRUCTION. COST FOR ADDITIONAL PIPE, FITTINGS, ETC. ARE INCLUDED IN THE COST OF THE PROJECT.
- LENGTH OF WATER MAIN SHALL BE DETERMINED ON A CASE BY CASE BASIS IN ORDER TO CONSTRUCT ACCORDING TO THE PLANS AND SPECIFICATIONS. COSTS FOR THE MAIN ARE INCLUDED IN THE COSTS OF THE PROJECT.
- RETAINER GLANDS SHALL BE USED ON ALL MECHANICAL JOINT FITTINGS.
- BURLAP, PLASTIC OR POLY (20 MILLS) OR APPROVED EQUAL SHALL BE PLACED BETWEEN THE CONCRETE THRUST BLOCK AND DEAD-END MAINS OR DEAD-END PLUGS, TEES, HYDRANTS AND CROSSES TO FACILITATE THE REMOVAL OF THE THRUST BLOCK FOR FUTURE EXTENSION AND MAINTENANCE.
- A PHYSICAL GAP SHALL BE MAINTAINED BETWEEN THE PROPOSED WATER MAIN AND THE EXISTING WATER MAIN UNTIL ALL WATER MAIN TESTING HAS BEEN COMPLETED AND APPROVED BY THE ENGINEER AND THE DPW.
- THE CONTRACTOR SHALL COORDINATE THE CONNECTION TO THE EXISTING WATER MAIN WITH THE DPW AND THE ENGINEER. THE DPW SHALL BE GIVEN A MINIMUM OF 24 HOURS NOTICE PRIOR TO ANY CONNECTIONS.
- IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN WATER FOR FLUSHING AND TESTING PURPOSES. CONTRACTOR SHALL COORDINATE WITH THE DPW, IF WATER IS OBTAINED FROM THE CITY/VILLAGE/TOWNSHIP WATER SYSTEM, THE DPW SHALL BE GIVEN 24 HOURS NOTICE PRIOR TO USING ANY WATER FROM THE TOWNSHIP WATER SYSTEM.
- TO FACILITATE WATER SAMPLING, THE CONTRACTOR MAY INSTALL TWO (2) INCH CORPORATION STOPS AND TYPE K COPPER TUBE FROM THE TWO (2) INCH CORPORATION TO APPROXIMATELY FOUR (4) FEET ABOVE THE FINISH GRADE IN LOCATIONS APPROVED BY THE FIELD ENGINEER. AFTER THE WATER MAIN HAS BEEN FLUSHED AND SATISFACTORY BACTERIOLOGICAL ANALYSIS TESTS HAVE PASSED, THE TYPE 'K' COPPER TUBE SHALL BE REMOVED AND THE TWO (2) INCH CORPORATION WILL BE CLOSED. CONTRACTOR WILL INFORM THE FIELD REPRESENTATIVE/CONSTRUCTION REPRESENTATIVE TO ALLOW HIM TO WITNESS THE REMOVING OF THE COPPER TUBING AND THE CLOSING OF THE CORPORATION.
- PRIOR TO PIGGING AND FLUSHING ALL LINES SHALL BE CHARGED WITH WATER.
- ALL PERMANENT BLOW-OFF ASSEMBLIES SHALL BE CUT OFF BELOW GRADE AFTER TESTING IS COMPLETE. THE STANDING WATER WITHIN THE BLOW-OFF SHALL BE PUMPED OUT OF THE RISER CAPPED, BOLTED AND BURIED.
- CONTRACTOR SHALL PROPERLY DISPOSE OF CHLORINATED WATER USED IN TESTING OPERATIONS.
- ACTUAL WATER MAIN, HYDRANT AND GATE VALVE LOCATIONS SHALL BE FIELD STAKED PRIOR TO CONSTRUCTION.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADJUSTING THE FIRE HYDRANTS AND VALVE BOXES TO THE FINISHED GRADE.
- THE CONTRACTOR MUST OBTAIN APPROVAL BEFORE DIRECTING ANY FLUSHING AND TESTING WATERS TO ANY COUNTY STORM WATER DRAINAGE DITCH SYSTEM. CONTRACTOR SHALL PROTECT THE DITCH FROM EROSION WHICH MAY REQUIRE THE USE AN ENERGY DISSIPATER ON THE DISCHARGE OF THE FLUSHING VALVE. ALL FLUSHING WATERS SHALL BE CONTAINED WITHIN THE DITCH AND SHALL NOT IMPACT THE ROADWAY OR ADJACENT LANDOWNERS. IF NOT APPROVED, AN ALTERNATE METHOD MUST BE DETERMINED AND APPROVED. ALL COSTS ASSOCIATED WITH FLUSHING, TESTING, AND DISCHARGING ARE INCLUDED IN THE COST OF THE PROJECT.
- WATER SERVICE LEADS SHOWN ARE FOR REFERENCE ONLY. ACTUAL LOCATIONS SHALL BE DETERMINED BY THE DPW AND ENGINEER PRIOR TO PLACEMENT, IF APPLICABLE.
- CONTRACTOR MUST MAINTAIN A MINIMUM HORIZONTAL SEPARATION OF TEN (10) FEET FROM ALL SANITARY SEWER AND STORM SEWER WHEN INSTALLING THE WATER MAIN, AS MEASURED FROM OUTSIDE TO OUTSIDE.
- CONTRACTOR MUST MAINTAIN A MINIMUM VERTICAL SEPARATION OF EIGHTEEN (18) INCHES AT ALL SANITARY SEWER AND STORM SEWER CROSSINGS WHEN INSTALLING THE WATER MAIN, AS MEASURED FROM OUTSIDE TO OUTSIDE.
- IT WILL BE REQUIRED THAT THE CONTRACTOR INSTALL ALL NEW WATER MAIN BELOW EXISTING WATER MAIN WHEN A CROSSING IS ENCOUNTERED. MAINTAIN A MINIMUM SIX (6) INCH SEPARATION FROM EXISTING WATER MAIN WITH PROPER BACKFILL/COMPACTION.
- FIRE HYDRANT ASSEMBLY SHALL CONSIST OF:
1-8"x6" TEE OR 1-8"x6" REDUCER
1-6" GATE VALVE
1-FIRE HYDRANT
- CONTRACTOR TO MAINTAIN WATER SERVICE TO CUSTOMERS AT ALL TIME WITH THE EXCEPTION OF LEAD TRANSFERS, IF APPLICABLE.
- CONTRACTOR TO PROTECT EXISTING WATER MAIN AND SERVICES DURING THE INSTALLATION OF THE PROPOSED WATER MAIN. IF EXISTING WATER MAIN IS DAMAGED, CONTRACTOR IS TO REPAIR TO MAINTAIN SERVICE TO RESIDENCE. ALL COST FOR THIS ARE INCLUDED IN THE COST OF THE PROJECT.
- ALL OPERATIONS OF EXISTING EQUIPMENT, VALVES, ETC. TO BE PERFORMED BY THE DPW STAFF ONLY.
- CONTRACTOR TO SUBMIT A CONSTRUCTION SCHEDULE AND SEQUENCE FOR APPROVAL PRIOR TO PERFORMING ANY WORK.

SANITARY SEWER/FORCE MAIN NOTES

- ALL CONSTRUCTION MATERIALS AND PROCEDURES MUST CONFORM WITH CURRENT DPW STANDARDS, SPECIFICATIONS AND DETAILS.
- ALL SANITARY SEWER SHALL BE SDR-35 PVC UNLESS DEEPER THAN 16 FT. SANITARY SEWER DEEPER THAN 16 FT SHALL BE SDR-26 AND MEET THE ASTM D 3034 REQUIREMENTS UNLESS OTHERWISE NOTED.
- THE CONTRACTOR SHALL NOTIFY THE ENGINEER 48 HOURS PRIOR TO THE START OF CONSTRUCTION OF THE SANITARY SEWER. CONTRACTOR SHALL ISSUE A WORK SCHEDULE TO THE ENGINEER PRIOR TO THE START OF SANITARY SEWER CONSTRUCTION.
- NO CONNECTION RECEIVING STORM WATER OR GROUND WATER SHALL BE MADE TO SANITARY SEWERS.
- NO CONNECTION TO THE EXISTING SANITARY SEWER SHALL BE MADE UNTIL THE NEW SEWER HAS BEEN INSTALLED, TESTED, INSPECTED, AND APPROVED BY THE ENGINEER AND THE DPW.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADJUSTING THE MANHOLE RIMS TO THE FINISH GRADE ELEVATIONS. THE ELEVATIONS SHOWN ARE BASED UPON PLAN GRADES AND ARE SUBJECT TO CHANGE.
- THE ALIGNMENT OF THE PROPOSED SANITARY SEWER/FORCE MAIN IS SHOWN FOR REFERENCE ONLY. CONTRACTOR MAY DEViate/DEFLECT AS NECESSARY TO AVOID CONFLICTS FOR EASIER CONSTRUCTION. COSTS FOR ADDITIONAL PIPING, FITTINGS, ETC. SHALL BE INCLUDED IN THE COST OF THE PROJECT.
- CONTRACTOR MUST MAINTAIN A MINIMUM HORIZONTAL SEPARATION OF TEN (10) FEET FROM ALL WATER MAIN WHEN INSTALLING THE SANITARY SEWER/FORCE MAIN, AS MEASURED FROM OUTSIDE TO OUTSIDE.
- CONTRACTOR MUST MAINTAIN A MINIMUM VERTICAL SEPARATION OF EIGHTEEN (18) INCHES AT ALL WATER MAIN CROSSINGS WHEN INSTALLING THE SANITARY SEWER/FORCEMAIN, AS MEASURED FROM OUTSIDE TO OUTSIDE.
- CONTRACTOR SHALL MAINTAIN A MINIMUM FIVE (5) FEET OF COVER OVER GRAVITY SANITARY SEWER AND SIX (6) FEET OF COVER OVER FORCE MAIN.
- IF THE CONTRACTOR CREATES HIGH POINTS IN THE FORCE MAIN DUE TO CONSTRUCTION METHODS, THE CONTRACTOR IS TO INSTALL ADDITIONAL AIR RELEASE STRUCTURES, AS PER SPECIFICATIONS, AT NO ADDITIONAL COST TO THE PROJECT.
- CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING EXISTING SANITARY SEWER/FORCE MAIN PRIOR TO MAKING ANY CONNECTIONS.
- CONTRACTOR SHALL MAINTAIN SEWER FLOWS AT ALL TIMES. PUMPING AND HAULING MAY BE REQUIRED TO TRANSFER FLOWS TO NEW LIFT STATION DURING CONNECTION TO EXISTING SANITARY SEWER/FORCE MAIN. STATION EXPERIENCES PEAK HOUR FLOWS UP TO XXX GPM AND EXISTING WET WELL HAS AVAILABLE HOLDING CAPACITY OF XXXX GALLONS. CONTRACTOR MUST VERIFY RATES. ALL COSTS FOR HAULING/TRANSFERRING FLOWS ARE TO BE INCLUDED IN THE COST OF THE PROJECT.
- CONTRACTOR SHALL BE RESPONSIBLE FOR PERFORMING ANY BY-PASS PUMPING AT NO ADDITIONAL COST TO PROJECT. CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR HAVING A BACKUP METHOD IN THE EVENT THE PRIMARY BY-PASS PUMPING METHOD FAILS.
- ALL WORK TO BE COORDINATED WITH THE DPW AND ENGINEER.
- CONTRACTOR TO SUBMIT A CONSTRUCTION SCHEDULE AND SEQUENCE FOR APPROVAL PRIOR TO PERFORMING ANY WORK.

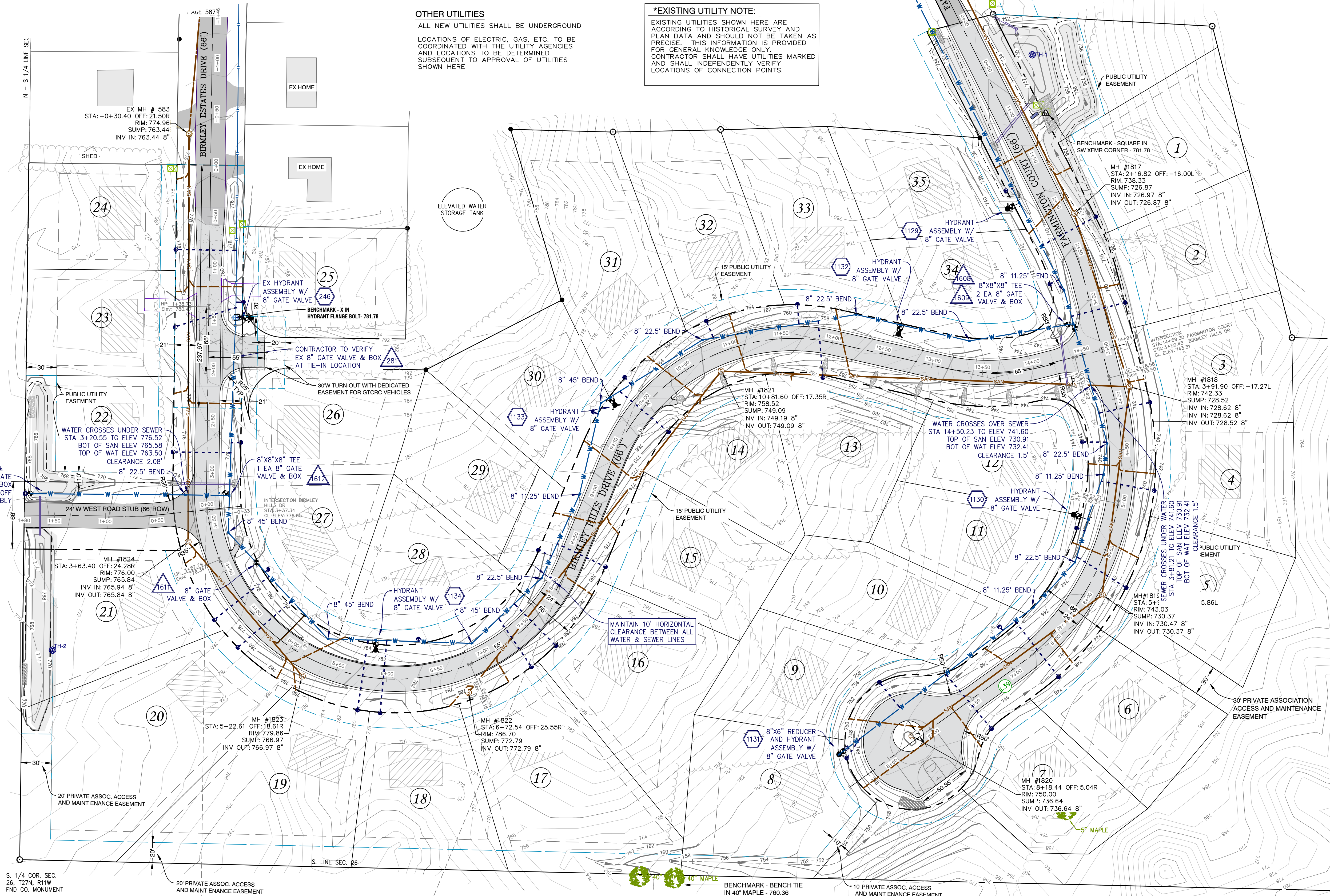
OTHER UTILITIES

ALL NEW UTILITIES SHALL BE UNDERGROUND

LOCATIONS OF ELECTRIC, GAS, ETC. TO BE COORDINATED WITH THE UTILITY AGENCIES AND LOCATIONS TO BE DETERMINED SUBSEQUENT TO APPROVAL OF UTILITIES SHOWN HERE

*EXISTING UTILITY NOTE:

EXISTING UTILITIES SHOWN HERE ARE ACCORDING TO HISTORICAL SURVEY AND PLAN DATA AND SHOULD NOT BE TAKEN AS PRECISE. THIS INFORMATION IS PROVIDED FOR GENERAL KNOWLEDGE ONLY. CONTRACTOR SHALL HAVE UTILITIES MARKED AND SHALL INDEPENDENTLY VERIFY LOCATIONS OF CONNECTION POINTS.



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BIRMLEY HILLS SITE CONDOMINIUM
PREPARED FOR:
T&R INVESTMENTS

841 Ashland Drive
Traverse City, MI

REVISIONS			
NO.	DATE	APP'D	ISSUE / REVISION DESCRIPTION
1	11/17/22	CAM	AGENCY REVIEW MODIFICATIONS
2	12/07/22	CAM	REMOVE SAN STUB & RENUMBER VALVES

SITE UTILITY PLAN

ORIGINAL ISSUE DATE:
09/21/2022
SCALE: 1"=50'
BED JOB NO. 22016
DRAWING NUMBER

C3.0

***EXISTING UTILITY NOTE:**
EXISTING UTILITIES SHOWN HERE ARE
ACCORDING TO HISTORICAL SURVEY AND
PLAN DATA AND SHOULD NOT BE TAKEN AS
PRECISE. THIS INFORMATION IS PROVIDED
FOR GENERAL KNOWLEDGE ONLY.
CONTRACTOR SHALL HAVE UTILITIES MARKED
AND SHALL INDEPENDENTLY VERIFY
LOCATIONS OF CONNECTION POINTS.

ADDITIONAL NOTES:
SEE PLAN SHEETS FOR ADDITIONAL NOTES:
SHEET C0.0 - GENERAL NOTES
SHEET C0.1 - SITE GRADING AND DRAINAGE
SHEET C3.0 - UTILITIES

GRAPHIC SCALE: 1 inch = 50 feet
0 25 50 100 150

72 HOURS
BEFORE YOU DIG
800-482-7171
(TOLL FREE)

LEGEND

PROPERTY LINE	EXISTING 10' CONTOUR LINE
LOT LINE	EXISTING 2' CONTOUR LINE
SETBACK	PROPOSED 10' CONTOUR LINE
EASEMENT	PROPOSED 2' CONTOUR LINE
RIGHT OF WAY	TREE LINE
PROPOSED ROADWAY CENTER	STORMWATER BASIN
EDGE OF PAVEMENT	WATER LINE
STORMWATER FLOW	SANITARY SEWER
EX PAVING / GRAVEL	WATER SERVICE LEAD
EX WATER LINE	WASSEWER SERVICE LEAD

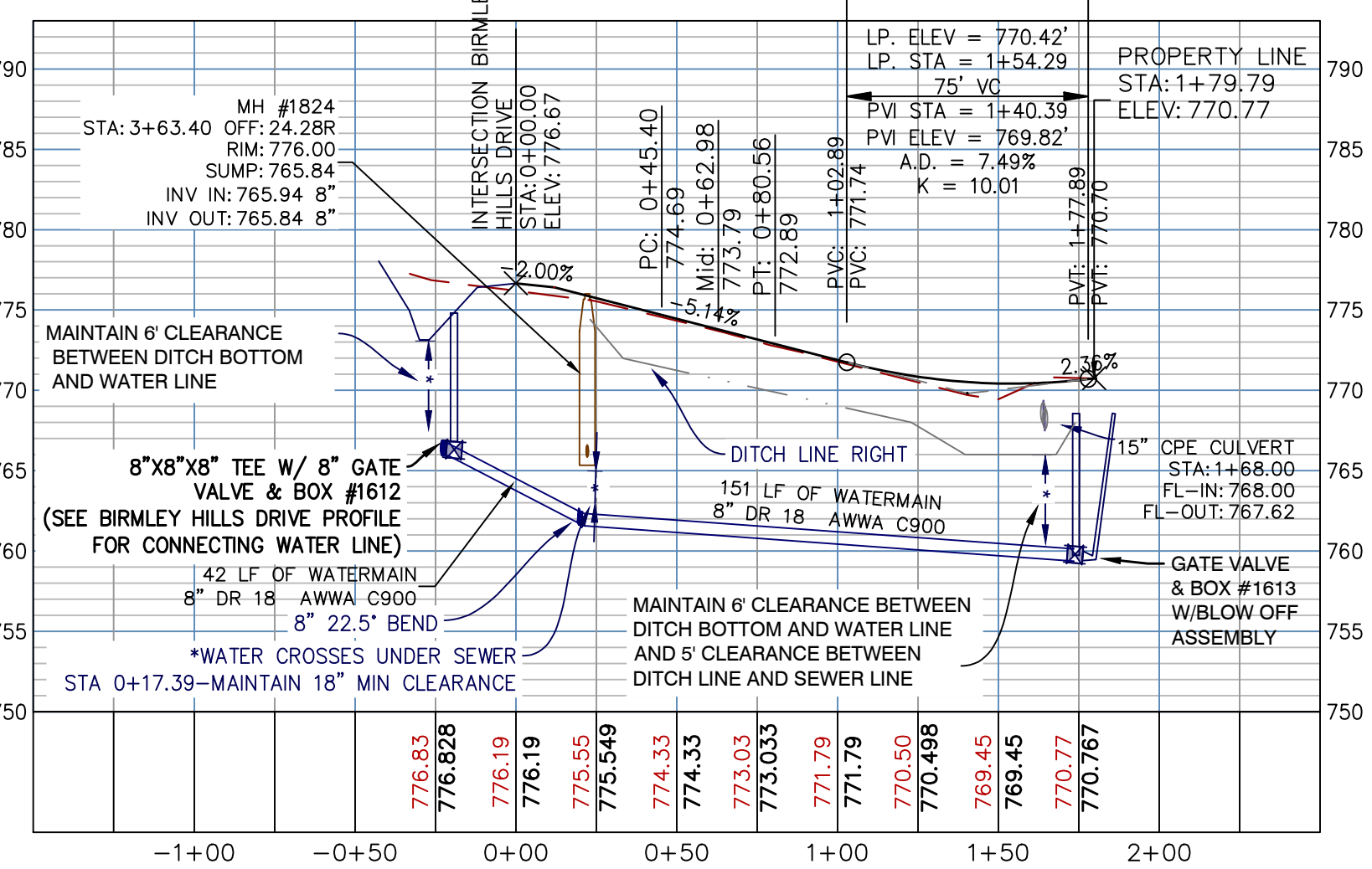
HYDRANT NUMBER
100
500

VALVE NUMBER
100
500

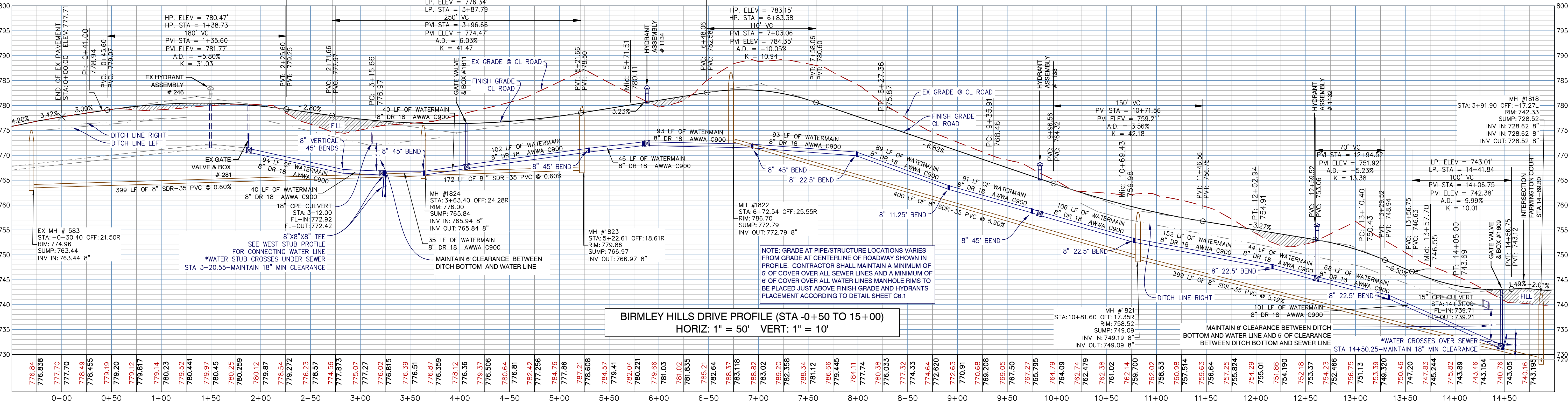
HYDRANT ASSEMBLY
GATE VALVE
BLOW OFF
BENCHMARK

Birmley Hills Drive					
Number	Radius	Length	Line/Chord Direction	Start Station	
L1	274.68	50' 44" 17.26°W		0+41.00	
C1	185.00	511.71	S78° 30' 04.50"E	3+15.66	
L2	108.55	N22° 15' 33.74"E		8+27.36	
C2	190.00	267.03	N62° 31' 19.66"E	9+35.91	
L3	107.45	S77° 12' 54.41"E		12+02.94	
C3	200.00	84.61	N89° 13' 59.42"E	13+10.40	
L4	64.30	N78° 40' 53.26"E		14+05.00	

WEST ROAD STUB PROFILE (STA -0+33 TO 1+80)
HORIZ: 1" = 50' VERT: 1" = 10'



PAVING INSPECTION NOTE:
THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF
READINESS FOR THE FOLLOWING INSPECTIONS 48
HOURS IN ADVANCE:
1. EXCAVATION TO SUBGRADE OF PAVING
2. COMPLETION OF PAVING BASE COURSE
3. COMPLETION OF PAVING
4. SUBSTANTIAL COMPLETION OF PROJECT
THE ENGINEER'S INSPECTION DOES NOT RELIEVE THE
CONTRACTOR OF RESPONSIBILITY TO BUILD
ACCORDING TO PLANS, SPECIFICATIONS, AND
REGULATORY REQUIREMENTS.



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P.O. Box 94
Boyme City, MI 49727
(231) 499-8361
boyneengineering.com

BIRMLEY HILLS SITE CONDOMINIUM
PREPARED FOR:
T&R INVESTMENTS
841 Ashland Drive
Traverse City, MI

REVISIONS			
NO.	DATE	APPD	ISSUE / REVISION DESCRIPTION
1	11/17/22	CAM	AGENCY REVIEW MODIFICATIONS
2	12/07/22	CAM	REMOVE SAN STUB & REMEMBER VALVES

**BIRMLEY HILLS DRIVE
PLAN & PROFILE**

ORIGINAL ISSUE DATE:
09/21/2022

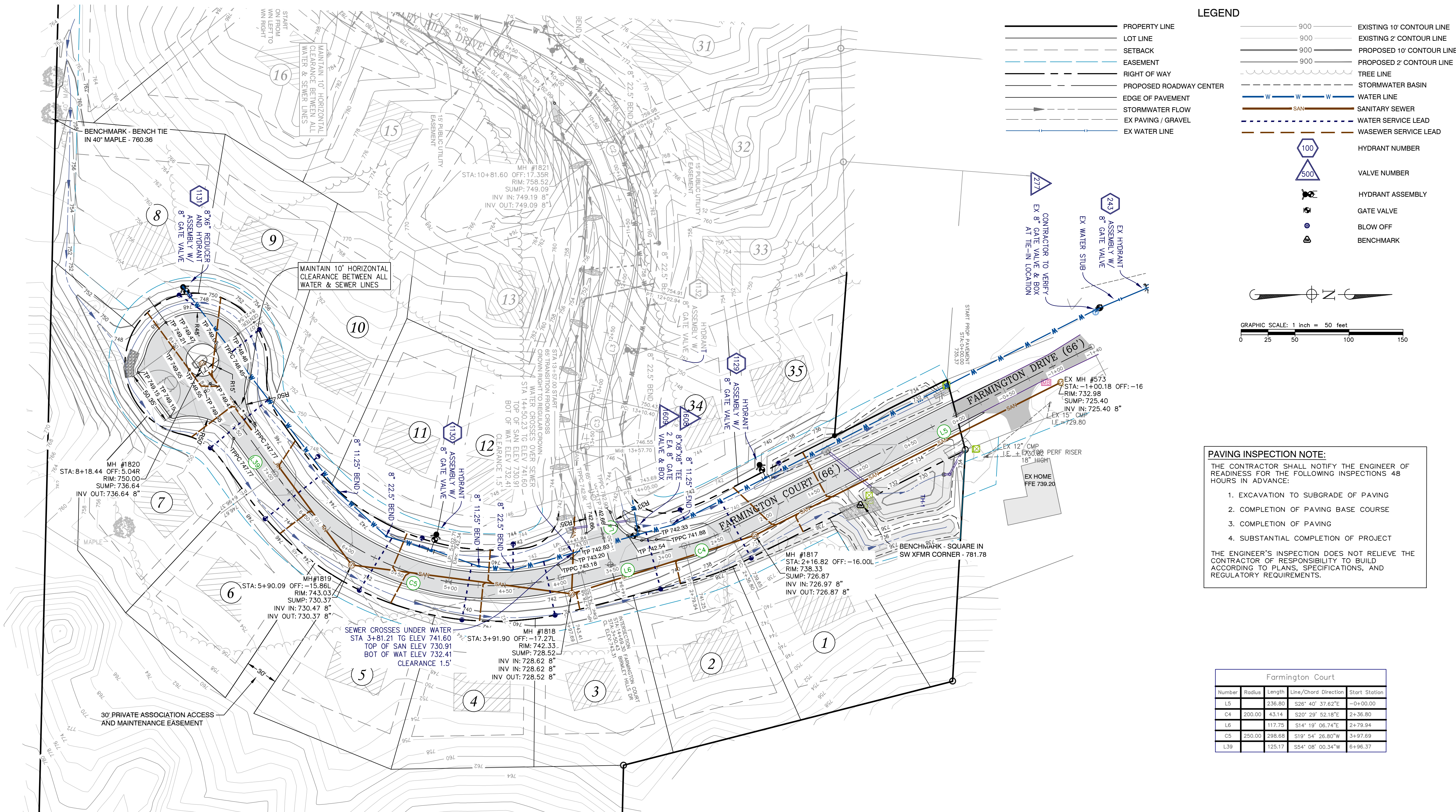
SCALE: 1"=50'

BED JOB NO. 22016

DRAWING NUMBER
C4.0

***EXISTING UTILITY NOTE:**
EXISTING UTILITIES SHOWN HERE ARE ACCORDING TO HISTORICAL SURVEY AND PLAN DATA AND SHOULD NOT BE TAKEN AS PRECISE. THIS INFORMATION IS PROVIDED FOR GENERAL KNOWLEDGE ONLY. CONTRACTOR SHALL HAVE UTILITIES MARKED AND SHALL INDEPENDENTLY VERIFY LOCATIONS OF CONNECTION POINTS.

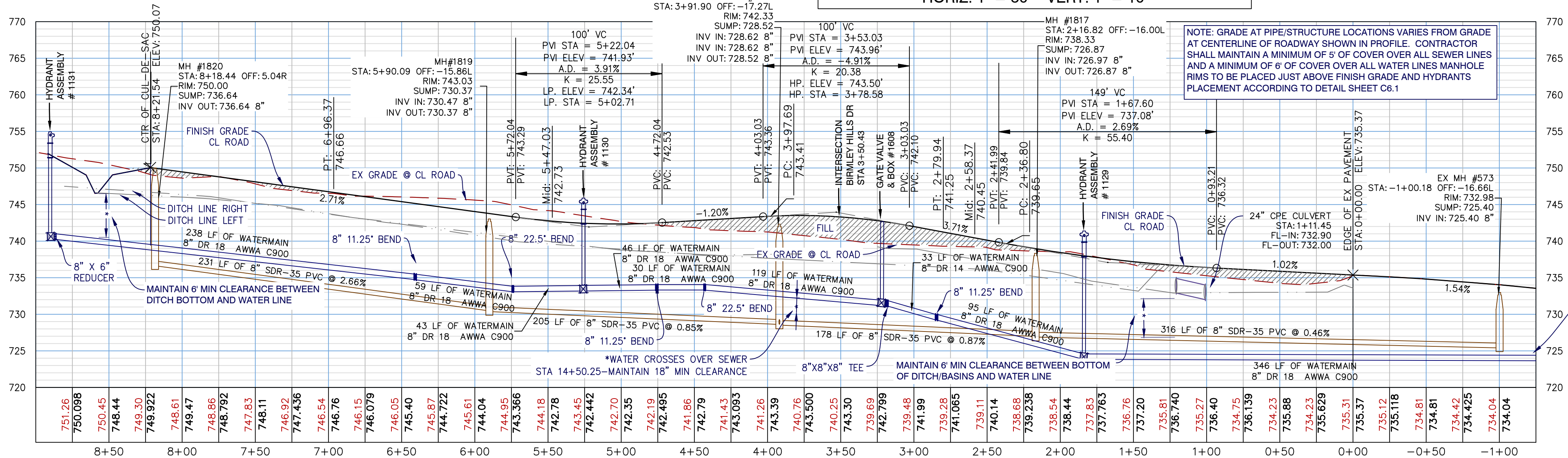
ADDITIONAL NOTES:
SEE PLAN SHEETS FOR ADDITIONAL NOTES:
SHEET C0.0 - GENERAL NOTES
SHEET C2.1 - SITE GRADING AND DRAINAGE
SHEET C3.0 - UTILITIES



PAVING INSPECTION NOTE:
THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF READINESS FOR THE FOLLOWING INSPECTIONS 48 HOURS IN ADVANCE:
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2. COMPLETION OF PAVING BASE COURSE
3. COMPLETION OF PAVING
4. SUBSTANTIAL COMPLETION OF PROJECT
THE ENGINEER'S INSPECTION DOES NOT RELIEVE THE CONTRACTOR OF RESPONSIBILITY TO BUILD ACCORDING TO PLANS, SPECIFICATIONS, AND REGULATORY REQUIREMENTS.

Farmington Court				
Number	Radius	Length	Line/Chord Direction	Start Station
L5		236.80	S28° 40' 37.62"E	-0+00.00
C4	200.00	43.14	S20° 29' 52.18"E	2+36.80
L6		117.75	S14° 19' 06.74"E	2+79.94
C5	250.00	298.68	S19° 54' 26.80"W	3+97.69
L39		125.17	S54° 08' 00.34"W	6+96.37

FARMINGTON COURT PROFILE (STA -1+25 TO 8+90)
HORIZ: 1" = 50' VERT: 1" = 10'



SEE PLAN FOR PIPE CONNECTION APPROXIMATELY 346LF FROM HYDRANT 1129
CONTRACTOR TO VERIFY EX 8" GATE VALVE & BOX # 277 AT TIE-IN LOCATION

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Boyne City, MI 49727
(231) 499-8361
boyneengineering.com

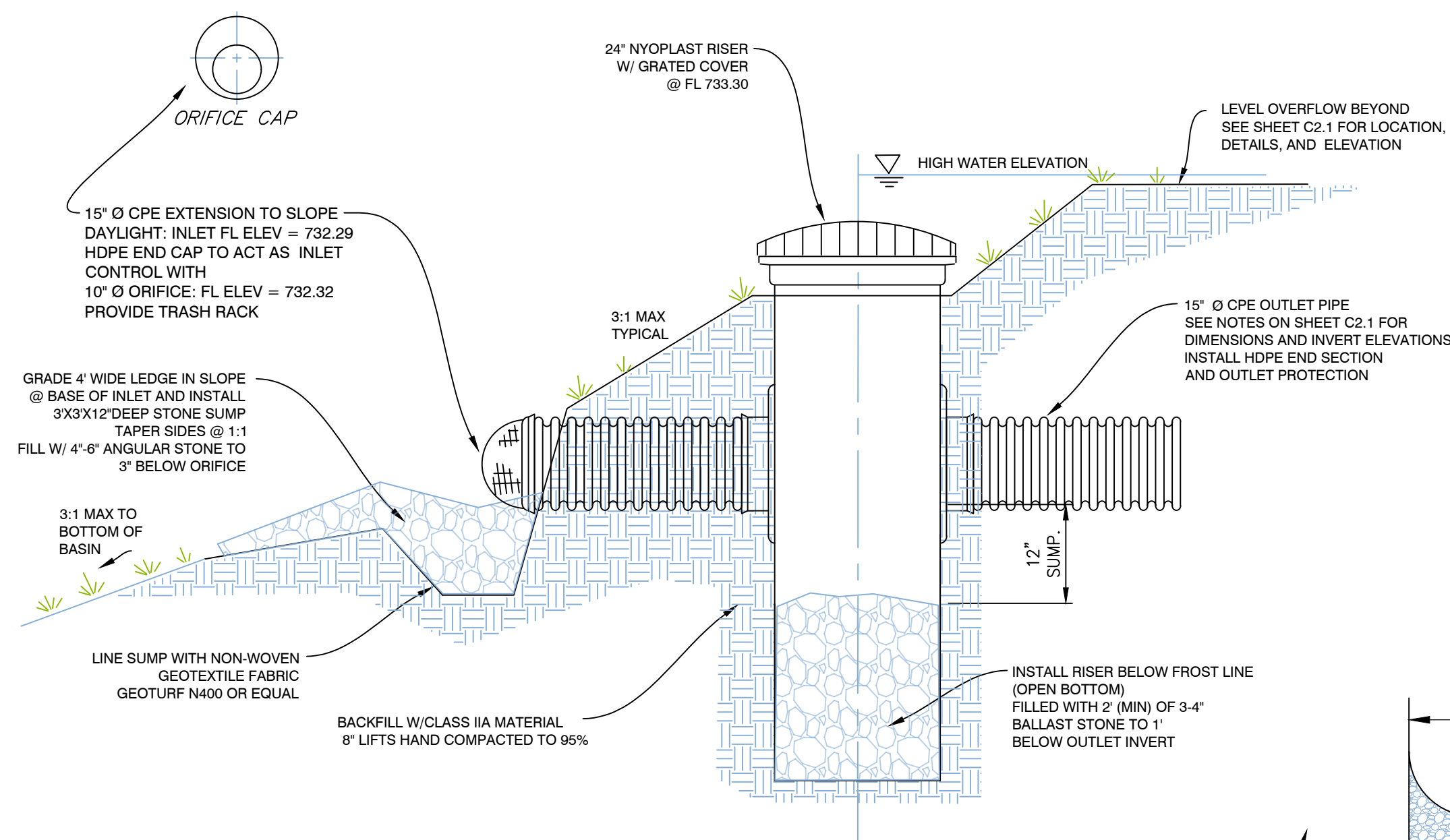
BIRMINGHAM HILLS SITE CONDOMINIUM
PREPARED FOR:
T&R INVESTMENTS
841 Ashland Drive
Traverse City, MI

REVISIONS		ISSUE / REVISION DESCRIPTION	
NO.	DATE	APPROVED	DESCRIPTION
1	11/17/22	CAM	AGENCY REVIEW MODIFICATIONS
2	12/07/22	CAM	REMOVE SAN STUB & REUMBER VALVES

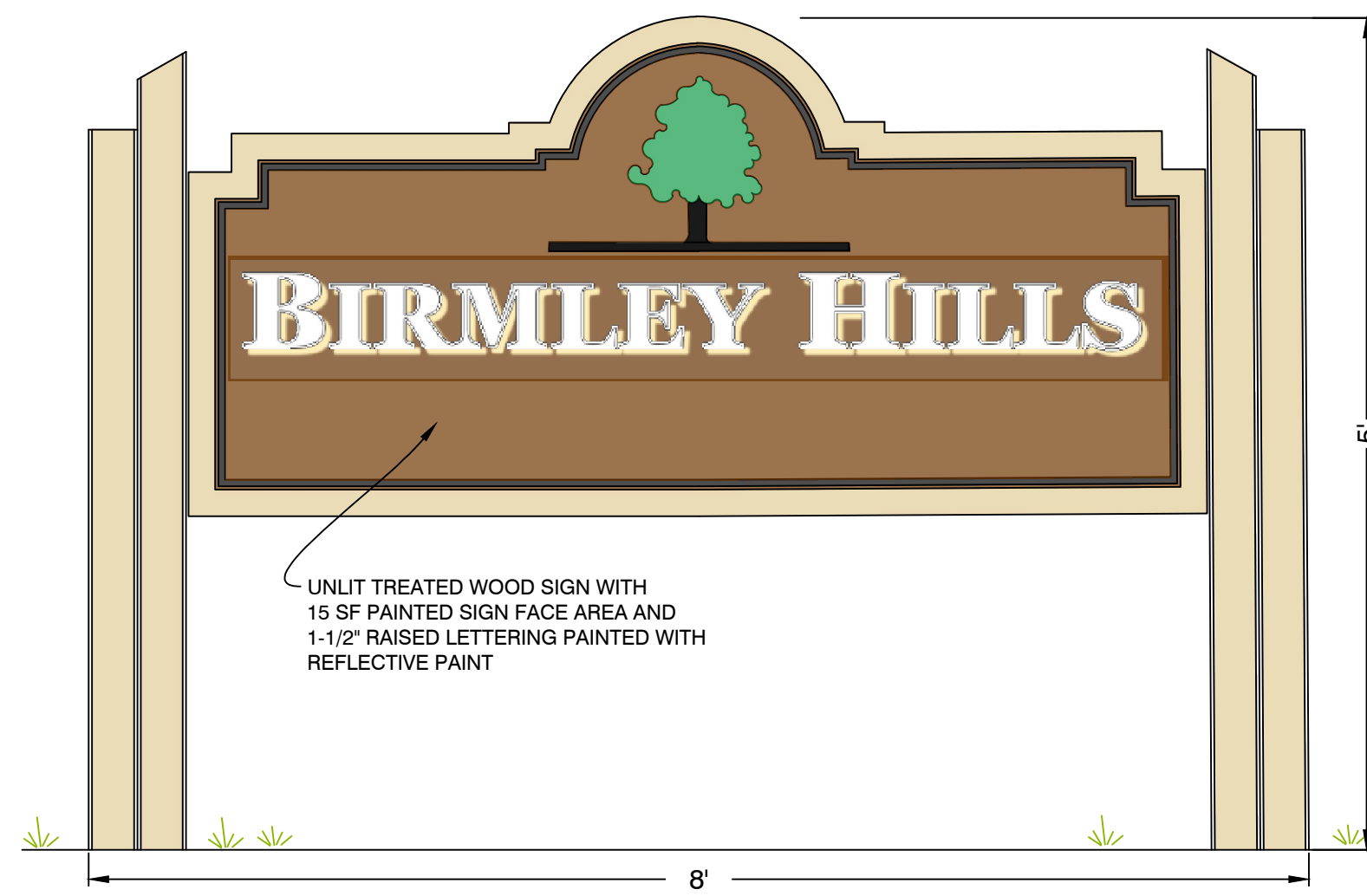
FARMINGTON COURT
PLAN & PROFILE

ORIGINAL ISSUE DATE:
09/21/2022
SCALE: 1"=50'
BED JOB NO. 22016
DRAWING NUMBER

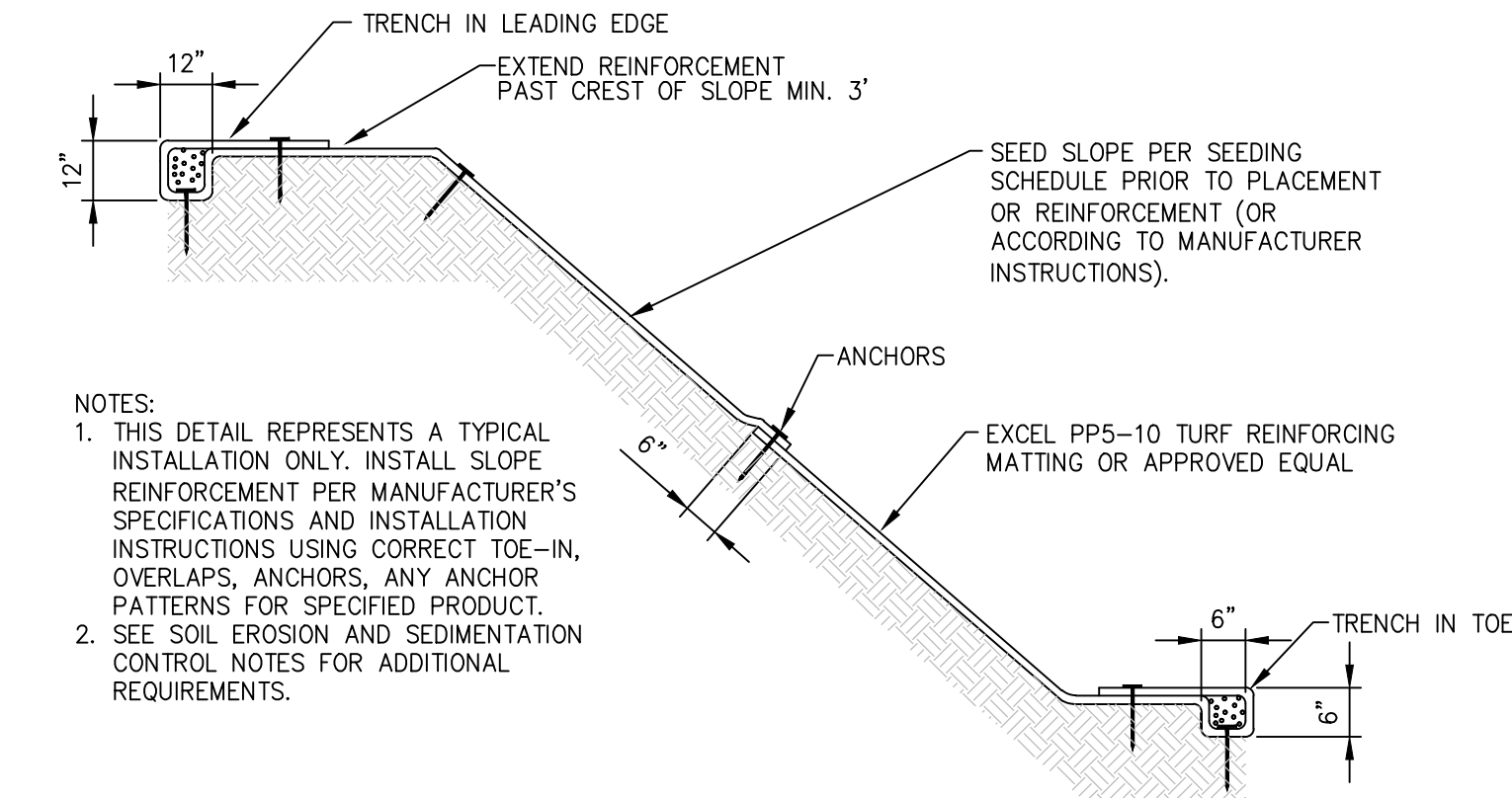
C4.1



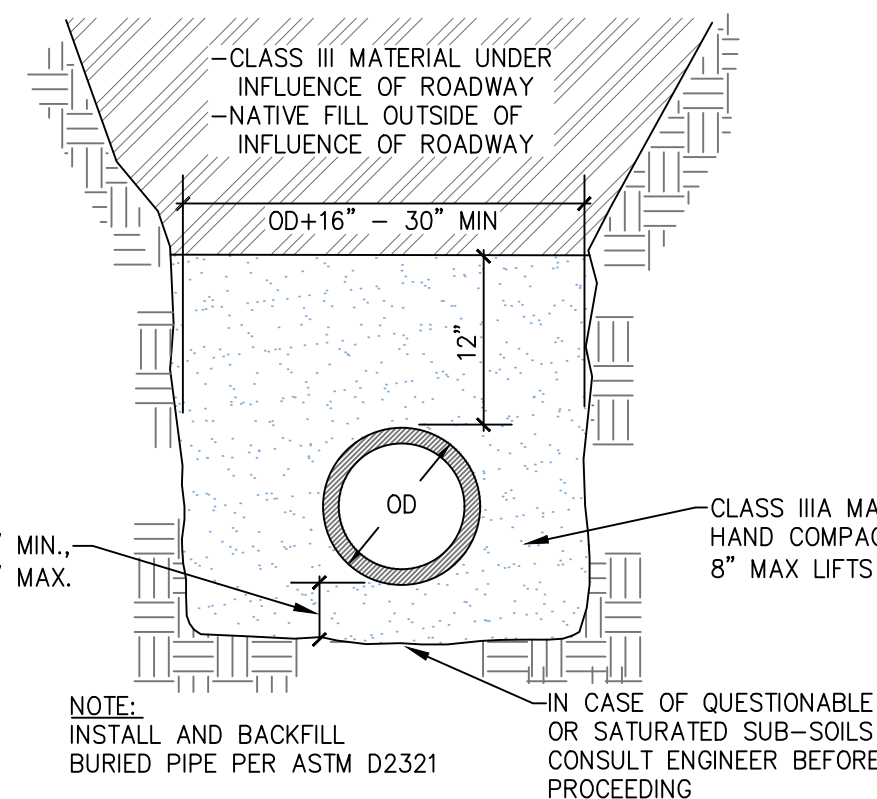
OUTLET STRUCTURE DETAIL BASIN B2B
NO SCALE



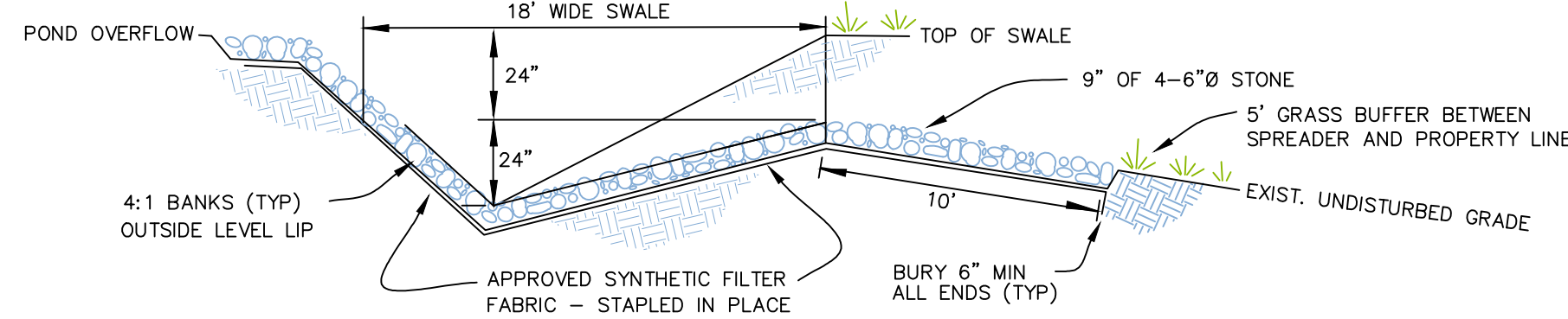
ENTRANCE SIGN
NO SCALE



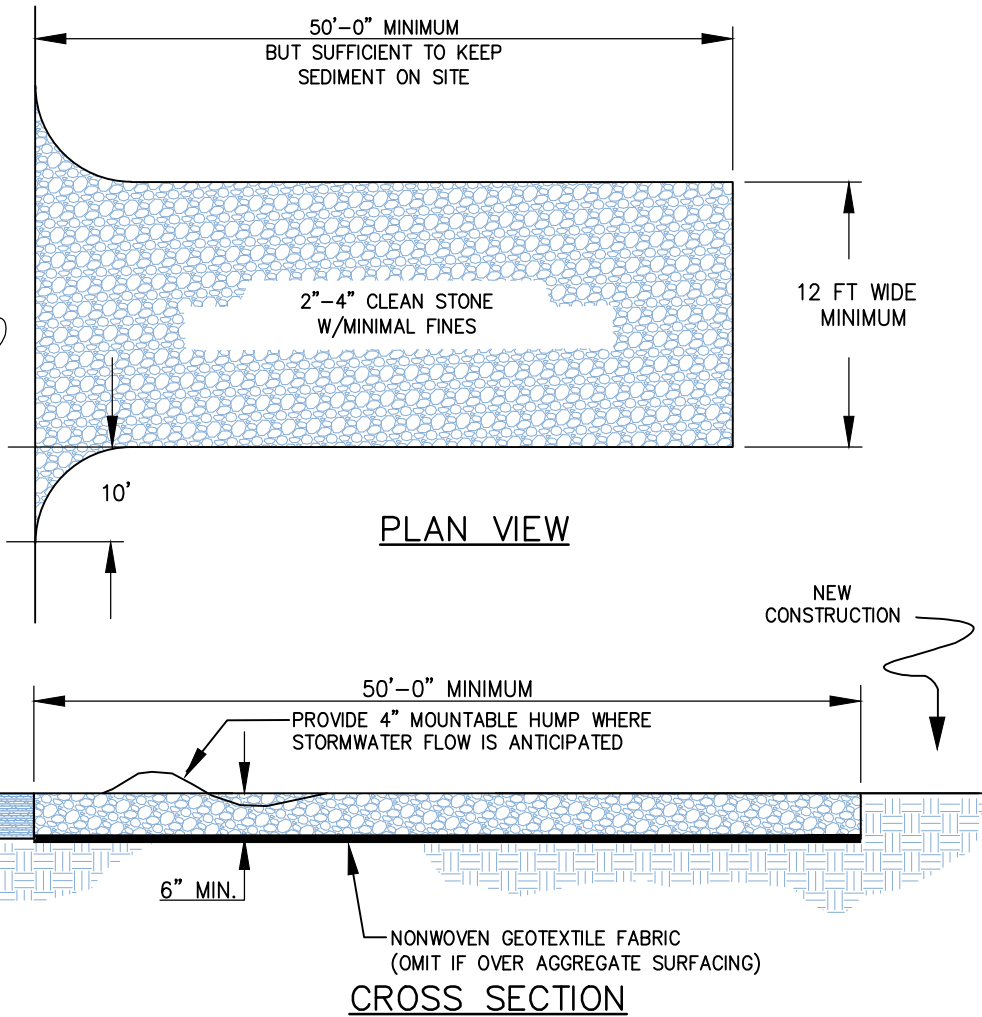
REINFORCEMENT ON CONSTRUCTED 2:1 SLOPES
NO SCALE



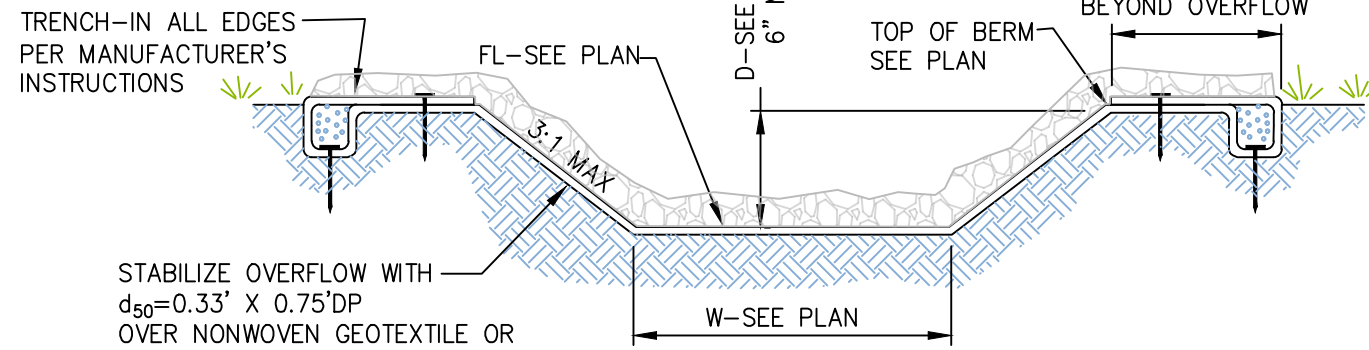
CULVERT BEDDING DETAIL
SMOOTH LINED CORRUGATED HDPE (CPE)
NO SCALE



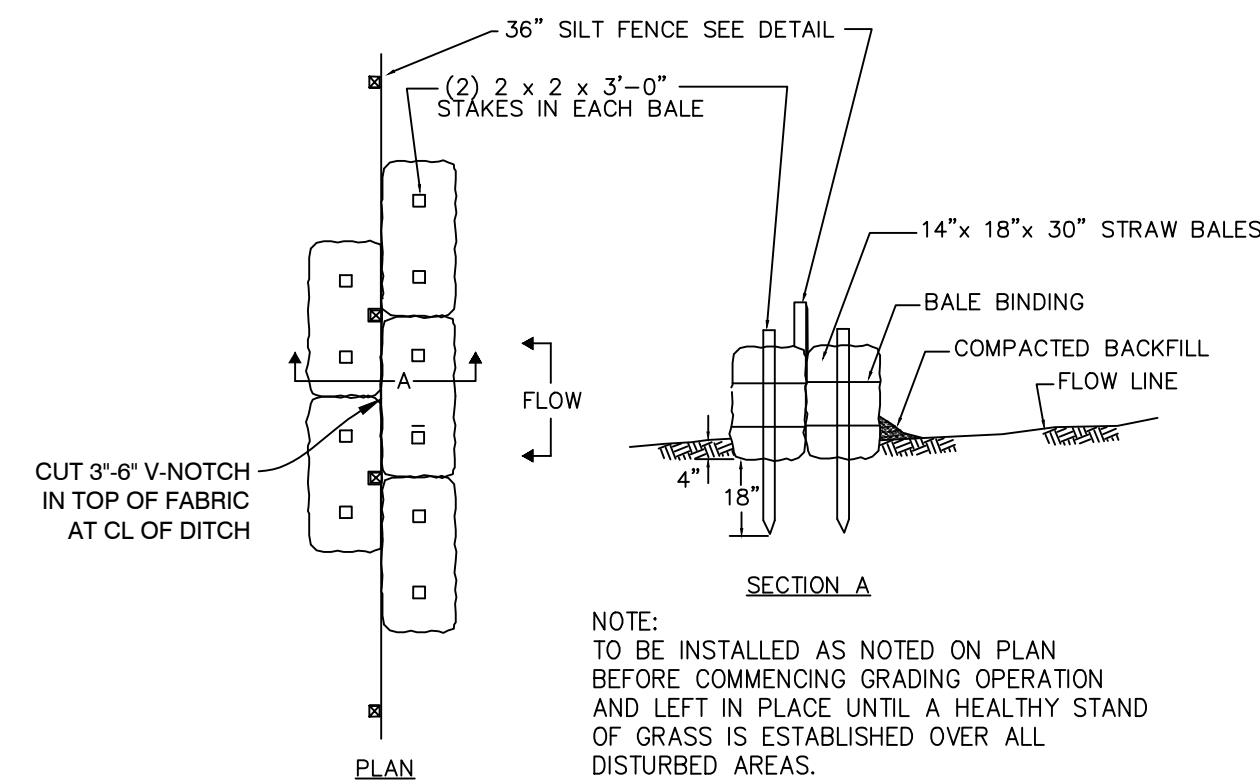
VEGETATED LEVEL SPREADER DETAIL
NOT TO SCALE



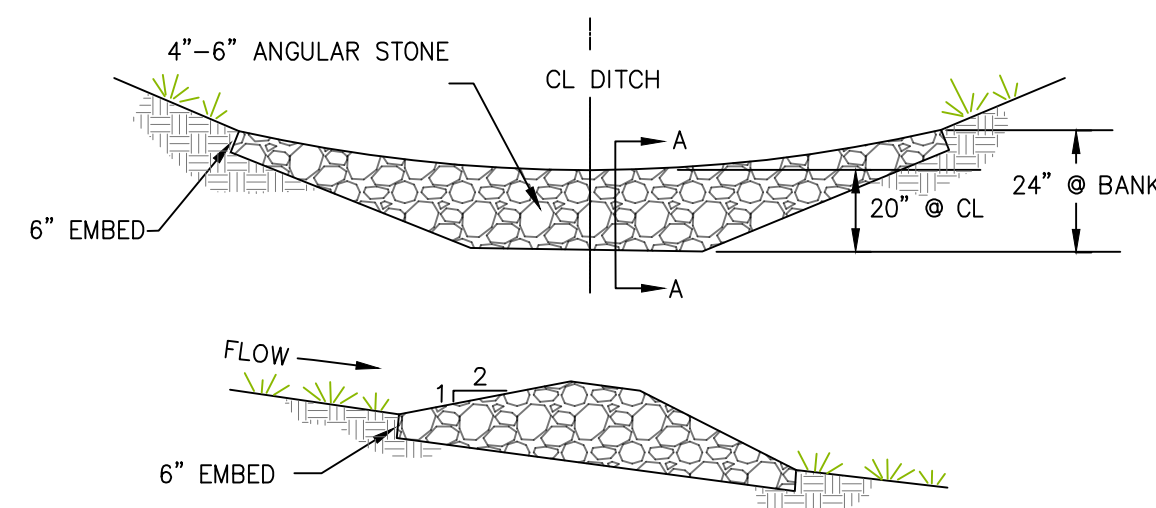
CONSTRUCTION ENTRANCE
NO SCALE



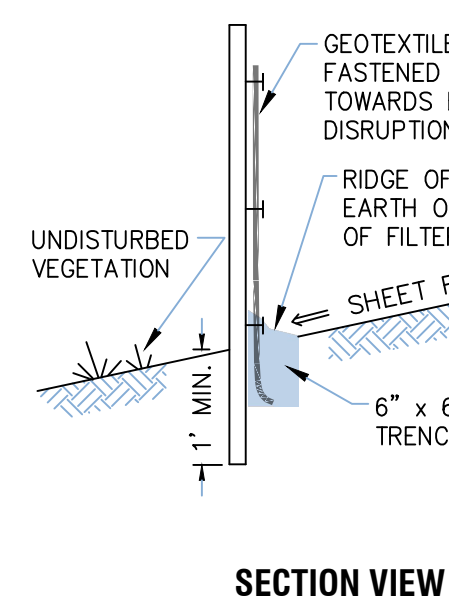
LEVEL OVERFLOW DETAIL
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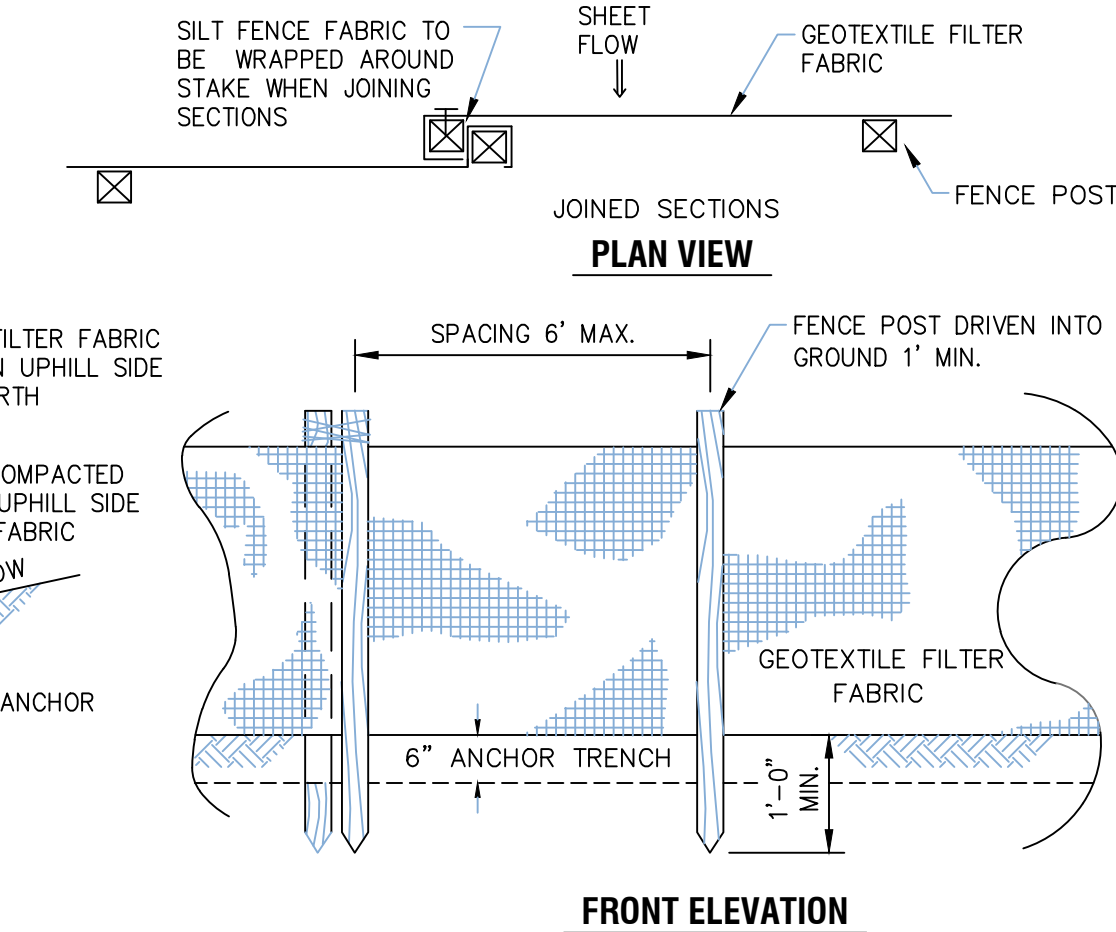
STRAW BALE DITCH CHECK



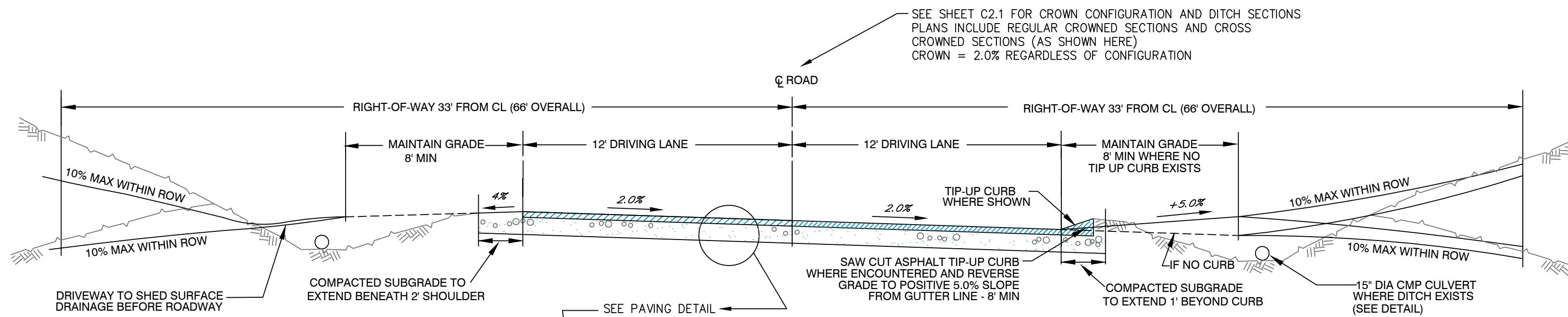
CHECK DAM
NO SCALE



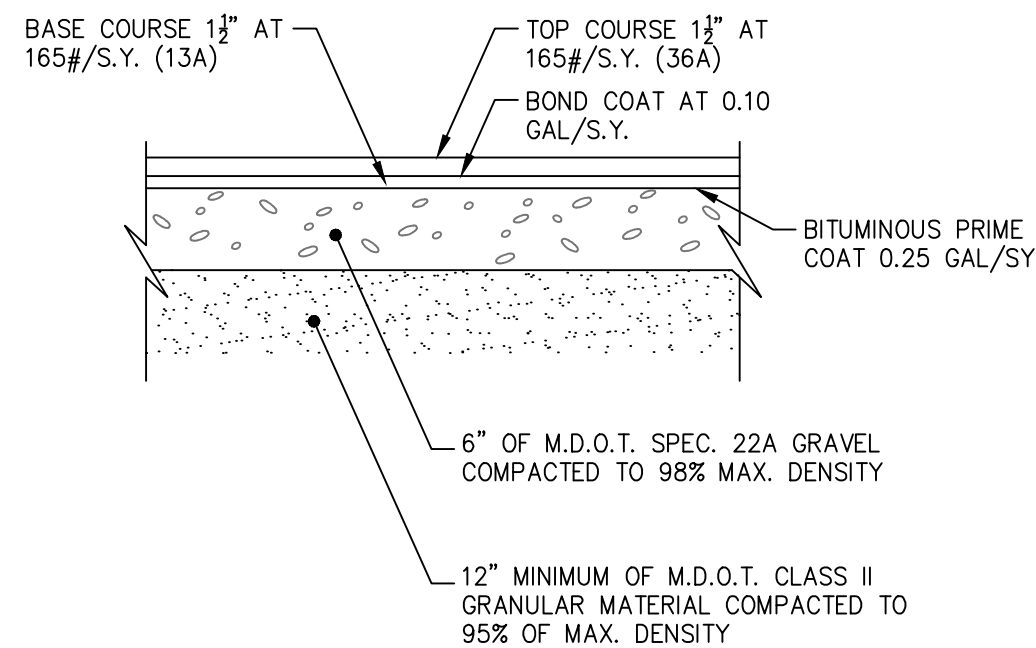
SECTION VIEW



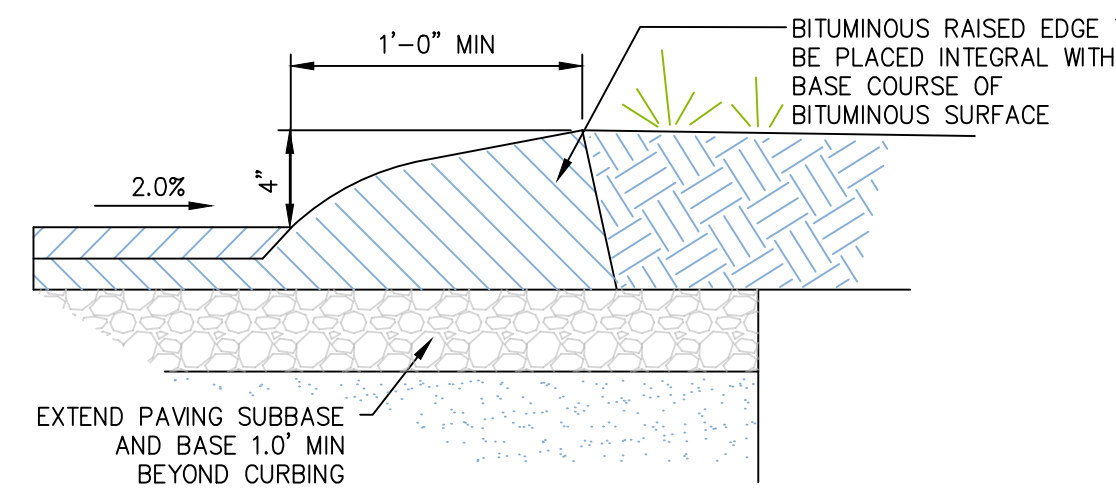
SILT FENCE DETAIL
NO SCALE



ROAD AND FUTURE DRIVEWAY CROSS SECTION
NO SCALE



PAVING DETAIL
NOT TO SCALE

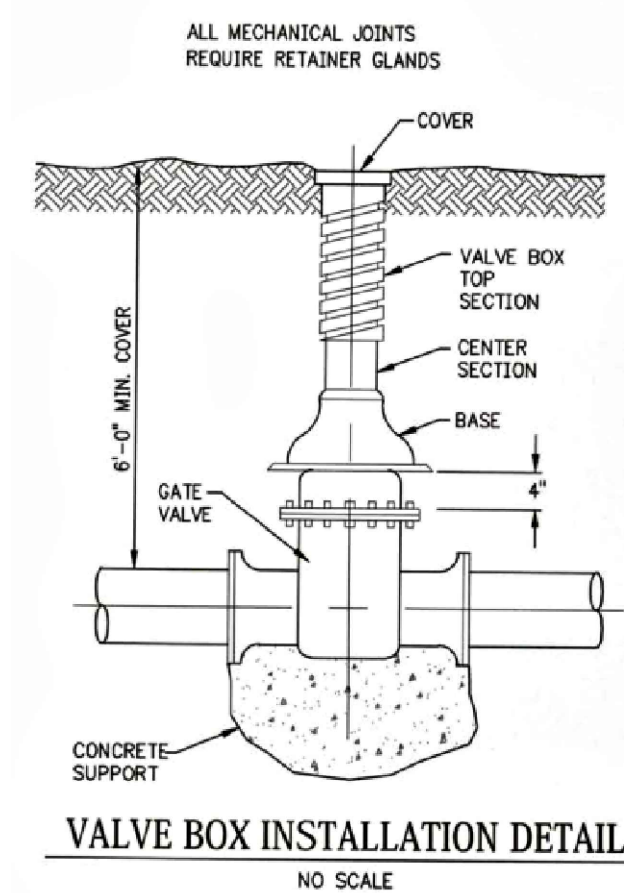
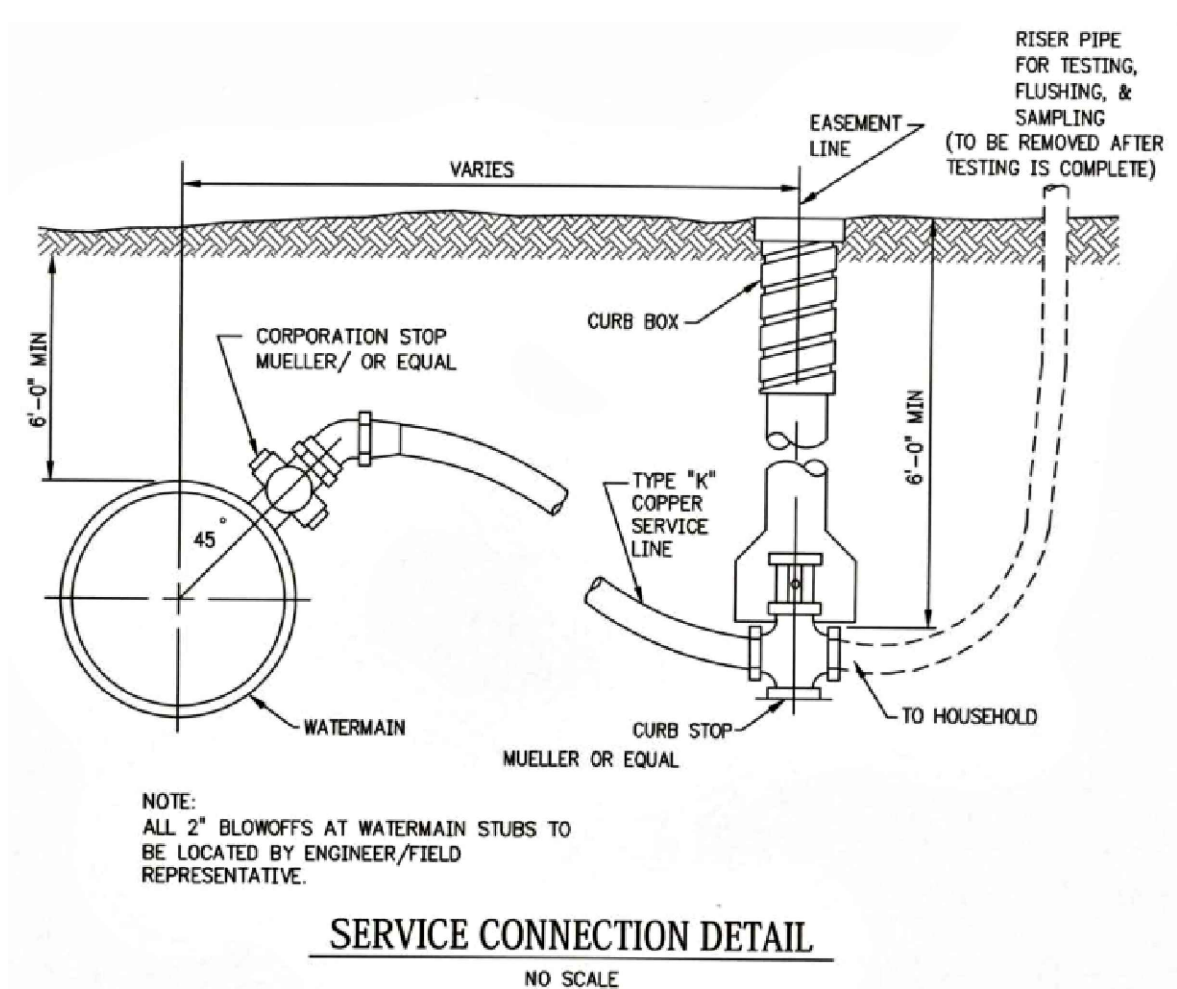
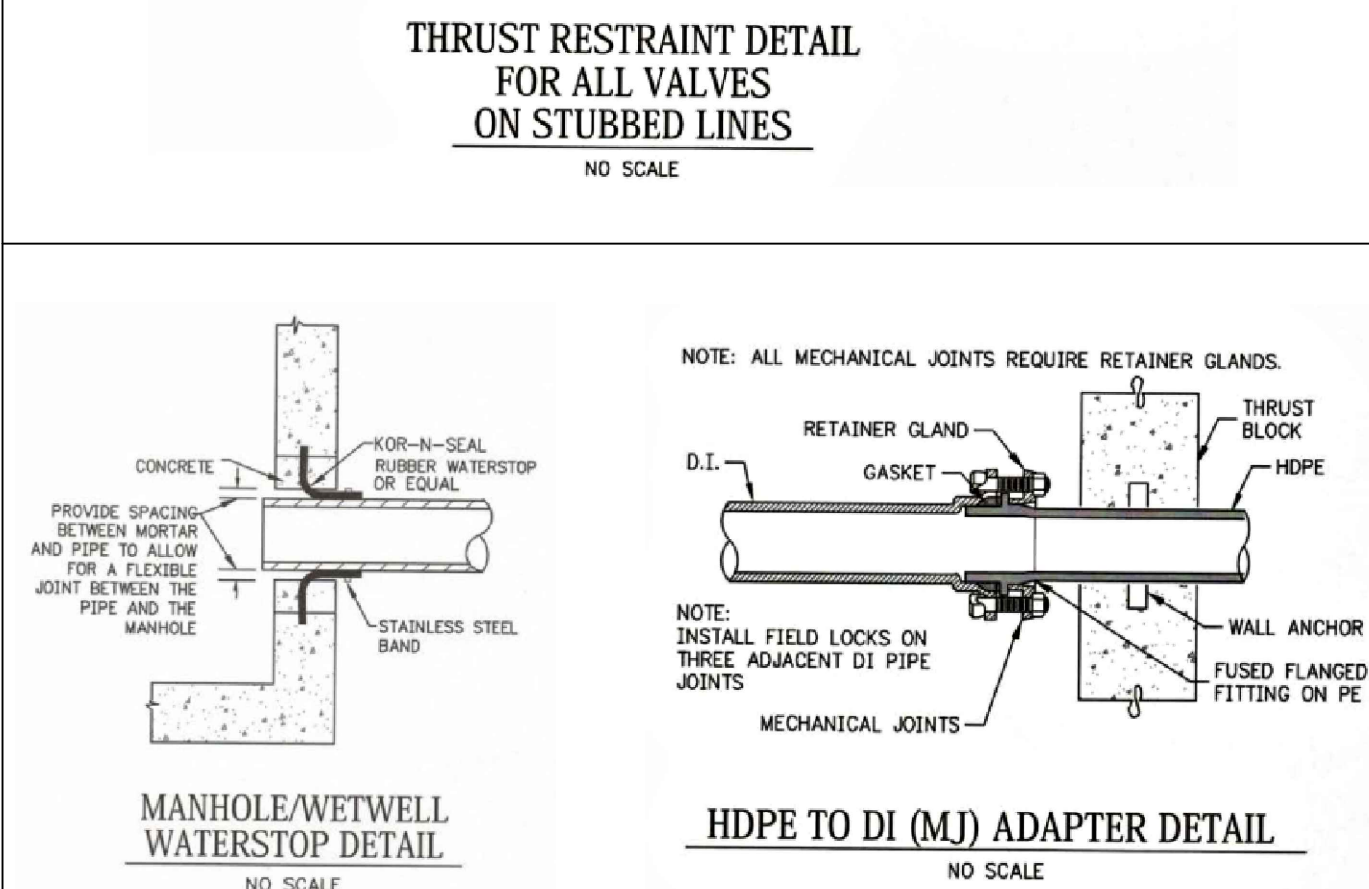
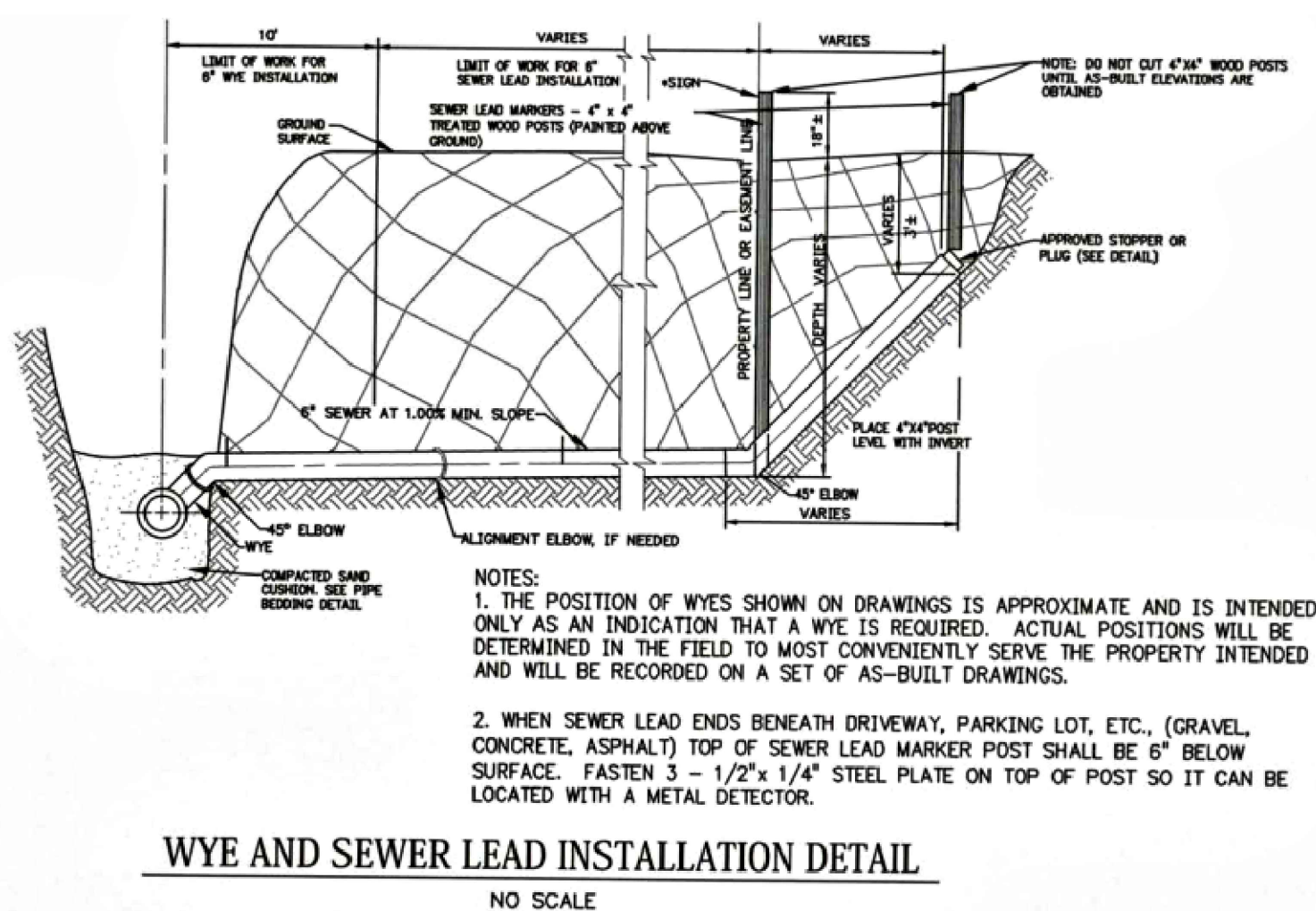
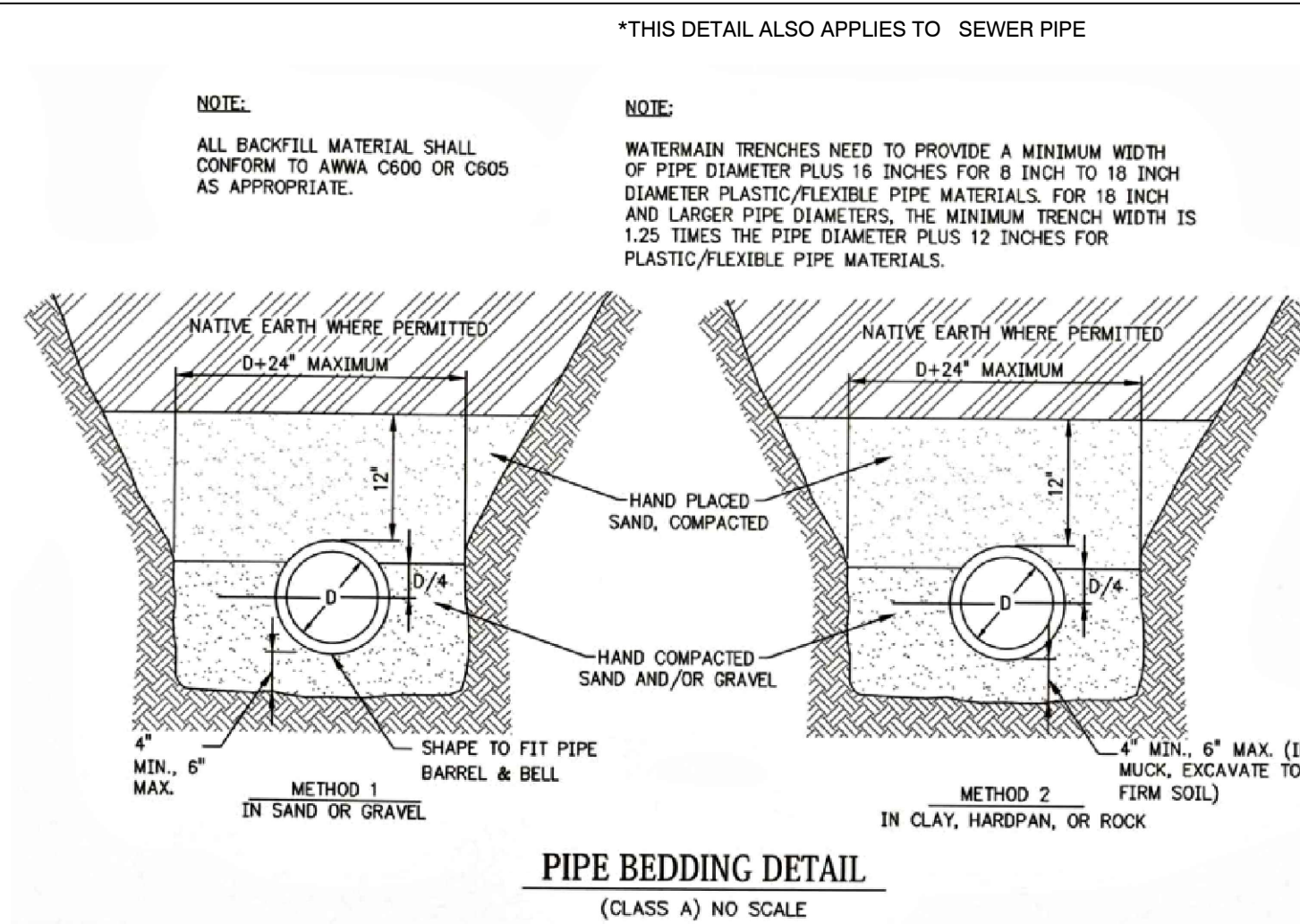
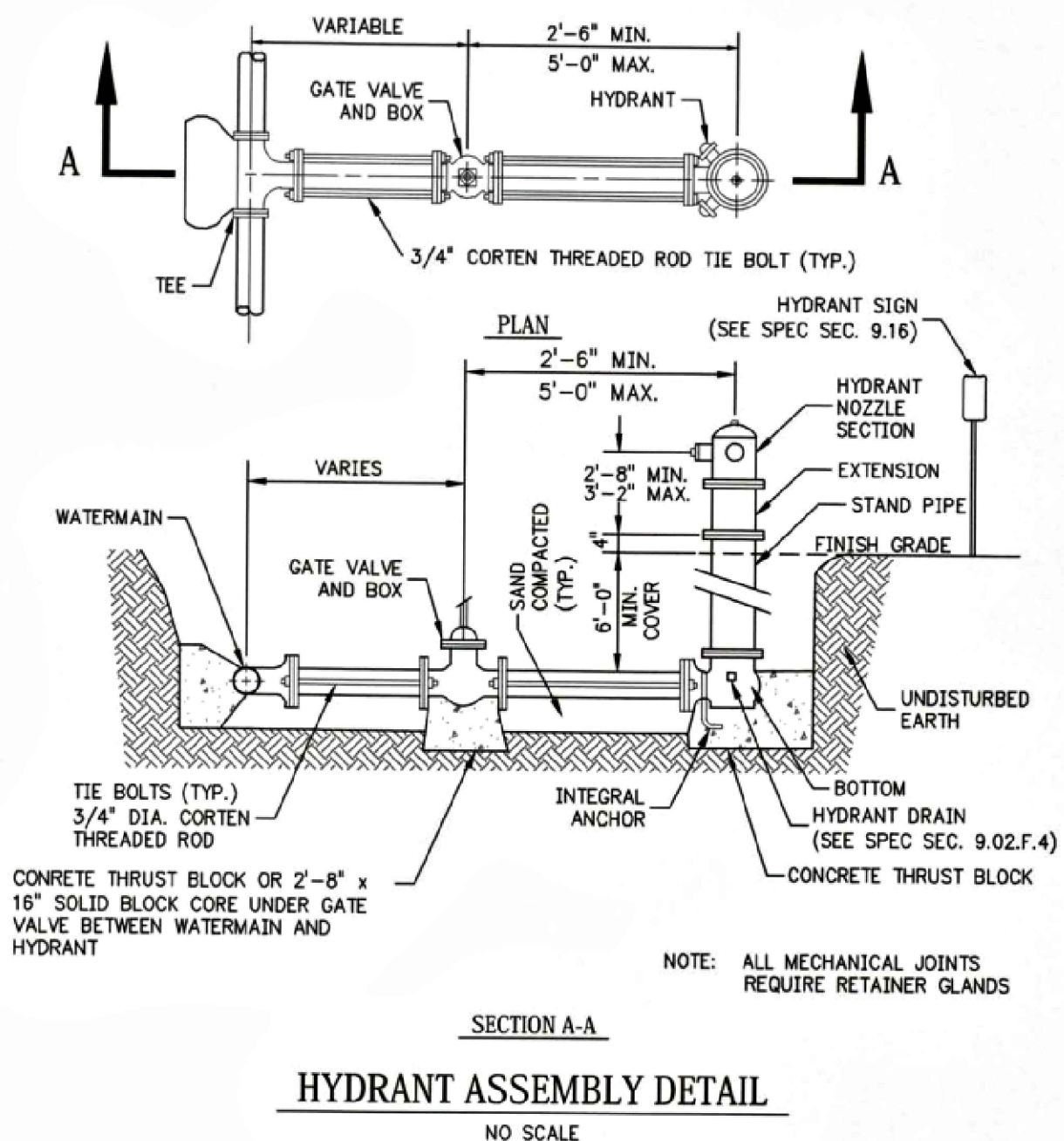
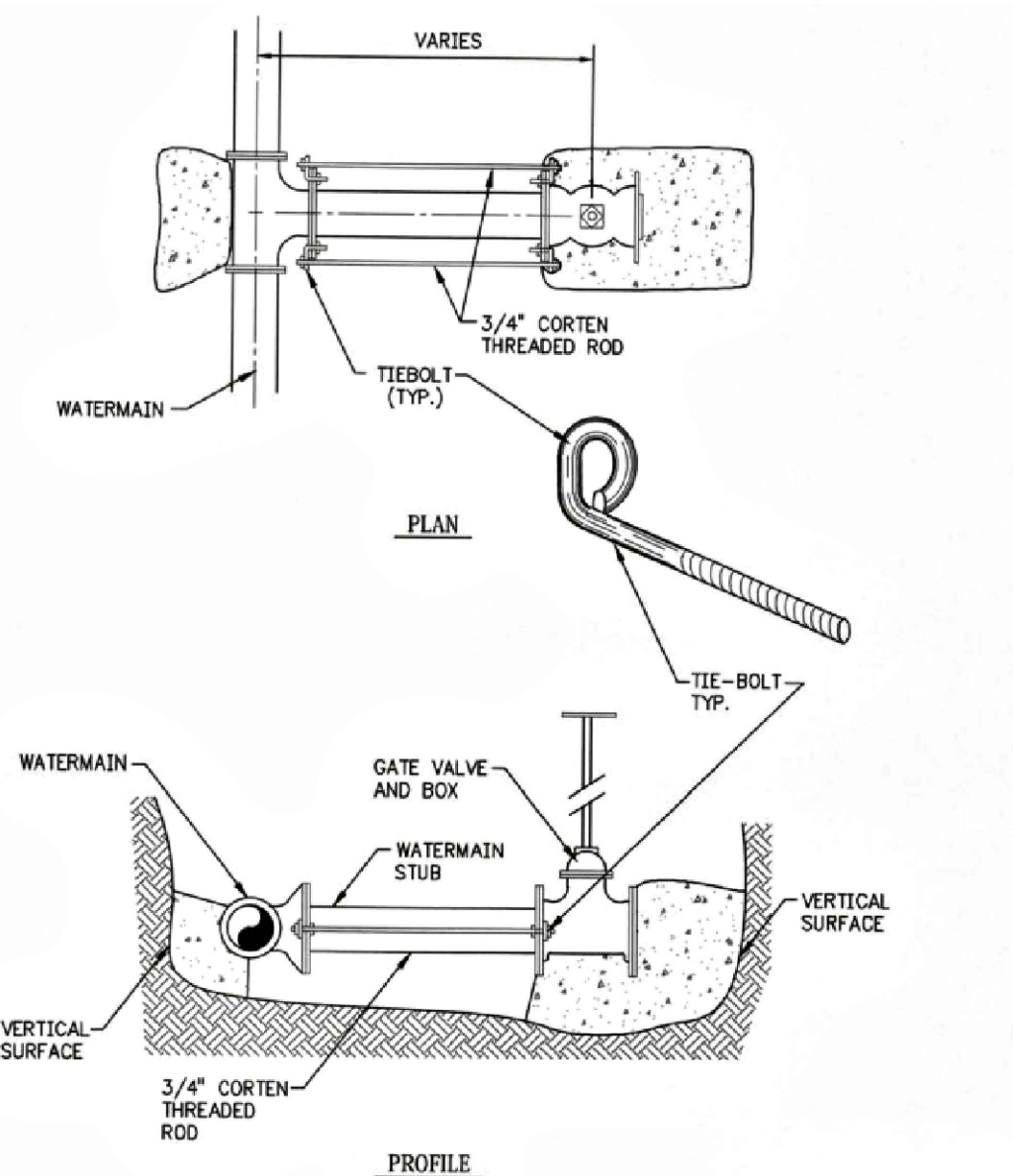
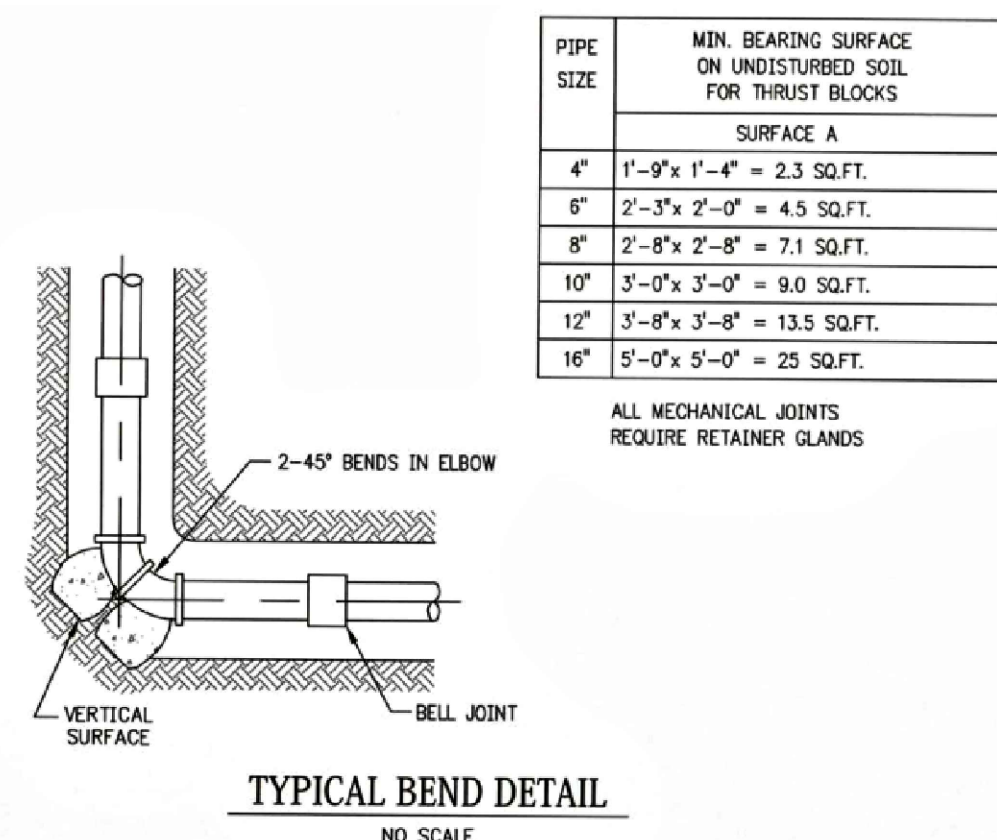
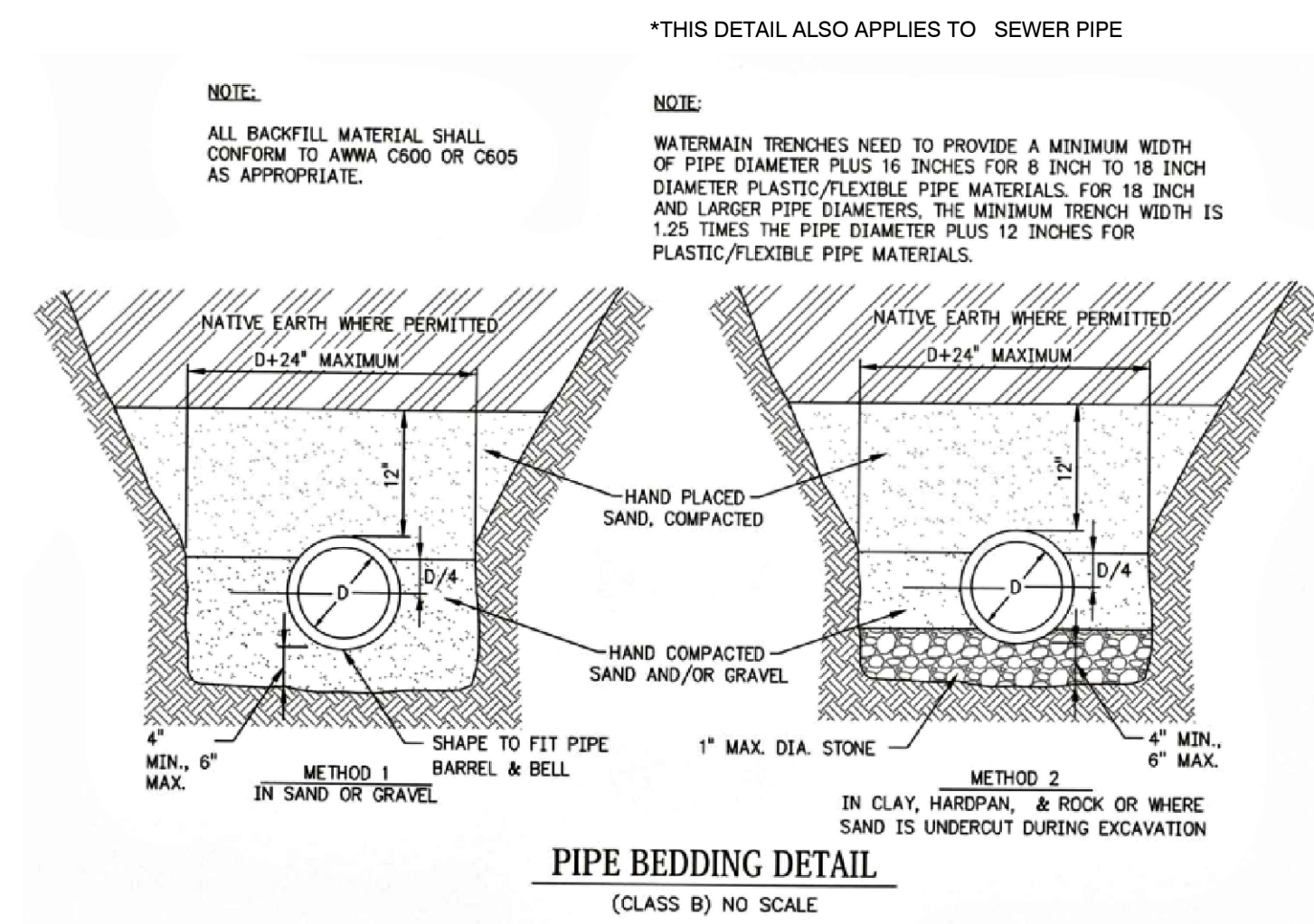
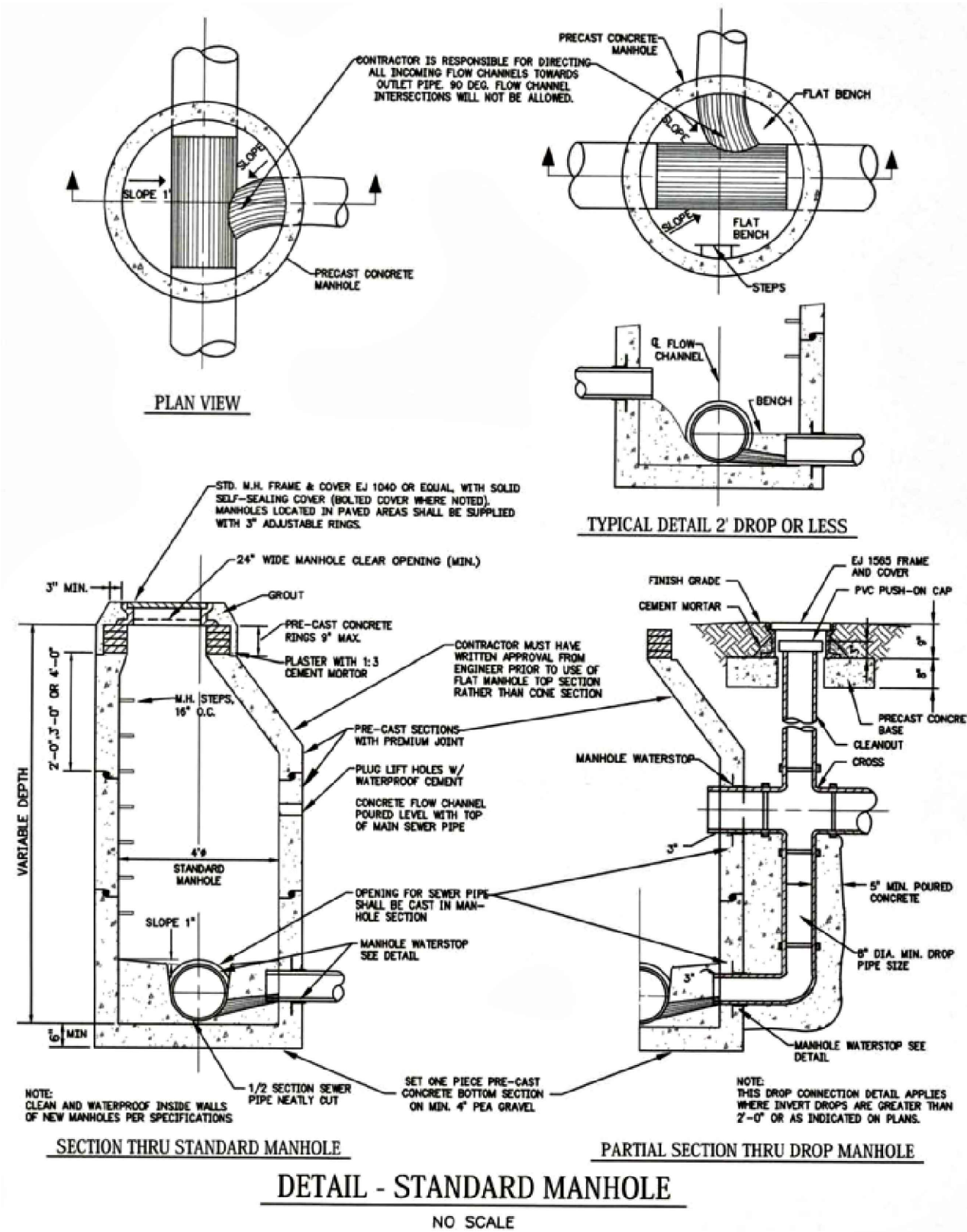
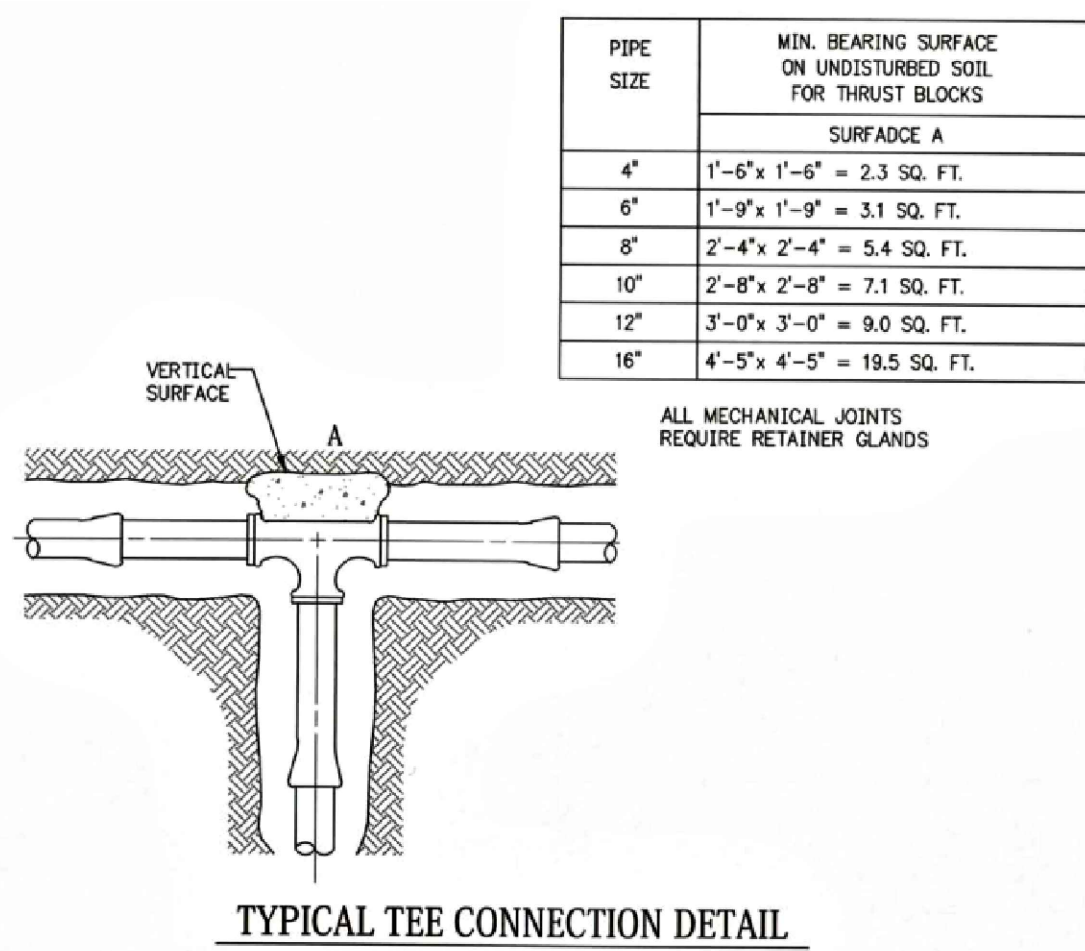


BITUMINOUS RAISED EDGE DETAIL
NOT TO SCALE

NO.	DATE	APP'D	REVISIONS	
			ISSUE /	REVISION DESCRIPTION

SITE DETAILS

ORIGINAL ISSUE DATE:	09/21/2022
SCALE:	
BED JOB NO.	22016
DRAWING NUMBER	



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AND DESIGN**
P.O. Box 94
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boyneengineering.com

BIRMINGHAM HILLS SITE CONDOMINIUM
PREPARED FOR:
T&R INVESTMENTS
841 Ashland Drive
Troy, Michigan 48063

841 Ashland Drive
Traverse City, MI[illegible]

UTILITY DETAILS

ORIGINAL ISSUE DATE	09/21/2022
SCALE:	
BED JOB NO.	22016
DRAWING NUMBER	

C6.1



Engineering
Surveying
Testing &
Operations

123 West Front Street
Traverse City, Michigan 49684
231.946.5874 
231.946.3703 

November 1, 2022

Mr. Chuck Korn, Supervisor
Charter Township of Garfield
3848 Veterans Drive
Traverse City, MI 49684

RE: Birmley Hills Site Condominium – T&R Investments
Water Main and Sanitary Sewer Extension, Plan Review
GFA No. 22300

Dear Mr. Korn,

We have reviewed the plans for the proposed water and sewer system improvements associated with the above referenced project. The review was based on the current standards adopted by Garfield Township in conjunction with the Grand Traverse County Department of Public Works as well as Michigan Department of Environmental Quality requirements, Ten State Standards and accepted engineering practice for this area. The plans were prepared by Boyne Engineering & Design dated 9-21-22. Based upon our review on behalf of Garfield Township with respect to utilities, I offer the following comments.

DESCRIPTION OF THE PROPOSED PROJECT

Water System

The proposed water system extension consists of a scaled quantity of approximately 2,200 linear feet of 8-inch PVC C900 water main to service the proposed development with one (1) extension. The system incorporates two (2) connections that loop back to the water system and provide increased reliability to this service area. The development will be served by the Lower Pressure zone of the Birmley District.

Sanitary Sewer System

The proposed sanitary sewer system extension consists of a scaled quantity of approximately 2,480 linear feet of 8-inch PVC sanitary sewer to service the proposed development extension. The system incorporates two (2) connections to the existing sanitary sewer system.

IMPACT ON THE EXISTING SYSTEM

Sanitary Sewer System

The Garfield Township sanitary sewer collection system is divided up into eight (8) distinct service areas, designated by name according to the primary trunkline running along the respective road. In this case the proposed developed would be immediately serviced by the Garfield Road Service District. The development proposes to connect to the existing sanitary sewer system at five (5) locations, including connections at two (2) existing structures and three (3) new “doghouse” structures on existing sanitary lines. Sewer flow will follow the gravity sewer system to Birmley Road, and north along Garfield Road to



Garfield Lift Station No. 1. The design peak flows for the developments ultimate buildout is approximately 35 gpm. Garfield Lift Station No. 1 was upgraded in 2005 to increase firm capacity to 2,700 gpm. The lift station is currently experiencing peak flows of approximately 1,032 gpm. Based on our review, the existing lift station is capable of handling the anticipated peak flows from the development. One segment of sanitary sewer (8" line between Manhole 565 and 565G) is the restrictive segment and will be at or near 90% capacity with full build out at permit flow values. The Township is aware of this and will maintain monitoring of the system and sees no issue to allow the connection. Sewer review does not account for ability to provide basement service and only finish floor.

Water System

The Garfield Township water distribution system is divided up into five (5) distinct service districts with the limits defined by the existing infrastructure that services the users. In this case the proposed developed would be immediately serviced by the Birmley District. A portion of the development proposes to connect to the Birmley Primary Lower Pressure Zone receiving its supply directly from the City of Traverse City's four (4) million gallon storage tank on LaFranier road. Pressure is supplied by the Birmley Estates Elevated Storage Tank and maintained by Booster Station #2 having a rated firm capacity of 1,440 gpm. This portion of the development proposes to connect to existing water main at two (2) locations. All locations are within previously constructed phases of the development. Based upon information obtained from the 2011 Water Reliability Study and hydrant test data conducted by GFA, operating pressures are range from 45 to 65 psi with an available fire flow of approximately 1,800 gpm at 20 psi. It is estimated that the design maximum domestic demands for this portion the development are approximately 18 gpm to serve 35 REUs, therefore the existing infrastructure appears to be capable to accommodate. GFA has requested a recent hydrant test report from the DPW and awaiting results. Our evaluation does not account for basement and/or 2nd story service and is limited to ensure a minimum of 35 psi working pressure at the main and minimum of 40 psi static pressure at the house. Finish Floor Elevations are not provided however to comply should be at or below 770.

COMMENTS ON THE PLANS

General Comments

1. All design standards and specifications shall comply with the Current Standards adopted by Grand Traverse County Sewer and Water Systems (2017). Copies may be obtained from the Grand Traverse County Department of Public Works.
2. Please ensure all local regulatory permits including Soil Erosion and EGLE NPDES Permits are obtained. Please ensure Township receives copies of issued permits.
3. Please ensure all easements have been obtained and recorded with the Township prior to final acceptance of the utilities. Currently the plans illustrate an ingress/ egress easement however this shall be updated to include utilities and/or an additional 20' independent easement shall be provided for utilities and illustrated on the drawings.
4. Please ensure the Grand Traverse County DPW and Fire Department has reviewed the proposed plans and accepted.
5. The installation of water main, sewer main, hydrants, valves, and manholes shall not be installed within proposed sidewalk, and/or asphalt that would inhibit access by the DPW. Please ensure that there are no obstructions that would prohibit access. If this cannot be complied with,



please note the DPW is not responsible for any costs associated with replacement of such infrastructure such as the landscaping, drives. It appears some of the water main and sanitary sewer are in close proximity to or below proposed private drive.

6. Hydrant #s are incorrect as shown on the plans and shall be updated to reflect: 1229 to 1234
7. Please also note the following: In order for a developer to obtain their building permit and begin site work all permits must be issued including benefit fee payment to the DPW. However the DPW cannot accept this payment unless the infrastructure is either in place (water / sewer main) or a bond is provided by the developer equivalent to 100% of the cost of the utility. Please contact the DPW if you need further clarification, etc.
8. The applicant / design engineer is responsible to verify and confirm adequate water and sewer lead design (size and slope) are adequate to meet demands.
9. There appears to be a lot of water / sewer lead installed that cross proposed ditching along the road. Confirm adequate coverage will be provided for all service leads.
10. Two (2) benchmarks shall be provided on each utility sheet.
11. Applicant shall confirm that all water main and lines maintain 18" vertical and 10' horizontal separation from existing and proposed sewer (storm and sanitary) mains and leads.

Water Main Plan and Profile Comments

1. Portions of water main and valves appear to be located outside of the proposed easement. Please adjust easement or watermain to confirm all are located within the proposed easement.
2. Multiple locations along the water main will at the same elevation as sanitary sewer piping causing concerns for service lead crossings not maintaining appropriate separation. The profile shall be updated to illustrate the crossings and denote 18" separation.
3. Please note that C900 DR 18 is a minimum requirement and DR 14 is proposed.
4. Sheet C4.1 profile sta. 3+25 to 2+75 water main length not called out.
5. Water main stub shall be provided to the abutting western parcel to accommodate a future access.
6. A main line valves shall be installed on Sheet C4.0. Valves are to be installed every 1,000 feet to accommodate isolation.
7. It is recommended hydrants be installed at high points to act as air release. Please adjust locations as possible to accommodate.
8. Watermain shall maintain minimum of 18" vertical separation from all storm water ditches / basins and 10' horizontal.

Sanitary Sewer Plan and Profile Comments

1. The proposed slope between existing MH#583 and proposed MH #1824 is 0.38%. The minimum slope required by Ten States Standards for 8" pipe is 0.4% to ensure 2 feet per second. This is of concern due to this sewer serving only 10 REUs and the minimum slope should be avoided to prevent solid deposition.
2. Manholes in the profile appear to be below/above existing grade in all locations, the manhole rim should at or slightly above proposed grade as to not impede on regular maintenance activities such as plowing, mowing.
3. Portions of sanitary sewer main and manholes appear to be outside or directly on the easement line, please adjust to assure all sanitary sewer is located within the proposed utility easement.



4. A sanitary main stub shall be provided to the abutting western parcel to accommodate a future access/ connection.
5. Sewer Manhole 1822 appears to have flow in two (2) directions and shall be separated into two (2) manholes and segments rather than connected to prevent backups and surcharging.
6. Manhole 1818 inverts and sump elevations do match between sheet C4.0 and C4.1
7. All manholes shall be constructed to provide 1/10 drop between in and out inverts. MH #1819 illustrates both as the same.

COMMENTS ON THE PERMIT APPLICATIONS

EGLE Part 41 and Act 399 Please provide word document draft of the permit application with items 1 - 19 filled out.

1. Technical specifications need to be provided and are available on the GTC DPWs website. Please prepare three (3) copies submitted, signed and sealed.
2. Please provide basis of design for the project. A typical REU usage value 350 GPD/REU and a maximum of 4 peaking factor should be applied for sewer and 200 GPD/ REU and a maximum peaking factor of 3.0 for water.

At this point we expect that the design engineer will be making the above revisions and re-submitting the plans and permit applications for a minor second review. We will provide the subsequent review to verify the appropriate revisions have been made. Assuming the appropriate corrections have been made we will make recommendation to the Township for submission of permit application. At such time, four (4) copies of plans and specifications (signed/ sealed) including an Act 399 Permit Application will need to be provided for submission.

We appreciate the opportunity to assist the Township during the approval of this project. If you have any questions, please don't hesitate to contact me at (231) 946-5874.

Sincerely,

Jennifer Graham, P.E.
Project Manager

CC: John Divozzo, Director, GTC DPW
Carrie May, P.E., Boyne Engineering & Design



GRAND TRAVERSE METRO FIRE DEPARTMENT

FIRE PREVENTION BUREAU

897 Parsons Road ~ Traverse City, MI 49686
Phone: (231) 922-2077 Fax: (231) 922-4918 ~ Website: www.gtfire.org Email: Info@gtfire.org

SITE PLAN REVIEW RECORD

ID # M7261-P1289

DATE: 10/4/2022

PROJECT NAME: Birmley Hills

PROJECT ADDRESS:

TOWNSHIP: Garfield

APPLICANT NAME: Steve Zakrajsek

APPLICANT COMPANY: T & R Investments

APPLICANT ADDRESS: 841 Ashland Dr.

APPLICANT CITY: Traverse City STATE: MI ZIP: 49696

APPLICANT PHONE: 231-838-6004

FAX #

REVIEW FEE: \$75.00

Reviewed By: Kathy Fordyce, Plan Reviewer

This review is based solely on the materials submitted for review and does not encompass any outstanding information. Compliance with all applicable code provisions is required and is the responsibility of the permit holder. Items not listed on the review do not negate any requirements of the code nor the compliance with same. Inspection requests must be made a minimum of 48 hours prior to needed inspection. This plan review is based on the 2015 International Fire Code, as adopted.



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SITE PLAN REVIEW

ID # M7261-P1289

DATE: 10/4/2022

1. 505.1 Address identification.

New and existing buildings shall be provided with approved address identification. The address identification shall be legible and placed in a position that is visible from the street or road fronting the property. Address identification characters shall contrast with their background. Address numbers shall be Arabic numbers or alphabetical letters. Numbers shall not be spelled out. Each character shall be not less than 4 inches (102 mm) high with a minimum stroke width of 1/2 inch (12.7 mm). Where required by the fire code official, address identification shall be provided in additional approved locations to facilitate emergency response. Where access is by means of a private road and the building cannot be viewed from the public way, a monument, pole or other sign or means shall be used to identify the structure. Address identification shall be maintained.

-Provide addresses during construction as well as permanently using numbers that area minimum height of 4 inches.

2. 505.2 Street or road signs.

Streets and roads shall be identified with approved signs. Temporary signs shall be installed at each street intersection when construction of new roadways allows passage by vehicles. Signs shall be of an approved size, weather resistant and be maintained until replaced by permanent signs.

-Provide street signs before construction begins.

3. 509.1 Fire protection equipment identification.

Fire protection equipment shall be identified in an approved manner. Rooms containing controls for air-conditioning systems, sprinkler risers and valves, or other fire detection, suppression or control elements shall be identified for the use of the fire department.

Approved signs required to identify fire protection equipment and equipment location shall be constructed of durable materials, permanently installed and readily visible.

- Provide hydrant signs for hydrants throughout the development.

4. 507.5.4 Obstruction.

Unobstructed access to fire hydrants shall be maintained at all times. The fire department shall not be deterred or hindered from gaining immediate access to fire protection equipment or fire hydrants.

5. 507.5.5 Clear space around hydrants.

A 3-foot (914 mm) clear space shall be maintained around the circumference of fire hydrants, except as otherwise required or approved.



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6. 507.5.6 Physical protection.

Where fire hydrants are subject to impact by a motor vehicle, guard posts or other approved means shall comply with Section 312.

7. 503.2.7 Grade.

The grade of the fire apparatus access road shall be within the limits established by the fire code official based on the fire department's apparatus.

-Fire department apparatus access roads shall have road grades less than 10%.

Project may proceed with township approval process.

Steve Hannon

From: Steve Barry <sbarry@gtcrc.org>
Sent: Tuesday, November 8, 2022 2:43 PM
To: boyneeng@torchlake.com
Subject: RE: Birmley Hills Site Condominium Review

Carrie,

GTCRC does support and approve the 30' Tee section. Please advise when you would like to proceed.

Thank you,

Steve Barry
GTCRC Permit and Violations Agent
231-922-4849 EXT 205

From: boyneeng@torchlake.com <boyneeng@torchlake.com>
Sent: Tuesday, November 8, 2022 12:27 PM
To: Steve Barry <sbarry@gtcrc.org>
Subject: FW: Birmley Hills Site Condominium Review

Hi Steve, here is that drawing again. The width of the tee section is 30'.



CARRIE MAY, PE | OWNER/PRINCIPAL ENGINEER
BOYNE ENGINEERING AND DESIGN, PLLC
Direct Phone: 231-499-8361 | E-mail: boyneeng@torchlake.com
boyneengineering.com
PO Box 94, Boyne City, MI 49712

From: boyneeng@torchlake.com <boyneeng@torchlake.com>
Sent: Monday, October 24, 2022 10:37 AM
To: 'Steve Barry' <sbarry@gtcrc.org>
Subject: RE: Birmley Hills Site Condominium Review

Hi Steve,

I am attaching a revised sheet C2.0 for Birmley Hills showing the turn-out at the water tower entrance. The dedicated easement would of course go all the way back to the property line. As we discussed, we are proposing to provide this turn-out in a dedicated easement for your vehicles at the end of Birmley Estates Drive and a maintenance agreement for the Birmley Hills Site Condominium Association to plow the unmaintained "Stub" called Farmington Drive between the maintained county road and Farmington Court. Please let me know if this is adequate so I can provide it to the township as well.

Thanks,
Carrie



CARRIE MAY, PE | OWNER/PRINCIPAL ENGINEER
BOYNE ENGINEERING AND DESIGN, PLLC
Direct Phone: 231-499-8361 | E-mail: boyneeng@torchlake.com
boyneengineering.com
PO Box 94, Boyne City, MI 49712

From: Steve Barry <sbarry@gtcrc.org>
Sent: Monday, October 10, 2022 9:05 AM
To: boyneeng@torchlake.com
Subject: RE: Birmley Hills Site Condominium Review

Carrie,

I forgot to attach it here you go.

Thank you,

Steve Barry
GTCRC Permit and Violations Agent
231-922-4849 EXT 205

From: boyneeng@torchlake.com <boyneeng@torchlake.com>
Sent: Monday, October 10, 2022 8:40 AM
To: Steve Barry <sbarry@gtcrc.org>
Subject: RE: Birmley Hills Site Condominium Review

Hi Steve,
Thanks for letting me know. I didn't see a hammerhead detail in your specs after all. I am planning on using the shape detailed in the attached 2015 IFC specs (international fire code). Is that acceptable?
Thanks,
Carrie



CARRIE MAY, PE | OWNER/PRINCIPAL ENGINEER
BOYNE ENGINEERING AND DESIGN, PLLC
Direct Phone: 231-499-8361 | E-mail: boyneeng@torchlake.com
boyneengineering.com
PO Box 94, Boyne City, MI 49712

From: Steve Barry <sbarry@gtcrc.org>
Sent: Monday, October 10, 2022 7:53 AM
To: boyneeng@torchlake.com
Subject: RE: Birmley Hills Site Condominium Review

Carrie,

I spoke to Wayne this morning and he is good with a hammerhead turn around. Let me know if you need anything.

Thank you,

Steve Barry
GTCRC Permit and Violations Agent
231-922-4849 EXT 205

From: boyneeng@torchlake.com <boyneeng@torchlake.com>

Sent: Monday, September 26, 2022 2:45 PM

To: Steve Barry <sbarry@gtcrc.org>

Subject: RE: Birmley Hills Site Condominium Review

Hi Steve,

Thanks for talking with me this afternoon. I will stop by tomorrow with a check and a hard copy of the plans. I am including a link below to a google drive with the plans and the submittal package that went to the Township for this development.

Google Drive with Birmley Hills Plans:

<https://drive.google.com/drive/folders/1aQNIbqNGNLxflpd4HMOXJKjiF01w3jB6?usp=sharing>

Thanks again, and have a nice afternoon,

Carrie



CARRIE MAY, PE | OWNER/PRINCIPAL ENGINEER
BOYNE ENGINEERING AND DESIGN, PLLC
Direct Phone: 231-499-8361 | E-mail: boyneeng@torchlake.com
boyneengineering.com
PO Box 94, Boyne City, MI 49712



Charter Township of Garfield

Grand Traverse County

3848 VETERANS DRIVE
TRAVERSE CITY, MICHIGAN 49684
PH: (231) 941-1620 • FAX: (231) 941-1588

To: Garfield Township Board of Trustees

From: Michael Green, Zoning Administrator

Re: Proposed Ordinance No. 78, entitled "Soil Erosion and Sedimentation Control Ordinance"

Date: Wednesday, January 4, 2023

BACKGROUND:

Staff has prepared Charter Township of Garfield Ordinance No. 78 – Control of Soil Erosion and Sedimentation (SESC) Ordinance for your consideration. Ordinance No. 78, if approved by the State of Michigan and adopted by this Board, would allow the Township to administer its own Soil Erosion and Sedimentation Control program. The full Ordinance, which has been reviewed and accepted by Attorney Scott Howard, is included as an attachment to this report.

SESC PROGRAM APPROVAL PROCESS:

Development of this Ordinance is the first step in an overall process in gaining designation as a Municipal Enforcement Agency (MEA) for the enforcement of Part 91 of the Natural Resources Environmental Protection Act – Soil Erosion and Sedimentation Control. The overall process is outlined in greater detail within the attached bulletin produced by the State of Michigan. If this Board is comfortable with the language presented, the proposed Ordinance and other documentation will be sent to the State of Michigan for review and approval. The draft Ordinance, if approved by the State of Michigan, will be brought back to this Board for formal adoption.

KEY ORDINANCE PROVISIONS:

The proposed Control of Soil Erosion and Sedimentation Ordinance (Ordinance No. 78), as written, proposes to administer the minimum regulatory requirements and does not contain any regulations not required by Part 91 as is the case with the Grand Traverse County SESC Ordinance. While the Township SESC Ordinance only requires permits for activities involving sites within 500 feet of a water body and sites that exceed one acre in area as prescribed by Part 91, the County SESC Ordinance also requires permits for sites that are:

- Located within 500 feet of a regulated wetland,
- Disturbing slopes of 20% or greater,
- Located within 500 feet of a county drain, and
- Disturbing soils on site that are classified as Group D hydrologic soils.

It should be noted that the property owner is responsible for maintaining proper soil erosion and sedimentation controls regardless on sites even when SESC permits are not required and are liable for any failures that result from if they fail to do so.

ACTION REQUESTED:

The purpose of bringing this item before the Township Board is to introduce the proposed Ordinance at their January 10, 2023, Meeting. Following discussion, if the Township Board is comfortable with the proposed Ordinance, then the following motion is suggested:

MOTION authorizing submission of proposed Garfield Township Ordinance No. 78, as attached to this report, to the State of Michigan for review and approval.

Any additional information the Commissioners feel is necessary should be added to this motion.

Attachments:

1. Proposed Ordinance No. 78.
2. State of Michigan Bulletin entitled “How to Change the Agency Designated as CEA/MEA”.

**Charter Township of Garfield
Grand Traverse County, Michigan
CONTROL OF SOIL EROSION AND SEDIMENTATION ORDINANCE
Ordinance No. 78**

PREAMBLE

AN ORDINANCE TO PROVIDE FOR THE CONTROL OF SOIL EROSION AND SEDIMENTATION AND TO PROTECT ADJACENT PROPERTY AND THE WATERS OF THE STATE FROM SEDIMENTATION UNDER THE PROVISIONS OF PART 91 OF THE SOIL EROSION AND SEDIMENTATION CONTROL, NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION ACT 451 OF PUBLIC ACTS OF 1994, MCL 324.9101 ET SEQ (AS AMENDED)

THE CHARTER TOWNSHIP OF GARFIELD ORDAINS:

Section 1. Purpose

The purpose of this Ordinance is to prevent soil erosion and sedimentation from occurring as a result of earth change activities within the Township by requiring proper provisions for water disposal and the protection of soil surfaces during and after earth change activities, in order to promote the safety, public health, convenience, and general welfare of the community.

Section 2. Definitions

The following definitions shall apply in the interpretation and enforcement of this Ordinance:

- A. "Accelerated soil erosion" – The increased loss of the land surface that occurs as a result of human activities.
- B. "Act" – The Natural Resources and Environmental Protection Act (1994 PA No. 451 as amended).
- C. "Earth Change" – A human made change in the natural cover or topography of land, including cut and fill activities, which may result in or contribute to accelerated soil erosion or sedimentation of the waters of the State. This includes, but is not limited to, grading and preparation for wells, septic fields, driveways, foundations, backfill, final grade changes and stockpiling of material. "Earth change" does not include the practice of plowing and tilling soil for the purpose of crop production.
- D. "Excavation or cut" – Any act by which soil, clay, gravel, sand, peat or topsoil is cut into, dug, uncovered, removed, displaced, or relocated, and the conditions resulting therefrom.
- E. "Final Completion Notice" – A signed, written statement by the Zoning Department that the permitted earth disturbance has been inspected and found to comply with all Soil

Erosion and Sedimentation Control plans, specifications, permit conditions and/or supplementary requirements.

- F. “Final Inspection Request” – A statement by the Permittee that the permitted site has been permanently stabilized and can be inspected for final completion.
- G. “Flood Plain” – That area which would be inundated by a flood having a one percent chance of being equaled or exceeded in any given year.
- H. “Grading” – Any stripping, excavating, filling, stockpiling, or any combination thereof, and shall also include the land in its excavated or filled condition.
- I. “Minor Project” – A project that results in less than 500 square feet of disturbance area and located more than one hundred (100) feet from the water of the State.
- J. “Notice of Deficiency” – A written statement by the Department which indicates specific deficiencies of on-site soil erosion and sedimentation control measures, either temporary or permanent, which are required to control soil erosion and sedimentation.
- K. “Notice of Violation” – A written statement by the Department which indicates specific failures and/or deficiencies of on-site soil erosion and sedimentation control measures, either temporary or permanent, which are required to control soil erosion and sedimentation and identifies the permittee as being in violation of the conditions of the issued Permit, the approved soil erosion and sedimentation control plan, Part 91, or this Ordinance.
- L. “Part 91” – Part 91, Soil Erosion and Sedimentation Control, of the Act.
- M. “Permittee or Permit Holder” – The landowner of the land involved in the earth change activity for which a permit is required and to whom a valid permit has been issued.
- N. “Person” – A natural person, firm corporation, partnership, association, limited liability company, or similar entity or governmental or quasi-governmental entity subject to the jurisdiction of the Township and this Ordinance.
- O. “Sediment” – Solid particulate matter including both mineral and organic matter that is in suspension in water, is being transported or has been removed from its site of origin by the actions of wind, water, or gravity, and has been deposited elsewhere.
- P. “Soil Erosion” – The process by which the ground surface is worn away by action of wind, water, gravity, or a combination thereof.
- Q. “Soil Erosion and Sedimentation Control Permit” – A permit to authorize work to be performed under this Ordinance.

- R. “Stop work order” – A written statement by the Zoning Department indicating that all construction and/or earth change activities, except those specifically identified by said Department, shall be suspended until otherwise indicated.
- S. “Stripping” – Any activity which removes or significantly disturbs the vegetative surface cover, including clearing and grubbing operations.
- T. “Temporary Soil Erosion and Sedimentation Control Measures” – Interim control measures which are installed or constructed for the control of soil erosion and sedimentation until permanent soil erosion and sedimentation control is installed.
- U. “Township” – The Charter Township of Garfield, Grand Traverse County, Michigan, and/or its duly authorized agent or designee.
- V. “Waters of the State” – The Great Lakes and their connecting waters, inland lakes and streams as defined in the rules promulgated under Part 91, and wetlands regulated under Part 303 of the Act.
- W. “Zoning Department” or “Department” – The Charter Township of Garfield Zoning Department.

Section 3. Compliance Required for Site Plan/Plat Approval

No site plan or preliminary plat shall be approved under the terms and conditions of the Charter Township of Garfield Zoning Ordinance and Land Division Ordinance unless the site plan includes soil erosion and sediment control measures consistent with the requirements of this Ordinance and related land development regulations.

Section 4. Compliance Required for Occupancy

- A. No permanent certificate of occupancy for any building shall be issued unless the applicant for said certificate shall have obtained a Final Completion Notice indicating compliance with all plans and specifications and completion of all required permanent soil erosion and sedimentation control measures.
- B. A temporary certificate of occupancy may be issued, at the discretion of the Department, prior to issuance of a Certificate of Completion if the permittee has achieved substantial completion as determined by the Department. “Substantial completion” shall mean satisfactory completion of all aspects of the work except growth of vegetative materials necessary for soil stabilization and minor structural appurtenances. A temporary Certificate of Occupancy shall be conditioned upon a listing of items and procedures to be completed, a schedule of completion, and the furnishing of adequate financial guarantees to insure completion of all such items.

Section 5. Permits and Fees

- A. *Permit requirement.* Except as expressly exempted by this Ordinance or Part 91 of the Act or the rules promulgated thereunder, no person shall perform or cause to be performed any earth change, until a valid Permit has been issued by Garfield Township Zoning Department for said work. The undertaking of any earth change activity under the authority of any other Authorized Public Agency shall be exempt from this Ordinance. This exception shall not be construed to eliminate requirements that permits be obtained from other agencies.
- B. *Permit application.* A separate application shall be required for each Permit. Said erosion and sedimentation control plans, specifications, and work schedules shall be submitted with each application for a permit.
- C. *Activities exempt from permit requirements.*
1. Subject to subsection 2, a person engaged in the logging industry, the mining industry or the plowing or tilling of land for the purpose of crop production or harvesting of crops is not required to obtain a permit under this part. However, all earth changes associated with the activities listed in this section shall conform to the same standards as if they required a permit under this part. The exemption from obtaining a permit under this subsection does not include either of the following:
 - a. Access roads to and from the site where active mining or logging is taking place.
 - b. Ancillary activities associated with logging and mining.
 - c. Removal of clay, gravel, sand, peat, or topsoil.
 2. This Ordinance does not apply to a metallic mineral mining activity that is regulated under a mining and reclamation plan that contains soil erosion and sedimentation control provisions and that is approved by the Department under Part 631 of the Act.
 3. A person is not required to obtain a permit from a county enforcing agency or a municipal enforcing agency for earth changes associated with well locations, surface facilities, flowlines, or access roads relating to oil or gas exploration and development activities regulated under Part 615 of the Act, if the application for a permit to drill and operate under Part 615 contains a soil erosion and sedimentation control plan that is approved by the Department under Part 615. However, those earth changes shall conform to the same standards as required for a permit under Part 91. This subsection does not apply to a multisource commercial hazardous waste disposal well as defined in Section 62506.a of the Act.

4. An earth change of a minor nature that is stabilized within twenty-four (24) hours of the initial earth disturbance and that will not contribute sediment to lakes or streams.
5. Normal road and driveway maintenance such as grading or leveling that does not increase the width or length of the road or driveway and that will not contribute sediment to lakes or streams.
6. Residential or Earth Change Activities. A residential property owner who causes the following activities to be conducted on individual residential property owned and occupied by such owner is not required to obtain a permit under this Ordinance if the earth change activities do not result in or contribute to soil erosion or sedimentation of the waters of the State of Michigan or a discharge of sediment offsite:
 - a. An earth change of a minor nature that is stabilized within twenty four (24) hours of the initial disturbance.
 - b. Gardening, if the natural elevation of the area is not raised. “Gardening” means activities necessary to the growing of plants for personal use, consumption, or enjoyment.
 - c. Post holes for fencing, decks, utility posts, mailboxes, or similar application, if no additional grading or earth change occurs for use of the posthole.
 - d. Removal of tree stumps, shrub stumps or roots resulting in an earth change not to exceed one hundred (100) square feet.
 - e. All of the following activities, if soil erosion and sedimentation controls are implemented, the earth change is stabilized within twenty-four (24) hours of the initial earth disturbance, and soil erosion or sedimentation to adjacent properties or the waters of the State has not or will not reasonably occur.
 - i. Planting of trees, shrubs or similar plants;
 - ii. Seeding or reseeding of lawns of less than one (1) acre if the seeded area is at least one hundred (100) feet from the waters of the State of Michigan;
 - iii. Seeding or reseeding of lawns closer to one hundred (100) feet of the waters of the State, if the area to be seeded or reseeded does not exceed one hundred (100) square feet;
 - iv. Temporary stockpiling of soil, sand, or gravel not greater than a total of ten (10) cubic yards on the property, if the stockpiling occurs at

least one hundred (100) feet from the waters of the state of Michigan.

7. Exemptions provided in this Section, Part 91, and the rules promulgated thereunder shall not be construed as exemptions from enforcement procedures under this Ordinance, Part 91 or said rules if the exempted activities cause or result in a violation of this Ordinance, Part 91 or the rules.
- D. Application data required. The soil erosion and sedimentation plans and specifications accompanying the Permit application shall contain the following data:
1. A site location sketch at the scale of not greater than one (1) inch to two hundred (200) feet, indicating the site location and proximity of any proposed earth change to lakes or streams.
 2. A boundary line survey of the site on which the work is to be performed.
 3. Name, address, and telephone number of the landowner, contractor, Authorized Agent and the one-site contact, as applicable.
 4. A schedule indicating the anticipated starting and completion dates of the development's construction sequence and the time of exposure of each area prior to the installation of permanent soil erosion sediment control measures.
 5. A statement of the quantity of excavation and fill involved.
 6. The estimated total cost of the required temporary and permanent soil erosion and sedimentation control measures.
 7. A plan of the site at a scale not greater than one (1) inch to one hundred (100) feet showing:
 - a. Legal description of property;
 - b. Physical limits of each proposed earth change;
 - c. Existing topography at a maximum of two (2) foot contour intervals;
 - d. Proposed final topography at a maximum of two (2) foot contour intervals;
 - e. Location of any structure or natural feature on the site;
 - f. Location of any structure or natural feature on the land adjacent to the site and within fifty (50) feet of the site boundary lines;
 - g. Location of any proposed additional structures or development on the site;

- h. Elevations, dimensions, location, extent, and the slope of all proposed grading (including building and driveway grades);
 - i. Plans of all drainage provisions, dewatering facilities, retaining walls, ribbing, planting and all temporary and permanent soil erosion and sedimentation control measures to be constructed in connection with, or as a part of, the proposed work together with a map showing the drainage area of land tributary to the site and estimated runoff of the area served by any streams;
 - j. Existing soil types based on the Unified Soil Classification System or Natural Resources Conservation Service soil classification;
 - k. A program proposal for the continued maintenance of all permanent Soil Erosion and Sedimentation Control measures that remain after project completion, including the designation of the person responsible for the maintenance. Maintenance responsibilities shall become a part of any sales or exchange agreement for the land on which the permanent Soil Erosion Control measure are located.
 - l. Other information or data as may be required by the Township Zoning Department, such as a soil investigation report which shall include, but not be limited to, data regarding the nature, distribution and supporting ability of existing soils and/or rock on the site.
8. The Department may waive or partially waive data submission requirements for earth changes for residential parcels for single- or two-family residences or projects involving earth disturbance of less than two hundred twenty-five (225) square feet.
- E. Fees. At the time of filing an application for a Permit, fees shall be paid the Township in accordance with the fee schedule adopted and as may be amended from time to time by Resolution of the Charter Township of Garfield Board of Trustees.

Section 6. Financial Guarantee

A Permit shall not be issued unless the permittee shall first post with the Township a bond executed by the landowner and a corporate surety with authority to do business in the State of Michigan as a surety or other security as may be required by this section.

The bond shall be in a form approved by the Township, payable to the Township and in the amount of the estimated total cost of all temporary and permanent soil erosion and sedimentation control measures, and an amount sufficient to assure installation and completion of corrective measures. The total cost shall be estimated by the Applicant and reviewed by the Township Zoning Department. The bond shall include provisions for failure to complete the work on schedule as specified on the Permit. In lieu of a surety bond, the applicant may file with the Township an

Irrevocable Letter of Credit in a form approved by the Township's attorney or cash deposit in the amount equal to that which would be required for the surety bond.

Every bond and instrument of credit shall include and every cash deposit shall be made conditioned upon the permittee's compliance with all of the provisions of this Ordinance and all of the terms and conditions of the Permit, and completion of all work contemplated under the Permit within the time limit specified in the Permit or Temporary Certificate of Occupancy, or, if no time limit is specified, within one hundred eighty (180) days after the date of the issuance of the Permit.

For Minor Projects and the construction of new single family residential homes, the Zoning Administrator or other designated person within the Department may waive financial guarantees that would otherwise be required by this section.

Section 7. Extension of Time

If the permittee is unable to complete the work within the specified time, the permittee may, at least ten (10) days prior to the expiration of the permit, present in writing to the Department a request for an extension of time setting forth the reasons for the requested extension. If an extension is warranted, the Department may grant a permit extension with a new expiration date for the completion of the work, but no such extension shall release the owner or surety on the bond or the person furnishing the instrument of credit or cash bond.

Section 8. Failure to Complete Work

In the event of failure to complete the work or failure to comply with all the requirements, conditions and terms of the permit, the Department may proceed with corrective actions as described in Section 18, Enforcement.

Section 9. Denial of Permit

Permits shall not be issued where:

- A. The proposed work would cause hazards to the public safety and welfare; or
- B. The work as proposed by the applicant will permanently or unreasonable damage any public or private property or interfere with any existing drainage course in such a manner as to cause damage to any adjacent property or result in the deposit of debris or sediment on any public way or into any waterway to create an unreasonable hazard to persons or property; or
- C. The land area for which earth change is proposed is subject to geological hazard to the extent that no reasonable amount of corrective work can eliminate or sufficiently reduce settlement, slope instability, or any other such hazard to persons or property; or
- D. The land area for which the work is proposed may lie within the flood plain of any stream or watercourse (not specifically designated and delineated by the Township as an area

subject to flood hazard), unless a hydrologic report, prepared by a professional engineer, is submitted to certify that the proposed grading will have no detrimental influence on the public welfare or upon the total development of the watershed.

Section 10. Work and Plans Approved Prior to Adoption of this Ordinance

Work pursuant to plans and permits issued by an approving agency prior to adoption of this Ordinance may proceed to completion pursuant to said previously approved plans and permits. However, any modification of said plans or work shall comply with the terms and requirements of this Ordinance, as well as those of the prior approving agency.

Section 11. Modification of Approved Soil Erosion and Sedimentation Control Plans

- A. All modifications of the approved soil erosion and sedimentation control plans must be submitted and approved by the Department. All necessary sustaining reports shall be submitted with any proposal to modify the approved soil erosion and sedimentation control plan.
- B. No earth change in connection with any proposed modifications shall be permitted without the approval of the Department.
- C. In the event that an earth change in connection with any proposed modification commences or is completed prior to approval of the proposed change by the Department, the Department will issue a notice of violation and the existing permit for the site may, at the sole discretion of the Department, be revoked if it is judged necessary in order to ensure that the purpose of this Ordinance is achieved. If the permit is revoked, no further work on the site will be allowed until a new permit has been issued by the Department and all applicable permit fees paid.

Section 12. Responsibility of Permittee and Owner

During earth change operations and until completion, the permittee and the owner of the property to which the Permit pertains shall be responsible for:

- A. The prevention of damage to any public utilities or services within the limits of the permitted work along any routes of travel of the equipment;
- B. The prevention of damage and/or repair damage caused to adjacent property. No person shall engage in grading or earth change on land so close to the property line as to endanger any adjoining public street, sidewalk, alley or any public or private property without supporting and protecting such property from settling, cracking or other damage which might result.
- C. Carrying out the proposed work in accordance with all the requirements of the Permit, the approved soil erosion and sedimentation control plans, and this Ordinance.

- D. The prompt removal of all soil, miscellaneous debris, or other materials applied, dumped, or otherwise deposited on streets, highways, sidewalks, or other thoroughfares, either public or private, during transit to and from the construction site.

Section 13. General Requirements

- A. Any earth changes shall be conducted in such manner so as to effectively reduce accelerated soil erosion and resulting off-site sedimentation.
- B. All earth changes shall be designed, constructed, and completed such that the time which an area of disturbed land is exposed shall be as limited as possible.
- C. Sediment caused by accelerated soil erosion shall be removed from runoff water before it leaves the site of the earth change. Any sediment caused by accelerated soil erosion which is deposited on any lands not specifically covered by an authorized Permit or deposited in the waters of the State shall be promptly removed in accordance with all necessary State, County, and local regulations at the sole expense of the permittee. Any restoration and/or stabilization measures required due to said sediment removal shall also be installed by and at the sole expense of the permittee.
- D. Any temporary or permanent facility designed and constructed for the conveyance of water around, through or from the earth change area shall be designed to limit the water flow to a non-erosive velocity.
- E. Temporary soil erosion and sedimentation control measures shall be installed before or upon commencement of the earth change activity and said measures shall be daily maintained. Temporary soil erosion and sediment control measures shall be removed after permanent soil erosion measures are in place and the area is stabilized. The area shall be stabilized with permanent soil erosion control measures under approved standards and specifications as described by the Permit, this Ordinance and Part 91.
- F. Permanent soil erosion control measures for all slopes, channels, ditches or any disturbed land area shall be implemented within five (5) calendar days after final grading of the final earth change has been completed. Where significant earth change ceases, temporary soil erosion control measures shall be implemented within five (5) calendar days. All temporary soil erosion control measures shall be maintained until permanent soil erosion control measures are implemented.
- G. Prior to the release of the required Bond, Irrevocable Letter of Credit or cash deposit, temporary soil erosion and sedimentation control measures shall be removed and earth change areas stabilized with permanent soil erosion control measures.
- H. The requirements of the Permit shall run with the land and no transfer of the land prior to completion of the work and termination of the Permit shall relieve the permittee and property owner of the obligations enumerated in this Ordinance.

Section 14. Incorporation of Part 91 and Rules Promulgated Thereunder

Except where the requirements of this Ordinance are more restrictive, this Ordinance incorporates by reference Part 91 of the Act and the rules promulgated thereunder. All persons engaged in earth changes shall design, implement, and maintain acceptable soil erosion and sedimentation control measures, in conformance with Part 91, Soil Erosion and Sedimentation Control, Natural Resource and Environmental Protection Act, Act 451 of Public Acts of 1994, and all administrative rules promulgated pursuant thereto

Section 15. Maintenance Requirements

Persons implementing soil erosion and sediment control measures under this Ordinance and all subsequent owners of property on which such measures have been taken shall maintain all permanent erosion control measures, retaining walls, structures, plantings and/or other protective measures. If a maintenance agreement is deemed necessary by the Zoning Department, the property owner shall be required to execute said agreement and such deed restrictions as may be appropriate to guarantee maintenance of permanent sedimentation and erosion control measures and facilities.

Section 16. Variance and Exceptions

- A. In addition to exemptions provided elsewhere in this Ordinance, no permits shall be required for the following:
 - 1. Those activities exempted from permitted by Sections 9115 and 9115a of Part 91 of the Act and the rules promulgated under Part 91;
 - 2. Notwithstanding exemption for permit issuance, those operations and constructions which are exempted shall be in compliance with the rules and regulations concerning grading and erosion specified in this Ordinance.

Section 17. Inspection

The requirements of this Ordinance shall be enforced by the Department. The Department shall inspect the work and may require inspection or testing by a soil engineer or by a soil testing agency approved by said Department, unless it is determined by that Department that such inspection requirements may be waived due to the non-hazardous nature of the earth change.

Upon completion of all work specified in approved soil erosion and sedimentation control plans and other requirements, the Applicant shall file with the Department a final inspection request. The Department shall inspect the completed work and, upon determination of satisfactory completion, issue a Notice of Final Completion. If the Department finds any existing conditions not in accordance with any application, Permit, approved plan or subsequent requirements, further work shall not be allowed until approval of a revised soil erosion and sedimentation control plan has been granted by the Department.

Section 18. Enforcement

- A. If the Permittee fails to complete the work or fails to comply with the requirements, conditions, and terms of the permit and/or subsequent requirements, including a Temporary Occupancy Permit, the Department shall issue a Notice of Deficiency. The issued notice shall provide a description of any deficiencies as well as the required corrective action(s). The permittee shall complete the required corrective actions within the time frame indicated on the issued notice. If permittee fails to comply with all requirements of the Notice of Deficiency, the Department will issue a Notice of Violation and/or a Stop Work Order.
- B. If a Notice of Violation is issued, the Department may order such work as is necessary to stabilize the site and eliminate any danger to persons, property, or natural resources. Such work will be completed by an assigned agent of the Department. The Permittee and the surety executing the bond or person issuing the instrument of credit or making the cash deposit as required in Section 6 shall be firmly bound under a continuing obligation for the payment of all costs and expenses that may be incurred by the Township in causing any and all such work to be performed. In the case of a cash deposit, any unused portion thereof will be refunded to the permittee. If the financial guarantee is insufficient, the permittee shall deposit an amount equal to the deficiency.
- C. If the Department finds it necessary to issue a Notice of Violation to permittee, the Department may require a One Thousand Dollars (\$1,000) cash performance deposit for each subsequent single residential Permit issued to that applicant. The amount of the performance deposit required for any other type of activity shall be determined by the Department at the time of application.
- D. Notwithstanding the existence or pursuit of any other remedy, the Township may maintain an action in its own name in any court of competent jurisdiction for an injunction or other process against any person to restrain or prevent violations of this ordinance.
- E. Acceptance of the Permit by Permittee shall constitute Permittee's consent that the Department may enter at all reasonable times in, or upon, any private or public property for the purpose of inspecting and investigation of conditions and practices which may be a violation of the Permit and/or this Ordinance.
- F. Civil Infractions.
 - 1. In addition to remedies for a violation provided in this Ordinance, a person who violates this Ordinance, Part 91 or the rules promulgated thereunder as incorporated herein, shall be liable for payment of a municipal civil infraction and may be ordered to pay a civil fine of not more than Two Thousand Five Hundred Dollars (\$2,500).

2. A person who knowingly violates this Ordinance, Part 91 or said rules, or who knowingly makes a false statement in an application for a Permit or in the Soil Erosion and Sedimentation Control Plan shall be responsible for payment of a civil fine or not more than Ten Thousand Dollars (\$10,000) for each day of violation.
3. A person who knowingly violates this Ordinance, Part 91, or the rules promulgated under Part 91, after receiving a Notice of Deficiency is responsible for payment of a civil fine of not less than Two Thousand Five Hundred Dollars (\$2,500) or more than Twenty-Five Thousand Dollars (\$25,000) for each day of violation.
4. Civil fines collected pursuant to this section shall be deposited with the Township.
5. A default in payment of a civil fine or a cost ordered under this section or installment of a fine or cost may be remedied by any means authorized under the Revised Judicature Act of 1961 (1961 PA 236; MCL 600.101 et seq).
6. In addition to the other remedies provided in this Ordinance, Part 91 or the rules promulgated under Part 91, a person in violation of Part 91 may be liable for damages for injury to or destruction of or loss of natural resources resulting from said violation and may be subject to such injunctive orders as may be appropriate, including orders to cease and desist all such activities and/or to restore the area or the areas affected by the violation to their condition as said condition existed prior to the violation.
7. Persons authorized by the Township Board to enforce municipal civil infractions within the Township are authorized to enforce the provisions of this Ordinance.

Section 19. Designation of Municipal Enforcing Agency

Upon adoption of this Ordinance by the Charter Township of Garfield Township Board, the Zoning Department will be designated as the municipal enforcing agency and is responsible for the administration and enforcement of this Ordinance.

Section 20. Severability

It is the legislative intent of the Township Board adopting this Ordinance that all provisions hereof shall be liberally construed to protect the public health, safety, and general welfare of the inhabitants of the Township and all other persons affected by this Ordinance. Consequently, should any provision of this Ordinance be held to be unconstitutional, invalid or of no effect, such holding shall not be construed as affecting the validity of any of the remaining provisions of this Ordinance, it being the intent of the Charter Township of Garfield Township Board that this Ordinance shall stand and remain in effect, notwithstanding the invalidity of any provision hereof.

Section 21. Effective Date

This Ordinance shall become effective on _____, after its adoption and publication as provided by laws and approve by the Michigan Department of Environmental Quality.

At a regular meeting held on _____, a motion was offered by _____, with support from _____, to approve the foregoing Ordinance No. xx. The motion carried as follows in a roll call vote.

Upon roll call vote, the following voted:

YES:

NO:

ABSENT:

ORDINANCE NO. xx ADOPTED.

Chuck Korn, Supervisor

Lanie McManus, Clerk

CERTIFICATE

I, Lanie McManus, the Clerk of Charter Township of Garfield, do hereby certify that the above is a true and correct copy of Ordinance No. xx which was adopted by the Township Board of the Charter Township of Garfield on the ____ day of _____, 2022. Garfield Township Ordinance No. _____ shall take effect upon the expiration of seven (7) days following publication.

Dated:

Lanie McManus, Clerk

Introduced:

Adopted:

Published:

Effective:



Water Resources Division

How to Change the Agency Designated as CEA/MEA

This document summarizes information found in Part 91, Soil Erosion and Sedimentation Control, of the Natural Resources Environmental Protection Act, 1994 PA 451, as amended (NREPA).

Background: Counties by resolution or by ordinance must designate a county agency or conservation district, as the county enforcing agency responsible for administration and enforcement of Part 91, Soil Erosion and Sedimentation Control (SESC), and the rules promulgated thereunder, in the name of the County. Municipalities may elect to provide Soil Erosion and Sedimentation Control within their jurisdiction by adopting an approved ordinance and must also designate a municipal agency to implement the Part 91 program in the name of the municipality. From time to time Counties or Municipalities may determine that the agency designated as the Part 91 Agency should change. The following steps outline the process and submittals necessary for making such a change in conformance with Part 91.

Process:

1. The County/Municipality, upon determining a different agency should be designated as the County Enforcing Agency (CEA)/Municipal Enforcing Agency (MEA) shall contact [DEQ Soil Erosion and Sedimentation Control Staff](#) and notify him or her of the intended candidate.
2. The following submittals are necessary prior to DEQ approving a new agency. DEQ staff may request modifications of these documents if they do not meet the minimum requirements of Part 91:
 - a. A draft ordinance or resolution (as appropriate) that reflects the intended appointment of the new agency as CEA/MEA and any other changes necessary to affect the change in agency.
 - b. A statement describing how the new CEA/MEA is expected to be funded. This may include one or more of the following: proposed fee schedules, general fund appropriates (if applicable), other funding sources.
 - c. A revised permit application template reflecting the new agency information that includes each of the elements found on the [state prescribed permit application template](#).
 - d. A revised permit template reflecting the new agency information that includes each of the elements found on the [state prescribed permit template](#).
 - e. An example of inspection logs that will be used by the agency to document inspections. An example log can be found at www.michigan.gov/soilerosion under Resources for Agencies.
 - f. Proof that the individuals with decision making authority for the new agency have certificates of training at that appropriate level. Training information and individuals with current certificates of training can be found at www.michigan.gov/soilerosion.
3. DEQ staff must provide copies of the draft ordinance/resolution to the Conservation District and the CEA (if the ordinance is associated with an MEA) for an opportunity to review and comment. DEQ shall provide 45 days for the comments to be returned. DEQ staff will review the draft ordinance/resolution to determine that it meets the minimum requirements of Part 91 and will approve or disapprove the ordinance within 90 days from receipt of the draft.

4. Once the County/Municipality receives draft ordinance/resolution approval and acceptance of the other submittal identified in step 2 above from DEQ, the County or Municipality must formally adopt the ordinance/resolution and return a formal "sealed" copy of the ordinance/resolution to the DEQ along with a copy of the minutes of the meeting where the ordinance/resolution was adopted.
5. Upon formal adoption of the ordinance/resolution, the new agency immediately becomes responsible for administering the county or municipal program in compliance with Part 91. The new agency is also obligated to ensure any previously issued permitted sites that are still active, are in compliance with Part 91. Any issues related to the handling of permit fees collected by the previous agency for earth change activities that are still active shall be conducted at the discretion of the County/Municipality.
6. Once the official adopted ordinance/resolution is obtained, DEQ staff shall send a formal Ordinance/Resolution Approval acknowledging the new CEA/MEA designated agency.

