



Town of Berthoud Planning Commission
Town Hall
807 Mountain Avenue
Thursday, January 11, 2023, at 6:00 p.m.

1. Call Meeting To Order
2. Roll Call
3. Pledge Of Allegiance
4. Approval Of Meeting Minutes

4.I. Planning Commission Meeting Minutes_2023-12-14

Documents:

[2023 12 14_DRAFT MINUTES.PDF](#)

5. Public Hearing: Harvest 47 Final Plat

To consider a request for a Final Plat known as Harvest 47 located south of Mountain Avenue on the southern half of property located at 735 State Highway 56 (Parcel 94-24-009702) near the intersection of Dorothy Drive and Remuda Road

Documents:

[HARVEST 47 INFORMATION SHEET AND STAFF REPORT.PDF](#)
[HARVEST 47 FINAL PLAT ATTACHMENTS.PDF](#)

6. Report By Staff

7. Adjourn

Join Zoom Meeting <https://us02web.zoom.us/j/86049631362> Meeting ID: 860 4963 1362
One tap mobile +17193594580,,86049631362# US

Individuals needing special accommodation may request assistance by contacting the Town Clerk at 807 Mountain Avenue, Berthoud, Colorado 80513, 970-532-2643 at least 24 hours in advance.



Planning Commission Minutes – December 14, 2023, at 6:00 p.m.

- 1. Call to Order** – The Planning Commission convened a regular meeting on. Commissioner Anderson called the meeting to order at 6:00 p.m.

- 2. Pledge of Allegiance**

- 3. Roll Call** – Members present: Karen Anderson (Chairperson)
Jon Van Benthem (Secretary)
Abigail Smith (Vice Chairperson)
Brett Wing (Commissioner)
Nick Semedalas (Commissioner)
Joe Donnelly (Commissioner)

Staff present: Anne Johnson (Community Development Director)
Tawn Hillenbrand (Senior Planner)
Teri Reger (Planning Technician)
Erin Smith (Town Attorney via Zoom)

- 4. Approval of Minutes** – Minutes from October 26, 2023, Planning Commission Meeting.

MOTION made by Commissioner Wing to APPROVE the Minutes for October 26, 2023.

SECONDED by Commissioner Semedalas.

With those all in favor, THE MOTION CARRIED.

- 5. Public Hearing:** Community Development Director introduced a recommendation to amend the following section of Chapter 30 of the Berthoud Municipal Code, specifically to amend the definition section regarding marijuana businesses (also Sections 30-3-113, 30-3-112, 30-1-117, 30-3-104, and Table 3.10); and clarifying land use application processing requirements throughout Chapter 30 via Ordinance.

MOTION made by Commission Wing to make a recommendation of approval to the Town Board of Trustees for the proposed Code amendments to Chapter 30 of the Berthoud Municipal Code as attached in the Draft Ordinance and attachment for the reason outlined in the staff report.

SECONDED by Vice Chair Smith. Commissioner Van Benthem abstained. Five Commissioners voted in the affirmative, THE MOTION CARRIED.

- 6. Reports by Staff**

- Wave 3 of the Code changes went before the Town Board of Trustees on November 28, 2023, and passed.
- The Board of Trustees have asked that more time be given to exploring the use of Storage Containers.
- The current Sign Code is currently under review.
- There will be some Land Use items coming to the Commission in January, possibly including a Final Plat.
- There are approximately 20 Land Use items in process currently.
- Staff will coordinate tours of downtowns and residential projects for Planning Commissioners to take in 2024.

7. Adjournment –

The meeting was adjourned at 6:55 p.m.

CHAIRPERSON

SECRETARY

PLANNING COMMISSION INFORMATION

COMMUNITY DEVELOPMENT DEPARTMENT



Meeting Date:	January 11, 2024
Agenda Title/Subject:	Public Hearing to consider a request for a Final Plat known as Harvest 47 located south of Mountain Avenue on the southern half of property located at 735 State Highway 56 (Parcel 94-24-009702) near the intersection of Dorothy Drive and Remuda Road
Type of Item:	Public Hearing
Purpose:	Request for approval of a Final Plat for Harvest 47
Presented by:	Anne Johnson, Community Development Director Lauren Richardson, Planner, Baseline Engineering

ATTACHMENTS:

- Staff Report
- Application materials
- Public Notification

BACKGROUND:

In July 2022, Planning Commission and the Town Trustees approved the applicant's request for a Neighborhood Master Plan, Rezoning and Minor Subdivision on the 5.98-acre parcel. The rezoning changed the classification of this property from PUD to Urban Residential (UR) consistent with the 2021 Comprehensive Plan update. The Planning Commission and the Town Board of Trustees approved the Preliminary Plat in May 2023.

UPDATE/NEXT STEPS:

After the Planning Commission public hearing, the applicant will need to enter into a Development Agreement to cover public improvements and landscaping. This Agreement is standard for all development in the Town and shall be entered into between the Town and the applicant. The Planning Commission is the final public hearing for a Final Plat. If approved as presented, any Conditions of Approval will need to be met before the Final Plat materials will be recorded with the Larimer County Clerk and Recorder.

FISCAL IMPACT AND FUND SOURCE:

There is no negative impact to the Town in consideration of this request.

COMMUNITY TOUCHSTONES:

Consideration of this request does not negatively impact community touchstones. The property includes 9 lots for Habitat for Humanity and offers a range of single-family housing options to diversity housing availability in Berthoud.

RECOMMENDED ACTION(S):

Staff recommends approval of the request. See suggested motions in the Staff Report.



STAFF REPORT: HARVEST 47 FINAL PLAT

DATE: January 11, 2023

GENERAL INFORMATION

Applicant	Larry Bebo	Size: 5.98 acres
Site Location	The property is located near the intersection of Dorothy Drive and Remuda Road. This project is located on the southern portion of the property at 735 State Highway 56 (Parcel 94-24-009702)	
Applicant's Request	The Applicant is requesting a final plat to subdivide the subject property into 29 lots intended for single family residential.	
Current Zoning	UR – Urban Residential	

UR ZONING DISTRICT INFORMATION

Max Density	N/A
Min. Lot Area	2,500 sq.ft.
Min. Lot Width	25'
Front Setback	10'
Side Setback	5'
Rear Setback	5-8'
Building Height	30'

SURROUNDING ZONING, LAND USE, AND REQUIRED BUFFERS

	<u>Adjacent Zoning</u>	<u>Adjacent Land Use</u>	<u>Setbacks for Adjacent Zoning/ Buffer required if rezoned</u>
North	PUD	Garden Center	N/A
South	UR	Future Single-Family	N/A
East	UR	Multi-Family	N/A
West	R1	Single-Family	N/A

This is an aerial map of a residential area with property boundaries and lot numbers. A red rectangle highlights a specific property labeled "BEBOMRD S-76-87 AMD". Other labels include "OMALLEY GLEN FARMSTEAD MINOR" and "JOHNSONS AMD". Street names visible include E Michigan Ave, Wild Honey Dr, and E Dorothy Dr.

Proposal

The applicant proposes to subdivide the existing 5.98-acre parcel into 29 lots for single-family residential purposes. The final plat, if approved, would subdivide the lots and allow the applicant to begin work on public improvements.

Background

In July 2022, a Neighborhood Master Plan, Rezoning, and Minor Subdivision were approved by Planning Commission and the Board of Trustees for this property. The minor subdivision split this lot from the neighboring garden center to the north, and the Rezoning changed this parcel from Planned Unit Development (PUD) to Urban Residential (UR). Additionally, on May 09, 2023, the Town Board approved a preliminary plat for the project that was identical to the proposed final plat.

Final Plat Review Criteria

In addition to all provisions of the Code, the Town shall use the following criteria to evaluate the applicant's request:

30-6-108(C) Review Criteria	Finding	Rationale
1. The Final Plat is in substantial conformance with the approved Preliminary Plat. For the purposes of this Code, "Substantial conformance." Includes design adjustments made to meet any conditions of preliminary plat approval, and is determined as follows: a. Does not change any land use of the proposed plat. b. Does not change the number of lots or residential density by more than 5%. c. Does not contain changes which would render the final plat in nonconformance with requirements of this Code. d. Does not contain significant changes in street alignment and/or access points, or other public elements such as drainage improvements, utility lines or facilities. e. Does not change any measurable standard (other than above) by more than 15 percent.	Yes	The final plat is identical to what was proposed during the preliminary plat phase.
2. The development complies with this Code, the Comprehensive Plan and the PORT Plan.	Yes	The land use mix is consistent with the current UR zone district. The future land use map lists this property as urban residential, which focuses on human-scale and new urbanism design. This project will utilize alley loaded garages to create a more walkable neighborhood. The project will also extend existing roadways and sidewalk connectivity. During the Neighborhood Master Plan phase of the project open space/ parks requirements were waived. This was due to the 9 lots that are being dedicated to Habitat for Humanity.
3. All applicable technical standards including the provision of water in sufficient amount and quality have been met.	Yes	Plans were reviewed by Town Staff as well as outside referral agencies. The applicant has provided adequate plans for utilities and transportation systems.

PUBLIC NOTICE AND COMMENT

Notice of the Planning Commission Public Hearing has been mailed to property owners within 500 feet of the subject property on December 27, 2023, a legal ad published December 27, 2023, and the property has been posted since the Preliminary Plan submitted prior to March 16 as required by the Development Code. In addition, when the project was submitted, the application was sent out to all property owners within 500 feet, with an invitation to comment on the request within three weeks of receipt. No comments were received during this initial notice period.

FINDINGS AND RECOMMENDATIONS

- **Staff recommends that Planning Commission find the application meets the intent of the Master Plans affecting the project, the Comprehensive Plan and Future Land Use Map, and the Land Use Code.**
- **Two suggested motions are below:**
 - ***Approval: I move to approve the Harvest 47 Final Plat, subject to the following conditions:***
 - ***The applicant shall finalize, with Town staff, a development agreement.***
 - ***The applicant shall add an additional signature block onto the Final Plat for the Planning Commission Chairperson.***
 - ***The applicant shall provide a finalized and executed agreement between The Farmstead and Harvest 47 for the construction and maintenance of the southern alley shared between the two projects.***
 - ***Denial: I move to deny the Harvest 47 Preliminary Plat for the following reasons _____***
_____.

Attachments

1. Application Form
2. Cover Letter
3. Final Plat
4. Construction Drawings
5. Traffic Letter
6. Drainage Report
7. Outstanding Staff Comments
8. Presentation from Staff



Town of Berthoud
807 Mountain Ave.
P.O. Box 1229
Berthoud, CO 80513
970.532.2643

DEVELOPMENT REVIEW APPLICATION

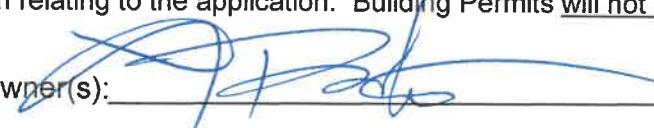
All required information must be provided before submittal will be accepted and deemed complete.
To be complete, the application must include all items identified on the submittal checklist.
Please complete both sides of application form.

Parcel Number(s): 9424138003		
Site Address: TBD		
Project Name: Harvest 47		
Brief description of project: Small residential development		
APPLICATION TYPE (Check as appropriate):		
☐ Annexation	☐ Preliminary Subdivision Plat	☐ Final Site Plan
☐ Rezoning	☒ Final Subdivision Plat	☐ PUD Amendment
☐ Concept Plan	☐ Plat Amendment	☐ PUD Preliminary Development Plan
☐ Minor Subdivision	☐ Oil and Gas	☐ PUD Final Development Plan
☐ Special Use Review	☐ ROW Vacation	☐ Other _____
APPLICANT		
Name: Larry Bebbo		
E-mail: mbebo@lmenterprisesinc.com	Mailing Address: 735 E. Hwy 56	
Phone: 9705323706	City/State/Zip: Berthoud CO 80513	
CONTACT PERSON (will receive correspondence from Town Staff/Referral Agencies)		
Name: Michael T. Cook P.E.		
E-mail: mtcookpe@msn.com	Mailing Address: 970 East CR. 8	
Phone: (970) 310-9332	City/State/Zip: Berthoud CO 80513	
OWNER(S) (If different than applicant)		
Name:		
E-mail:	Mailing Address:	
Phone:	City/State/Zip:	
CONSULTANT (Engineer, Surveyor, or Planner)		
Name: Troy Cambel		
E-mail: troy@i2-consultnts.com	Mailing Address: 16911 Pots Place	
Phone: (970) 217-9148	City/State/Zip: Mead CO 80542	

LAND USE INFORMATION							
Existing Use: Commercial / Agricultural Proposed Use: Residential Existing Zoning: R-2 urban residential Proposed Zoning: (if applicable): Number of acres: 5.98 Proposed Access: Dorothy Drive	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center; background-color: #f2f2f2;">Adjacent zoning / land use:</th> </tr> </thead> <tbody> <tr> <td style="width: 50%;">East Side: R-3</td> <td style="width: 50%;">North Side: PUD</td> </tr> <tr> <td>West Side: R-1</td> <td>South Side: R-2</td> </tr> </tbody> </table>	Adjacent zoning / land use:		East Side: R-3	North Side: PUD	West Side: R-1	South Side: R-2
Adjacent zoning / land use:							
East Side: R-3	North Side: PUD						
West Side: R-1	South Side: R-2						
UTILITY SERVICE INFORMATION							
Water: TOB	Sewer: TOB						
PROJECT INFORMATION							
Number of proposed units: 29 Number of phases: 1 Number of Units per phase: 29 Number of lots proposed: 29 Lot size minimum: 4,212.75 S.F. lot 3, Block 1 Lot size maximum: 9,458.80 S.F. lot 6, block2 Lot size average: 6,519.43 S.F. Gross density (units/acre): 4.85 Net density (units/acre): 6.84 Area and percent open space: 0.%	Non-Residential Building Area (Sq. Ft.) Proposed: 0.0 Non-Residential Construction Floor Area Ratio Proposed: Total Number of Parking Spaces: <u>Acreage of Site:</u> a. Gross: 5.98 b. Right-of-Way: 1.74 c. Net (a-b) 4.24 <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center; background-color: #f2f2f2;">Type of Housing Proposed (please check):</th> </tr> </thead> <tbody> <tr> <td style="width: 50%; vertical-align: top;"> ☒ Future Single Family ☐ Duplex ☐ Multi-family (# of units: 29) </td> <td style="width: 50%; vertical-align: top;"> ☐ Townhouse ☐ Condominium </td> </tr> </tbody></table>	Type of Housing Proposed (please check):		☒ Future Single Family ☐ Duplex ☐ Multi-family (# of units: 29)	☐ Townhouse ☐ Condominium		
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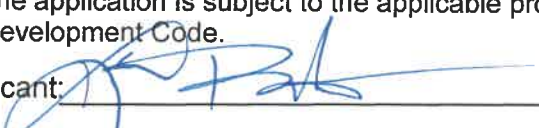
Signatures are required for ALL Property Owners and the Applicant

I hereby certify that I am the lawful owner of the parcel(s) of land that this application concerns and consent to the action. I hereby permit Town of Berthoud staff to enter upon the property for the purposes of inspection relating to the application. Building Permits will not be accepted while this application is in process.

Property Owner(s):  Date: 7-6-23

Property Owner(s): _____ Date: _____

In submitting the application materials and signing this application agreement, I acknowledge and agree that the application is subject to the applicable processing and public hearing requirements set forth in the Development Code.

Applicant:  Date: 7-6-23

FOR OFFICE USE ONLY

Received By:

Date:

July 24th, 2023

Michael T. Cook P.E.
Construction Superintendent
Berthoud Habitat for Humanity
970 East County Road 8
Berthoud, CO 80513
(970) 310-9332
mtcookpe@msn.com

Anne Best Johnson, AICP MBA
Community Development Director
Community Development Director
Town of Berthoud
P.O. Box 1229
Berthoud, CO 80513

RE: Harvest 47 Subdivision final plat submittal:

Dear Anne:

Attached is our submittal for the Final Plat for the Harvest 47 subdivision.

Attached you will find:

- 1.0 Harvest 47 cover letter (this document).
- 2.0 T.O.B. Final Plat check list.
- 3.0 Completed T.O.B. Development Review Application.
- 4.0 T.O.B. Harvest 47 project fees tabulation.
- 5.0 Receipt showing payment of BFPD review fees.
- 6.0 Completed T.O.B. Memorandum of Understanding.
- 7.0 Harvest 47 project title commitment.
- 8.0 Harvest 47 project narrative.
- 9.0 Harvest 47 project vicinity map.
- 10.0 Harvest 47 Final Plat survey information.
- 11.0 Harvest 47 final plat and construction Documents. (Follow link)
- 12.0 Harvest 47 traffic letter.
- 13.0 Harvest 47 preliminary drainage and erosion control report.
- 14.0 Preliminary soils report.
- 15.0 Affidavit of ownership of oil and gas.
- 16.0 Proposed HOA formation document
- 17.0 Proposed Farmstead HOA MOU.
- 18.0 Harvest 47 final drainage report (Follow link)

Thank you for your patience and help to bring this unique opportunity for development of affordable housing to Berthoud. We look forward to working with the Town of Berthoud on moving this project forward to construction.

Michael T. Cook P.E.
Berthoud Habitat for Humanity

FINAL PLAT FOR

1. This Minor Subdivision was prepared with the benefit of a TBD Title Commitment prepared by Land Title Guarantee Company (Old Republic National Title Insurance Company) Order No. FCIF25194885, effective date September 27, 2023. No further easement and/or right of way research, other than shown on this Plat, was requested by the client or performed by Intermill Land Surveying, Inc. for the preparation of this survey.
2. **RIGHT TO FARM STATEMENT:** The Town of Berthoud has adopted a "Right to Farm" policy. All new and existing residents are expected to read and understand the policy. For a copy of the policy, please contact the Town of Berthoud.
3. **SITE SPECIFIC DEVELOPMENT PLAN:** This plan constitutes a site specific development plan as defined in Article 68 of Title 24, C.R.S., as amended, and Chapter 30 of the Berthoud Development Code available at the Berthoud Town Hall, 807 Mountain Ave., Berthoud, Colorado 80513.
4. According to Colorado law you must commence any legal action based upon any defect in this survey within three years after you first discover such defect. In no event, may any action based upon any defect in this survey be commenced more than ten years from the date of the certification shown herein.
5. **FLOOD ZONE NOTE:** Per the Federal Emergency Management Agency (FEMA) Flood Zone Mapping (Map 08069C1387H, effective 01/15/2021, panel 1387 of 1420), the property appears to be located in an "area of minimal flood hazard", Zone X.
6. This Final Plat of Harvest 47 Subdivision supersedes the Preliminary Plat of Harvest 47 Subdivision that was recorded at Reception No. 20230021486 in the records of the Larimer County Clerk & Recorder.
7. The Alleys, Tract 1 & Tract 2, are dedicated as a Public Access, Utility & Drainage Easements with this Plat & will be privately maintained.

VESTING OF PROPERTY RIGHTS: Approval of this site-specific development plan constitutes the creation of vested property rights pursuant to Article 68 of Title 24, C.R.S., as amended. The approval of vested property rights shall be subject to all rights of referendum and judicial review. This approved site specific development plan voids any and all pre-existing vested property rights on the same real property.

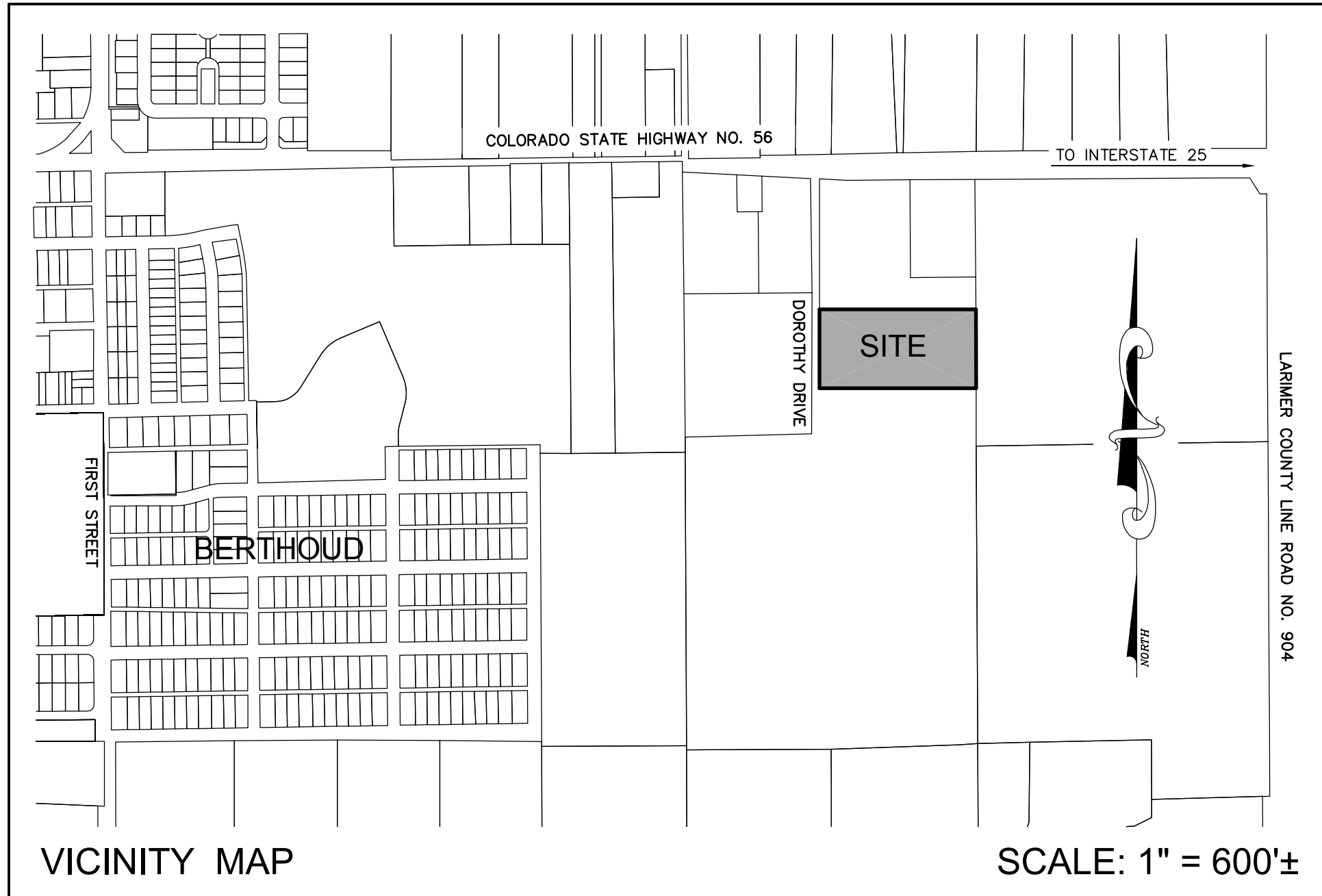
PROJECT APPROVAL: The plans contained on this plat as well as the staff report dated _____ and Resolution _____ Ordinance _____ are the limits of the approval. Any changes to the approved plans may necessitate an amendment or new permit.

DEVELOPMENT IMPROVEMENTS: All Development Improvements shall be constructed in accordance with the Plat and Plans as well as the requirements of the Berthoud Municipal Code. The development shall adhere to the Development Agreement entered into between the Developer and the Town of Berthoud.

EROSION CONTROL: Prior to commencement of construction of any Development Improvements including alterations to existing graded contours, removal of vegetation and/or excavating, the Town-approved erosion control plan will be implemented. The Town-approved erosion control plan measures shall be installed and maintained throughout the construction of Development Improvements and shall not be removed or abandoned until authorized by the Town. At all times during construction on the Property, or off-site projects associated with development of the Property, Developer shall maintain all streets, drainage, and drainage facilities in an orderly and workmanlike fashion.

CONSTRUCTION RULES AND REGULATIONS: Construction activities shall adhere to the Construction Rules and Regulations found in Chapter 30 of the Berthoud Municipal Code at all times.

DARK SKY: The Town of Berthoud has adopted a Dark Sky Ordinance. All development shall adhere to the Town of Berthoud Dark Sky Ordinance No. 1230, adopted January 9, 2018, and as may be amended, at all times.



KNOW ALL MEN BY THESE PRESENTS: That the undersigned, being the owners those portions of the Northwest Quarter of the Northeast Quarter of Section 24, Township 4 North, Range 69 West of the 6th Principal Meridian, Town of Berthoud, County of Larimer, State of Colorado, more particularly described as follows:

Lot 2, O'MALLEY GLEN MINOR SUBDIVISION to the Town of Berthoud, County of Larimer, State of Colorado.

Containing an area of 260,491.50 Square Feet or 5.98 Acres, more or less.

Have laid out, platted, and subdivided the above described land, under the name and style of **HARVEST 47 SUBDIVISION**, and by these presents now dedicated to the Town of Berthoud in fee simple the street and public rights-of-way as shown on the plat, and grants to the Town of Berthoud such easements as are created hereby and depicted or, by note, referenced herein, along with the right to install, maintain, operate, manage, transmit lines, service lines, and appurtenances, either above or below ground, for all the various public utilities, as may be necessary to provide such utility, cable television, water, electric, natural gas and sanitary services within this subdivision or property contiguous thereto, though, over, under, and across streets, utility and other easements, and other public places as shown on the plat.

OWNER(S): LAWRENCE L. BEBO and JACQUELYN D. BEBO

Lawrence L. Bebo

Jacquelyn D. Bebo

STATE OF COLORADO)
COUNTY OF LARIMER) ss

The foregoing certificate of ownership was acknowledged before me this _____ day of _____, 20____, by Lawrence L. Bebo and Jacquelyn D. Bebo.

Witness my hand and official seal.

My commission expires _____

Notary Public

I, Steven John Stencel, a Registered Land Surveyor in the State of Colorado, do hereby certify that the survey of HARVEST 47 SUBDIVISION was made under my supervision and the accompanying plat accurately and properly shows said subdivision and is in compliance with the Subdivision Regulations of the Town of Berthoud.

PREPARED BY AND ON BEHALF OF:

INTERMILL LAND SURVEYING, INC.
1301 North Cleveland Avenue
Loveland, Colorado 80537
P: (970) 669-0516

Steven John Stencel
Colorado PLS No. 30462

Date:



Approved by the Town of Berthoud, Colorado, this _____ day of _____, A.D., 20____.

Mayor

The foregoing plat is approved for filing and accepted by the Town of Berthoud, Colorado, this ____ day of _____, A.D., 20____.

ATTEST:

Town Clerk

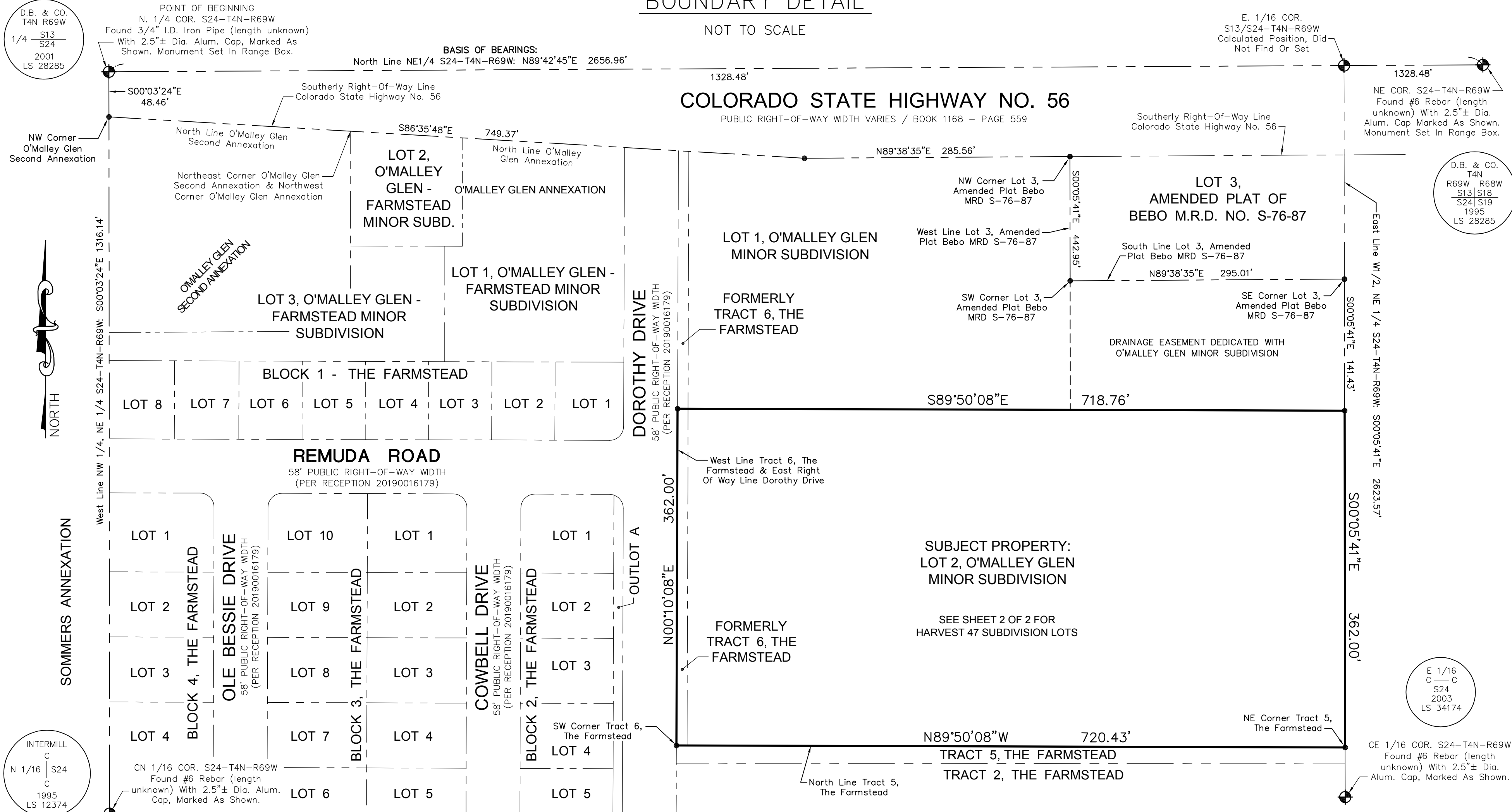
The foregoing plat is approved for filing and accepted by the County of Larimer, Colorado, this _____ day of _____ A.D., 20____.

ATTEST:

County Clerk

The Town of Berthoud Planning Commission approved a waiver to the Open Space requirements for The Harvest 47 Neighborhood Master plan approval on June 23, 2022. The waiver is contingent upon the dedication of 9 lots to Berthoud Habitat for Humanity for future deed-restricted affordable housing.

Basis of Bearings for this Plat is based on the record bearing of N89°42'45"E on the North line of the Northeast Quarter of Section 24, Township 4 North, Range 69 West of the 6th P.M., County of Larimer, State of Colorado. Record bearing derived from the Final Plat of The Farmstead, Town of Berthoud, County of Larimer, State of Colorado as filed for record April 1, 2019 in the real property records of the Office of the Clerk and Recorder of Larimer County, Colorado at Reception Number 20190016179. Note: Monumentation of said line as shown herein.



REVISIONS:	BY:	DATE:
2. Per Technical Review Committee Comments (dated Nov. 1, 2023).		11/21/2023
1. Per Technical Review Committee Comments (dated Aug. 31, 2023).		jEB
		10/09/2023
		jEB

INTERMILL LAND SURVEYING, INC.

LARRY and JACKIE BEBO

FINAL PLAT FOR
HARVEST 47 SUBDIVISION

DRAWN BY: JEB

CHECKED BY:

APPROVED BY:

DATE: 11/21/2023

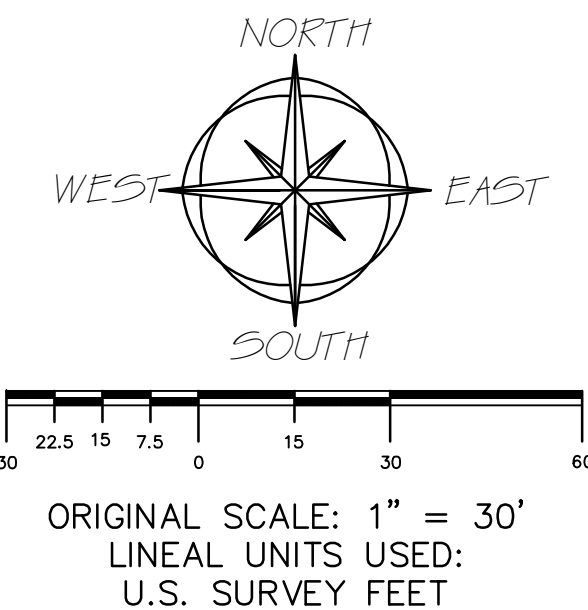
SCALE: 1" = 30'

PROJECT NO.:

P-08-6486

SHEET	OF
1	2

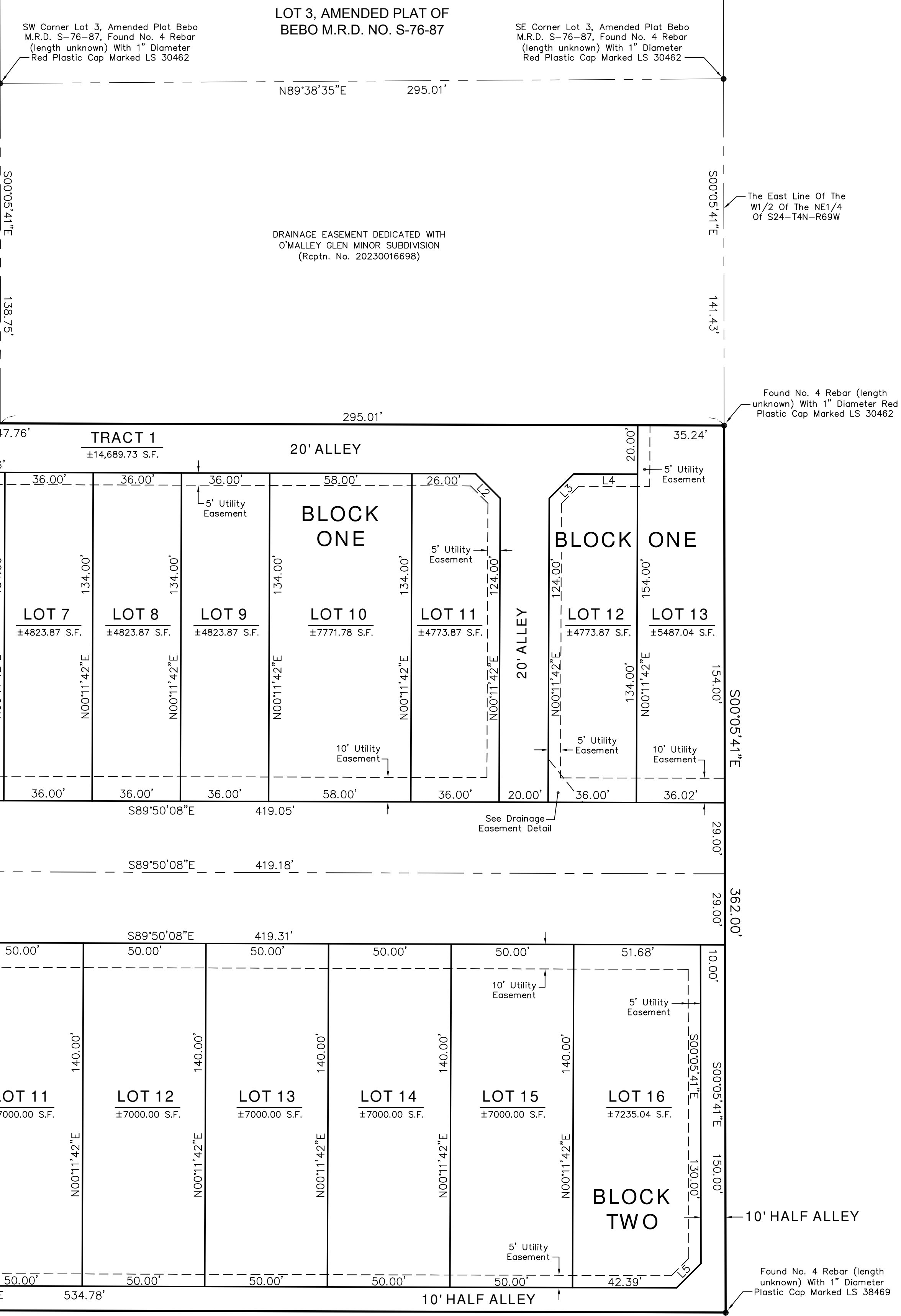
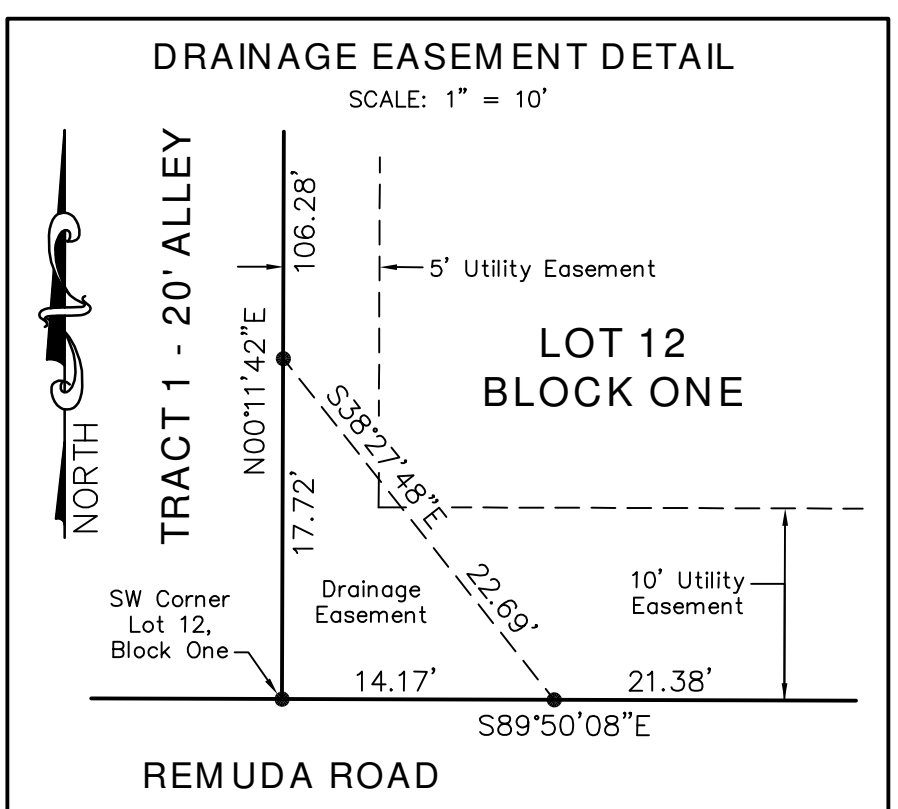
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FINAL PLAT FOR
HARVEST 47 SUBDIVISION
BEING A SUBDIVISION OF LOT 2, O'MALLEY GLEN MINOR SUBDIVISION,
SITUATE IN THE NORTHWEST QUARTER OF THE NORTHEAST QUARTER OF
SECTION 24, TOWNSHIP 4 NORTH, RANGE 69 WEST OF THE 6TH P.M.,
TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO.

ALLEY NOTE:
The Alleys, Tract 1 & Tract 2, are dedicated as a Public Access, Utility & Drainage Easements with this Plat & will be privately maintained.

SITE SIGNAGE NOTE:
The subdivision sign will be owned & maintained by the Harvest 47 Home Owner's Association. The sign will not be the responsibility of the individual lot owner.



BLOCK 1,
THE FARMSTEAD

LOT 1

REMUDA ROAD
58' PUBLIC RIGHT-OF-WAY WIDTH
(PER RECEPTION 20190016179)

LOT 1

LOT 2

LOT 3

LOT 4

LOT 5

DOROTHY DRIVE
58' PUBLIC RIGHT-OF-WAY
(PER RECEPTION 20190016179)

BLOCK 2, THE FARMSTEAD
OUTLOT A

PREPARED BY AND ON BEHALF OF:
INTERMILL LAND SURVEYING, INC.
1301 North Cleveland Avenue
Loveland, Colorado 80537
P: (970) 669-0516
Steven John Stencil
Colorado PLS No. 30462
Date:



TRACT 2, THE FARMSTEAD

TRACT 5, THE FARMSTEAD

LINE	BEARING	LENGTH
L1	N45°10'47"E	14.15'
L2	N44°49'13"W	14.14'
L3	N45°10'47"E	14.15'
L4	S89°50'08"E	26.00'
L5	N45°02'03"E	14.11'
L6	N44°49'13"W	14.14'
L7	N45°10'47"E	14.15'

CURVE	DELTA	RADIUS	LENGTH	BEARING	CHORD
C1	42°02'28"	165.00'	121.07'	N68°48'32"W	118.37'
C2	42°02'50"	165.00'	121.09'	S68°48'43"E	118.39'
C3	29°15'58"	194.00'	99.09'	N75°11'47"W	98.02'
C4	05°44'49"	194.00'	19.46'	N50°39'42"W	19.45'
C5	42°02'28"	136.00'	99.79'	N68°48'32"W	97.57'
C6	42°02'50"	136.00'	99.81'	S68°48'43"E	97.58'
C7	42°02'50"	194.00'	142.37'	S68°48'43"E	139.20'
C8	04°35'16"	136.00'	10.89'	S50°04'56"E	10.89'
C9	17°21'53"	136.00'	41.22'	S61°03'31"E	41.06'
C10	20°05'40"	136.00'	47.70'	S79°47'18"E	47.45'
C11	13°37'04"	194.00'	46.11'	S54°35'50"E	46.00'
C12	15°48'53"	194.00'	53.55'	S69°18'49"E	53.38'
C13	12°36'53"	194.00'	42.71'	S83°31'42"E	42.63'
C14	07°01'41"	194.00'	23.80'	N57°02'57"W	23.78'

According to Colorado law you must commence any legal action based upon any defect in this survey within three years after you first discover such defect. In no event, may any action based upon any defect in this survey be commenced more than ten years from the date of the certification shown hereon.

INTERMILL LAND SURVEYING, INC.
BUS. (970) 669-0516 / FAX (970) 635-9775
80537
LOVELAND, COLORADO

CLIENT:
LARRY and JACKIE BEBO

TITLE:
FINAL PLAT FOR
HARVEST 47 SUBDIVISION
TO THE TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO

DRAWN BY: JEB
CHECKED BY:
APPROVED BY:
DATE: 11/21/2023
SCALE: 1" = 30'
PROJECT NO.: P-08-6486
SHEET 2 OF 2

DATE:
BY:
REVISIONS:
1. Per Technical Review Committee Comments (dated Nov. 1, 2023). JEB
2. Per Technical Review Committee Comments (dated Aug. 31, 2023). JEB
11/21/2023
10/09/2023

CONSTRUCTION DOCUMENTS FOR HARVEST 47 SUBDIVISION

LOCATED IN THE NORTHEAST QUARTER OF SECTION 24, TOWNSHIP 4 NORTH, RANGE 69 WEST OF
THE 6TH PRINCIPAL MERIDIAN, TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO

NOVEMBER 2023

PRELIMINARY
NOT FOR CONSTRUCTION
11/30/2023



i2
Consultants,
Inc.
16911 Potts Place
Mead, Colorado
970.217.9148

Sheet List Table

Sheet Number	Sheet Title
C-1	COVER SHEET
C-2	GENERAL NOTES
C-3	SITE PLAN
C-4	OVERALL UTILITY PLAN
C-5	OVERALL GRADING & DRAINAGE PLAN
C-6	SPOT ELEVATION PLAN
C-7	INTERSECTION & POND DETAILS
C-8	ROADWAY PLAN & PROFILE
C-9	SANITARY PLAN & PROFILE
C-10	STORM PLAN & PROFILE
C-11	WATER PLAN & PROFILE
C-12	EROSION CONTROL PLAN
C-13	DETAILS
C-14	DETAILS
C-15	DETAILS
C-16	DETAILS
C-17	DETAILS
C-18	DETAILS
C-19	DETAILS
C-20	DETAILS

SITE DATA

SITE AREA: ±260,489 S.F. (±5.98 ACRES)
ZONING CLASSIFICATION: UR
LAND USE: SINGLE FAMILY RESIDENTIAL
NUMBER OF LOTS: 29
PROPOSED DENSITY: 4.8 UNITS/ACRE
JURISDICTION: TOWN OF BERTHOUD
SITE ADDRESS: TO BE DETERMINED

PROJECT CONTACTS

OWNER: L. BEBO & J BEBO PO BOX W BERTHOUD, CO 80513	
SURVEYOR: INTERMILL LAND SURVEYING, INC. STEVE STENCIL, PLS 1301 N. CLEVELAND AVE. LOVELAND, CO 80537 970.669.0516	CIVIL ENGINEER: I2 CONSULTANTS, INC. TROY W. CAMPBELL, P.E. 16911 POTTS PLACE MEAD, CO 80542 970.217.9148

UTILITY CONTACTS

WATER SYSTEM: TOWN OF BERTHOUD 807 MOUNTAIN AVENUE BERTHOUD, CO 80513 970.532.2643	WASTEWATER SYSTEM: TOWN OF BERTHOUD 807 MOUNTAIN AVENUE BERTHOUD, CO 80513 970.532.2643
POWER: XCEL ENERGY AL ERMER AL.ERMER@XCELENERGY.COM 970.225.7869	COMMUNICATIONS: CENTURYLINK DENNIS ODELL DENNIS.ODELL@CENTURYLINK.COM MARK FAIRCHILD MARK.FAIRCHILD@CENTURYLINK.COM
GAS: XCEL ENERGY AL ERMER AL.ERMER@XCELENERGY.COM 970.225.7869	

LEGEND OF SYMBOLS

EXISTING	PROPOSED
WATER LINES FIRE HYD ELECTRIC GAS OVERHEAD TELEPHONE STORM DRAIN	W S E G O/H T SD
CONTOURS (1')	4995
FLOW DIRECTION	
EXISTING ASPHALT	
EXISTING CONCRETE	
PROPOSED CONCRETE	
PROPOSED ASPHALT	
SPILL CURB & GUTTER	
DESIGN POINT	1
MAJOR SITE DRAINAGE BASIN	A
BASIN BOUNDARY	



VICINITY MAP

SCALE: 1" = 1,000'

LEGAL DESCRIPTION

HARVEST 47 SUBDIVISION, BEING A SUBDIVISION OF LOT 2, O'MALLEY GLEN MINOR SUBDIVISION, BEING A PART OF THE NORTHEAST QUARTER OF SECTION 24, TOWNSHIP 4 NORTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN, TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO.

BASIS OF BEARING

BEARINGS ARE BASED ON THE RECORD BEARING OF N89°42'45"E ON THE NORTH LINE OF THE NORTHEAST QUARTER OF SECTION 24, TOWNSHIP 4 NORTH, RANGE 69 WEST OF THE 6TH PM, COUNTY OF LARIMER, STATE OF COLORADO. RECORD BEARING DERIVED FROM THE FINAL PLAT OF THE FARMSTEAD, TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO AS FILED FOR RECORD APRIL 1, 2019 IN THE REAL PROPERTY RECORDS OF THE OFFICE OF THE CLERK AND RECORDER OF LARIMER COUNTY, COLORADO AT RECEPTION NUMBER 20190016179. NOTE: MONUMENTATION OF SAID LINE AS SHOWN HEREON.

HARVEST 47 SUBDIVISION
CONSTRUCTION DOCUMENTS
COVER SHEET

LOCATED IN THE NE 1/4, SECTION 24, TOWNSHIP 4 NORTH, RANGE 69 WEST
TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO

				DATE
				APPV
				REVISION/ISSUE
				DATE
				BY
				DATE

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TOWN OF BERTHOUD APPROVAL

ALL WORK SHALL BE CONSTRUCTED TO THE TOWN STANDARDS AND SPECIFICATIONS. THESE PLANS HAVE BEEN REVIEWED BY THE TOWN OF BERTHOUD FOR CONCEPT ONLY AND GENERAL CONFORMANCE WITH THE TOWN'S STANDARDS AND SPECIFICATIONS. THE REVIEW BY THE TOWN OF BERTHOUD DOES NOT IMPLY RESPONSIBILITY BY THE TOWN OF BERTHOUD OR THE TOWN ENGINEER FOR ACCURACY AND CORRECTNESS OF THE PLANS AND CALCULATIONS.

THESE PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM THE DATE OF THE TOWN ENGINEER'S APPROVAL.

APPROVED BY:

TOWN ENGINEER DATE

SHEET
C-1

1 OF 20 SHEETS

1. ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE LATEST EDITION OF BERTHOUD STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC AND PRIVATE IMPROVEMENTS, COLORADO DEPARTMENT OF TRANSPORTATION, BERTHOUD FIRE PROTECTION DISTRICT REQUIREMENTS, AND ALL APPLICABLE STATE AND LOCAL STANDARDS AND SPECIFICATIONS.
2. THE CONTRACTOR SHALL HAVE IN POSSESSION AT THE JOB SITE AT ALL TIMES ONE (1) SIGNED COPY OF APPROVED PLANS, STANDARDS AND SPECIFICATIONS, AND PERMITS. CONTRACTOR SHALL CONSTRUCT AND MAINTAIN EMERGENCY ACCESS ROUTES TO THE SITE AND STRUCTURE AT ALL TIMES PER THE APPLICABLE MOUNTAIN VIEW FIRE PROTECTION DISTRICT REQUIREMENTS. THE CONTRACTOR SHALL OBTAIN WRITTEN APPROVAL FOR ANY VARIANCE TO THE ABOVE DOCUMENTS. THE CONTRACTOR SHALL NOTIFY THE TOWN ENGINEER OF ANY CONFLICTING STANDARDS OR SPECIFICATIONS. IN THE EVENT OF ANY CONFLICTING STANDARD OR SPECIFICATION, THE MORE STRINGENT OR HIGHER QUALITY STANDARD, DETAIL OR SPECIFICATION SHALL APPLY.
3. THE CONTRACTOR SHALL OBTAIN, AT HIS OWN EXPENSE, ALL APPLICABLE CODES, LICENSES, STANDARD SPECIFICATIONS, PERMITS, BONDS, ETC., WHICH ARE NECESSARY TO PERFORM THE PROPOSED WORK, INCLUDING, BUT NOT LIMITED TO A LOCAL AND STATE GROUNDWATER DISCHARGE AND COLORADO DEPARTMENT OF HEALTH AND ENVIRONMENT (CDPHE) STORMWATER DISCHARGE PERMIT ASSOCIATED WITH CONSTRUCTION ACTIVITY.
4. ALL WORK SHALL BE SUBJECT TO INSPECTION AND APPROVAL BY AUTHORIZED TOWN OF BERTHOUD PERSONNEL.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING THE TOWN ENGINEER, GEOTECHNICAL ENGINEER, AND TO UTILITY OWNERS, AT LEAST 48 HOURS BEFORE START OF ANY CONSTRUCTION, PRIOR TO BACKFILLING, AND AS REQUIRED BY JURISDICTIONAL AUTHORITY AND/OR PROJECT SPECIFICATIONS. THE CONTRACTOR SHALL CONTINUE WITH NOTIFICATIONS THROUGHOUT THE PROJECT AS REQUIRED BY THE STANDARDS AND SPECIFICATIONS.
6. THE CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE FOR CONDITIONS AT AND ADJACENT TO THE JOB SITE; INCLUDING SAFETY OF PERSONS AND PROPERTY, MAINTAINING THE PERFORMANCE OF WORK. THE REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. THE TOWN CONSTRUCTION REVIEW OF THE CONTRACTOR'S PERFORMANCE IS NOT INTENDED TO INCLUDE REVIEW OF THE ADEQUACY OF THE CONTRACTOR'S SAFETY MEASURES IN, ON, OR NEAR THE CONSTRUCTION SITE.
7. THE CONTRACTOR SHALL PREPARE A TRAFFIC CONTROL PLAN FOR TOWN APPROVAL BY THE TOWN OF BERTHOUD PRIOR TO CONSTRUCTION AND PROVIDE ALL REQUIRED SIGNAGE, BARRICADES, FENCIBLE FLAGMEN OR OTHER DEVICES NECESSARY TO PROVIDE FOR PUBLIC SAFETY. THE CONTRACTOR AGREES TO COMPLY WITH THE PROVISIONS OF THE TRAFFIC CONTROL PLAN AND THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD)," PART VI, FOR CONSTRUCTION SIGNAGE AND TRAFFIC CONTROL. ALL TEMPORARY AND PERMANENT TRAFFIC SIGNS SHALL COMPLY TO THE MUTCD WITH REGARD TO SIGN SHAPE, COLOR, SIZE, LETTERING, ETC. UNLESS OTHERWISE SPECIFIED. IF APPLICABLE, PART NUMBERS ON SIGNAGE DETAILS REFER TO MUTCD SIGN NUMBERS.
8. THE TYPE, SIZE, LOCATION, AND NUMBER OF ALL KNOWN UNDERGROUND UTILITIES ARE APPROXIMATE AS SHOWN ON THE DRAWINGS BASED ON INFORMATION BY OTHERS. NOT ALL UTILITIES ARE SHOWN. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXISTENCE, SIZE, TYPE, AND LOCATION OF ALL UNDERGROUND UTILITIES WHETHER SHOWN OR NOT ALONG THE ROUTE OF THE WORK. LOCATION OF EXISTING UTILITIES SHALL BE VERIFIED BY CONTRACTOR PRIOR TO DATE OF CONSTRUCTION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY SIZE AND HORIZONTAL AND VERTICAL LOCATIONS OF EXISTING FACILITIES PRIOR TO CONSTRUCTION AND NOTIFY THE TOWN OF ANY DISCREPANCIES. THE ENGINEER AND/OR OWNER ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS SHOWN ON THE CONTRACTOR SHALL BE FULLY AND SOLELY RESPONSIBLE FOR ANY AND ALL DAMAGES AND COSTS WHICH MIGHT OCCUR BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UTILITIES. THE CONTRACTOR SHALL NOTIFY ALL PUBLIC AND PRIVATE OWNERS AND DETERMINE THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO ANY WORK BEING DONE WITH GRADING AND CONSTRUCTION. ALL WORK PERFORMED IN THE AREA OF UTILITIES SHALL BE PERFORMED AND INSPECTED ACCORDING TO THE REQUIREMENTS OF THE UTILITY OWNER. LIKEWISE, THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND MAPPING ANY EXISTING UTILITY (INCLUDING WHICH MAY CONFLICT WITH THE PROPOSED CONSTRUCTION, AND FOR RELOCATING ENCOUNTERED UTILITIES AS DIRECTED BY THE ENGINEER. CONTRACTOR SHALL CONTACT AND RECEIVE APPROVAL FROM TOWN ENGINEER AND THE UTILITY OWNER BEFORE RELOCATING ANY ENCOUNTERED UTILITIES. CONTRACTOR RESPONSIBLE FOR SERVICE CONNECTIONS, AND FOR KEEPING ALL PIPES AND CONDUITS PROTECTED UTILITIES. COORDINATE WITH UTILITY OWNERS AND FOR ENGINEER, INCLUDING NON-MUNICIPAL UTILITIES (TELEPHONE, GAS, CABLE, ETC., WHICH SHALL BE COORDINATED WITH THE UTILITY OWNER). THE CONTRACTOR SHALL IMMEDIATELY CONTACT THE TOWN ENGINEER UPON DISCOVERY OF A UTILITY DISCREPANCY OR CONFLICT. AT LEAST 48 HOURS PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL NOTIFY THE UTILITY NOTIFICATION CENTER OF COLORADO (1-800-922-1987, WWW.UCCNC.ORG).
9. ALL TRENCHES SHALL BE ADEQUATELY SUPPORTED AND THE SAFETY OF WORKERS PROVIDED FOR AS REQUIRED BY THE MOST RECENT OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) "SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION." THESE REGULATIONS ARE DESCRIBED IN SUBPART P, PART 1926 OF THE CODE OF FEDERAL REGULATIONS. SHEETING AND SHORING SHALL BE UTILIZED WHERE NECESSARY TO PREVENT ANY EXCESSIVE WIDENING OR SLOUGHING OF THE TRENCH WHICH MAY BE DETRIMENTAL TO HUMAN SAFETY, TO THE PIPE BEING PLACED, TO TREES, OR TO ANY EXISTING STRUCTURE WHERE EXCAVATIONS ARE MADE UNDER SEVERE WATER CONDITIONS. THE CONTRACTOR MAY BE REQUIRED TO USE AN APPROVED PILING INSTEAD OF SHEETING AND SHORING.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING ANY GROUNDWATER ENCOUNTERED DURING THE CONSTRUCTION OF ANY PORTION OF THIS PROJECT. GROUNDWATER SHALL BE PUMPED, PIPED, REMOVED AND DISPOSED OF IN A MANNER WHICH DOES NOT CAUSE FLOODING OF EXISTING STREETS NOR EROSION ON ADJUTING PROPERTIES IN ORDER TO CONSTRUCT THE IMPROVEMENTS SHOWN ON THESE PLANS. GROUNDWATER TO BE PUMPED TO THE STREET, TO A DRAINAGE DITCH, PERMITTED, AND PUMPED PER THE STATE OF COLORADO AND LOCAL GROUNDWATER DISCHARGING PERMIT REQUIREMENTS.
11. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANING NEARBY PUBLIC STREETS OF MUD OR DEBRIS DUE TO CONSTRUCTION ACTIVITY INITIATED BY SAID CONTRACTOR ON A DAILY BASIS OR AS OTHERWISE DIRECTED BY AUTHORIZED TOWN PERSONNEL.
12. ALL SURPLUS MATERIALS, TOOLS, AND TEMPORARY STRUCTURES, FURNISHED BY THE CONTRACTOR, SHALL BE REMOVED FROM THE PROJECT SITE BY THE CONTRACTOR. ALL DEBRIS AND RUBBISH CAUSED BY THE OPERATIONS OF THE CONTRACTOR SHALL BE REMOVED, AND THE AREA OCCUPIED DURING CONSTRUCTION ACTIVITIES SHALL BE RESTORED TO ITS ORIGINAL CONDITION OR BETTER, WITHIN 48 HOURS OF PROJECT COMPLETION.
13. PRIOR TO THE BEGINNING OF WORK, A PRECONSTRUCTION CONFERENCE SHALL BE HELD BETWEEN THE TOWN, THE RESPONSIBLE PARTY WHO IS SCHEDULED TO PERFORM THE WORK, THE DESIGNATED ON-SITE FIELD REPRESENTATIVE, THE CONSULTING ENGINEER OR LANDSCAPE PROFESSIONAL, AND ANY OTHER ENTITIES INVOLVED IN THE CONSTRUCTION.
14. THE CONTRACTOR IS REQUIRED TO PROVIDE AND MAINTAIN EROSION AND SEDIMENT CONTROL MEASURES IN ACCORDANCE WITH THE TOWN OF BERTHOUD STANDARDS AND SPECIFICATION, THE STATE OF COLORADO, MILE HIGH FLOOD DISTRICT "URBAN STORM DRAINAGE CRITERIA MANUAL VOLUME 3", THE M-STANDARD PLANS OF THE COLORADO DEPARTMENT OF TRANSPORTATION, AND THE APPROVED EROSION CONTROL PLAN. THE TOWN OF BERTHOUD MAY REQUIRE THE CONTRACTOR TO PROVIDE ADDITIONAL EROSION CONTROL MEASURES AT THE CONTRACTOR'S EXPENSE DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE PLANS DO NOT FUNCTION AS INTENDED. THE CONTRACTOR IS RESPONSIBLE FOR PROHIBITING SILT AND DEBRIS LOADED RUNOFF FROM LEAVING THE SITE, AND FOR KEEPING ALL PIPES AND CONDUITS PROTECTED UTILITIES. COORDINATE WITH UTILITY OWNERS AND FOR ENGINEER, INCLUDING NON-MUNICIPAL UTILITIES (TELEPHONE, GAS, CABLE, ETC., WHICH SHALL BE COORDINATED WITH THE UTILITY OWNER). THE CONTRACTOR SHALL IMMEDIATELY CONTACT THE TOWN ENGINEER UPON DISCOVERY OF A UTILITY DISCREPANCY OR CONFLICT. AT LEAST 48 HOURS PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL NOTIFY THE UTILITY NOTIFICATION CENTER OF COLORADO (1-800-922-1987, WWW.UCCNC.ORG).
15. DEVELOPMENT PHASING OF ANY PROJECT MUST BE SHOWN ON THE CONSTRUCTION PLANS, APPROVED BY THE TOWN ENGINEER AND MADE A PART OF THE APPLICATION PROCEDURE. NO PHASING SHALL BE PERMITTED UNLESS THIS REQUIREMENT HAS BEEN ADHERED TO.
16. NO WORK SHALL BEGIN UNTIL THE INSTALLING RESPONSIBLE PARTY IS IN POSSESSION OF AN APPROVED SET OF PLANS AND THE TOWN OF BERTHOUD STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC AND PRIVATE IMPROVEMENTS, AND ALL NECESSARY PERMITS FOR THE IMPROVEMENTS HAS BEEN ISSUED BY THE TOWN. TOWN ENGINEERING'S APPROVAL SHALL BE FOR GENERAL CONFORMITY TO THE UTILITY SPECIFICATIONS AND SHALL NOT CONSTITUTE BLANKET APPROVAL OF ALL DIMENSIONS, QUANTITIES AND DETAILS OF THE MATERIAL OR EQUIPMENT SHOWN. NOR SHALL SUCH APPROVAL RELIEVE THE RESPONSIBLE PARTY, CONSULTING ENGINEER, OR LANDSCAPE ARCHITECT OF THEIR RESPONSIBILITY FOR ERRORS CONTAINED IN THE DRAWINGS.
17. THE RESPONSIBLE PARTY SHALL FURNISH REASONABLE AID AND ASSISTANCE REQUIRED BY THE TOWN ENGINEER FOR THE PROPER EXAMINATION OF THE MATERIALS AND WORK. WORK SHALL BE PERFORMED IN ACCORDANCE WITH ACCEPTED WORKMANSHIP PRACTICES AND THE TOWN OF BERTHOUD STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC AND PRIVATE IMPROVEMENTS. ANY WORK NOT ACCEPTED BY THE TOWN ENGINEER SHALL BE REDONE UNTIL COMPLIANCE WITH THESE STANDARDS IS ACHIEVED. INSTRUCTIONS GIVEN BY THE TOWN ENGINEER RELATING TO QUALITY OF MATERIALS AND WORKMANSHIP MUST BE OBTAINED AT ONCE BY THE RESPONSIBLE PARTY. THE TOWN SHALL NOT SUPERVISE SET OUT WORK, OR GIVE LINE AND GRADE STAKES.

- THE MATERIALS USED IN PROJECTS SHALL BE NEW AND SUBJECT TO THE INSPECTION AND APPROVAL OF THE INSPECTOR AT ALL TIMES. THE INSPECTOR HAS THE RIGHT TO PERFORM ANY TESTING DEEMED NECESSARY TO ENSURE COMPLIANCE OF THE MATERIAL WITH THESE STANDARDS. NO MATERIAL SHALL BE USED BEFORE BEING INSPECTED AND APPROVED BY THE INSPECTOR. FAILURE OR NEGLECT ON THE PART OF THE INSPECTOR, TO CONDEMN OR REJECT INFERIOR MATERIALS OR WORK SHALL NOT BE CONSTRUED TO WAIVE THEIR ACCEPTANCE SHOULD THEIR INFERIORITY BECOME EVIDENT AT ANY TIME PRIOR TO FINAL ACCEPTANCE OF THE WORK. INSPECTORS HAVE THE AUTHORITY TO REJECT DEFECTIVE OR INFERIOR MATERIALS AND/OR DEFECTIVE WORKSMANSHIP AND TO SUSPEND WORK UNTIL SUCH TIME AS THE RESPONSIBLE PARTY SHALL CORRECT THE DISCREPANCIES IN QUESTION.
19. WHENEVER DEFECTIVE MATERIALS AND WORK ARE REJECTED, THE RESPONSIBLE PARTY SHALL PROMPTLY REMOVE SUCH DEFECTIVE MATERIALS AND CONSTRUCTION FROM THE JOB SITE AND REPLACE ALL DEFECTIVE PORTIONS TO THE SATISFACTION OF THE TOWN ENGINEER. IN THE EVENT THE RESPONSIBLE PARTY FAILS TO REMOVE REJECTED ITEMS FROM THE JOB SITE WITHIN A REASONABLE LENGTH OF TIME, THE TOWN ENGINEER MAY ARRANGE FOR SUCH REMOVAL AT THE EXPENSE OF THE RESPONSIBLE PARTY.
20. INSPECTION SHALL NOT RELIEVE THE RESPONSIBLE PARTY FROM ANY OBLIGATION TO PERFORM THE WORK STRICTLY IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS OR ANY MODIFICATIONS THEREOF. WORK NOT SO CONSTRUCTED SHALL BE REMOVED AND CORRECTED BY THE RESPONSIBLE PARTY AT HIS SOLE EXPENSE, WHENEVER SO ORDERED BY THE TOWN ENGINEER, WITHOUT REFERENCE TO ANY PREVIOUS ERROR OR OVERSIGHT IN INSPECTION.
21. EXCEPT IN CASES OF EMERGENCY, MAINTENANCE, OR PROTECTION OF WORK ALREADY COMPLETED, NO WORK SHALL BE ALLOWED BETWEEN THE HOURS OF 7 P.M. AND 7 A.M.; NOR ON SATURDAY, SUNDAY, OR LEGAL HOLIDAYS UNLESS APPROVED BY THE TOWN ENGINEER. IN EACH CASE, WHEN ANY INSPECTOR IS REQUIRED TO WORK OUTSIDE THE HOURS OF 7 A.M. TO 4 P.M. ON REGULAR TOWN BUSINESS DAYS, OVERTIME SHALL BE CHARGED TO THE RESPONSIBLE PARTY. HOWEVER, SUCH INSPECTORS SHALL REMAIN EMPLOYEES OF THE TOWN FOR ALL PURPOSES. REQUESTS FOR OVERTIME SHALL BE MADE TO THE TOWN ENGINEER AT LEAST 48 HOURS IN ADVANCE. PAYMENT FOR SUCH OVERTIME WORK SHALL BE MADE TO THE TOWN PRIOR TO FINAL ACCEPTANCE.
22. IN THE EVENT ONE OR MORE INSPECTORS REPRESENTING PRIVATE CONSULTING ENGINEERING FIRMS ARE ALSO INSPECTING A PROJECT ALONG WITH THE TOWN ENGINEER, THE INSTRUCTIONS GIVEN BY THE TOWN ENGINEER SHALL PREVAIL IN THE EVENT OF CONFLICTING INSTRUCTIONS.
23. PROTECT ALL TREES AND VEGETATION. PLACE CONSTRUCTION FENCING AT DRIP LINE OF TREES AND PLANTS NEAR THE WORK ZONE. DEBRIS WATER TREES WEEKLY. HAND EXCAVATION REQUIRED AT ROOT ZONES WHERE PROPOSED PAVING OR UTILITY WORK IS WITHIN DRIPLINE OF TREES. REPAIR OF ANY DAMAGE TO EXISTING IMPROVEMENTS OR LANDSCAPING IS THE RESPONSIBILITY OF THE CONTRACTOR.
24. THE WORK SHALL BE SURVEYED AND STAKED UNDER THE SUPERVISION OF A LICENSED LAND SURVEYOR IN ACCORDANCE WITH THE APPROVED PLANS.
25. RIM AND GRATE ELEVATIONS SHOWN ON PLANS ARE APPROXIMATE ONLY AND ARE NOT TO BE TAKEN AS FINAL ELEVATIONS. THE CONTRACTOR SHALL ADJUST RIMS AND OTHER IMPROVEMENTS TO MATCH FINAL PAVEMENT AND FINISHED GRATE ELEVATIONS.
26. THE CONTRACTOR SHALL FURNISH THE ENGINEER OF RECORD A COMPLETE SET OF CONSTRUCTION RECORD DRAWINGS ("AS-BUILTS") FOR THE CONSTRUCTED IMPROVEMENTS. THE PLANS SHALL SHOW SUFFICIENT DIMENSION LINES TO PERMANENT SURFACE FEATURES FOR ALL BURIED FACILITIES AND LOW VOLTAGE UTILITY LAYOUT. THE PLANS SHALL SHOW FINAL PAVEMENT, FLOW LINE ELEVATIONS, CONTOURS AT POND/DRAINAGE FEATURES (AS SURVEYED AND CERTIFIED BY A COLORADO P.L.S.), MANHOLE, PIPE, AND INLET LOCATIONS, INVERTS, GRATE ELEVATIONS, SIZES OF ALL UTILITIES, AND ANY VARIATIONS FROM THE APPROVED PLAN. FINAL AS-BUILT PLANS PREPARED BY THE ENGINEER OF RECORD SHALL BE PROVIDED TO THE TOWN OF BERTHOUD.
27. IF A FOUNDATION UNDERDRAIN SYSTEM IS INSTALLED IN THE PUBLIC RIGHT-OF-WAY, THE FOLLOWING STATEMENT SHALL BE INCLUDED IN THE DRAWINGS:
 - a. "THE FOUNDATION UNDERDRAIN SYSTEM IS THE RESPONSIBILITY OF THE OWNER/DEVELOPER OR ITS ASSIGNS. THE TOWN IS NOT RESPONSIBLE FOR THE MAINTENANCE OR REPAIR OF SAID SYSTEM."

1. CONSTRUCTION SHALL ADHERE TO THE FOLLOWING SEQUENCE UNLESS OTHERWISE SPECIFIED BY THE TOWN ENGINEER: SANITARY SEWER INSTALLATION, WATER MAIN INSTALLATION, CURB AND GUTTER INSTALLATION, WATER SERVICE INSTALLATION.
2. COMPACTION OF ALL TRENCHES MUST BE ATTAINED AND COMPACTION TEST RESULTS SUBMITTED TO THE ENGINEER AND THE TOWN OF BERTHOUD PRIOR TO FINAL ACCEPTANCE.
3. ALL WORK, INCLUDING CORRECTION WORK, SHALL BE INSPECTED BY A TOWN REPRESENTATIVE WHO SHALL HAVE THE AUTHORITY TO HALT CONSTRUCTION WHEN STANDARD CONSTRUCTION PRACTICES ARE NOT BEING ADHERED TO.
4. DEVELOPER AND BUILDER SHALL REGULARLY PATROL THE PUBLIC LANDS ADJACENT TO THE DEVELOPMENT TO REMOVE CONSTRUCTION DEBRIS AND KEEP THE SITE CLEAN AND SAFE.
5. ALL SITE GRADING (EXCAVATION, EMBANKMENT, AND COMPACTION) SHALL CONFORM TO THE RECOMMENDATIONS OF THE LATEST SOILS INVESTIGATION FOR THIS PROPERTY AND SHALL FURTHER BE IN CONFORMANCE WITH THE TOWN OF BERTHOUD STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC AND PRIVATE IMPROVEMENTS: LATEST EDITION. A COPS GENERAL PERMIT FOR STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITIES SHALL BE OBTAINED PRIOR TO ANY GRADING BEING PERFORMED ON SITES ONE (1) ACRE OR LARGER IN SIZE. THESE PERMITS CAN BE OBTAINED FROM THE STATE WATER QUALITY CONTROL DIVISION.
6. NATURAL VEGETATION SHALL BE RETAINED AND PROTECTED WHEREVER POSSIBLE. EXPOSURE OF SOIL TO EROSION BY REMOVAL OR DISTURBANCE OF VEGETATION SHALL BE LIMITED TO THE AREA REQUIRED FOR IMMEDIATE CONSTRUCTION OPERATION AND FOR THE SHORTEST PRACTICAL PERIOD OF TIME.
7. TOPSOIL SHALL BE STOCKPILED TO THE EXTENT PRACTICABLE ON THE SITE FOR USE ON AREAS TO BE REVEGETATED. ANY AND ALL STOCKPILES SHALL BE LOCATED AND PROPER MEASURES TAKEN TO CONTROL EROSION AND SEDIMENT MOVEMENT.
8. AT ALL TIMES, THE PROPERTY SHALL BE MAINTAINED AND/OR WATERED TO PREVENT WIND-CAUSED EROSION. EARTHWORK OPERATIONS SHALL BE DISCONTINUED WHEN DUST SIGNIFICANTLY IMPACTS ADJACENT PROPERTY. IF EARTHWORK IS COMPLETE OR DISCONTINUED AND DUST FROM THE SITE CONTINUES TO CREATE PROBLEMS, THE OWNER/DEVELOPER SHALL IMMEDIATELY INSTITUTE MITIGATIVE MEASURES AND SHALL CORRECT DAMAGE TO ADJACENT PROPERTY.
9. PERMANENT SLOPES SHALL NOT EXCEED 4:1 (H:V) IN AREAS TO BE SEEDDED OR RETAINING WALLS SHALL BE REVIEWED AND APPROVED BY SEPARATE APPLICATION TO THE TOWN OF BERTHOUD.
10. THIS EROSION AND SEDIMENT CONTROL PLAN HAS BEEN SUBMITTED TO THE TOWN OF BERTHOUD AND IS IN GENERAL CONFORMANCE WITH THE TOWN'S EROSION CONTROL STANDARDS. ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES MAY BE REQUIRED OF THE OWNER AND HIS AGENTS DUE TO UNFORESEEN EROSION PROBLEM OR IF THE PROPOSED EROSION CONTROL MEASURES DO NOT FUNCTION AS INTENDED. THE REQUIREMENTS OF THIS EROSION CONTROL PLAN AND THE OBLIGATION OF THE LANDOWNER SHALL RUN WITH THE LAND UNTIL SUCH TIME AS THE EROSION CONTROL PLAN IS PROPERLY COMPLETED, OFFICIALLY MODIFIED, OR VOIDED.

3. ALL WATER MATERIALS, CONSTRUCTION, AND TESTING SHALL MEET THE REQUIREMENTS OF BERTHOUD STANDARDS AND SPECIFICATIONS. THE BERTHOUD FIRE PROTECTION DISTRICT SPECIFICATIONS.
4. FIRE HYDRANT SPECIFICATIONS:
 - A. ALL FIRE HYDRANTS WILL BE MUELLER.
 - B. ALL HYDRANTS WILL HAVE A FIVE AND ONE-QUARTER (5-1/4) INCH OR LARGER VALVE OPENING, TWO (2) TWO AND ONE-HALF (2-1/2) INCH HOSE NOZZLES, ONE (1) PUMPER NOZZLE AND SIX (6) INCH OR LARGER MECHANICAL JOINT INLET.
 - C. ALL NOZZLES SHALL HAVE NATIONAL STANDARD THREADS.
 - D. THE HYDRANT SHALL BE OF TRAFFIC HAZARD TYPE WITH SAFETY FEATURES WHICH WILL PREVENT BARREL BREAKAGE.
 - E. SPECIFICATIONS FOR THE OPERATING NUT AND STUBS AND CUPS SHALL BE ONE (1) INCH SQUARE OR PENTAGON AND OPEN R
5. WATER SERVICE LINE SPECIFICATIONS:
 - A. CORPORATION STOPS SHALL HAVE INLET THREADED CC TYPE, OUTLET COPPER COMPRESSION OR FLARE, NO SOLDERING WILL BE ALLOWED.
 - B. WATER SERVICE SADDLES SHALL BE "O"RING GASKET, DOUBLE BAND, OR HINGE PIN CC THREAD, 1/2 INCH - 2 INCH COPPER.
 - C. CURB STOP STYLE SHALL BE COMPRESSION OR FLARED COPPER BOTH ENDS, MINNEAPOLIS PATTERN VALVE-THREADS AROUND ALLOW MINNEAPOLIS STYLE CURB BOX.
 - D. CURB BOX SHALL HAVE MINNEAPOLIS BASE EXTENSION TYPE CURB BOXES, CAST IRON LID AND BASE WITH BRASS PENTAGON H PLUG USING A 1 1/2 INCH UPPER SECTION.
6. ALL WATER VALVES SHALL OPEN LEFT.
7. THE MINIMUM COVER OVER THE WATER LINE IS 5 FEET AND THE MAXIMUM COVER IS 6 FEET UNLESS OTHERWISE NOTED IN THE PLAN APPROVED BY THE TOWN.
8. PRIOR TO INSTALLATION OF WATER MAINS, ROAD/DRIVE CONSTRUCTION MUST HAVE PROGRESSED TO AT LEAST THE "SUB-GRADE" STATUS-SUB-GRADE IS DEFINED AS AN ELEVATION OF NO MORE THAN SEVEN (7) INCHES BELOW THE FINISHED STREET GRADE. ALL VALVE B AND FIRE HYDRANTS WILL BE ADJUSTED TO THE FINAL FINISHED GRADE BY THE CONTRACTOR.
9. BEFORE ANY TAPS ARE MADE FROM MAINS, APPLICATIONS FOR THE TAPS MUST BE RECEIVED AND APPROVED BY THE TOWN.
10. TRACER WIRE SHALL BE USED FOR ALL NON-METALLIC WATER MAINS. TRACER WIRE SHALL BE BROUGHT UP TO TEST STATIONS AT ALL FIRE HYDRANTS.
11. PVC WATER MAINS SHALL BE AWWA C900, DR 18.
12. ALL WATER SERVICES SHALL BE TYPE K COPPER.
13. CONTRACTOR TO CONTACT BUILDING DEPARTMENT PRIOR TO INSTALLATION OF METER SETTER.

Know what's **below**.
Call before you dig.

**HARVEST 47 SUBDIVISION
CONSTRUCTION DOCUMENTS
GENERAL NOTES**

[illegible]

Design	TWC	Drawn	TWC
Checked		Checked	
Date	NOVEMBER 20, 2023		
Job No.	1053-1		
D-	HarvestCD_CV		

SHEET
C-2

2 OF 20 SHEETS

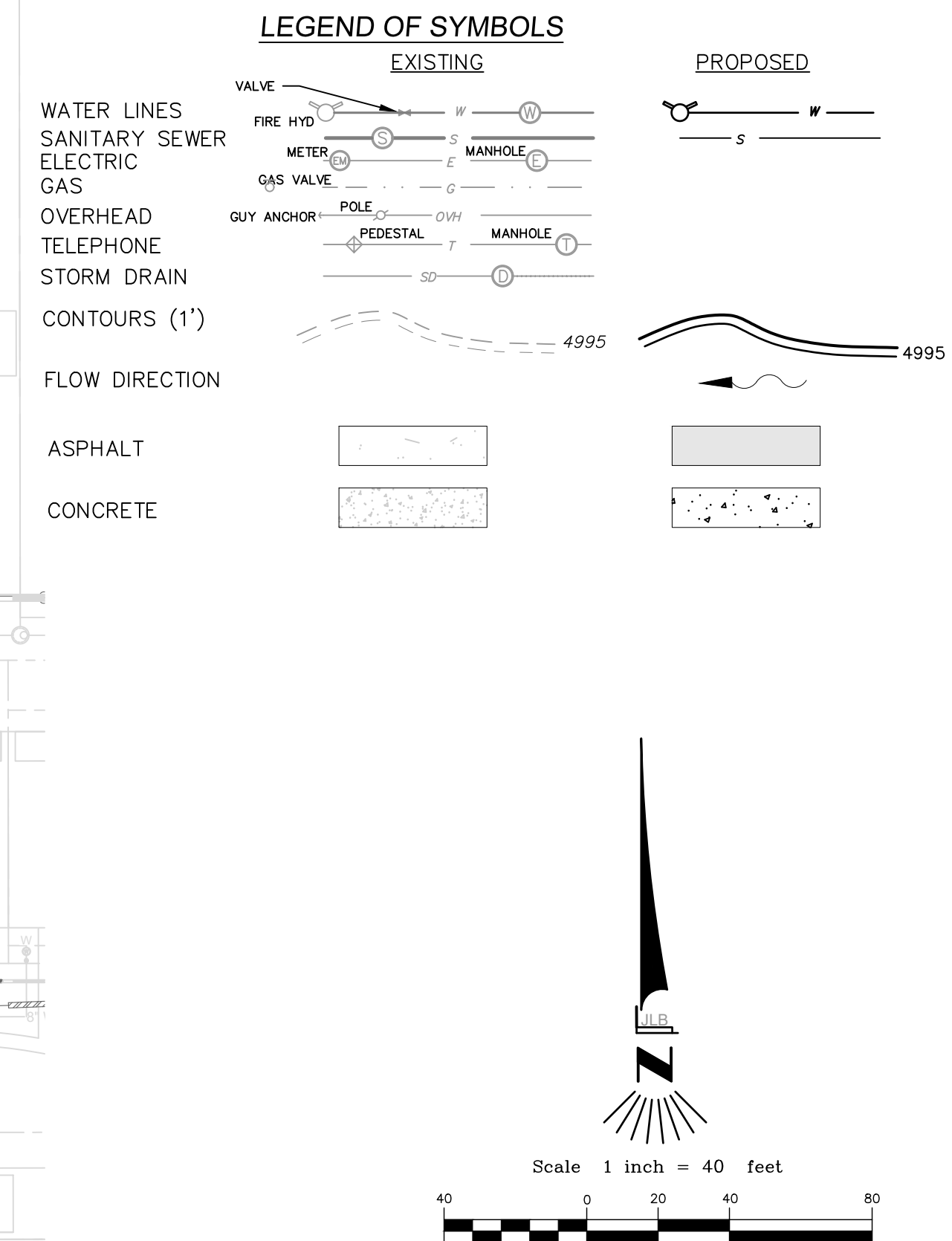
Know what's **below**.
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HARVEST 47 SUBDIVISION
CONSTRUCTION DOCUMENTS
SITE/LANDSCAPE PLAN

LOCATED IN THE NE 1/4, SECTION 24, TOWNSHIP 4 NORTH, RANGE 69 WEST
TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO

<i>Design</i>	<i>Drawn</i>
<i>Checked TWC</i>	<i>Checked TWC</i>
<i>Date</i> NOVEMBER 20, 2023	
<i>Job No.</i> 1053-1	
<i>D- Harvest</i> CD_HC	

3 OF 20 SHEETS



REFER TO THE FINAL PLAT FOR THE SUBDIVISION FOR ALL LOT DIMENSIONS AND SQUARE FOOTAGE.

ⓐ SMALL TREE PLANTING (2" & 3" CALIPER)
NOT TO SCALE

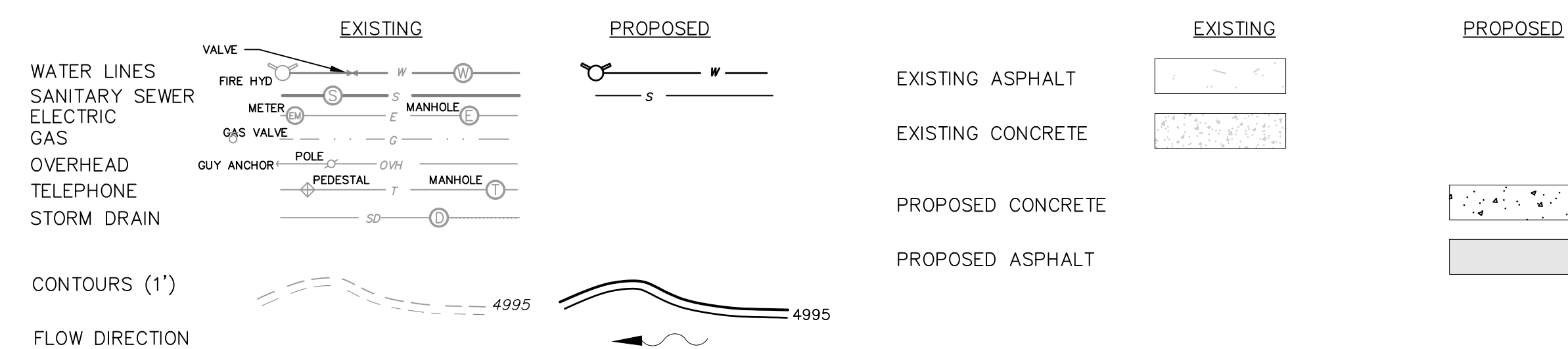
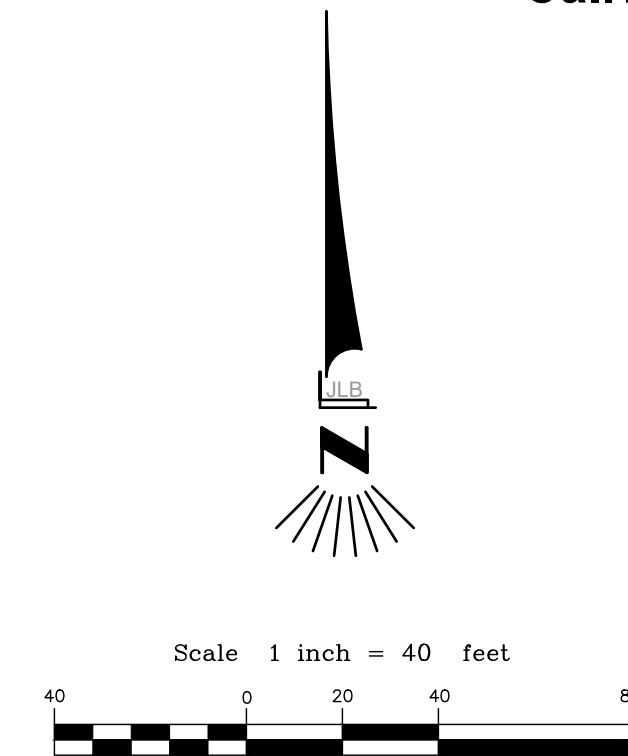
Diagram illustrating a cross-section of a 58' ROW (MIN.) (Right of Way Minimum). The layout includes:

- 5' WALK DETACHED
- 7' PKWY w/ vertical curb
- 34' ROADWAY
- 7' PKWY w/ vertical curb
- 5' WALK DETACHED
- 10' UTIL. ESMT (Utility Easement)
- 7' PARK'G (Parking)
- 10' TRAVEL
- 10' TRAVEL
- 7' PARK'G
- 10' UTIL. ESMT

Know what's **below**.
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HARVEST 47 SUBDIVISION
CONSTRUCTION DOCUMENTS
OVERALL UTILITY PLAN

LOCATED IN THE NE 1/4, SECTION 24, TOWNSHIP 4 NORTH, RANGE 69 WEST
TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO



1. CONTRACTOR SHALL VERIFY THE SIZE, TYPE AND MATERIAL OF ALL UTILITIES PRIOR TO CONSTRUCTION.
2. CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATIONS OF ALL UTILITIES PRIOR TO CONSTRUCTION.

[illegible]

Know what's **below**.
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HARVEST 47 SUBDIVISION
CONSTRUCTION DOCUMENTS
OVERALL GRADING & DRAINAGE PLAN

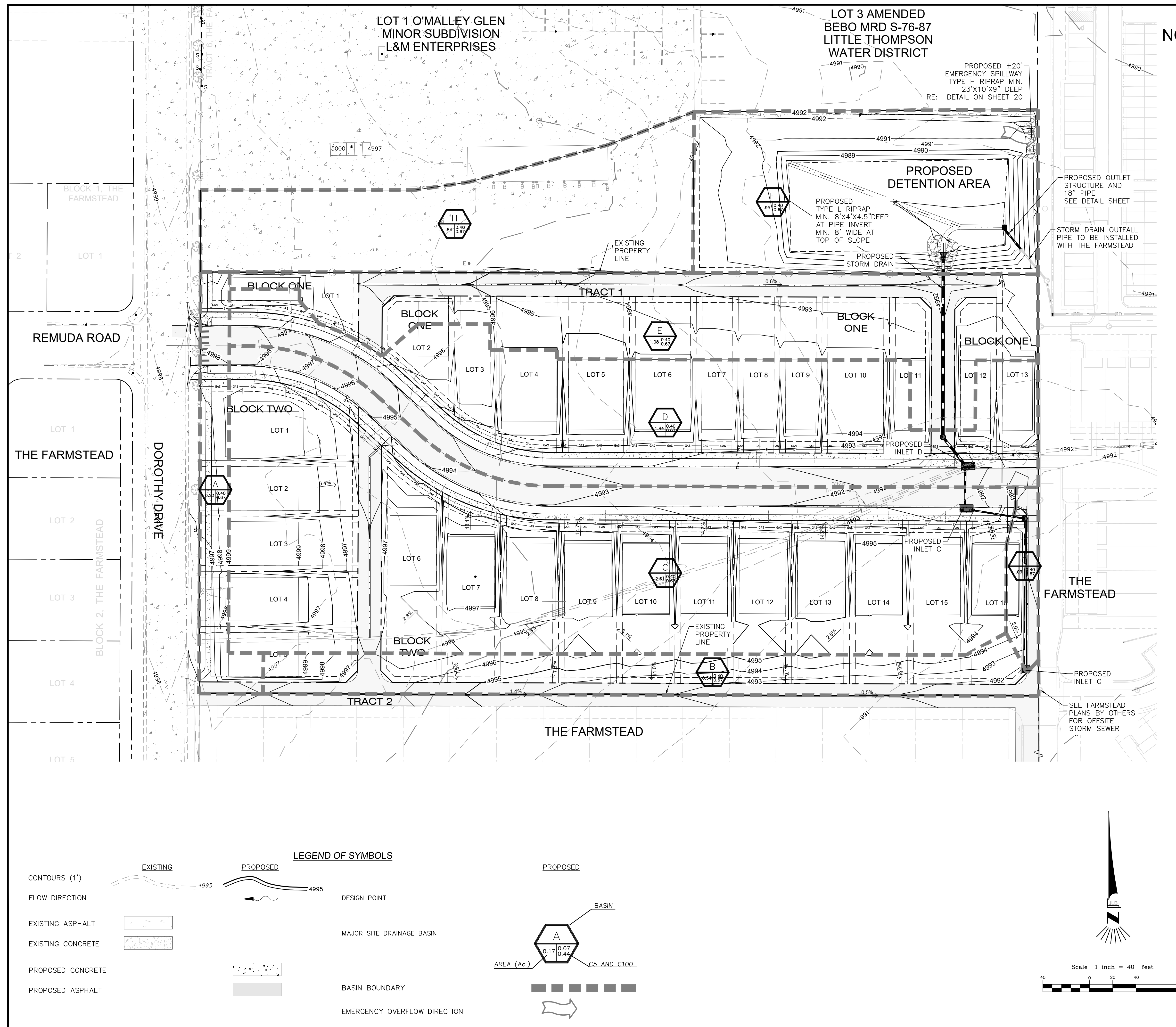
LOCATED IN THE NE 1/4, SECTION 24, TOWNSHIP 4 NORTH, RANGE 69 WEST
TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO

[illegible]

<i>Design</i>	<i>Drawn</i>
<i>Checked TWC</i>	<i>Checked TWC</i>
<i>Date</i> NOVEMBER 20, 2023	
<i>Job No.</i> 1053-1	
<i>D-</i>	<i>HarvestCD_GR</i>

SHEET
C-5

5 OF 20 SHEETS



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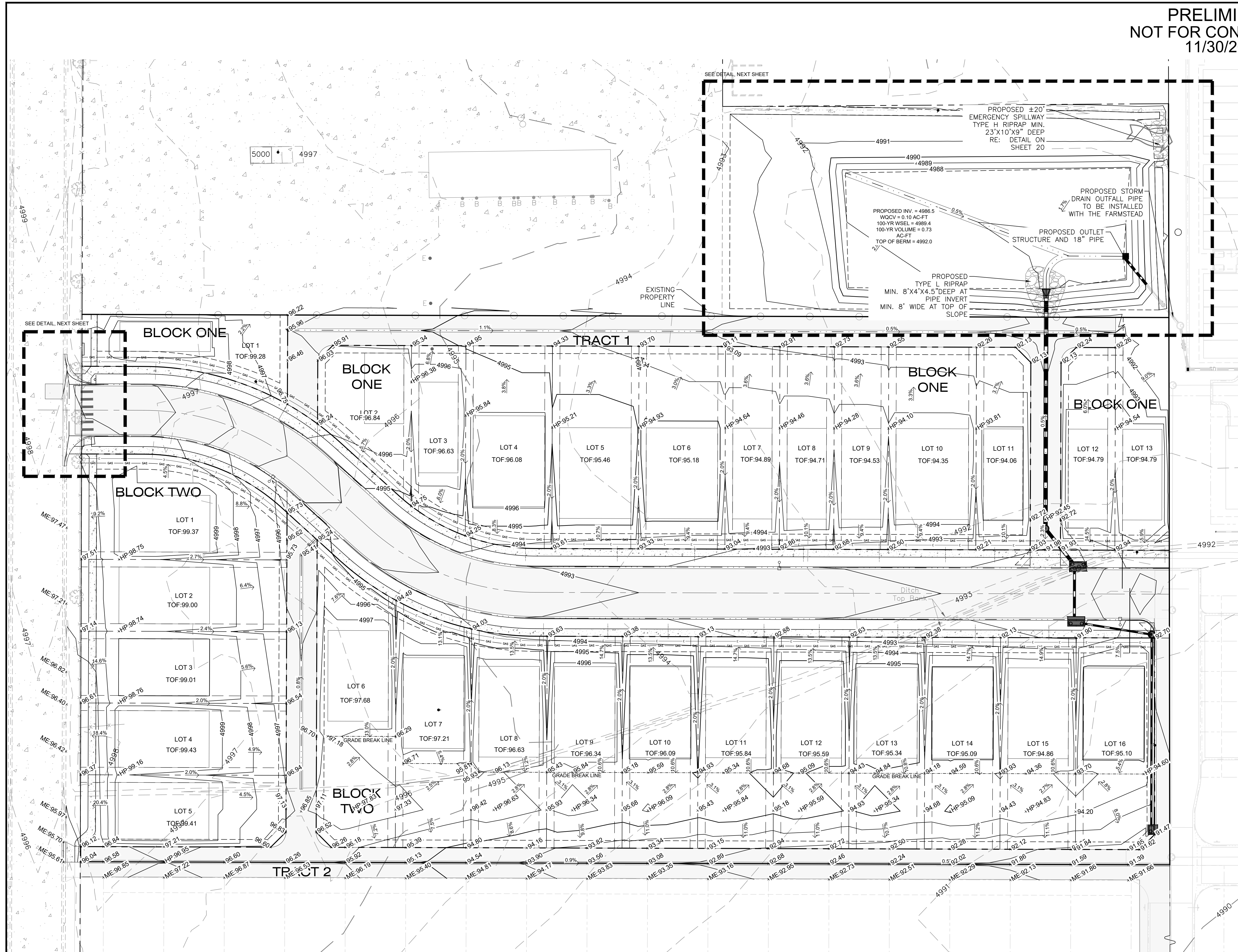
HARVEST 47 SUBDIVISION
CONSTRUCTION DOCUMENTS
SPOT ELEVATION PLAN

LOCATED IN THE NE 1/4, SECTION 24, TOWNSHIP 4 NORTH, RANGE 69 WEST
TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO

[illegible]

<i>Design</i>	<i>Drawn</i>
<i>Checked TWC</i>	<i>Checked TWC</i>
<i>Date</i> NOVEMBER 20, 2023	
<i>Job No.</i> 1053-1	
<i>D-</i>	<i>HarvestCD_GR</i>

SHEET
C-6
6 OF 20 SHEETS

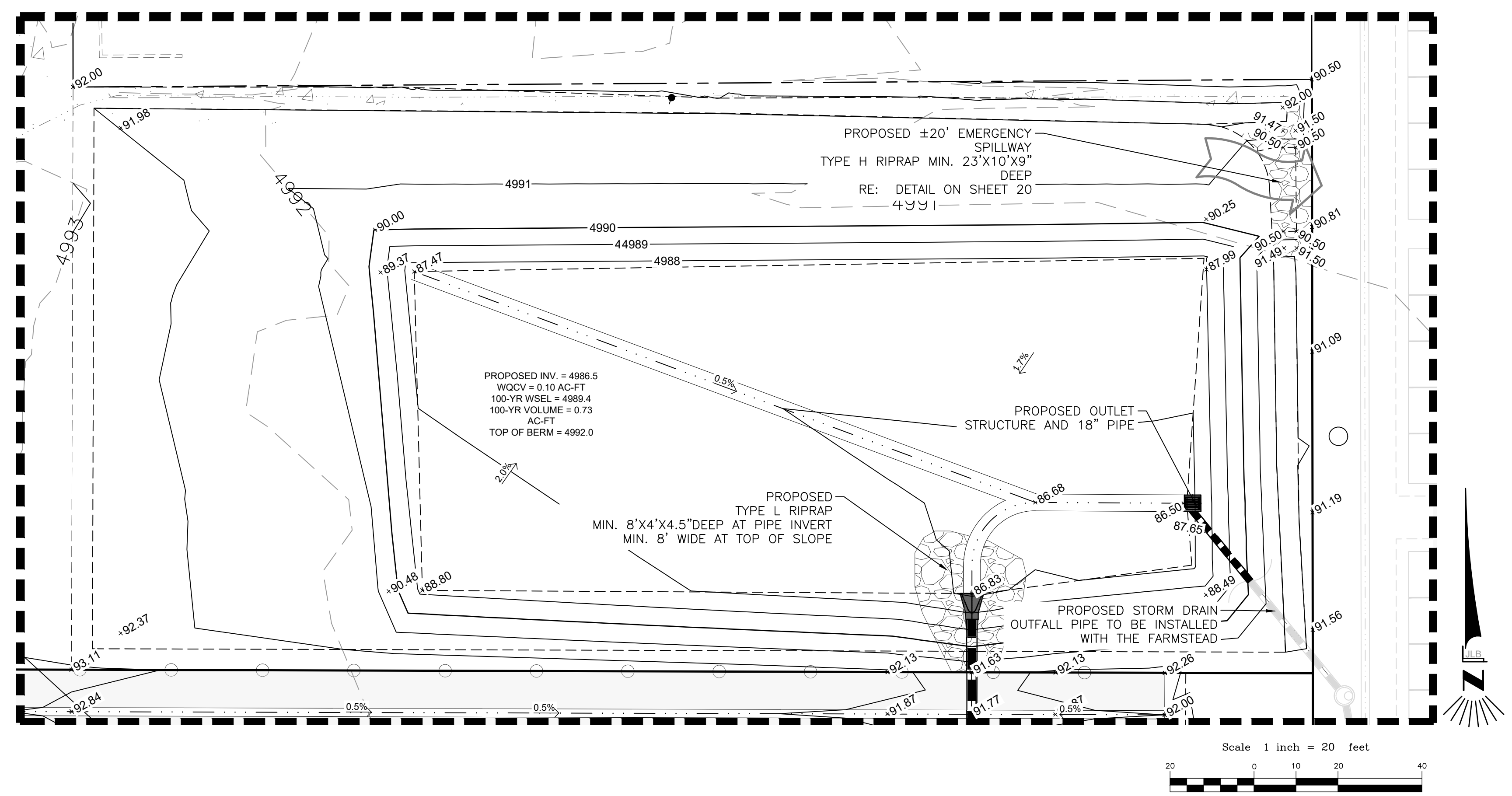


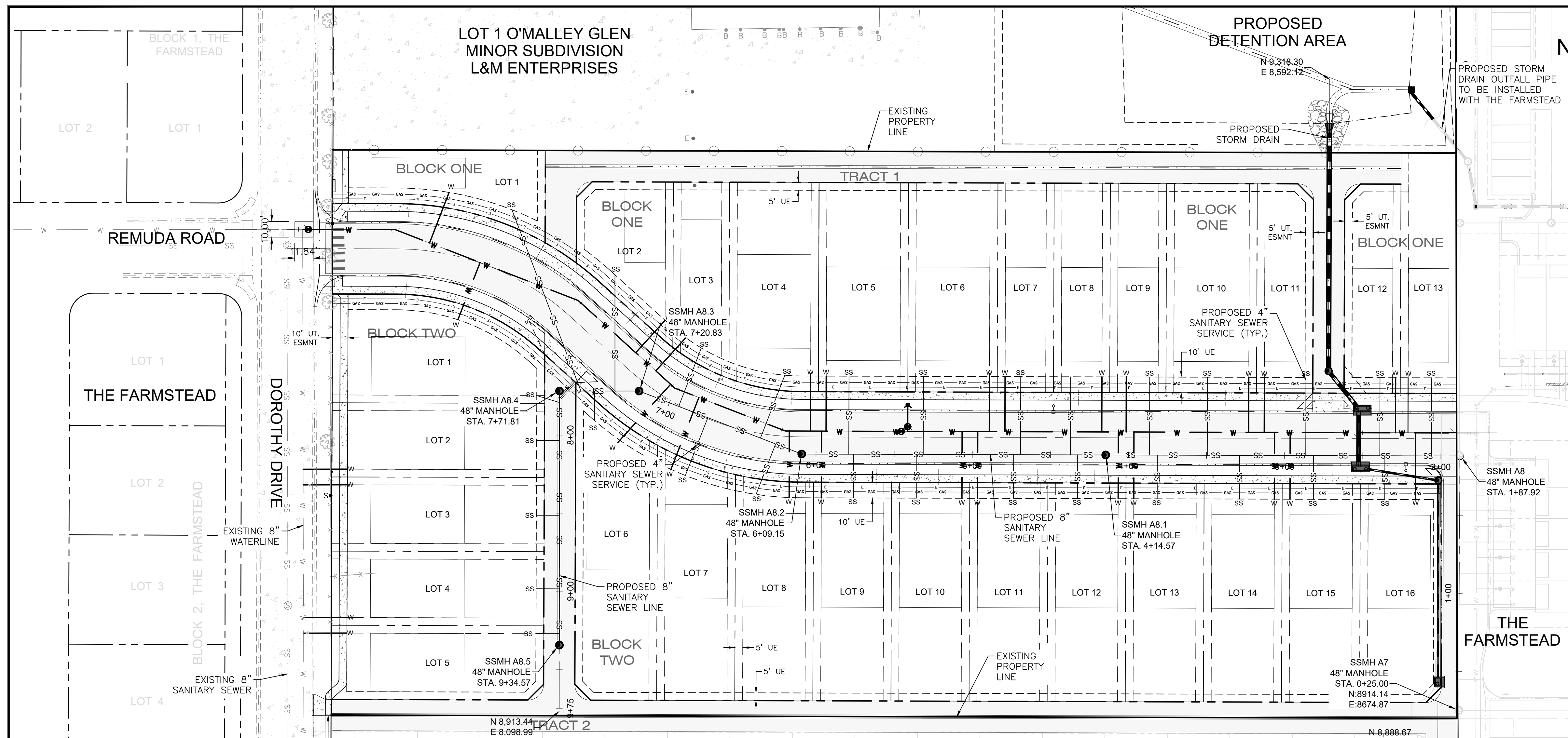


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[illegible]

SHEET
C-7
7 OF 20 SHEETS





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11/30/2023



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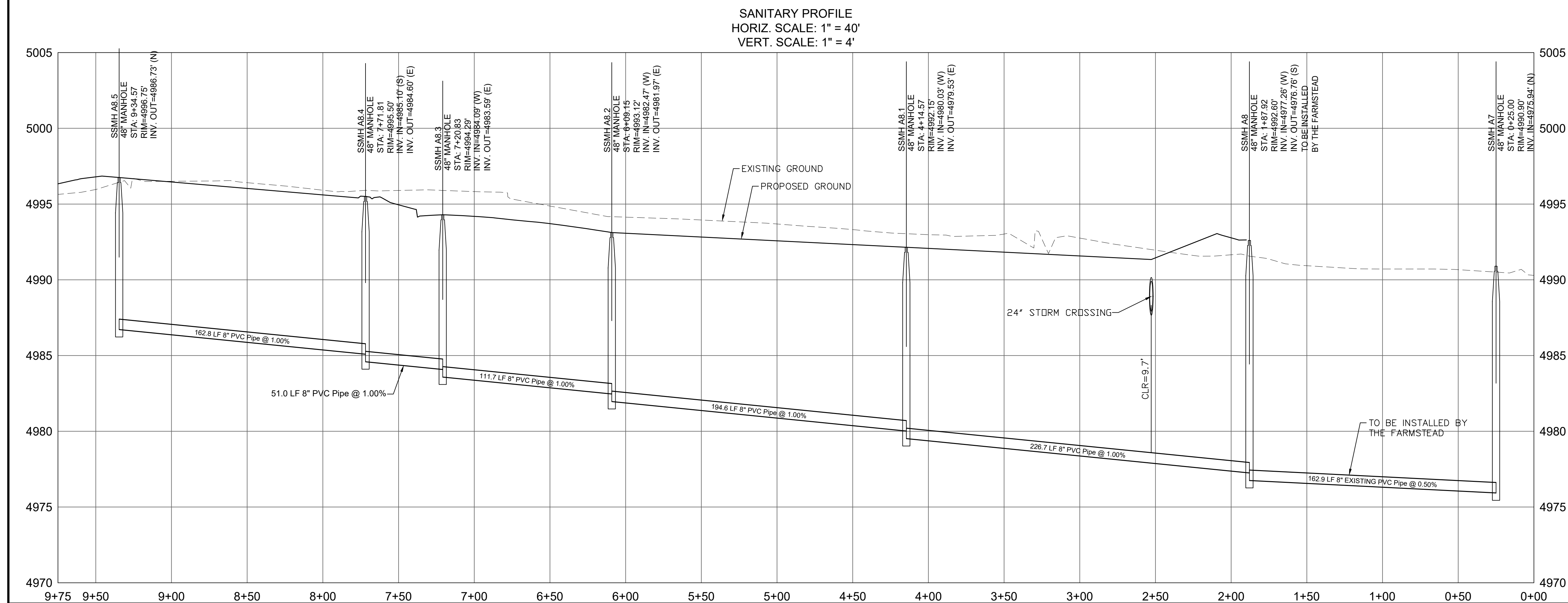
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**HARVEST 47 SUBDIVISION
CONSTRUCTION DOCUMENTS
SANITARY PLAN & PROFILE**

LOCATED IN THE NE 1/4, SECTION 24, TOWNSHIP 4 NORTH, RANGE 69 WEST
TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO

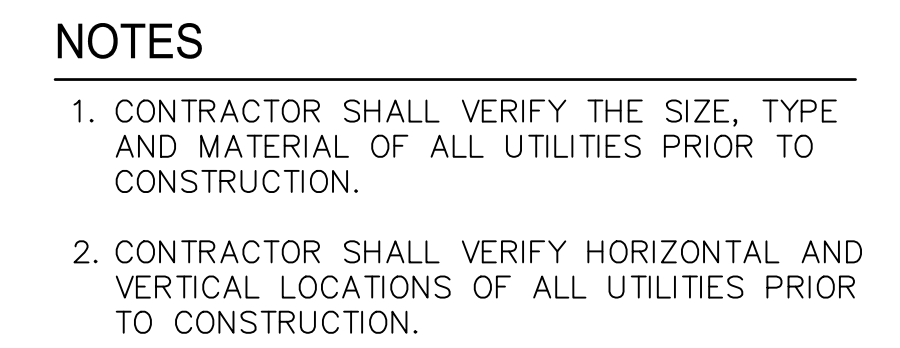
NOTES

1. CONTRACTOR SHALL VERIFY THE SIZE, TYPE AND MATERIAL OF ALL UTILITIES PRIOR TO CONSTRUCTION.
2. CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATIONS OF ALL UTILITIES PRIOR TO CONSTRUCTION.

[illegible]



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[illegible]

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**HARVEST 47 SUBDIVISION
CONSTRUCTION DOCUMENTS
WATER PLAN & PROFILE**

LOCATED IN THE NE 1/4, SECTION 24, TOWNSHIP 4 NORTH, RANGE 69 WEST
TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO

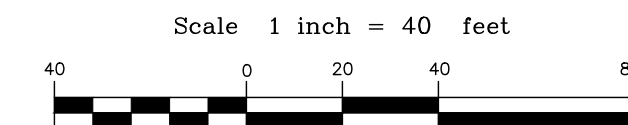
**HARVEST 47 SUBDIVISION
CONSTRUCTION DOCUMENTS
WATER PLAN & PROFILE**

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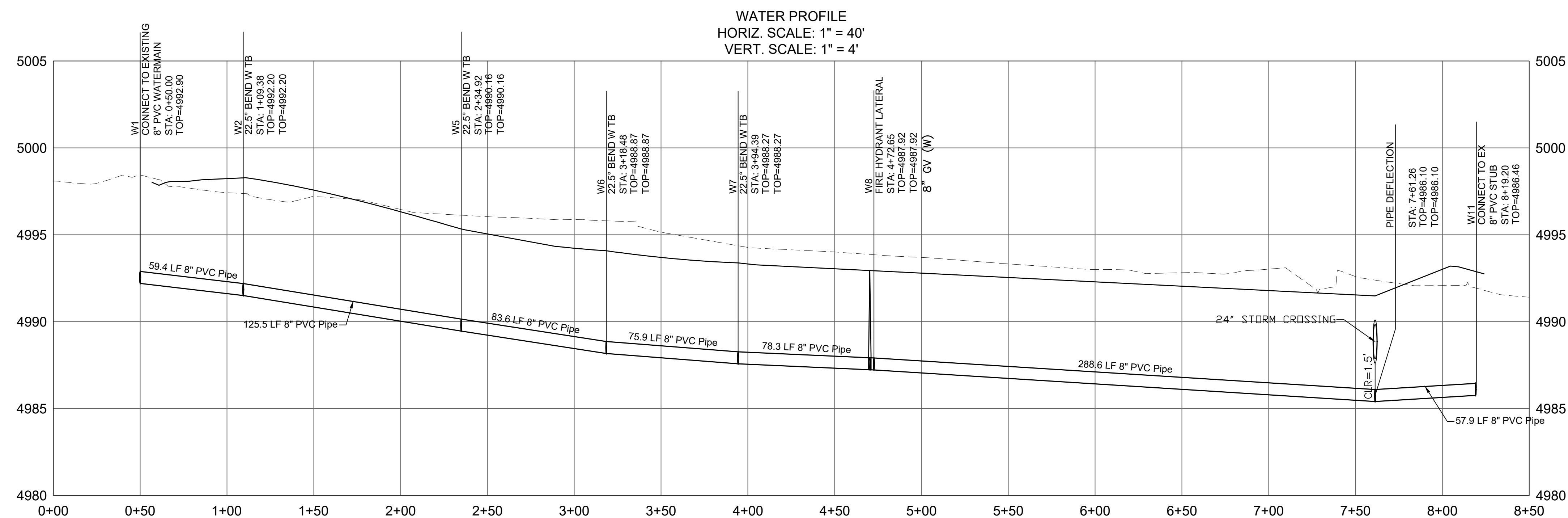
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<i>Date</i> NOVEMBER 20, 2023	
<i>Job No.</i> 1053-1	
<i>D-</i>	<i>HarvestCD_UT</i>

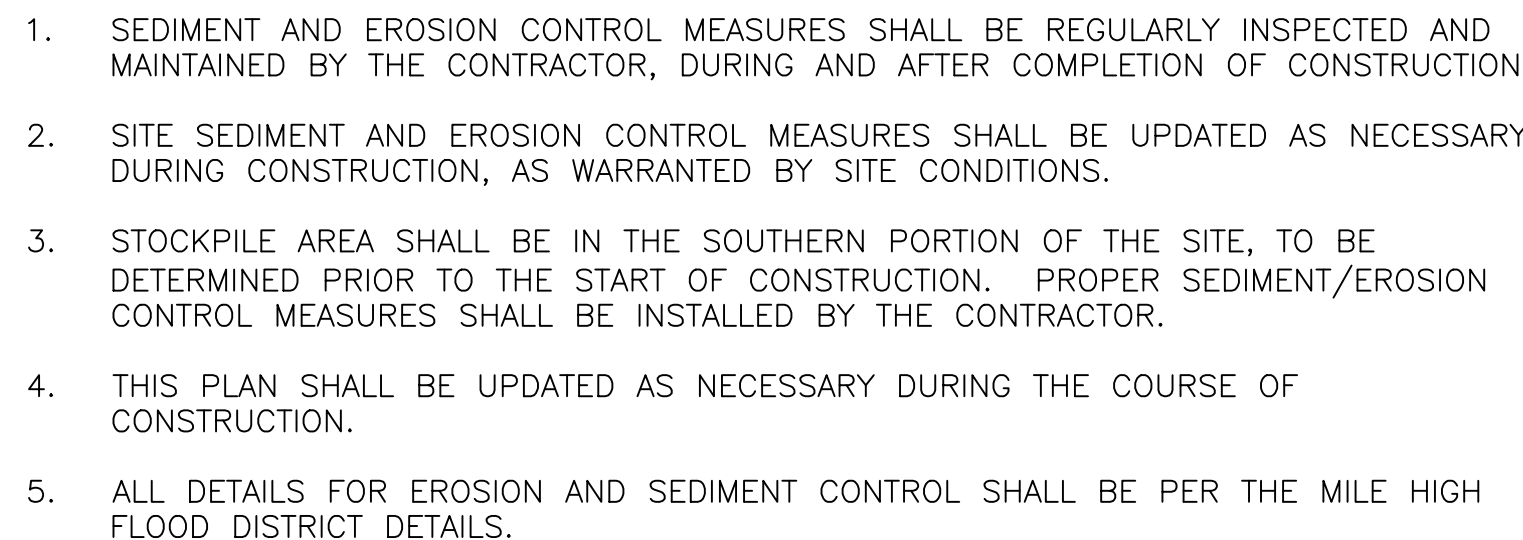
SHEET
C-11

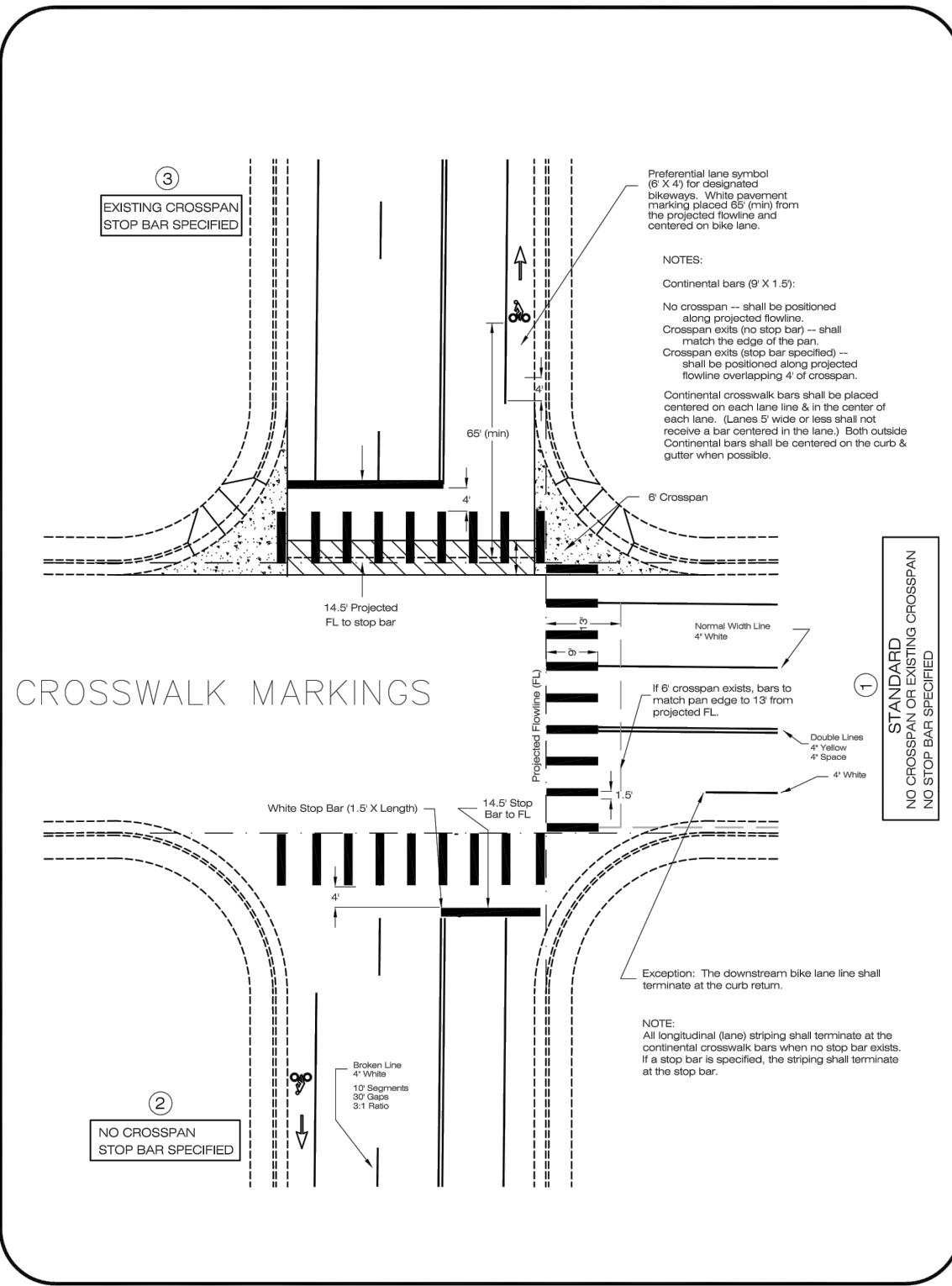
11 OF 20 SHEETS



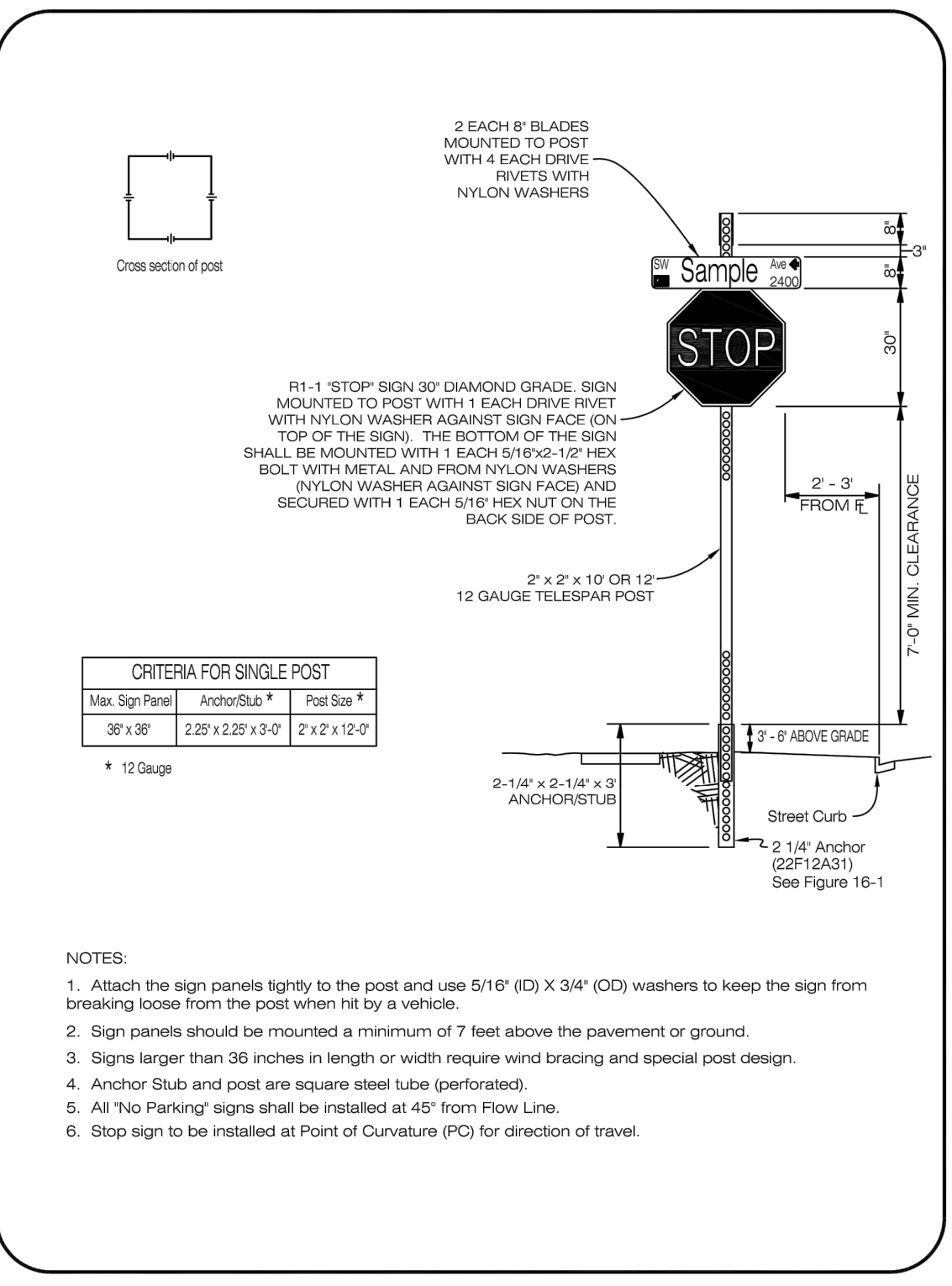
1. CONTRACTOR SHALL VERIFY THE SIZE, TYPE AND MATERIAL OF ALL UTILITIES PRIOR TO CONSTRUCTION.
2. CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATIONS OF ALL UTILITIES PRIOR TO CONSTRUCTION.



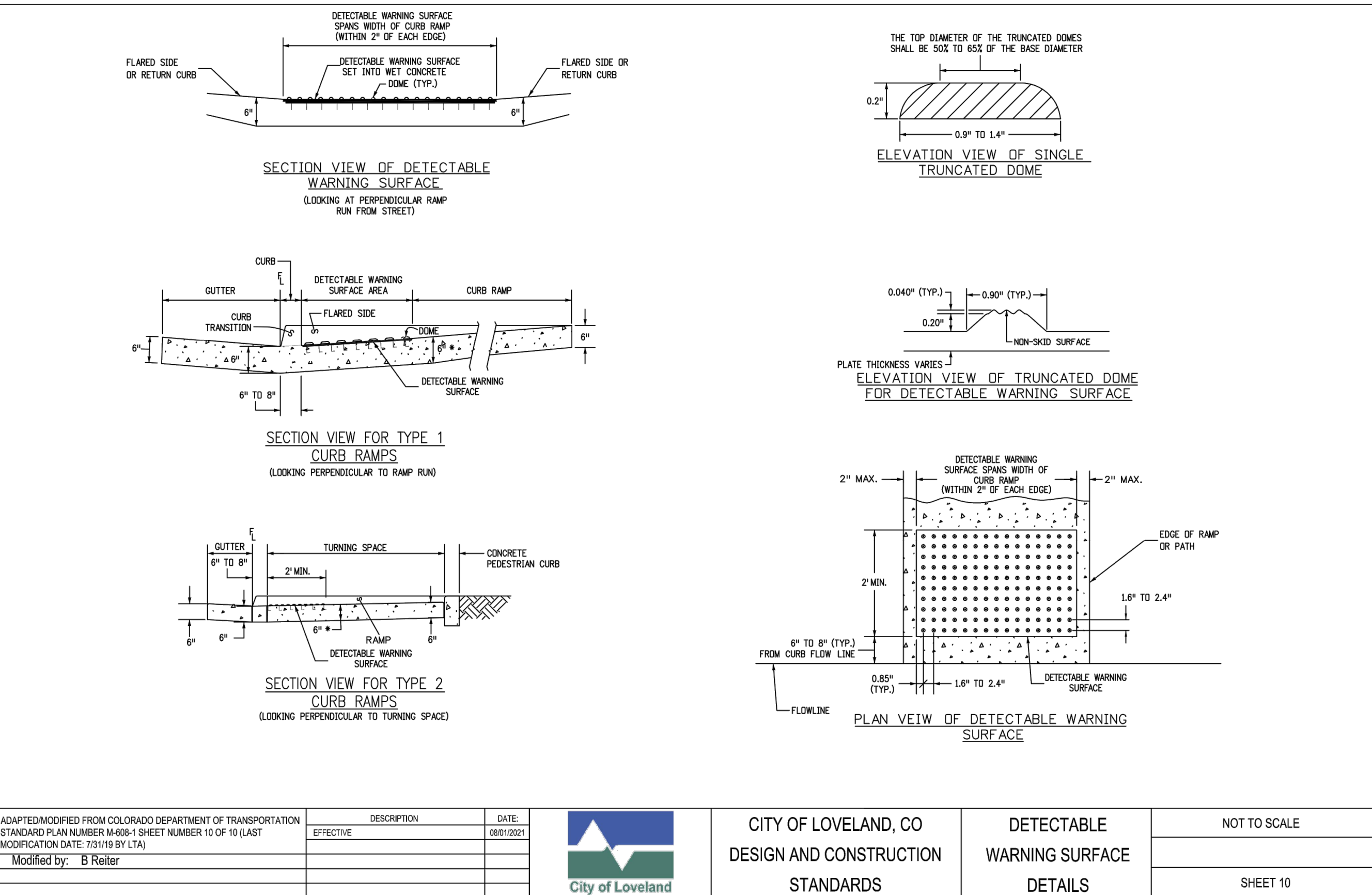
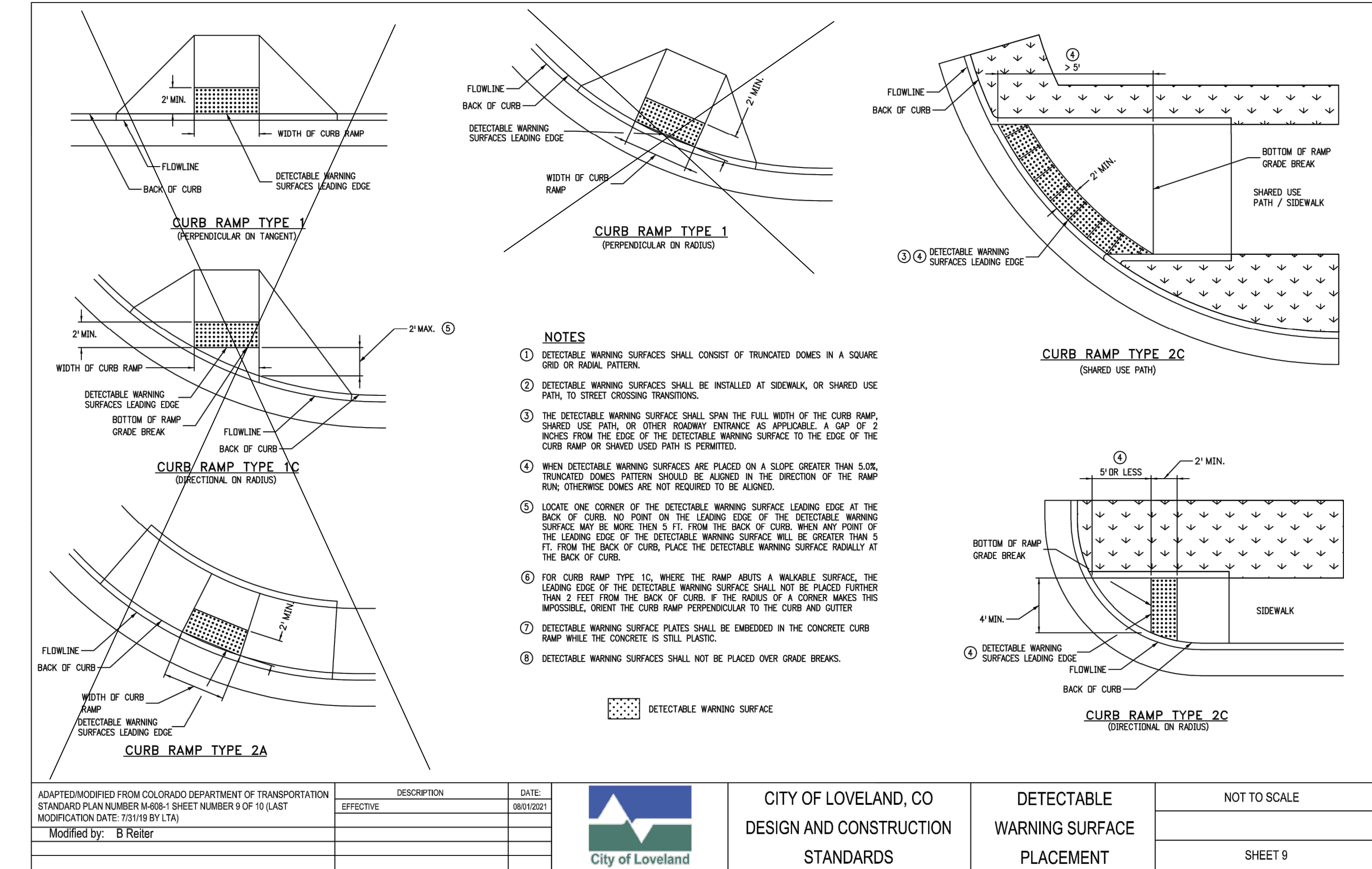
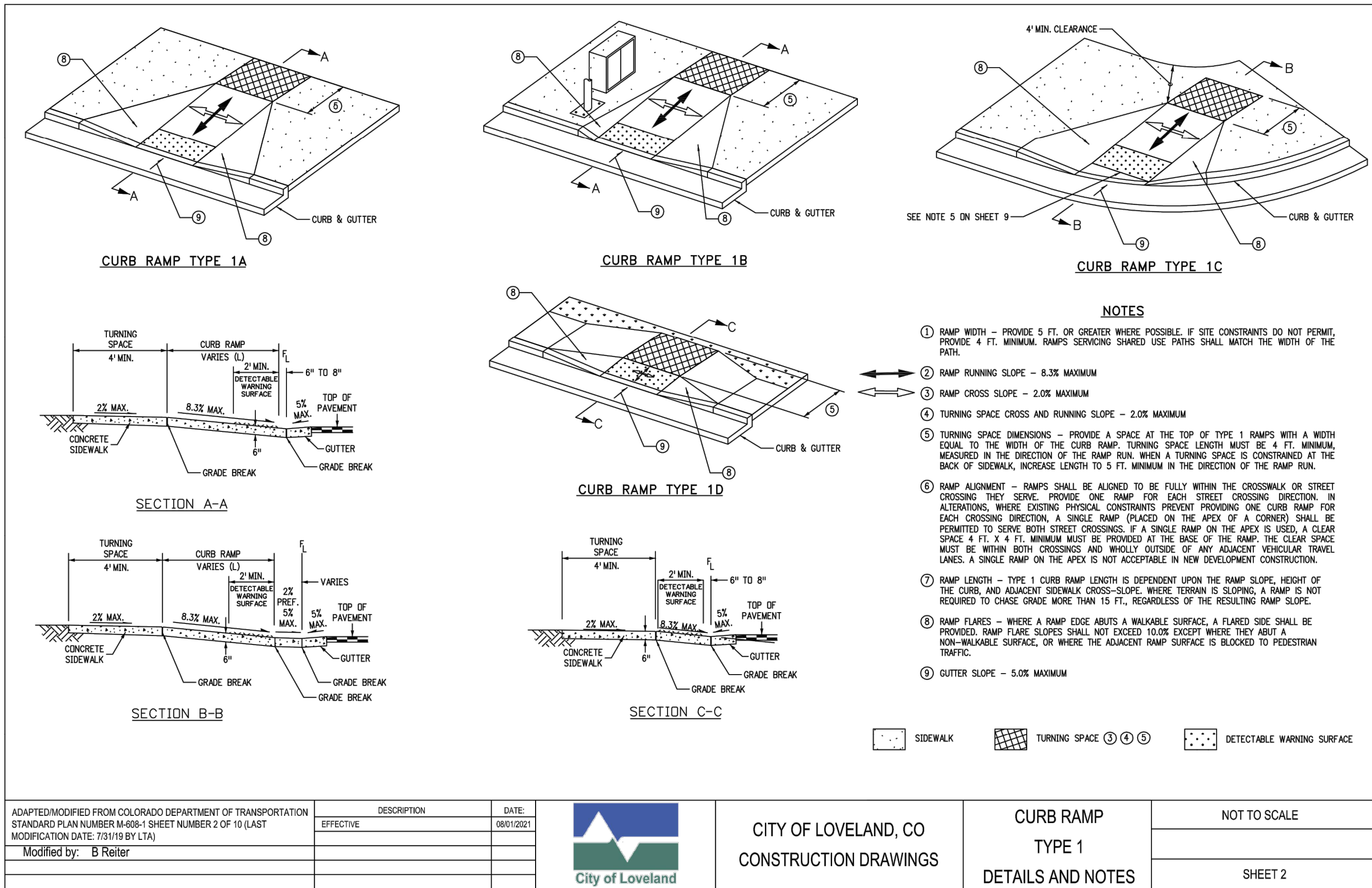




STANDARD PAVEMENT MARKINGS			
LARIMER COUNTY URBAN AREA STREET STANDARDS	CONSTRUCTION DRAWINGS	REVISION NO: 1 DATE: 03/01/02	DRAWING 1403



SIGN POST			
LARIMER COUNTY URBAN AREA STREET STANDARDS	CONSTRUCTION DRAWINGS	REVISION NO: 2 DATE: 08/01/21	DRAWING 1401

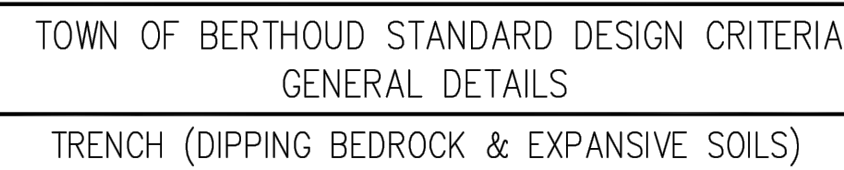
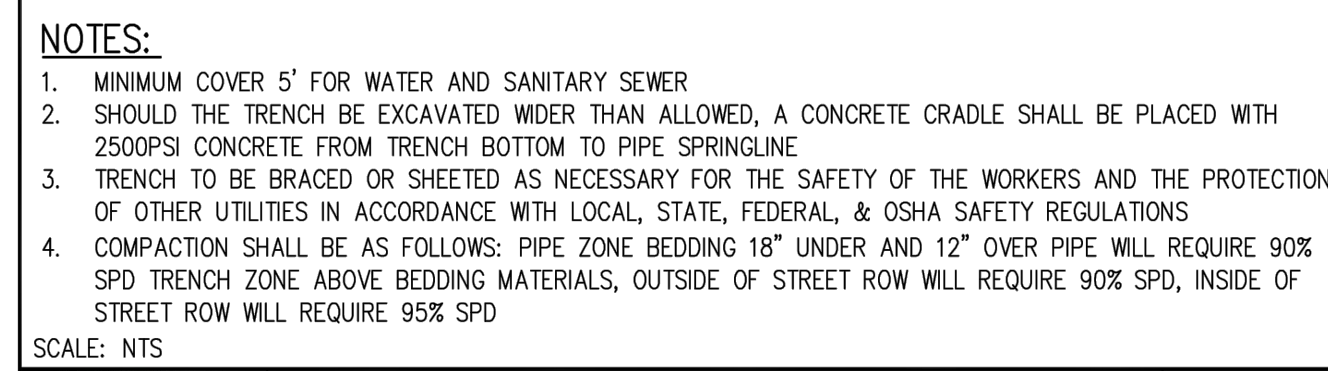


DESIGN	DRAWN	DATE	APPROVED	REVISION/ISSUE
Checked TWC	Checked TWC	NOVEMBER 20, 2023		
Job No. 1053-1				
D- BLS_DT				

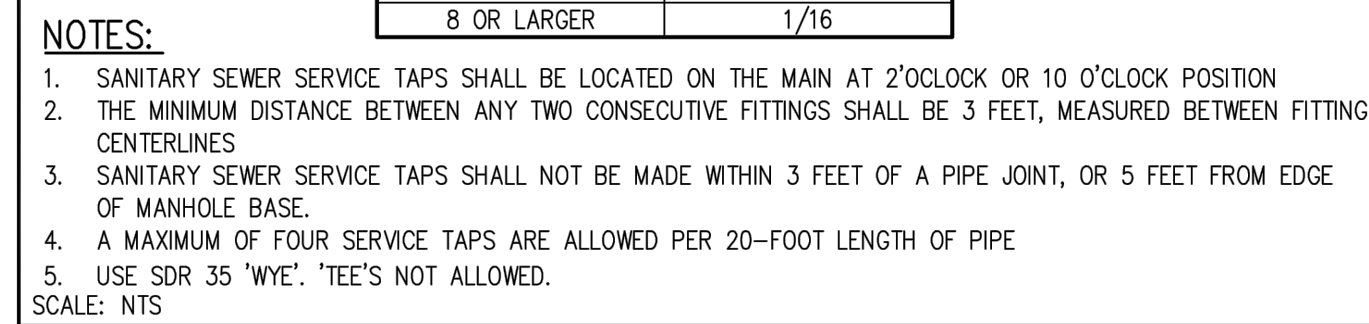
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HARVEST 47 SUBDIVISION
CONSTRUCTION DOCUMENTS
DETAIL SHEET 3

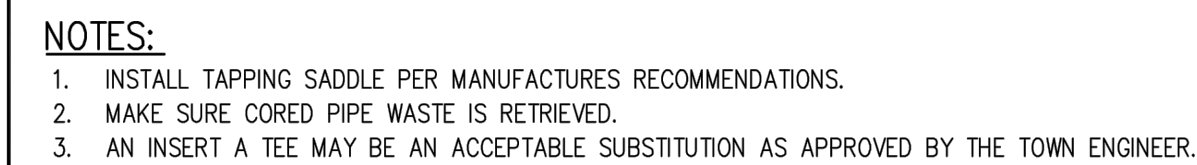
LOCATED IN THE NE 1/4, SECTION 24, TOWNSHIP 4 NORTH, RANGE 69 WEST
TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO



DATE: 12/2020



DATE: 12/2020



DATE: 12/2020

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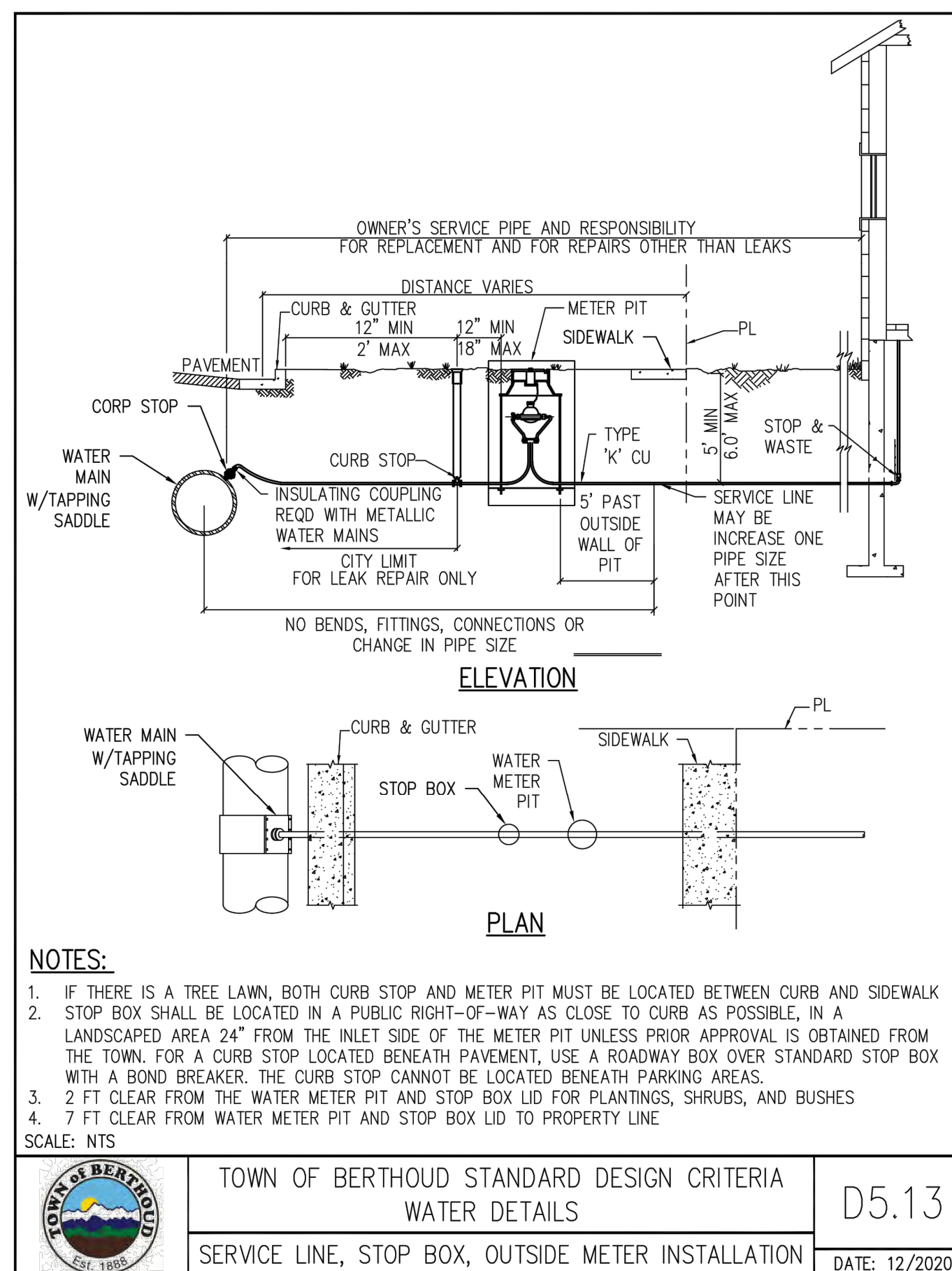
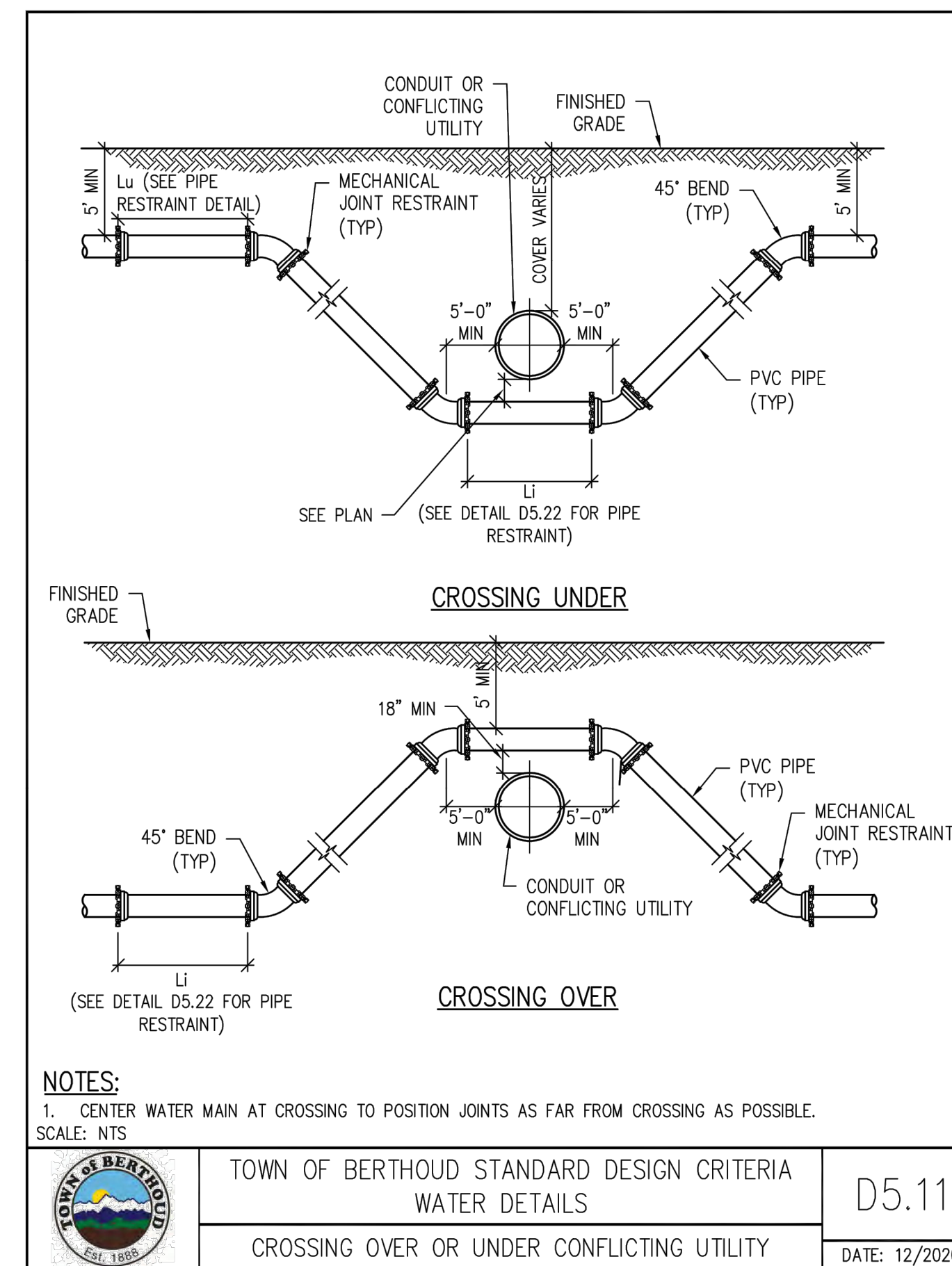
D-	BLS_DT
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15 OF 20 SHEETS

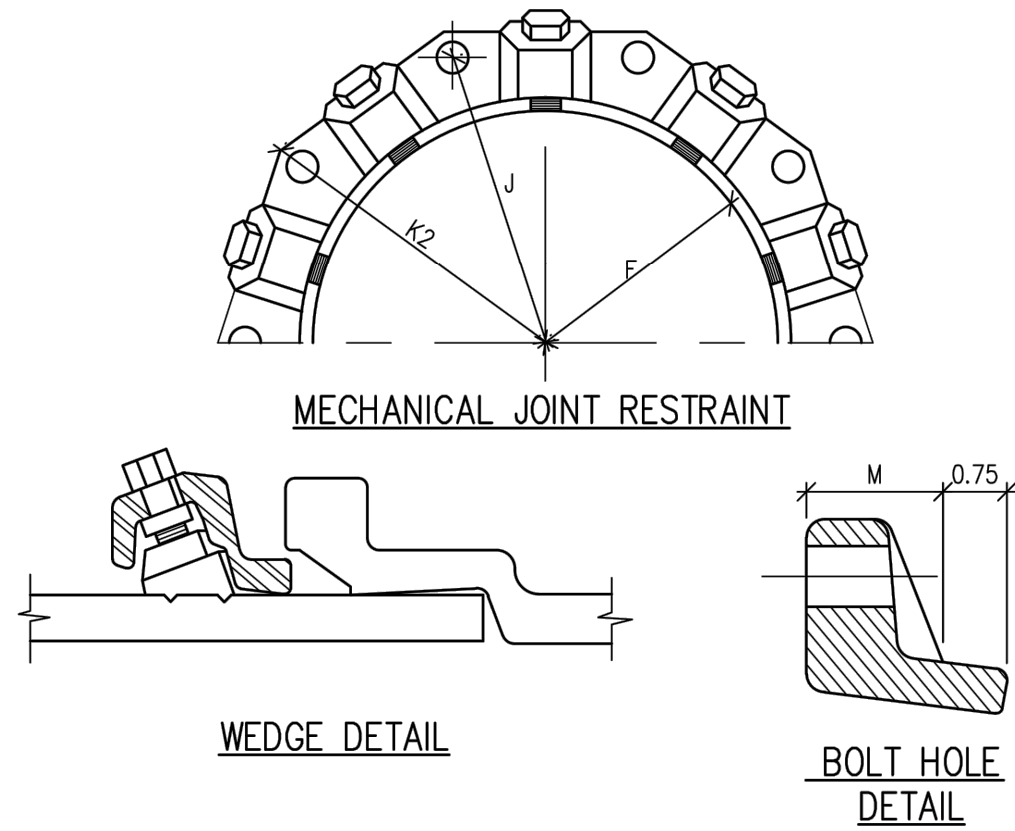


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TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO



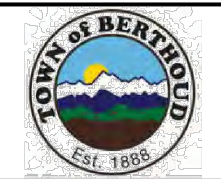
Design _____ Drawn TWC Checked TWC Checked TWC Date NOVEMBER 20, 2023 Job No. 1053-1 D- <u>BLS_DT</u>		DATE _____ BY _____ REVISION/ISSUE _____ APPV _____ DATE _____	
SHEET C-16		© 12 CONSULTANTS, INC.	
16	OF	20	SHEETS

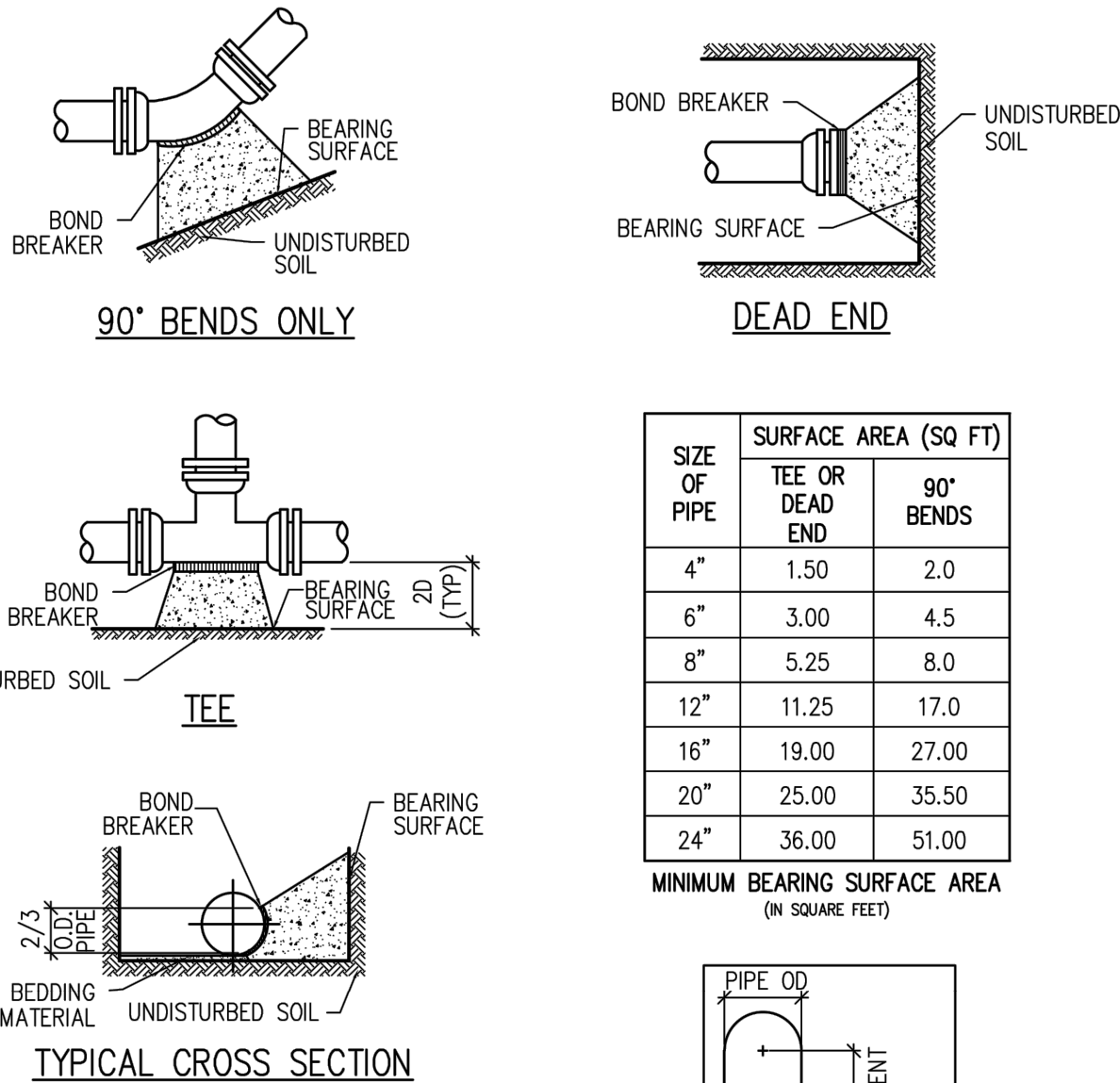


	NOMINAL PIPE SIZE	NO. OF BOLTS	NO. OF WEDGES	K2 INCHES	J INCHES	F INCHES	M INCHES	
P	4"	2	2					P
V	6"	6	3	11.12	9.50	7.00	0.88	V
	8"	6	4	13.37	11.75	9.15	1.00	
C	10"	8	6	15.62	14.00	11.20	1.00	C
	12"	8	8	17.88	16.25	13.30	1.25	
D	4"	4	2					D
I	6"	6	3	11.12	9.50	7.00	0.88	I
	8"	6	4	13.37	11.75	9.15	1.00	
	10"	8	6	15.62	14.00	11.20	1.00	
	12"	8	8	17.88	16.25	13.30	1.25	
	16"	12	12	22.50	21.00	17.54	1.56	
	20"	14	14	27.00	25.50	21.74	1.69	

DIMENSIONS

- NOTE:
1. BASED ON "MEGA LUG" PIPE RESTRAINT SYSTEM BY EBAA IRON
 2. OTHER MECHANICAL JOINT RESTRAINT DEVICES MUST BE APPROVED BY TOWN ENGINEER BEFORE INSTALLATION.
- SCALE: NTS

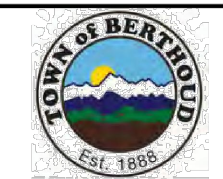
	TOWN OF BERTHOUD STANDARD DESIGN CRITERIA	D5.22
	WATER DETAILS	
	MECHANICAL JOINT RESTRAINT	
	DATE: 12/2020	



SIZE OF PIPE	TEE OR DEAD END	90° BENDS
4"	1.50	2.0
6"	3.00	4.5
8"	5.25	8.0
12"	11.25	17.0
16"	19.00	27.00
20"	25.00	35.50
24"	36.00	51.00

MINIMUM BEARING SURFACE AREA (IN SQUARE FEET)

- NOTES:
1. BEARING SURFACES SHOWN IN CHART ARE MINIMUM
 2. BASED ON 150 PSI INTERNAL PIPE PRESSURE PLUS WATER HAMMER
 3. 6", 8", & 12" WATER HAMMER = 110 PSI
 4. 16", 20" AND 24" WATER HAMMER = 70 PSI
 5. BASED ON 3000 PSI SOIL BEARING CAPACITY
 6. THRUST BLOCK SHALL NOT INTERFERE W/MECHANICAL JOINT BOLT OPERATION
- SCALE: NTS

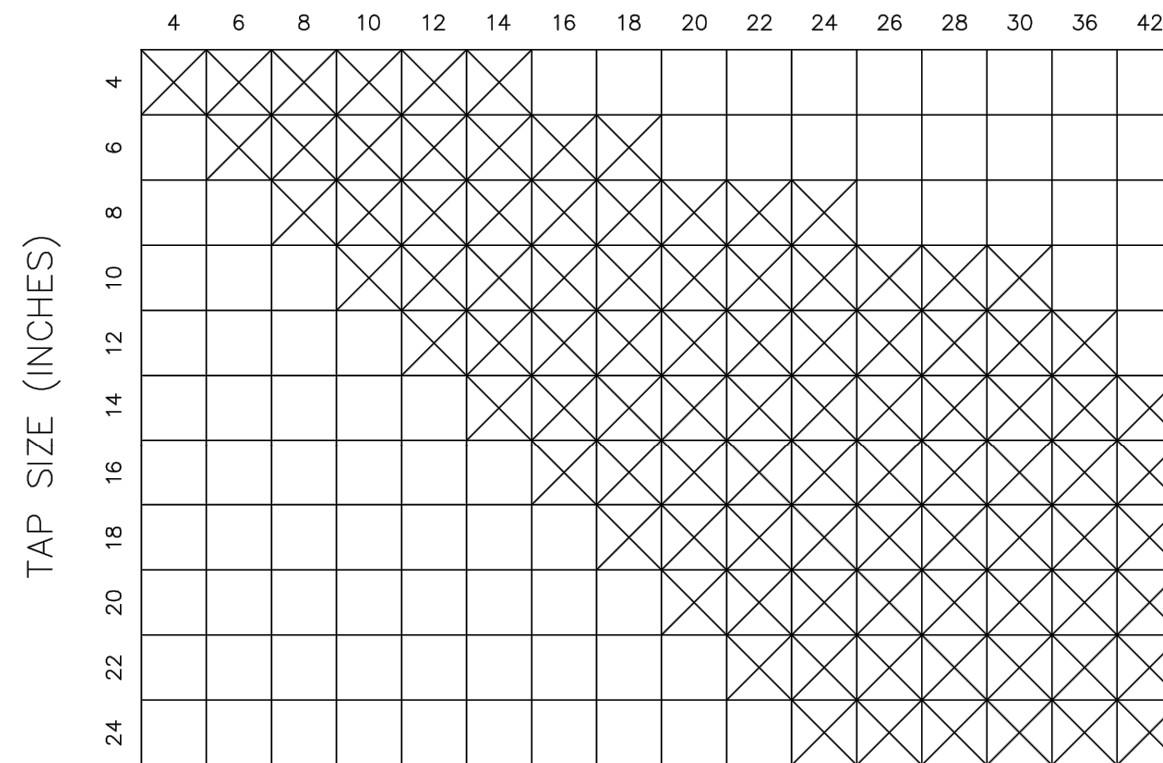
	TOWN OF BERTHOUD STANDARD DESIGN CRITERIA	D5.23
	WATER DETAILS	
	CONCRETE THRUST BLOCKS 1 OF 2	
	DATE: 12/2020	

CONCRETE THRUST BLOCKS

WATER MAIN AND TAP SIZE COMBINATIONS WHICH REQUIRE A CONC THRUST BLOCK BEHIND THE MAIN AT THE TAPPING SLEEVE OR SADDLE

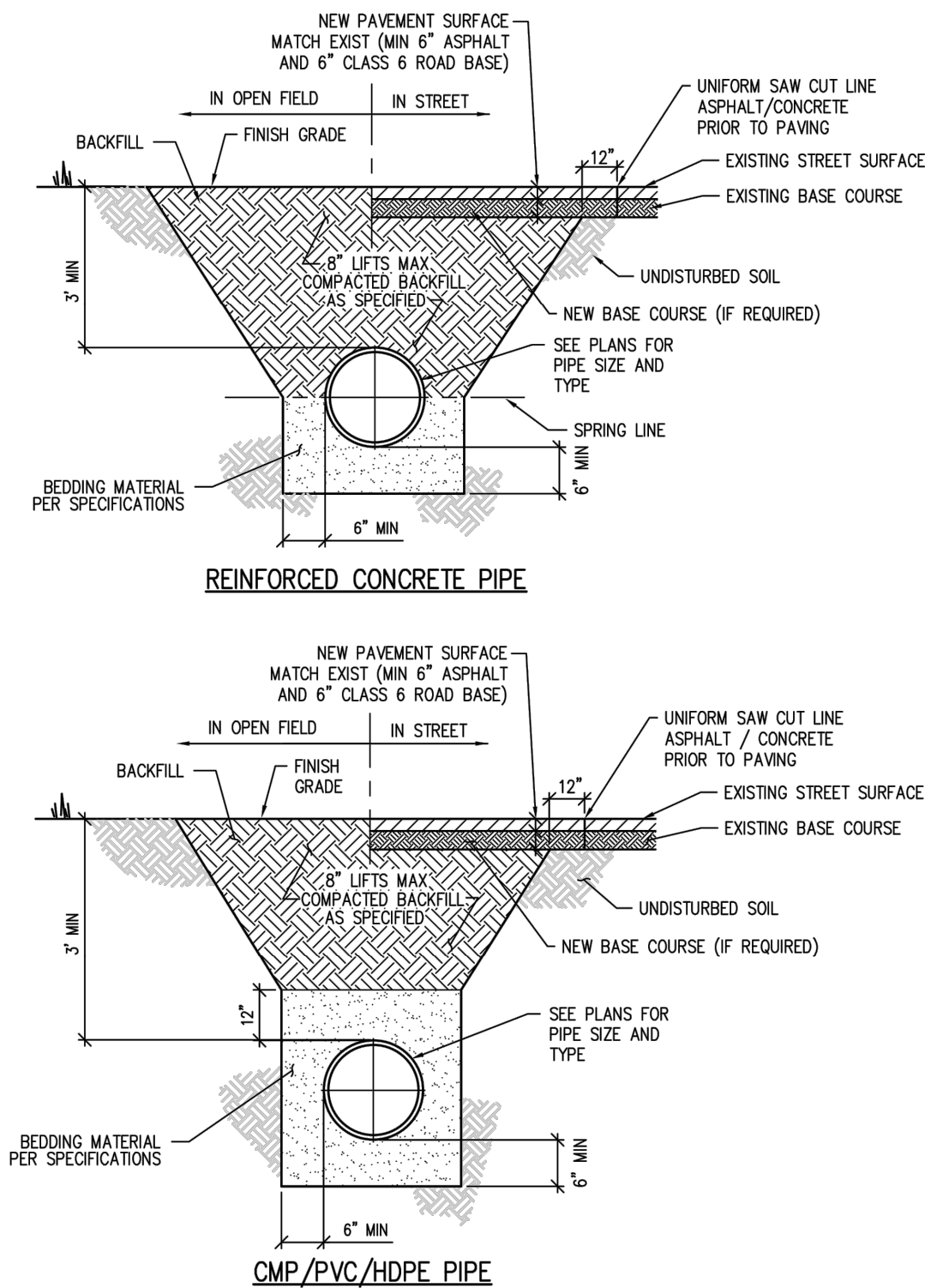
ALL WATER MAINS

INDICATED CONC THRUST BLOCK REQD MAIN SIZE (INCHES)

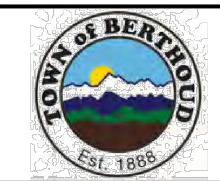


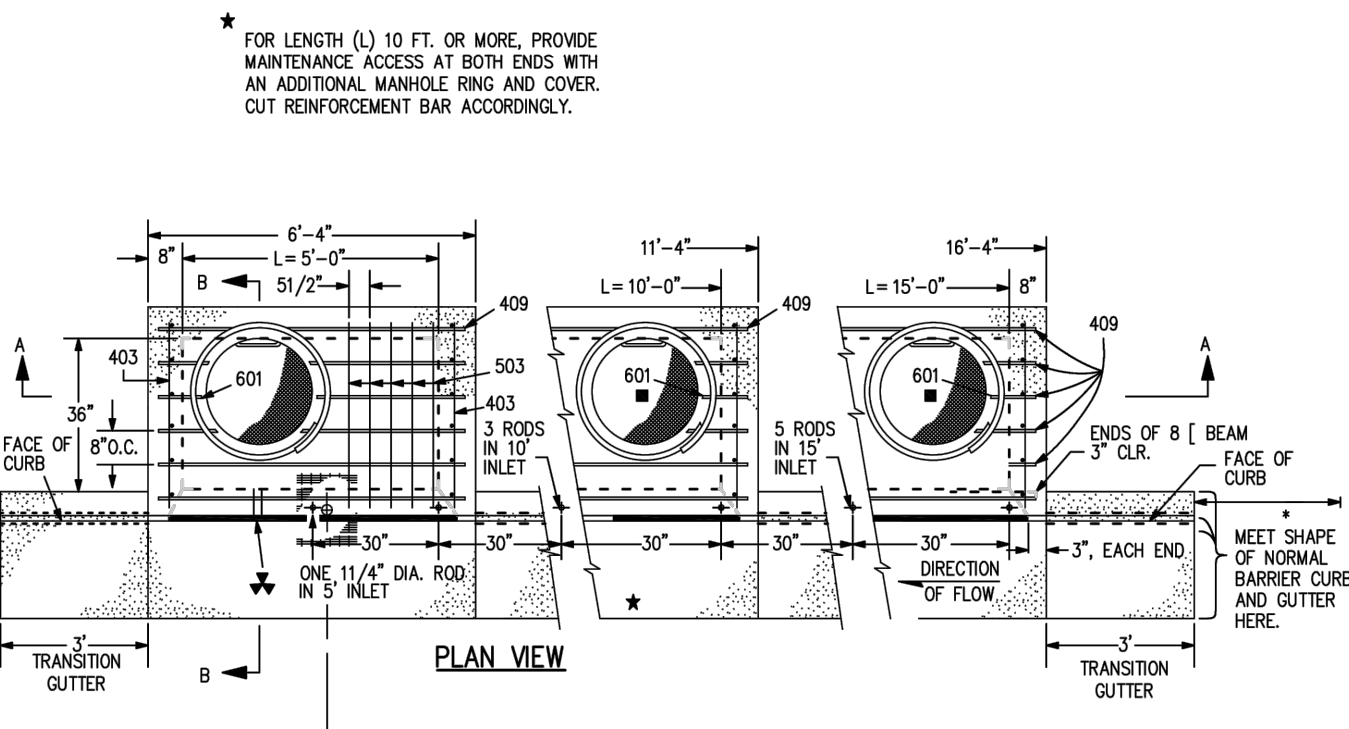
- NOTES:
1. ANY THRUST BLOCK REQUIREMENTS FOR WATER MAIN AND TAP SIZED COMBINATIONS OTHER THAN THOSE SHOWN ABOVE WILL REQUIRE SPECIAL DESIGN APPROVAL BY THE TOWN ENGINEER
- SCALE: NTS

	TOWN OF BERTHOUD STANDARD DESIGN CRITERIA	D5.24
	WATER DETAILS	
	CONCRETE THRUST BLOCKS 2 OF 2	
	DATE: 12/2020	

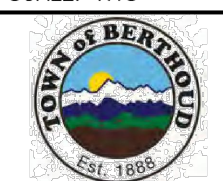


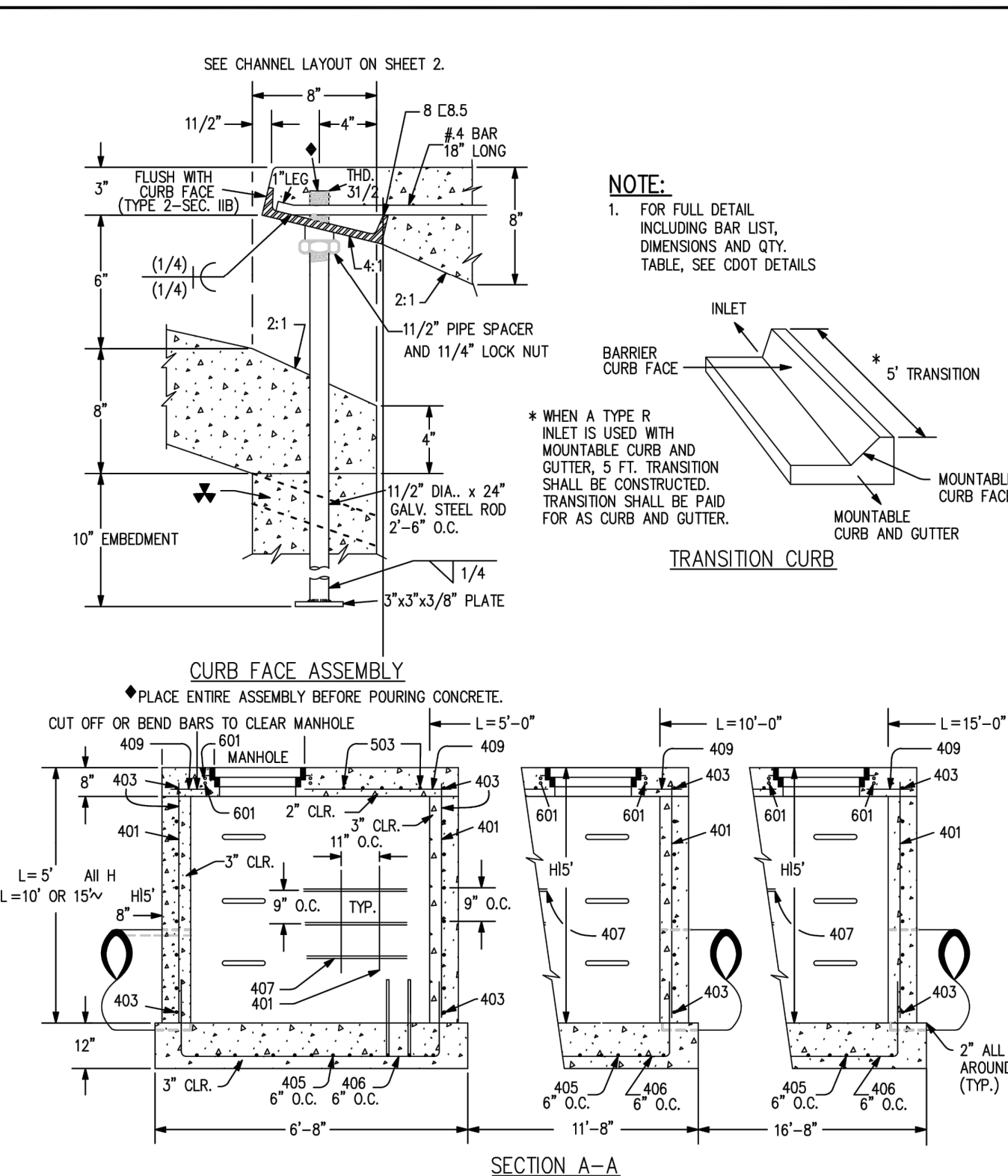
- NOTES:
1. IF UNSTABLE MATERIALS ARE FOUND IN TRENCH, OVEREXCAVATE PER SPECIFICATIONS OR AS REQUIRED.
 2. TRENCH TO BE BRACED OR SHIELDED AS NECESSARY FOR THE SAFETY OF THE WORKERS AND THE PROTECTION OF OTHER UTILITIES.
- SCALE: NTS

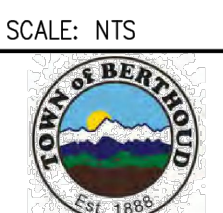
	TOWN OF BERTHOUD STANDARD DESIGN CRITERIA	D6.02
	STORM SEWER DETAILS	
	STORM SEWER BEDDING DETAIL	
	DATE: 12/2020	



- NOTES:
1. USE OF A TYPE R INLET MUST BE APPROVED BY THE TOWN.
 2. CONCRETE SHALL BE CLASS B. INLET MAY BE CAST-IN-PLACE OR PRECAST.
 3. CONCRETE WALLS SHALL BE FORMED ON BOTH SIDES AND SHALL BE 8 IN. THICK.
 4. INLET STEPS SHALL BE IN CONFORMANCE WITH AASHTO M 199.
 5. CURB FACE ASSEMBLY SHALL BE GALVANIZED AFTER WELDING. 5. EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED 3/4 IN. CURB AND GUTTER CORNERS SHALL BE FINISHED TO MATCH THE EXISTING CURB AND GUTTER BEYOND THE TRANSITION GUTTER.
 6. REINFORCING BARS SHALL BE DEFORMED AND SHALL HAVE A 2 IN. MINIMUM CLEARANCE. ALL REINFORCING BARS SHALL BE EPOXY COATED.
 7. DIMENSIONS AND WEIGHTS OF TYPICAL MANHOLE RING AND COVER ARE NOMINAL.
 8. MATERIAL FOR MANHOLE RINGS AND COVERS SHALL BE GRAY OR DUCILE CAST IRON IN ACCORDANCE WITH SUBSECTION 712.06.
 9. SINCE PIPE ENTRIES INTO THE INLET ARE VARIABLE, THE DIMENSIONS SHOWN ARE TYPICAL. ACTUAL DIMENSIONS AND QUANTITIES FOR CONCRETE AND REINFORCEMENT SHALL BE AS REQUIRED IN THE WORK. QUANTITIES INCLUDE VOLUMES OCCUPIED BY PIPES.
 10. STRUCTURAL STEEL SHALL BE GALVANIZED AND SHALL BE IN ACCORDANCE WITH SUBSECTION 712.06.
 11. ALL MANHOLE COVERS SHALL BE CAST WITH A "NO DUMPING DRAINS TO STREAM" MESSAGE AND A FISH SYMBOL. THE SURFACE OF THE MANHOLE COVER SHALL HAVE A NON-SLIP PATTERN.
 12. FOR FULL DETAIL INCLUDING BAR LIST AND DIMENSION TABLE, SEE CDDT DETAIL M-604-12 SHEETS 1 AND 2
- SCALE: NTS

	TOWN OF BERTHOUD STANDARD DESIGN CRITERIA	D6.09A
	STORM SEWER DETAILS	
	TYPE R CURB INLET (1 OF 3)	
	DATE: 12/2020	



	TOWN OF BERTHOUD STANDARD DESIGN CRITERIA	D6.09B
	STORM SEWER DETAILS	
	TYPE R CURB INLET (2 OF 3)	
	DATE: 12/2020	

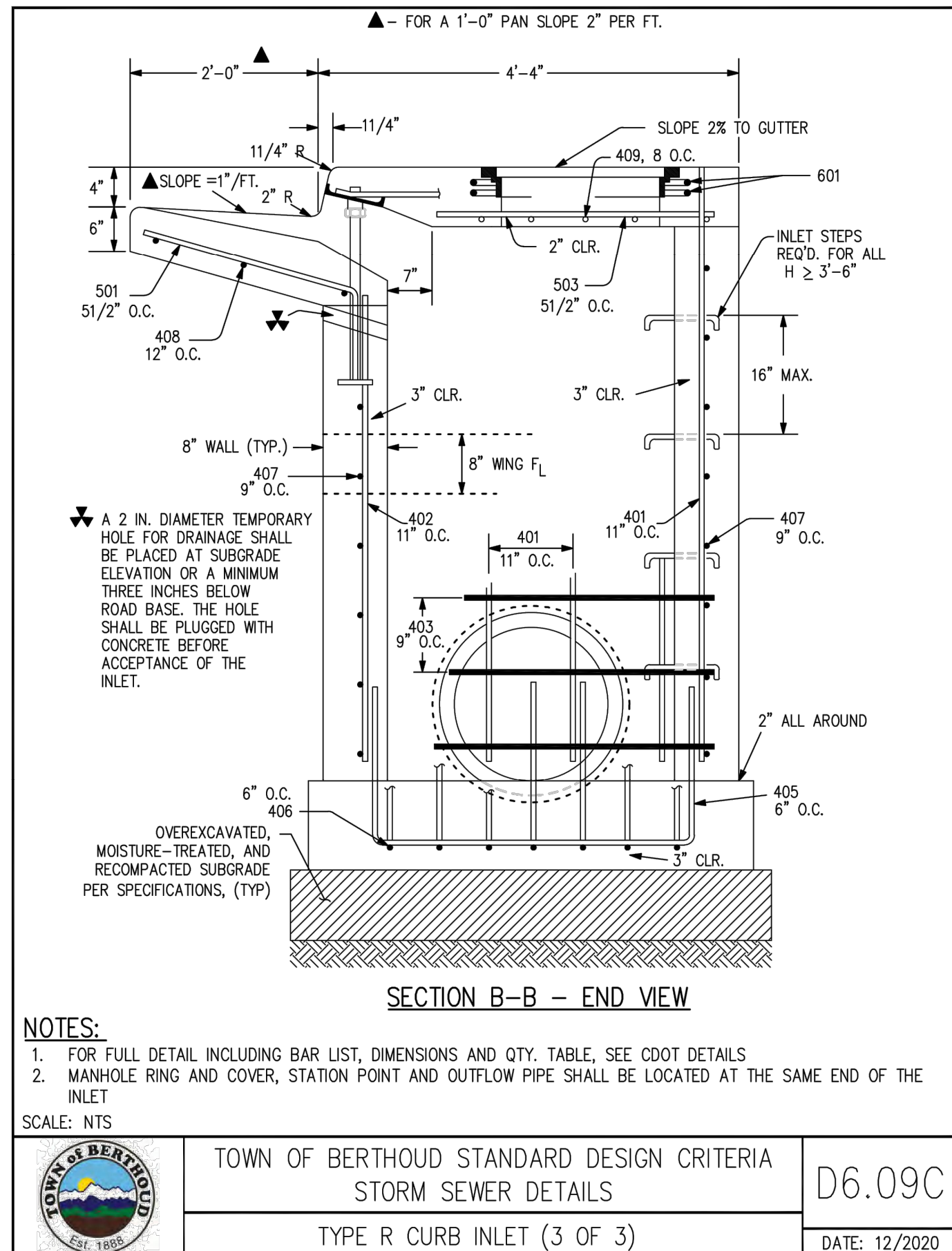
PRELIMINARY
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11/30/2023



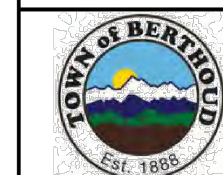
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HARVEST 47 SUBDIVISION
CONSTRUCTION DOCUMENTS
DETAIL SHEET 5
LOCATED IN THE NE 1/4, SECTION 24, TOWNSHIP 4 NORTH, RANGE 69 WEST
TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO



- NOTES:
1. FOR FULL DETAIL INCLUDING BAR LIST, DIMENSIONS AND QTY. TABLE, SEE CDDT DETAILS
 2. MANHOLE RING AND COVER, STATION POINT AND OUTFLOW PIPE SHALL BE LOCATED AT THE SAME END OF THE INLET
- SCALE: NTS

	TOWN OF BERTHOUD STANDARD DESIGN CRITERIA	D6.09C
	STORM SEWER DETAILS	
	TYPE R CURB INLET (3 OF 3)	
	DATE: 12/2020	

DESIGN	DRAWN	DATE	APPROVED	REVISION/ISSUE
Checked TWC	Checked TWC			
Date	NOVEMBER 20, 2023			
Job No	1053-1			
D-	BLS_DT			
SHEET C-17				
17 OF 20 SHEETS				

SHEET
C-19

Harvest 47

735 E. Highway 56, Berthoud, CO

Traffic Letter

KE Job #2021-056

Prepared for:

i2 Consultants
16911 Potts Place
Mead, CO

Prepared by:



KELLAR ENGINEERING

skellar@kellarengineering.com
970.219.1602 phone



December 3, 2021
Sean K. Kellar, PE, PTOE

This document, together with the concepts and recommendations presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization from Kellar Engineering LLC shall be without liability to Kellar Engineering LLC.

1.0 Introduction

The purpose of this Traffic Generation Letter (Traffic Letter) is to evaluate the traffic generated by the proposed project located at 735 E. Highway 56 in Berthoud, CO.

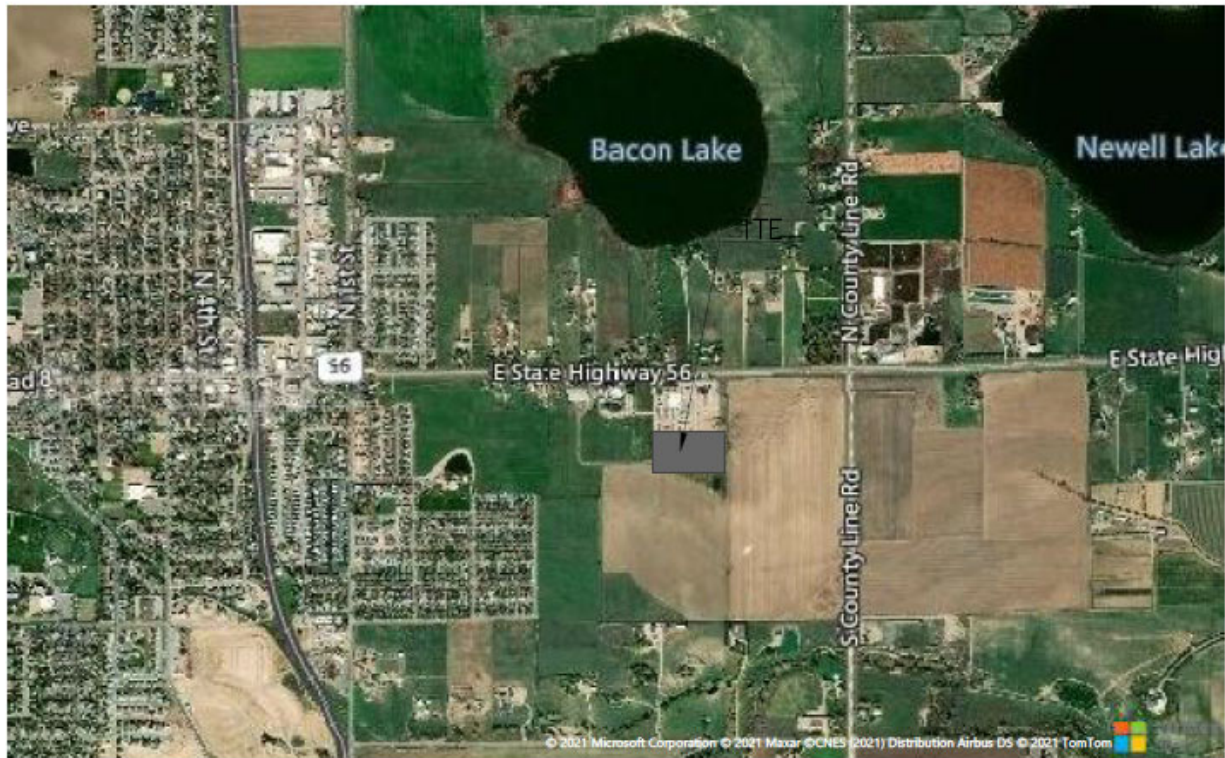
2.0 Proposed Development

The proposed project consists of 28 single-family homes. See Table 1: Trip Generation and Figure 2: Site Plan.

3.0 Trip Generation

Site generated traffic estimates are determined through a process known as trip generation. Rates and equations are applied to the proposed land use to estimate traffic generated by the development during a specific time interval. The acknowledged source for trip generation rates is the *Trip Generation Report* published by the Institute of Transportation Engineers (ITE). ITE has established trip generation rates in nationwide studies of similar land uses. For this study, Kellar Engineering LLC (KE) used the *ITE 10th Edition Trip Generation Report* average trip rates. Per the ITE, the proposed project is anticipated to generate approximately 264 daily trips, 21 AM total peak hour trips, and 28 PM total peak hour trips. See Table 1: Trip Generation.

Figure 1: Vicinity Map



VICINITY MAP

Table 1: Trip Generation (ITE Trip Generation, 10th Edition)

ITE Code	Land Use	Size	Average Daily Trips		AM Peak Hour Trips						PM Peak Hour Trips					
			Rate	Total	Rate	% In	In	% Out	Out	Total	Rate	% In	In	% Out	Out	Total
210	Single Family	28 DU	9.44	264	0.74	25%	5	75%	16	21	0.99	63%	18	37%	10	28
Total				264			5		16	21			18		10	28

DU = Dwelling Units

4.0 Appropriateness

Access to the project site is proposed from a local street internal to a subdivision and not from an arterial roadway. Site access should be taken, when available, on the road of lower classification as proposed with the current project. Therefore, the access to the project site is appropriate based upon the existing road network and location of the project site. The proposed project consists of 28 single-family homes. The adjacent neighborhood also consists of single-family residential homes. The project's site generated traffic is low and the existing transportation network is appropriate to accommodate the proposed project's traffic.

5.0 Conclusions

Based upon the review of the project's low trip generation and location, it can be determined that the proposed use is appropriate from a traffic engineering perspective. The trip generation, site location, land use, and size is appropriate from a traffic engineering perspective.

- Per the ITE, the proposed project generates 264 daily trips, 21 AM total peak hour trips, and 28 PM total peak hour trips. See Table 1: Trip Generation.
- The project's proposed access is appropriate from a traffic engineering standpoint.
- The existing roadway improvements are appropriate to accommodate the proposed project's traffic.



APPENDIX:



Single-Family Detached Housing (210)

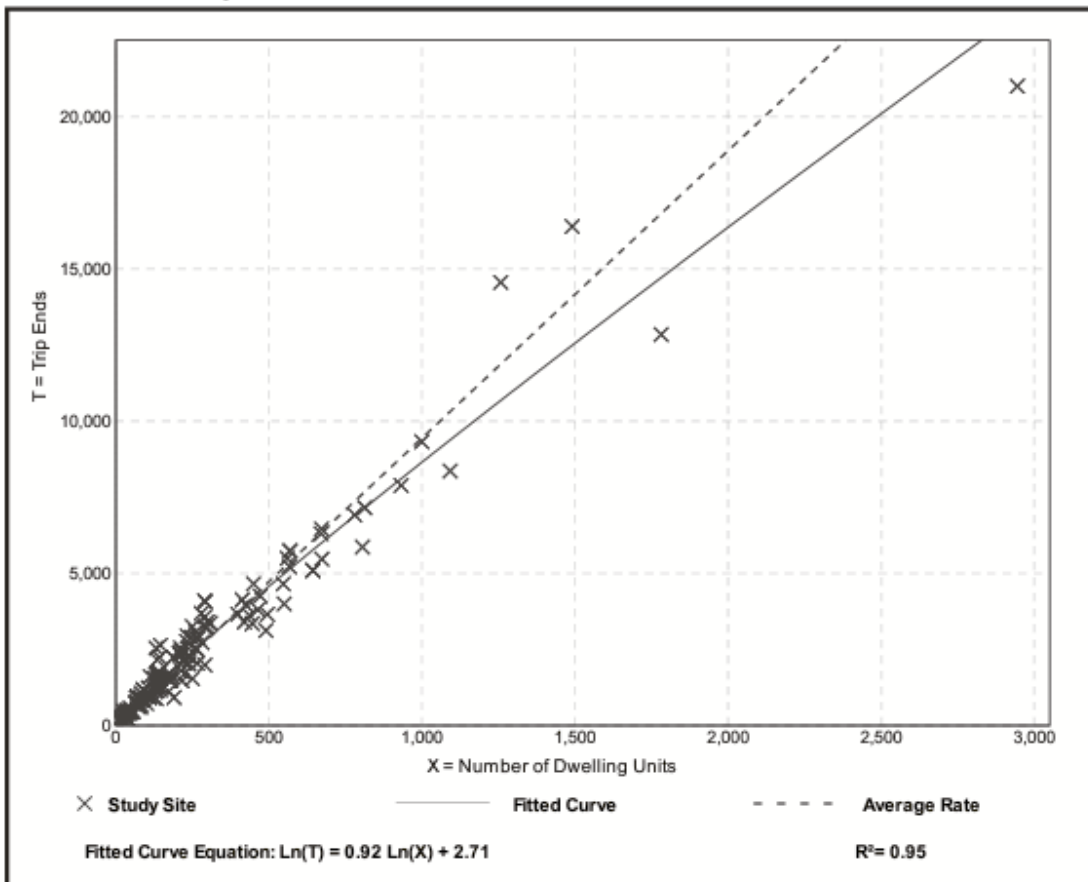
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 159
Avg. Num. of Dwelling Units: 264
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.44	4.81 - 19.39	2.10

Data Plot and Equation



Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Setting/Location: General Urban/Suburban

Number of Studies: 173

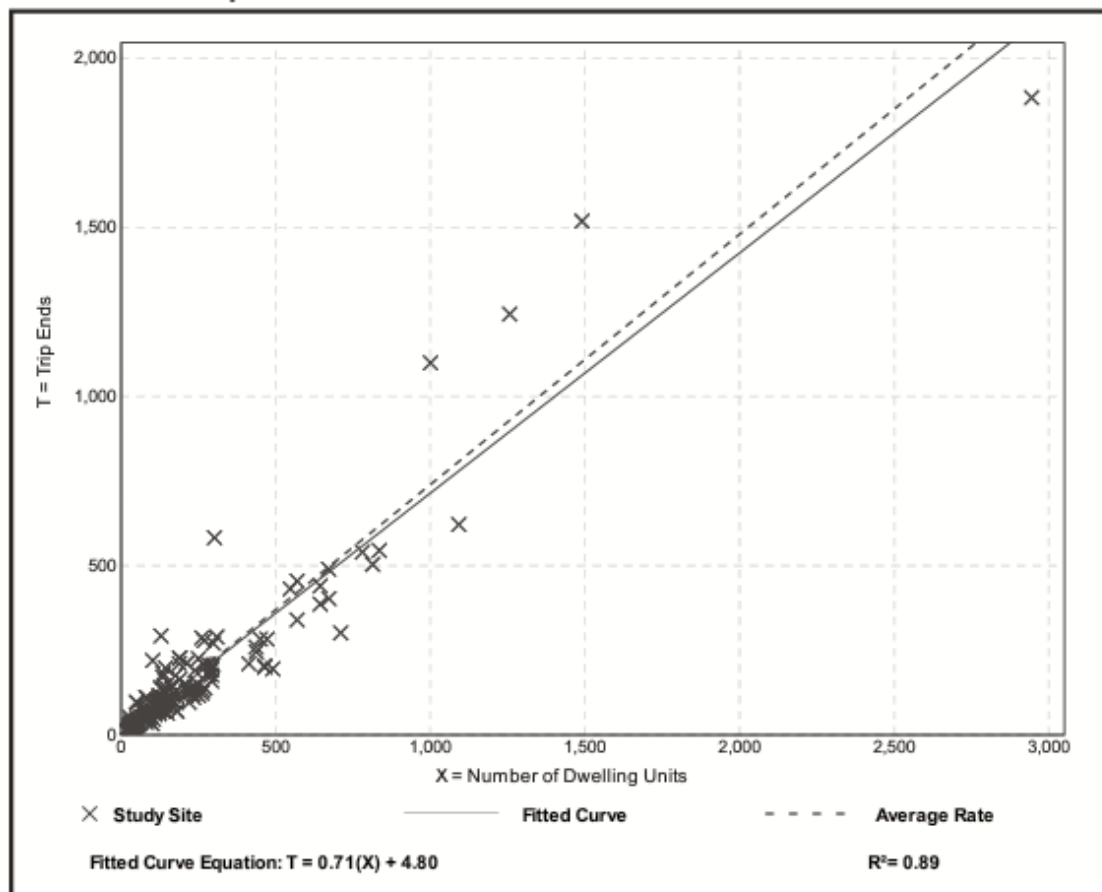
Avg. Num. of Dwelling Units: 219

Directional Distribution: 25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.74	0.33 - 2.27	0.27

Data Plot and Equation



Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic,

One Hour Between 4 and 6 p.m.

Setting/Location: General Urban/Suburban

Number of Studies: 190

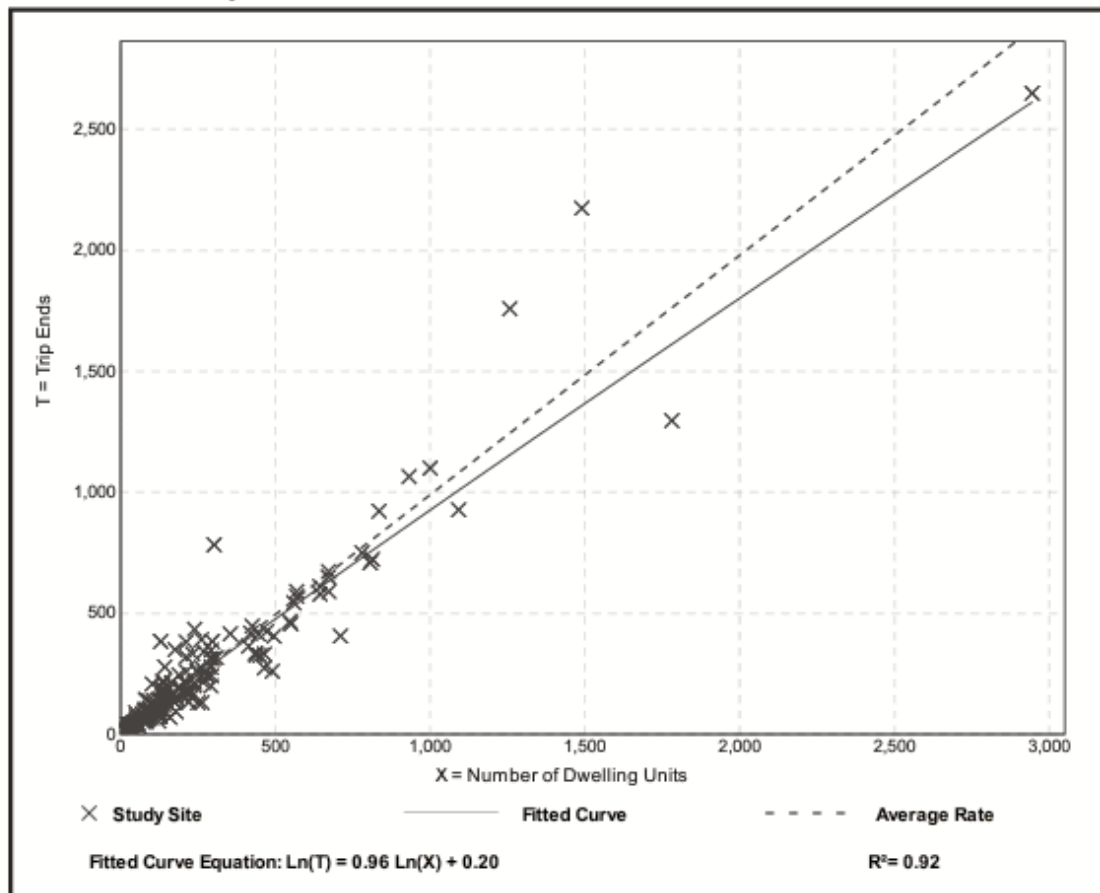
Avg. Num. of Dwelling Units: 242

Directional Distribution: 63% entering, 37% exiting

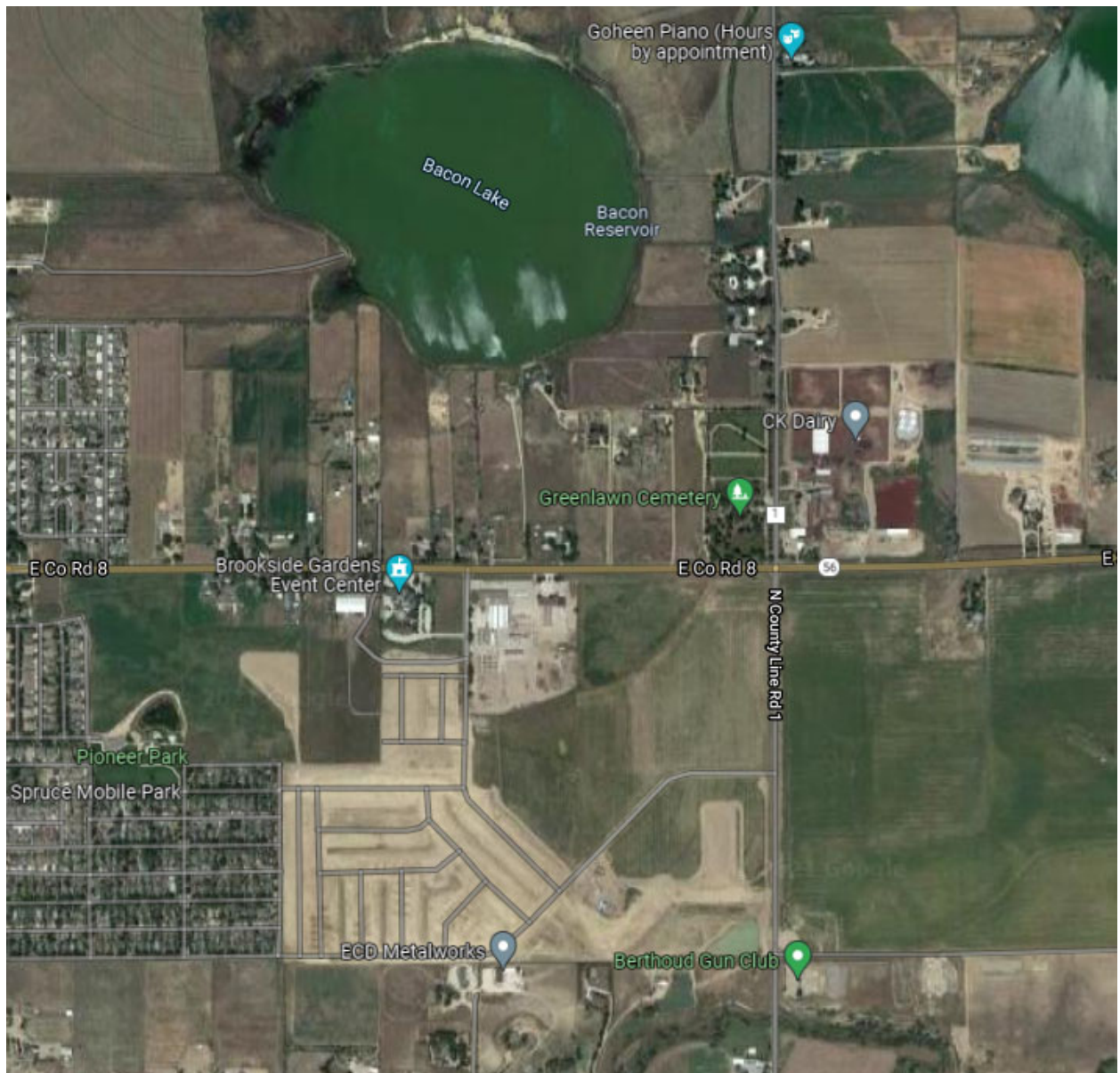
Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Data Plot and Equation



Aerial Photo





Sean Kellar, PE, PTOE

Principal Engineer

Education

B.S., Civil Engineering, Arizona State University – Tempe, AZ

Registration

Colorado, Professional Engineer (PE)
Wyoming, Professional Engineer (PE)
Arizona, Professional Engineer (PE)
Kansas, Professional Engineer (PE)
Missouri, Professional Engineer (PE)
Professional Traffic Operations Engineer (PTOE)

Professional Memberships

Institute of Transportation Engineers (ITE)

Industry Tenure

22 Years

Sean's wide range of expertise includes: transportation planning, traffic modeling, roadway design, bike and pedestrian facilities, traffic impact studies, traffic signal warrant analysis, parking studies, corridor planning and access management. Sean's experience in both the private and public sectors; passion for safety and excellence; and strong communication and collaboration skills can bring great value to any project. Prior to starting Kellar Engineering, Sean was employed at the Missouri Department of Transportation (MoDOT) as the District Traffic Engineer for the Kansas City District. Sean also worked for the City of Loveland, CO for over 10 years as a Senior Civil Engineer supervising a division of transportation/traffic engineers. While at the City of Loveland, Sean managed several capital improvement projects, presented several projects to the City Council and Planning Commission in public hearings, and managed the revisions to the City's Street Standards. Sean is also proficient in Highway Capacity Software, Synchro, PT Vissim, Rodel, GIS, and AutoCAD.



WORK EXPERIENCE:

Kellar Engineering, Principal Engineer/President – January 2016 – Present

Missouri Department of Transportation, District Traffic Engineer, Kansas City District – June 2015 – January 2016

City of Loveland, Colorado, Senior Civil Engineer, Public Works Department – February 2005 – June 2015

Kirkham Michael Consulting Engineers, Project Manager - February 2004 – February 2005

Dibble and Associates Consulting Engineers, Project Engineer – August 1999 – February 2004

DRAINAGE & EROSION CONTROL REPORT

HARVEST 47 SUBDIVISION

Berthoud, CO

November 30, 2023

Prepared for:

L & J Bebo
PO Box W
Berthoud, CO 80513

Prepared by:



i2 Consultants, Inc.

16911 Potts Place
Mead, CO 80542
Phone: 970.217.9148

Project Number: 1053-1



i2 Consultants, Inc.

November 30, 2023

16911 Potts Place, Mead, CO
970.217.9148
troy@i2-consultants.com

Mr. Noah Nemmers, PE
Baseline Engineering Corporation
112 N. Rubey Drive, #210
Golden, CO 80403
c/o Town of Berthoud

RE: Drainage & Erosion Control Report for Harvest 47 Subdivision
Berthoud, CO

Dear Mr. Nemmers:

We are pleased to present this Drainage & Erosion Control Report for Harvest 47 Subdivision for your review and approval. This report has been prepared in general accordance with the *Town of Berthoud Engineering and Infrastructure Design Standards and Construction Specifications, dated October 2021* (Design Standards) and Larimer County Storm Drainage Standards.

We look forward to your favorable review of this project and report. Please do not hesitate to contact our office if you have any questions.

Sincerely,

i2 Consultants, Inc.

Troy W. Campbell, PE
Senior Project Engineer

i2 Consultants, Inc.

RESPONSIBLE PARTY CERTIFICATION

L. & J. Bebo, hereby certifies that the drainage facilities for Harvest 47 Subdivision, Berthoud, CO will be constructed according to the design presented in this report. I understand that the Town of Berthoud does not and shall not assume liability for the drainage facilities designed and/or certified by my engineer. I understand that the Town of Berthoud reviews drainage plans but cannot, on behalf of Harvest 47 Subdivision, Berthoud, CO, guarantee that the final drainage design review will absolve L. & J. Bebo and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the Plat and/or Development Permit does not imply approval of my engineer's drainage design.

Attest:

L. Bebo

Authorized Signature

ENGINEER'S CERTIFICATION

I, Troy W. Campbell, hereby certify that this report (plan) for the drainage design of Harvest 47 Subdivision, Berthoud, CO was prepared by me (or under my direct supervision) in accordance with the provisions of the Town of Berthoud Standards and Specifications for the Design and Construction of Public and Private Improvements for the Responsible Parties thereof. I understand that the Town of Berthoud does not and shall not assume liability for drainage facilities designed by others.

Registered Professional Engineer
State of Colorado No. 41159
(Seal)

Drainage & Erosion Control Report
Harvest 47 Subdivision
Located within the Northeast Quarter of Section 24,
Township 4 North, Range 69 West of the 6th P.M.
Town of Berthoud, County of Larimer, State of Colorado

TABLE OF CONTENTS	Page
I. GENERAL LOCATION AND DESCRIPTION	4
A. Site Location	
B. Description of Property	
C. Proposed Project Description	
D. Flood Hazard and Relevant Drainage Studies	
II. DRAINAGE BASIN	5
A. Overall Drainage Basin	
B. Sub-basin and Site Drainage	
III. DRAINAGE DESIGN CRITERIA	5
A. Regulations	
B. Development Criteria Reference and Constraints	
C. Hydrological Criteria	
D. Hydraulic Criteria	
E. Variances from Criteria	
IV. DRAINAGE FACILITY DESIGN	7
A. General Concept	
B. Specific Details	
C. Open Channel Flow	
D. Storm Drainage Pipes	
E. Sediment and Erosion Control	
F. Maintenance of Drainage Facilities	
V. CONCLUSIONS	10
A. Compliance with Standards	
B. Drainage Concept	
VI. REFERENCES	11
VII. APPENDICIES	12

I. GENERAL LOCATION AND DESCRIPTION

A. Site Location:

The subject site is located in the northeast quarter of Section 24, Township 4 North, Range 69 West, of the 6th Principal Meridian, Town of Berthoud, County of Larimer, State of Colorado. Furthermore, the project is located south of Highway 56, east of Dorothy Drive and west of County Line Road.

B. Site Description:

The subject site is roughly 6.0 acres and is currently undeveloped.

The proposed development will consist of single-family lots, roadway, alleys, sidewalks and landscaping.

Detention and water quality for the subject site will be to the northeast of the subject site.

The site to the west has been developed and contains single family lots. The area to the south and east is currently being developed as multi-family and single-family lots.

According to the Natural Resources Conversation Service (NRCS) Web Soil Survey, the native soils in this area are:

- Nunn Clay Loam, 0 to 1 percent slopes (Map Unit Symbol #73), which is a Type C soil.
- Wiley Silt Loam, 1 to 3 percent slopes (Map Unit Symbol #118), which is a Type B soil.

Please refer to the NRCS soils information in the Appendix.

There are no irrigation facilities within the subject property boundary. An abandoned irrigation ditch has been removed from the property.

C. Proposed Project Description:

The subject site consists of roughly 6.0 acres and the subject development will be constructed in one phase. The subject project will consist of single-family lots, roadway section, alley and landscaping.

D. Flood Hazard and Relevant Drainage Studies:

The site is shown on FEMA panel 08069C1391H, effective 01/15/2021. The subject site is located with Zone X of the FEMA panel.

Relevant drainage studies for this area include the *Drainage Investigation for L&M Enterprises – MRD*, prepared by Messner Engineering Associates, dated October 11, 1990, as well as the *Preliminary Drainage Report for The Farmstead Third Filing*, prepared by Northern Engineering, dated August 10, 2022.

II. DRAINAGE BASIN

A. Overall Drainage Basin:

Related documents for the subject site are provided below:

- *Drainage Investigation for L&M Enterprises – MRD*, prepared by Messner Engineering Associates, dated October 11, 1990;
- *Preliminary Drainage Report for The Farmstead Third Filing*, prepared by Northern Engineering, dated August 10, 2022.

B. Sub-basin and Site Drainage:

The proposed site is currently undeveloped and the site runoff currently flows from west to northeast and west to southeast.

The subject site has previously been studied in the report prepared by Messner Engineering Associates and has also been included in previous drainage reports for The Farmstead development.

There is runoff from the property to the west of the detention pond that flows into the proposed detention pond. This runoff will be pass-through flow in the detention pond. Please refer to the Appendix for calculations regarding runoff from this basin.

III. DRAINAGE DESIGN CRITERIA

A. Regulations:

This report has been prepared in general accordance with the Town of Berthoud Design Standards, Larimer County Storm Drainage Standards, the Mile High Flood Control District/*Urban Storm Drainage Criteria Manual (USDCM)* and the *Drainage Investigation for L&M Enterprises – MRD*, prepared by Messner Engineering Associates, dated October 11, 1990.

B. Development Criteria Reference and Constraints:

The study area is currently undeveloped and vacant land.

The increase in runoff from the proposed development will be routed through the proposed detention facility northeast of the site as well as the proposed detention pond to be installed with the Farmstead development.

C. Hydrological Criteria:

Drainage design is in accordance with the Town of Berthoud Design Standards, Larimer County Stormwater Design Standards criteria, as well as the USDCM.

The design storms for this project are the 2-year and the 100-year recurrence intervals. Runoff is calculated using the Rational Method since all basins are smaller than 160 acres. The Rational Method calculations are computed by the following:

$$Q = ciA \quad \text{where:} \quad \begin{array}{ll} Q & = \text{Runoff in cubic feet per second} \\ c & = \text{Calculated runoff coefficient for design event} \\ i & = \text{Storm intensity in inches/hour} \\ A & = \text{Basin area in acres} \end{array}$$

Rational calculations were prepared using *Peak Runoff Prediction by the Rational Method, Version 2.00*, released May 2017, Urban Drainage and Flood Control District.

D. Hydraulic Criteria:

Proposed hydraulic calculations were prepared using *Hydraflow Express Extension for AutoDesk Civil 3D* as well as the *Detention Basin Volume Estimating Workbook, Version 2.35, Released January 2015*, by Urban Drainage and Flood Control District. Refer to the Appendix, Hydraulic Calculations for additional information as well as the Drainage Plan.

E. Variances from Criteria:

No variances are requested with the subject development.

IV. DRAINAGE FACILITY DESIGN

A. General Concept:

The drainage patterns associated with the proposed improvements are generally consistent, to the extent practical and reasonable, with the existing topography, adjacent development and previous drainage investigation for the subject property.

The estimated runoff for the site was determined using the Rational Method, as detailed above. Based on the direction of flow and existing drainage features the subject site has been divided into six (6) onsite drainage basins.

B. Specific Details:

The drainage analysis for the subject area and the layout of the basins corresponds with the proposed drainage conditions to the extent practical. Due to the proposed development, there are some differences between the previously designed basins and proposed basins due to the required layout, surrounding development and grading of the site.

Basin A

Basin A is the western portion of the site and will contain the front portion of residential lots. The proposed drainage pattern for this basin is generally from east to west and then south along Dorothy Drive. Runoff will be conveyed via curb & gutter to the south in Dorothy Drive.

Basin B

Basin B is in the southern portion of the site and will contain the rear/back portion of residential lots. The proposed drainage pattern for this basin is generally from north to south and then east in the alley along the common lot line for Harvest 47 and The Farmstead. Runoff will be conveyed to The Farmstead storm system and will be detained off-site.

Basin C

Basin C contains the majority of the residential lots south of Remuda Road. Runoff will drain from the south to north and west to east in Remuda Road to a proposed 10' Type R inlet (in sump). Runoff will be conveyed in the proposed storm system to the proposed detention pond.

Basin D

Basin D contains the majority of the residential lots north of Remuda Road. Runoff will drain from the north to south and west to east in Remuda Road to a proposed 10' Type R inlet (in sump). Runoff will be conveyed in the proposed storm system to the proposed detention pond.

Basin E

Basin E contains a portion of the residential lots north of Remuda Road (and south of the northernmost alley). Runoff will drain from the south to north and west to east and be conveyed in the proposed alley to the proposed detention pond.

Basin F

Basin F contains the proposed detention pond. Runoff in this basin will flow directly into the detention pond.

Basin G

Basin G contains a small portion of the eastern alley as well as a portion of a residential lot. The basin generally flows from north to south to a proposed inlet. Runoff will be conveyed via storm pipe to the proposed detention pond.

Basin H

Basin H is an off-site basin located west of the proposed detention pond. This basin generally drains from west to east and will reach the proposed detention pond. Runoff from this basin will be pass-through flow through the proposed detention pond.

The proposed drainage from the subject site is not anticipated to have a negative impact on existing or proposed downstream facilities. Detention and water quality for Basins C-G will be provided in the proposed detention pond.

Basins C-G will be detained in the proposed detention pond and will be released to The Farmstead storm system at a 100-year flow of roughly 6 cfs. The release rate was previously determined in the *Drainage Investigation for L&M Enterprises – MRD*, prepared by Messner Engineering Associates, dated October 11, 1990. The required 100-year detention volume is roughly 0.59 ac-ft; water quality of 0.10 ac-ft is included within this 100-year volume. The volume provided is 0.73 ac-ft, which is the maximum volume stored in the pond. The detention pond includes an emergency overflow weir on the east side of the pond. The emergency overflow spillway will be graded to convey flows to the east towards The Farmstead development. The spillway will be protected with Type H riprap through the spillway.

The proposed pond invert is roughly 4986.5, 100-year WSEL is 4989.4 and pond top is 4992.0. The provided detention volume is 0.73 ac-ft up to elevation 4989.4. The bottom of the emergency spillway will be at elevation 4990.5. The emergency overflow weir will be +/-20' wide and have a depth of roughly 0.5'.

C. Open Channel Flow

Common lot line swales between the single family lots will be necessary to convey developed runoff from the lots. Runoff will also be conveyed in curb & gutter as well as pans within the alleys.

D. Storm Drainage Pipes

Storm drainage pipes will be utilized to convey runoff from the subject site to the proposed detention pond. The pipes have been sized to convey the 100-year event.

E. Sediment and Erosion Control

Several sediment and erosion control measures will be incorporated into the construction. The initial sediment and erosion control measures to be installed shall include silt fence, as well as vehicle tracking control. After the initial grading operations, sediment control logs shall be installed in onsite swales and rock socks within the curb and gutter adjacent to the subject site.

As construction progresses, there will be a location designated for a concrete washout area. After the onsite roadway has final surface stabilization, rock socks shall be installed along onsite the curb and gutter and remain until final overall development landscaping has been completed.

Inlet protection shall be installed around any onsite inlets and inlets immediately downstream of the subject site.

Additionally, any area that has been disturbed by construction activities and left exposed for more than fourteen (14) days, shall receive drilled seeding and straw mulch at 2 tons/acre, until permanent landscaping or ground cover has been provided.

All stormwater quality and sediment/erosion control measures shall be regularly inspected and maintained during and after the completion of construction. Furthermore, sufficient care shall be taken by the contractor with materials handling and storage.

The proposed measures for sediment and erosion control shall be updated as necessary during construction, as warranted by site conditions.

F. Maintenance of Drainage Facilities

The onsite drainage facilities shall be regularly inspected and maintained by the property owner or homeowner's association. The inspections should include a log for the date, items inspected, maintenance actions and any updates to the drainage system.

The facilities shall be maintained at any time that erosion occurs in order to mitigate possible future erosion and to mitigate material leaving the subject site.

Furthermore, items such as onsite culverts and chases shall be cleaned and inspected on a regular basis.

Onsite vegetation shall be maintained and replanted if necessary to establish vegetated groundcover.

V. CONCLUSIONS

A. Compliance with Standards:

The drainage design is in general compliance with the Town of Berthoud Design Standards, Larimer County Storm Drainage Standards, the Mile High Flood Control District/*Urban Storm Drainage Criteria Manual (USDCM)* and the *Drainage Investigation for L&M Enterprises – MRD*, prepared by Messner Engineering Associates, dated October 11, 1990.

B. Drainage Concept:

The drainage patterns associated with the proposed improvements are generally consistent, to the extent practical and reasonable, with the design in the *Drainage Investigation for L&M Enterprises – MRD*, prepared by Messner Engineering Associates, dated October 11, 1990.

The drainage design for this project should not negatively impact improvements downstream or the existing storm system.

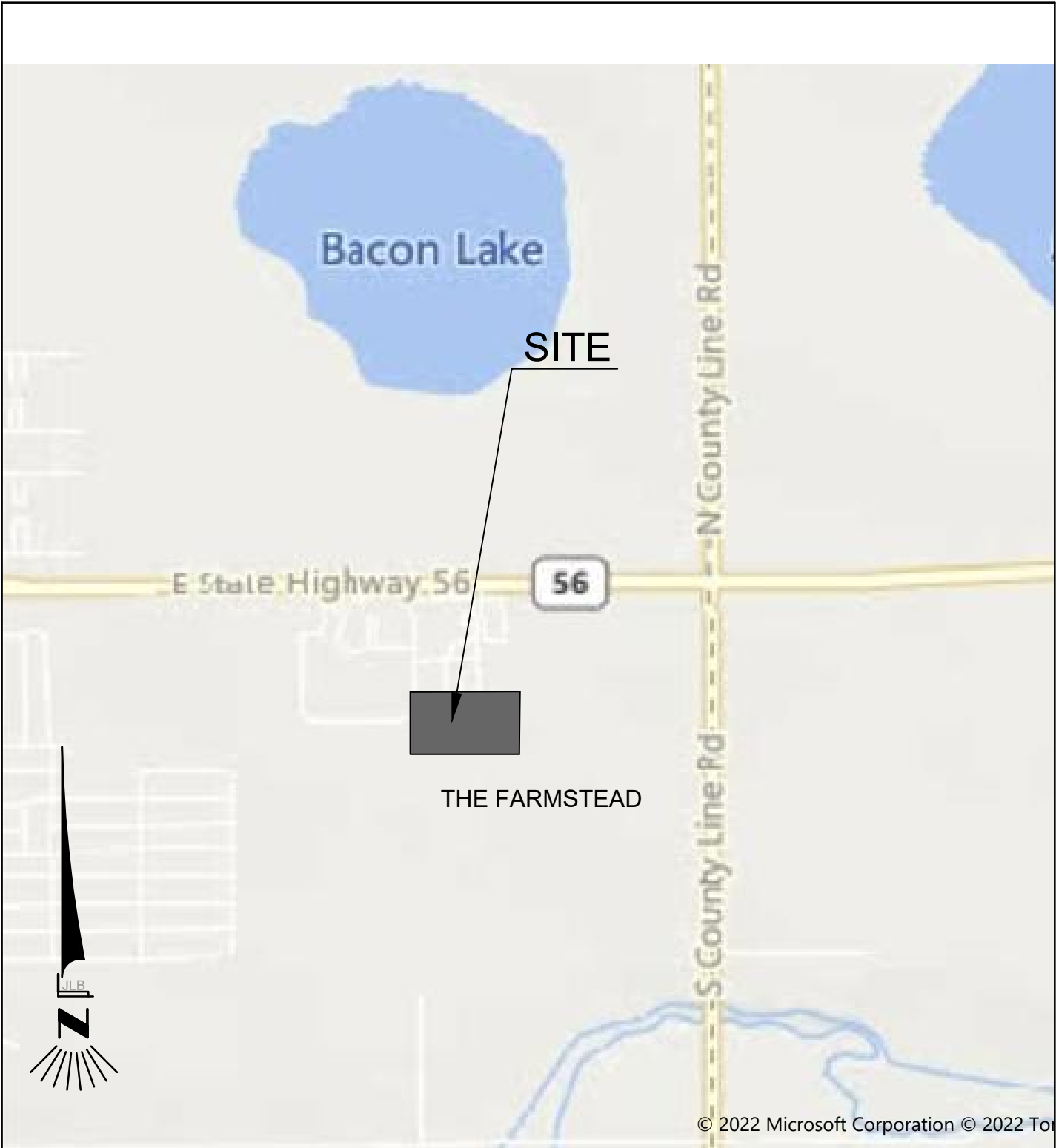
VI. REFERENCES

1. *Town of Berthoud Engineering and Infrastructure Design Standards and Construction Specifications, dated October 2021.*
2. *Larimer County Stormwater Design Standards (Addendum to the Urban Storm Drainage Criteria Manuals – Volumes 1, 2 and 3), adopted June 20, 2005.*
3. Urban Drainage and Flood Control District, Drainage Criteria Manual Volumes 1, Revised August 2018, Volume 2, Revised September 2017 and the Volume 3, dated November 2010 and Updated October 2019.
4. *Drainage Investigation for L&M Enterprises – MRD*, prepared by Messner Engineering Associates, dated October 11, 1990.
5. *Preliminary Drainage Report for The Farmstead Third Filing*, prepared by Northern Engineering, dated August 10, 2022.

VII.APPENDICIES

- ❑ Vicinity Map
- ❑ FEMA & Existing Geotechnical Information
- ❑ Hydrologic Calculations
- ❑ Hydraulic Calculations
- ❑ Excerpts from Previous Report
- ❑ Charts and Figures

Vicinity Map



VICINITY MAP

SCALE: 1" = 1,000'

i2
Consultants,
Inc.
16911 Potts Place
Mead, Colorado
970.217.9148

HARVEST 47

BERTHOUD, CO

CLIENT: BEBO
PROJECT NO: 1053-1
DATE: 12/19/2022
REVISED: -

SHEET: 1 OF 1

FEMA & Existing Geotechnical Information

National Flood Hazard Layer FIRMMette



B-1

105°4'W 40°18'26"N



0 250 500 1,000 1,500 2,000 Feet 1:6,000

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

Legend

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

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
OTHER FEATURES		Levee, Dike, or Floodwall
		Coastal Transect Baseline
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped
		The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

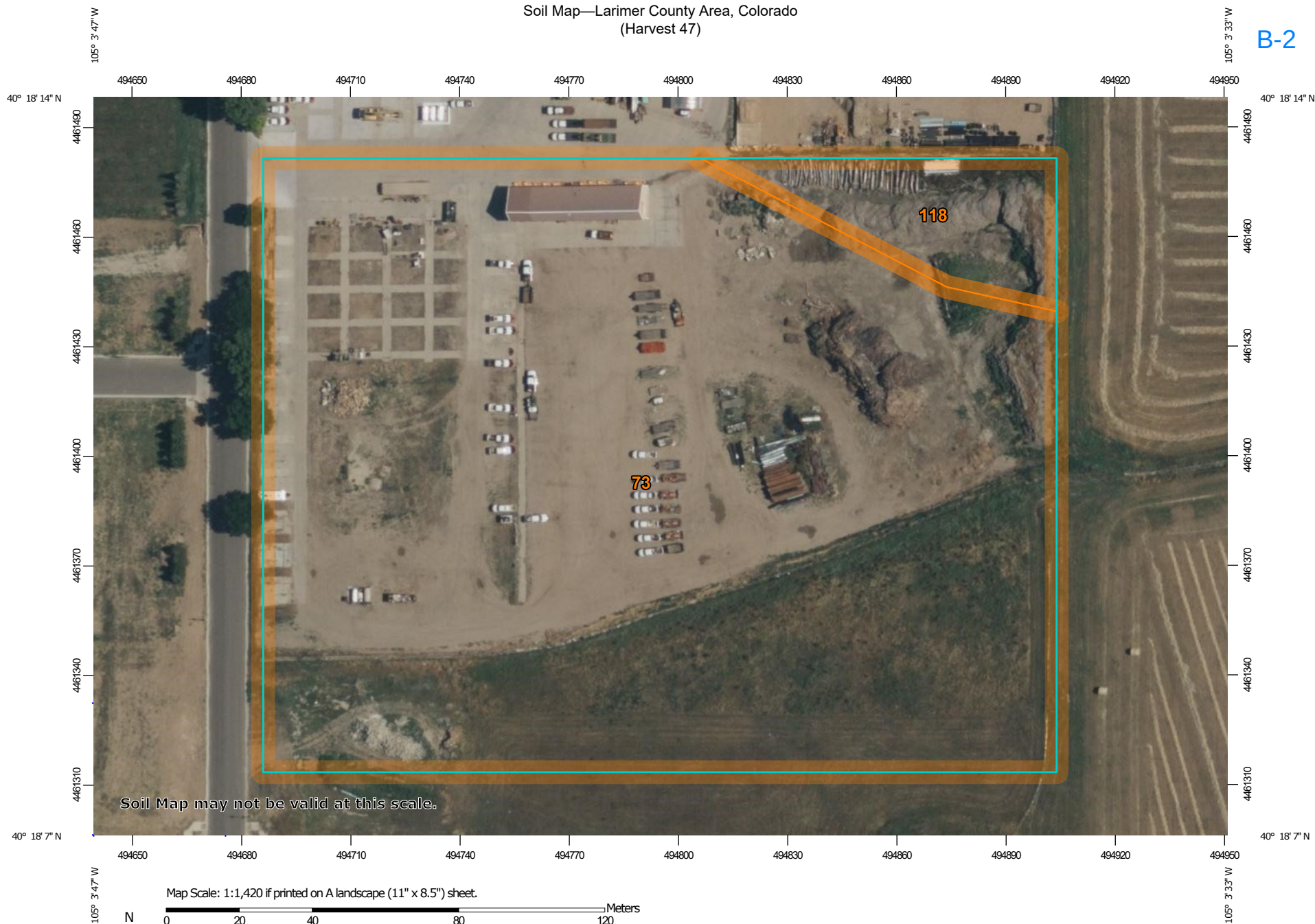
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **12/18/2022 at 1:11 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

Soil Map—Larimer County Area, Colorado (Harvest 47)

B-2



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

12/18/2022
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Larimer County Area, Colorado

Survey Area Data: Version 17, Sep 7, 2022

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

Date(s) aerial images were photographed: Jul 2, 2021—Aug 25, 2021

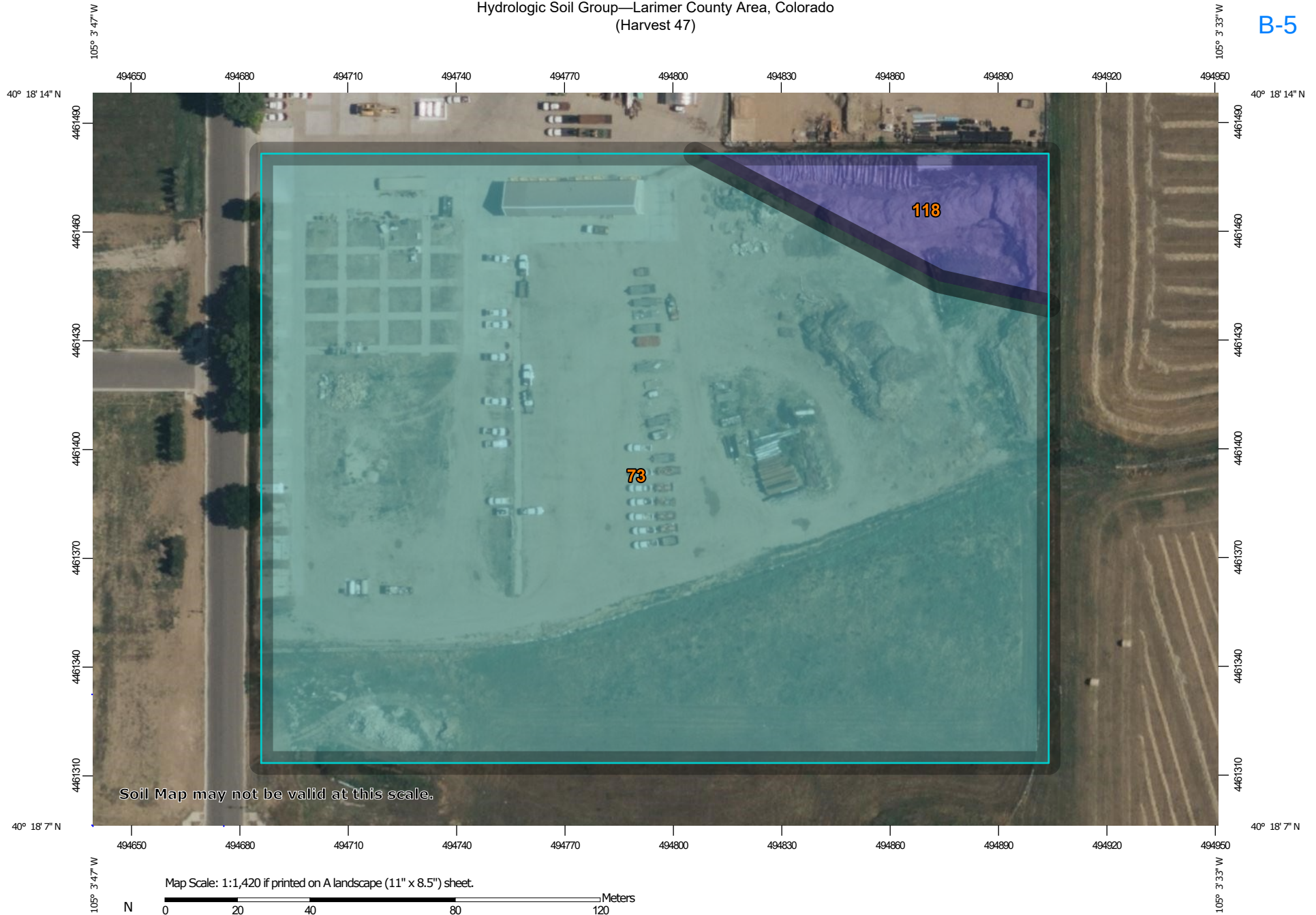
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
73	Nunn clay loam, 0 to 1 percent slopes	8.5	93.6%
118	Wiley silt loam, 1 to 3 percent slopes	0.6	6.4%
Totals for Area of Interest		9.1	100.0%

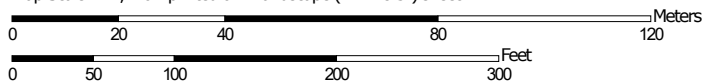
Hydrologic Soil Group—Larimer County Area, Colorado (Harvest 47)

B-5



Soil Map may not be valid at this scale.

Map Scale: 1:1,420 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

12/18/2022
Page 1 of 4

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Larimer County Area, Colorado
 Survey Area Data: Version 17, Sep 7, 2022

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

Date(s) aerial images were photographed: Jul 2, 2021—Aug 25, 2021

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
73	Nunn clay loam, 0 to 1 percent slopes	C	8.5	93.6%
118	Wiley silt loam, 1 to 3 percent slopes	B	0.6	6.4%
Totals for Area of Interest			9.1	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Hydrologic Calculations

Calculation of Peak Runoff using Rational Method

Designer:	twc
Company:	i2 Consultants, Inc.
Date:	10/4/2023
Project:	Harvest 47
Location:	Berthoud, CO

Version 2.00 released May 2017

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_i^{0.33}}$$

$$t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t}$$

Computed $t_c = t_i + t_t$

$$\text{Regional } t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

$$t_{\text{minimum}} = 5 \text{ (urban)}$$

$$t_{\text{minimum}} = 10 \text{ (non-urban)}$$

$$\text{Selected } t_c = \max\{t_{\text{minimum}}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$$

Select UDFCD location for NOAA Atlas 14 Rainfall Depths from the pulldown list OR enter your own depths obtained from the NOAA website ([click this link](#)).

1-hour rainfall depth, P1 (in) =	0.85	1.11	1.40	1.92	2.38	2.89	4.32
----------------------------------	------	------	------	------	------	------	------

	a	b	c
Rainfall Intensity Equation Coefficients =	28.50	10.00	0.786

$$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$$

$$Q(cfs) = CIA$$

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C							Overland (Initial) Flow Time					Channelized (Travel) Flow Time							Time of Concentration			Rainfall Intensity, I (in/hr)								Peak Flow, Q (cfs)							
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Overland Flow Length L _i (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Overland Flow Slope S _i (ft/ft)	Overland Flow Time t _i (min)	Channelized Flow Length L _i (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Channelized Flow Slope S _i (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V _i (ft/sec)	Channelized Flow Time t _i (min)	Computed t _c (min)	Regional t _c (min)	Selected t _c (min)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr		
A	0.23	C	45.0	0.34	0.40	0.46	0.57	0.62	0.67	0.73	25.00			0.020	5.01	250.00			0.010	20	2.00	2.08	7.10	21.07	7.10	2.60	3.40	4.28	5.88	7.28	8.84	13.22	0.20	0.31	0.46	0.77	1.03	1.36	2.22		
				0.34	0.40	0.46	0.57	0.62	0.67	0.73	25.00			0.020	5.01	380.00			0.010	20	2.00	3.17	8.18	22.49	8.18	2.48	3.24	4.08	5.60	6.94	8.43	12.60	0.46	0.70	1.02	1.73	2.31	3.04	4.96		
B	0.54	C	45.0	0.34	0.40	0.46	0.57	0.62	0.67	0.73	25.00			0.020	5.01	380.00			0.010	20	2.00	3.17	8.18	22.49	8.18	2.48	3.24	4.08	5.60	6.94	8.43	12.60	0.46	0.70	1.02	1.73	2.31	3.04	4.96		
				0.34	0.40	0.46	0.57	0.62	0.67	0.73	60.00			0.020	7.77	700.00			0.010	20	2.00	5.83	13.60	25.98	13.60	2.02	2.64	3.33	4.56	5.65	6.86	10.26	1.85	2.85	4.14	7.00	9.36	12.34	20.14		
C	2.69	C	45.0	0.34	0.40	0.46	0.57	0.62	0.67	0.73	60.00			0.020	7.77	700.00			0.010	20	2.00	5.83	13.60	25.98	13.60	2.02	2.64	3.33	4.56	5.65	6.86	10.26	1.85	2.85	4.14	7.00	9.36	12.34	20.14		
				0.34	0.40	0.46	0.57	0.62	0.67	0.73	20.00			0.020	4.49	665.00			0.010	20	2.00	5.54	10.03	25.59	10.03	2.30	3.00	3.78	5.19	6.43	7.81	11.68	1.13	1.74	2.52	4.27	5.70	7.51	12.27		
D	1.44	C	45.0	0.34	0.40	0.46	0.57	0.62	0.67	0.73	20.00			0.020	4.49	665.00			0.010	20	2.00	5.54	10.03	25.59	10.03	2.30	3.00	3.78	5.19	6.43	7.81	11.68	1.13	1.74	2.52	4.27	5.70	7.51	12.27		
				0.34	0.40	0.46	0.57	0.62	0.67	0.73	10.00			0.020	3.17	610.00			0.010	20	2.00	5.08	8.25	24.99	8.25	2.47	3.23	4.07	5.58	6.92	8.40	12.56	0.91	1.40	2.03	3.44	4.60	6.06	9.90		
E	1.08	C	45.0	0.01	0.05	0.15	0.33	0.40	0.49	0.59	50.00			0.020	10.65	100.00			0.005	7	0.49	3.37	14.02	28.20	14.02	1.99	2.60	3.28	4.50	5.58	6.77	10.12	0.02	0.13	0.46	1.41	2.13	3.17	5.71		
				0.34	0.40	0.46	0.57	0.62	0.67	0.73	10.00			0.020	3.17	100.00			0.005	20	1.41	1.18	4.35	19.89	5.00	2.88	3.76	4.75	6.51	8.07	9.80	14.65	0.09	0.14	0.20	0.33	0.45	0.59	0.96		
F	0.95	C	2.0	0.01	0.05	0.15	0.33	0.40	0.49	0.59	50.00			0.020	10.65	100.00			0.005	7	0.49	3.37	14.02	28.20	14.02	1.99	2.60	3.28	4.50	5.58	6.77	10.12	0.02	0.13	0.46	1.41	2.13	3.17	5.71		
				0.34	0.40	0.46	0.57	0.62	0.67	0.73	10.00			0.020	3.17	100.00			0.005	20	1.41	1.18	4.35	19.89	5.00	2.88	3.76	4.75	6.51	8.07	9.80	14.65	0.09	0.14	0.20	0.33	0.45	0.59	0.96		
G	0.09	C	45.0	0.34	0.40	0.46	0.57	0.62	0.67	0.73	10.00			0.020	3.17	100.00			0.005	20	1.41	1.18	4.35	19.89	5.00	2.88	3.76	4.75	6.51	8.07	9.80	14.65	0.09	0.14	0.20	0.33	0.45	0.59	0.96		
				0.34	0.40	0.46	0.57	0.62	0.67	0.73	50.00			0.020	7.09	200.00			0.010	20	2.00	1.67	8.76	20.53	8.76	2.42	3.16	3.98	5.46	6.77	8.22	12.29	0.69	1.07	1.55	2.62	3.50	4.61	7.53		
H	0.84	C	45.0	0.34	0.40	0.46	0.57	0.62	0.67	0.73	50.00			0.020	7.09	200.00			0.010	20	2.00	1.67	8.76	20.53	8.76	2.42	3.16	3.98	5.46	6.77	8.22	12.29	0.69	1.07	1.55	2.62	3.50	4.61	7.53		
				0.34	0.40	0.46	0.57	0.62	0.67	0.73																															
				0.34	0.40	0.46	0.57	0.62	0.67	0.73																															
				0.34	0.40	0.46	0.57	0.62	0.67	0.73																															
				0.34	0.40	0.46	0.57	0.62	0.67	0.73																															
				0.34	0.40	0.46	0.57	0.62	0.67	0.73																															

Hydraulic Calculations

Version 4.05 Released March 2017

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet G	Inlet C	Inlet D
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows			
Minor Q_{known} (cfs)	0.09	1.98	1.28
Major Q_{known} (cfs)	0.59	13.19	8.51
Bypass (Carry-Over) Flow from Upstream			
Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Watershed Characteristics			
Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			
Watershed Profile			
Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			
Minor Storm Rainfall Input			
Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			
Major Storm Rainfall Input			
Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	0.1	2.0	1.3
Major Total Design Peak Flow, Q (cfs)	0.6	13.2	8.5
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	N/A	N/A
Minor Storm (Calculated) Analysis of Flow Time			
C	N/A	N/A	N/A
C_s	N/A	N/A	N/A
Overland Flow Velocity, V_i	N/A	N/A	N/A
Channel Flow Velocity, V_t	N/A	N/A	N/A
Overland Flow Time, T_i	N/A	N/A	N/A
Channel Travel Time, T_t	N/A	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A	N/A
Regional T_c	N/A	N/A	N/A
Recommended T_c	N/A	N/A	N/A
T_c selected by User	N/A	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A	N/A
Major Storm (Calculated) Analysis of Flow Time			
C	N/A	N/A	N/A
C_s	N/A	N/A	N/A
Overland Flow Velocity, V_i	N/A	N/A	N/A
Channel Flow Velocity, V_t	N/A	N/A	N/A
Overland Flow Time, T_i	N/A	N/A	N/A
Channel Travel Time, T_t	N/A	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A	N/A
Regional T_c	N/A	N/A	N/A
Recommended T_c	N/A	N/A	N/A
T_c selected by User	N/A	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A	N/A

Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

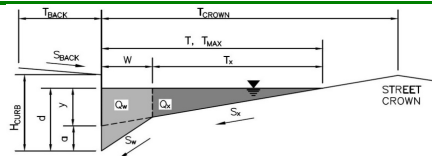
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Harvest 47 Subdivision

Inlet ID:

Inlet G

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

 $T_{BACK} = 5.0$ ft

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

 $S_{BACK} = 0.020$ ft/ft

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 10.0$ ft

Gutter Width

 $W = 1.00$ ft

Street Transverse Slope

 $S_X = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_W = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_O = 0.010$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.020$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	10.0	10.0	ft
$d_{MAX} =$	4.0	6.0	inches

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

	Minor Storm	Major Storm	
$d_{MAX} =$	4.0	6.0	inches

☐ check = yes

Allow Flow Depth at Street Crown (leave blank for no)

MINOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	2.1	2.1	cfs

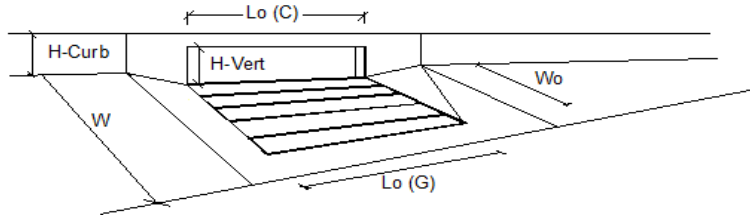
MAJOR STORM Allowable Capacity is based on Spread Criterion

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_r G$ =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_r C$ =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity		MINOR		MAJOR	
Design Discharge for Half of Street (from Sheet Inlet Management)		Q_o =	0.1	0.6	cfs
Water Spread Width		T =	1.3	6.0	ft
Water Depth at Flowline (outside of local depression)		d =	1.1	2.2	inches
Water Depth at Street Crown (or at T_{MAX})		d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow		E_o =	1.009	0.493	
Discharge outside the Gutter Section W, carried in Section T_x		Q_x =	0.0	0.3	cfs
Discharge within the Gutter Section W		Q_w =	0.1	0.3	cfs
Discharge Behind the Curb Face		Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W		A_w =	0.05	0.14	sq ft
Velocity within the Gutter Section W		V_w =	1.9	2.1	fps
Water Depth for Design Condition		d_{LOCAL} =	4.1	5.2	inches
Grate Analysis (Calculated)		MINOR		MAJOR	
Total Length of Inlet Grate Opening		L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_o-GRATE$ =	N/A	N/A	
Under No-Clogging Condition		MINOR		MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Interception Capacity		Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR		MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow		R_f =	N/A	N/A	
Interception Rate of Side Flow		R_x =	N/A	N/A	
Actual Interception Capacity		Q_a =	N/A	N/A	cfs
Carry-Over Flow = $Q_o - Q_a$ (to be applied to curb opening or next d/s inlet)		Q_b =	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR		MAJOR	
Equivalent Slope S_e (based on grate carry-over)		S_e =	0.333	0.174	ft/ft
Required Length L_T to Have 100% Interception		L_T =	0.85	3.00	ft
Under No-Clogging Condition		MINOR		MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L , L_T)		L =	0.85	3.00	ft
Interception Capacity		Q_i =	0.1	0.6	cfs
Under Clogging Condition		MINOR		MAJOR	
Clogging Coefficient		CurbCoef =	1.00	1.00	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.10	0.10	
Effective (Unclogged) Length		L_e =	4.50	4.50	ft
Actual Interception Capacity		Q_a =	0.1	0.6	cfs
Carry-Over Flow = $Q_o - Q_a$		Q_b =	0.0	0.0	cfs
Summary		MINOR		MAJOR	
Total Inlet Interception Capacity		Q =	0.1	0.6	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_b =	0.0	0.0	cfs
Capture Percentage = Q_i/Q_o		C% =	100	100	%

Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

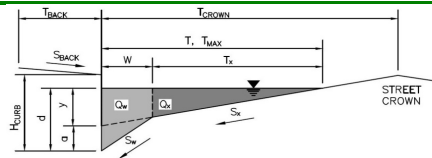
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Harvest 47 Subdivision

Inlet ID:

Inlet C

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

 $T_{BACK} = 10.0$ ft

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

 $S_{BACK} = 0.020$ ft/ft

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 17.0$ ft

Gutter Width

 $W = 1.00$ ft

Street Transverse Slope

 $S_x = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_w = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_o = 0.000$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.020$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.0	6.0	inches

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

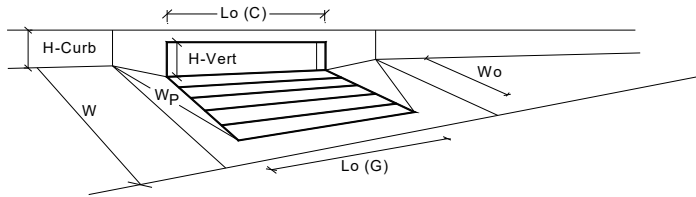
☐☐**MINOR STORM** Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

MAJOR STORM Allowable Capacity is based on Depth Criterion

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)

Type of Inlet

Local Depression (additional to continuous gutter depression 'a' from above)

Number of Unit Inlets (Grate or Curb Opening)

Water Depth at Flowline (outside of local depression)

Grate Information

Length of a Unit Grate

Width of a Unit Grate

Area Opening Ratio for a Grate (typical values 0.15-0.90)

Clogging Factor for a Single Grate (typical value 0.50 - 0.70)

Grate Weir Coefficient (typical value 2.15 - 3.60)

Grate Orifice Coefficient (typical value 0.60 - 0.80)

Curb Opening Information

Length of a Unit Curb Opening

Height of Vertical Curb Opening in Inches

Height of Curb Orifice Throat in Inches

Angle of Throat (see USDCM Figure ST-5)

Side Width for Depression Pan (typically the gutter width of 2 feet)

Clogging Factor for a Single Curb Opening (typical value 0.10)

Curb Opening Weir Coefficient (typical value 2.3-3.7)

Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)

Low Head Performance Reduction (Calculated)

Depth for Grate Midwidth

Depth for Curb Opening Weir Equation

Combination Inlet Performance Reduction Factor for Long Inlets

Curb Opening Performance Reduction Factor for Long Inlets

Grated Inlet Performance Reduction Factor for Long Inlets

Total Inlet Interception Capacity (assumes clogged condition)

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

	MINOR	MAJOR
Type =	CDOT Type R Curb Opening	
a_{local} =	3.00	3.00
No =	1	1
Ponding Depth =	4.8	7.0
	inches	inches
	MINOR	MAJOR
L_o (G) =	N/A	N/A
W_o =	N/A	N/A
A_{ratio} =	N/A	N/A
C_t (G) =	N/A	N/A
C_w (G) =	N/A	N/A
C_o (G) =	N/A	N/A
	MINOR	MAJOR
L_o (C) =	10.00	10.00
H_{vert} =	6.00	6.00
H_{throat} =	6.00	6.00
Theta =	63.40	63.40
W_p =	1.00	1.00
C_t (C) =	0.10	0.10
C_w (C) =	3.60	3.60
C_o (C) =	0.67	0.67
	MINOR	MAJOR
d_{Grate} =	N/A	N/A
d_{Curb} =	0.32	0.50
$RF_{Combination}$ =	0.46	0.66
RF_{Curb} =	0.86	0.99
RF_{Grate} =	N/A	N/A
	MINOR	MAJOR
Q_a =	6.2	13.9
$Q_{PEAK REQUIRED}$ =	2.0	13.2
	cfs	cfs

Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

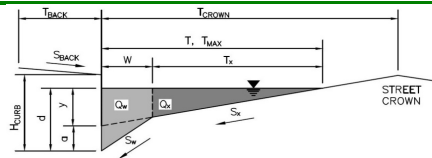
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Harvest 47 Subdivision

Inlet ID:

Inlet D

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

 $T_{BACK} = 10.0$ ft

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

 $S_{BACK} = 0.020$ ft/ft

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 17.0$ ft

Gutter Width

 $W = 1.00$ ft

Street Transverse Slope

 $S_x = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_w = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_o = 0.000$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.020$

Max. Allowable Spread for Minor & Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.0	6.0	inches

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

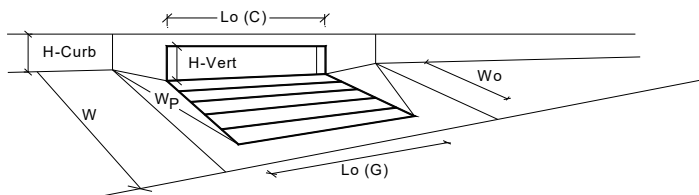
☐☐**MINOR STORM** Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	SUMP	SUMP	cfs

MAJOR STORM Allowable Capacity is based on Depth Criterion

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)

Type of Inlet

Local Depression (additional to continuous gutter depression 'a' from above)

Number of Unit Inlets (Grate or Curb Opening)

Water Depth at Flowline (outside of local depression)

Grate Information

Length of a Unit Grate

Width of a Unit Grate

Area Opening Ratio for a Grate (typical values 0.15-0.90)

Clogging Factor for a Single Grate (typical value 0.50 - 0.70)

Grate Weir Coefficient (typical value 2.15 - 3.60)

Grate Orifice Coefficient (typical value 0.60 - 0.80)

Curb Opening Information

Length of a Unit Curb Opening

Height of Vertical Curb Opening in Inches

Height of Curb Orifice Throat in Inches

Angle of Throat (see USDCM Figure ST-5)

Side Width for Depression Pan (typically the gutter width of 2 feet)

Clogging Factor for a Single Curb Opening (typical value 0.10)

Curb Opening Weir Coefficient (typical value 2.3-3.7)

Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)

Low Head Performance Reduction (Calculated)

Depth for Grate Midwidth

Depth for Curb Opening Weir Equation

Combination Inlet Performance Reduction Factor for Long Inlets

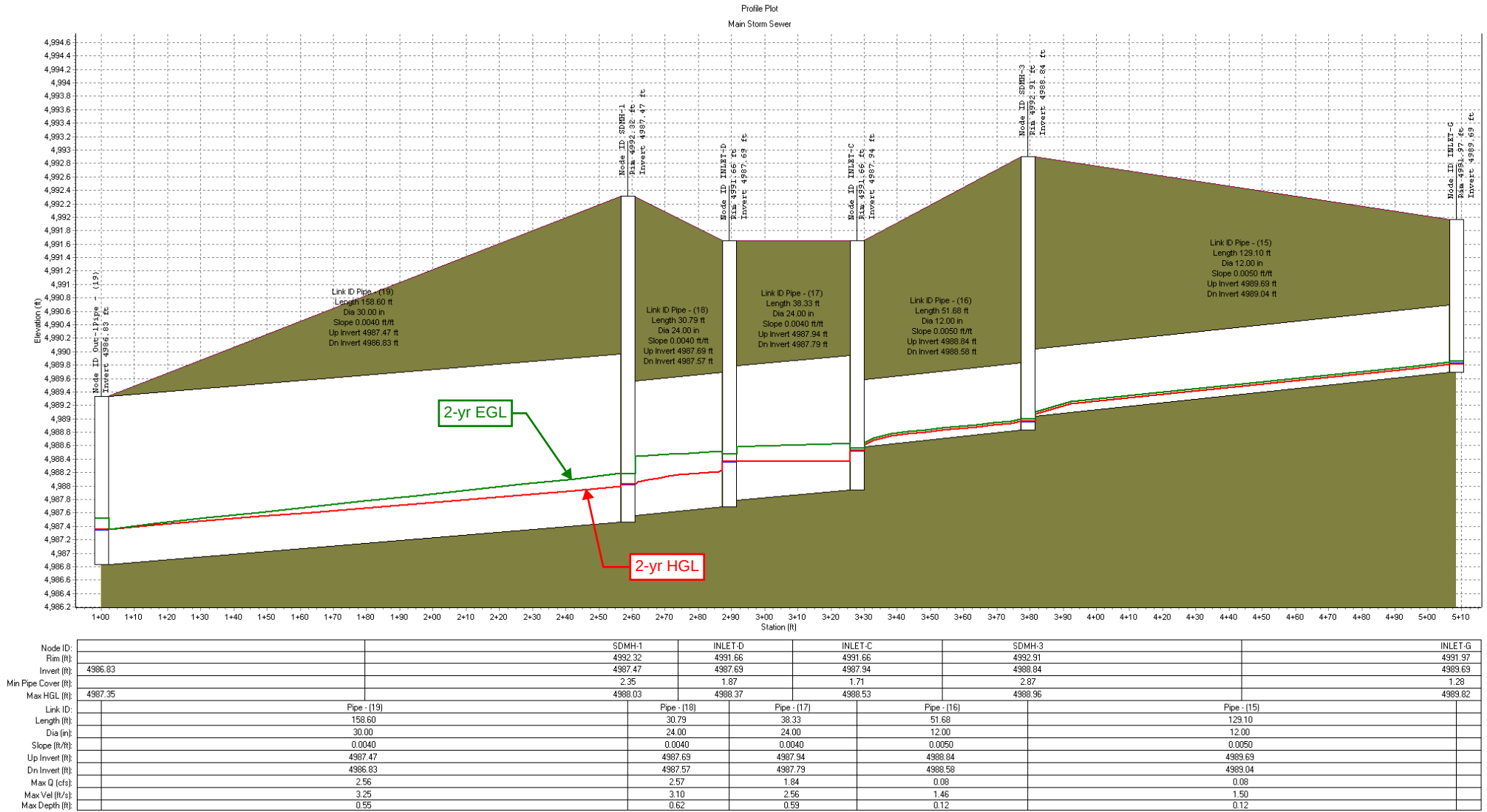
Curb Opening Performance Reduction Factor for Long Inlets

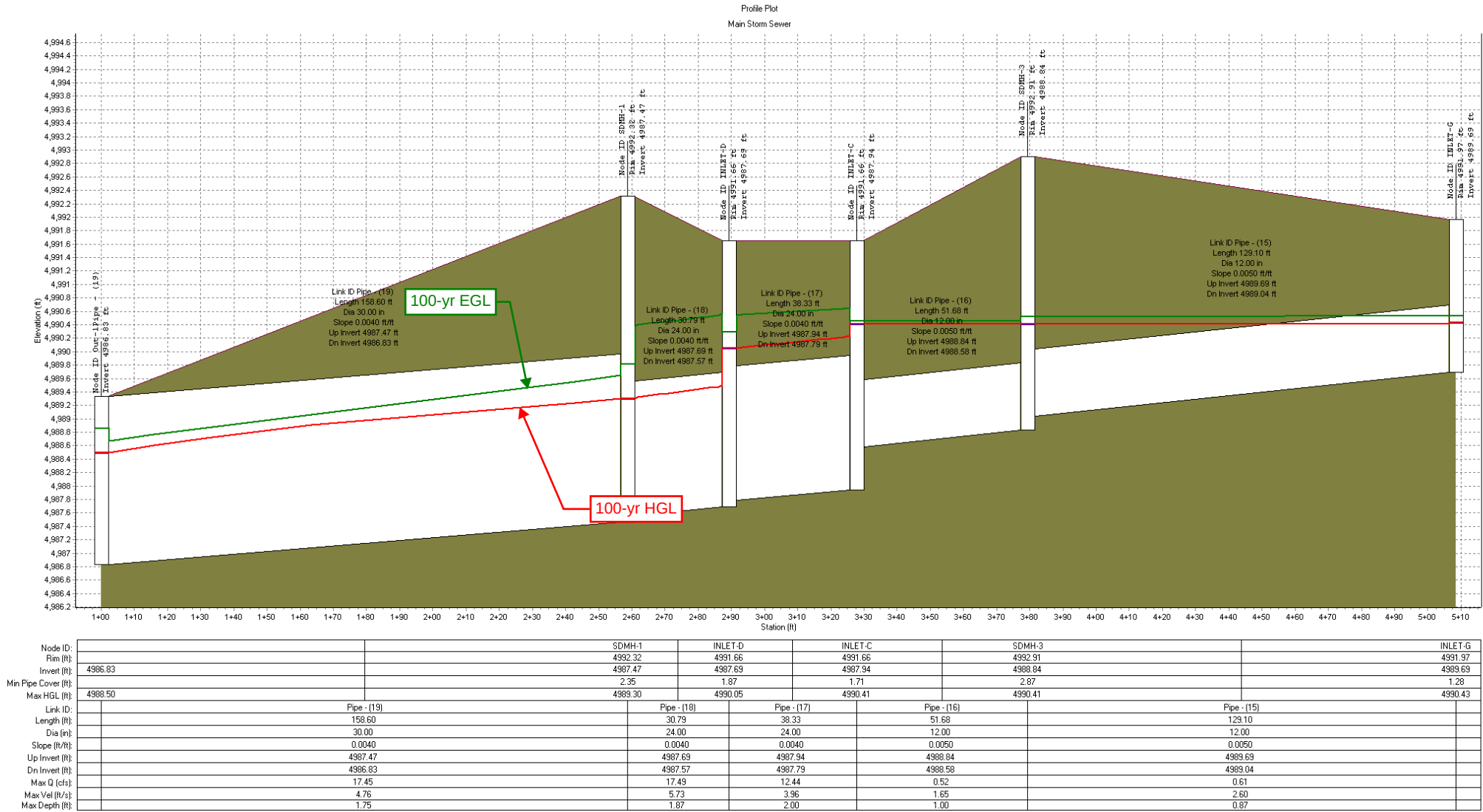
Grated Inlet Performance Reduction Factor for Long Inlets

Total Inlet Interception Capacity (assumes clogged condition)

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

	MINOR	MAJOR	
Type =	CDOT Type R Curb Opening		
a_{local} =	3.00	3.00	inches
No =	1	1	
Ponding Depth =	4.8	6.0	inches
	MINOR	MAJOR	✓ Override Depths
L_o (G) =	N/A	N/A	
W_o =	N/A	N/A	feet
A_{ratio} =	N/A	N/A	
C_t (G) =	N/A	N/A	
C_w (G) =	N/A	N/A	
C_o (G) =	N/A	N/A	
	MINOR	MAJOR	
L_o (C) =	10.00	10.00	feet
H_{vert} =	6.00	6.00	inches
H_{throat} =	6.00	6.00	inches
Theta =	63.40	63.40	degrees
W_p =	1.00	1.00	feet
C_t (C) =	0.10	0.10	
C_w (C) =	3.60	3.60	
C_o (C) =	0.67	0.67	
	MINOR	MAJOR	
d_{Grate} =	N/A	N/A	ft
d_{Curb} =	0.32	0.42	ft
$RF_{Combination}$ =	0.46	0.57	
RF_{Curb} =	0.86	0.93	
RF_{Grate} =	N/A	N/A	
	MINOR	MAJOR	
Q_a =	6.2	10.0	cfs
$Q_{PEAK REQUIRED}$ =	1.3	8.5	cfs



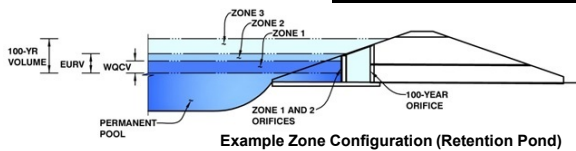


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Harvest 47 Subdivision

Basin ID: Site



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.13	0.099	Orifice Plate
Zone 2 (2-year)	1.34	0.056	Circular Orifice
Zone 3 (100-year)	2.56	0.431	Weir&Pipe (Restrict)
Total (all zones)		0.586	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = 1.13 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 0.33 inches
Orifice Plate: Orifice Area per Row = 0.59 sq. inches (diameter = 7/8 inch)

Calculated Parameters for Plate
WQ Orifice Area per Row = 4.097E-03 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.33						
Orifice Area (sq. inches)	0.59	0.59						

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = 1.13 Not Selected ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = 1.34 Not Selected ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = 5.00 Not Selected inches

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = 0.14 Not Selected ft²
Vertical Orifice Centroid = 0.21 Not Selected feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

Overflow Weir Front Edge Height, H_o = 2.00 Not Selected ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = 2.92 Not Selected feet
Overflow Weir Gate Slope = 0.00 Not Selected H:V
Horiz. Length of Weir Sides = 2.92 Not Selected feet
Overflow Gate Type = Type C Gate Not Selected %
Debris Clogging % = 50% Not Selected %

Calculated Parameters for Overflow Weir
Height of Gate Upper Edge, H_u = 2.00 Not Selected feet
Overflow Weir Slope Length = 2.92 Not Selected feet
Gate Open Area / 100-yr Orifice Area = 7.82 Not Selected
Overflow Gate Open Area w/o Debris = 5.93 Not Selected ft²
Overflow Gate Open Area w/ Debris = 2.97 Not Selected ft²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Depth to Invert of Outlet Pipe = 0.00 Not Selected ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = 18.00 Not Selected inches
Restrictor Plate Height Above Pipe Invert = 8.00 Not Selected inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = 0.76 Not Selected ft²
Outlet Orifice Centroid = 0.39 Not Selected feet
Half-Central Angle of Restrictor Plate on Pipe = 1.46 Not Selected radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 4.00 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 20.00 feet
Spillway End Slopes = 4.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.44 feet
Stage at Top of Freeboard = 5.44 feet
Basin Area at Top of Freeboard = 0.47 acres
Basin Volume at Top of Freeboard = 1.21 acre-ft

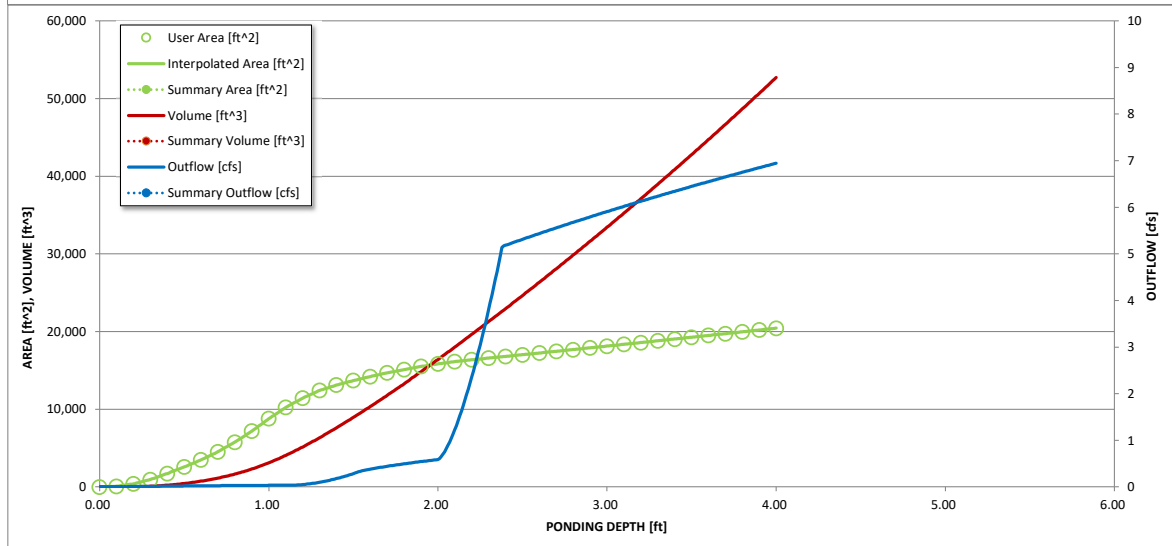
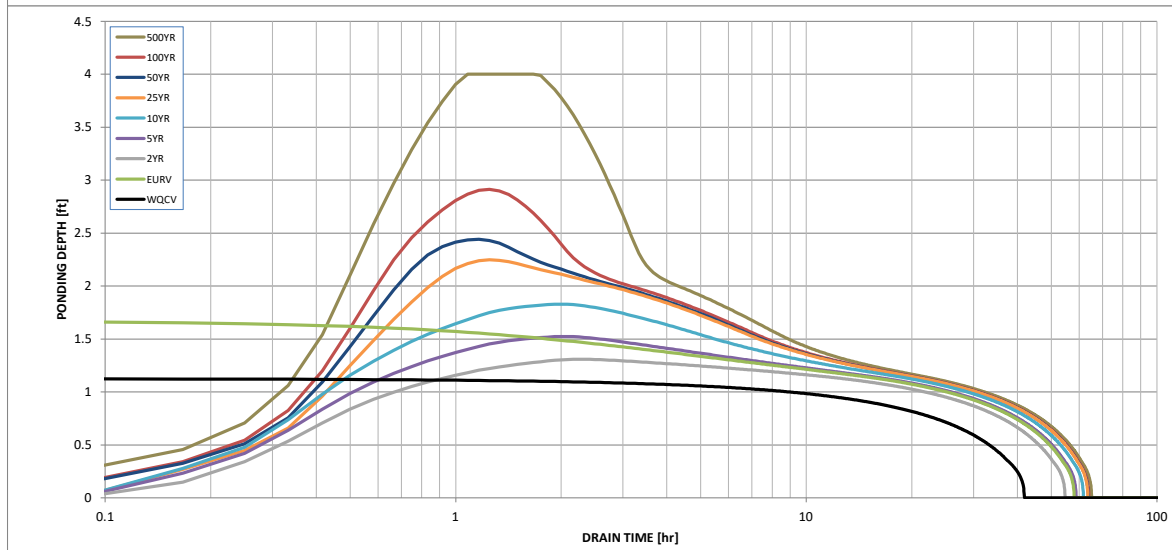
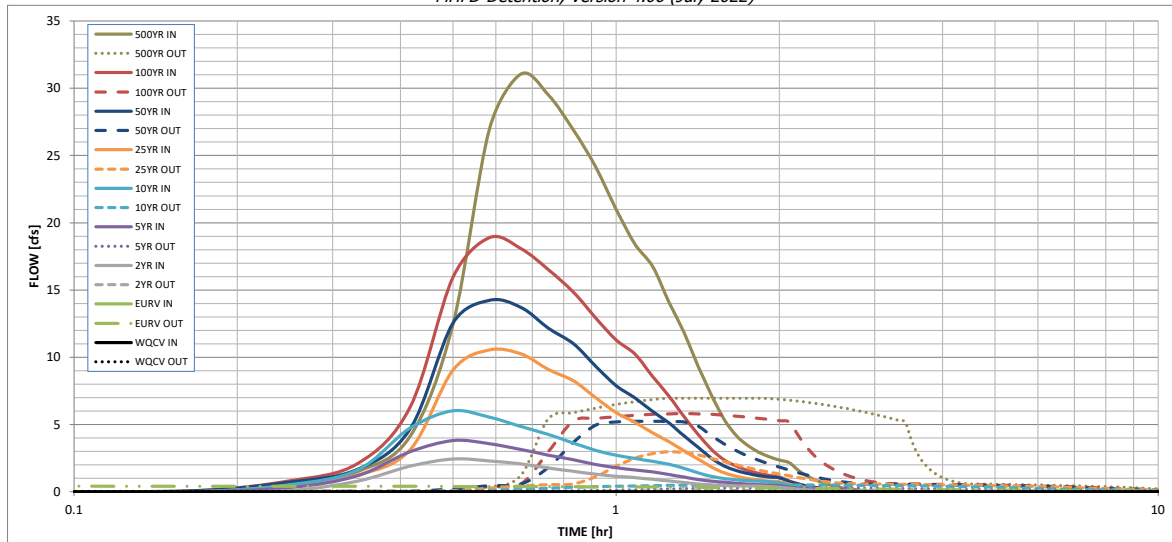
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period	N/A	N/A	0.81	1.08	1.38	1.87	2.32	2.84	4.32
One-Hour Rainfall Depth (in)	0.099	0.262	0.160	0.246	0.377	0.643	0.874	1.165	1.959
CUHP Runoff Volume (acre-ft)	N/A	N/A	0.160	0.246	0.377	0.643	0.874	1.165	1.959
Inflow Hydrograph Volume (acre-ft)	N/A	N/A	0.1	0.5	1.9	5.2	7.7	10.8	19.0
CUHP Predevelopment Peak Q (cfs)	N/A	N/A	0.01	0.08	0.31	0.85	1.25	1.75	3.08
OPTIONAL Override Predevelopment Peak Q (cfs)	N/A	N/A	2.4	3.8	6.0	10.5	14.2	18.9	31.1
Predevelopment Unit Peak Flow, q (cfs/acre)	N/A	N/A	0.1	0.3	0.5	3.0	5.2	5.8	6.9
Peak Inflow Q (cfs)	N/A	N/A	N/A	0.6	0.3	0.6	0.7	0.5	0.4
Ratio Peak Outflow to Predevelopment Q	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	N/A
Structure Controlling Flow	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Gate 1 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Gate 2 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours)	38	51	50	52	53	51	48	44	37
Time to Drain 99% of Inflow Volume (hours)	40	55	53	56	57	57	56	55	52
Maximum Ponding Depth (ft)	1.13	1.68	1.31	1.52	1.83	2.25	2.44	2.91	4.00
Area at Maximum Ponding Depth (acres)	0.24	0.34	0.29	0.32	0.35	0.38	0.39	0.41	0.47
Maximum Volume Stored (acre-ft)	0.101	0.264	0.146	0.212	0.312	0.465	0.538	0.730	1.210

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.08	0.42
	0:15:00	0.00	0.00	0.09	0.31	0.52	0.47	0.72	0.81	1.50
	0:20:00	0.00	0.00	0.80	1.19	1.61	1.25	1.66	2.09	4.11
	0:25:00	0.00	0.00	1.90	2.98	4.73	3.12	4.67	6.29	12.45
	0:30:00	0.00	0.00	2.44	3.80	6.01	9.04	12.53	15.95	26.95
	0:35:00	0.00	0.00	2.29	3.57	5.56	10.54	14.24	18.90	31.06
	0:40:00	0.00	0.00	2.06	3.13	4.86	10.25	13.71	18.08	29.50
	0:45:00	0.00	0.00	1.77	2.72	4.25	9.10	12.16	16.52	26.91
	0:50:00	0.00	0.00	1.52	2.38	3.63	8.25	11.01	14.85	24.14
	0:55:00	0.00	0.00	1.31	2.03	3.08	6.99	9.34	12.93	21.00
	1:00:00	0.00	0.00	1.16	1.78	2.71	5.88	7.89	11.28	18.40
	1:05:00	0.00	0.00	1.05	1.61	2.47	5.16	6.97	10.24	16.76
	1:10:00	0.00	0.00	0.92	1.47	2.25	4.39	5.98	8.58	14.15
	1:15:00	0.00	0.00	0.80	1.29	2.05	3.74	5.13	7.13	11.85
	1:20:00	0.00	0.00	0.69	1.09	1.74	3.04	4.16	5.60	9.34
	1:25:00	0.00	0.00	0.59	0.92	1.40	2.43	3.30	4.27	7.16
	1:30:00	0.00	0.00	0.51	0.79	1.14	1.83	2.49	3.14	5.37
	1:35:00	0.00	0.00	0.46	0.71	0.98	1.40	1.91	2.36	4.16
	1:40:00	0.00	0.00	0.44	0.63	0.89	1.14	1.57	1.89	3.43
	1:45:00	0.00	0.00	0.43	0.57	0.83	0.98	1.35	1.58	2.94
	1:50:00	0.00	0.00	0.42	0.53	0.78	0.87	1.20	1.37	2.60
	1:55:00	0.00	0.00	0.37	0.50	0.73	0.80	1.10	1.21	2.35
	2:00:00	0.00	0.00	0.33	0.46	0.66	0.75	1.03	1.10	2.17
	2:05:00	0.00	0.00	0.25	0.35	0.50	0.56	0.77	0.81	1.61
	2:10:00	0.00	0.00	0.19	0.26	0.37	0.42	0.57	0.59	1.18
	2:15:00	0.00	0.00	0.14	0.20	0.27	0.31	0.42	0.43	0.87
	2:20:00	0.00	0.00	0.11	0.15	0.20	0.23	0.31	0.32	0.64
	2:25:00	0.00	0.00	0.08	0.10	0.15	0.16	0.22	0.23	0.47
	2:30:00	0.00	0.00	0.06	0.07	0.11	0.12	0.16	0.17	0.33
	2:35:00	0.00	0.00	0.04	0.05	0.08	0.08	0.12	0.12	0.24
	2:40:00	0.00	0.00	0.03	0.04	0.05	0.06	0.08	0.08	0.17
	2:45:00	0.00	0.00	0.02	0.02	0.03	0.04	0.05	0.05	0.11
	2:50:00	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.06
	2:55:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

RIPRAP APRON CALCULATION - End of Culvert into Pond

Design Point

Pond

Outlet Variables

Number of Culverts

1

Pipe diameter, Do

30 inches

Total Discharge, Q

17.5 cfs

Discharge, Qo

17.5 cfs

Allowable Velocity, V

5 fps

Is tailwater elevation known?

yes

Depth of tailwater

1.58 ft

5 fps for erosive soils and 7 for erosion resistant soils.

Riprap Length and Size Calculations

Step 1:

Yt = Tw, or 0.4 =

1.58 ft

At = Qo/V =

3.5 ft

Yt/D =

0.6

Q/D^2.5 =

1.8

Step 2:

From figure MD-23, expansion factor, 1/(2*tan X) =

6.66

Step 3:

Length of Protection, Lp =

7.50 ft

Note: The length calculated was less than 3D, so 3D was used

Step 4:

If single conduit, use Qo/Do^1.5 =

4.4

If multiple conduit, use Q/Wi*Hi^1.5

Yt/D =

0.6

Q/WH^0.5

From Figure MD-21, Riprap size, D50 =

9 in

Type L

Recommendations?

9 in

Type L

Reference Chacpter 9 - Drainage Criteria Manual, Volume 1, Urban Drainage and Flood Control District.

Step 5: Compute width, T

Lp

7.5 ft

X

0.07 rad

W

2.5 ft

tan(x)

0.08

T

4 ft

per culvert

4 ft

total

FIGURE MD-23
Expansion Factor for Circular Conduits

Use D₅₀ instead of D whenever flow is supercritical in the barrel.
** Use Type L for a distance of 3D downstream.

FIGURE MD-21
Riprap Erosion Protection at Circular Conduit Outlet. Valid for Q/D^{2.5} ≤ 6.0

TABLE MD-7 Classification and Gradation of Ordinary Riprap			
Riprap Designation	% Smaller Than Given Size by Weight	Intermediate Rock Dimensions (inches)	d ₅₀ (inches)*
Type VL	70-100	12	6**
	50-70	9	
	35-50	6	
	2-10	2	
Type L	70-100	15	9**
	50-70	12	
	35-50	9	
	2-10	3	
Type M	70-100	21	12**
	50-70	18	
	35-50	12	
	2-10	4	
Type H	70-100	30	18
	50-70	24	
	35-50	18	
	2-10	6	
Type VH	70-100	42	24
	50-70	33	
	35-50	24	
	2-10	9	

* d₅₀ = mean particle size (intermediate dimension) by weight.
** Mix VL and L riprap with 30% (by volume) topsoil and bury it with 6+ inches of topsoil, all vibration compacted, and revegetate.

Hydraulic Structures Chapter 9

Figure 9-34. Riprap apron detail for culverts in-line with the channel

9-68 Urban Drainage and Flood Control District September 2017
Urban Storm Drainage Criteria Manual Volume 2

RIPRAP APRON CALCULATION - Overflow Spillway

Design Point

Spillway

Outlet Variables

Number of Culverts

1

Pipe diameter, Do

30 inches

Total Discharge, Q

29.67 cfs

Discharge, Qo

29.67 cfs

Allowable Velocity, V

5 fps

Is tailwater elevation known?

no

Depth of tailwater

0 ft

5 fps for erosive soils and 7 for erosion resistant soils.

Riprap Length and Size Calculations

Step 1:

$Y_t = T_w$, or $0.4 =$

0.4 ft

$At = Q_o/V =$

5.934 ft

$Y_t/D =$

0.2

$Q/D^{2.5} =$

3.0

Step 2:

From figure MD-23, expansion factor, $1/(2 \cdot \tan X) =$

2

Step 3:

Length of Protection, $L_p =$

24.67 ft

Step 4:

If single conduit, use $Q_o/D_o^{1.5} =$

7.5

If multiple conduit, use $Q/W_i^{1/3} H^{1.5}$

$Y_t/D =$

0.2

$Q/WH^{0.5}$

18 in

Type H

From Figure MD-21, Riprap size, $D_{50} =$

18 in

Type H

Recommendations?

Reference

Chacpter 9 - Drainage Criteria Manual, Volume 1, Urban Drainage and Flood Control District.

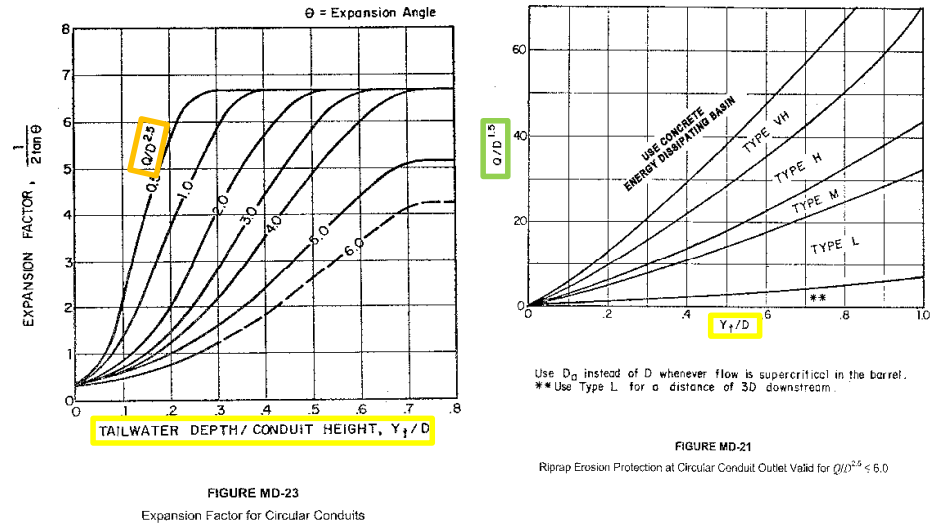


TABLE MD-7 Classification and Gradation of Ordinary Riprap			
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Type VL	70-100	12	6**
	50-70	9	
	35-50	6	
	2-10	2	
Type L	70-100	15	9**
	50-70	12	
	35-50	9	
	2-10	3	
Type M	70-100	21	12**
	50-70	18	
	35-50	12	
	2-10	4	
Type H	70-100	30	18
	50-70	24	
	35-50	18	
	2-10	6	
Type VH	70-100	42	24
	50-70	33	
	35-50	24	
	2-10	9	

* d_{50} = mean particle size (intermediate dimension) by weight.
** Mix VL and L riprap with 30% (by volume) topsoil and bury it with 6+ inches of topsoil, all vibration compacted, and revegetate.

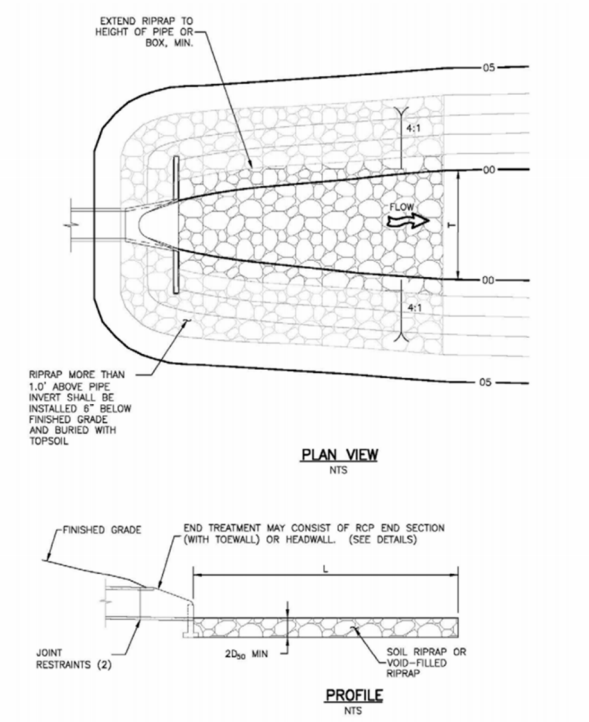


Figure 9-34. Riprap apron detail for culverts in-line with the channel

Excerpts from Previous Report

1053-1

DRAINAGE INVESTIGATION
FOR
L & M ENTERPRISES - M.R.D.
LARIMER, COUNTY, COLORADO

Prepared for

L & M Enterprises, Inc.
835 East Highway No. 56
Berthoud, Colorado 80513

October 11, 1990
Project No. PLA-017-89

CONSULTING ENGINEER

MESSNER Engineering Associates
150 East 29th Street, Suite 225
Loveland, Colorado 80538

Civil and Environmental Engineering Consultants

MESSNER

Engineering Associates

Project No. PLA-017-89
October 11, 1990

Mr. Larry Bebo
L & M Enterprises, Inc.
835 E. Hwy. 56
Berthoud, Colorado 80513

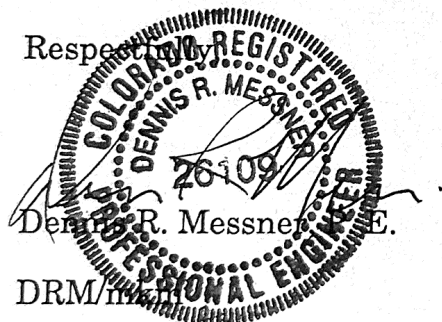
Dear Mr. Bebo,

The enclosed report represents the results of a drainage investigation for the L & M ENTERPRISES - M.R.D. as applies to the proposed and existing accesses to L& M Enterprises, Inc. and the L & M Greenhouse located in Larimer County, Colorado.

This investigation was based upon the M.R.D. site development plan; on-site observations; and available topographic information. The investigation was performed in accordance with the criteria established in the Larimer County - "Storm Drainage Criteria Manual".

Enclosed you will find the results of this investigation. If you should have any questions or desire additional information, please feel free to contact this office.

Respectfully,

A circular professional engineer seal for Dennis R. Messner, Colorado. The seal contains the text "COLORADO REGISTERED PROFESSIONAL ENGINEER" around the perimeter, "DENNIS R. MESSNER" in the center, and the number "26109" below the name. A signature is written over the seal.

Dennis R. Messner, E.

DRM/m

Enclosure

TABLE OF CONTENTS

Letter of Transmittal	i
Table of Contents	ii
Scope	1
Site Description	1
Existing Conditions	1
Proposed Development	2
Conclusions and Recommendations	2

EXHIBITS

Vicinity Map	Exhibit A
Calculations	Exhibit B
Drainage Details	Exhibit C

SCOPE

The following report represents the results of a drainage investigation for existing and future development to be known as the L & M ENTERPRISES - M.R.D., Larimer County, Colorado. The investigation was performed for L & M Enterprises, Inc. The purpose of this investigation is to determine the effects of the development on the areas existing drainage conditions and to determine the improvements, if any, and the appropriate sizing for proposed improvements so that it may be incorporated with the construction of access drives for the project. The conclusions and recommendations presented in this report are based upon the M.R.D. site development plan; proposed access construction plans; on-site observations; and the available topographic information. The analysis was performed in accordance with the Larimer County "Storm Drainage Criteria Manual".

SITE DESCRIPTION

The site is generally rectangular in shape and is $77.6\pm$ acres in area. The sites East-West dimension is approximately 1,329 feet and its North-South dimension varies from approximately 2,583 feet at the westerly boundary to approximately 2,527 feet at the easterly boundary. The site is situated approximately one-half mile east of the Town of Berthoud and abuts the southerly right-of-way of Colorado Highway 56. The site is not located within a designated floodway.

EXISTING CONDITIONS

The site is presently comprised of four distinct uses. A contracting business, L & M Enterprises, Inc., is situated on the $5\pm$ acre tract located at the northeast corner of the site. This tract is identified as Lot 3 on the attached exhibits. The existing retail greenhouse and landscaping materials business, L & M Greenhouse, is located on the $7.5\pm$ acre tract located immediately west of the contracting business. The greenhouse and associated landscaping materials business is located on Lot 4. Lot 2 is the largest of the parcels and comprises approximately 62.7 acres. This tract is currently being used for agricultural purposes. It is expected to be developed into service related retail uses along the Highway frontage with single-family residential to be situated on the balance of the tract. No near term development of this tract is anticipated. Lot 1 is a single-family residential lot with the existing Bebo residence. Lot 1 contains approximately 2.3 acres.

The site does not receive runoff from any other properties. The irrigation ditch which forms the southerly boundaries of Lots 3 and 4 is situated along the crest of a ridge traversing the site from west to east. The natural slope away from this ridge crest is 1% to 1.5%. The direction of fall away from the crest is towards the south and the north. The portion of the properties located to the west of the site on the northerly side of the ditch drain toward the north and eventually into the curb and gutter section of Highway 56. The runoff flows easterly along the gutter until the curb and gutter ends at a point on the easterly boundary of Lot 1. The runoff is then carried easterly in a roadside drainage swale. The swale is discharged into a inlet that is situated over the outlet pipe from Bacon Lake. This ultimately discharges into the little Thompson River.

PROPOSED DEVELOPMENT

The proposed construction is to consist of a new access to serve the existing greenhouse and landscaping business located on Lot 4 as well as the future development that is anticipated for Lot 2. The access is to be a dedicated public street. The existing accesses serving Lot 1 and Lot 3 are to remain.

The drainage considerations made for the existing and proposed accesses are:

1.) Only the area situated to the north of the existing irrigation ditch has been considered.

2.) The existing useage and development on Lot 3 has been considered in order to determine the volume of detention and rate of release to conform with the existing access permit requirements.

3.) Additional consideration was made for the ultimate paving of the greenhouse parking lot located on Lot 4 in order to determine the volume of detention and rate of release.

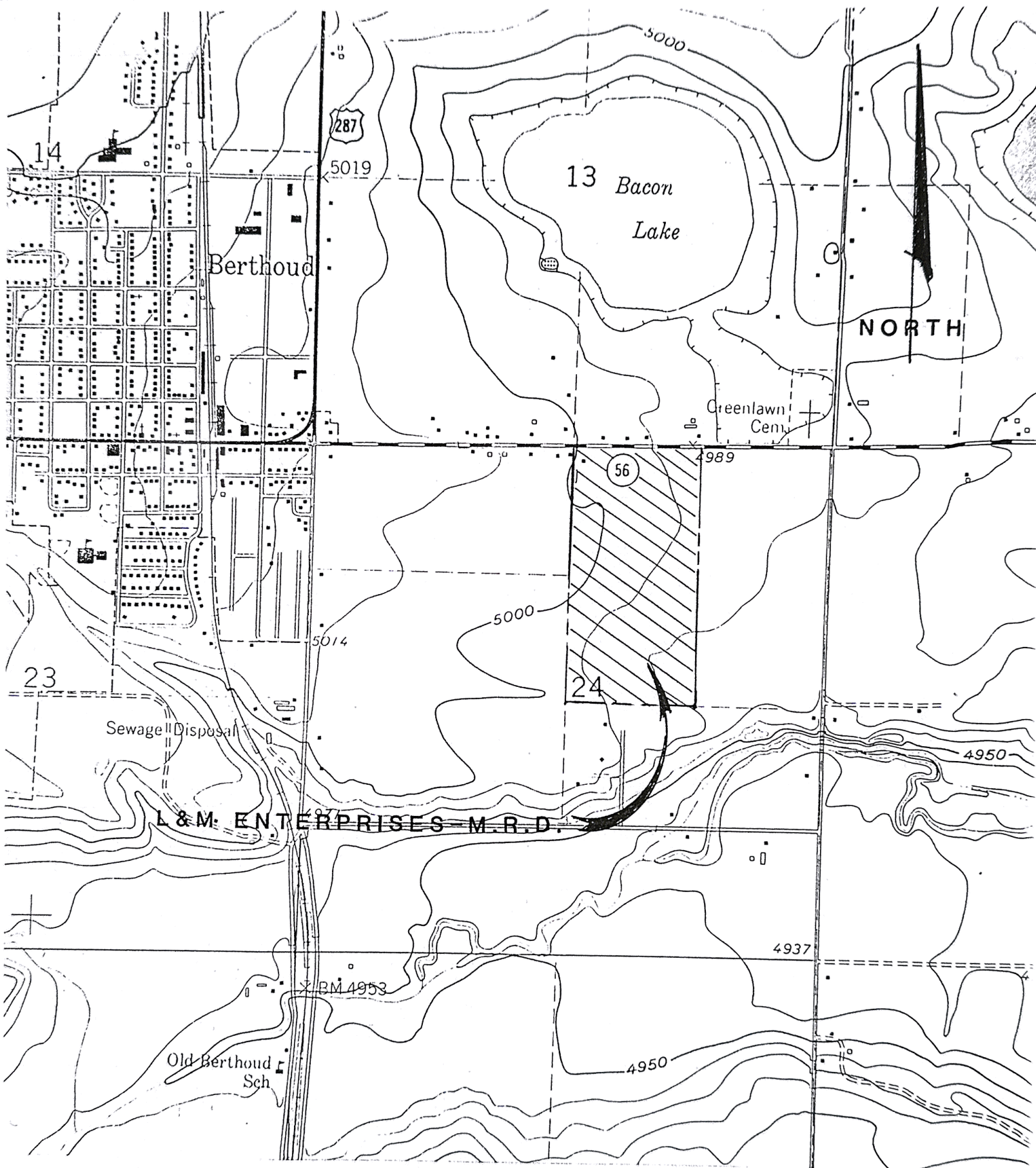
4.) No determination was made for the volume of detention and rate of release to be established on Lot 2. Due to the unknown nature of development that may occur on this lot, it is not possible to adequately project these requirements. The design and construction of these drainage improvements will be performed at the time that the property is considered for development.

CONCLUSIONS AND RECOMMENDATIONS

1. The construction as proposed will improve the existing drainage pattern to the benefit of the existing development in the vicinity.
2. Onsite detention of storm water is required by the Colorado State Department of Highways in order to discharge runoff from the site onto the existing Highway right-of-way.
3. All construction is recommended to be performed in accordance with the State of Colorado State Department of Highways-Standards and Specifications.
4. The site is not located within the designated floodway or flood plain.

VICINITY MAP

EXHIBIT "A"



VICINITY MAP

CALCULATIONS

EXHIBIT "B"

Calculations for Drainage Investigation for L & M Enterprises - M.R.D.

$$\begin{aligned}\text{Total Area} &= 77.6 \text{ acres} \pm \\ \text{Area Considered} &= 26.75 \text{ acres} \pm\end{aligned}$$

NOTE, only the area of the site that is situated north of the irrigation ditch traversing the site is considered to drain toward Highway 56.

Area "A" - located at the Northwest portion of the site that includes all of Lot 1 and all of Lot 2 that lies North of the irrigation ditch. No change from the existing conditions anticipated at this time.

$$\text{Area} = 15.3 \text{ acres} \pm$$

$$C_{10} = 0.20 \quad C_{100} = 0.35$$

$$T_c = 25 \text{ minutes} \pm$$

Rainfall Intensities:

$$I_{10} @ 25 \text{ min.} = 2.85 \text{ in./hr} \quad I_{100} @ 25 \text{ min.} = 4.6 \text{ in./hr.}$$

Runoff, Q = CIA

Therefore, the Estimated Drainage Flow from the site concentrating at Point "A"

$$Q_{10} = 8.7 \text{ c.f.s.}$$

$$Q_{100} = 24.6 \text{ c.f.s.}$$

Area "B" - includes existing greenhouse and approximately one-half of the L & M Enterprises building and surrounding concrete pavement.

$$\text{Area} = 5.25 \text{ acres} \pm$$

Area of Impervious Coverage (Building and Concrete Pavement) = 2.15 acres $\pm$

Therefore, Impervious Coverage = 41%

$$C_{10} = 0.26 \quad C_{100} = 0.40$$

$$T_c = 15 \text{ minutes}$$

Rainfall Intensities:

$$I_{10} @ 15 \text{ min.} = 3.65 \text{ in./hr} \quad I_{100} @ 15 \text{ min.} = 6.0 \text{ in./hr.}$$

Therefore, the Estimated Drainage Flow Concentrating at "B"

$$Q_{10} = 8.6 \text{ c.f.s.}$$

$$Q_{100} = 17.3 \text{ c.f.s.}$$

Area "C" - includes approximately one-half of the L & M Enterprises building and surrounding concrete pavement and the undeveloped portion to the South and West.

$$\text{Area} = 6.2 \text{ acres} \pm$$

Area of Impervious Coverage (Building and Concrete Pavement) = 1.4 acres $\pm$

Therefore, Impervious Coverage = 23%

$$C_{10} = 0.30 \quad C_{100} = 0.45$$

(Area "C" calculations cont.)

$$T_c = 20 \text{ minutes}$$

Rainfall Intensities:

$$I_{10} @ 20 \text{ min.} = 3.25 \text{ in./hr} \quad I_{100} @ 20 \text{ min.} = 5.2 \text{ in./hr.}$$

Therefore, the Estimated Drainage Flow Concentrating at "C"

$$Q_{10} = 6.05 \text{ c.f.s.}$$

$$Q_{100} = 14.5 \text{ c.f.s.}$$

Total Area draining to Northeast corner of site.

$$\text{Area} = 26.75 \text{ acres} \pm$$

Area of Impervious Coverage (Building and Concrete Pavement) = 3.55 acres $\pm$

Therefore, Impervious Coverage = 15%

$$C_{10} = 0.27 \quad C_{100} = 0.41$$

$$T_c = 30 \text{ minutes}$$

Rainfall Intensities:

$$I_{10} @ 30 \text{ min.} = 2.55 \text{ in./hr} \quad I_{100} @ 30 \text{ min.} = 4.2 \text{ in./hr.}$$

Therefore, the Estimated Drainage Flow Concentrating at the Northeast Corner

$$Q_{10} = 18.4 \text{ c.f.s.}$$

$$Q_{100} = 46.1 \text{ c.f.s.}$$

DETENTION SIZING

Onsite Detention is to be required by the Colorado State Department of Highways.

The Urban Drainage and Flood Control District's criteria has been used. This is an empirical formula method, where:

$$V = KA$$

$$K_{100} = (1.78 \times I - 0.002 \times I^2 - 3.56) / 1000$$

$$K_{10} = (0.95 \times I - 1.90) / 1000$$

I = Developed Basin imperviousness (%)

A = Basin Area (Acres)

V = Volume (Acre-Feet)

$$Q_{100} = 1.00 \times A$$

$$Q_{10} = 0.24 \times A$$

Q = Release Rate (Cubic-Feet-Per-Second)

Area "B"

Detention Sizing

$$I = 41\%$$

$$\text{Area} = 5.25 \text{ Acres}$$

$$K_{10} = (0.95 \times 41 - 1.90) / 1000 = 0.037$$

$$K_{100} = (1.78 \times 41 - 0.002 \times 41^2 - 3.56) / 1000 = 0.066$$

$$V_{10} = K_{10} A = 0.037 \times 5.25 = 0.195 \text{ Ac-Ft} = 8,473 \text{ cu. ft.}$$

$$V_{100} = K_{100} A = 0.066 \times 5.25 = 0.347 \text{ Ac-Ft} = 15,107 \text{ cu.ft.}$$

$$Q_{10} = 0.24 \times 5.25 = 1.26 \text{ c.f.s.}$$

$$Q_{100} = 1.00 \times 5.25 = 5.25 \text{ c.f.s.}$$

Outlet Sizing

$$\text{Weir Equation } Q = CLH^{3/2}$$

$$Q = \text{Discharge (c.f.s.)}$$

$$C = \text{Weir Coefficient}$$

$$L = \text{Length (feet)}$$

$$H = \text{Total Energy Head (feet)}$$

$$L = Q / CH^{3/2}$$

$$L_{10} = 1.26 / (2.85 \times 0.50^{3/2}) = 1.25 \text{ ft.} = 1 \text{ ft.} - 3 \text{ in.}$$

$$L_{100} = 5.25 / (2.85 \times 0.22^{3/2}) = 17.85 \text{ ft.} = 17 \text{ ft.} - 10\text{-}1/4 \text{ in.}$$

Area "C"

Detention Sizing

$$I = 23\%$$

$$\text{Area} = 6.2 \text{ Acres}$$

$$K_{10} = (0.95 \times 23 - 1.90) / 1000 = 0.02$$

$$K_{100} = (1.78 \times 23 - 0.002 \times 23^2 - 3.56) / 1000 = 0.04$$

$$V_{10} = K_{10} A = 0.02 \times 6.2 = 0.124 \text{ Ac-Ft} = 5,388 \text{ cu. ft.}$$

$$V_{100} = K_{100} A = 0.04 \times 6.2 = 0.225 \text{ Ac-Ft} = 9,809 \text{ cu.ft.}$$

$$Q_{10} = 0.24 \times 6.2 = 1.5 \text{ c.f.s.}$$

$$Q_{100} = 1.00 \times 6.2 = 6.2 \text{ c.f.s.}$$

Outlet Sizing

$$L = Q / CH^{3/2}$$

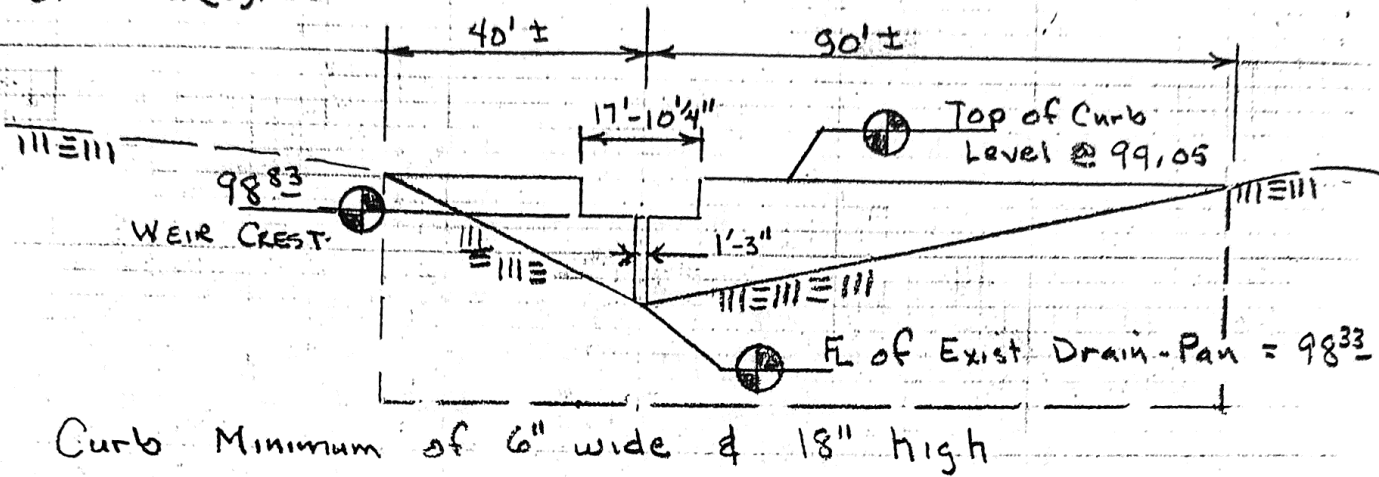
$$L_{10} = 1.5 / (2.85 \times 1.0^{3/2}) = 0.53 \text{ ft.} = 0 \text{ ft.} - 6\text{-}5/16 \text{ in.}$$

$$L_{100} = 6.2 / (2.85 \times 0.5^{3/2}) = 6.15 \text{ ft.} = 6 \text{ ft.} - 1\text{-}13/16 \text{ in.}$$

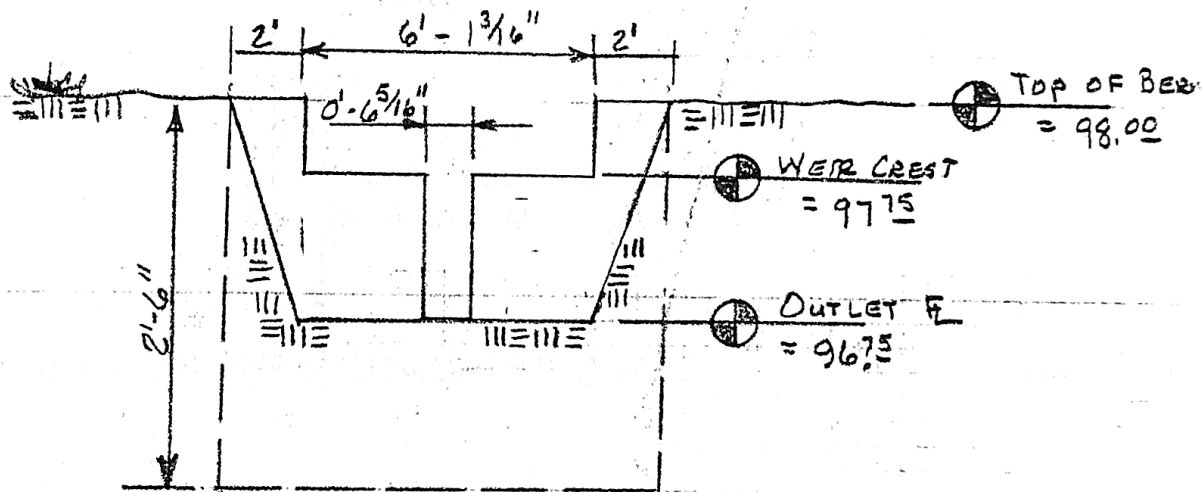
DRAINAGE DETAILS

EXHIBIT "C"

CURB @ Pt. "B" w/ OUTLET CONTROL
OPENING(S).



CONCRETE CONTROL STR. @ Pt. "C"



CONCRETE TO BE MINIMUM OF 6" THICK.

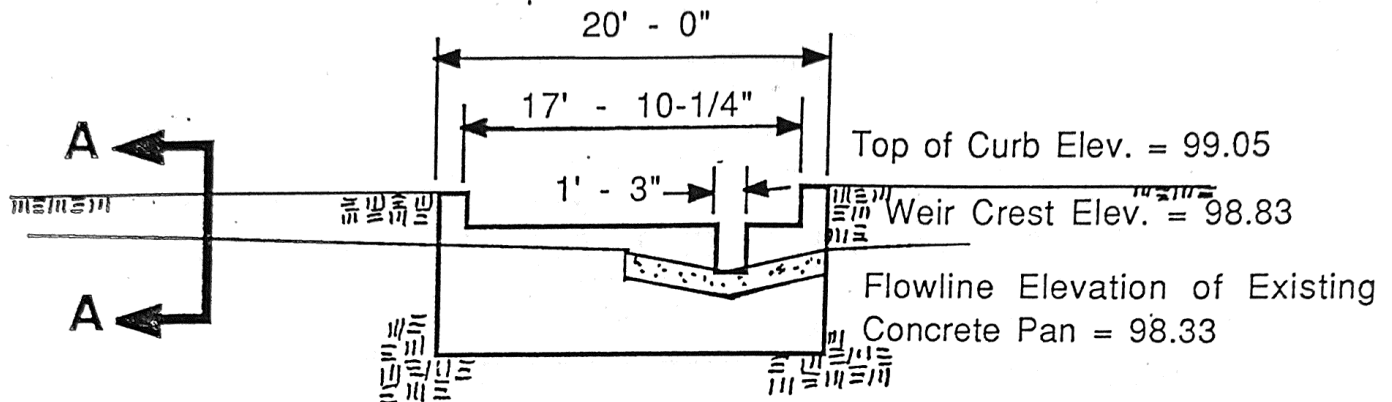
10-7-90
L&M

L&M ENTERPRISES
#HYD-017-89.

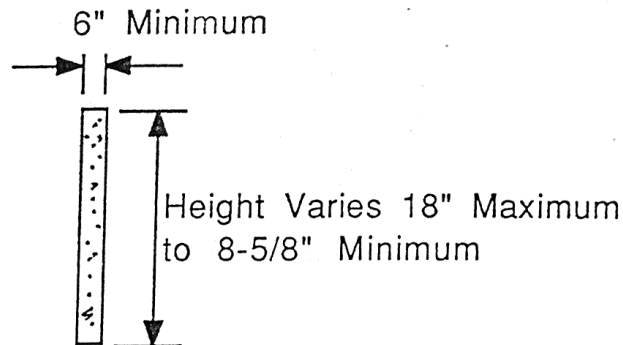
DRAINAGE DETAILS

DISCHARGE CONTROL OPENING @ DESIGN PT. "B"

Extend Top of Berm Level at Elev. 99.05 to Point of Match

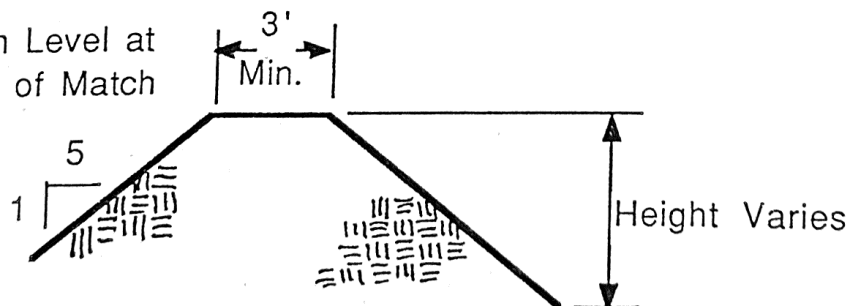


CONCRETE CURB / CONTROL OPENING



SECTION THRU CONCRETE CURB

Extend Top of Berm Level at Elev. 99.05 to Point of Match



SECTION A - A
(Earth Berm)

Note that berm may be widened and side slopes flattened to match existing conditions

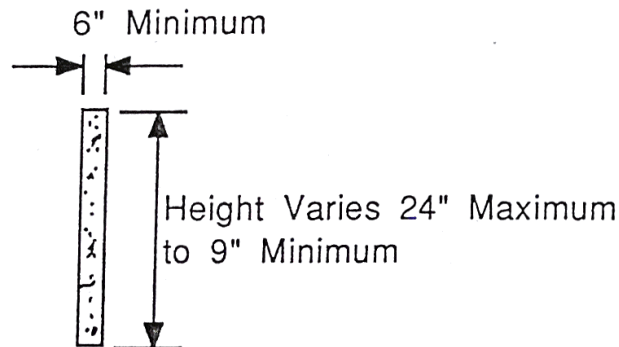
Revised: Sept. 24, 1991
By: DRM

L & M ENTERPRISES, INC.
HYD - 017 - 89

DRAINAGE DETAIL
SHEET 1 of 2

Diagram illustrating the cross-section of a weir structure. The structure is shown with a central opening and a concrete pan below it. Key dimensions and elevations are provided:

- Top of Curb Elev. = 98.00
- Weir Crest Elev. = 97.75
- Flowline Elevation of Exist Concrete Pan = 96.75
- Dimensions (from left to right):
 - 9' - 0"
 - 6' - 1-3/16"
 - 0' - 6-5/16"



A diagram of a vertical column of height H . A horizontal force is applied at the top of the column, represented by two arrows pointing in opposite directions. The column is shown with a dashed line indicating its original position and a solid line showing its deflected shape. The height H is indicated by a vertical double-headed arrow on the right side of the column.

1 5

Revised: Sept. 24, 1991
By: DRM

DRAINAGE DETAIL
SHEET 2 of 2

Charts and Figures

Town of Berthoud Engineering and Infrastructure Standards

1. Drainage designs for areas in and around the Town of Berthoud should use the depth-duration frequency information provided in the Precipitation-Frequency Atlas of the Western United States (Volume 2 - Colorado), published by NOAA. The NOAA Atlas can be accessed on the NOAA website.

Table 600-1, shall be used but may be superseded if more recent NOAA data is published for the Town. The table below is based on NOAA Atlas 14, Volume 8, Version 2 for Berthoud, Colorado.

Table 600- 1: Point Precipitation Frequency Estimates in Inches

Estimated Rainfall Depth in Inches									
	Average Return Interval (ARI)								
	(Years)								
Duration	1	2	5	10	25	50	100	200	500
5-minutes	0.233	0.277	0.37	0.469	0.635	0.787	0.961	1.16	1.45
10-minutes	0.341	0.405	0.542	0.686	0.93	1.15	1.41	1.7	2.13
15-minutes	0.416	0.494	0.661	0.837	1.13	1.41	1.72	2.07	2.6
30-minutes	0.553	0.658	0.881	1.12	1.51	1.87	2.28	2.74	3.44
60-minutes	0.684	0.811	1.08	1.38	1.87	2.32	2.84	3.44	4.32
2-hours	0.816	0.963	1.29	1.63	2.23	2.78	3.41	4.13	5.21
3-hours	0.899	1.06	1.41	1.79	2.44	3.04	3.73	4.52	5.71
6-hours	1.07	1.26	1.66	2.09	2.81	3.48	4.24	5.11	6.4
24-hours	1.56	1.84	2.37	2.88	3.68	4.37	5.14	5.98	7.2

C. The Rational Method

1. The Rational Method is one method for determining runoff from a proposed development or road construction project. Note that it should not be used for basins greater than 160 acres. The MHFD spreadsheets can also be used for basins that are no greater than 160 acres. Refer to the rainfall chapter of the MHFD USDCM for more information regarding the rainfall parameters required to use the Rational Method.

D. Larger Basin Rainfall Methods (Basins sizes 160 acres and greater)

1. As noted above, the Rational Method should not be used to determine runoff for basins larger than 160 acres. Where areas are larger than 160 acres that have drainage characteristics similar to an urban area, the Colorado Urban Hydrograph Procedure (CUHP) is an acceptable model for determining runoff amounts. The CUHP model can be used for basins from 0 to 3,000 acres. The parameter adjustments provided in the runoff chapter of the MHFD USDCM Manual (Volume 1) should be used when dealing with basins that are larger than 160 acres.
2. The CUHP model is not applicable in non-urban areas, including those areas in Larimer County that are outside of the Denver metropolitan area. The U.S. Army Corps of Engineers (USACE) HEC-HMS model is more applicable for mixed suburban-agricultural areas. The HEC-HMS model can be used on watersheds and drainage basins larger than 160 acres provided the modeling follows the parameters in the HEC- HMS User's Manual, the HEC-HMS Technical Reference Manual, the HEC-HMS Application's Guide.

D. Differences between the Town of Berthoud and the MHFD

1. The Town of Berthoud will allow the use of other modeling methodologies on a case-by-case basis when complete documentation of all assumptions is provided. The Town of Berthoud reserves the right to review alternative methods and compare with other commonly used approaches, including those discussed in the MHFD USDCM Manual.

Table 600- 2: Recommended Percentage Imperviousness Values

Land Use or Surface Characteristics	Percentage of Imperviousness
Business:	
Commercial Areas	95
Neighborhood Area	85
Residential Lots: (lot area only)	
Single-Family, 0.25 acres or less	45
Single-Family, 0.25 - 0.75 acres	30
Single Family, 0.75 acres or larger	20
Multi-Family (attached)	60
Multi-Family (detached)	75
Apartments	80
Industrial:	
Light Areas	80
Heavy Areas	90
Parks and Cemeteries	10
Playgrounds	25
Schools	55
Railroad Yard Areas	50
Undeveloped Areas	
Historic Flow Analysis	2
Greenbelts, Agricultural	2
Off-site flow analysis (when land use not defined)	45
Streets:	
Paved	100
Gravel (packed)	40
Drive and Walks	90
Roofs	90
Lawns, sandy soil	2
Lawns, clayey soil	2

602.4 Roadway and Street Drainage

A. General Criteria

1. When runoff in the street exceeds allowable limits, a storm sewer system or open channel is required to convey the excess flows.
2. Design Criteria Based on Frequency and Magnitude: The design criteria for the collection and conveyance of storm water runoff on public streets are based on an allowable frequency and magnitude of traffic interference. The primary design objective shall be to keep the depth and spread (encroachment) of stormwater on the street below an acceptable value for a given storm event.

Know what's **below**.
Call before you dig.

HARVEST 47 SUBDIVISION
CONSTRUCTION DOCUMENTS
OVERALL GRADING & DRAINAGE PLAN

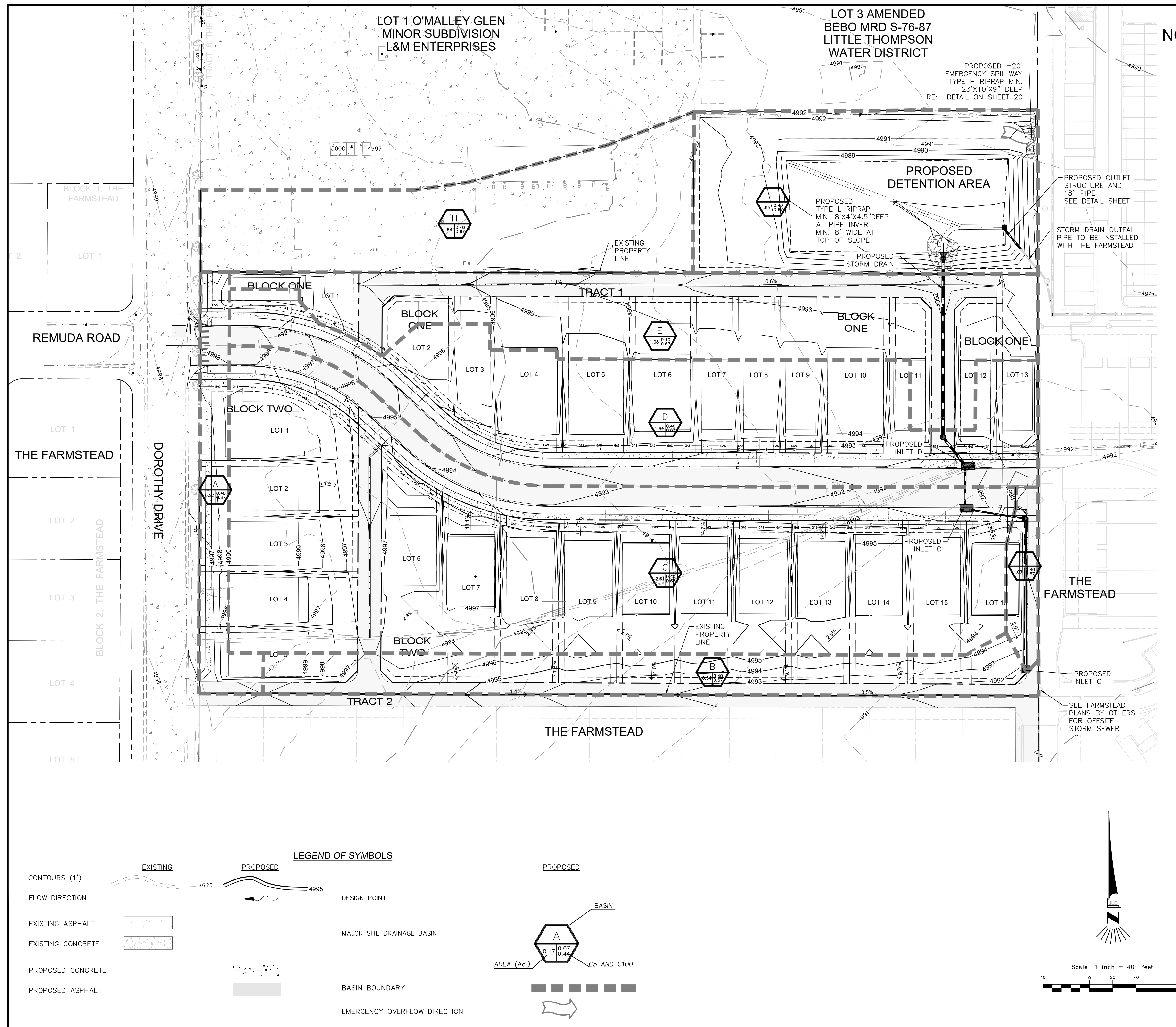
LOCATED IN THE NE 1/4, SECTION 24, TOWNSHIP 4 NORTH, RANGE 69 WEST
TOWN OF BERTHOUD, COUNTY OF LARIMER, STATE OF COLORADO

[illegible]

<i>Design</i>	<i>Drawn</i>
<i>Checked TWC</i>	<i>Checked TWC</i>
<i>Date</i> NOVEMBER 20, 2023	
<i>Job No.</i> 1053-1	
<i>D-</i>	<i>HarvestCD_GR</i>

SHEET
C-5

5 OF 20 SHEETS



17 OF 20 SHEETS

IP-1. BLOCK AND ROCK SOCK SUMP OR ON GRADE
INLET PROTECTION

BLOCK AND CURB SOCK INLET PROTECTION INSTALLATION NOTES

1. SEE ROCK SOCK DESIGN DETAIL FOR INSTALLATION REQUIREMENTS.
2. CONCRETE "CINDER" BLOCKS SHALL BE LAID ON THEIR SIDES AROUND THE INLET IN A SINGLE ROW, ABUTTING ONE ANOTHER WITH THE OPEN END FACING AWAY FROM THE CURB.
3. GRAVEL BAGS SHALL BE PLACED AROUND CONCRETE BLOCKS, CLOSELY ABUTTING ONE ANOTHER AND JOINED TOGETHER IN ACCORDANCE WITH ROCK SOCK DESIGN DETAIL.



1. SEE ROCK SOCK DESIGN DETAIL INSTALLATION REQUIREMENTS.
2. PLACEMENT OF THE SOCK SHALL BE APPROXIMATELY 30 DEGREES FROM PERPENDICULAR IN THE OPPOSITE DIRECTION OF FLOW.
3. SOCKS ARE TO BE FLUSH WITH THE CURB AND SPACED A MINIMUM OF 5 FEET APART.
4. AT LEAST TWO CURB SOCKS IN SERIES ARE REQUIRED UPSTREAM OF ON-GRADE INLET.

1. SEE PLAN VIEW FOR:
 - LOCATION OF INLET PROTECTION.
 - TYPE OF INLET PROTECTION (IP.1, IP.2, IP.3, IP.4, IP.5, IP.6)
2. INLET PROTECTION SHALL BE INSTALLED PROMPTLY AFTER INLET CONSTRUCTION OR PAVING IS COMPLETE (TYPICALLY WITHIN 48 HOURS). IF A RAINFALL/RUNOFF EVENT IS FORECAST, INSTALL INLET PROTECTION PRIOR TO ONSET OF EVENT.
3. MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

4. SEDIMENT ACCUMULATED UPSTREAM OF INLET PROTECTION SHALL BE REMOVED AS NECESSARY TO MAINTAIN BMP EFFECTIVENESS, TYPICALLY WHEN STORAGE VOLUME REACHES 50% OF CAPACITY, A DEPTH OF 6" WHEN SILT FENCE IS USED, OR 1/4 OF THE HEIGHT FOR STRAW RAJES.

5. INLET PROTECTION IS TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS PERMANENTLY STABILIZED, UNLESS THE LOCAL JURISDICTION APPROVES EARLIER REMOVAL OF INLET PROTECTION IN STREETS.

6. WHEN INLET PROTECTION AT AREA INLETS IS REMOVED, THE DISTURBED AREA SHALL BE COVERED WITH TOP SOIL, SEEDED AND MULCHED, OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

NOTE: THE DETAILS INCLUDED WITH THIS FACT SHEET SHOW COMMONLY USED, CONVENTIONAL METHODS OF INLET PROTECTION IN THE DENVER METROPOLITAN AREA. THERE ARE MANY PROPRIETARY INLET PROTECTION METHODS ON THE MARKET. UDPC NEITHER ENDORSES NOR DISCOURAGES USE OF PROPRIETARY INLET PROTECTION; HOWEVER, IN THE EVENT PROPRIETARY METHODS ARE USED, THE APPROPRIATE DETAIL FROM THE MANUFACTURER MUST BE INCLUDED IN THE SWMP AND THE BMP MUST BE INSTALLED AND MAINTAINED AS SHOWN IN THE MANUFACTURER'S DETAILS.

NOTE: SOME MUNICIPALITIES DISCOURAGE OR PROHIBIT THE USE OF STRAW BALES FOR INLET PROTECTION. CHECK WITH LOCAL JURISDICTION TO DETERMINE IF STRAW BALE INLET PROTECTION IS ACCEPTABLE.

TRENCHED SEDIMENT CONTROL LOG

SCL-1. TRENCHED SEDIMENT CONTROL LOG

1. SEE PLAN VIEW FOR LOCATION AND LENGTH OF SEDIMENT CONTROL LOGS.
2. SEDIMENT CONTROL LOGS THAT ACT AS A PERIMETER CONTROL SHALL BE INSTALLED PRIOR TO ANY UPGRADE/LAND-DISTURBING ACTIVITIES.
3. SEDIMENT CONTROL LOGS SHALL CONSIST OF STRAW, COMPOST, EXCELISOR OR COCONUT FIBER MATS SHALL BE PLACED ON TOP OF ANY NOXIOUS WEED SEEDS OR DEFECTS INCLUDING RIPS, HOLES AND OBVIOUS WEAR.
4. SEDIMENT CONTROL LOGS MAY BE USED TO SMALL CHECK DAMS IN DITCHES AND SWALES. HOWEVER, THEY SHOULD NOT BE USED IN PERENNIAL STREAMS.
5. IT IS RECOMMENDED THAT SEDIMENT CONTROL LOGS BE TRENCHED INTO THE GROUND TO A MINIMUM OF 12" DEEP. IF THE LOGS ARE NOT TRENCHED TO A MINIMUM OF 12" DEPTH IS NOT FEASIBLE AND/OR DESIRABLE (SHORT TERM INSTALLATION WITH DESIRE NOT TO TRENCH) THE LOGS SHALL BE PLACED ON TOP OF ANY ACCEPTABLE WEED MATS. FOR MOST ROBUST STAKING, COMPOST LOGS THAT ARE 8 LB/FT DO NOT NEED TO BE TRENCHED.

6. THE UPHILL SIDE OF THE SEDIMENT CONTROL LOG SHALL BE BACKFILLED WITH SOIL OR FILTER MATERIAL THAT IS FREE OF ROCKS AND DEBRIS. THE LOG SHALL BE TIGHTLY COMPACTED INTO THE SHAPE OF A RIGHT TRIANGLE USING A SHOVEL OR WEIGHTED LAWN ROLLER OR BLOWN IN PLACE.

7. FOLLOW MANUFACTURERS' GUIDANCE FOR STAKING. IF MANUFACTURERS' INSTRUCTIONS DO NOT SPECIFY SPACING, STAKES SHALL BE PLACED ON 4' CENTERS AND EMBEDDED A MINIMUM OF 6" INTO THE GROUND. 3" OF THE STAKE SHALL PROTRUDE FROM THE TOP OF THE LOG. WHEN STAKES ARE PRIOR TO INSTALLATION SHALL BE REPLACED. COMPOST LOGS SHOULD BE STAKED 10' ON CENTER.

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. SEDIMENT ACCUMULATED UPSTREAM OF SEDIMENT CONTROL LOG SHALL BE REMOVED AS NEEDED TO MAINTAIN FUNCTIONALITY OF THE BMP, TYPICALLY WHEN DEPTH OF ACCUMULATED SEDIMENTS IS APPROXIMATELY $\frac{1}{2}$ OF THE HEIGHT OF THE SEDIMENT CONTROL LOG.

5. SEDIMENT CONTROL LOG SHALL BE REMOVED AT THE END OF CONSTRUCTION. COMPOST FROM COMPOST LOGS MAY BE LEFT IN PLACE AS LONG AS BAGS ARE REMOVED AND THE AREA SEEDED. IF DISTURBED AREAS EXIST AFTER REMOVAL, THEY SHALL BE COVERED WITH TOP SOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.

(DETAILS ADAPTED FROM TOWN OF PARKER, COLORADO, JEFFERSON COUNTY, COLORADO, DOUGLAS COUNTY, COLORADO, AND CITY OF AURORA, COLORADO, NOT AVAILABLE IN AUTOCAD)

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

WASHOUT AREA PLAN

CWA-1. CONCRETE WASHOUT AREA

1. SEE PLAN VIEW FOR:
-CWA INSTALLATION LOCATION.

2. DO NOT LOCATE ANY UNLOADED CWA WITHIN 400' OF ANY NATURAL DRAINAGE PATHWAY OR WATERBODY. DO NOT LOCATE WITHIN 1,000' OF ANY WELLS OR DRINKING WATER SOURCES. IF SITE CONSTRAINTS MAKE THIS INFEASIBLE, OR IF HIGHLY PERMEABLE SOLIDS EXIST ON SITE, THIS AREA MUST BE ISOLATED BY A 10' HIGH WALL WITH A MIN. THICKNESS OF 18" AND SURFACE STORAGE ALTERNATIVES USING PREFABRICATED CONCRETE WASHOUT DEVICES OR A LINED ABOVE GROUND STORAGE ARE SHOULD BE USED.
3. THE CWA SHALL BE INSTALLED PRIOR TO CONCRETE PLACEMENT ON SITE.
4. CWA SHALL INCLUDE A FLAT SUBSURFACE PIT THAT IS AT LEAST 8" BY 8" SLOPES LEADING OUT OF THE SUBSURFACE PIT SHALL BE 3:1 OR FLATTER. THE PIT SHALL BE AT LEAST 3' DEEP.
5. BERM SURROUNDING SLOES AND BACK OF THE CWA SHALL HAVE MINIMUM HEIGHT OF 1'.
6. VEHICLE TRACKING PAD SHALL BE SLOPED 2% TOWARDS THE CWA.
7. SIGNS SHALL BE PLACED AT THE CONSTRUCTION ENTRANCE, AT THE CWA, AND AT THE BERM. SIGNS AS INDICATED ON CLEAR MAPS SHOULD LOCATE THE LOCATION OF THE CWA TO OPERATORS OF CONCRETE TRUCKS AND PUMP ROPS.
8. USE EXCAVATED MATERIAL FOR PERMETER BERM CONSTRUCTION.

TEMPORARY OUTLET PROTECTION PLAN



SIZING TABLE			
PIPE DIAMETER, Do (INCHES)	DISCHARGE, Q (CFS)	APRON LENGTH, La (FT)	RIPRAP D50 DIAMETER MIN (INCHES)
8	2.5 5	5 10	4 6
12	5 10	10 13	4 6
18	10	10	6
	20	16	9
	30	23	12
24	40	26	16
	30	16	9
	40	25	9
	50	26	12
	60	38	16

OP-1. TEMPORARY OUTLET PROTECTION

1. SEE PLAN VIEW FOR
-LOCATION OF OUTLET PROTECTION.
-DIMENSIONS OF OUTLET PROTECTION.
2. DETAIL IS INTENDED FOR PIPES WITH SLOPE $\leq 10\%$. ADDITIONAL EVALUATION OF RIPRAP SIZING AND OUTLET PROTECTION DIMENSIONS REQUIRED FOR STEEPER SLOPES.
3. TEMPORARY OUTLET PROTECTION INFORMATION IS FOR OUTLETS INTENDED TO BE UTILIZED LESS THAN 2 YEARS.

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

(DETAILS ADAPTED FROM AURORA, COLORADO AND PREVIOUS VERSION OF VOLUME 3, NOT AVAILABLE IN AUTOCAD)

November 2010
Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3
TOP-3



Town of Berthoud
807 Mountain Ave.
P.O. Box 1229
Berthoud, CO 80513
970.532.2643

REVIEW COMMENTS

DATE: November 1, 2023

Project Name: Harvest 47

Project Type: Final Plat

Location: Lot 2, O'Malley Glen Minor Subdivision

Project Applicant: Larry Bebbo

It has been approximately four weeks since your submittal. As promised, the Town of Berthoud is providing comments to you at this time to advance the development review process.

**THE FOLLOWING AGENCIES RECEIVED OR WERE MAILED THIS SUBMITTAL
AND THEIR RESPONSES ARE PROVIDED ON THE FOLLOWING PAGES:**

TOWN OF BERTHOUD

- ☐ Engineer/Public Works Director
- ☐ Project Planner
- ☐ Town Attorney
- ☐ Town Arborist
- ☐ Traffic Consultant

OTHER AGENCIES

- ☐ Berthoud Fire Protection District
- ☐ Little Thompson Water District
- ☐ Ditch Companies
- ☐ CDOT
- ☐ Larimer County Engineering
- ☐ Larimer County Health Dept.
- ☐ Larimer County Planning

Specific and complete comments are provided under each individual agency's section. Please read the entire report and address each comment. If you have any questions or concerns regarding any comment, contact the Planning Department or the individual agency to clarify the statement and reach an understanding. It is in your interest to do so in order to streamline the review process.

"NO RESPONSE" indicates an agency has not sent any comments to the project planner before the writing of this summary.

If you have any questions concerning comments on your project or the development review process, please feel free to contact the Planning Department at 281.352.2709.

TECHNICAL REVIEW COMMITTEE COMMENTS

DATE: 12/20/2023

Project Name: Harvest 47

PLANNING

Response received: 12/20/2023

Community Development Department

Will Charles will.charles@baselinecorp.com

1. The final plat has progressed enough to move forward for hearings. This project will be scheduled for the January 11 hearing.
2. Add a signature block for Planning Commission Chairperson. The Larimer County signature block can be removed if space is needed (they no longer sign these).
3. An approved DA will be required.
4. A signed and finalized agreement between Farmstead and Harvest 47 for the southern alley will be required.

TOWN OF BERTHOUD, COLORADO

NOTICE OF PUBLIC HEARING
HARVEST 47 SUBDIVISION FINAL PLAT

PUBLIC NOTICE IS HEREBY GIVEN of a public hearing before the Berthoud Planning Commission on Thursday, January 11, 2024 at 6:00 p.m. to consider the applicant's request for the Harvest 47 Subdivision Final Plat. The request is for the platting of 29 residential lots on 5.98 acres located at 735 Mountain Avenue. The public hearing will be held at Town Hall, 807 Mountain Avenue, Berthoud 80513.

For additional information, please contact the Community Development Department at 970-532-2643.

Given and posted this _____ day of _____, 202__.

Published: Loveland Reporter Herald _____