

Water and Sanitation Report

WATER & SANITATION REPORT

for

Greenough Heights

Legally Described as:

THAT PROPERTY DESCRIBED IN BOOK 1046, AT PAGE 794, MICRO RECORDS OF MISSOULA COUNTY AND FURTHER SHOWN AS AREA'S 15 AND 16 ON DEED EXHIBIT NO. 3161, RECORDS OF MISSOULA COUNTY, LOCATED IN THE NORTHEAST ONE-QUARTER OF THE NORTHEAST ONE-QUARTER (NE1/4NE1/4) OF SECTION 22, TOWNSHIP 13 NORTH, RANGE 19 WEST, PRINCIPAL MERIDIAN, MONTANA, MISSOULA COUNTY MONTANA

Published: July 2, 2021

Prepared For:

Greenough Heights LLC
1412 Ashley Drive
Virginia Beach, VA 23454

Prepared By:

IMEG
1817 South Avenue West, Suite A
Missoula, MT 59801

J.1. Map. A vicinity map or plan that shows:

- a. The location, within 100 feet outside of the exterior property line of the subdivision and on the proposed lots, of flood plains; surface water features; springs; irrigation ditches;
A vicinity map is included showing the location of the property in relation to the surrounding area. A more detailed and extensive exhibit meeting the requirements of a Montana Department of Environmental Quality (MDEQ) Lot Layout Exhibit is provided in the Supplemental Data Sheets (Section A) showing all the required information outlined in Section J.1 of the subdivision application and Section J.3 of the subdivision application. There are no irrigation ditches that cross through the property or are located within 100 feet outside of the exterior property line of the subdivision. The surface water and floodplain associated with Rattlesnake Creek is within 100 feet of the subdivision property but not on the subdivision. There is a small intermittent drainage way on the southeast edge of our subdivision site that can potentially have surface water throughout the year. Both locations are shown on the Supplemental Data Sheets.
- b. Existing, previously approved, and, for parcels fewer than 20 acres, proposed water wells and wastewater treatment systems; for parcels less than 20 acres, mixing zones;
Existing on the subdivision property is an existing home that was built in 1940 according to the property tax database. This home is served by an existing city water line and an onsite wastewater system that does not have a permit record. More than likely this system is a cesspool, meaning there is no septic tank. The house and the wastewater and water systems will be abandoned and removed prior to subdivision construction. The cesspool will be appropriately abandoned according to the Missoula City-County Health Code, Regulation 1.

All existing wastewater treatment systems have been shown within 100 feet of the property boundary. The neighboring septic systems do not have mixing zones associated with them as the sources predate 1993.

- c. The representative drainfield site used for the soil profile description; and
Onsite wastewater systems utilizing drainfields are not proposed for this site.
- d. The location, within 500 feet outside of the exterior property line of the subdivision, of public water and sewer facilities.
The location of existing public water and sewer facilities adjacent and surrounding the subdivision have been shown on the Supplemental Data Sheets.

J.2. Description. A description of the proposed subdivision's water supply systems, storm water systems, solid waste disposal systems, and wastewater treatment systems, including whether the water supply and wastewater treatment systems are individual, shared, multiple user, or public as those systems are defined in rules published by the Montana Department of Environmental Quality (DEQ). **The proposed subdivision will be served by Missoula Water and City of Missoula Sewer. An Intent to Serve letter was issued by Missoula Public Works and Mobility Department to IMEG on April 28, 2021. This Intent to Serve letter is included in Section D of this application. A new water main will be extended from the existing water main located in Peggio Ln and onto the subdivision and will loop through the alley back to itself. The proposed sewer will be connected from each individual house utilizing E-One pumps that will connect to a force main located in the subdivision road and will connect to the existing gravity sewer main located on the north side of Greenough Drive. The storm water system will be comprised of onsite mitigation and infiltration based on Missoula City requirements, see Grading and Drainage Report in Section D of this application for more details on the storm water system.**

J.3. Lot Layout. A drawing of the conceptual lot layout at a scale no smaller than 1 inch equal to 200 feet that shows all information required for a lot layout document in rules adopted by the Montana Department of Environmental Quality pursuant to 76-4-104, MCA.

A drawing of the Supplemental Data Sheets at a scale of 1-inch equals 200 feet that shows all of the information required pursuant to 76-4-104, MCA is included.

J.4. Suitability. Evidence of suitability for new on-site wastewater treatment systems that, at a minimum, include:

- a. A soil profile description from a representative drain-field site identified on the vicinity map that complies with standards published by the Montana Department of Environmental Quality;
No drainfields are proposed; this requirement is not applicable.
- b. Demonstration that the soil profile contains a minimum of 4 feet of vertical separation distance between the bottom of the permeable surface of the proposed wastewater treatment system and a limiting layer; and
No drainfields are proposed; this requirement is not applicable.
- c. In cases in which the soil profile or other information indicates that ground water is within 7 feet of the natural ground surface, evidence that the ground water will not exceed the minimum vertical separation distance of 4 feet.



No drainfields are proposed; this requirement is not applicable.

J.5. Water Quantity. For new water supply systems, unless cisterns are proposed, evidence of adequate water availability:

- a. obtained from well logs or testing of onsite or nearby wells;
This is not applicable as Missoula Water, a regulated public water supply, is providing water to this proposed subdivision.
- b. obtained from information contained in published hydro-geological reports; or
This is not applicable as Missoula Water, a regulated public water supply, is providing water to this proposed subdivision.
- c. as otherwise specified by rules adopted by the Montana Department of Environmental Quality pursuant to 76-4-104, MCA.
This is not applicable as Missoula Water, a regulated public water supply, is providing water to this proposed subdivision.

J.6. Water Quality. Evidence of sufficient water quality in accordance with rules adopted by the Montana Department of Environmental Quality pursuant to 76-4-104, MCA.

This is not applicable as Missoula Water, a regulated public water supply, is providing water to this proposed subdivision.

J.7. Impacts to groundwater quality. Preliminary analysis of potential impacts to ground water quality from new wastewater treatment systems, using as guidance rules adopted by the board of environmental review pursuant to 75-5-301, MCA and 75-5-303, MCA related to standard mixing zones for ground water, source specific mixing zones, and non-significant changes in water quality. The preliminary analysis may be based on currently available information and must consider the effects of overlapping mixing zones from proposed and existing wastewater treatment systems within and directly adjacent to the subdivision. Instead of performing the preliminary analysis, the sub-divider may perform a complete non-degradation analysis in the same manner as is required for an application that is reviewed under Title 76, Chapter 4.

The impacts to groundwater quality are not applicable for new wastewater treatment systems as the proposed wastewater treatment system for this subdivision is connection to the Missoula City Sewer System. The wastewater from this subdivision will be processed and discharged to surface water at the Missoula Wastewater Treatment Facility.

Prepared by:

IMEG



Dan Fultz, R.S.





Surface Water Memo



MEMO

To: City of Missoula Planning
From: Daniel Fultz, R.S. and Anna Vickers
Subject: Surface Water

IMEG #: 20-5651
Project: Greenough Heights Subdivision
Date: September 22, 2021

There is an intermittent drainage located at the bottom of the proposed open space of the Greenough Heights Subdivision. This drainage flows during the spring months of the year. This is a small drainage that is approximately 1' wide during the time of the year it runs. The homesites adjacent to the open space have a 20' rear yard setback from the limits of the open space. The only other applicable surface water is Rattlesnake Creek which runs through Greenough Park approximately 100' to the east of the subject property. Rattlesnake Creek is approximately 60' wide, it is used for recreational purposes, and has water present within its banks all year long. All construction will occur on the subject property which is physically and topographically separated from the creek.

Rattlesnake Creek is not on the list of Impaired Waters per DEQ's 2020 Integrated Report and 303(d) List. Rattlesnake Creek is monitored by volunteers from May to November in coordination with the Missoula City-County Water Quality District. There are seven monitoring locations and Chloride, Nitrate + Nitrite, total Nitrogen, Phosphorous and Total Suspended Solids are monitored. Currently the creek is not listed as an impaired surface water.

Because of the protective regulations regarding storm drainage where a subdivision must retain the 100-year storm even onsite the storm drainage system implemented within the subdivision will not see excessive runoff into Rattlesnake Creek or the small drainage after construction. During construction will be the greatest potential of runoff or additional sediment load into the drainages. Construction will be required to submit and follow a SWPPP Plan based on DEQ requirements and City of Missoula MS4 requirements. During construction there will weekly SWPPP inspections to ensure that there are no issues with storm water runoff from the site. The storm water management plan will also implement the use of fencing and silt socks to help ensure the runoff is properly maintained.

The weed management plan indicates methods for homeowners to ensure that there are no dangerous pesticides or herbicides contributing to groundwater or surface water contamination. This plan has been reviewed and approved by the Missoula County weed district. Special consideration was given to the type of pesticides and herbicides because of the proximity to Rattlesnake Creek. All riparian area vegetation will be maintained because of setbacks and this vegetation will also act as a protective buffer and filter from any runoff from the lawn areas. We have also requested a variance to reduce/minimalize the roadway in order to limit the disturbance into this riparian area, and to ensure that this vegetative buffer is left in tack.

Based on the planned erosion control and best management practices outlined above, and the long-term maintenance plan that will be implemented for the storm drainage system it is unlikely that this subdivision negatively impacts the flora or fauna of the Rattlesnake Creek. Because

this subdivision will be served by newly installed City Wastewater infrastructure. It is also unlikely that the wastewater from this subdivision will impact water quality of Rattlesnake Creek.

There is one existing well located nearby the property. This well is known as GWIC ID:68549. This well shows a static water level of 35 feet in January of 1951. Water was found between 52 and 56 feet. The Missoula Water Quality District has a monitoring well located in Greenough Park. This well is known as WQD WELL W131914C. This well is located approximately at 3,273 feet above sea level. This well shows a high-water level of 6.5 feet below ground surface in late May to early June of each year. The lowest water level is recorded typically in September of each year around 9 feet below ground surface. This subdivision site is approximately at 3,300 feet above sea level. Based on this information, groundwater is expected at 33.5 feet below ground surface in late May to early June as the minimum depth and 36 feet below ground surface as a maximum depth.

Having a depth of approximately 33.5 feet to ground water will also provide a protective buffer and adequate soil depth for adsorption of phosphorus and filtration of other nutrients and chemicals associated with residential household use.

Intent to Serve Letter



MISSOULA

PUBLIC WORKS & MOBILITY DEPARTMENT—Infrastructure & Mobility Engineering

1345 W. Broadway • Missoula, Montana 59802 • (406) 552-6769

CORR #2021-0097

28 April 2021

Cale Mages, PE

Cale.A.Mages@imegcorp.com

RE: Greenough Heights Subdivision - Intent to Serve Water and Sewer Availability
Project #2021-009

Cale,

The intent of this letter is to satisfy requirements for the subdivision application. At this time, our expectation is that you will also need a water and sewer availability letter to satisfy Montana Department of Environmental Quality (DEQ) regulations. Upon request, the water and sewer availability letter will be provided when the infrastructure plan is submitted to DEQ.

It is the City of Missoula's intent to provide public water and sanitary sewer for the Greenough Heights Subdivision. It is the obligation of the developer to design and construct infrastructure necessary to serve the development. The City will review and approve design prior to construction.

With respect to the water and sanitary sewer systems and the information provided to the City at this time, if the planned water and sanitary sewer infrastructure is designed and constructed that meets City of Missoula capacity criteria (including main size, lift station size, and plant capacity) and standards, then service will be available to the property at Greenough Heights Subdivision, legally described as S22, T13 N, R19 W, C.O.S. PLAT M, NE4 5.79 AC.

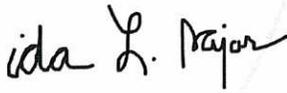
The property is within the City of Missoula Wastewater and Water Facilities Service Area boundaries. This property is also outside the City's incorporated boundary and the City cannot legally provide sanitary sewer in the future unless the property developer owner contracts to receive service. Please ensure to comply with the below requirements:

1. Include **Project #2021-009** on all future correspondence for this project;
2. Obtain State Department of Environmental Quality approval of the proposed water and sewer system if a public water and sewer main extension is proposed;
3. Submit design report(s) to City Engineering for review;
4. Obtain City approval of plans design report and specifications from the City Engineering Division if a water and sewer main extension is proposed;

5. Prior to connection to water and sewer systems, the property owners must pay the necessary utility development, connection or other applicable fees, and sign the appropriate legal documents as applicable;
6. Arrange for a City licensed and bonded contractor to obtain the necessary excavation permits and perform the installation of the sewer and utility lines;
7. Prior to construction startup, verify information regarding depth and location of the existing water and sewer lines with Missoula Water and Utility Services staff; and
8. If the sewer is dry-laid, it will be the responsibility of the parcel/lot owners to bring the dry-laid sanitary sewer into compliance with City standards at the time of connection.

For further questions or comments, please contact engineering@ci.missoula.mt.us.

Sincerely,



Digitally signed

by Ida Sajor

Date: 2021.04.28

14:09:15 -06'00'

Ida L. Sajor

Public Works Infrastructure & Mobility Engineering

cc: Logan McInnis
Kevin Slovarp, Troy Monroe,
Ross Mollenhauer, Andy Schultz
Jane Plummer

Engineering Permit Techs
GIS Analysts
Mickey Morin, Sue Lowery

Water Right Abstract

The DNRC Water Right Query was searched by the geocode, section, township, range, and owner's last name. The DNRC system did not produce any results for these searches.

NRCS Farmland and Soil Report



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

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

Custom Soil Resource Report for **Missoula County Area, Montana**



Preface

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

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

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

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

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

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

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Preface	2
How Soil Surveys Are Made	5
Soil Map	8
Soil Map.....	9
Legend.....	10
Map Unit Legend.....	11
Map Unit Descriptions.....	11
Missoula County Area, Montana.....	13
10—Bigarm-Minesinger complex, 30 to 60 percent slopes.....	13
105—Totelake gravelly loam, 2 to 8 percent slopes.....	14
114—Urban land.....	16
Soil Information for All Uses	18
Suitabilities and Limitations for Use.....	18
Land Classifications.....	18
Farmland Classification.....	18
References	24

How Soil Surveys Are Made

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

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

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

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

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

Custom Soil Resource Report

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

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

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

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

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

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

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

Custom Soil Resource Report

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

Soil Map

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

Custom Soil Resource Report Soil Map



Map Scale: 1:1,950 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot

-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features

Water Features

 Streams and Canals

Transportation

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

Background

 Aerial Photography

MAP INFORMATION

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

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: Missoula County Area, Montana
 Survey Area Data: Version 18, Jun 4, 2020

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

Date(s) aerial images were photographed: Aug 6, 2014—Nov 2, 2016

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
10	Bigarm-Minesinger complex, 30 to 60 percent slopes	0.4	5.0%
105	Totelake gravelly loam, 2 to 8 percent slopes	3.4	43.1%
114	Urban land	4.1	51.9%
Totals for Area of Interest		8.0	100.0%

Map Unit Descriptions

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

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The

Custom Soil Resource Report

delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Missoula County Area, Montana

10—Bigarm-Minesinger complex, 30 to 60 percent slopes

Map Unit Setting

National map unit symbol: 4w8x
Elevation: 2,600 to 5,500 feet
Mean annual precipitation: 14 to 19 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 90 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

Bigarm and similar soils: 50 percent
Minesinger and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bigarm

Setting

Landform: Mountain slopes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Tertiary colluvium

Typical profile

A1 - 0 to 11 inches: gravelly loam
A2 - 11 to 15 inches: very gravelly loam
Bw - 15 to 40 inches: very gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 30 to 60 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.71 to 2.13 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: R043BP818MT - Upland Grassland
Hydric soil rating: No

Description of Minesinger

Setting

Landform: Mountain slopes
Down-slope shape: Linear
Across-slope shape: Linear

Custom Soil Resource Report

Parent material: Tertiary colluvium

Typical profile

A1 - 0 to 6 inches: cobbly loam
A2 - 6 to 13 inches: cobbly loam
Bt - 13 to 24 inches: very gravelly clay
Bk - 24 to 60 inches: very gravelly clay loam

Properties and qualities

Slope: 30 to 60 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.07 to 0.21 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 8 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R043BP818MT - Upland Grassland, R044AA036MT - Droughty (Dr) LRU 44A-A
Hydric soil rating: No

Minor Components

Hogsby

Percent of map unit: 10 percent
Landform: Mountain slopes
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044XW146MT - Shallow (Sw) 15-19" p.z.
Hydric soil rating: No

Rock outcrop

Percent of map unit: 5 percent
Hydric soil rating: No

105—Totelake gravelly loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 4w93
Elevation: 2,900 to 6,200 feet
Mean annual precipitation: 10 to 30 inches
Mean annual air temperature: 39 to 45 degrees F

Custom Soil Resource Report

Frost-free period: 60 to 135 days

Farmland classification: Farmland of local importance

Map Unit Composition

Totelake and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Totelake

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Sandy and gravelly alluvium

Typical profile

O_i - 0 to 1 inches: slightly decomposed plant material

A - 1 to 8 inches: gravelly loam

B_w - 8 to 23 inches: very gravelly sandy loam

2C - 23 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 2 to 8 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high to high
(0.57 to 1.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: B

Ecological site: F043BP910MT - Upland Cool Woodland

Hydric soil rating: No

Minor Components

Glaciercreek

Percent of map unit: 8 percent

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Perma

Percent of map unit: 5 percent

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R044XW184MT - Silty (Si) 15-19" p.z.

Hydric soil rating: No

Poorly drained soils

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044XW127MT - Wet Meadow (WM) 10-14" p.z.
Hydric soil rating: Yes

114—Urban land

Map Unit Setting

National map unit symbol: 4w9f
Elevation: 2,600 to 5,500 feet
Mean annual precipitation: 11 to 19 inches
Mean annual air temperature: 41 to 45 degrees F
Frost-free period: 90 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Minor Components

Orthents

Percent of map unit: 3 percent
Hydric soil rating: No

Bigarm

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044XW184MT - Silty (Si) 15-19" p.z.
Hydric soil rating: No

Argiborolls

Percent of map unit: 3 percent
Hydric soil rating: No

Grassvalley

Percent of map unit: 2 percent
Landform: Lake plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044XW125MT - Silty (Si) 10-14" p.z.
Hydric soil rating: No

Desmet

Percent of map unit: 2 percent

Custom Soil Resource Report

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044XW125MT - Silty (Si) 10-14" p.z.
Hydric soil rating: No

Grantsdale

Percent of map unit: 2 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044XW184MT - Silty (Si) 15-19" p.z.
Hydric soil rating: No

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Farmland Classification

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Custom Soil Resource Report Map—Farmland Classification



Map Scale: 1:1,950 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of statewide importance, if drained
-  Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
-  Farmland of statewide importance, if irrigated

-  Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
-  Farmland of statewide importance, if irrigated and drained
-  Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
-  Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

-  Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
-  Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
-  Farmland of statewide importance, if warm enough
-  Farmland of statewide importance, if thawed
-  Farmland of local importance
-  Farmland of local importance, if irrigated

-  Farmland of unique importance
-  Not rated or not available

Soil Rating Lines

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

Custom Soil Resource Report

 Prime farmland if subsoiled, completely removing the root inhibiting soil layer	 Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season	 Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium	 Farmland of unique importance	 Prime farmland if subsoiled, completely removing the root inhibiting soil layer
 Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60	 Farmland of statewide importance, if irrigated and drained	 Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season	 Not rated or not available	 Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
 Prime farmland if irrigated and reclaimed of excess salts and sodium	 Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season	 Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season	Soil Rating Points  Not prime farmland	 Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
 Farmland of statewide importance	 Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium	 Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season	 Prime farmland if drained	 Prime farmland if irrigated and reclaimed of excess salts and sodium
 Farmland of statewide importance, if drained	 Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer	 Farmland of statewide importance, if thawed	 Prime farmland if protected from flooding or not frequently flooded during the growing season	 Farmland of statewide importance
 Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season	 Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60	 Farmland of local importance	 Prime farmland if irrigated	 Farmland of statewide importance, if drained
 Farmland of statewide importance, if irrigated		 Farmland of local importance, if irrigated	 Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	 Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
			 Prime farmland if irrigated and drained	 Farmland of statewide importance, if irrigated
			 Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season	

Custom Soil Resource Report

<ul style="list-style-type: none"> Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season Farmland of statewide importance, if irrigated and drained Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60 	<ul style="list-style-type: none"> Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season Farmland of statewide importance, if warm enough Farmland of statewide importance, if thawed Farmland of local importance Farmland of local importance, if irrigated 	<ul style="list-style-type: none"> Farmland of unique importance Not rated or not available <p>Water Features</p> <ul style="list-style-type: none"> Streams and Canals <p>Transportation</p> <ul style="list-style-type: none"> Rails Interstate Highways US Routes Major Roads Local Roads <p>Background</p> <ul style="list-style-type: none"> Aerial Photography 	<p>The soil surveys that comprise your AOI were mapped at 1:24,000.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Warning: Soil Map may not be valid at this scale.</p> <p>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.</p> </div> <p>Please rely on the bar scale on each map sheet for map measurements.</p> <p>Source of Map: Natural Resources Conservation Service Web Soil Survey URL: Coordinate System: Web Mercator (EPSG:3857)</p> <p>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.</p> <p>This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.</p> <p>Soil Survey Area: Missoula County Area, Montana Survey Area Data: Version 18, Jun 4, 2020</p> <p>Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.</p> <p>Date(s) aerial images were photographed: Aug 6, 2014—Nov 2, 2016</p> <p>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.</p>
---	---	---	---

Table—Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
10	Bigarm-Minesinger complex, 30 to 60 percent slopes	Not prime farmland	0.4	5.0%
105	Totelake gravelly loam, 2 to 8 percent slopes	Farmland of local importance	3.4	43.1%
114	Urban land	Not prime farmland	4.1	51.9%
Totals for Area of Interest			8.0	100.0%

Rating Options—Farmland Classification

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

References

- American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.
- American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.
- Federal Register. July 13, 1994. Changes in hydric soils of the United States.
- Federal Register. September 18, 2002. Hydric soils of the United States.
- Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.
- National Research Council. 1995. Wetlands: Characteristics and boundaries.
- Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262
- Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577
- Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580
- Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.
- United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.
- United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374
- United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084>

Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Slope Analysis Report and Map

SLOPE ANALYSIS REPORT

PREPARED IN ACCORDANCE WITH MISSOULA COUNTY SUBDIVISION REGULATIONS, SECTION 7.6.3

for

GREENOUGH HEIGHTS SUBDIVISION

That property described in Book 1046, at Page 794, Micro Records of Missoula County and further shown as area's 15 and 16 on Deed Exhibit no. 3161, records of Missoula County, located in the northeast one-quarter of the northeast one-quarter (NE1/4NE1/4) of Section 22, Township 13 North, Range 19 West, Principal Meridian, Montana, Missoula County, Montana

Published: June 4, 2021

Prepared For:

Greenough Heights, LLC
1412 Ashley Drive
Virginia Beach, VA 23454

Prepared By:

IMEG Corp.
1817 South Avenue West, Suite A
Missoula, MT 59801

1.0 GENERAL

The Greenough Heights Subdivision is a major subdivision which proposes 20 lots to be utilized for residential purposes. All lots will be utilized for single family homes. The property is located directly adjacent to the south of the intersection of Peggio Lane and W. Greenough Drive. The site is currently utilized for one single family home.

The proposed development contains land with existing grades in excess of 25% slope. These areas are generally on the south and west sides of the property and are clearly shown in relation to the proposed development in the included slope map. The purpose of this report is to provide information as required by the City of Missoula Subdivision Regulations, Section 3-030.1B such that these areas do not need to be designated as "no build" as part of the proposed development. A geotechnical analysis was conducted for the site to verify slope stability, and a report stamped by a licensed geotechnical engineer is included within this subdivision submittal.

2.0 SLOPE MAP

A slope map with one-foot vertical contour intervals is included with this report. Most of the site is below 15% slope; the southern part of the site contains slopes mostly from 15% to 25%, with a few areas exceeding 25%.

3.0 SOIL DATA

Soil data is described in the Geotechnical Analysis Report.

4.0 GEOLOGY, HYDROLOGY

The geology and hydrology are described in the Geotechnical Analysis Report.

5.0 GRADING

Conclusions and recommendations for grading are included in the Geotechnical Analysis Report. Grading plans created for the development project will be reviewed and approved by the geotechnical engineer before being finalized.

6.0 PLANS

The subdivision regulations contemplate plans or designs for proposed corrective or mitigation measures for building on the slopes that exceed 25% grade. Grading plans will be created to ensure slope stability on the developed site.

7.0 RECOMMENDATION

The geotechnical report confirms that the site is suitable for construction. Per the recommendation in the report, the geotechnical engineer will approve final grading plans for the site. Additionally, conditions will be put in place requiring lot owners to obtain approval of residence plans by a geotechnical engineer prior to construction.

8.0 CONCLUSIONS

By following the recommendations for grading and stabilization in this report and the geotechnical report, there is no need for slopes to be deemed a no-build area as part of approval of this subdivision.

Prepared by:

IMEG Corp



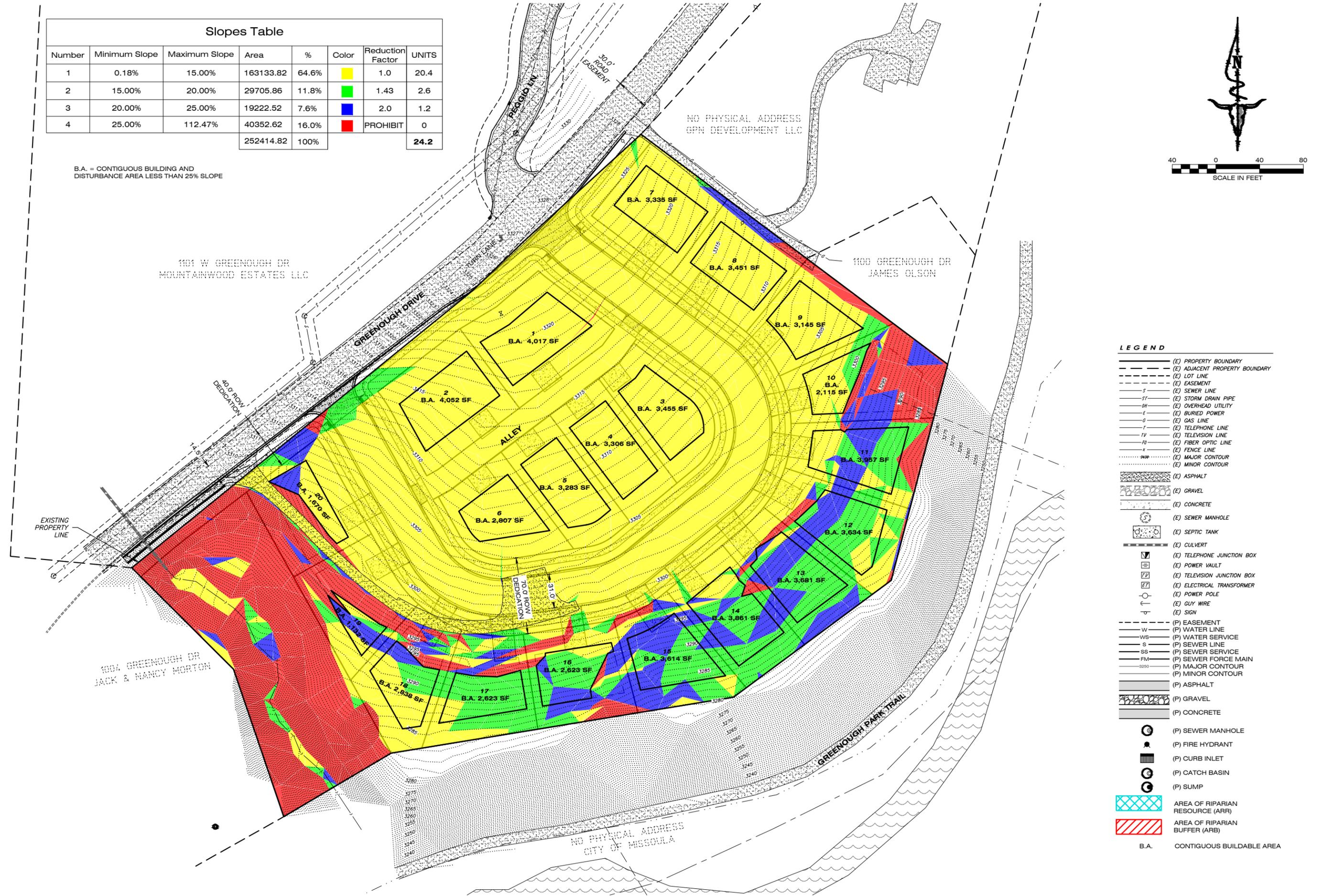
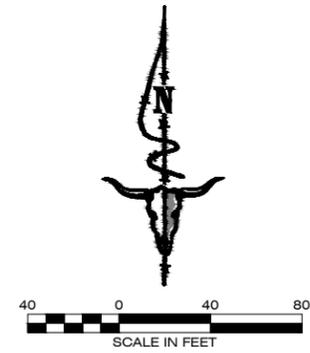
Cale Mages, P.E.



Attachments: Slope Category Map
Hillside Property Density Reduction

Slopes Table							
Number	Minimum Slope	Maximum Slope	Area	%	Color	Reduction Factor	UNITS
1	0.18%	15.00%	163133.82	64.6%	Yellow	1.0	20.4
2	15.00%	20.00%	29705.86	11.8%	Green	1.43	2.6
3	20.00%	25.00%	19222.52	7.6%	Blue	2.0	1.2
4	25.00%	112.47%	40352.62	16.0%	Red	PROHIBIT	0
			252414.82	100%			24.2

B.A. = CONTIGUOUS BUILDING AND DISTURBANCE AREA LESS THAN 25% SLOPE



LEGEND

- (E) PROPERTY BOUNDARY
- (E) ADJACENT PROPERTY BOUNDARY
- (E) LOT LINE
- (E) EASEMENT
- (E) SEWER LINE
- (E) STORM DRAIN PIPE
- (E) OVERHEAD UTILITY
- (E) BURIED POWER
- (E) GAS LINE
- (E) TELEPHONE LINE
- (E) TELEVISION LINE
- (E) FIBER OPTIC LINE
- (E) FENCE LINE
- (E) MAJOR CONTOUR
- (E) MINOR CONTOUR
- (E) ASPHALT
- (E) GRAVEL
- (E) CONCRETE
- (E) SEWER MANHOLE
- (E) SEPTIC TANK
- (E) CULVERT
- (E) TELEPHONE JUNCTION BOX
- (E) POWER VAULT
- (E) TELEVISION JUNCTION BOX
- (E) ELECTRICAL TRANSFORMER
- (E) POWER POLE
- (E) GUY WIRE
- (E) SIGN
- (P) EASEMENT
- (P) WATER LINE
- (P) WATER SERVICE
- (P) SEWER LINE
- (P) SEWER SERVICE
- (P) SEWER FORCE MAIN
- (P) MAJOR CONTOUR
- (P) MINOR CONTOUR
- (P) ASPHALT
- (P) GRAVEL
- (P) CONCRETE
- (P) SEWER MANHOLE
- (P) FIRE HYDRANT
- (P) CURB INLET
- (P) CATCH BASIN
- (P) SUMP
- AREA OF RIPARIAN RESOURCE (ARR)
- AREA OF RIPARIAN BUFFER (ARB)
- B.A. CONTIGUOUS BUILDABLE AREA

IMEG
 1817 SOUTH AVE. W. STE. A PH: 406.721.0142
 MISSOULA, MT FAX: 406.721.5224
 www.imegcorp.com 59801

DATE	
REVISIONS	

DESIGNED: *DO*
 DRAFTED: *DO*
 CHECKED: *PF*
 DATE: 4/28/2020

LOCATION: 1006 W GREENOUGH DRIVE
 SECTION 22, T18N, R19W, P.M.M.
 MISSOULA COUNTY
 PREPARED FOR: GREENOUGH HEIGHTS, LLC

PROJECT NAME: GREENOUGH HEIGHTS
 SHEET TITLE: SLOPE CATEGORY EXHIBIT

PROJECT NO. 20-5651
 SHEET: 1 OF 1

PRELIMINARY

D:\GIS\LOCATION_0\MISSOULA\TUPROJECTS\ACTIVE FILES\2020\PROJECTS\0561 - KORNALDO GREENOUGH - FEASIBILITY\DRAWINGS\AUTOCAD\EXHIBIT\0561-90-081_SLP_DP_DATA.DWG
 DATE: 02/20/2020 3:01 PM

CITY HILLSIDE PROPERTY DENSITY REDUCTION CALCULATION WORKSHEET

Applicant Name: IMEG CORP Phone #: (406) 721-0142

Project Name: Greenough Heights

Property Legal Description and/or Address: 1006 W. Greenough Drive, Missoula, MT 59802

Slope Category Map attached? (required) Attached

Area of Property (sq. ft.): 252,415 sq. ft.

Property Zoning Designation: R8

Number of units permitted at base zoning: 31

Required minimum parcel area (sq. ft.): 8,000

Area (sq. ft.) in Slope Categories:

0-15%: 163,134

15.01-20%: 29,706

20.01-25%: 19,223

> 25%: 40,353

0-15% Slope Category:

$$\begin{aligned} & \frac{163,134}{8,000} \text{ sq. ft.} \\ \div & \frac{8,000}{8,000} \text{ Minimum parcel area (sq. ft.)} \\ = & \underline{20.39} \text{ Units permitted at base density (to two decimals)} \end{aligned}$$

15.01-20% Slope Category:

$$\begin{aligned} & \frac{29,706}{8,000} \text{ sq. ft.} \\ \div & \frac{8,000}{8,000} \text{ Minimum parcel area (sq. ft.)} \\ = & \underline{3.71} \text{ Units permitted at base density (to two decimals)} \\ \div & \frac{1.43}{1.43} \text{ Density adjustment} \\ = & \underline{2.59} \text{ Units permitted at adjusted density (to two decimals)} \end{aligned}$$

20.01-25% Slope Category:

$$\begin{aligned} & \frac{19,223}{8,000} \text{ sq. ft.} \\ \div & \frac{8,000}{8,000} \text{ Minimum parcel area (sq. ft.)} \\ = & \underline{2.40} \text{ Units permitted at base density (to two decimals)} \\ \div & \frac{2}{2} \text{ Density adjustment} \\ = & \underline{1.20} \text{ Units permitted at adjusted density (to two decimals)} \end{aligned}$$

TOTAL NUMBER OF ADJUSTED UNITS ON HILLSIDE PROPERTY

Add the number of units permitted in each slope category:

$$\begin{aligned} & \frac{20.39}{20.39} \text{ Units permitted in the 0-15% slope category (without density bonus)} \\ + & \frac{2.59}{2.59} \text{ Adjusted units permitted in the 15.01-20% slope category} \\ + & \frac{1.20}{1.20} \text{ Adjusted units permitted in the 20.01-25% slope category} \end{aligned}$$

=	<u>24</u>	Total adjusted units permitted (rounded down)
----------	-----------	--

Geotechnical Analysis



April 9, 2021

Mr. Roy Korkalo
8702 NE 17th Street
Vancouver, Washington 98664

**RE: Geotechnical Evaluation
 Greenough Heights
 1006 W. Greenough Drive
 Missoula, Montana
 ALLWEST Project No. 721-013G**

Mr. Korkalo,

ALLWEST has completed the authorized geotechnical evaluation for the proposed residential subdivision located at 1006 W. Greenough Drive in Missoula, Montana. The purpose of this evaluation was to characterize the soil and geologic conditions on the property. The attached report presents the results of the field evaluation and our recommendations to assist with design and construction of the proposed project.

We appreciate the opportunity to provide professional services for this project. If you have any questions or need additional information, please do not hesitate to call us at (406) 206-5911.

Sincerely,

ALLWEST

Prepared by:

A handwritten signature in blue ink, appearing to read "J. Thomasson", written over a light blue oval background.

James Thomasson, P.E.
Senior Geotechnical Engineer

Reviewed by:

A handwritten signature in blue ink, appearing to read "S. Turpin", written over a light blue oval background.

Shawn Turpin, P.E.
Senior Geotechnical Engineer

**GEOTECHNICAL EVALUATION
GREENOUGH HEIGHTS
1006 W. GREENOUGH DRIVE
MISSOULA, MONTANA
ALLWEST PROJECT NO. 721-013G**

April 9, 2021



Prepared for:
Mr. Roy Korkalo
8702 NE 17th Street
Vancouver, Washington 98664

A handwritten signature in blue ink, appearing to read "J. Thomasson", positioned to the left of the digital signature information.

Digitally signed by James
Thomasson, P.E.
Date: 2021.04.09 21:46:15
-06'00'

Prepared by:
ALLWEST
2720 Palmer St Unit A
Missoula, Montana 59808



CONTENTS
Geotechnical Evaluation
Greenough Heights
1006 W. Greenough Drive
Missoula, Montana

Page

EXECUTIVE SUMMARY

1.0	SCOPE OF SERVICES	1
2.0	PROJECT DESCRIPTION.....	1
3.0	EVALUATION PROCEDURES.....	2
4.0	SITE CONDITIONS.....	2
4.1	General Geologic Conditions	2
4.2	General Soil Conditions	2
5.0	SUBSURFACE CONDITIONS.....	3
5.1	Subsurface Soil Conditions	3
5.2	Groundwater Conditions	3
6.0	LABORATORY TESTING	3
7.0	INFILTRATION TESTING.....	4
8.0	SLOPE STABILITY ANALYSIS	4
9.0	CONCLUSIONS AND RECOMMENDATIONS.....	5
9.1	Planning Considerations	5
9.2	Site Preparation	5
9.3	Excavation	6
9.4	Materials	6
9.5	Fill Placement and Compaction	7
9.6	Wet Weather Construction.....	7
9.7	Cold Weather Construction.....	7
9.8	Preliminary Foundation Recommendations	8
9.9	Concrete Slabs-on-Grade	8
9.10	Lateral Earth Pressures	9
9.11	Seismicity.....	9
9.12	Stormwater and Drainage	10
10.0	ADDITIONAL SERVICES.....	10
11.0	EVALUATION LIMITATIONS.....	10

Appendix A – Vicinity Map, Test Pit & Cross Section Location Map

Appendix B – Test Pit Logs, Unified Soil Classification System

Appendix C – Laboratory Test Results

Appendix D – Global Slope Stability Analysis



EXECUTIVE SUMMARY

ALLWEST has completed the authorized geotechnical evaluation for the proposed Greenough Heights residential subdivision located at 1006 W. Greenough Drive in Missoula, Montana. The general location of the project is shown on the Vicinity Map, Figure A-1, in Appendix A of this report. The purpose of the evaluation was to assess the subsurface conditions on the property with respect to the proposed design and construction. This report details the results of the field evaluation and presents our recommendations to assist the design and construction of the proposed project. A summary of geotechnical considerations follows:

- An allowable bearing pressure of 2,500 pounds per square foot (psf) can be used for design of concrete spread footings bearing on natural granular soil subgrade.
- Preliminary analyses indicates the lots within the proposed subdivision should be considered buildable from a slope stability standpoint and do not require 'no-build' zone designations.
- The recommendations contained herein are considered 'confirmation-dependent'. An ALLWEST geotechnical engineer should review the proposed construction on each lot and be afforded the opportunity to review the geologic conditions exposed during foundation excavation.

Close monitoring of the construction operations discussed herein will be critical in achieving the design subgrade support. If we are not retained to provide required construction observation and materials testing services, we cannot be responsible for soil engineering related construction errors or omissions. This summary should be used in conjunction with the entire report for design and construction purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. Report section titled *9.0 EVALUATION LIMITATIONS* should be read for an understanding of the report limitations.

**Geotechnical Evaluation
Greenough Heights
1006 W. Greenough Drive
Missoula, Montana**

1.0 SCOPE OF SERVICES

To complete this geotechnical evaluation, we accomplished the following scope of services:

- 1) Performed a field evaluation by observing the excavation of 10 test pits throughout the proposed subdivision area. The subsurface conditions observed in the test pits were described and visually classified and the subsurface profiles were logged.
- 2) Performed laboratory tests on soil samples to assess some of the soil properties and characteristics.
- 3) Reviewed the results of the field evaluation and laboratory testing with respect to the proposed construction.
- 4) Performed engineering analyses and prepared recommendations to assist project planning, design, and construction.
- 5) Prepared this report.

Our services were provided in general accordance with our proposal 721-013P dated February 5, 2021.

2.0 PROJECT DESCRIPTION

Development of the site is anticipated to include the construction of 20 single-family residences with associated asphalt-paved roadway and alley. Residences are anticipated to include walk-out basements near the steeply sloped edge of the site, and regular basements near the central portion of the site, away from the steeply sloped areas.



3.0 EVALUATION PROCEDURES

To complete this evaluation, we reviewed soil and geologic literature for the project area. We evaluated the subsurface conditions by excavating 10 test pits at the project site. The approximate locations of the test pits are shown on Figure A-2, Test Pit & Cross Section Location Map included in Appendix A. Information obtained from the field evaluation and geotechnical analyses was utilized to develop the recommendations presented in this report.

4.0 SITE CONDITIONS

The project site is a 5.8-acre parcel that is largely undeveloped. There are two existing residential structures near the south border of the site with associated driveway. The site generally slopes down to the south with an overall elevation change of approximately 50 feet and is mostly surrounded by other existing residential development.

4.1 General Geologic Conditions

The site is in an area mapped by the Montana Bureau of Mines and Geology as Quaternary gravel (Qgr). The Quaternary gravel overlies rock of the Belt Supergroup, specifically the Upper Missoula Group (Ymu). Geologic conditions in the site vicinity are mapped as coarse-grained soil deposits that are predominantly comprised of sand and gravel with varying amounts of silt and clay. Rock underlying the gravel deposits is mapped as hard to very hard quartzite.

The soils observed in the test pits are generally consistent with the geologic mapping. The upper portion of the Belt Supergroup rock was observed to be somewhat weathered and excavatable.

4.2 General Soil Conditions

The USDA Natural Resources Conservation Service (NRCS) has mapped the soil on the property as Totelake gravelly loam, 2 to 8 percent slopes and Urban land. The Totelake gravelly loam is described as a stream terrace deposit with parent material comprising sandy and gravelly alluvium. A soil description for the Urban land map unit is not provided by the NRCS.

5.0 SUBSURFACE CONDITIONS

Ten test pits were excavated on the site on March 9 and March 10, 2021. The test pits were excavated with a CAT 320E trackhoe with a standard soil excavation bucket. The approximate locations of the test pits are shown on Figure A-2, Test Pit & Cross Section Location Map in Appendix A. Test pits were located using a hand-held GPS device. Soil and rock conditions observed in the test pits were visually described and classified in general accordance with ASTM D2488 and the subsurface profiles were logged.

Detailed descriptions of the soil and rock observed in the test pits are presented on the test pit logs in Appendix B of this report. The descriptive soil terms used on the test pit logs, and in this report, can be referenced by the Unified Soil Classification System (USCS). A summary of USCS is included in Appendix B. The subsurface conditions may vary between exploration locations. Such changes in conditions would not be apparent until construction. If the subsurface conditions do change from those observed in the test pits, the construction timing, plans, and costs may change.

5.1 Subsurface Soil Conditions

The subsurface soil profile observed in the test pits generally consisted of natural granular soil deposits overlying rock of the Upper Missoula formation of the Belt Supergroup. Descriptions of the soil and rock types observed may be referenced on the test pit logs in Appendix B.

5.2 Groundwater Conditions

A minor amount of groundwater was observed to be perched on the excavatable rock layer in test pit TP-08 at 13½ feet below grade. Changes in precipitation, irrigation, construction, or other factors may impact depth to groundwater and surface water flow on the property and therefore, conditions may be different during construction. However, we do not anticipate groundwater will adversely affect the proposed construction.

6.0 LABORATORY TESTING

We performed laboratory testing to supplement field classifications and to assess some of the soil engineering properties, the laboratory tests conducted included natural water content (ASTM D2216), particle-size distribution (ASTM D6913), and Atterberg limits (ASTM D4318). The laboratory tests results are presented and summarized in Appendix C and on the test pit logs in Appendix B.



7.0 INFILTRATION TESTING

We performed in situ infiltration testing at test pit locations TP-03 and TP-04. Testing was performed in general accordance with City of Missoula testing procedures for double-depth drywells.

Infiltration in TP-03 was fast and field-measured at 0.41 mpi (minutes per inch). Infiltration in TP-04 was fast and field-measured at 0.07 mpi.

We recommend the civil engineer apply appropriate factors of safety to these measured values or select lower values based on previously observed and documented performance of drywells in the vicinity of the project. Intentional concentration of water in the vicinity of slopes can reduce the overall stability of those slopes. Accordingly, we recommend infiltration facilities not be used within the vicinity of lots along the perimeter slopes.

8.0 SLOPE STABILITY ANALYSIS

ALLWEST analyzed three cross sections for global slope stability. The section locations are shown on Figure A-2, Test Pit & Cross Section Location Map. The cross section locations were selected so that a representative sample of potential topographic and geologic profile scenarios could be evaluated.

Strength parameters for the existing soil and rock were estimated using information from field observations, laboratory test results, and published typical values. The estimated soil strengths are shown on Figures D-1 through D-6 in Appendix D. ALLWEST chose to use strength parameters in the analyses that are considered conservative. In addition, a distributed load of 2,500 psf was applied within the entire limits of the potential structure location to conservatively model the effect of a residential building constructed at or near existing grade (3-foot minimum foundation embedment). A pad-cut geometry was assumed for each section and built into the slope stability analysis.

Global stability of the reconstructed slopes was calculated using Slide 7.0 slope stability software developed by RocScience. Assumed 'circular' failure surfaces were modeled for soils with a high degree of homogeneity. The strength characteristics used in our analyses are shown on the reinforced slope cross section shown in Appendix D. Our calculations indicate global factors of safety for static and seismic conditions as 1.4 and 1.1, respectively for the reconstructed slope.

Analysis	Factor of Safety (Static)	Factor of Safety (Seismic)
Cross section A-A'	1.9	1.5
Cross section B-B'	1.8	1.3
Cross section C-C'	2.0	1.4

Generally accepted factors of safety for slopes supporting structures or roadways are 1.5 and 1.1 for static and seismic conditions, respectively. Based on our site observations and analyses to date, we do not perceive there to be a significant global stability geohazard at the home sites. Large cuts and fills will have a significant effect on overall global stability and proposed grading should be reviewed by the geotechnical engineer of record prior to construction.

9.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are presented to assist the planning and design of the proposed residential subdivision. The recommendations are based on our understanding of the proposed construction, the conditions observed in the test pits, laboratory testing, and engineering analyses. If the construction scope changes, or if conditions are encountered during construction which are different than those described in this report, we should be notified so we can review our recommendations and provide revisions, if necessary.

9.1 Planning Considerations

The upper portion (about ½-foot to 1½-feet) of the soil observed in all test pits was topsoil. Topsoil is not considered suitable for re-use as structural fill and should be removed its full depth below structural improvements and disposed offsite or reused in landscape areas for non-structural applications. Some variations in topsoil thickness and composition should be expected across the site.

9.2 Site Preparation

Clearing and Stripping: Based on observation of subsurface conditions in our explorations, the stripping (over-excavation) depth for topsoil will vary throughout the site but is estimated to be on average approximately ½-foot to 1½-feet within the structure and pavement envelopes. The earthwork contractor should employ good construction practices and perform frequent visual observations to determine whether the topsoil layer has been substantially removed. Removed soil may be replaced with compacted granular structural fill to achieve design elevations if required. Where feasible, extend topsoil removal a minimum of five feet beyond the perimeter of the residential building footprints and three feet beyond pavement. Topsoil material is considered frost-susceptible and full-depth topsoil removal should be considered below all landscape features that may be negatively affected by frost-induced heave.

Footing Subgrade Preparation: We anticipate soil at footing bearing elevations will consist of natural granular soil. We recommend the footing subgrade be scarified a minimum of 8-inches, moisture-conditioned where required to within two percentage points of the optimum moisture content and compacted to a minimum of 92 percent of the maximum dry density determined by ASTM D1557 (modified Proctor).



Moisture conditioning of the subgrade surface may involve wetting or drying of the soil to facilitate proper compaction. Please refer to the in-situ moisture content laboratory test results for an estimation of existing soil-moisture conditions (at the time of exploration).

Slab Subgrade Preparation: We anticipate soil encountered at slab subgrade elevations will consist of natural granular soil. We recommend the slab subgrade be scarified a minimum of 8-inches, moisture-conditioned where required to within two percentage points of the optimum moisture content and compacted to a minimum of 92 percent of the maximum dry density determined by ASTM D1557 (modified Proctor).

Moisture conditioning of the subgrade surface may involve wetting or drying of the soil to facilitate proper compaction. Please refer to the in-situ moisture content laboratory test results for an estimation of existing soil-moisture conditions (at the time of exploration).

9.3 Excavation

Based on conditions observed in the test pits, we anticipate excavation of the on-site soil and the upper portion of the underlying rock can be achieved with typical excavation equipment. Basement excavations may encounter harder rock that is not excavatable. Hydraulic hammers may be required to assist with excavation of harder rock in these areas.

Unsupported vertical slopes or cuts deeper than 4 feet are not recommended if worker access is necessary. The cuts should be adequately sloped, shored, or supported to prevent injury to personnel from local sloughing and spalling. Excavation should conform to applicable federal, state, and local regulations. Regarding trench wall support, the site soil is considered Type C soil according to OSHA guidelines and therefore should not exceed a 1.5H:1V temporary slope.

9.4 Materials

Natural onsite granular soils are generally considered suitable for reuse as structural fill. Import soil, where required to backfill footing excavations to achieve foundation grades, should be granular soil, relatively free of organics, debris, and other deleterious material and meet the following recommendations. Import materials should be approved by the Geotechnical Engineer prior to delivery to the site.



Fill Type	Recommendations
Import Granular Structural Fill	Maximum size \leq 3 inches; Retained on $\frac{3}{4}$ -inch sieve $<30\%$ * Passing No. 200 Sieve $\leq 15\%$; Non-plastic
Utility Trench Backfill	Maximum size \leq 2 inches; Passing No. 200 Sieve $\leq 15\%$; Non-plastic

* Soils with more than 30% retained on the $\frac{3}{4}$ -inch sieve are considered 'oversized' and may require method-based compaction methods and full-time observation during placement.

9.5 Fill Placement and Compaction

Fill should be placed in lift thicknesses which are appropriate for the compaction equipment used. Typically, six to eight-inch loose lifts are appropriate for typical rubber tire and steel drum compaction equipment. Lift thicknesses should be reduced to four inches for hand operated compaction equipment. Fill should be moisture conditioned to within two percentage points of the optimum moisture content prior to placement to facilitate compaction. Structural fill and utility trench backfill should be compacted to a minimum of 95 percent of the maximum dry density determined by ASTM D1557 (modified Proctor).

9.6 Wet Weather Construction

Due to the climatic effects in this region during late fall, winter, and spring (generally wet conditions), we recommend construction (especially site grading) take place during the summer and early fall season, if possible. If construction occurs during or immediately after excessive precipitation, it may be necessary to over-excavate and replace wet subgrade soil which might otherwise be suitable.

If construction is undertaken in wet periods of the year, it will be important to slope the ground surface to provide drainage away from construction. In addition, the groundwater level will likely be higher during wet periods of the year. However, we do not anticipate groundwater will affect the proposed construction.

9.7 Cold Weather Construction

Foundations should be embedded adequately to protect against frost action as recommended in the Foundation Recommendations section of this report. We recommend removal of frost susceptible soil within the frost-depth zone below concrete flatwork (walkways, entryway pads, etc.) to help reduce the potential detrimental effects of frost heave.

If site grading and construction are anticipated during cold weather, we recommend good winter construction practices be observed. Snow and ice should be removed from excavated and fill areas prior to additional earthwork or construction. Footings, floor slabs or structural portions of the construction should not be placed on frozen ground; nor should the supporting soils for buildings be permitted to freeze during or after construction. Frozen soils should not be used as backfill or fill.

9.8 Preliminary Foundation Recommendations

We expect the proposed residential structures may be supported on conventional shallow spread footings bearing on compacted natural granular soil subgrade. Since geologic conditions vary throughout the site, ALLWEST should be contacted to review the proposed construction for each lot to confirm these recommendations are appropriate and that footings do not bear on a combination of soil and rock. The following preliminary (confirmation-dependent) recommendations are provided for design and construction of foundations based on the subsurface conditions observed:

- Footings bearing on properly prepared granular soil subgrade may be designed for an allowable bearing pressure of 2,500 psf. The allowable bearing pressure value may be increased by one-third to account for transient loads such as wind and seismic.
- An ultimate value for coefficient of friction between cast-in-place concrete and granular soil subgrade of 0.45 may be used for design.
- Foundation bearing surfaces should be free of loose soil and debris.
- Footings should be embedded at least 36 inches below finished exterior ground surface to help protect against frost action.
- We recommend foundation wall backfill be placed uniformly on both sides of the foundation walls to reduce displacement of the foundation walls.
- If the previous recommendations are implemented, it is our opinion the total settlement will be less than one inch and differential settlement will be less than ½-inch in 30-feet.

9.9 Concrete Slabs-on-Grade

Concrete slabs-on-grade should be supported on at least 6 inches of crushed base course. The crushed base course below the slabs should be compacted to at least 95 percent of the maximum dry density established by modified Proctor (ASTM D1557). The slab subgrade should be prepared as previously recommended.



A vapor retarder is commonly used beneath concrete slabs-on-grade when moisture sensitive floor coverings and/or adhesives are used. If a vapor retarder is used, we recommend using a 15-mil, puncture-resistant proprietary product such as Stego Wrap, or an approved equivalent that is classified as a Class A vapor retarder in accordance with ASTM E1745. Overlap lengths and the appropriate tape used to seal the laps should be in accordance with the vapor retarder manufacturer's recommendations. To help avoid puncturing of the vapor retarder, a thin sand layer placed over the crushed gravel is recommended. When conditions warrant the use of a vapor retarder, the slab designer and slab contractor should refer to ACI 302 and ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

9.10 Lateral Earth Pressures

Below-grade foundation walls should be designed for resisting lateral earth pressures due to sliding. The lateral earth pressures for approved onsite and import granular structural fill should be calculated using the following equivalent fluid pressures:

Condition	Equivalent Fluid Pressure Granular Structural Fill (pcf)
At-rest	55
Active	35
Passive	350

The above values are for level backfill only.

9.11 Seismicity

We anticipate the 2018 International Residential Code (IRC) will be used as the basis for design of the proposed structures. The soil and rock at the site can be characterized as Site Class C for seismic design.

The following seismic parameters were calculated using USGS U.S. Seismic Design Maps for use with the 2018 IBC. The latitude and longitude for the site were used to specify the location of the subject property. The following Site Class C seismic parameters may be used for design.

Latitude (degrees)	Longitude (degrees)	Spectral Accelerations		Site Coefficients	
		S _s	S ₁	F _a	F _v
46.8765	-113.9793	0.430g	0.143g	1.3	1.5

9.12 Stormwater and Drainage

We recommend the grading plan include slopes such that storm water run-off is directed away from the building and pavement areas to a storm water management system. We recommend ground surface adjacent to foundations be sloped a minimum of five percent within 10 feet of the buildings. If the adjoining ground surface consists of hardscapes it may be sloped a minimum of two percent in the first 10 feet. Water should not be allowed to infiltrate or pond adjacent to foundations or slopes.

We anticipate soils at foundation elevations to be free-draining but shallow rock could cause water to be trapped around basement foundations. Therefore, installation of a foundation drain system and drainage discharge in accordance with 2018 IBC sections 1805.4.2 & 1805.4.3 is recommended.

10.0 ADDITIONAL SERVICES

ALLWEST should be retained to provide geotechnical consultation before and during home construction on each individual lot. ALLWEST should also be retained to provide construction materials testing and observation to verify the soil and geologic conditions and the report recommendations are incorporated into the actual construction. If we are not retained to provide required construction observation and materials testing services, we cannot be responsible for soil engineering related construction errors or omissions.

11.0 EVALUATION LIMITATIONS

This report has been prepared to assist the planning and design for the proposed Greenough Heights residential subdivision project located at 1006 W. Greenough Drive in Missoula, Montana. Reliance by any other party other than the addressee and the current site owner is prohibited without the written authorization of ALLWEST. Our services consist of professional opinions and conclusions made in accordance with generally accepted geotechnical engineering principles and practices in the local area at the time this report was prepared. This acknowledgement is in lieu of all warranties, express or implied.

The following appendices complete this report:

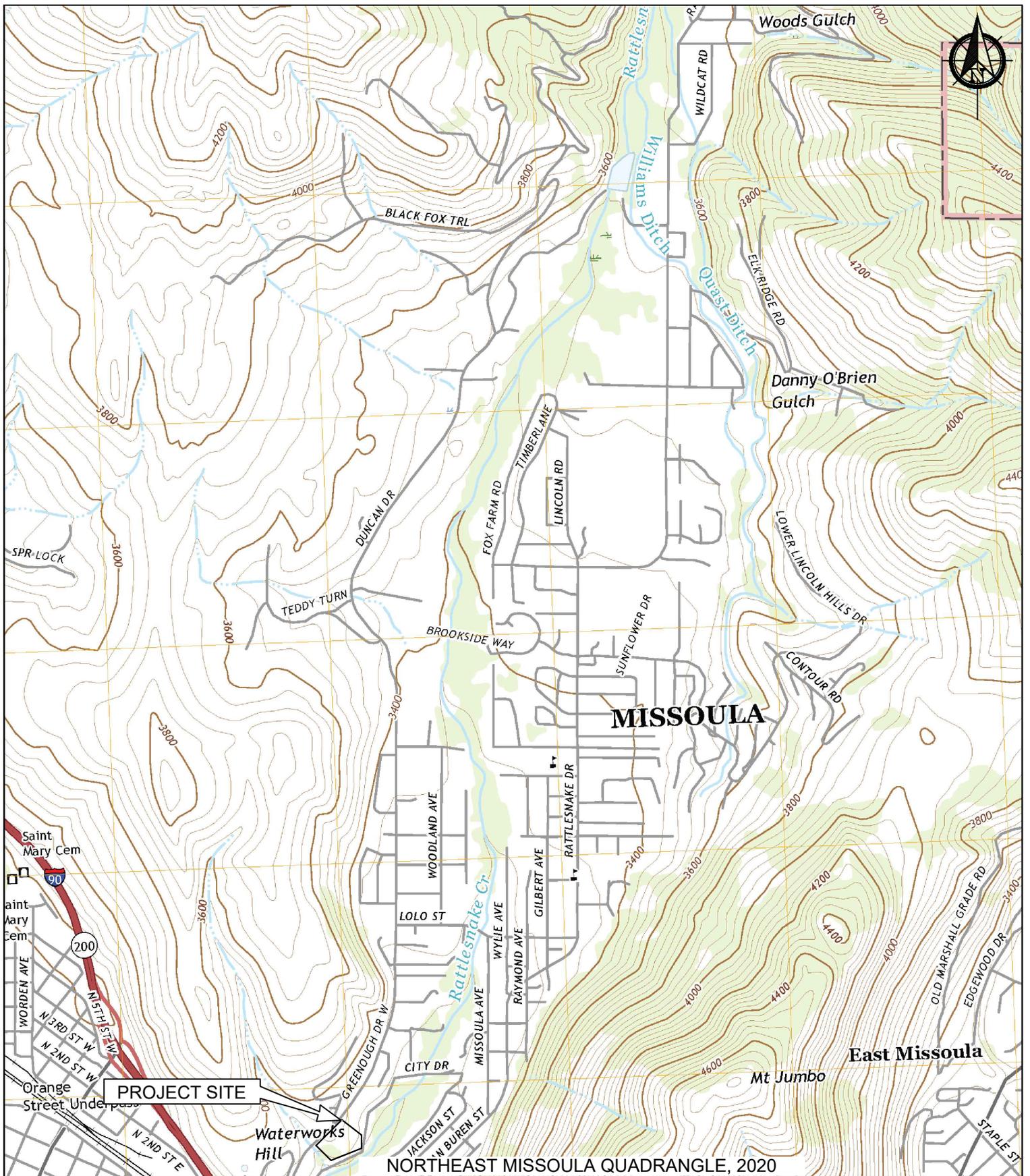
- Appendix A – Vicinity Map, Test Pit & Cross Section Location Map
- Appendix B – Test Pit Logs, Unified Soil Classification System
- Appendix C – Laboratory Test Results
- Appendix D – Global Slope Stability Analysis



Appendix A

Vicinity Map
Test Pit & Cross Section Location Map





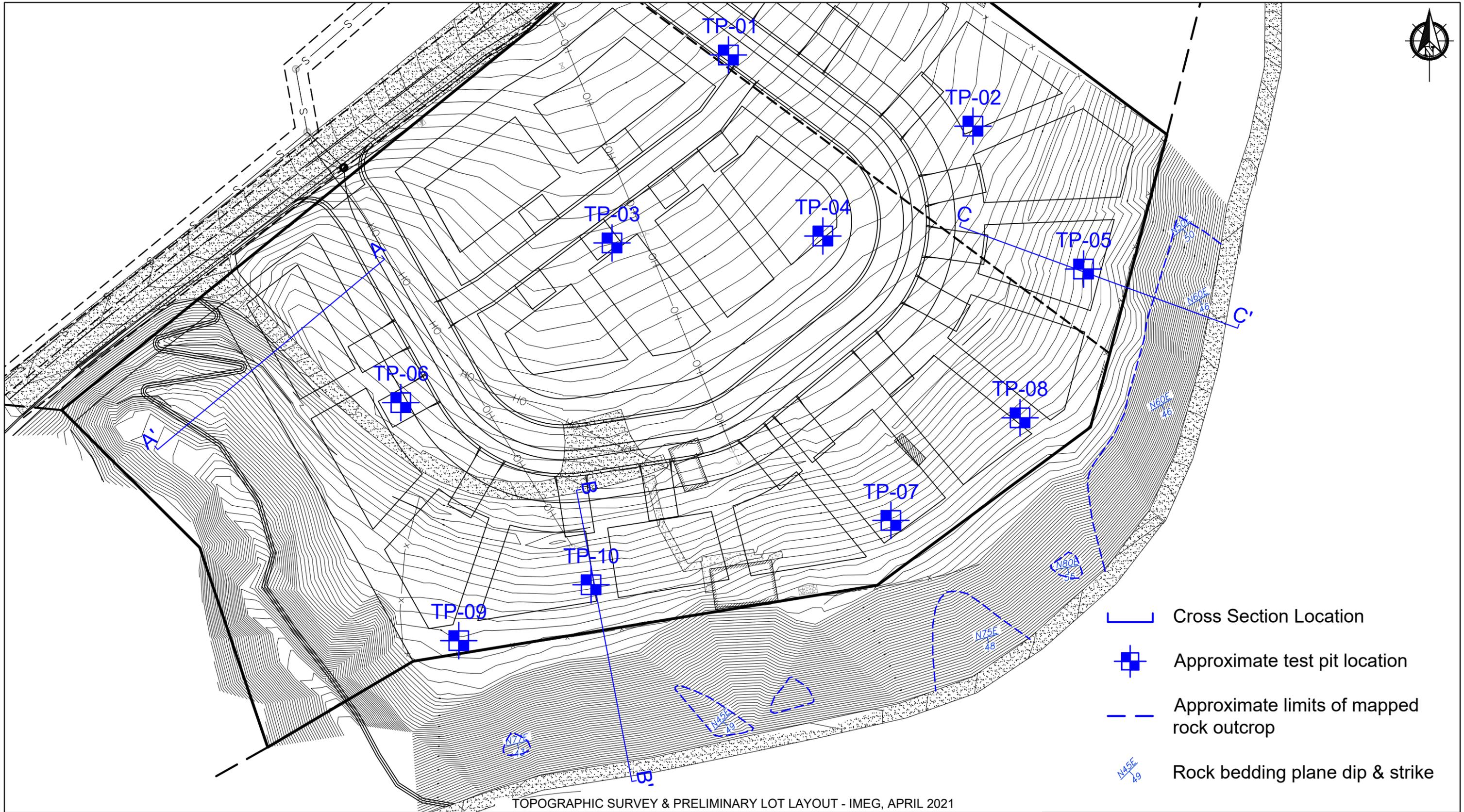
NORTHEAST MISSOULA QUADRANGLE, 2020

FIGURE A-1: VICINITY MAP




 2720 Palmer St Unit A
 Missoula, Montana 59808
 (406) 206-5911
 www.allwesttesting.com

PROJECT:	721-013G Greenough Heights
LOCATION:	Missoula, Montana
CLIENT NAME:	Roy Korkalo
DATE:	April 2021



TOPOGRAPHIC SURVEY & PRELIMINARY LOT LAYOUT - IMEG, APRIL 2021

-  Cross Section Location
-  Approximate test pit location
-  Approximate limits of mapped rock outcrop
-  Rock bedding plane dip & strike



2720 Palmer St Unit A
Missoula, Montana 59808
(406) 206-5911
www.allwesttesting.com

FIGURE A-2: TEST PIT & CROSS SECTION LOCATION MAP	
PROJECT:	721-013G Greenough Heights
LOCATION:	Missoula, Montana
CLIENT NAME:	Roy Korkalo
DATE:	April 2021

Appendix B

Test Pit Logs
Unified Soil Classification System



**ALLWEST
MISSOULA, MONTANA
GEOTECHNICAL SECTION
TEST PIT LOG**

DATE STARTED: 03/10/2021
DATE FINISHED: 03/10/2021
OPERATOR: Unknown
COMPANY: Grant Creek Exc.
LOGGER: Cody Bodman
WEATHER: Clear

TEST PIT TP-01
EXCAVATOR: CAT 320E
EXCAVATION METHOD: Soil Excavation
Bucket

PROJECT: 721-013G Greenough Heights

NOTES: Refer to Figure A-2 for approximate test pit location
Approximate test pit elevation = 3318'

DEPTH (ft)	USCS	LATITUDE (DEGREES): N 46°52'37.2612" (46.877017°) LONGITUDE (DEGREES): W -113°58'46.4412" (-113.979567°)		GRAPHIC LOG	SAMPLE #	NOTES
		TOTAL DEPTH: 11'				
		DESCRIPTION				
0	SM	Topsoil - Silty sand (SM), brown, moist, loose.				Bulk sample at 2' Gravel = 7% Sand = 71% Silt/Clay = 22% MC = 9%
1	SM	Silty sand (SM), brown, moist, non-plastic to low plasticity, trace gravel, medium dense.				
2	SP	Poorly graded sand (SP), light brown, moist, trace gravel, medium dense, minor caving.				
3						
4						
5	SM-SC	Silty, clayey sand (SM-SC), brown, moist, low to medium plasticity, trace gravel, medium stiff.				
6						
7						
8						
9						
10						
11		Test pit TP-1 terminated at 11' No groundwater observed.				
12						
13						
14						
15						
16						
17						
18	WATER LEVELS					
	▽ WHILE EXCAVATING ▼ AT COMPLETION ▼ AFTER EXCAVATING					

**ALLWEST
MISSOULA, MONTANA
GEOTECHNICAL SECTION
TEST PIT LOG**

DATE STARTED: 03/09/2021
DATE FINISHED: 03/09/2021
OPERATOR: Unknown
COMPANY: Grant Creek Exc.
LOGGER: Cody Bodman
WEATHER: Clear

TEST PIT TP-02
EXCAVATOR: CAT 320E
EXCAVATION METHOD: Soil Excavation
Bucket

PROJECT: 721-013G Greenough Heights

NOTES: Refer to Figure A-2 for approximate test pit location
Approximate test pit elevation = 3305'

DEPTH (ft)	USCS	LATITUDE (DEGREES): N 46°52'36.9012" (46.876917°) LONGITUDE (DEGREES): W -113°58'44.0436" (-113.978901°)		GRAPHIC LOG	SAMPLE #	NOTES	
		TOTAL DEPTH: 14'					
		DESCRIPTION					
0	SM	Topsoil - Silty sand (SM), brown, moist, loose.					
1	GP-GC	Poorly graded gravel with clay and sand and cobbles (GP-GC), brown, moist, low plasticity, fine to coarse, sub-angular to sub-rounded, trace boulders, minor caving, medium dense.					
2							
3							
4							Bulk sample at 4' MC = 4%
5							
6							
7							
8							
9							
10							
11							
12							
13							
14		Test pit TP-2 terminated at 14' No groundwater observed.					
15							
16							
17							
18	WATER LEVELS						
	▽ WHILE EXCAVATING ▼ AT COMPLETION ▼ AFTER EXCAVATING						

**ALLWEST
MISSOULA, MONTANA
GEOTECHNICAL SECTION
TEST PIT LOG**

DATE STARTED: 03/10/2021
DATE FINISHED: 03/10/2021
OPERATOR: Unknown
COMPANY: Grant Creek Exc.
LOGGER: Cody Bodman
WEATHER: Clear

TEST PIT TP-03
EXCAVATOR: CAT 320E
EXCAVATION METHOD: Soil Excavation
Bucket

PROJECT: 721-013G Greenough Heights

NOTES: Refer to Figure A-2 for approximate test pit location
Approximate test pit elevation = 3313'

DEPTH (ft)	USCS	LATITUDE (DEGREES): N 46°52'36.0012" (46.876667°) LONGITUDE (DEGREES): W -113°58'47.4636" (-113.979851°)		GRAPHIC LOG	SAMPLE #	NOTES
		TOTAL DEPTH: 10'				
		DESCRIPTION				
0	SM	Topsoil - Silty sand (SM), brown, moist, loose.				
1	SP	Poorly graded sand with gravel (SP), light brown, moist, trace cobbles, medium dense.				
2						
3						
4	CL	Sandy lean clay (CL), brown, moist, low to medium plasticity, trace gravel, medium dense.				
5						Bulk sample at 5' Gravel = 8% Sand = 33% Silt/Clay = 59% MC = 15% LL = 32 PI = 15
6						
7						
8						
9						
10		Test pit TP-3 terminated at 10' No groundwater observed.				
11						
12						
13						
14						
15						
16						
17						
18	WATER LEVELS					
	▽ WHILE EXCAVATING ▼ AT COMPLETION ▾ AFTER EXCAVATING					

**ALLWEST
MISSOULA, MONTANA
GEOTECHNICAL SECTION
TEST PIT LOG**

DATE STARTED: 03/09/2021
DATE FINISHED: 03/09/2021
OPERATOR: Unknown
COMPANY: Grant Creek Exc.
LOGGER: Cody Bodman
WEATHER: Clear

TEST PIT TP-04
EXCAVATOR: CAT 320E
EXCAVATION METHOD: Soil Excavation
Bucket

PROJECT: 721-013G Greenough Heights

NOTES: Refer to Figure A-2 for approximate test pit location
Approximate test pit elevation = 3307'

DEPTH (ft)	USCS	LATITUDE (DEGREES): N 46°52'36.1236" (46.876701°) LONGITUDE (DEGREES): W -113°58'45.4188" (-113.979283°)		GRAPHIC LOG	SAMPLE #	NOTES
		TOTAL DEPTH: 10'				
		DESCRIPTION				
0	SM	Topsoil - Silty sand (SM), brown, moist, loose.				Bulk sample at 2½' MC = 8%
1	SP-SM	Poorly graded sand with silt and gravel (SP-SM), brown, moist, non-plastic to low plasticity, fine to coarse, sub angular to subrounded, medium dense.				
2						
3						
4	GP	Poorly graded gravel with sand and cobbles (GP), moist, brown, fine to coarse, sub angular to subrounded, medium dense.				
5						
6						
7						
8						
9						
10		Test pit TP-4 terminated at 10' No groundwater observed.				
11						
12						
13						
14						
15						
16						
17						
18	WATER LEVELS					
	<input type="checkbox"/> WHILE EXCAVATING <input type="checkbox"/> AT COMPLETION <input type="checkbox"/> AFTER EXCAVATING					

**ALLWEST
MISSOULA, MONTANA
GEOTECHNICAL SECTION
TEST PIT LOG**

DATE STARTED: 03/09/2021
DATE FINISHED: 03/09/2021
OPERATOR: Unknown
COMPANY: Grant Creek Exc.
LOGGER: Cody Bodman
WEATHER: Clear

TEST PIT TP-05
EXCAVATOR: CAT 320E
EXCAVATION METHOD: Soil Excavation
Bucket

PROJECT: 721-013G Greenough Heights

NOTES: Refer to Figure A-2 for approximate test pit location
Approximate test pit elevation = 3289'

DEPTH (ft)	USCS	LATITUDE (DEGREES): N 46°52'36.0012" (46.876667°) LONGITUDE (DEGREES): W -113°58'42.8412" (-113.978567°)		GRAPHIC LOG	SAMPLE #	NOTES	
		TOTAL DEPTH: 11'					
		DESCRIPTION					
0	SM	Topsoil - Silty sand (SM), dark brown, moist, loose.					
1	GP-GC	Poorly graded gravel with clay and sand and cobbles (GP-GC), brown, moist, low plasticity, fine to coarse, sub-angular to sub-rounded, trace boulders, minor caving, medium dense to very dense.					
2							
3							
4							
5							
6							
7							
8							
9	ARGILLIT	Excavatable argillite, retrieved as hard, fine to coarse, angular gravel.					
10							
11		Test pit TP-5 terminated at 11' No groundwater observed.					
12							
13							
14							
15							
16							
17							
18	WATER LEVELS						
	<input type="checkbox"/> WHILE EXCAVATING <input type="checkbox"/> AT COMPLETION <input type="checkbox"/> AFTER EXCAVATING						

**ALLWEST
MISSOULA, MONTANA
GEOTECHNICAL SECTION
TEST PIT LOG**

DATE STARTED: 03/09/2021
DATE FINISHED: 03/09/2021
OPERATOR: Unknown
COMPANY: Grant Creek Exc.
LOGGER: Cody Bodman
WEATHER: Clear

TEST PIT TP-06
EXCAVATOR: CAT 320E
EXCAVATION METHOD: Soil Excavation
Bucket

PROJECT: 721-013G Greenough Heights

NOTES: Refer to Figure A-2 for approximate test pit location
Approximate test pit elevation = 3300'

DEPTH (ft)	USCS	LATITUDE (DEGREES): N 46°52'34.8636" (46.876351°) LONGITUDE (DEGREES): W -113°58'49.4436" (-113.980401°)		GRAPHIC LOG	SAMPLE #	NOTES
		TOTAL DEPTH: 10'				
		DESCRIPTION				
0	SM	Topsoil - Silty sand (SM), dark brown, moist, loose.				Bulk sample at 2' Gravel = 2% Sand = 52% Silt/Clay = 46% MC = 14%
1	SM	Silty sand (SM), brown to light gray, dry to moist, non-plastic to low plasticity, trace gravel, medium dense.				
2	SM					
3	SM					
4	SM					
4	GP-GM	Poorly graded gravel with silt and sand and cobbles (GP-GM), light gray, moist, fine to coarse, sub-angular to sub-rounded, trace boulders, medium dense to very dense.				
5	GP-GM					
6	GP-GM					
7	GP-GM					
8	GP-GM					
9	GP-GM					
9	GP	Poorly graded gravel with sand and cobbles (GP), gray, moist, fine to coarse, sub-angular to sub-rounded, medium dense to very dense.				
10	GP					
11	GP					
12	GP					
13	GP					
14	GP	Test pit TP-6 terminated at 14' No groundwater observed.				
15	GP					
16	GP					
17	GP					
18	WATER LEVELS					
	<input type="checkbox"/> WHILE EXCAVATING <input type="checkbox"/> AT COMPLETION <input type="checkbox"/> AFTER EXCAVATING					

**ALLWEST
MISSOULA, MONTANA
GEOTECHNICAL SECTION
TEST PIT LOG**

DATE STARTED: 03/09/2021
DATE FINISHED: 03/09/2021
OPERATOR: Unknown
COMPANY: Grant Creek Exc.
LOGGER: Cody Bodman
WEATHER: Clear

TEST PIT TP-07
EXCAVATOR: CAT 320E
EXCAVATION METHOD: Soil Excavation
Bucket

PROJECT: 721-013G Greenough Heights

NOTES: Refer to Figure A-2 for approximate test pit location
Approximate test pit elevation = 3287'

DEPTH (ft)	USCS	LATITUDE (DEGREES): N 46°52'34.2588" (46.876183°) LONGITUDE (DEGREES): W -113°58'44.5836" (-113.979051°)		GRAPHIC LOG	SAMPLE #	NOTES	
		TOTAL DEPTH: 15'					
		DESCRIPTION					
0	SM	Topsoil - Silty sand (SM), dark brown, moist, loose.					
1	GP-GC	Poorly graded gravel with clay and sand and cobbles (GP-GC), brown, moist, low plasticity, fine to coarse, sub-angular to sub-rounded, trace boulders, minor caving, medium dense to very dense.					
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15	ARGILLIT	Excavatable argillite, retrieved as hard, fine to coarse, angular gravel. Test pit TP-7 terminated at 15' No groundwater observed.					
16							
17							
18	WATER LEVELS						
	▽ WHILE EXCAVATING ▽ AT COMPLETION ▽ AFTER EXCAVATING						

**ALLWEST
MISSOULA, MONTANA
GEOTECHNICAL SECTION
TEST PIT LOG**

DATE STARTED: 03/09/2021
DATE FINISHED: 03/09/2021
OPERATOR: Unknown
COMPANY: Grant Creek Exc.
LOGGER: Cody Bodman
WEATHER: Clear

TEST PIT TP-08
EXCAVATOR: CAT 320E
EXCAVATION METHOD: Soil Excavation
Bucket

PROJECT: 721-013G Greenough Heights

NOTES: Refer to Figure A-2 for approximate test pit location
Approximate test pit elevation = 3287'

DEPTH (ft)	USCS	LATITUDE (DEGREES): N 46°52'34.9788" (46.876383°) LONGITUDE (DEGREES): W -113°58'43.3812" (-113.978717°)		GRAPHIC LOG	SAMPLE #	NOTES
		TOTAL DEPTH: 14'				
		DESCRIPTION				
0	SM	Topsoil - Silty sand (SM), dark brown, moist, loose.				
1		Poorly graded gravel with clay and sand and cobbles (GP-GC), brown, moist to wet, low plasticity, fine to coarse, sub-angular to sub-rounded, trace boulders, minor caving, medium dense to very dense.				
2	GP-GC					
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13	ARGILLIT	Excavatable argillite, retrieved as hard, fine to coarse, angular gravel.				
14		Test pit TP-8 terminated at 14' Perched groundwater observed at ~13½'.				
15						
16						
17						
18	WATER LEVELS					
13.5'	▽ WHILE EXCAVATING					
	▼ AT COMPLETION					
	▼ AFTER EXCAVATING					

**ALLWEST
MISSOULA, MONTANA
GEOTECHNICAL SECTION
TEST PIT LOG**

DATE STARTED: 03/09/2021
DATE FINISHED: 03/09/2021
OPERATOR: Unknown
COMPANY: Grant Creek Exc.
LOGGER: Cody Bodman
WEATHER: Clear

TEST PIT TP-09
EXCAVATOR: CAT 320E
EXCAVATION METHOD: Soil Excavation
Bucket

PROJECT: 721-013G Greenough Heights

NOTES: Refer to Figure A-2 for approximate test pit location
Approximate test pit elevation = 3285'

DEPTH (ft)	USCS	LATITUDE (DEGREES): N 46°52'33.2436" (46.875901°) LONGITUDE (DEGREES): W -113°58'48.7812" (-113.980217°)		GRAPHIC LOG	SAMPLE #	NOTES
		TOTAL DEPTH: 13'				
		DESCRIPTION				
0	SM	Topsoil - Silty sand (SM), dark brown, moist, loose.				Bulk sample at 3' MC = 2%
1	SM	Silty sand (SM), brown, moist, non-plastic to low plasticity, trace gravel.				
2	GP	Poorly graded gravel with sand and cobbles (GP), brown, moist, fine to coarse, sub-angular to sub-rounded, trace boulders, minor caving, medium dense to very dense.				
3	ARGILLIT	Excavatable argillite, retrieved as hard, fine to coarse, angular gravel.				
4						
5						
6						
7						
8						
9						
10						
11						
12						
13		Test pit TP-9 terminated at 13' No groundwater observed.				
14						
15						
16						
17						
18	WATER LEVELS					
	<input type="checkbox"/> WHILE EXCAVATING <input type="checkbox"/> AT COMPLETION <input type="checkbox"/> AFTER EXCAVATING					

**ALLWEST
MISSOULA, MONTANA
GEOTECHNICAL SECTION
TEST PIT LOG**

DATE STARTED: 03/09/2021
DATE FINISHED: 03/09/2021
OPERATOR: Unknown
COMPANY: Grant Creek Exc.
LOGGER: Cody Bodman
WEATHER: Clear

TEST PIT TP-10
EXCAVATOR: CAT 320E
EXCAVATION METHOD: Soil Excavation
Bucket

PROJECT: 721-013G Greenough Heights

NOTES: Refer to Figure A-2 for approximate test pit location
Approximate test pit elevation = 3290'

DEPTH (ft)	USCS	LATITUDE (DEGREES): N 46°52'33.7188" (46.876033°) LONGITUDE (DEGREES): W -113°58'47.5212" (-113.979867°)		GRAPHIC LOG	SAMPLE #	NOTES
		TOTAL DEPTH: 17'				
		DESCRIPTION				
0	SM	Topsoil - Silty sand (SM), dark brown, moist, loose.				
1		Poorly graded gravel with clay and sand and cobbles (GP-GC), brown, moist to very moist, low plasticity, fine to coarse, sub-angular to sub-rounded, trace boulders, minor caving, medium dense to very dense.				
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17		Test pit TP-10 terminated at 17' No groundwater observed.				
18	WATER LEVELS					
	▽ WHILE EXCAVATING ▽ AT COMPLETION ▽ AFTER EXCAVATING					

Unified Soil Classification System

MAJOR DIVISIONS		SYMBOL	TYPICAL NAMES
COARSE GRAINED SOILS	GRAVELS	CLEAN GRAVELS	GW Well-Graded Gravel, Gravel-Sand Mixtures.
			GP Poorly-Graded Gravel, Gravel-Sand Mixtures.
		GRAVELS WITH FINES	GM Silty Gravel, Gravel-Sand-Silt Mixtures.
			GC Clayey Gravel, Gravel-Sand-Clay Mixtures.
	SANDS	CLEAN SANDS	SW Well-Graded Sand, Gravelly Sand.
			SP Poorly-Graded Sand, Gravelly Sand.
		SANDS WITH FINES	SM Silty Sand, Sand-Silt Mixtures.
			SC Clayey Sand, Sand-Clay Mixtures.
FINE GRAINED SOILS	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50%	ML Inorganic Silt, Silty or Clayey Fine Sand.	
		CL Inorganic Clay of Low to Medium Plasticity, Sandy or Silty Clay.	
		OL Organic Silt and Clay of Low Plasticity.	
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%	MH Inorganic Silt, Elastic Silt, Micaceous Silt, Fine Sand or Silt.	
		CH Inorganic Clay of High Plasticity, Fat Clay.	
		OH Organic Clay of Medium to High Plasticity.	
Highly Organic Soils		PT Peat, Muck and Other Highly Organic Soils.	

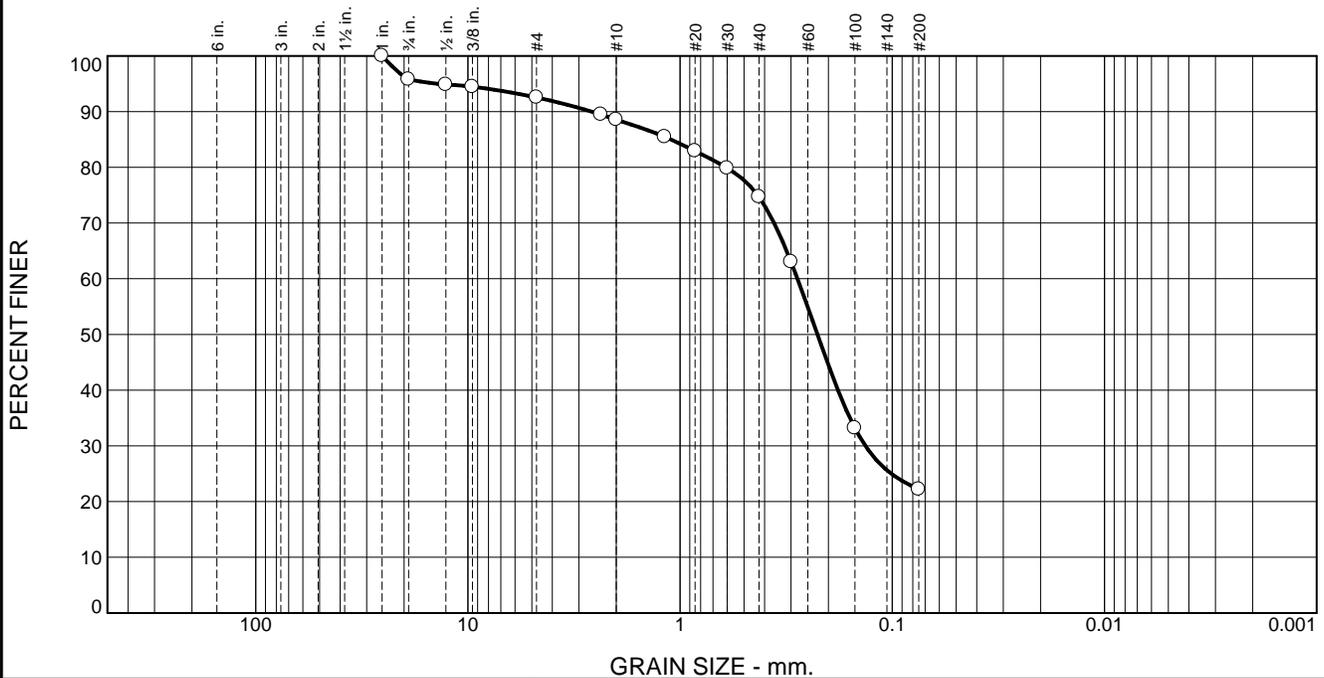


Appendix C

Laboratory Test Results



Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	4	3	4	14	53	22	

Test Results (ASTM C 136 & ASTM C 117)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100		
3/4"	96		
1/2"	95		
3/8"	94		
#4	93		
#8	89		
#10	89		
#16	85		
#20	83		
#30	80		
#40	75		
#50	63		
#100	33		
#200	22		

* (no specification provided)

Material Description

Silty sand (SM), brown, moist, non-plastic to low plasticity, trace gravel. (Visual-Manual)

Atterberg Limits (ASTM D 4318)

PL= NT LL= NT PI= NT

Classification

USCS (D 2487)= NT AASHTO (M 145)= NT

Coefficients

D₉₀= 2.6126 D₈₅= 1.1063 D₆₀= 0.2798
D₅₀= 0.2253 D₃₀= 0.1339 D₁₅=
D₁₀= C_u= C_c=

Remarks

NT = Not Tested; Sampled by C. Bodman (ALLWEST); Procedure A (entire sample).

Date Received: 03/10/2021 Date Tested: 04/07/2021

Tested By: C. Bodman - G.I.T.

Checked By: J. Thomasson - P.E.

Title: Snr. Geotechnical Engineer

Location: TP-1 @ 2'
Sample Number: S721-0071 Depth: 2'

Date Sampled: 03/10/2021

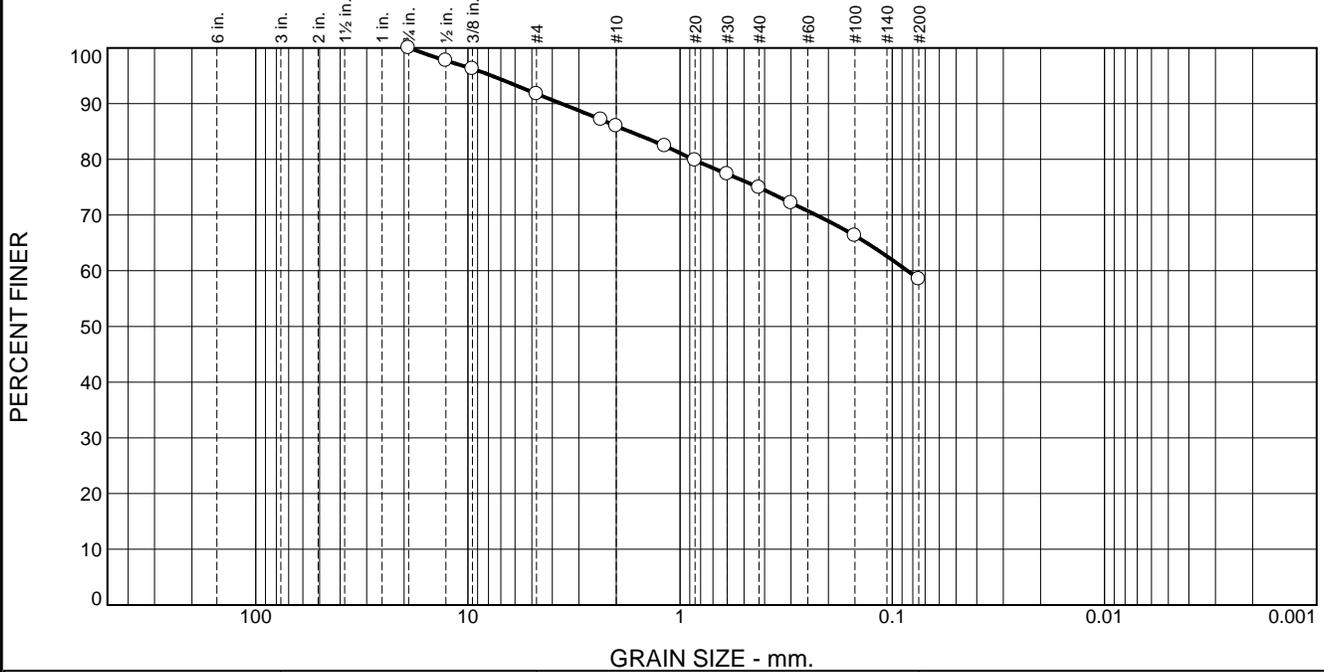


Client: Roy Korkalo
Project: Greenough Heights Geotechnical Evaluation

Project No: 721-013G

Figure C-1

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	8	6	11	16	59	

Test Results (ASTM C 136 & ASTM C 117)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100		
1/2"	98		
3/8"	96		
#4	92		
#8	87		
#10	86		
#16	82		
#20	80		
#30	77		
#40	75		
#50	72		
#100	66		
#200	59		

Material Description

Sandy lean clay (CL), brown, moist, low to medium plasticity, trace gravel.

Atterberg Limits (ASTM D 4318)

PL= 17 LL= 32 PI= 15

Classification

USCS (D 2487)= CL AASHTO (M 145)= A-6(6)

Coefficients

D₉₀= 3.6331 D₈₅= 1.7310 D₆₀= 0.0849
D₅₀= D₃₀= D₁₅=
D₁₀= C_u= C_c=

Remarks

Sampled by C. Bodman (ALLWEST), Procedure A (entire sample)

Date Received: 03/10/2021 Date Tested: 04/07/2021

Tested By: C. Bodman - G.I.T.

Checked By: J. Thomasson - P.E.

Title: Snr. Geotechnical Engineer

* (no specification provided)

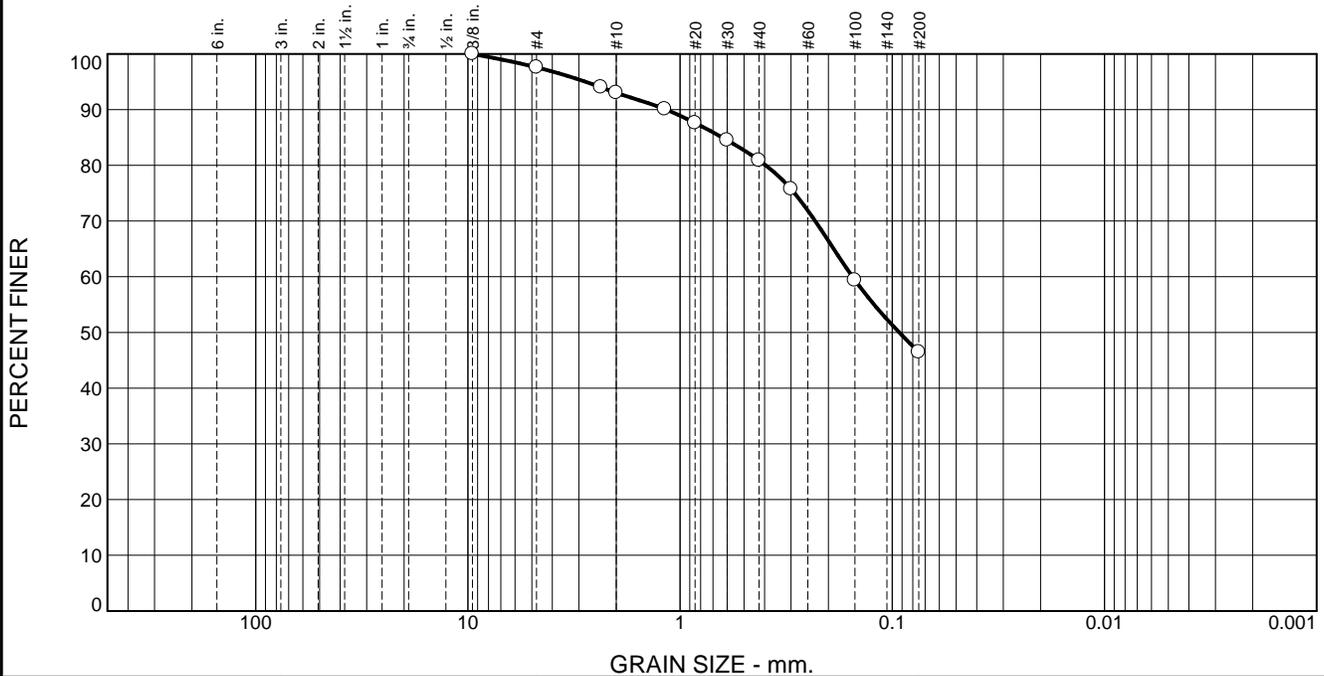
Location: TP-3 @ 5' Date Sampled: 03/10/2021
Sample Number: S721-0073 Depth: 5'



Client: Roy Korkalo
Project: Greenough Heights Geotechnical Evaluation

Project No: 721-013G Figure C-2

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	2	5	12	35	46	

Test Results (ASTM C 136 & ASTM C 117)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100		
#4	98		
#8	94		
#10	93		
#16	90		
#20	88		
#30	85		
#40	81		
#50	76		
#100	59		
#200	46		

* (no specification provided)

Material Description

Silty sand (SM), brown to light gray, dry to moist, non-plastic to low plasticity, trace gravel. (Visual-Manual)

Atterberg Limits (ASTM D 4318)

PL= NT LL= NT PI= NT

Classification

USCS (D 2487)= NT AASHTO (M 145)= NT

Coefficients

D₉₀= 1.1638 D₈₅= 0.6329 D₆₀= 0.1540
D₅₀= 0.0927 D₃₀= D₁₅=
D₁₀= C_u= C_c=

Remarks

NT = Not Tested; Sampled by C. Bodman (ALLWEST); Procedure A (entire sample)

Date Received: 03/09/2021 Date Tested: 04/07/2021

Tested By: C. Bodman - G.I.T.

Checked By: J. Thomasson - P.E.

Title: Snr. Geotechnical Engineer

Location: TP-6 @ 2'
Sample Number: S721-0075 Depth: 2'

Date Sampled: 03/09/2021



Client: Roy Korkalo
Project: Greenough Heights Geotechnical Evaluation

Project No: 721-013G

Figure C-3

Summary of Laboratory Test Results

Test Pit No.	Depth (feet)	Water Content (%)	Gradation			Atterberg Limits		Sample Classification
			Gravel (%)	Sand (%)	Silt / Clay (%)	Liquid Limit (%)	Plasticity Index (%)	
TP-01	2	9	7	71	22	-	-	Silty sand (SM)
TP-02	4	4	-	-	-	-	-	Poorly graded gravel with clay and sand and cobbles (GP-GC)
TP-03	5	15	8	33	59	32	15	Sandy lean clay (CL)
TP-04	2½	8	-	-	-	-	-	Poorly graded sand with silt and gravel (SM)
TP-06	2	14	2	52	46	-	-	Silty sand (SM)
TP-09	3	2	-	-	-	-	-	Poorly graded gravel with sand and cobbles (GP)



Table C-1: Summary of Laboratory Test Results

Greenough Heights Geotechnical Evaluation

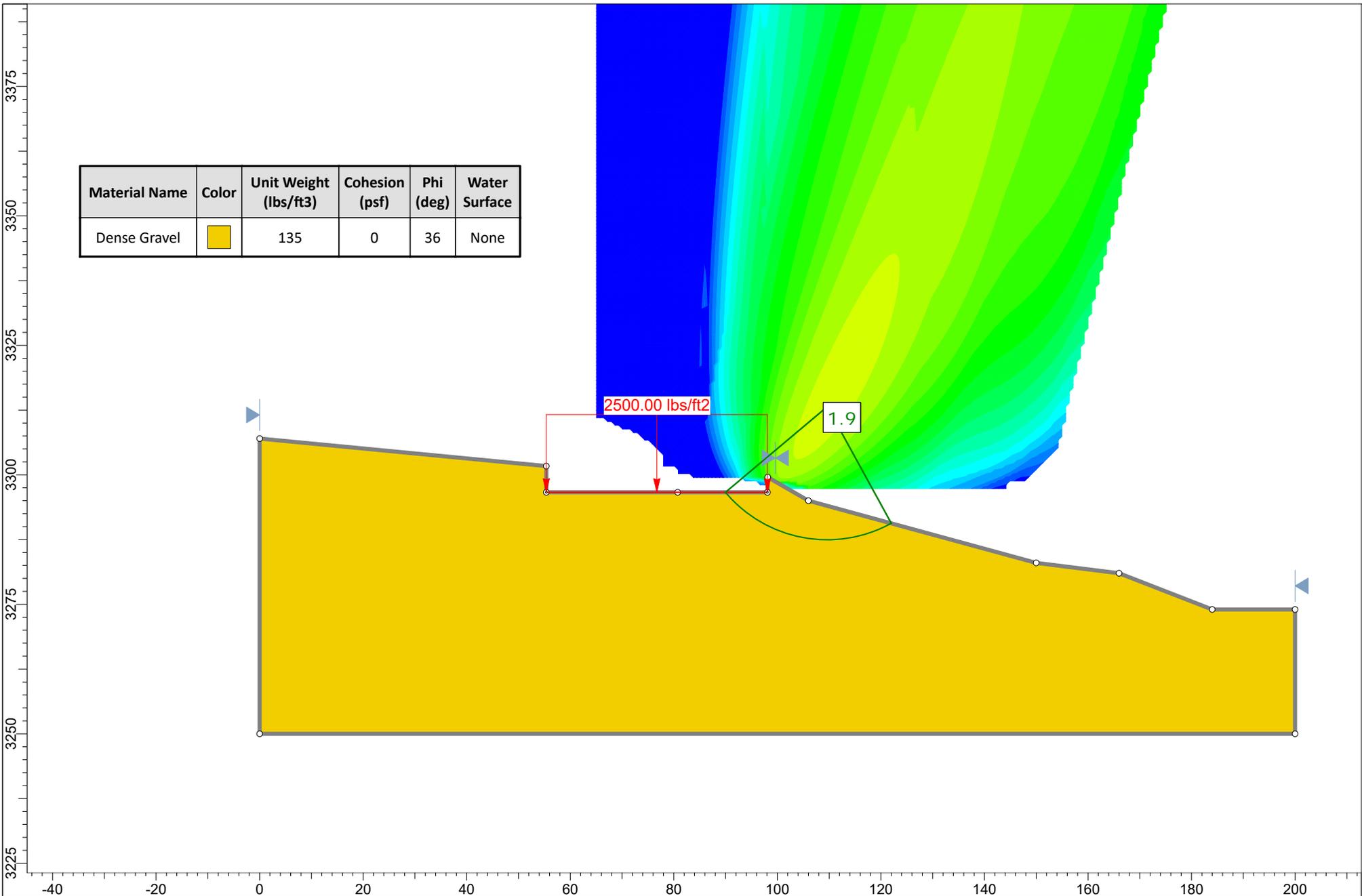
Missoula, Montana

ALLWEST Project No.: 721-013G

Appendix D

Global Slope Stability Analysis

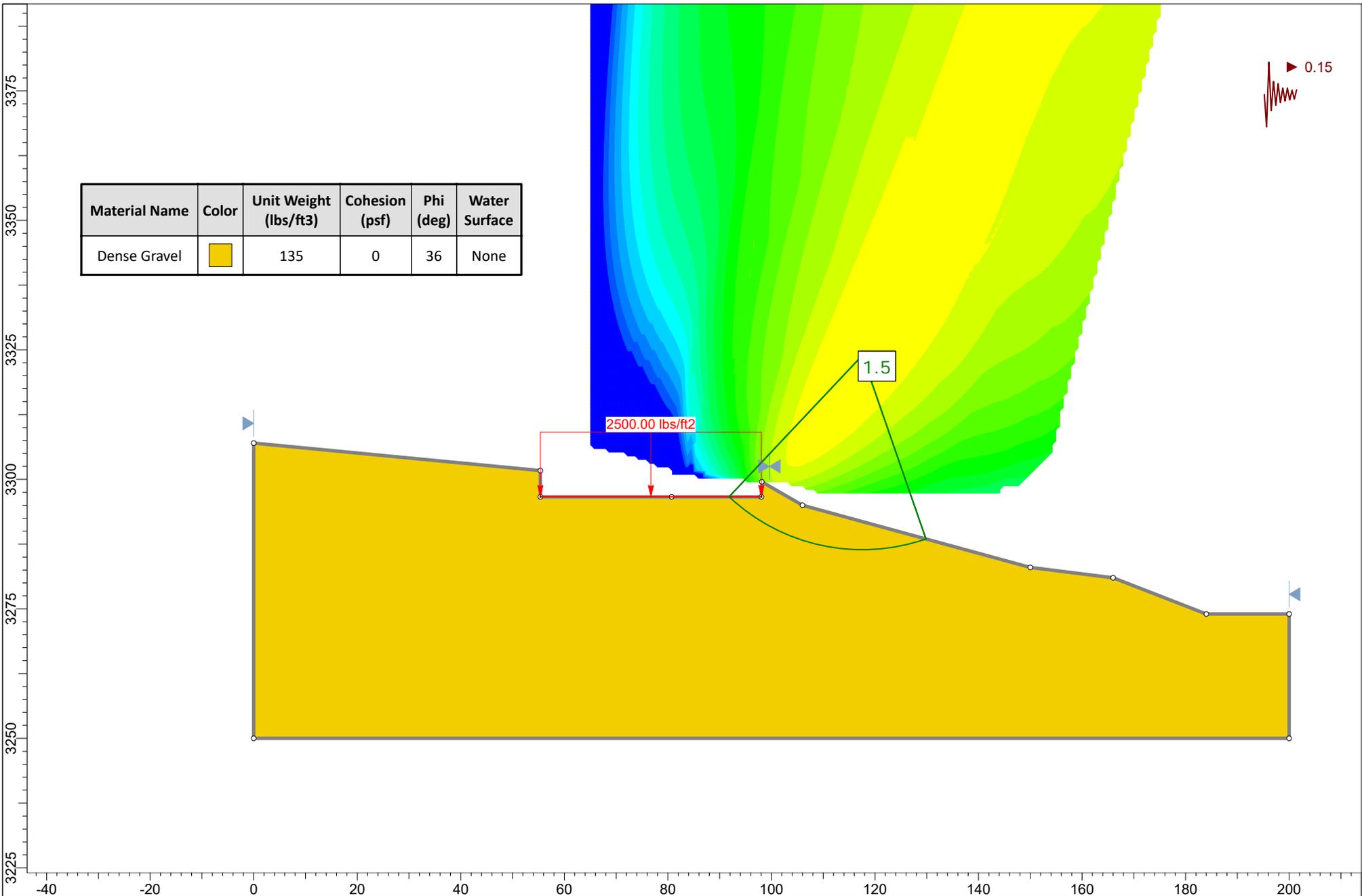




Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Water Surface
Dense Gravel		135	0	36	None

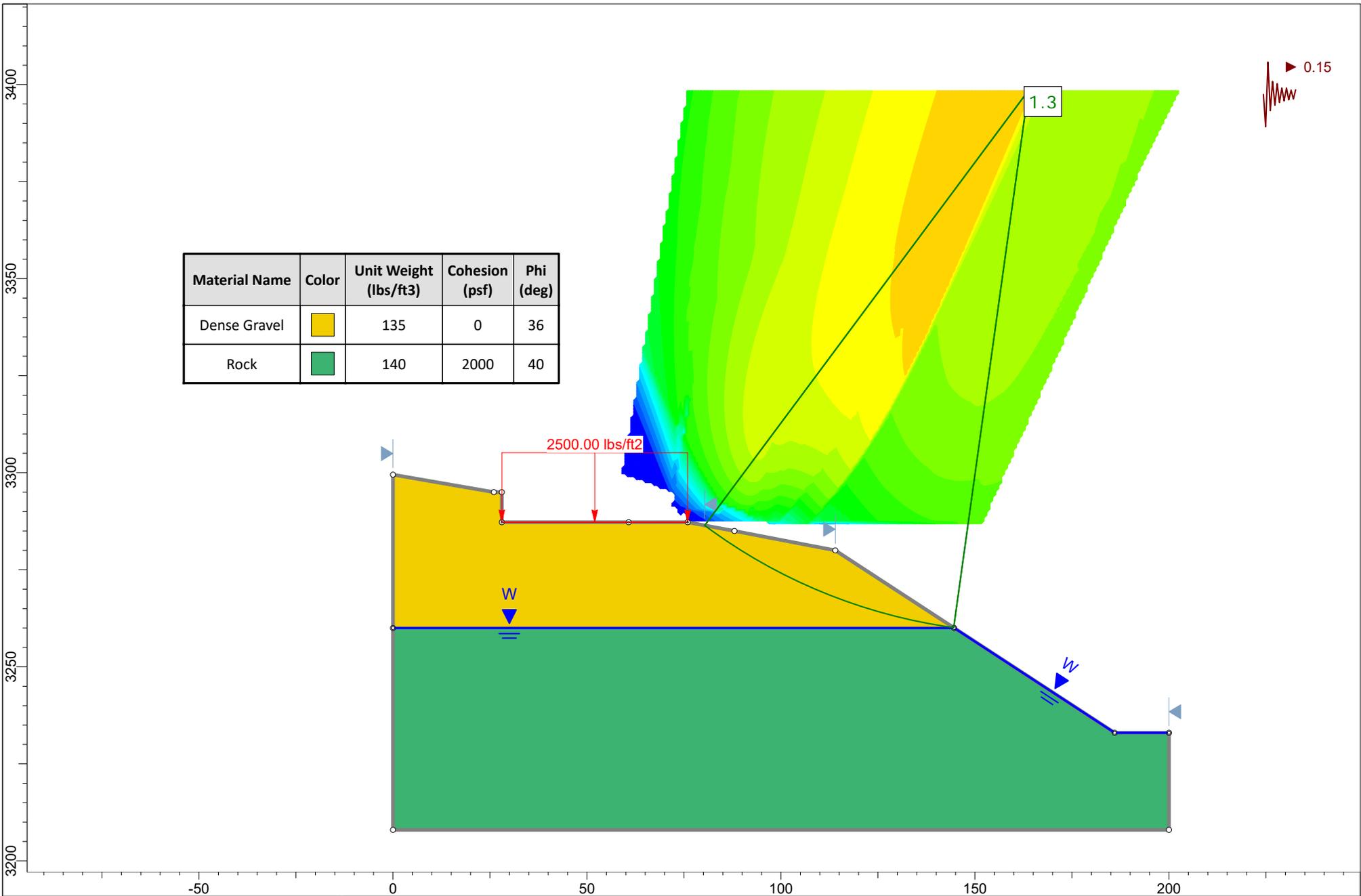


Project		Greenough Heights	
Analysis Description		Figure D1 - Cross Section A-A'	
Drawn By	James Thomasson, P.E.	Scale	1:300
Date		April 2021	
Company		ALLWEST	
File Name		Cross-Section A-A'.slim	

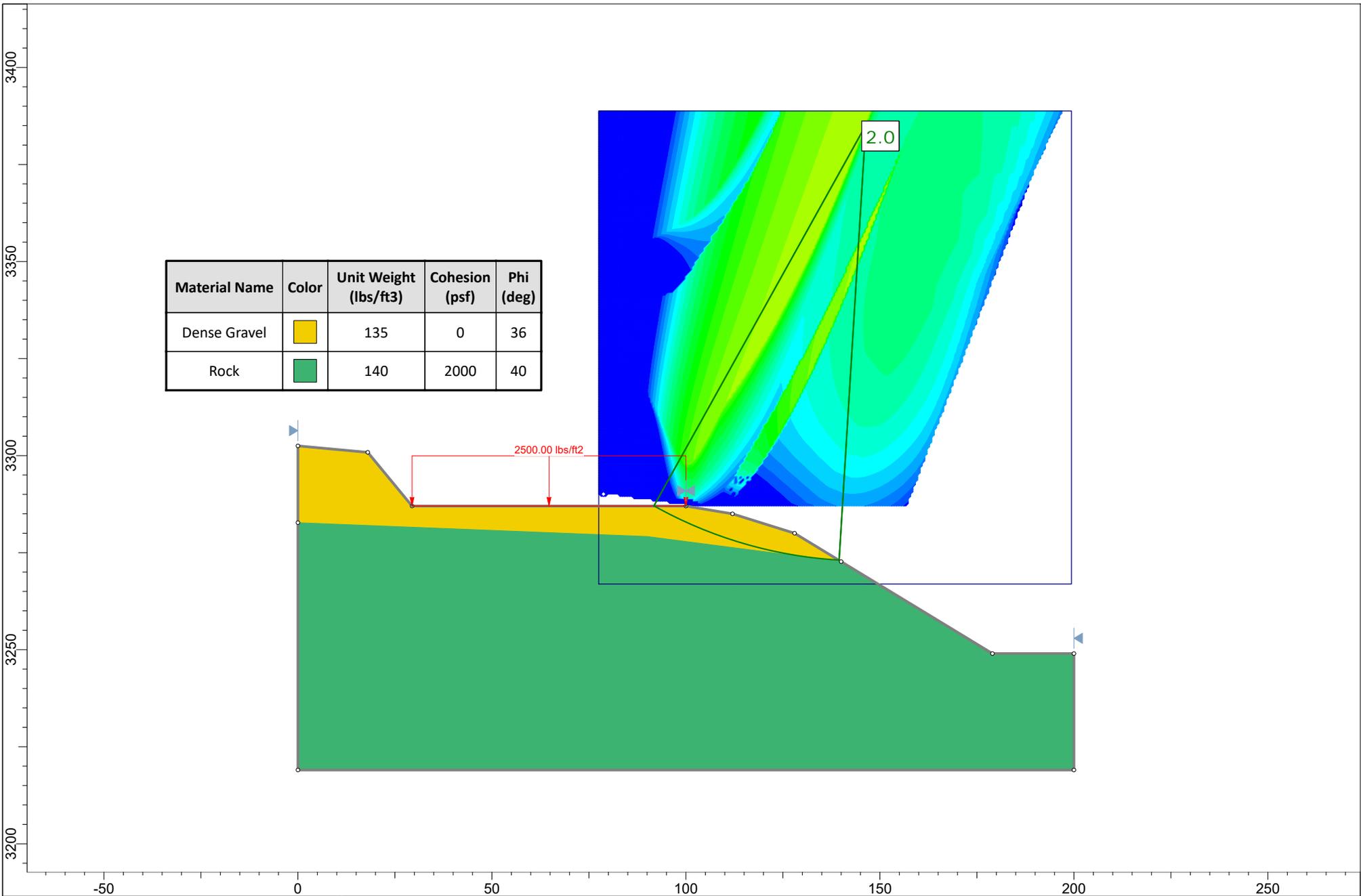


Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Water Surface
Dense Gravel		135	0	36	None

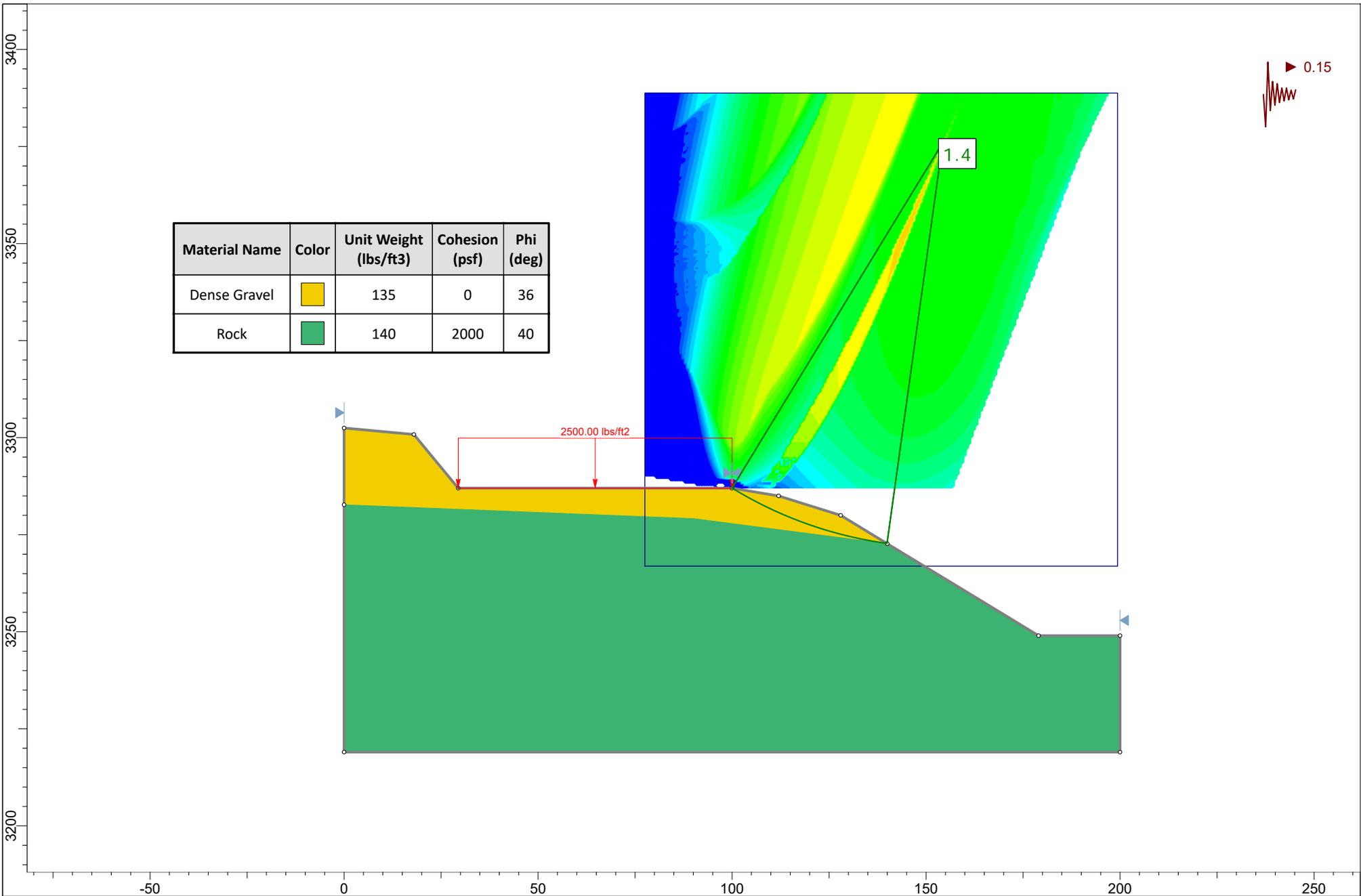
	Project			Greenough Heights		
	Analysis Description			Figure D2 - Cross Section A-A' (seismic)		
	Drawn By	James Thomasson, P.E.	Scale	1:300	Company	ALLWEST
	Date	April 2021	File Name	Cross-Section A-A' seismic.slim		



	Project			Greenough Heights		
	Analysis Description			Figure D4 - Cross Section B-B' (Seismic)		
	Drawn By	James Thomasson, P.E.	Scale	1:400	Company	ALLWEST
	Date	April 2021	File Name	Cross-Section B-B' seismic.slim		



	Project			Greenough Heights		
	Analysis Description			Figure D5 - Cross Section C-C' (Static)		
	Drawn By	James Thomasson, P.E.	Scale	1:400	Company	ALLWEST
	Date	April 2021		File Name	Cross-Section C-C'.slim	



	Project			Greenough Heights		
	Analysis Description			Figure D6 - Cross Section C-C' (Seismic)		
	Drawn By	James Thomasson, P.E.	Scale	1:400	Company	ALLWEST
	Date	April 2021		File Name	Cross-Section C-C' seismic.slim	

Riparian Resource Plan and Map

Riparian Resource Area Management Plan

for the

Greenough Heights Subdivision

Located in
S. 22, T. 13 N., R. 19 W., P.M.M.
Missoula County, Montana

The attached Riparian Resource Area Management Plan Exhibit depicts locations within the Greenough Heights Subdivision that meet the criteria for designation as an “area of riparian resource” per Article 3-130 of the City of Missoula Subdivision Regulations. These riparian areas are a resource to be protected and preserved for quality of vegetation, water, wildlife, and aquatic habitat. Riparian areas require minimal disturbance for maintenance of important functions. Those functions can include: songbird nesting, erosion protection provided by the native woody plant root systems, stream productivity from deciduous leaf fall into the water, fish habitat as overhead cover over the water, as well as shading of streamside areas to maintain cool water temperatures and many other functions.

The Greenough Heights Subdivision shall include proper management of the riparian resources within the delineated “Area of Riparian Resource” zones as indicated in this management plan. The property’s riparian areas have been delineated on the Riparian Resource Area Management Plan Exhibit as “Area of Riparian Resource” zones and are surrounded by a 10’ wide “Area of Riparian Buffer”. The following definition and guidelines are mandated to preserve the riparian areas:

The existing vegetation within the riparian area consists of riparian type trees, shrubs, and grasses to include alders, dogwood, aspens, willows, spruce, and cottonwood (see the attached Riparian Resource Area Management Plan Exhibit for the location and abundance of these vegetation types). The vegetation could provide cover for deer and many kinds of smaller mammals, birds, and pheasants. All of the above vegetation contributes to bank stabilization.

Definition: "Area of Riparian Resource":

The “Area of Riparian Resource” zones shall include the prohibition of all buildings, structures, fences (except for wildlife friendly fencing), roads, motorized vehicle access, and/or drainage facilities installation, maintenance and/or repairs, parking, storage, livestock grazing or watering, or any other development. It shall also prohibit any mining, or filling with substances such as gravel, soil, slash, or other debris. See the attached Riparian Resource Area Management Plan Exhibit for the delineation of boundaries.

A. Proposed access to or through the area:

Vehicular access is not permitted through the “Area of Riparian Resource”.

B. Proposed low-impact use of the area:

No improvements will be permitted to be placed or constructed in the “Area of Riparian Resource”. Low-impact pedestrian access is permitted.

C. Planned restoration of the area with native species:

No alteration or removal of riparian vegetation dead or alive, particularly shrubs and trees is permitted. Exceptions include: the proper use of chemical or other methods of control for noxious weeds is permitted and the removal or trimming of vegetation that is potentially dangerous to humans. Native vegetation should remain as ground cover in the “Area of Riparian Resource”; as this avoids the use of fertilizers that contribute to water quality problems. Any planting in the

“Area of Riparian Resource” zones shall be native vegetation which enhances the riparian area and aids in maintaining its natural state.

D. Planned mitigation of impacts from all proposed uses:

All improvements or alterations to the “Area of Riparian Resource” zones shall be done with a minimum of disturbance. Erosion and sediment controlling measures shall be taken during maintenance operations.

Definition: “Area of Riparian Buffer”:

This is an area intended to prevent encroachment by structures and filter run-off from the surrounding non-riparian areas.

A. Planned buffer to mitigate development adjacent to “Areas of Riparian Resource”:

An “Area of Riparian Resource Buffer” is established for the area of riparian resource which extends an additional 10’ beyond the “Area of Riparian Resource”. This buffer is shown on the Riparian Resource Area Management Plan Exhibit. See the attached Riparian Resource Management Plan Area Exhibit for delineation of riparian area and riparian buffer boundaries.

Grading and Drainage Report



May 26, 2021

Dave DeGrandpre
Development Services
435 Ryman Street
Missoula, Montana 59802

RE: Preliminary Stormwater Design

Dear Dave:

This letter serves as a preliminary stormwater design summary for the proposed development as required by the subdivision process. A full DEQ-8 report will be prepared in the future as the design progresses and the City's Stage Review and DEQ requirements are addressed. A geotechnical evaluation of the site has been completed and stamped by a geotechnical engineer. During the geotechnical analysis infiltration tests were performed and these results support the proposed use of drywell sumps on the site.

The measured infiltration rates listed in the geotechnical report were relatively high at 0.41 minutes per inch (mpi) and 0.07 mpi. These relatively high values indicate drywell sumps are suitable for use. To determine a preliminary number of sumps required for the site, the street and boulevard impervious area of approximately 45,610 square feet (sq ft) is divided by 8,000 sq ft. This yields a conservative number of sumps as the historical general rule was to use no more than 10,000 sq ft per sump. Dividing by 8,000 sq ft shows that six sumps are required and due to the site layout, shown in the included preliminary drawings, seven sumps are currently proposed.

As stated previously, these initial design values will be expanded upon in greater detail during the future design period and detailed in a DEQ-8 report.

Sincerely,

A handwritten signature in blue ink that reads "Cale Mages".

Cale A. Mages
Project Engineer
cale.a.mages@imegcorp.com

CAM/do

\\files\Corporate\Offices\Missoula\TL\Projects\1_ACTIVE FILES\2020 Projects\5651 - Korkalo Greenough Feasibility\3_ENG DESIGN\3.5_DEQ8 (Storm Drainage)\2021.05.26.Ltr.Prelim Stormwater.docx

LEGEND

EXISTING	PROPOSED
(E) PROPERTY BOUNDARY	(P) EASEMENT
(E) ADJACENT PROPERTY BOUNDARY	(P) WATER LINE
(E) LOT LINE	(P) WATER SERVICE
(E) EASEMENT	(P) SEWER LINE
(E) WATER LINE	(P) SEWER SERVICE
(E) SEWER SERVICE	(P) SEWER FORCE MAIN
(E) SEWER LINE	(P) SEWER FORCE MAIN SERVICE
(E) SEWER SERVICE	(P) STORM DRAIN PIPE
(E) SEWER FORCE MAIN SERVICE	(P) OVERHEAD UTILITY
(E) STORM DRAIN PIPE	(P) GAS LINE
(E) OVERHEAD UTILITY	(P) TELEPHONE LINE
(E) BURIED POWER	(P) TELEVISION LINE
(E) GAS LINE	(P) FIBER OPTIC LINE
(E) TELEPHONE LINE	(P) ROAD CENTERLINE
(E) TELEVISION LINE	(P) FENCE LINE
(E) FIBER OPTIC LINE	(P) DITCH
(E) ROAD CENTERLINE	(P) SWALE
(E) FENCE LINE	(P) IRRIGATION FORCE MAIN
(E) DITCH	(E) IRRIGATION FORCE MAIN
(E) SWALE	(E) STREAM
(E) IRRIGATION FORCE MAIN	(E) MAJOR CONTOUR
(E) STREAM	(E) MINOR CONTOUR
(E) ASPHALT	(P) ASPHALT
(E) GRAVEL	(P) GRAVEL
(E) CONCRETE	(P) CONCRETE
(E) SEWER MANHOLE	(P) SEWER MANHOLE
(E) SEWER CLEANOUT	(P) SEWER CLEANOUT
(E) SOIL PROFILE	(P) SEPTIC TANK
(E) PERCOLATION TEST	(P) DRAINFIELD
(E) GROUNDWATER MONITORING	(P) WELL
(E) SEPTIC TANK	(P) FIRE HYDRANT
(E) DRAINFIELD	(P) WATER METER
(E) WELL	(P) WATER VALVE
(E) FIRE HYDRANT	(P) REDUCER
(E) WATER METER	(P) THRUST BLOCK
(E) WATER VALVE	(P) WATER BLOW-OFF
(E) WATER BLOW-OFF	(P) STORM DRAIN MANHOLE
(E) STORM DRAIN MANHOLE	(P) CULVERT
(E) CULVERT	(P) CURB INLET
(E) CURB INLET	(P) CATCH BASIN
(E) CATCH BASIN	(P) SUMP
(E) SUMP	(P) UTILITY MANHOLE
(E) UTILITY MANHOLE	(P) LIGHT POLE
(E) TELEPHONE JUNCTION BOX	(P) SIGN
(E) POWER VAULT	(P) MAILBOX
(E) TELEVISION JUNCTION BOX	(P) DECIDUOUS TREE
(E) ELECTRICAL TRANSFORMER	(P) CONIFEROUS TREE
(E) POWER METER	(P) BUSH/ SHRUB
(E) GAS METER	
(E) POWER POLE	
(E) GUY WIRE	
(E) LIGHT POLE	
(E) SIGN	
(E) MAILBOX	
(E) DECIDUOUS TREE	
(E) CONIFEROUS TREE	
(E) BUSH/ SHRUB	

SYMBOLS

	DETAIL SECTION
	DETAIL CALLOUT
	KEYED NOTE CALLOUT
	SPOT ELEVATION CALLOUT
	SLOPE GRADE
	FLOW DIRECTION

GENERAL CONDITIONS OF CONSTRUCTION:

- The Standard General Conditions of the Contract prepared by the Engineers Joint Contract Documents Committee (Copyright 2007), as included in Montana Public Works Standard Specifications, are herein referred to as the General Conditions within these Drawings. Copies of the General Conditions will be provided to Contractor upon written request to Engineer.
- Wherever used in these Drawings, the terms, whether printed with initial capital letters or not, as listed in the Standard General Conditions of the Construction Contract (General Conditions), Article 1 - Definitions and Terminology, prepared by the Engineers Joint Contract Documents Committee (Copyright 2007) will have the meanings indicated, which are applicable to both the singular and plural thereof, except as follows:
 - The Contract Documents shall mean the Drawings as shown in these plans and any applicable referenced standards, specifications, or laws.
 - The Contract Price shall mean the moneys payable by Owner to Contractor for completion of the Work in accordance with the Agreement.
 - The Contract Times shall mean the number of days or the dates stated in the Agreement to complete the Work so that it is ready for final payment. If no such dates are established, the Contract Time shall be 120 days to complete the Work.
 - Effective Date of the Agreement shall have the meaning as listed in the General Conditions, Article 1. If no such Agreement exists, the Effective Date of the Agreement shall be the day the Contractor proceeds with the Work.
- By proceeding with the Work as shown on these Drawings, the Contractor makes the following representations:
 - Contractor has examined and carefully studied the Drawings and other related data.
 - Contractor is familiar with and is satisfied as to all federal, state and local laws and Regulations that may affect cost, progress, performance and furnishing of the Work.
 - Contractor has visited the site and become familiar with and is satisfied as to the general, local and Site conditions that may affect cost, progress, performance or furnishing of the Work.
 - Contractor acknowledges that Owner and Engineer do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Drawings with respect to Underground Facilities at or contiguous to the site.
 - Contractor has obtained and carefully studied (or assumes responsibility for having done so) all such additional supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise, which may affect cost, progress, performance or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor including applying the specific means, methods, techniques, sequences and procedures of construction, if any, expressly required by the Drawings to be employed by the Contractor, and safety precautions and programs incident thereto.
 - Contractor is aware of the general nature of work to be performed by Owner and others at the site that relates to the Work.
 - Contractor has given Engineer written notice of all conflicts, errors, ambiguities or discrepancies that Contractor has discovered in the Drawings and the written resolution thereof by Engineer is acceptable to Contractor.
 - The Drawings are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
- In resolving disputes resulting from conflicts, errors or discrepancies, the order of precedence shall be as follows, as applicable to this project: Written agreement between owner and contractor, specifications, Drawings. Within the Specifications, the order of precedence is as follows, as applicable to this project: Addenda/Change Orders, Contractor's Bid, Special Provisions, Instructions to Bidders, Supplemental General Conditions, Notice Inviting Bids, General Conditions, Technical Specifications, Referenced Standard Specifications. With reference to the Drawings, the order of precedence is as follows, as applicable to this project: Figures govern over scaled dimensions, Detail drawings govern over general drawings, Addenda/Change Order drawings govern over contract drawings, contract drawings govern over standard drawings, contract drawings govern over shop drawings.
- If Contractor believes that any subsurface or physical condition at or contiguous to the Site that
 - is uncovered or revealed either is of such a nature as to require a change in the Drawings; or
 - differs materially from that shown or indicated in the Drawings; or
 - is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided in the drawings;
 then Contractor shall promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.
- Section 2.06 of the General Conditions is hereby incorporated into these Drawings.
- Section 3.03.A.2 of the General Conditions is hereby incorporated into these Drawings.
- Section 3.05 of the General Conditions is hereby incorporated into these Drawings.
- Section 3.06 of the General Conditions is hereby incorporated into these Drawings.
- Section 4.05 of the General Conditions is hereby incorporated into these Drawings.
- Section 6.01, 6.02.A, and 6.03 of the General Conditions are hereby incorporated into these Drawings.
- Substitutes and "Or-Equals" items are subject to the provisions of the General Conditions, Section 6.05.
- Section 6.13 of the General Conditions is hereby incorporated into these Drawings, except that Section 6.13.D shall be replaced with the following sentence:
Contractor's duties and responsibility for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer and Owner, as applicable to the Work, have accepted that the work is complete.
- Section 6.11, 6.14, 6.15, 6.16, 6.18, 6.19, 6.20, and 6.21 of the General Conditions are hereby incorporated into these Drawings.
- Article 9 - Engineer's Status During Construction of the General Conditions is hereby incorporated into these Drawings, except as follows:
 - Delete the last sentence of Section 9.05.A.
 - Delete Section 9.06, 9.07, 9.08.B, 9.08.C, and 9.09.D.
- Section 10.02 of the General Conditions is hereby incorporated into these Drawings.
- Article 13 - Tests and Inspections, Correction, Removal or Acceptance of Defective Work of the General Conditions is hereby incorporated into these Drawings.

STANDARD SPECIAL PROVISIONS:

- The Contractor shall be responsible for all permits, licenses and fees required for completion of this project unless specifically noted otherwise.
- The Contractor shall provide the Owner with a 24 hour phone number of a party responsible and capable of immediate local response to emergency maintenance for the duration of the Work. Contractor shall provide the name of the responsible party and phone number in writing prior to proceeding with the Work.
- Unless noted otherwise, the contractor shall be responsible for any necessary traffic control on and off-site including obtaining any applicable permits.
- Material stockpiled along the project route shall be done so in a manner that does not affect public safety and is in a neat and orderly fashion.
- The Contractor shall be responsible for disposing of all waste and excess materials such as, but not limited to: vegetation, trees, brush, asphalt, concrete, sub-grade soils, etc., offsite in accordance with local, state and federal laws. The Owner reserves the right to request certain waste materials to be stockpiled at a location on-site.
- The contractor will be responsible to adhere to the MDEQ or EPA approved Storm Water Pollution Prevention Plan (SWPPP), if applicable to the project. The contractor is responsible for repairing any damage made to BMPs identified in the SWPPP. The approved Storm Water Pollution Prevention Plan will be provided by Owner to Contractor upon written request. If a SWPPP has not been prepared for the project, but is required by regulation, the Contractor is responsible for preparing and submitting a Notice of Intent and SWPPP.
- The Contractor will be required to make every effort to immediately restore the construction area once the construction task is completed. All seeding shall be completed in accordance with MPWSS 02910. This includes such required activities as finish grading, spreading of topsoil, restoring irrigation, replacing traffic and street signs, etc. The contractor will have 48 hours to begin restoration once the construction task in the immediate area is complete. Once restoration is begun, it must be completed without interruption to the extent possible.
- After all work on this project is completed and before final acceptance of the project, the entire project shall be neatly finished to the lines, grades, and cross sections shown on the plans and as hereinafter specified.
 - Drainage facilities, such as inlets, catch basins, storm pipe, culverts, and curb and gutter shall be cleaned of all debris, gravel, silt or other foreign material.
 - The Contractor shall remove and dispose of all construction stakes.
 - All areas disturbed by the construction shall be shaped to present a uniform appearance blending into the contour of adjacent properties. All surface replacement and landscaping shall be completed.
 - Except as otherwise permitted, all excess excavated materials shall be disposed of away from the site of the work.
 - Broken concrete and other debris resulting from pavement or sidewalk removal, excavated rock in excess of the amount permitted, and other waste and debris encountered in excavated work, and other similar waste materials shall be disposed of away from the site.
 There will be no separate measurement or payment for cleanup, and all costs for such work shall be included in the Contract Price.
- No on-site burning of waste materials will be allowed.
- If a street has not been surfaced and cleaned, the Contractor shall be responsible for dust control and maintenance of the street. Also, if detours are made on a gravel road, the Contractor is responsible for dust control and maintenance on the detours. See "Air Quality" below also.
- Daily street sweeping shall be completed on both ends of each street during construction. Unpaved detours or any other fugitive dust emission sources from construction and demolition should be watered and/or chemically stabilized so emissions are less than 20% opacity.

UTILITY NOTES:

- The Contractor shall notify appropriate personnel for utility locations and notice of construction commencement at least two business days prior to proceeding with the Work. Before Contractor proceeds with the Work, a common locate service (One Call) is available at 1-800-424-5555. All Underground Facilities may not be located by the One Call service including but not limited to such Underground Facilities as irrigation systems, public and private water and sewer systems, etc.
- The information and data shown or indicated in the Drawings with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise noted:
 - Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data; and
 - The cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - Reviewing and checking all such information and data,
 - Locating all Underground Facilities shown or indicated in the Drawings,
 - Coordination of the Work with the owners of such Underground Facilities, including Owner, during construction, and
 - The safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.
 - At least 2 business days before beginning any excavation, the Contractor shall, according to MCA 69-4-501, notify all owners of underground facilities and coordinate the Work with the owners of such underground facilities. The information shown or indicated in the Drawings with respect to existing underground facilities is based on information and data obtained from the owners of the facilities without field exploration, and as such, Owner and Engineer are not responsible for the accuracy or completeness of such information or data.
- The Contractor shall support and protect all exposed utilities in conformance with the utility owner's standards.
- All utility services shall be constructed per the International Plumbing Code, Local Jurisdictional policy, and the service provider standards and specifications.
- All utility work shall be completed before paving.

SUBMITTALS, QUALITY CONTROL & ASSURANCE, INSPECTIONS, AND TESTING

- Contractor shall comply with Summary of Work, Section 01010, MPWSS.
- Contractor shall comply with Project Coordination, Section 01041, MPWSS.
- Contractor shall comply with Field Engineering, Section 01050, MPWSS. Replace Part 1.1.A with "Notify Engineer of required survey work at least 5 days before starting work."
- Contractor shall comply with Submittals, Section 01300, MPWSS.
- Contractor shall comply with the Contractor Quality Control and Owner Quality Assurance, Section 01400 MPWSS.
- Contractor shall comply with Contract Closeout, Section 01700, MPWSS.
- Contractor shall comply with all Density Control Testing, Part 1.3, for Sub Base Course, Section 02234 MPWSS. This does not include any other requirements of Section 02234 MPWSS.
- Contractor shall comply with all Density Control Testing, Part 1.3, and Materials Submittals, Part 1.4, for Crushed Base Course, Section 02235 MPWSS. This does not include any other requirements of Section 02235 MPWSS.
- Contractor shall comply with Pavement and Material Testing Requirements, Part 3.29, for Asphalt Concrete Pavement, Section 02510 MPWSS. This does not include any other requirements of Section 02510 MPWSS.
- Contractor shall complete trench excavation and backfill in accordance with Section 02221 MPWSS. This includes backfill for storm drainage infrastructure.
- The Contractor shall coordinate with Engineer to obtain samples of trench backfill material to be used on-site. This includes backfill for storm drainage infrastructure.
- Contractor will be responsible for coordination with a material testing company of the Owner's selection to complete compaction testing of trench backfill. Coordination includes updating appropriate personnel employed by the material testing company every work day as to progress of work so adequate testing can be completed.
- The Contractor will be required to prepare a set of detailed as-built drawings to be presented to the Engineer at the completion of the project. The as-built drawings shall be updated daily and reviewed weekly by the Project Engineer. As-built drawings shall include, but not limited to location/depths of existing utilities encountered during completing the Work and location/depths of installed infrastructure completed as part of the Work. Installed infrastructure includes culverts, ponds, storm drainage systems, catch basins, dry-well sums, storm manholes, swales, ditches, dry utilities (gas, power, phone, etc.), and road and pedestrian features such as handicap ramps, sidewalks, roads, curb and gutter, etc.

CONSTRUCTION NOTES:

- All Work shall be in accordance with the Montana Public Works Standard Specifications (MPWSS), Sixth Edition, dated April 2010, City of Missoula Public Works Manual, Special Provisions, and Contract Documents.
- Contractor shall comply with Construction and Temporary Facilities, Section 01500, MPWSS.
- Contractor shall comply with Construction Traffic Control, Section 01570, MPWSS.
- For road plan and profile sheets, the stationing and elevations provided are for finished grade at centerline of road, unless noted otherwise.
- For proposed pipe installations (culverts, storm drains, irrigation, etc.), the stationing is from centerline of pipe and elevations are from invert of pipe, unless noted otherwise.
- Elevations shown on the Drawings are to finished surface grade unless otherwise indicated. Elevations provided at curb lay downs are for the "projected" top back of curb, as though the specified curb was being installed through the lay down. This allows the contractor to set his curb string line or forms based on the elevations shown on the plans, and then cut out the extra concrete for the lay down.
- All material furnished on or for this project shall meet the minimum requirements of the approving agencies or as set forth herein, whichever is more restrictive.
- If more than one acre will be disturbed during construction the contractor is responsible to notify DEQ or submit Storm Water Pollution Prevention Permit (SWPPP) to DEQ prior to construction.

CONSTRUCTION STAKING:

- The owner will provide construction staking one time. Additional staking will be the responsibility of the contractor for scheduling and payment.
- Contractor is responsible to coordinate and request staking at least two days in advance, unless otherwise agreed upon in writing by Engineer.
- Staking will be provided as indicated in the Contract Documents, or as requested by contractor.
- Cut sheets will be provided to the contractor with elevation from hub to finished grade, unless noted otherwise. Cut sheets for pipe installation provide the elevation from the hub to the invert of the pipe, unless noted otherwise.
- Engineer does not consider staking to be complete and ready for use until cut sheets have been delivered to Contractor. Contractor's uses of construction staking prior to receipt of cut sheets is at contractor's risk. Any work incorrectly installed due to contractor's use of preliminary construction staking will be removed and replaced at contractor's expense.

GRADING NOTES:

- All ramps shall be sloped @ 12:1 max (8.33%) with a cross slope less than 2%.
- Square cut all asphalt.
- Contractor shall protect all adjacent improvements (buildings, roadways, fences, ditches, parking lots, utilities, sidewalks, curbs, gutter, park recreation improvements, trees, etc.) from damage and erosion. All disturbed areas shall be restored to their original condition.
- Compact subgrade and gravel cushion to 95% proctor density or per geotechnical engineering report, whichever provides a greater level of compaction.

STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

- SWPPP Administrator shall turn in SWPPP reports generated from the beginning of construction to date that As-Built are turned into Engineer. Engineer in turn submits SWPPP reports to City Engineering as part of As-Built documentation.
- SWPPP Administrator is required to renew City SWPPP permit annually unless the site has been stabilized. SWPPP Administrator will submit any remaining SWPPP reports to City Engineering when filing for Notice of Termination.

ABBREVIATIONS:

BC	BACK OF CURB	MUTC	MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES
BP	BEGINNING POINT	MVC	MOUNTAIN WATER COMPANY
BSW	BACK OF SIDEWALK	NWE	NORTHWESTERN ENERGY
CBU	CLUSTER BOX UNIT	(P)	PROPOSED
CMP	CORRUGATED METAL PIPE	PRC	POINT OF REVERSE CURVATURE
ELEV	ELEVATION	PC	POINT OF CURVATURE
EP	ENDING POINT	PT	POINT OF TANGENT
(E)	EXISTING	PVI	POINT OF VERTICAL INTERSECTION
FFEL	FINISHED FLOOR ELEVATION	R	RADIUS
FG	FINISHED GRADE	ROW	RIGHT OF WAY
FL	FLOWLINE	SF	SQUARE FOOT
HP	HIGH POINT	SIM	SIMILAR
I.E.	INVERT ELEVATION	STA	STATION
INV	INVERT	STD	CITY OF MISSOULA STANDARD DRAWING
LD	LAYDOWN	SW	SIDEWALK
LF	LINEAR FOOT	TBC	TOP BACK OF CURB
MAX	MAXIMUM	TOA	TOP OF ASPHALT
MIN	MINIMUM	TOC	TOP OF CONCRETE
ME	MATCH EXISTING	TYP	TYPICAL
M.E.P.	MECHANICAL, ELECTRICAL, & PLUMBING	U.N.O.	UNLESS NOTED OTHERWISE
MPOC	MID POINT OF CURVE		

NOTE: NOT ALL FEATURES SHOWN IN LEGEND WILL BE PRESENT ON PLANS

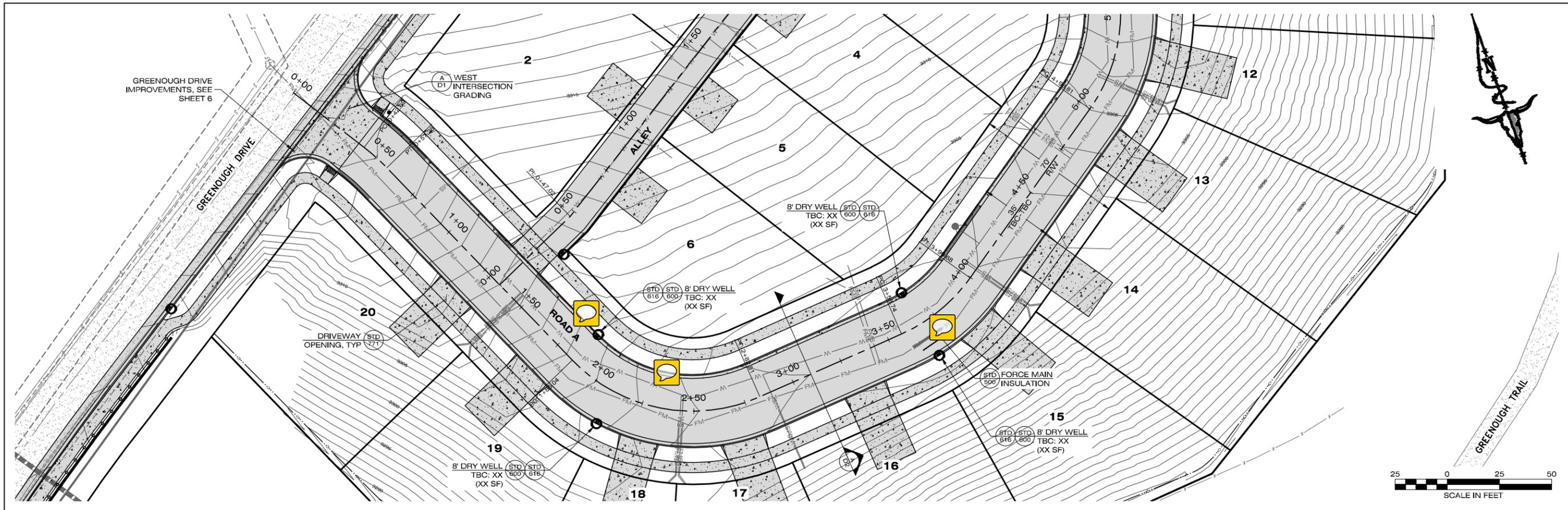


DATE	REVISIONS
DESIGNED:	CM
DRAFTED:	JW
CHECKED:	CD
DATE:	JULY, 2021

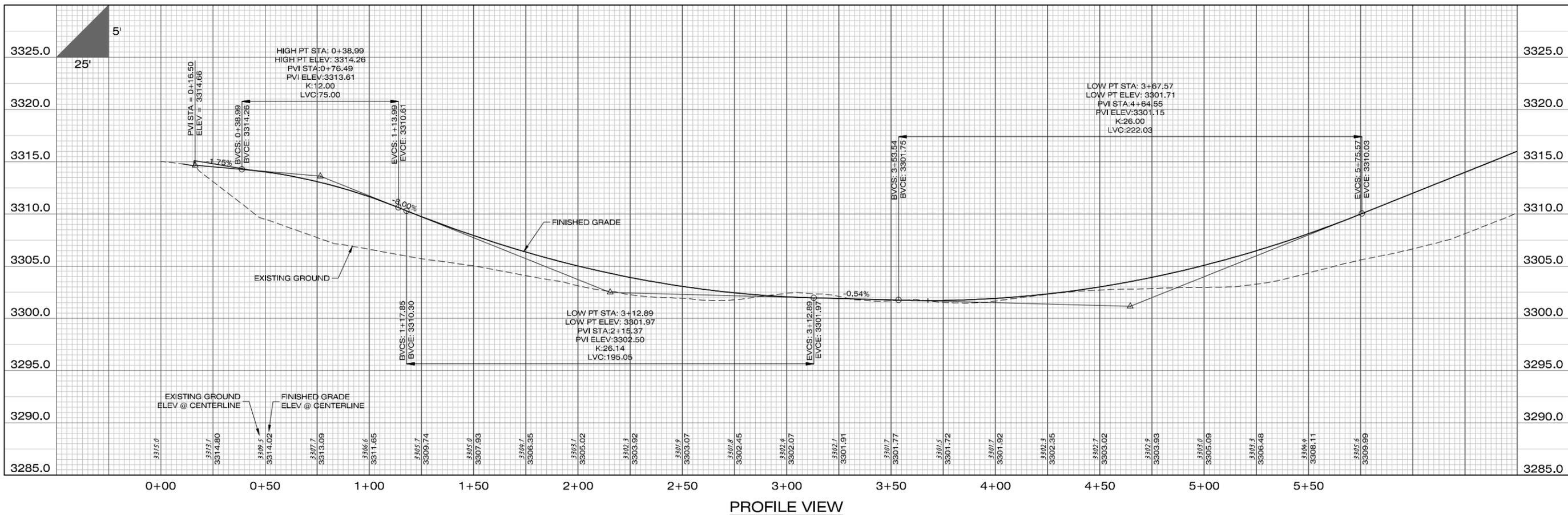
LOCATION: 1006 GREENOUGH DR, COS PLAT M SECTION 22 T13N, R19W, P.M.M. MISSOULA, MISSOULA COUNTY, MT
PREPARED FOR: CHRISTIAN KORKALO

PROJECT NAME: GREENOUGH HEIGHTS SUBDIVISION
PROJECT NO: 20-5651
SHEET TITLE: GRADING, DRAINAGE, AND ROAD PLANS
LEGEND AND NOTES SHEET
SHEET: 2 OF 12

PRELIMINARY



PLAN VIEW



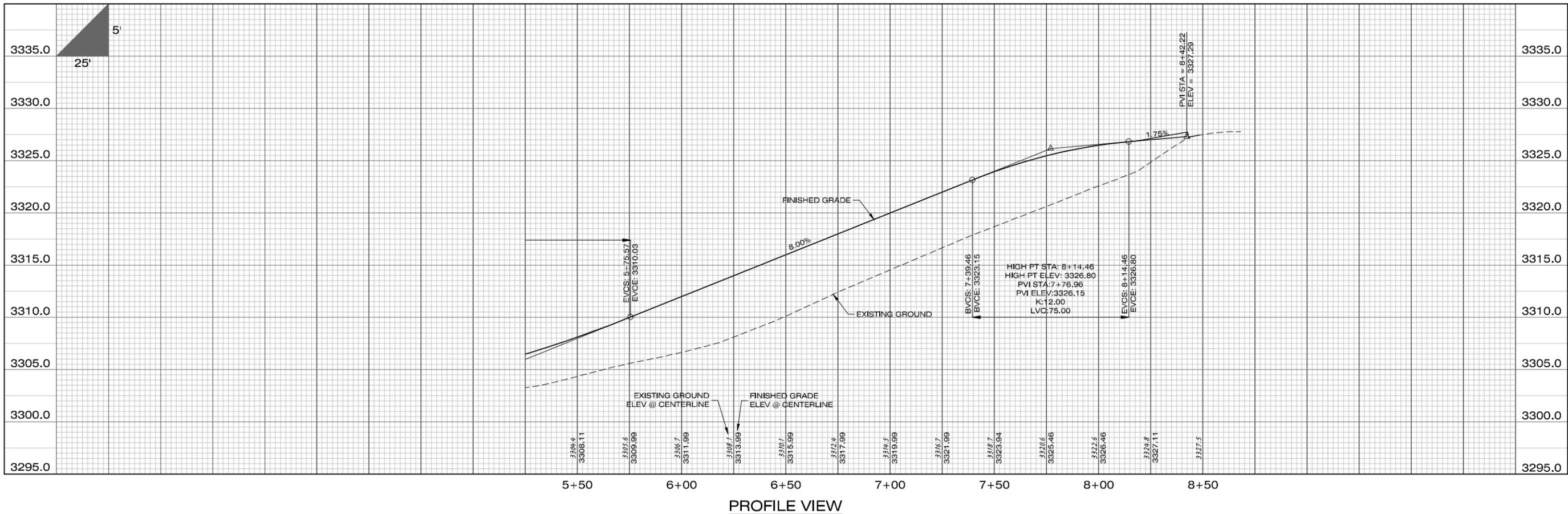
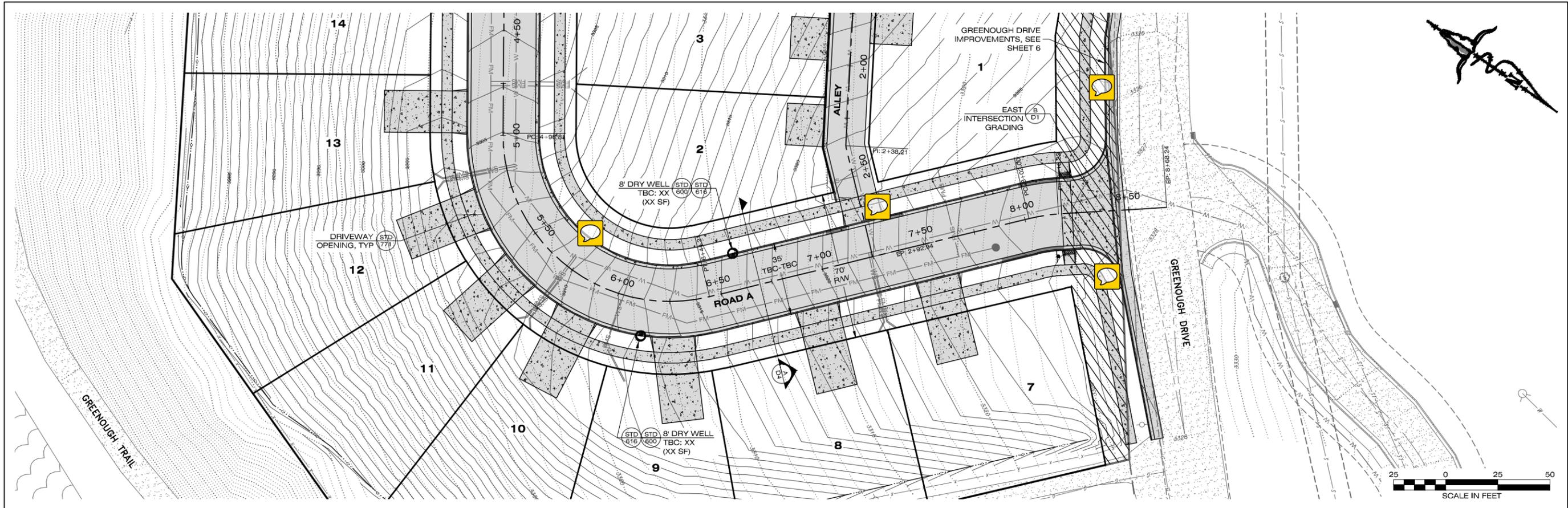
PROFILE VIEW

DATE	
REVISIONS	
DESIGNED:	CM
DRAFTED:	JW
CHECKED:	CP
DATE:	JULY, 2021

LOCATION:
 1006 GREENOUGH DR, COS PLAT M
 SECTION 22, T13N, R19W, P.M.M.
 MISSOULA, MISSOULA COUNTY, MT
 PREPARED FOR:
 CHRISTIAN KORKALO

PROJECT NAME:
 GREENOUGH HEIGHTS SUBDIVISION
 SHEET TITLE:
 GRADING, DRAINAGE, AND ROAD PLANS
 ROAD PLAN AND PROFILE SHEET
 PROJECT NO:
 20-5651
 SHEET:
 3 OF 12

PRELIMINARY



DATE	
REVISIONS	

DESIGNED: CM
 DRAFTED: JW
 CHECKED: CP
 DATE: JULY, 2021

LOCATION:
 1006 GREENOUGH DR, COS PLAT M
 SECTION 22, T13N, R19W, P.M.M.
 MISSOULA, MISSOULA COUNTY, MT

PREPARED FOR:
 CHRISTIAN KORKALO

PROJECT NAME:
 GREENOUGH HEIGHTS SUBDIVISION

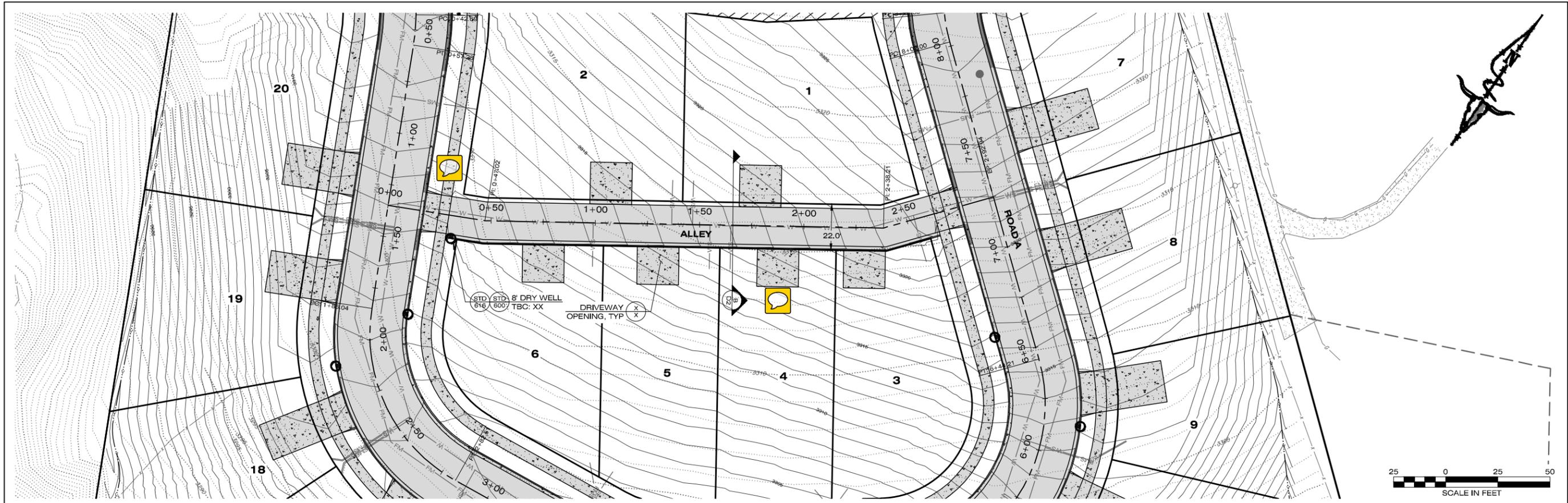
PROJECT NO:
 20-5651

SHEET TITLE:
 GRADING, DRAINAGE, AND ROAD PLANS
 ROAD PLAN AND PROFILE SHEET

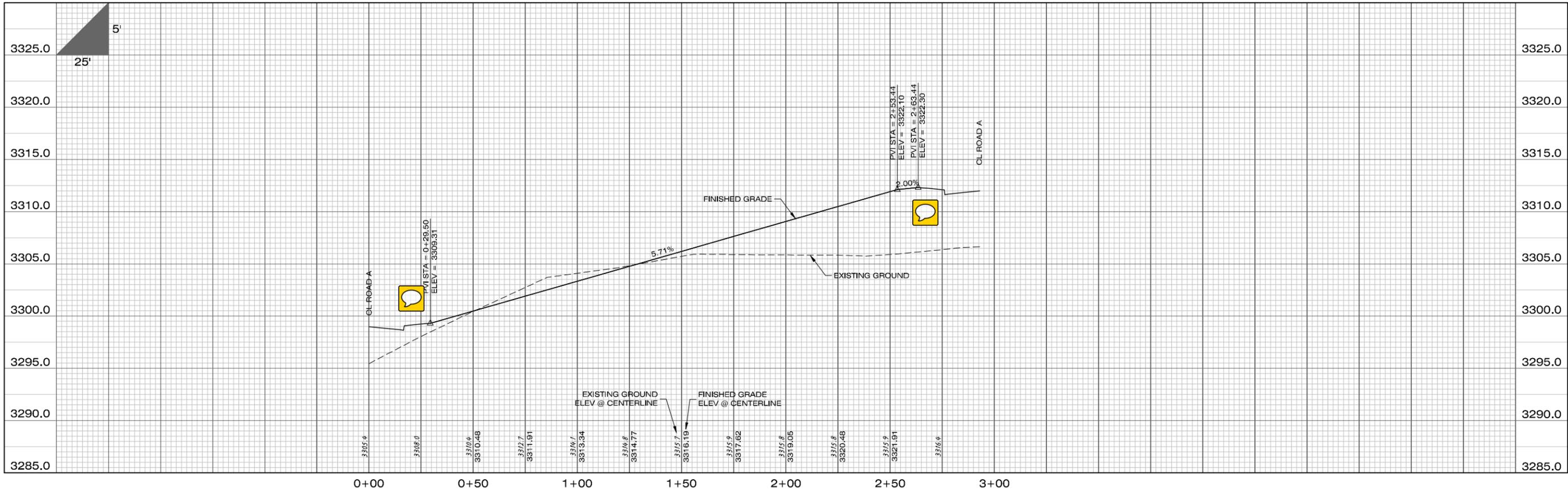
SHEET:
 4 OF 12

PRELIMINARY

DRAWN LOCATION: MISSOULA, MT PROJECT NO: 20-5651 PROJECT TITLE: GREENOUGH HEIGHTS SUBDIVISION PREPARED FOR: CHRISTIAN KORKALO MISSOULA, MISSOULA COUNTY, MT DATE: JULY, 2021



PLAN VIEW



PROFILE VIEW

REVISIONS	DATE

DESIGNED: CM
 DRAFTED: JW
 CHECKED: CP
 DATE: JULY, 2021

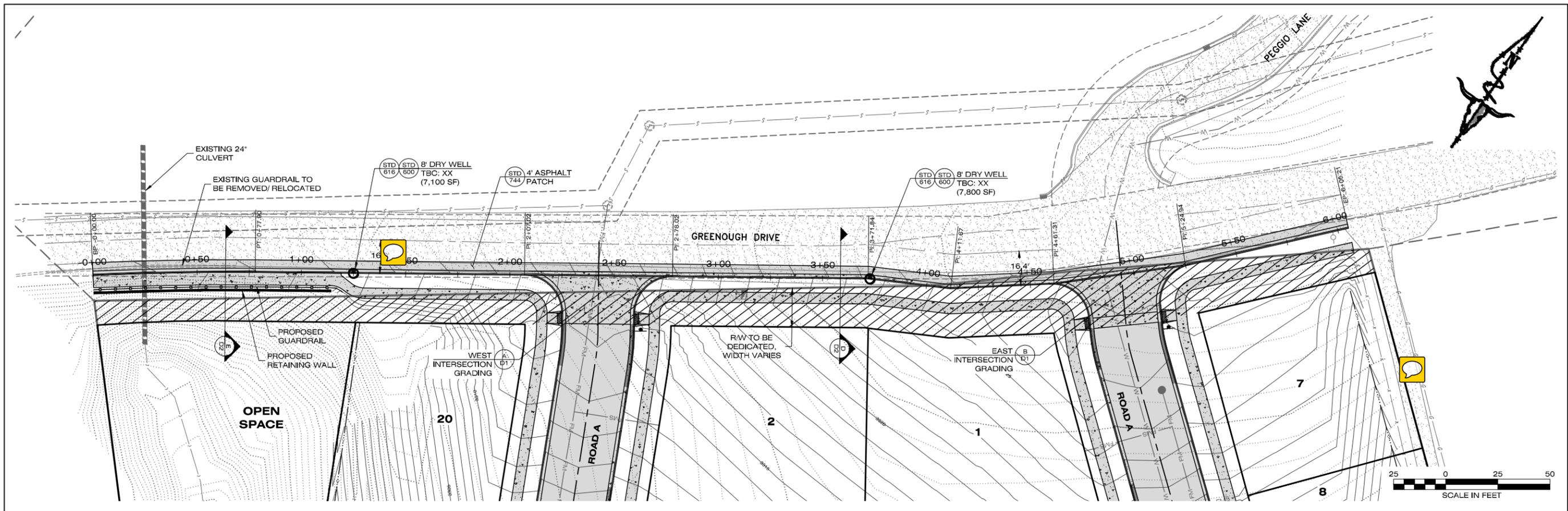
LOCATION:
 1006 GREENOUGH DR, COS PLAT M
 SECTION 22, T13N, R19W, P.M.M.
 MISSOULA, MISSOULA COUNTY, MT
 PREPARED FOR:
 CHRISTIAN KORKALO

PROJECT NAME:
 GREENOUGH HEIGHTS SUBDIVISION
 SHEET TITLE:
 GRADING, DRAINAGE, AND ROAD PLANS
 ROAD PLAN AND PROFILE SHEET

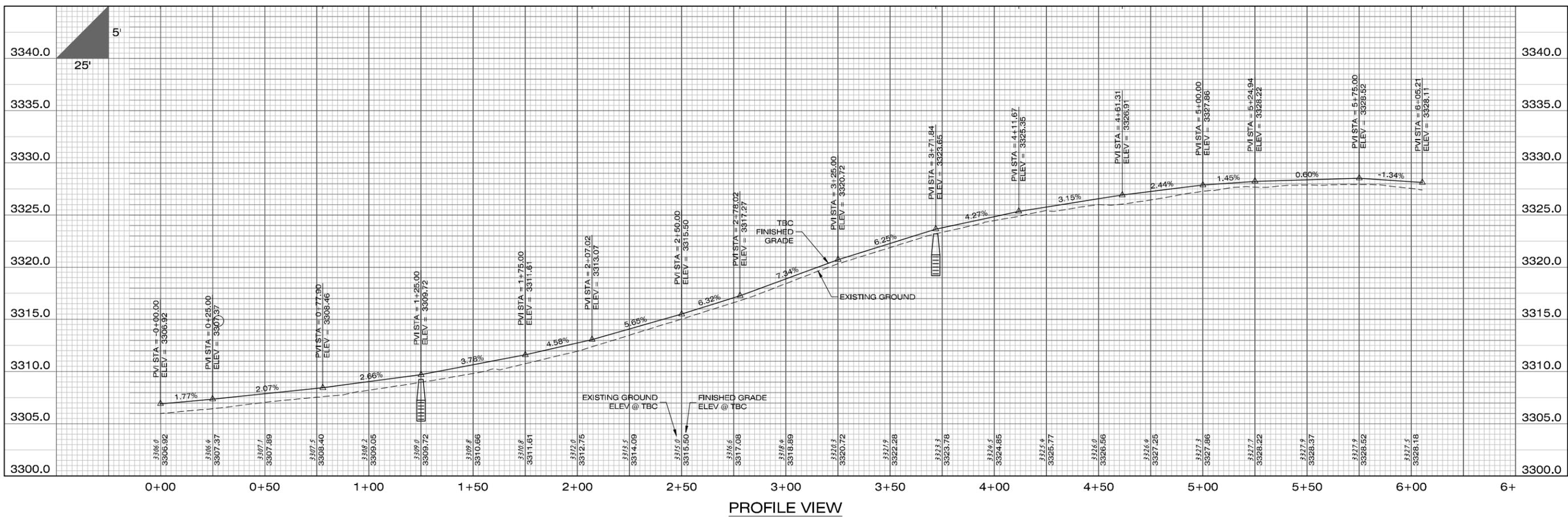
PROJECT NO.
 20-5651
 SHEET:
 5 OF 12

PRELIMINARY

DRAWN LOCATION: C:\MSOFT\AUTOCAD\PROJECTS\20-5651\20-5651-05.DWG DATE: 7/19/2021 1:04:44 PM



PLAN VIEW



PROFILE VIEW

DATE	
REVISIONS	
DESIGNED:	CM
DRAFTED:	JW
CHECKED:	CP
DATE:	JULY, 2021

LOCATION:
 1006 GREENOUGH DR, COS PLAT M
 SECTION 22, T13N, R19W, P.M.M.
 MISSOULA, MISSOULA COUNTY, MT

PREPARED FOR:
 CHRISTIAN KORKALO

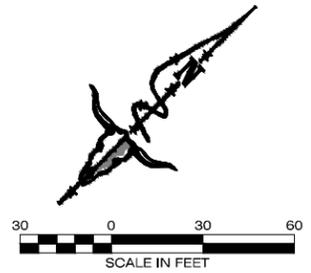
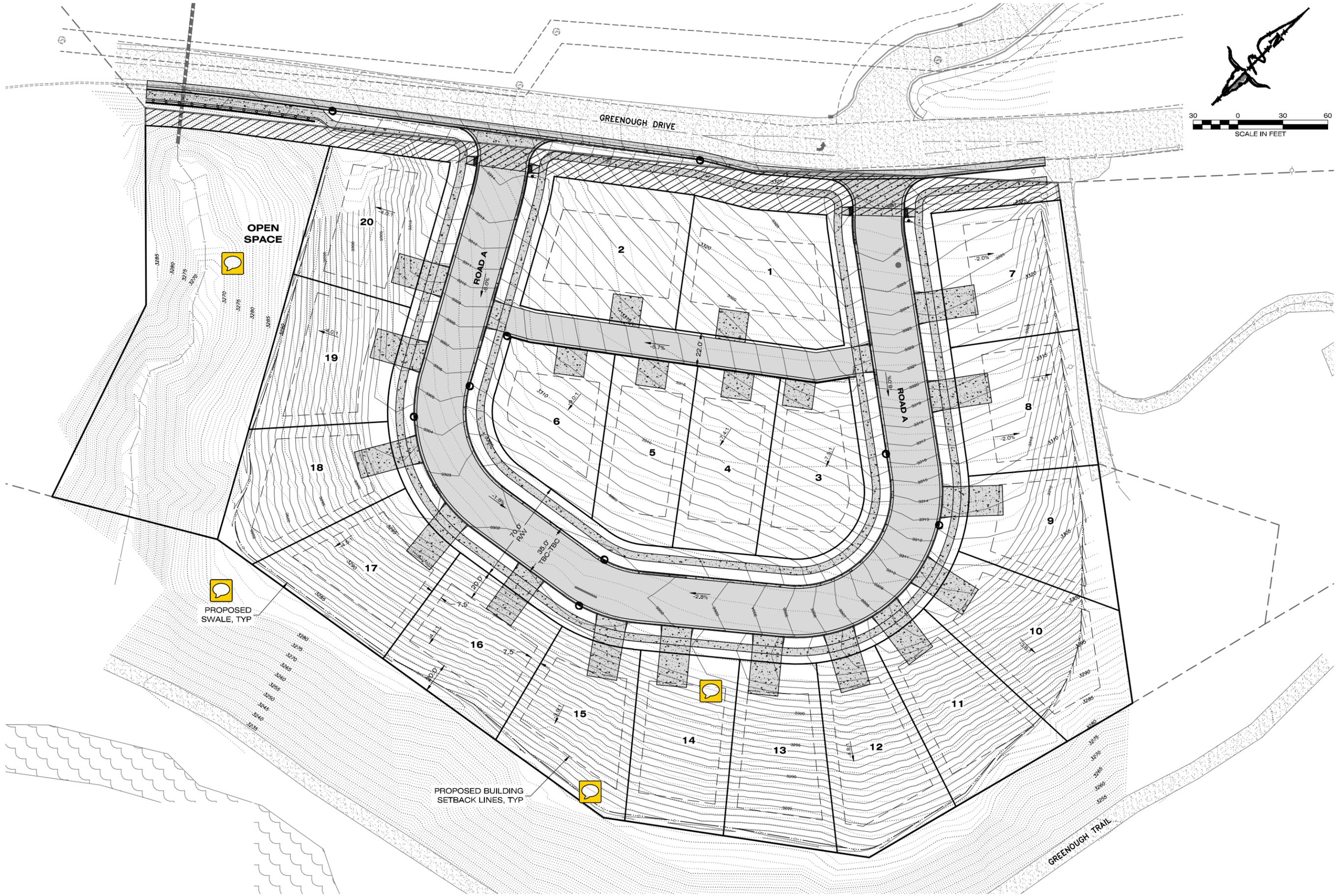
PROJECT NAME:
 GREENOUGH HEIGHTS SUBDIVISION

SHEET TITLE:
 GRADING, DRAINAGE, AND ROAD PLANS
 FRONTAGE PLAN AND PROFILE SHEET

PROJECT NO:
 20-5651

SHEET:
 6 OF 12

PRELIMINARY



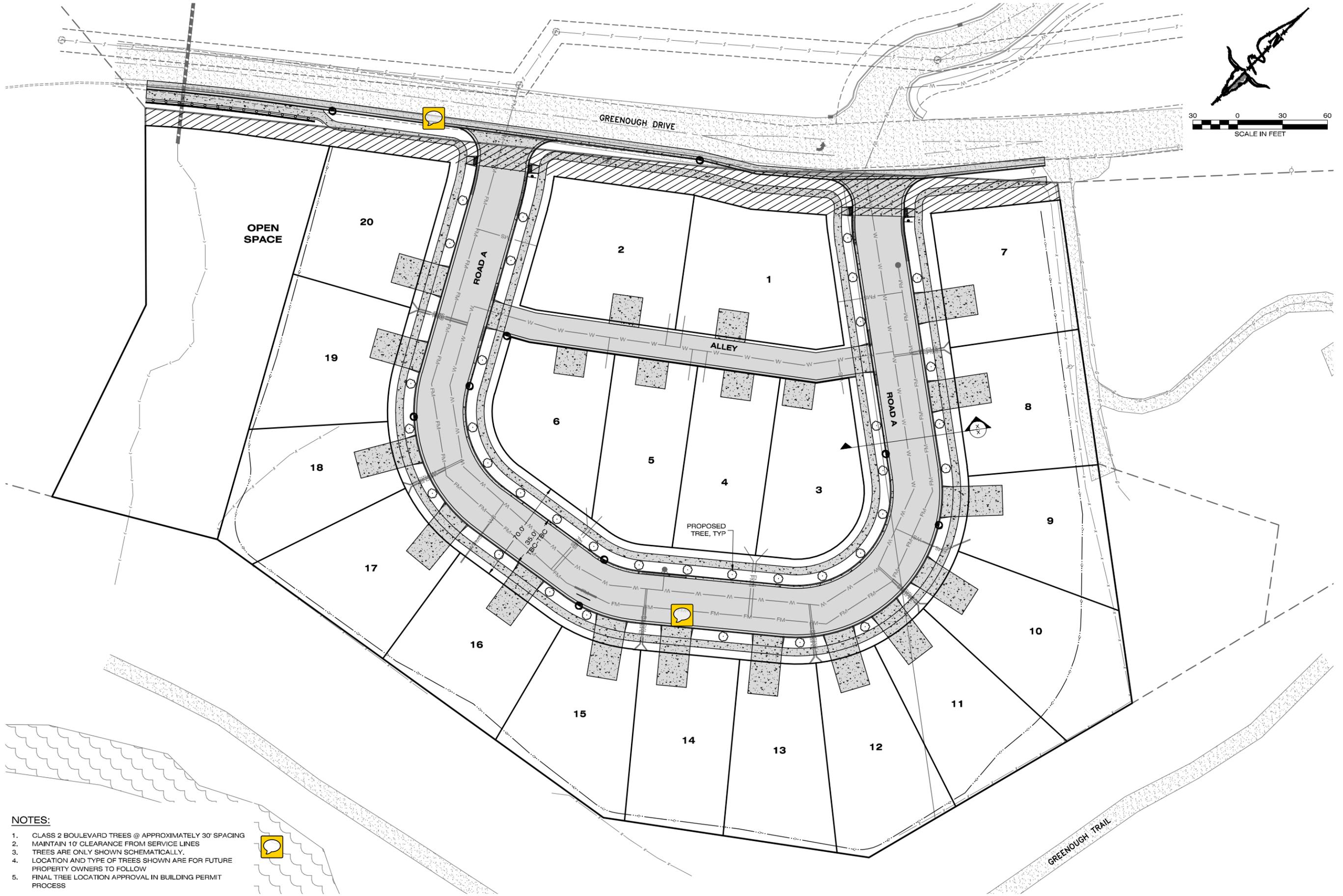
DATE	
REVISIONS	
DESIGNED:	CM
DRAFTED:	JW
CHECKED:	CP
DATE:	JULY, 2021

LOCATION:
 1006 GREENOUGH DR, COS PLAT M
 SECTION 22, T13N, R19W, P.M.M.
 MISSOULA, MISSOULA COUNTY, MT
 PREPARED FOR:
 CHRISTIAN KORKALO

PROJECT NAME
GREENOUGH HEIGHTS SUBDIVISION
 SHEET TITLE:
**GRADING, DRAINAGE, AND ROAD PLANS
 OVERALL GRADING PLAN**

PROJECT NO.
 20-5651
 SHEET:
 7 OF 12

PRELIMINARY



DATE	
REVISIONS	
DESIGNED:	CM
DRAFTED:	JW
CHECKED:	CP
DATE:	JULY, 2021

LOCATION:
 1006 GREENOUGH DR, COS PLAT M
 SECTION 22, T13N, R19W, P.M.M.
 MISSOULA, MISSOULA COUNTY, MT
 PREPARED FOR:
 CHRISTIAN KORKALO

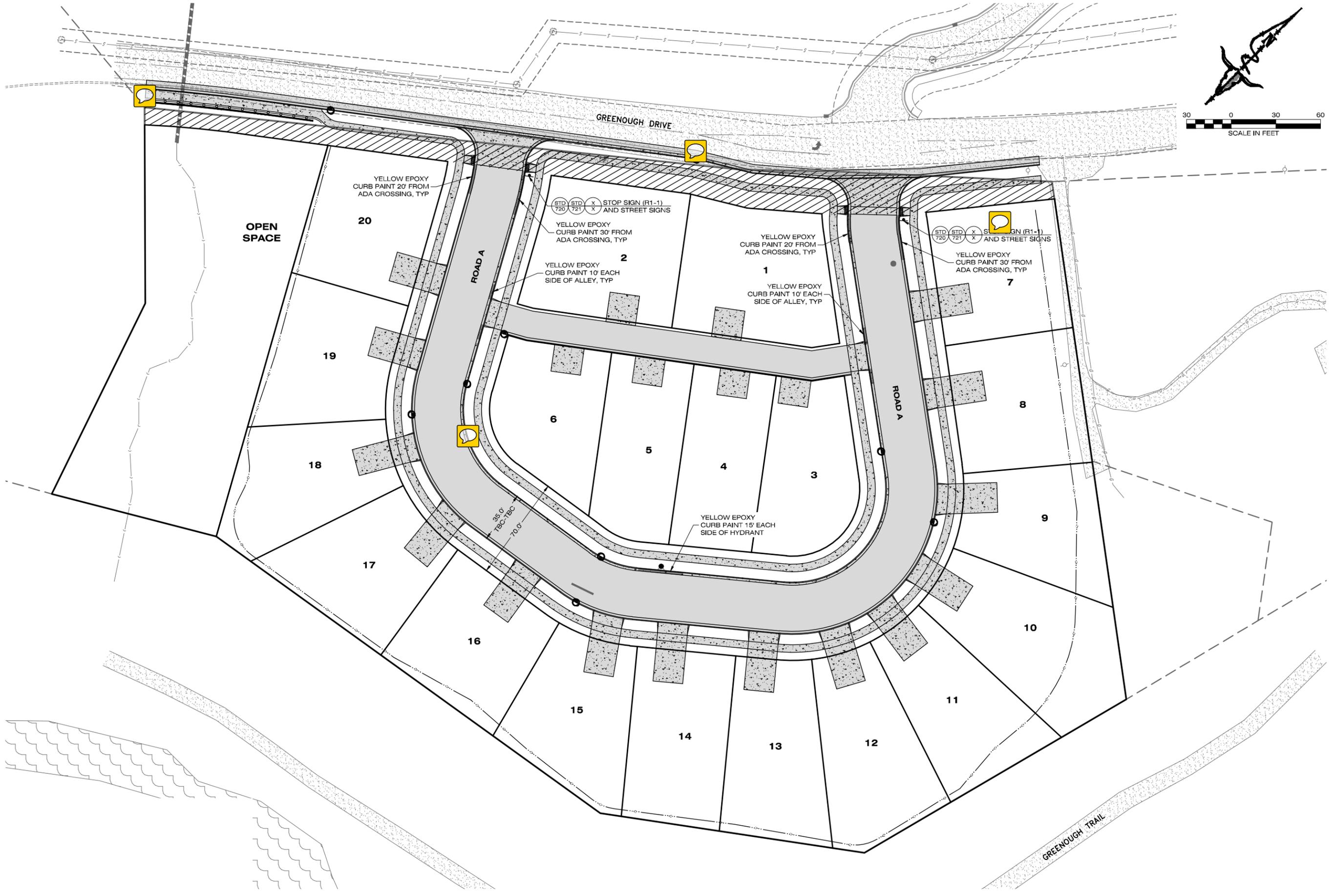
PROJECT NAME:
 GREENOUGH HEIGHTS SUBDIVISION
 SHEET TITLE:
 GRADING, DRAINAGE, AND ROAD PLANS
 BOULEVARD TREE PLAN

PROJECT NO.
 20-5651
 SHEET:
 8 OF 12

PRELIMINARY

- NOTES:**
1. CLASS 2 BOULEVARD TREES @ APPROXIMATELY 30' SPACING
 2. MAINTAIN 10' CLEARANCE FROM SERVICE LINES
 3. TREES ARE ONLY SHOWN SCHEMATICALLY.
 4. LOCATION AND TYPE OF TREES SHOWN ARE FOR FUTURE PROPERTY OWNERS TO FOLLOW
 5. FINAL TREE LOCATION APPROVAL IN BUILDING PERMIT PROCESS





DATE	
REVISIONS	
DESIGNED:	CM
DRAFTED:	JW
CHECKED:	CP
DATE:	JULY, 2021

LOCATION:
 1006 GREENOUGH DR, COS PLAT M
 SECTION 22, T13N, R19W, P.M.M.
 MISSOULA, MISSOULA COUNTY, MT
 PREPARED FOR:
 CHRISTIAN KORKALO

PROJECT NAME:
GREENOUGH HEIGHTS SUBDIVISION
 SHEET TITLE:
**GRADING, DRAINAGE, AND ROAD PLANS
 SIGNAGE AND STRIPING PLAN**

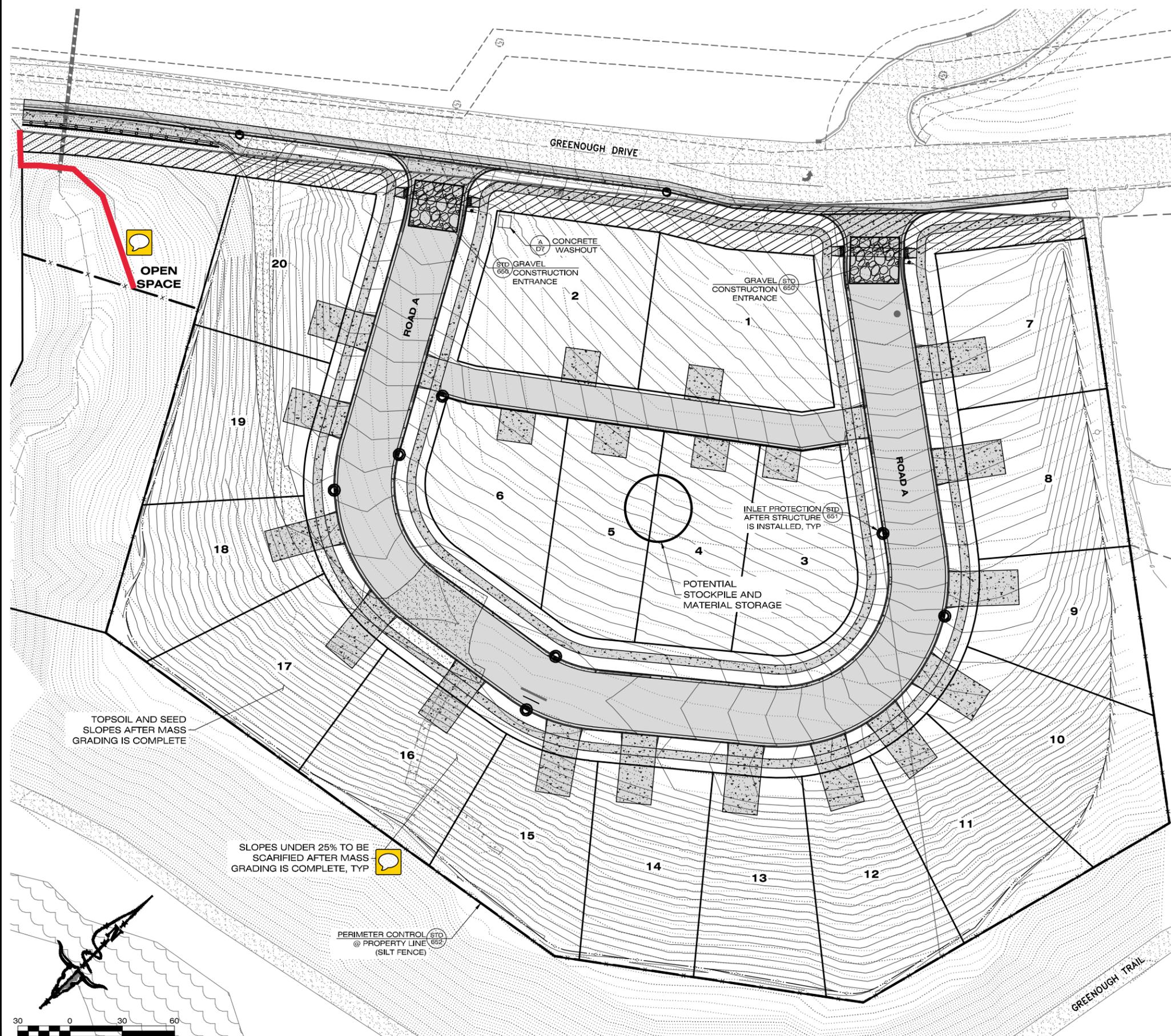
PROJECT NO.
 20-5651
 SHEET:
 9 OF 12

PRELIMINARY

STORM WATER POLLUTION PREVENTION PLAN (SWPPP) NOTES

1. CONTRACTOR IS TO BE FAMILIAR WITH THE REQUIREMENTS OF SECTION 402(P) OF THE FEDERAL CLEAN WATER ACT AND REGULATIONS ADOPTED BY THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA). (AMENDMENTS TO TITLE 40 OF THE CODE OF FEDERAL REGULATIONS, PART 122, PUBLISHED IN THE FEDERAL REGISTER ON NOVEMBER 16, 1990 AND ON APRIL 2, 1992.) ALSO, DEQ 1200-C PERMIT FOR THE CONTROL OF STORM WATER ASSOCIATED WITH CONSTRUCTION ACTIVITIES.
2. CONTRACTOR IS TO BE FAMILIAR WITH ALL REQUIREMENTS OF THE SWPPP.
3. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH LOCAL JURISDICTION AND MONTANA DEQ FOR EROSION AND SEDIMENT CONTROL.
4. THE TEMPORARY POLLUTION CONTROL SYSTEM SHALL BE INSTALLED PRIOR TO ALL OTHER CONSTRUCTION.
5. ALL EQUIPMENT MAINTENANCE AND RE-FUELING SHALL BE CONDUCTED IN A SAFE MANNER AND SPILL KITS SHALL BE MAINTAINED ON-SITE TO CLEAN ANY SPILLS THAT MAY OCCUR.
6. ALL EXPOSED AND UNWORKED SOILS SHALL BE STABILIZED BY SUITABLE APPLICATION OF BEST MANAGEMENT PRACTICES (BMP'S), SUCH AS VEGETATIVE COVER, MULCHING, PLASTIC COVERING OR APPLICATION OF GRAVEL SURFACES IN AREAS TO BE GRAVELED. NO EXPOSED AND UNWORKED SOILS SHALL REMAIN UNSTABILIZED. ONCE CONSTRUCTION ACTIVITY IS COMPLETED IN AN AREA BETWEEN THE MONTHS OF OCTOBER 1 AND APRIL 30, PERMANENT SEEDING SHALL BE INSTALLED.
7. THE CONTRACTOR IS RESPONSIBLE FOR DUST CONTROL AT ALL TIMES DURING CONSTRUCTION.
8. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING PROPER TRASH RECEPTACLES AND PORTABLE TOILETS ON-SITE AS WELL AS THE REGULAR MAINTENANCE OF THESE FACILITIES.
9. ALL CLEARING LIMITS AND/OR EASEMENT SETBACKS, SENSITIVE CRITICAL AREAS AND THEIR BUFFERS, SIGNIFICANT TREES AND DRAINAGE COURSES SHALL BE CLEARLY STAKED AND MARKED AS SHOWN ON PLANS.
10. PROPERTIES ADJACENT TO THE PROJECT SITE THAT ARE SUBJECT TO POTENTIAL EROSION CAUSED BY CONSTRUCTION ACTIVITIES SHALL BE PROTECTED FROM SEDIMENT DEPOSITION THROUGH THE USE OF SILT FENCE, HAY BALES OR OTHER BMP SELECTED BY THE CONTRACTOR.
11. ALL FACILITIES INTENDED TO TRAP SEDIMENT ON-SITE SHALL BE CONSTRUCTED AS A FIRST STEP IN GRADING. THESE FACILITIES SHALL BE FUNCTIONAL BEFORE ANY LAND DISTURBING ACTIVITIES TAKE PLACE. EARTHEN STRUCTURES SUCH AS DAMS, DIKES AND DIVERSIONS SHALL BE SEEDED AND MULCHED ACCORDING TO THE TIME PERIOD STATED IN #6 ABOVE.
12. ALL CUT AND FILL SLOPES SHALL BE CONSTRUCTED IN A MANNER THAT WILL MINIMIZE EROSION. ALL SLOPES SHALL BE STABILIZED WITHIN THE TIME PERIOD STATED IN #6 ABOVE.
13. ALL STORM DRAINAGE INLETS MADE OPERABLE DURING CONSTRUCTION SHALL BE PROTECTED WITH A GRAVEL INTAKE FILTER TO PREVENT SEDIMENT FROM ENTERING THE SYSTEM. THE FILTER MUST BE INSPECTED REGULARLY AND CLEANED WHEN NECESSARY.
14. THE FOLLOWING SHALL APPLY TO CONSTRUCTION OF UTILITY LINES:
 - A. WHERE FEASIBLE, NO MORE THAN 500' OF TRENCH SHALL BE OPEN AT ONE TIME.
 - B. WHERE CONSISTENT WITH SAFETY AND SPACE CONSIDERATIONS, EXCAVATED MATERIAL SHALL BE PLACED ON THE UPHILL SIDE OF TRENCHES.
 - C. TRENCH DEWATERING DEVICES SHALL DISCHARGE AND SHALL REMAIN ON-SITE AND IN NO WAY ENTER PUBLIC PROPERTY OR WATERWAY.
15. WHEREVER CONSTRUCTION VEHICLE ACCESS ROUTES INTERSECT PAVED ROADS, A STABILIZED CONSTRUCTION ENTRANCE/EXIT SHALL BE CONSTRUCTED (SEE DETAIL SHEET) TO MINIMIZE THE TRANSPORT OF SEDIMENT (MUD) ONTO THE PAVED ROAD. IF SEDIMENT IS TRANSPORTED ONTO A ROAD SURFACE, THE ROADS SHALL BE CLEANED THOROUGHLY AT THE END OF EACH DAY. SEDIMENT SHALL BE REMOVED FROM ROADS BY SHOVELING OR SWEEPING AND BE TRANSPORTED TO A CONTROLLED SEDIMENT DISPOSAL AREA. STREET WASHING SHALL ONLY BE ALLOWED AFTER SEDIMENT IS REMOVED IN THIS MANNER. A MINIMUM OF ONE (1) ON-SITE STABILIZED CONSTRUCTION ENTRANCES SHALL BE INSTALLED.
16. CONCRETE TRUCKS SHALL NOT BE ALLOWED TO WASH OUT ON-SITE UNLESS A PROPERLY CONSTRUCTED CONCRETE TRUCK WASHOUT AREA IS CONSTRUCTED AND MAINTAINED.
17. ALL TRUCKS USED TO HAUL EXCAVATED SOILS FROM THE SITE SHALL BE INSPECTED AND SWEEPED CLEAN OF LOOSE SOIL PRIOR TO LEAVING THE SITE.
18. FUEL, LUBRICANTS AND OTHER FLUIDS REQUIRED FOR THE MAINTENANCE OF THE EQUIPMENT SHALL NOT BE STORED ON-SITE.
19. ALL TEMPORARY SEDIMENT AND EROSION CONTROL SHALL BE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION IS ACHIEVED. TRAPPED SEDIMENT SHALL BE REMOVED OR STABILIZED ON-SITE. DISTURBED SOIL AREAS RESULTING FROM REMOVAL SHALL BE PERMANENTLY STABILIZED.
20. ALL POLLUTANTS OTHER THAN SEDIMENT THAT OCCUR ON-SITE DURING CONSTRUCTION SHALL BE HANDLED AND DISPOSED OF IN A MANNER THAT DOES NOT CAUSE CONTAMINATION OF STORM WATER OR THE SITE.
21. ALL TEMPORARY AND PERMANENT EROSION AND SEDIMENT CONTROL FACILITIES SHALL BE INSPECTED, MAINTAINED AND REPAIRED BY THE CONTRACTOR AS NEEDED TO ASSURE CONTINUED PERFORMANCE OF THEIR INTENDED USE. ALL ON-SITE EROSION AND CONTROL MEASURES SHALL BE INSPECTED BY THE CONTRACTOR AT LEAST ONCE EVERY SEVEN (7) DAYS AND WITHIN 24 HOURS OF ANY STORM EVENT EQUAL TO OR GREATER THAN 0.25" OF RAIN PER 24 HOUR PERIOD. AN INSPECTION REPORT FILE SHALL BE MAINTAINED BY THE CONTRACTOR AND KEPT ON-SITE.
22. THE CONTRACTOR IS RESPONSIBLE TO PROVIDE ADDITIONAL TEMPORARY SEDIMENT PONDS/TRAPS AS SITE CONDITIONS REQUIRE. CONTRACTOR SHALL COORDINATE WITH THE ENGINEER.
23. THE CONTRACTOR IS RESPONSIBLE TO PROVIDE ADDITIONAL EROSION CONTROL MEASURES, INCLUDING BUT NOT LIMITED TO SILT FENCING, SEDIMENT PONDS/TRAPS, DIVERSION SWALES, CHECK DAMS, SEDIMENT BARRIERS, FILTER FABRIC MULCH AND SEEDING, AS CONDITIONS REQUIRE. THE CONTRACTOR SHALL COORDINATE WITH THE ENGINEER.
24. BMP'S TO LIMIT DISTURBANCE AND VEGETATIVE BUFFER AROUND LIMITS OF DISTURBANCE WHERE PRACTICAL.
25. CONTRACTOR TO PROVIDE SWPPP PACKET AND DEQ NOI CONFIRMATION LETTER TO CITY OF MISSOULA AND ACQUIRE CITY OF MISSOULA SWPPP PERMIT PRIOR TO ANY EARTH DISTURBING ACTIVITIES.
26. SWPPP INSPECTION RECORDS, NOT, AND NOT CONFIRMATION LETTER SHALL BE PROVIDED TO THE CITY OF MISSOULA AFTER THE PROJECT HAS REACHED FINAL STABILIZATION TO CLOSE OUT CITY PERMIT.
27. PUBLIC SIGNAGE IS REQUIRED PER SECTION 1.2.3 OF GENERAL PERMIT.

NOTE:
CONTRACTOR IS RESPONSIBLE FOR OBTAINING A CITY OF MISSOULA SWPPP PERMIT & DEQ PERMIT.



IMEG
1817 SOUTH AVE. W. STE. A PH: 406.721.0142 MISSOULA, MT FAX: 406.721.5224 www.imegcorp.com 59801

DATE: _____

REVISIONS: _____

DESIGNED: CM
DRAFTED: JW
CHECKED: CD
DATE: JULY, 2021

LOCATION: 1006 GREENOUGH DR, COS PLAT M SECTION 22, T13N, R19W, P.M.M. MISSOULA, MISSOULA COUNTY, MT

PREPARED FOR: CHRISTIAN KORKALO

PROJECT NAME: GREENOUGH HEIGHTS SUBDIVISION

SHEET TITLE: GRADING, DRAINAGE, AND ROAD PLANS SWPP PLAN

PROJECT NO: 20-5651

SHEET: 11 OF 12

PRELIMINARY

TBD

PRELIMINARY

PROJECT NO.
20-5651

PROJECT NAME

GREENOUGH HEIGHTS SUBDIVISION

SHEET:

12 OF 12

SHEET TITLE:

GRADING, DRAINAGE, AND ROAD PLANS
ROAD CROSS SECTIONS

LOCATION:

1006 GREENOUGH DR, COS PLAT M
SECTION 22, T13N, R19W, P.M.M.
MISSOULA, MISSOULA COUNTY, MT

PREPARED FOR:

CHRISTIAN KORKALO

DESIGNED: CM
DRAFTED: JW
CHECKED: CP
DATE: JULY, 2021

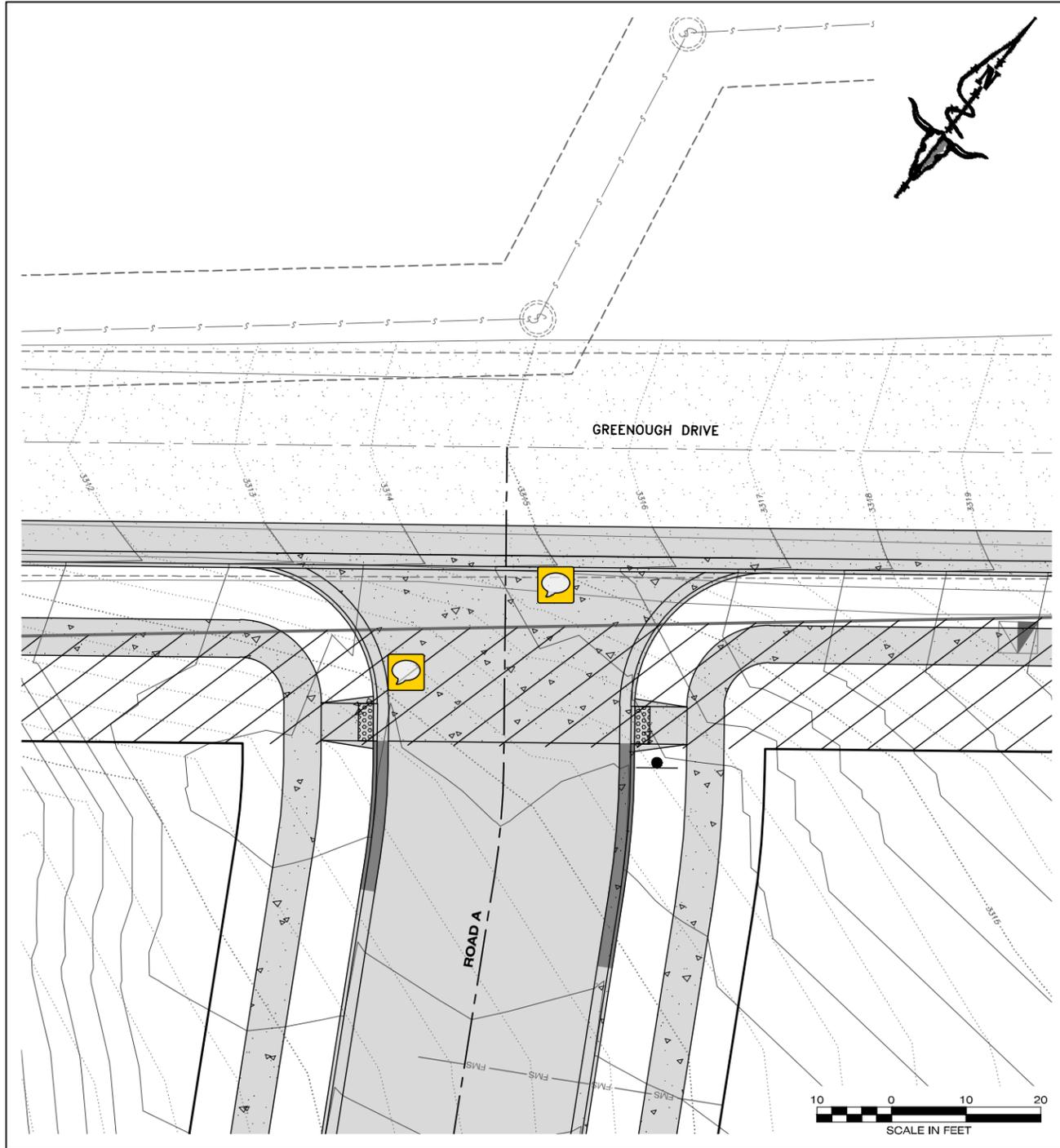
REVISIONS

DATE

REVISIONS	DATE

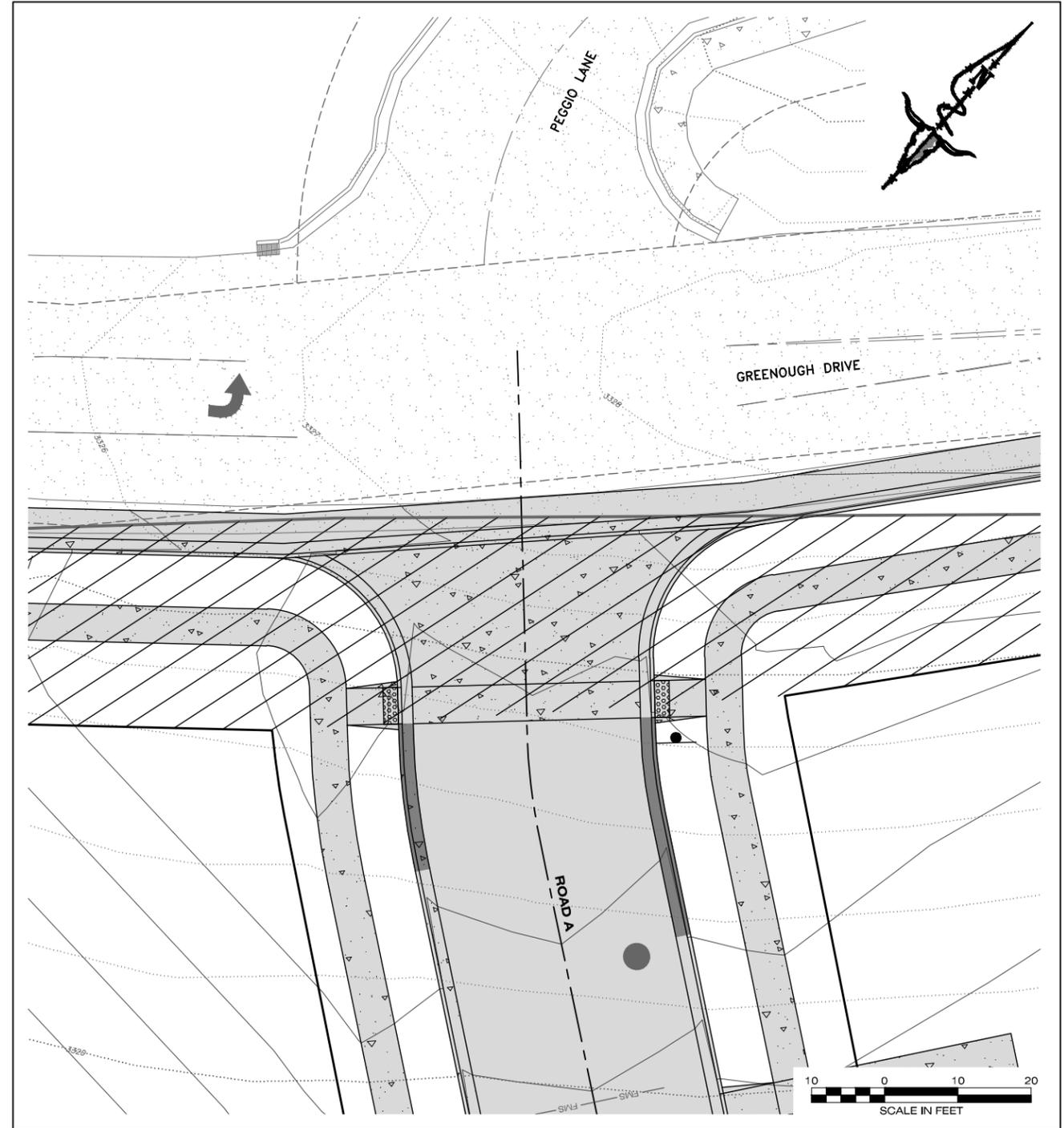


1817 SOUTH AVE. W. STE. A
MISSOULA, MT 59801
PH: 406.721.0142
FAX: 406.721.5224
www.imegcorp.com



A WEST INTERSECTION

NOT TO SCALE



B EAST INTERSECTION

NOT TO SCALE

REVISIONS	DATE

DESIGNED: *CM*
 DRAFTED: *JW*
 CHECKED: *CP*
 DATE: *JULY, 2021*

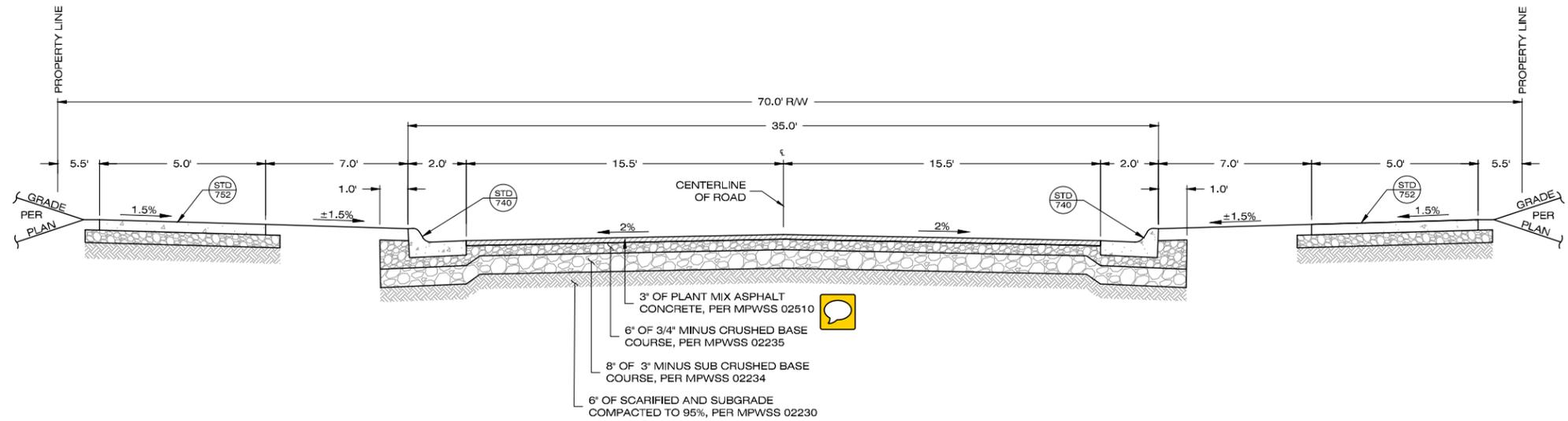
LOCATION:
 1006 GREENOUGH DR, COS PLAT M
 SECTION 22 T13N, R19W, P.M.M.
 MISSOULA, MISSOULA COUNTY, MT
 PREPARED FOR: CHRISTIAN KORKALO

PROJECT NAME: GREENOUGH HEIGHTS SUBDIVISION
 SHEET TITLE: GRADING, DRAINAGE, AND ROAD PLANS
 DETAIL SHEET

PROJECT NO. 20-5651
 SHEET: D1 OF D5

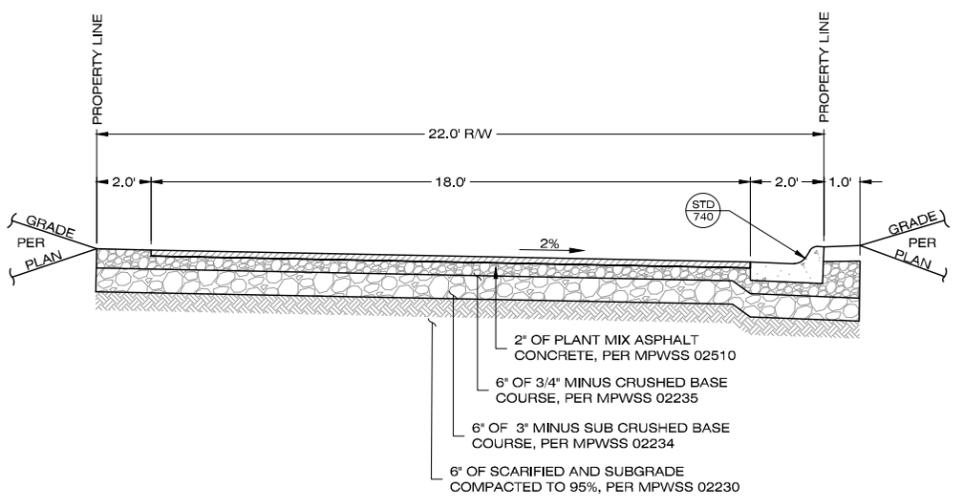
PRELIMINARY

DWG LOCATION: G:\MISSOULA\PROJECTS\20-5651 - KORKALO GREENOUGH HEIGHTS SUBDIVISION\DRAWINGS\AUTOCAD\PLAN\SET\20-5651-DWG1.DWG



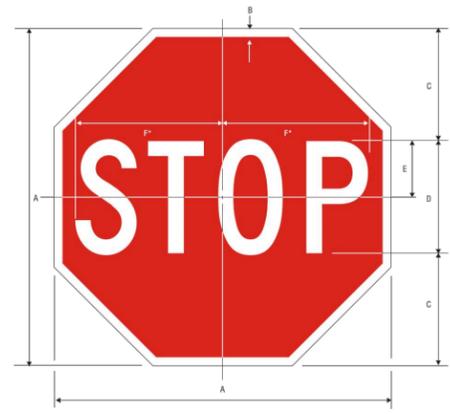
A TYPICAL ROAD CROSS SECTION

NOT TO SCALE



B TYPICAL ALLEY CROSS SECTION

NOT TO SCALE



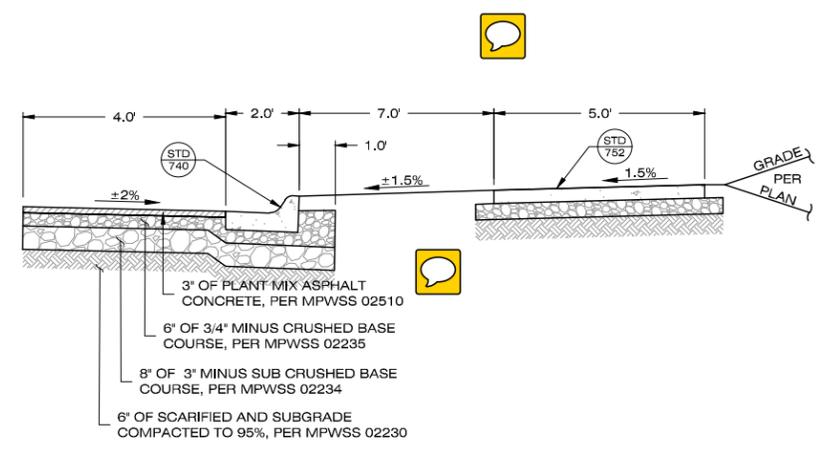
R1-1 STOP *Reduce spacing 40%

A	B	C	D	E	F
18	.375	6	6 C	3	7.75
24	.625	8	8 C	4	10
30	.75	10	10 C	5	12.5
36	.875	12	12 C	6	15
48	1.25	16	16 C	8	20

COLORS: LEGEND - WHITE (RETROREFLECTIVE)
 BACKGROUND - RED (RETROREFLECTIVE)
 1-1

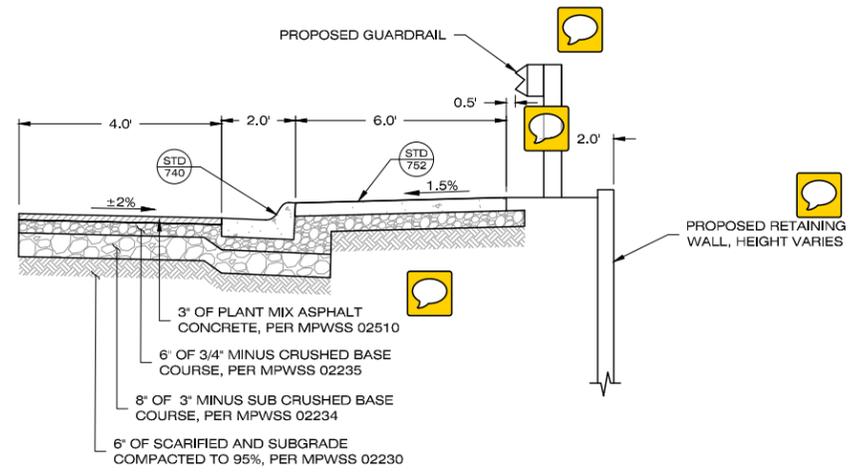
C STOP SIGN

NOT TO SCALE



D TYPICAL GREENOUGH SECTION

NOT TO SCALE



E TYPICAL GREENOUGH SECTION W/ WALL AND RAIL

NOT TO SCALE

DATE: _____

REVISIONS:

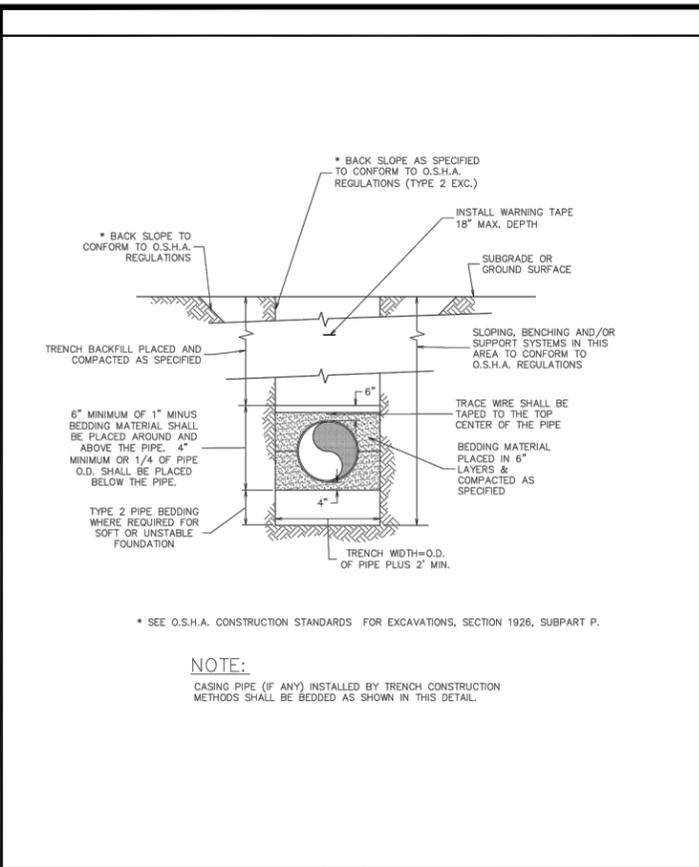
DESIGNED: CM
 DRAFTED: JW
 CHECKED: CP
 DATE: JULY, 2021

LOCATION: 1006 GREENOUGH DR, COS PLAT M SECTION 22 T13N, R19W, P.M.M. MISSOULA, MISSOULA COUNTY, MT
 PREPARED FOR: CHRISTIAN KORKALO

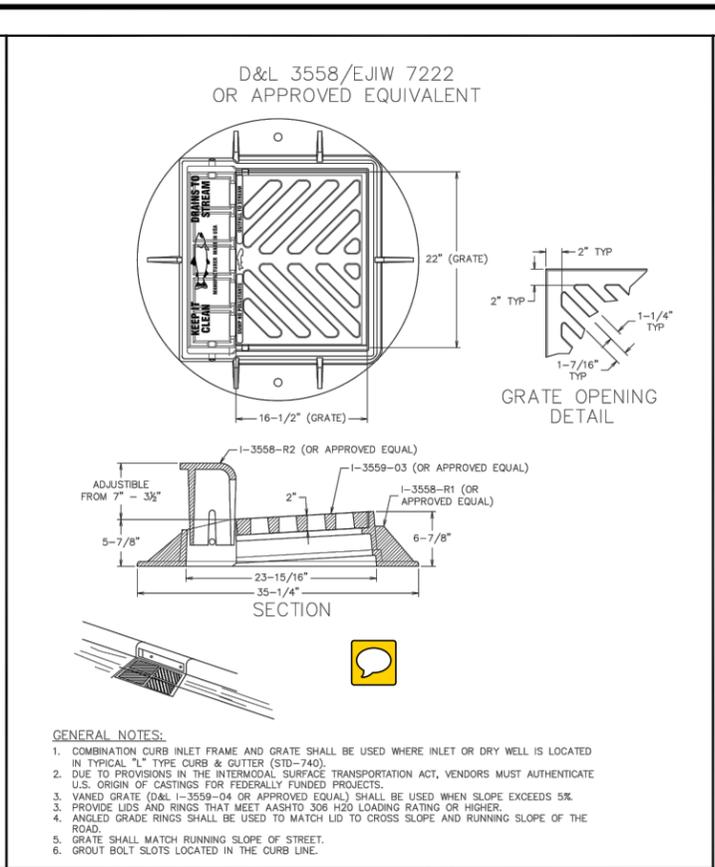
PROJECT NAME: GREENOUGH HEIGHTS SUBDIVISION
 PROJECT NO: 20-5651
 SHEET: D2 OF D5

SHEET TITLE: GRADING, DRAINAGE, AND ROAD PLANS
 DETAIL SHEET

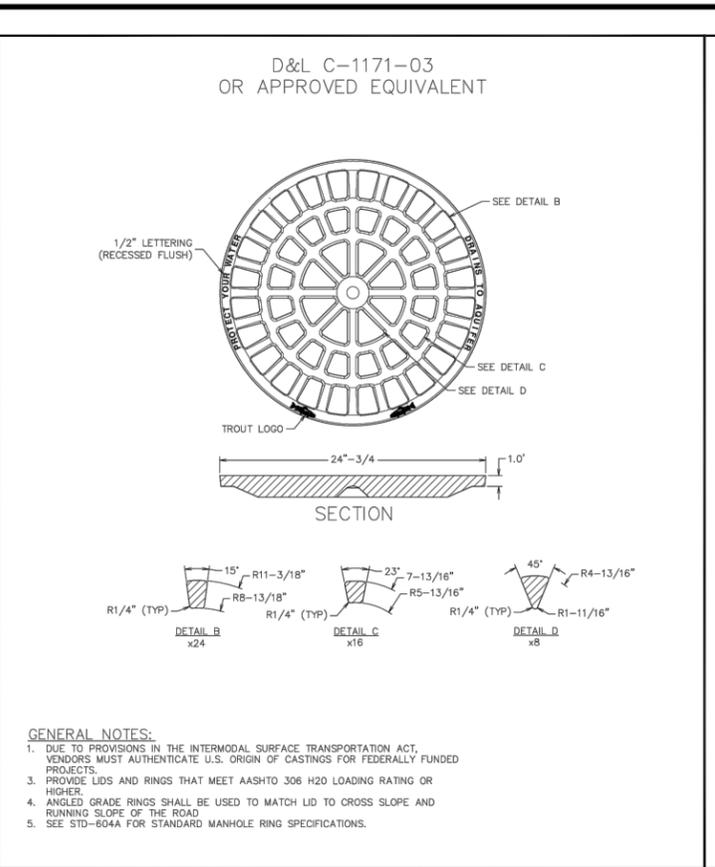
PRELIMINARY



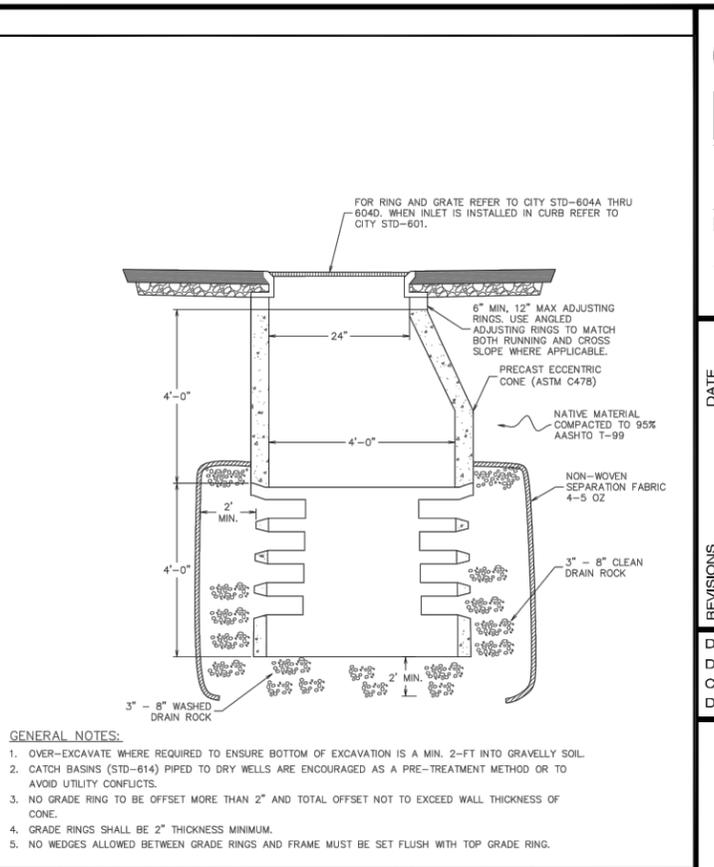
Engineering Division	Approved By Utilities Engineer Logan McInnis, PE	Revised: 09/28/2020	STD - 401
----------------------	--	---------------------	-----------



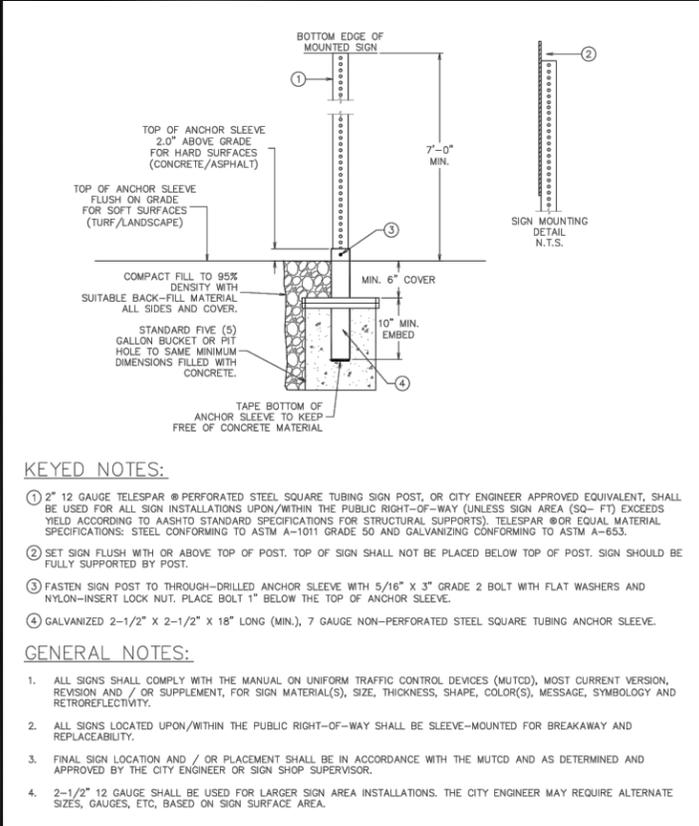
Engineering Division	Approved By Utility Engineer Andy Schultz, PE	Revised: 09/28/2020	STD - 601
----------------------	---	---------------------	-----------



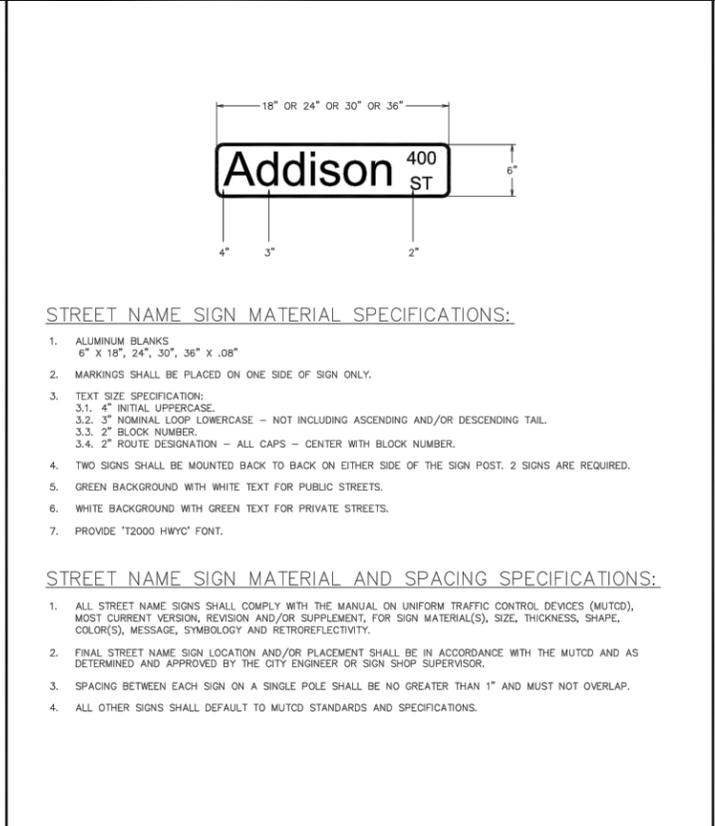
Engineering Division	Approved By Utility Engineer Andy Schultz, PE	Revised: 09/28/2020	STD - 604C
----------------------	---	---------------------	------------



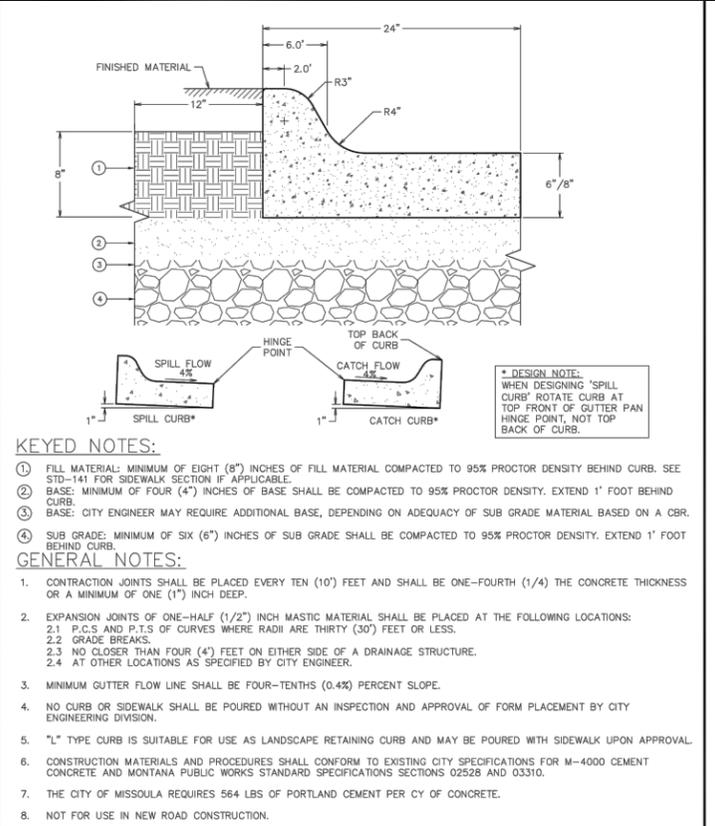
Engineering Division	Approved By Utility Engineer Andy Schultz, PE	Revised: 09/28/2020	STD - 616
----------------------	---	---------------------	-----------



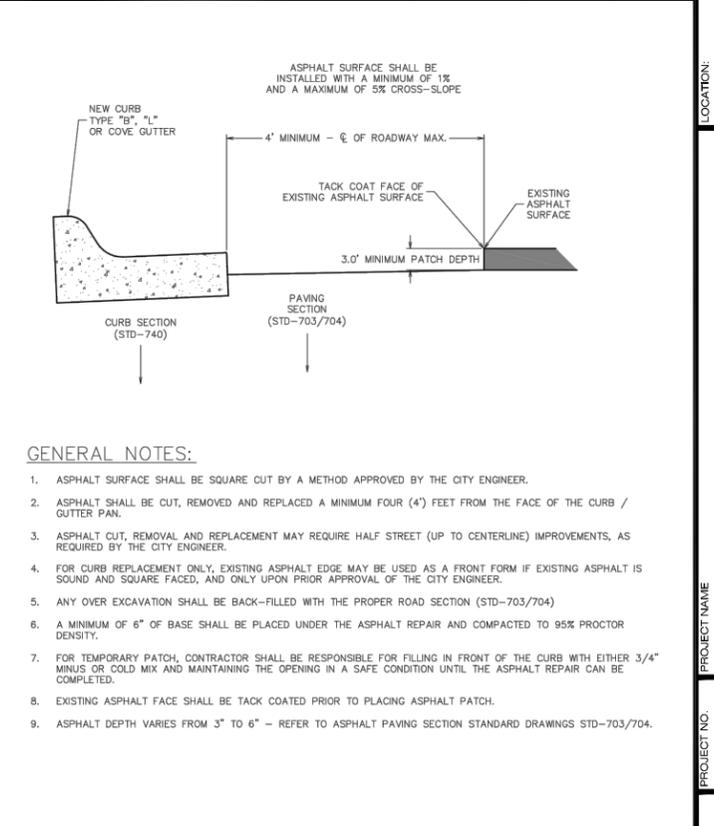
Engineering Division	Approved By City Engineer Kevin J. Slovarg	Adopted: 01/27/1999 Revised: 01/10/2017	STD - 720
----------------------	--	--	-----------



Engineering Division	Approved By City Engineer Kevin J. Slovarg	Adopted: 03/15/2006 Revised: 01/13/2017	STD - 721
----------------------	--	--	-----------



Engineering Division	Approved By City Engineer Kevin J. Slovarg	Adopted: 01/30/1980 Revised: 03/15/2017	STD - 740
----------------------	--	--	-----------



Engineering Division	Approved By City Engineer Kevin J. Slovarg	Adopted: 02/06/1986 Revised: 03/20/2017	STD - 744
----------------------	--	--	-----------

IMEG
1817 SOUTH AVE. W. STE. A PH: 406.731.0142
MISSOULA, MT FAX: 406.731.5223
www.imegcorp.com 59801

DATE: _____

REVISIONS: _____

DESIGNED: CM

DRAFTED: JW

CHECKED: CD

DATE: JULY, 2021

LOCATION:
1006 GREENOUGH DR, COS PLAT M
SECTION 22, T13N, R19W, P.M.M.
MISSOULA, MISSOULA COUNTY, MT

PREPARED FOR:
CHRISTIAN KORKALO

PROJECT NAME:
GREENOUGH HEIGHTS SUBDIVISION

PROJECT NO:
20-5651

SHEET:
D3 OF D5

PRELIMINARY

DATE	
REVISIONS	

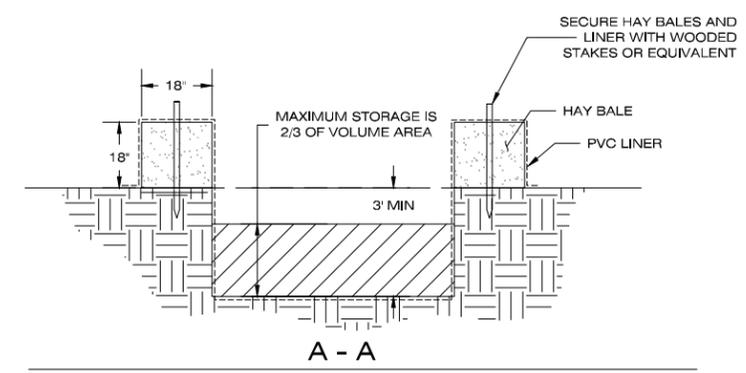
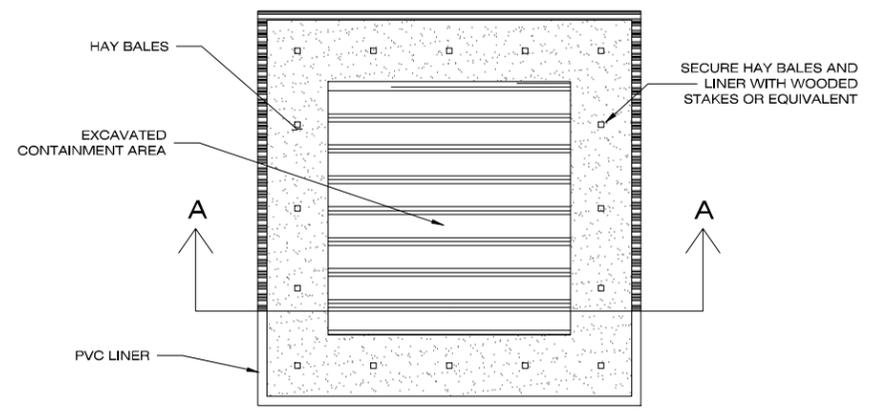
DESIGNED: CM
 DRAFTED: JW
 CHECKED: CD
 DATE: JULY, 2021

LOCATION:
 1006 GREENOUGH DR, COS PLAT M
 SECTION 22, T13N, R19W, P.M.M.
 MISSOULA, MISSOULA COUNTY, MT
 PREPARED FOR:
 CHRISTIAN KORKALO

PROJECT NAME:
 GREENOUGH HEIGHTS SUBDIVISION
 SHEET TITLE:
 GRADING, DRAINAGE, AND ROAD PLANS
 DETAIL SHEET

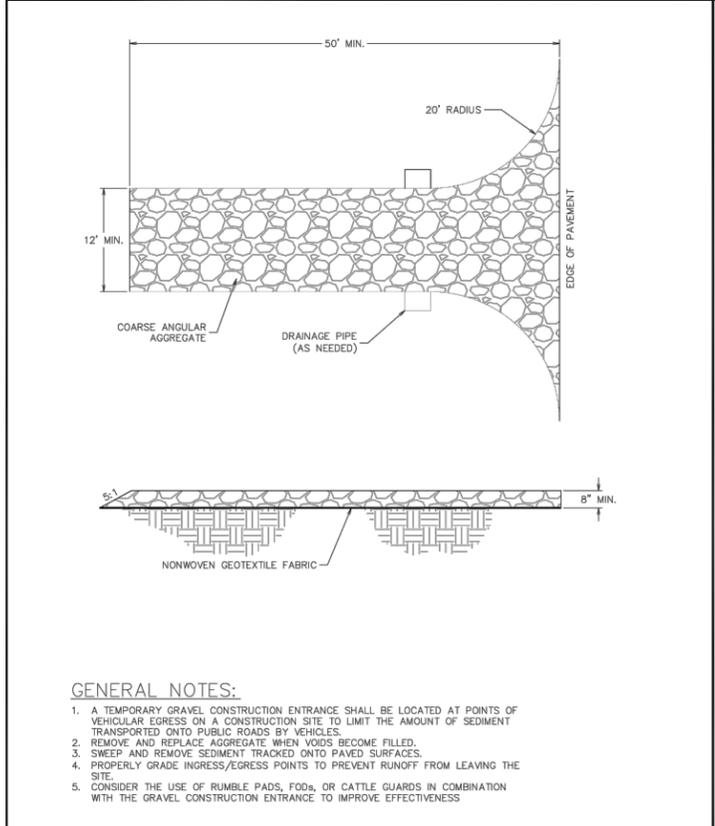
PROJECT NO:
 20-5651
 SHEET:
 D5 OF D5

PRELIMINARY

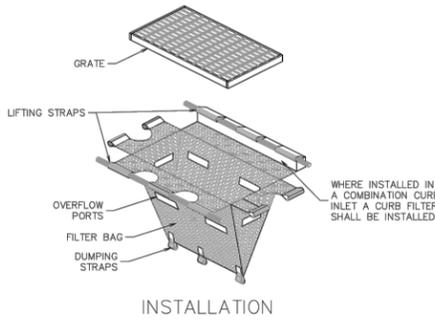
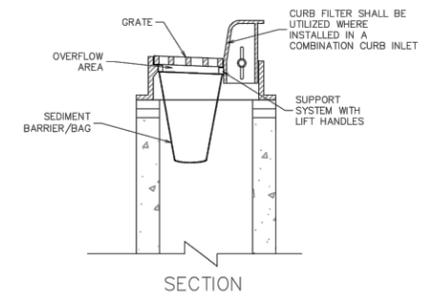


A
 CONCRETE WASHOUT AREA DETAIL

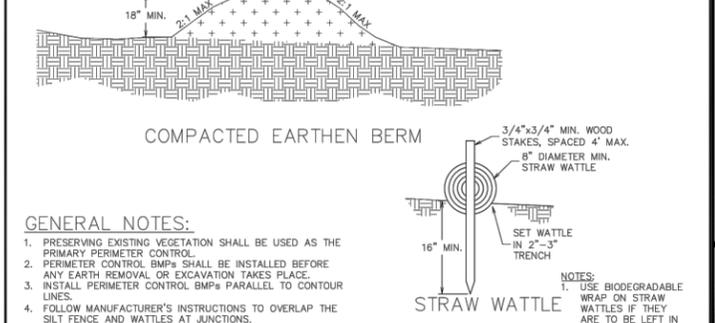
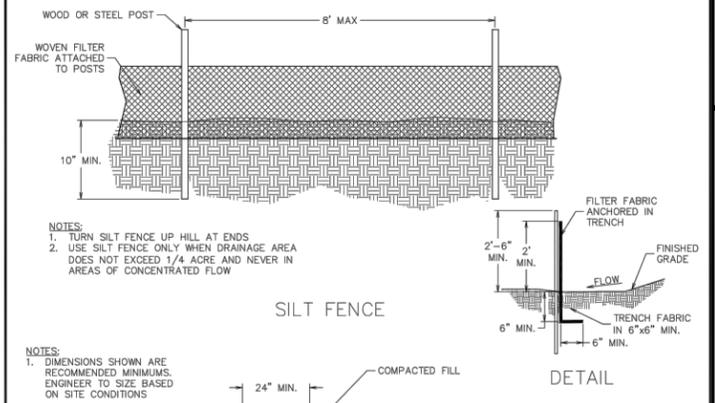
NOT TO SCALE



- GENERAL NOTES:**
1. A TEMPORARY GRAVEL CONSTRUCTION ENTRANCE SHALL BE LOCATED AT POINTS OF VEHICULAR EGRESS ON A CONSTRUCTION SITE TO LIMIT THE AMOUNT OF SEDIMENT TRANSPORTED ONTO PUBLIC ROADS BY VEHICLES.
 2. REMOVE AND REPLACE AGGREGATE WHEN VOIDS BECOME FILLED.
 3. SWEEP AND REMOVE SEDIMENT TRACKED ONTO PAVED SURFACES.
 4. PROPERLY GRADE INGRESS/EGRESS POINTS TO PREVENT RUNOFF FROM LEAVING THE SITE.
 5. CONSIDER THE USE OF RUMBLE PADS, FODS, OR CATTLE GUARDS IN COMBINATION WITH THE GRAVEL CONSTRUCTION ENTRANCE TO IMPROVE EFFECTIVENESS.



- GENERAL NOTES:**
1. INLET PROTECTION SHALL BE USED AS A "LAST RESORT" BMP. CARE SHALL BE TAKEN TO MINIMIZE SEDIMENT LADEN STORM WATER FROM REACHING INLETS/DRY WELLS.
 2. INLET PROTECTION SHALL BE INSPECTED REGULARLY AND AFTER STORM EVENTS. IF UNIT IS MORE THAN 1/3 FULL OF ACCUMULATED SEDIMENT, THE UNIT MUST BE EMPTIED.
 3. ALL TEMPORARY BMP'S TO BE REMOVED AT FINAL STABILIZATION.



- GENERAL NOTES:**
1. PRESERVING EXISTING VEGETATION SHALL BE USED AS THE PRIMARY PERIMETER CONTROL.
 2. PERIMETER CONTROL BMP'S SHALL BE INSTALLED BEFORE ANY EARTH REMOVAL OR EXCAVATION TAKES PLACE.
 3. INSTALL PERIMETER CONTROL BMP'S PARALLEL TO CONTOUR LINES.
 4. FOLLOW MANUFACTURER'S INSTRUCTIONS TO OVERLAP THE SILT FENCE AND WATTLES AT JUNCTIONS.
 5. ALL TEMPORARY BMP'S TO BE REMOVED AT FINAL STABILIZATION.

MISSOULA
 Engineering Division
 Approved By
 Utility Engineer
 Andy Schultz, PE
 Revised: 09/28/2020
 STD - 650

MISSOULA
 Engineering Division
 Approved By
 Utility Engineer
 Andy Schultz, PE
 Revised: 09/28/2020
 STD - 651

MISSOULA
 Engineering Division
 Approved By
 Utility Engineer
 Andy Schultz, PE
 Revised: 09/28/2020
 STD - 652

SEWER FORCE MAIN CONSTRUCTION PLANS

GREENOUGH HEIGHTS SUBDIVISION
 LOCATED IN SECTION 22, T13N, R19W, P.M.M., MISSOULA COUNTY, MONTANA



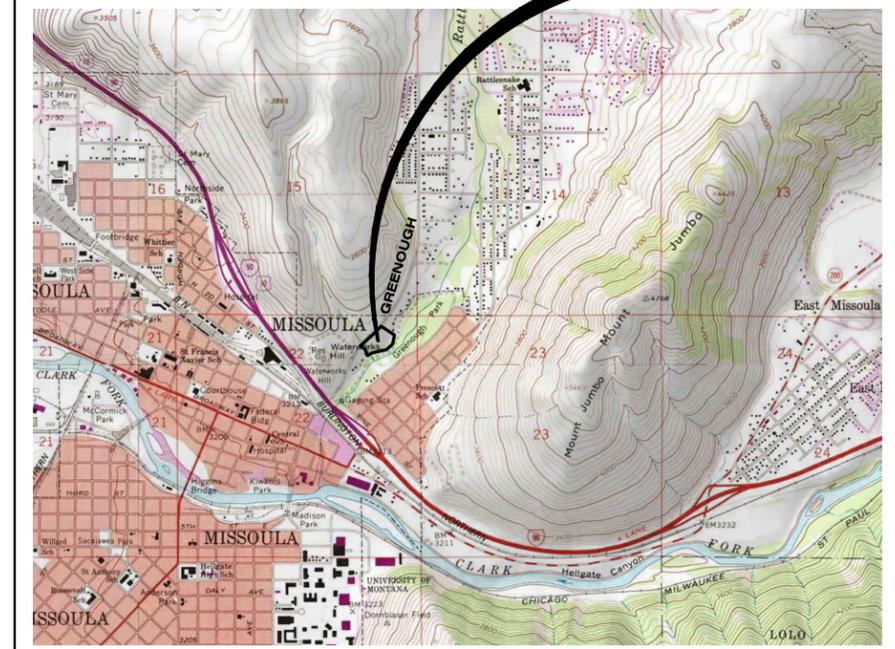
CALL UTILITY NOTIFICATION
 CENTER OF MONTANA
1-800-424-5555
 CALL FOR THE MARKING OF
 UNDERGROUND UTILITIES
2 BUSINESS DAYS BEFORE
 YOU DIG, GRADE, OR EXCAVATE



SHEET INDEX

DESCRIPTION	SHEET NO.
LEGEND AND NOTES SHEET	SHEET 2 OF 4
SEWER PLAN & PROFILE SHEET	SHEET 3 OF 4
SEWER PLAN & PROFILE SHEET	SHEET 4 OF 4
DETAIL SHEET	SHEET D1 OF D2
DETAIL SHEET	SHEET D2 OF D2

VICINITY MAP



MISSOULA, MISSOULA COUNTY



DATE	2/10/2021
REVISIONS	CITY MSLSA STAGE 3 COMMENTS

DESIGNED:	CM
DRAFTED:	JW
CHECKED:	CP
DATE:	JULY, 2021

LOCATION:
 1006 GREENOUGH DR, COS PLAT M
 SECTION 22, T13N, R19W, P.M.M.,
 MISSOULA, MISSOULA COUNTY, MT
 PREPARED FOR:
 CHRISTIAN KORKALO

PROJECT NAME
 GREENOUGH HEIGHTS SUBDIVISION
 PROJECT NO.
 20-5651
 SHEET TITLE:
 SEWER MAIN CONSTRUCTION PLANS
 COVER SHEET
 SHEET:
 1 OF 4

PRELIMINARY

PROJECT STATUS

THESE PLANS REQUIRE, AT A MINIMUM, APPROVAL FROM THE AGENCIES LISTED BELOW. THEREFORE, THE OWNER & CONTRACTOR ARE ADVISED THAT BIDS & CONTRACTS SHOULD NOT BE FINALIZED UNTIL INDICATED BELOW.

AGENCIES REVIEW STATUS:	REFERENCE #	APPROVAL DATE
MONTANA DEPT. OF ENV. QUALITY	EQ#:	
CITY OF MISSOULA	2021-009	

PLAN SET IS READY FOR CONSTRUCTION YES NO

AS-BUILT DATE:
 PROJECT HAS BEEN CONSTRUCTED IN GENERAL CONFORMANCE WITH THE ABOVE APPROVALS, STATED SPECIFICATIONS, AND SHOWN HERE IN, UNLESS OTHERWISE SPECIFIED.

PROJECT NOTES:

LEGEND

Table with columns for EXISTING and PROPOSED. Lists various utility lines (e.g., Water Line, Sewer Line, Storm Drain Pipe) and structures (e.g., Sewer Manhole, Septic Tank, Well) with their corresponding symbols and abbreviations.

Table containing ABBREVIATIONS (e.g., E for Elevation, STA for Station) and SYMBOLS (e.g., DETAIL SECTION, DETAIL CALLOUT, KEYED NOTE CALLOUT).

GENERAL CONDITIONS OF CONSTRUCTION:

- 1. The Standard General Conditions of the Contract prepared by the Engineers Joint Contract Documents Committee (Copyright 2007)...
- 2. Wherever used in these Drawings, the terms, whether printed with initial capital letters or not, as listed in the Standard General Conditions...
- 3. By proceeding with the Work as shown on these Drawings, the Contractor makes the following representations:

STANDARD SPECIAL PROVISIONS:

- 1. The Contractor shall be responsible for all permits, licenses and fees required for completion of this project unless specifically noted otherwise.
- 2. The Contractor shall provide the Owner with a 24 hour phone number of a party responsible and capable of immediate local response to emergency maintenance for the duration of the Work.
- 3. Unless noted otherwise, the contractor shall be responsible for any necessary traffic control on and off-site including obtaining any applicable permits.

UTILITY NOTES:

- 1. The Contractor shall notify appropriate personnel for utility locations and notice of construction commencement at least two business days prior to proceeding with the Work.
- 2. The Contractor shall support and protect all exposed utilities in conformance with the utility owners standards.
- 3. The information and data shown or indicated in the Drawings with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities...

SUBMITTALS, QUALITY CONTROL & ASSURANCE, INSPECTIONS, AND TESTING

- 1. Contractor is responsible to comply with the Contractor Quality Control and Owner Quality Assurance, Section 01400 MPWSS.
- 2. Contract shall complete trench excavation and backfill in accordance with Section 02221 MPWSS.
- 3. The Contractor shall coordinate with Engineer to obtain samples of trench backfill material to be used on-site.
- 4. Contractor will be responsible for coordination with a material testing company of the Engineer's selection to complete compaction testing of trench backfill.

SEWER CONSTRUCTION NOTES:

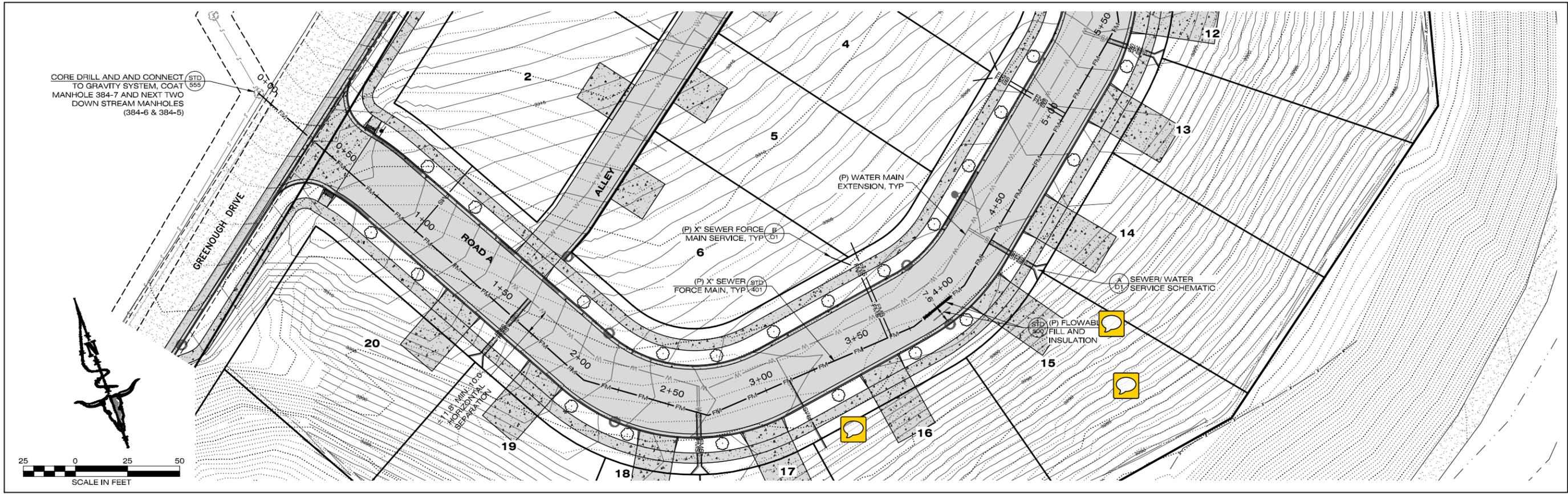
- 1. All Work shall be in accordance with the Montana Public Works Standard Specifications (MPWSS) (Sixth Edition, dated April 2010) and City of Missoula Public Works Standards and Specifications Manual (dated November 18, 2020).
- 2. Invert elevations are provided from center of manhole, unless noted otherwise.
- 3. Manhole stations are provided from center of manhole, unless noted otherwise.

CONSTRUCTION STAKING:

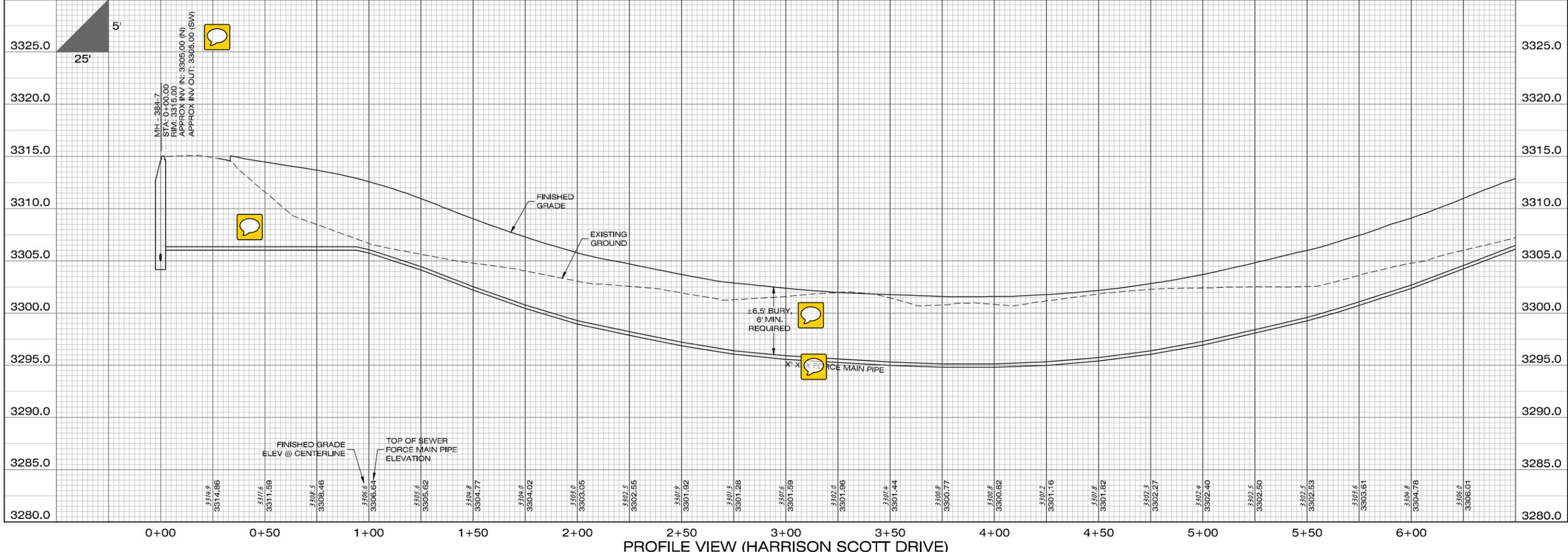
- 1. The owner will provide construction staking one time. Additional staking will be the responsibility of the contractor for scheduling and payment.
- 2. Contractor is responsible to coordinate and request staking at least five days in advance, unless otherwise agreed upon in writing by Engineer.
- 3. Staking will be provided as follows: a. Manholes: Center of Manholes and two offset stakes.

Vertical sidebar containing project information: PROJECT NAME (GREENOUGH HEIGHTS SUBDIVISION), PROJECT NO. (20-5651), SHEET (2 OF 4), LOCATION (1006 GREENOUGH DR, COS PLAT M SECTION 22, T13N, R19W, P.M.M. MISSOULA, MISSOULA COUNTY, MT), PREPARED FOR (CHRISTIAN KORKALO), and company logo (IMEG).

PRELIMINARY



PLAN VIEW



PROFILE VIEW (HARRISON SCOTT DRIVE)

CORE DRILL AND AND CONNECT TO GRAVITY SYSTEM, COAT MANHOLE 384-7 AND NEXT TWO DOWN STREAM MANHOLES (384-6 & 384-5)

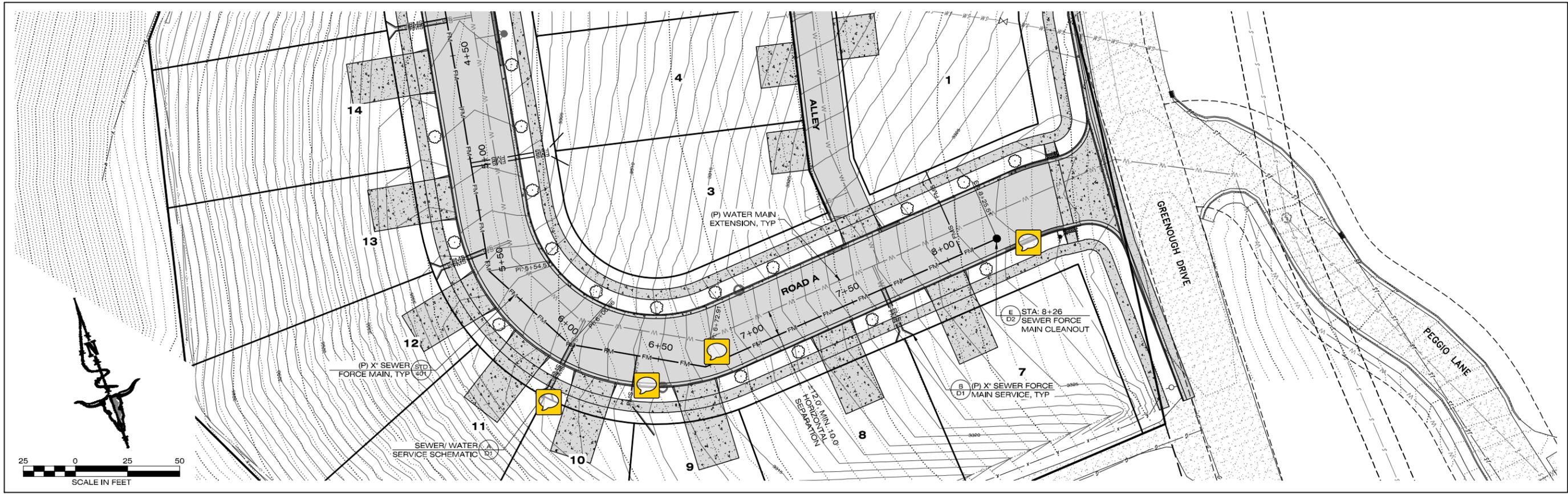


DATE	2/10/2021
REVISIONS	
CITY/MSLA STAGE 3 COMMENTS	
DESIGNED:	CM
DRAFTED:	JW
CHECKED:	CP
DATE:	JULY, 2021

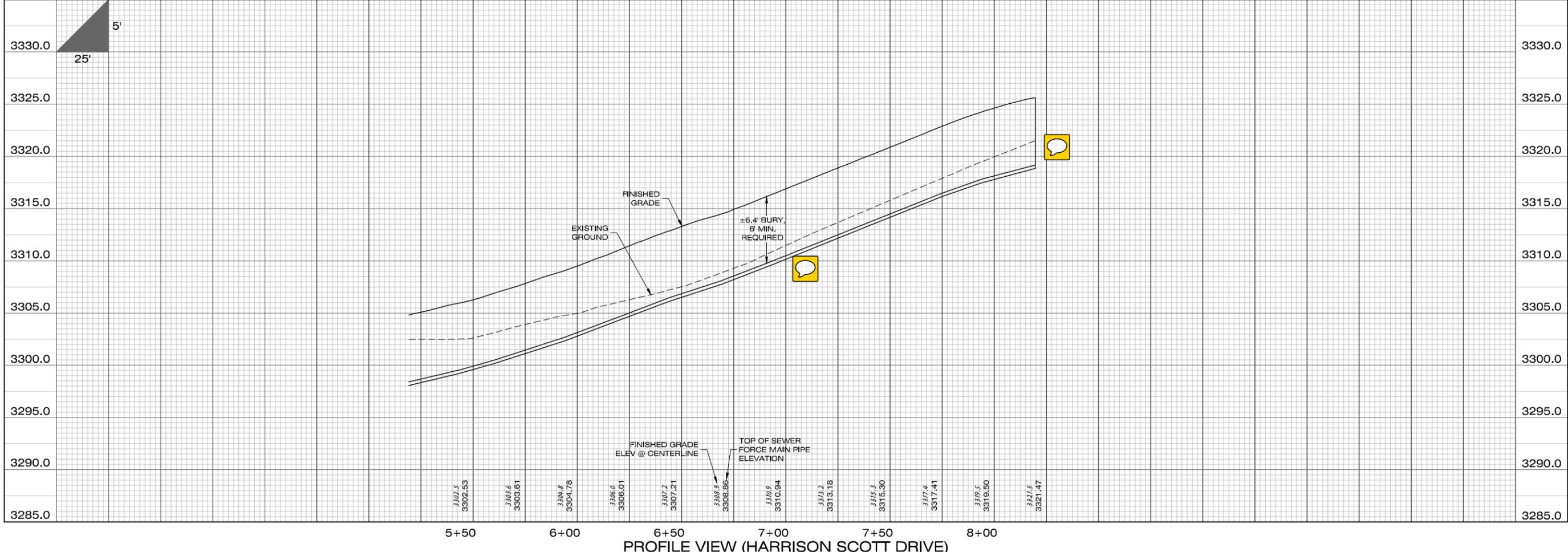
LOCATION:
 1006 GREENOUGH DR, COS PLAT M
 SECTION 22, T13N, R19W, P.M.M.
 MISSOULA, MISSOULA COUNTY, MT
 PREPARED FOR: CHRISTIAN KORKALO

PROJECT NAME: GREENOUGH HEIGHTS SUBDIVISION
 PROJECT NO: 20-5651
 SHEET TITLE: SEWER MAIN CONSTRUCTION PLANS
 SHEET: 3 OF 4

PRELIMINARY



PLAN VIEW



PROFILE VIEW (HARRISON SCOTT DRIVE)

REVISIONS	DATE
CITY MSLA STAGE 3 COMMENTS	2/10/2021

DESIGNED:	CM
DRAFTED:	JW
CHECKED:	CP
DATE:	JULY, 2021

LOCATION:
 1006 GREENOUGH DR, COS PLAT M
 SECTION 22, T13N, R19W, P.M.M.
 MISSOULA, MISSOULA COUNTY, MT

PREPARED FOR:
 CHRISTIAN KORKALO

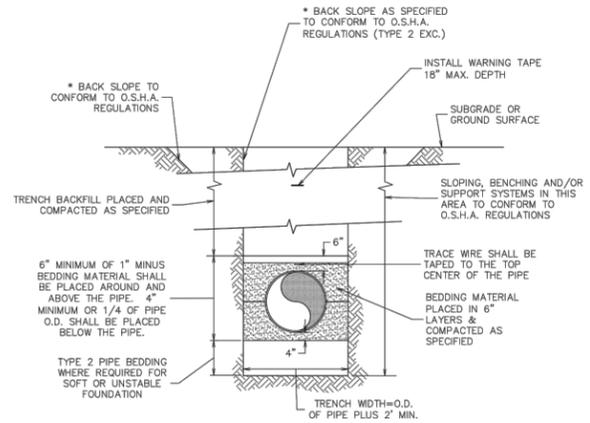
PROJECT NAME:
 GREENOUGH HEIGHTS SUBDIVISION

SHEET TITLE:
 SEWER MAIN CONSTRUCTION PLANS
 PLAN AND PROFILE SHEET

PROJECT NO:
 20-5651

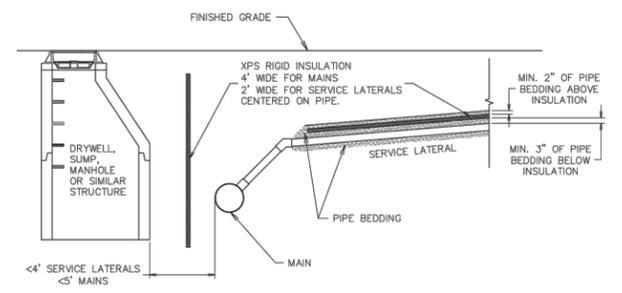
SHEET:
 4 OF 4

PRELIMINARY



* SEE O.S.H.A. CONSTRUCTION STANDARDS FOR EXCAVATIONS, SECTION 1926, SUBPART P.

NOTE:
CASING PIPE (IF ANY) INSTALLED BY TRENCH CONSTRUCTION METHODS SHALL BE BEDDED AS SHOWN IN THIS DETAIL.

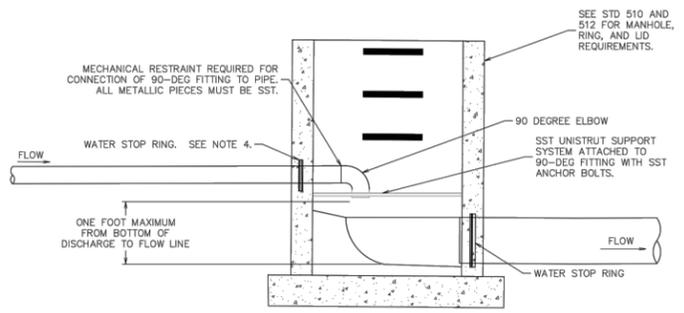


GENERAL NOTES:

- INSULATION IS REQUIRED WHEN A SANITARY SEWER PIPE IS LESS THAN 4 FEET FOR A SERVICE LATERAL AND LESS THAN 5 FEET FOR A SEWER MAIN, FROM FINISHED GRADE, A DRYWELL SUMP, IRRIGATION PIPE OR ANY STRUCTURE THAT HAS THE POTENTIAL TO TRANSFER COLD OR PROMOTE FREEZING.
- PROVIDE TWO INCHES OF INSULATION THICKNESS, EQUIVALENT TO AN R-VALUE OF 10, PER FOOT OF MISSING COVER OR VOID SPACE LESS THAN FIVE FEET.
- USE A HIGH DENSITY, RIGID INSULATION (PINK BOARD) WITH 35 PSI OR GREATER RATING IN TRAFFIC AREAS.

NOTES:

- FORCE MAIN SHALL HAVE BOTH MECHANICAL RESTRAINERS AND THRUST BLOCKS.
- ALIGN THE 90-DEGREE BEND WITH THE CENTER OF THE GRAVITY PIPE CHANNEL.
- ENTIRE MANHOLE, AS WELL AS TWO MANHOLES DOWNSTREAM, SHALL BE COATED WITH SHERWIN WILLIAMS DURA-PLATE 6000 OR APPROVED AS PER PUBLIC WORKS MANUAL.
- STAINLESS STEEL LINK SEALS SHALL BE USED WHEN CORING A FORCE MAIN INTO AN EXISTING MANHOLE.



Typical Utility Trench Detail

Engineering Division

Approved By
Utilities Engineer
Logan McInnis, PE

Revised: 09/28/2020

STD - 401

Sanitary Sewer Service and Main Insulation Requirements

Engineering Division

Approved By Utility Project Manager -
Ross Mollenhauer, PE

Revised: 09/28/2020

STD - 500

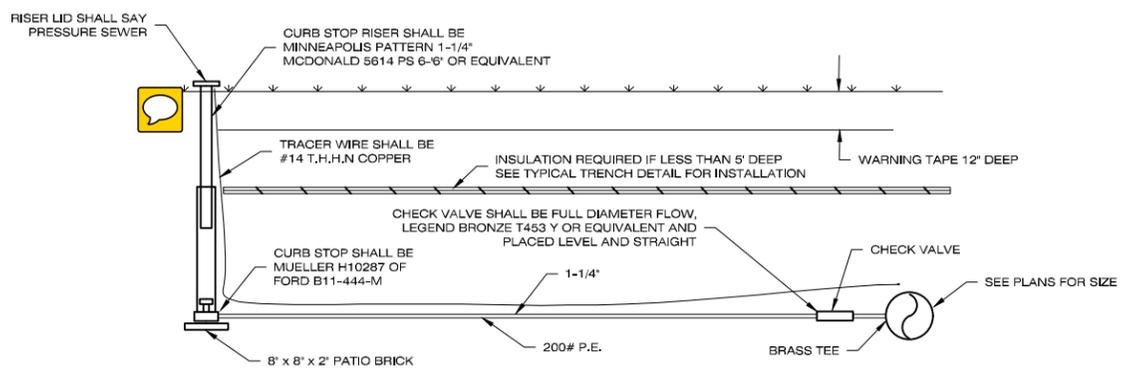
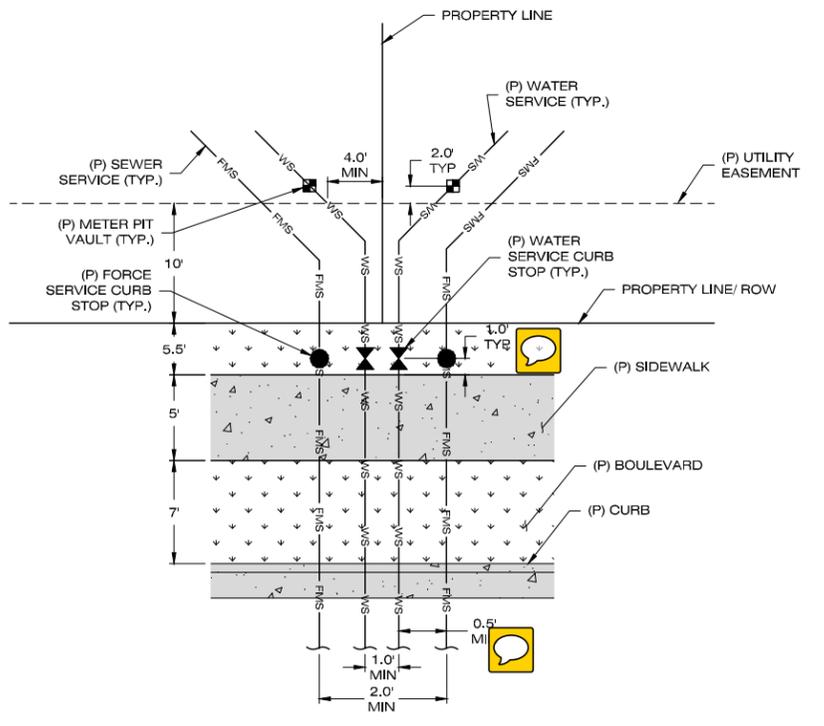
FORCE MAIN TERMINATION DETAIL

Engineering Division

Approved By Utility Project Manager -
Ross Mollenhauer, PE

Revised: 09/28/2020

STD - 555



A WATER/SEWER SERVICES SHARED LOT LINE DETAIL NOT TO SCALE

B FORCE MAIN SEWER SERVICE DETAIL NOT TO SCALE

DATE	2/10/2021
REVISIONS	CITY MSLA STAGE 3 COMMENTS
DESIGNED:	CM
DRAFTED:	JW
CHECKED:	CP
DATE:	JULY, 2021

LOCATION:
1006 GREENOUGH DR, COS PLAT M SECTION 22, T13N, R19W, P.M.M. MISSOULA, MISSOULA COUNTY, MT

PREPARED FOR:
CHRISTIAN KORKALO

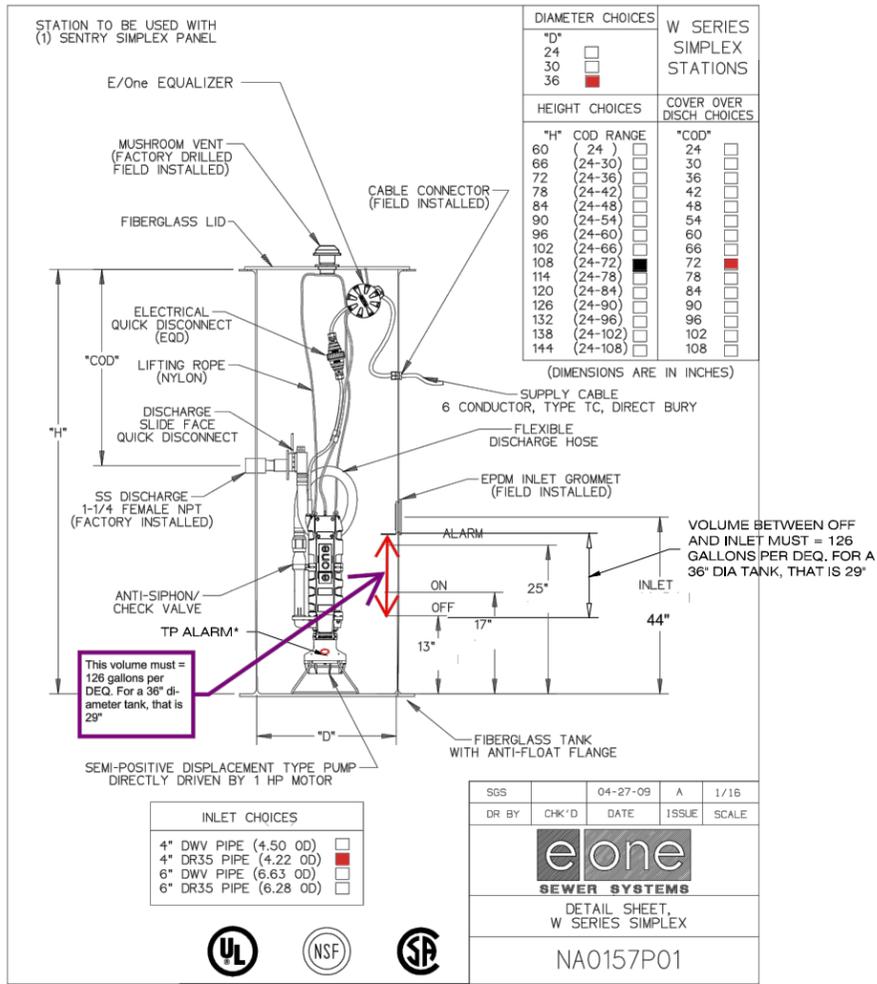
PROJECT NAME:
GREENOUGH HEIGHTS SUBDIVISION

PROJECT NO:
20-5651

SHEET TITLE:
SEWER MAIN CONSTRUCTION PLANS
DETAIL SHEET

SHEET:
D1 OF D2

PRELIMINARY



A E/ONE GRINDER PUMP STATION

NOT TO SCALE

DETAIL A NOTE:

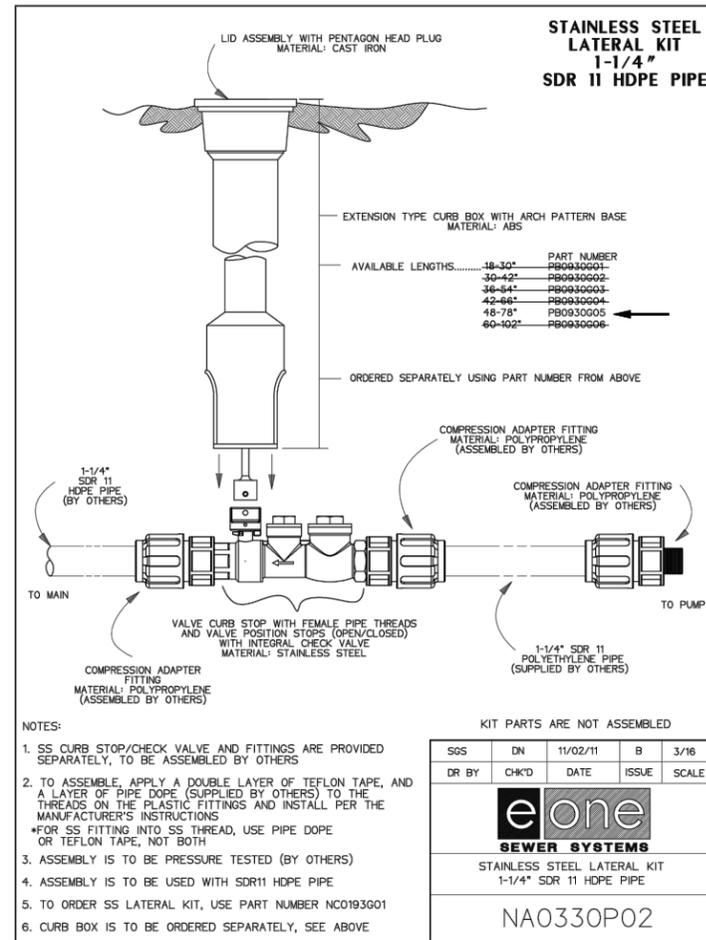
*E-ONE PUMP MUST BE EQUIPT WITH THERMAL SENSOR PROTECTION WITH REDUNDANT SHUT OFF/LOW LEVEL ALARM.

**E-ONE PUMP TO BE CAPABLE OF MEETING DEQ-2 C.721 *STEP AND GP UNITS RECEIVING WASTEWATER FROM PRIVATE SEWERS MUST BE PROVIDED WITH PUMPS AND CONTROLS THAT ARE CORROSION RESISTANT AND ARE LISTED BY UNDERWRITERS LABORATORIES, CANADIAN STANDARDS ASSOCIATION, OR OTHER APPROVED TESTING AND/OR ACCREDITING AGENCY AS MEETING THE REQUIREMENTS FOR NATIONAL ELECTRIC CODE FOR SUCH UNITS. IN ADDITION, THE DESIGN MUST PROVIDE FOR THE PUMPS AND MOTORS TO BE TOTALLY SUBMERGED AT ALL TIMES.

***CONTRACTOR IS REQUIRED TO PROVIDE TESTING ON THE SEWER MAINS IN ACCORDANCE WITH MPVSS 02730. TESTING SHALL INCLUDE LEAK TEST. PERFORM LEAK TEST AFTER PUMP VAULT HAS BEEN INSTALLED AND SEALED. SEAL ALL INLETS & OUTLETS, FILL TANK TO 6" ABOVE OUTLET, & ALLOW THE TANK TO STAND FOR AT LEAST 8 HOURS. IF THERE IS A MEASURABLE LOSS (1 INCH OR MORE), REFILL & LET STAND FOR ANOTHER 8 HOURS. IF THERE IS AGAIN MEASURABLE LOSS OR GAIN, THE TANK WILL BE REJECTED.

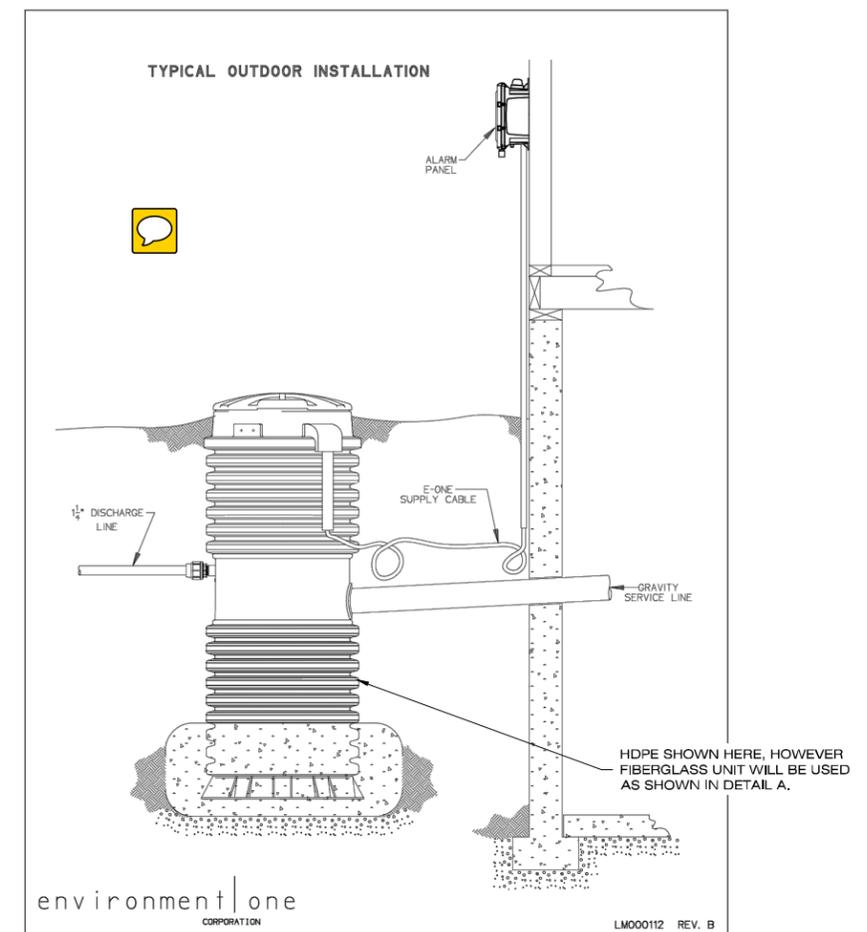
CONTRACTOR REQUIRED TO COORDINATE WITH SYSTEM OPERATOR AND COUNTY INSPECTOR FOR WITNESSING OF ALL TESTING. PRESSURE TESTING OF SERVICE LINES MUST BE COMPLETED WITH THE BALL VALVE AT THE MAINLINE IN THE CLOSED POSITION. PRESSURE TESTING OF THE MAINLINE MUST BE COMPLETED WITH THE SERVICE LINE BALL VALVES IN THE OPEN POSITION TO VERIFY THE EFFECTIVENESS OF CHECK VALVES.

NOTE:
 THE DRAWINGS SHOWN HERE AND PROVIDED BY ENVIRONMENT ONE ARE SUBJECT TO CHANGE AT ANY TIME. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONFIRM CURRENT DRAWINGS AND STANDARDS AND BRING TO THE ENGINEER'S ATTENTION SHOULD DIFFERENCES OR CHANGES OCCUR.



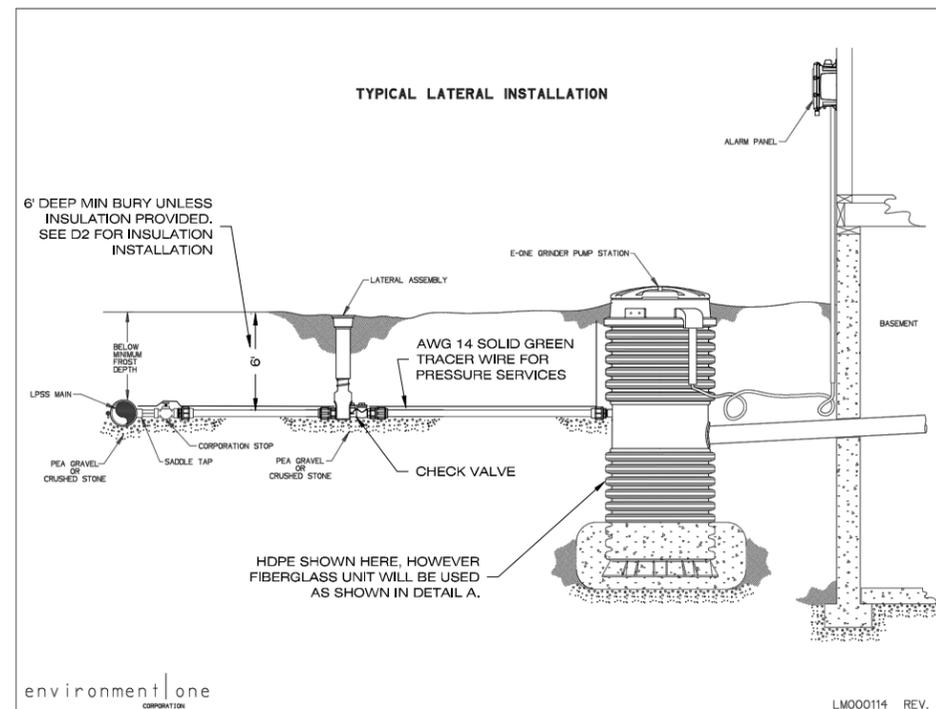
B E/ONE LATERAL ASSEMBLY KIT

NOT TO SCALE



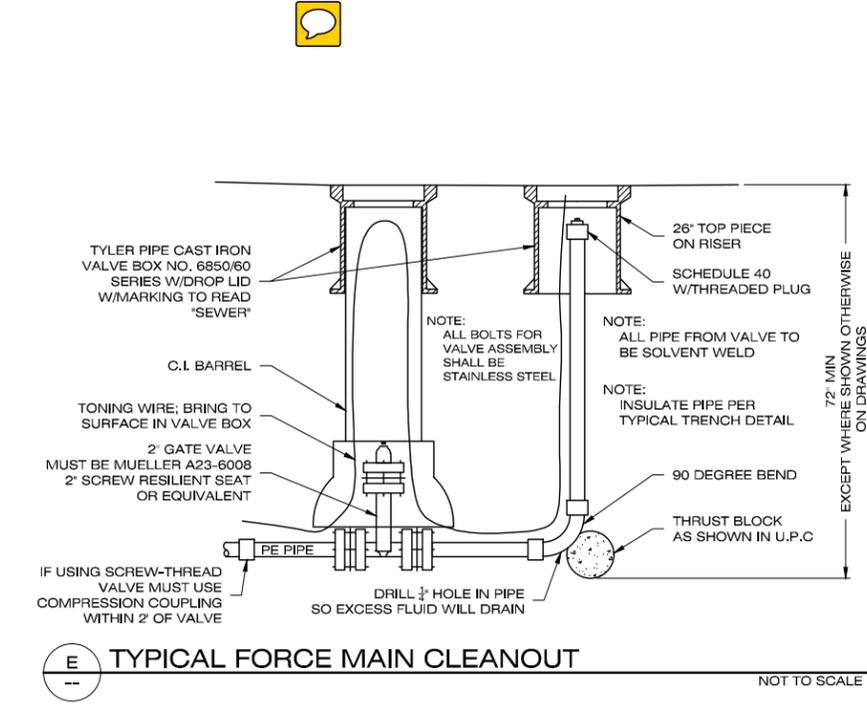
C E/ONE TYPICAL OUTDOOR INSTALLATION

NOT TO SCALE



D E/ONE TYPICAL LATERAL INSTALLATION

NOT TO SCALE



E TYPICAL FORCE MAIN CLEANOUT

NOT TO SCALE

IMEG
 1817 SOUTH AVE. W. STE. A PH: 406.721.0142
 MISSOULA, MT FAX: 406.721.5224
 www.imegcorp.com

DATE: 2/10/2021

REVISIONS
 CITY/MSLA STAGE 3 COMMENTS

DESIGNED: CM
 DRAFTED: JW
 CHECKED: CD
 DATE: JULY, 2021

LOCATION:
 1006 GREENOUGH DR, COS PLAT M
 SECTION 22 T13N, R19W, P.M.M.
 MISSOULA, MISSOULA COUNTY, MT

PREPARED FOR:
 CHRISTIAN KORKALO

PROJECT NAME:
 GREENOUGH HEIGHTS SUBDIVISION

SHEET TITLE:
 SEWER MAIN CONSTRUCTION PLANS
 DETAIL SHEET

PROJECT NO:
 20-5651

SHEET:
 D2 OF D2

PRELIMINARY

WATER MAIN EXTENSION CONSTRUCTION PLANS

GREENOUGH HEIGHTS SUBDIVISION
 LOCATED IN SECTION 22, T13N, R19W, P.M.M., MISSOULA COUNTY, MONTANA



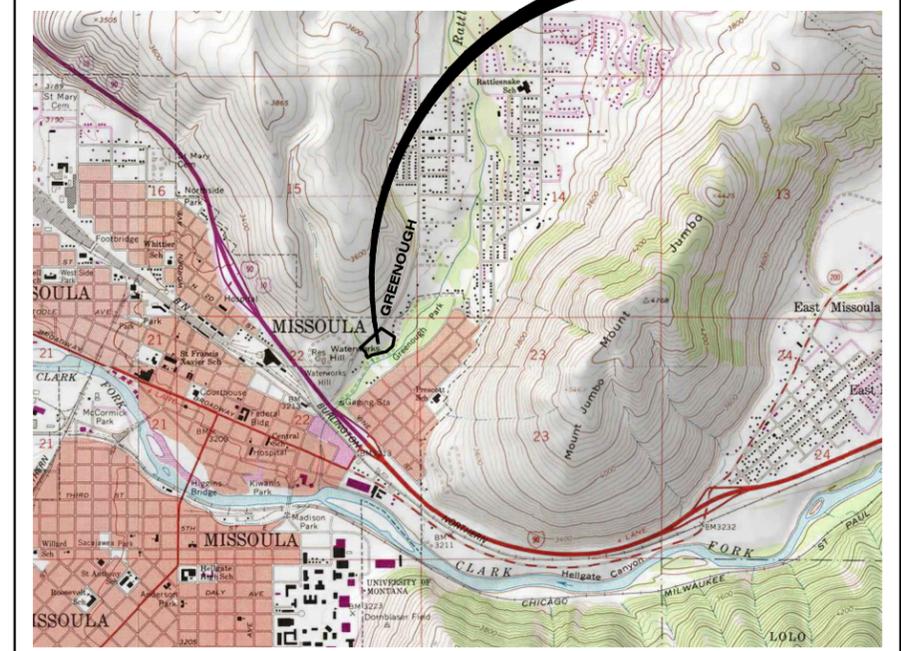
CALL UTILITY NOTIFICATION
 CENTER OF MONTANA
1-800-424-5555
 CALL FOR THE MARKING OF
 UNDERGROUND UTILITIES
2 BUSINESS DAYS BEFORE
 YOU DIG, GRADE, OR EXCAVATE



SHEET INDEX

DESCRIPTION	SHEET NO.
LEGEND AND NOTES SHEET	SHEET 2 OF 5
WATER PLAN & PROFILE SHEET	SHEET 3 OF 5
WATER PLAN & PROFILE SHEET	SHEET 4 OF 5
WATER PLAN & PROFILE SHEET	SHEET 5 OF 5
DETAIL SHEET	SHEET D1 OF D2
DETAIL SHEET	SHEET D2 OF D2

VICINITY MAP



MISSOULA, MISSOULA COUNTY



PRELIMINARY

DESIGNED: *CM*
 DRAFTED: *JW*
 CHECKED: *CP*
 DATE: *JULY, 2021*

LOCATION:
 1006 GREENOUGH DR, COS PLAT M
 SECTION 22, T13N, R19W, P.M.M.,
 MISSOULA, MISSOULA COUNTY, MT
 PREPARED FOR:
 CHRISTIAN KORKALO

PROJECT NAME:
 GREENOUGH HEIGHTS SUBDIVISION
 PROJECT NO:
 2000421
 SHEET:
 1 OF 5
 SHEET TITLE:
 WATER MAIN EXTENSION PLANS
 COVER SHEET

REVISIONS	DATE

IMEG
 1817 SOUTH AVE. W. STE. A
 MISSOULA, MT 59801
 PH: 406.721.0142
 FAX: 406.721.5224
 www.imegcorp.com
PLOT DATE: 7/18/2021 11:11 AM

PROJECT STATUS

THESE PLANS REQUIRE, AT A MINIMUM, APPROVAL FROM THE AGENCIES LISTED BELOW. THEREFORE, THE OWNER & CONTRACTOR ARE ADVISED THAT BIDS & CONTRACTS SHOULD NOT BE FINALIZED UNTIL INDICATED BELOW.

AGENCIES REVIEW STATUS:	REFERENCE #	APPROVAL DATE
MONTANA DEPT. OF ENV. QUALITY	EQ#:	
CITY OF MISSOULA	2021-009	

PLAN SET IS READY FOR CONSTRUCTION YES NO

AS-BUILT DATE:
 PROJECT HAS BEEN CONSTRUCTED IN GENERAL CONFORMANCE WITH THE ABOVE APPROVALS, STATED SPECIFICATIONS, AND SHOWN HERE IN, UNLESS OTHERWISE SPECIFIED.

PROJECT NOTES:

LEGEND

EXISTING	PROPOSED
(E) PROPERTY BOUNDARY	(P) EASEMENT
(E) ADJACENT PROPERTY BOUNDARY	(P) WATER LINE
(E) LOT LINE	(P) WATER SERVICE
(E) EASEMENT	(P) SEWER LINE
(E) WATER LINE	(P) SEWER SERVICE
(E) WATER SERVICE	(P) SEWER FORCE MAIN
(E) SEWER LINE	(P) SEWER FORCE MAIN SERVICE
(E) SEWER FORCE MAIN	(P) STORM DRAIN PIPE
(E) SEWER FORCE MAIN SERVICE	(P) OVERHEAD UTILITY
(E) STORM DRAIN PIPE	(P) BURIED POWER
(E) BURIED POWER	(P) GAS LINE
(E) GAS LINE	(P) TELEPHONE LINE
(E) TELEVISION LINE	(P) TELEVISION LINE
(E) FIBER OPTIC LINE	(P) FIBER OPTIC LINE
(E) ROAD CENTERLINE	(P) FENCE LINE
(E) FENCE LINE	(P) DITCH
(E) DITCH	(P) SWALE
(E) IRRIGATION FORCE MAIN	(P) IRRIGATION FORCE MAIN
(E) STREAM	(P) MAJOR CONTOUR
(E) MAJOR CONTOUR	(P) MINOR CONTOUR
(E) MINOR CONTOUR	(P) ASPHALT
(E) ASPHALT	(P) GRAVEL
(E) GRAVEL	(P) CONCRETE
(E) CONCRETE	(P) SEWER MANHOLE
(E) SEWER MANHOLE	(P) SEWER CLEANOUT
(E) SEWER CLEANOUT	(P) SEPTIC TANK
(E) SOIL PROFILE	(P) DRAINFIELD
(E) PERCOLATION TEST	(P) WELL
(E) GROUNDWATER MONITORING	(P) FIRE HYDRANT
(E) SEPTIC TANK	(P) WATER METER
(E) DRAINFIELD	(P) WATER VALVE
(E) WELL	(P) REDUCER
(E) FIRE HYDRANT	(P) THRUST BLOCK
(E) WATER METER	(P) WATER BLOW-OFF
(E) WATER VALVE	(P) STORM DRAIN MANHOLE
(E) WATER BLOW-OFF	(P) CULVERT
(E) STORM DRAIN MANHOLE	(P) CURB INLET
(E) CULVERT	(P) CATCH BASIN
(E) CURB INLET	(P) SUMP
(E) CATCH BASIN	(P) UTILITY MANHOLE
(E) SUMP	(P) LIGHT POLE
(E) UTILITY MANHOLE	(P) SIGN
(E) TELEPHONE JUNCTION BOX	(P) MAILBOX
(E) POWER VAULT	(P) DECIDUOUS TREE
(E) TELEVISION JUNCTION BOX	(P) CONIFEROUS TREE
(E) ELECTRICAL TRANSFORMER	(P) BUSH/ SHRUB
(E) POWER METER	
(E) GAS METER	
(E) POWER POLE	
(E) GUY WIRE	
(E) LIGHT POLE	
(E) SIGN	
(E) MAILBOX	
(E) DECIDUOUS TREE	
(E) CONIFEROUS TREE	
(E) BUSH/ SHRUB	

SYMBOLS

	DETAIL DESIGNATOR	DETAIL SECTION
	SHEET DESIGNATOR	DETAIL CALLOUT
	KEYED NOTE CALLOUT	KEYED NOTE CALLOUT
	PROPOSED ELEVATION XXXX.XX TBC EXISTING ELEVATION XXXX.XX	SPOT ELEVATION CALLOUT
	±X.X%	SLOPE GRADE
	←	FLOW DIRECTION

GENERAL CONDITIONS OF CONSTRUCTION:

- The Standard General Conditions of the Contract prepared by the Engineers Joint Contract Documents Committee (Copyright 2007), as included in Montana Public Works Standard Specifications, are herein referred to as the General Conditions within these Drawings. Copies of the General Conditions will be provided to Contractor upon written request to Engineer.
- Wherever used in these Drawings, the terms, whether printed with initial capital letters or not, as listed in the Standard General Conditions of the Construction Contract (General Conditions), Article 1 - Definitions and Terminology, prepared by the Engineers Joint Contract Documents Committee (Copyright 2007) will have the meanings indicated, which are applicable to both the singular and plural thereof, except as follows:
 - The Contract Documents shall mean the Drawings as shown in these plans and any applicable referenced standards, specifications, or laws.
 - The Contract Price shall mean the moneys payable by Owner to Contractor for completion of the Work in accordance with the Agreement.
 - The Contract Times shall mean the number of days or the dates stated in the Agreement to complete the Work so that it is ready for final payment. If no such dates are established, the Contract Time shall be 120 days to complete the Work.
 - Effective Date of the Agreement shall have the meaning as listed in the General Conditions, Article 1. If no such Agreement exists, the Effective Date of the Agreement shall be the day the Contractor proceeds with the Work.
- By proceeding with the Work as shown on these Drawings, the Contractor makes the following representations:
 - Contractor has examined and carefully studied the Drawings and other related data.
 - Contractor is familiar with and is satisfied as to all federal, state and local laws and Regulations that may affect cost, progress, performance and furnishing of the Work.
 - Contractor has visited the site and become familiar with and is satisfied as to the general, local and Site conditions that may affect cost, progress, performance or furnishing of the Work.
 - Contractor acknowledges that Owner and Engineer do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Drawings with respect to Underground Facilities at or contiguous to the site.
 - Contractor has obtained and carefully studied (or assumes responsibility for having done so) all such additional supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise, which may affect cost, progress, performance or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor including applying the specific means, methods, techniques, sequences and procedures of construction, if any, expressly required by the Drawings to be employed by the Contractor, and safety precautions and programs incident thereto.
 - Contractor is aware of the general nature of work to be performed by Owner and others at the site that relates to the Work.
 - Contractor has given Engineer written notice of all conflicts, errors, ambiguities or discrepancies that Contractor has discovered in the Drawings and the written resolution thereof by Engineer is acceptable to Contractor.
 - The Drawings are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
- In resolving disputes resulting from conflicts, errors or discrepancies, the order of precedence shall be as follows, as applicable to this project: Written agreement between owner and contractor, specifications, Drawings. Within the Specifications, the order of precedence is as follows, as applicable to this project: Addenda/Change Orders, Contractor's Bid, Special Provisions, Instructions to Bidders, Supplemental General Conditions, Notice Inviting Bids, General Conditions, Technical Specifications, Referenced Standard Specifications. With reference to the Drawings, the order of precedence is as follows, as applicable to this project: Figures govern over scaled dimensions, Detail drawings govern over general drawings, Addenda/Change Order drawings govern over contract drawings, contract drawings govern over standard drawings, contract drawings govern over shop drawings.
- If Contractor believes that any subsurface or physical condition at or contiguous to the Site that
 - is uncovered or revealed either is of such a nature as to require a change in the Drawings; or
 - differs materially from that shown or indicated in the Drawings; or
 - is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided in the drawings;
 then Contractor shall promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.
- Section 2.06 of the General Conditions is hereby incorporated into these Drawings.
- Section 3.03.A.2 of the General Conditions is hereby incorporated into these Drawings.
- Section 3.05 of the General Conditions is hereby incorporated into these Drawings.
- Section 3.06 of the General Conditions is hereby incorporated into these Drawings.
- Section 4.05 of the General Conditions is hereby incorporated into these Drawings.
- Section 6.01, 6.02.A, and 6.03 of the General Conditions are hereby incorporated into these Drawings.
- Substitutes and "Or-Equals" items are subject to the provisions of the General Conditions, Section 6.05.
- Section 6.13 of the General Conditions is hereby incorporated into these Drawings, except that Section 6.13.D shall be replaced with the following sentence:
Contractor's duties and responsibility for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer and Owner, as applicable to the Work, have accepted that the work is complete.
- Section 6.11, 6.14, 6.15, 6.16, 6.18, 6.19, 6.20, and 6.21 of the General Conditions are hereby incorporated into these Drawings.
- Article 9 - Engineer's Status During Construction of the General Conditions is hereby incorporated into these Drawings, except as follows:
 - Delete the last sentence of Section 9.05.A.
 - Delete Section 9.06, 9.07, 9.08.B, 9.08.C, and 9.09.D.
- Section 10.02 of the General Conditions is hereby incorporated into these Drawings.
- Article 13 - Tests and Inspections, Correction, Removal or Acceptance of Defective Work of the General Conditions is hereby incorporated into these Drawings.

STANDARD SPECIAL PROVISIONS:

- The Contractor shall be responsible for all permits, licenses and fees required for completion of this project unless specifically noted otherwise.
- The Contractor shall provide the Owner with a 24 hour phone number of a party responsible and capable of immediate local response to emergency maintenance for the duration of the Work. Contractor shall provide the name of the responsible party and phone number in writing prior to proceeding with the Work.
- Unless noted otherwise, the contractor shall be responsible for any necessary traffic control on and off-site including obtaining any applicable permits.
- Material stockpiled along the project route shall be done so in a manner that does not affect public safety and is in a neat and orderly fashion.
- The Contractor shall be responsible for disposing of all waste and excess materials such as, but not limited to: vegetation, trees, brush, asphalt, concrete, sub-grade soils, etc., offsite in accordance with local, state and federal laws. The Owner reserves the right to request certain waste materials to be stockpiled at a location on-site.
- The contractor will be responsible to adhere to the MDEQ or EPA approved Storm Water Pollution Prevention Plan (SWPPP), if applicable to the project. The contractor is responsible for repair of damage made to BMPs identified in the SWPPP. The approved Storm Water Pollution Prevention Plan will be provided to Contractor if required.
- The Contractor will be required to make every effort to immediately restore the construction area once the construction task is completed. All sod and seeding shall be completed in accordance with MPWSS 02910. This includes such required activities as finish grading, spreading of topsoil, restoring irrigation, replacing traffic and street signs, etc. The contractor will have 48 hours to begin restoration once the construction task in the immediate area is complete. Once restoration is begun, it must be completed without interruption to the extent possible.
- After all work on this project is completed and before final acceptance of the project, the entire project shall be neatly finished to the lines, grades, and cross sections shown on the plans and as hereinafter specified.
 - Drainage facilities, such as inlets, catch basins, storm pipe, culverts, and curb and gutter shall be cleaned of all debris, gravel, silts or other foreign material caused by or attributed to construction.
 - The Contractor shall remove and dispose of all construction stakes.
 - All areas disturbed by the construction shall be shaped to present a uniform appearance blending into the contour of adjacent properties. All surface replacement and landscaping shall be completed.
 - Except as otherwise permitted, all excess excavated materials shall be disposed of away from the site of the work.
 - Broken concrete and other debris resulting from pavement or sidewalk removal, excavated rock in excess of the amount permitted, and other waste and debris encountered in excavated work, and other similar waste materials shall be disposed of away from the site.
 There will be no separate measurement or payment for cleanup, and all costs for such work shall be included in the Contract Price.
- No on-site burning of waste materials will be allowed.
- If a street has not been surfaced and cleaned, the Contractor shall be responsible for dust control and maintenance of the street. Also, if detours are made on a gravel road, the Contractor is responsible for dust control and maintenance on the detours. See "Air Quality" below also.
- Daily street sweeping shall be completed on both ends of each street during construction. Unpaved detours or any other fugitive dust emission sources from construction and demolition should be watered and/or chemically stabilized so emissions are less than 20% opacity.

UTILITY NOTES:

- The Contractor shall notify appropriate personnel for utility locations and notice of construction commencement at least two business days prior to proceeding with the Work. Before Contractor proceeds with the Work, a common locate service (One Call) is available at 1-800-424-5555. All Underground Facilities may not be located by the One Call service including but not limited to such Underground Facilities as irrigation systems, public and private water and sewer systems, etc.
- The Contractor shall support and protect all exposed utilities in conformance with the utility owner's standards.
- The information and data shown or indicated in the Drawings with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise noted:
 - Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data; and
 - The cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - Reviewing and checking all such information and data.
 - Locating all Underground Facilities shown or indicated in the Drawings.
 - Coordination of the Work with the owners of such Underground Facilities, including Owner, during construction, and
 - The safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.
 At least 2 business days before beginning any excavation, the Contractor shall, according to MCA 69-4-501, notify all owners of underground facilities and coordinate the Work with the owners of such underground facilities. The information shown or indicated in the Drawings with respect to existing underground facilities is based on information and data obtained from the owners of the facilities without field exploration, and as such, Owner and Engineer are not responsible for the accuracy or completeness of such information or data.

SUBMITTALS, QUALITY CONTROL & ASSURANCE, INSPECTIONS, AND TESTING

- Contractor is responsible to comply with the Contractor Quality Control and Owner Quality Assurance, Section 01400 MPWSS.
- Contractor shall complete trench excavation and backfill in accordance with Section 02221 MPWSS.
- The Contractor shall coordinate with Engineer to obtain samples of trench backfill material to be used on-site.
- Contractor will be responsible for coordination with a material testing company of the Engineer's selection to complete compaction testing of trench backfill. Coordination includes updating appropriate personnel of the material testing company every day as to progress of work so adequate testing can be completed.
- The Contractor will be required to prepare a set of detailed as-built drawings to be presented to the Engineer at the completion of the project. The as-built drawings shall be updated daily and reviewed weekly by the Project Engineer. As-built drawings shall include, but not limited to location/depths of water mains and services, sewer mains and services, utilities, culverts, drainage structures, etc.
- Contractor will be responsible for completing water service ditch cards for all water services. Information on the ditch cards must be provided as directed by Engineer including lot number or building address served; as-built service connection location on the water main relative to stationing on the Drawings; Contractor who made tap; date tap was made; distance from main to curb stop; size of tap; size and material of service; size and material of water main; depth of main at tap; and depth of service at curb stop. Engineer will provide Contractor with example ditch card upon written request. One water ditch card shall be completed for each water service.
- Testing, cleaning, and disinfection of water mains, valves, and fittings shall be completed in accordance with MPWSS Section 02660, Part 3.4. Water testing procedure shall be as follows:
 - Chlorination
 - Flushing to reduce Chlorine residual to 0.5 ppm or less, or as otherwise approved by the engineer
 - Bacteriological Test
 - Hydrostatic and leakage testing
- Water testing shall be completed in the presence of the Engineer. The Contractor is responsible for coordinating with the Engineer to be present for water testing.

WATER CONSTRUCTION NOTES

- All Work shall be in accordance with the Montana Public Works Standard Specifications (MPWSS), Sixth Edition, dated April 2010, City of Missoula Specifications, and Missoula Water Standards and Specifications. Water Work shall conform to Section 02600 and any referenced specifications.
- Stations are provided from center of bend, tee, or connection, unless noted otherwise.
- Water services shall be constructed and inspected per Uniform Plumbing Code, City of Missoula Public Works, and Missoula Water.
- Water services (new or swaps/replacements) shall only be completed after water main has been installed, completed, tested and certified by Missoula Water, City of Missoula, and the Engineer of record.

CONSTRUCTION STAKING

- The owner will provide construction staking one time. Additional staking will be the responsibility of the contractor for scheduling and payment.
- Contractor is responsible to coordinate and request staking at least five days in advance, unless otherwise agreed upon in writing by Engineer.
- Staking will be provided as follows:
 - Bends, Tees/Connections, and Hydrants: Center of structure and two offset stakes.
 - Water Main: Hub offset set at 25' stations. Offset distance and side of trench as requested by Contractor in writing to engineer.
- Cut sheets will be provided to the contractor with elevation from hub to top of pipe elevation.
- Engineer does not consider staking to be complete and ready for use until cut sheets have been delivered to Contractor.

ABBREVIATIONS

APPROX.	APPROXIMATE
B/W	BETWEEN
DEQ/MDEQ	MT DEPARTMENT OF ENVIRONMENTAL QUALITY
D.I. / D.I.P.	DUCTILE IRON PIPE
(E)	EXISTING
EG / E.G.	EXISTING GROUND
ELEV	ELEVATION
EOA	EDGE OF ASPHALT
(F)	FUTURE
FG / F.G.	FINISHED GRADE
FL/FLG	FLANGE
INV	INVERT
LF	LINEAR FOOT
LT	LEFT
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
MJ / M.J.	MECHANICAL JOINT
N.I.C.	NOT IN CONTRACT
(P)	PROPOSED
PC	POINT OF CURVATURE
PT	POINT OF TANGENT
REQ./REQ'D	REQUIRED
RT	RIGHT
SIM	SIMILAR
STA	STATION
TBC	TOP BACK OF CURB
TBD	TO BE DETERMINED
TOC	TOP OF CONCRETE
TYP	TYPICAL
UNK	UNKNOWN
W/	WITH

SYMBOLS

	DETAIL DESIGNATOR	DETAIL SECTION
	SHEET DESIGNATOR	DETAIL CALLOUT
	KEYED NOTE CALLOUT	KEYED NOTE CALLOUT
	PROPOSED ELEVATION XXXX.XX TBC EXISTING ELEVATION XXXX.XX	SPOT ELEVATION CALLOUT
	±X.X%	SLOPE GRADE
	←	FLOW DIRECTION

1817 SOUTH AVE. W. STE. A
 MISSOULA, MT 59801
 PH: 406.721.0142
 FAX: 406.721.5224
 www.imegcorp.com

DATE

REVISIONS

DESIGNED:

CM

DRAFTED:

JW

CHECKED:

CD

DATE:

JULY, 2021

LOCATION:

1006 GREENOUGH DR, COS PLAT M
 SECTION 22, T13N, R19W, P.M.M.
 MISSOULA, MISSOULA COUNTY, MT

PROJECT NAME:

GREENOUGH HEIGHTS SUBDIVISION

PROJECT NO.:

2000421

SHEET TITLE:

WATER MAIN EXTENSION PLANS
LEGEND AND NOTES SHEET

SHEET:

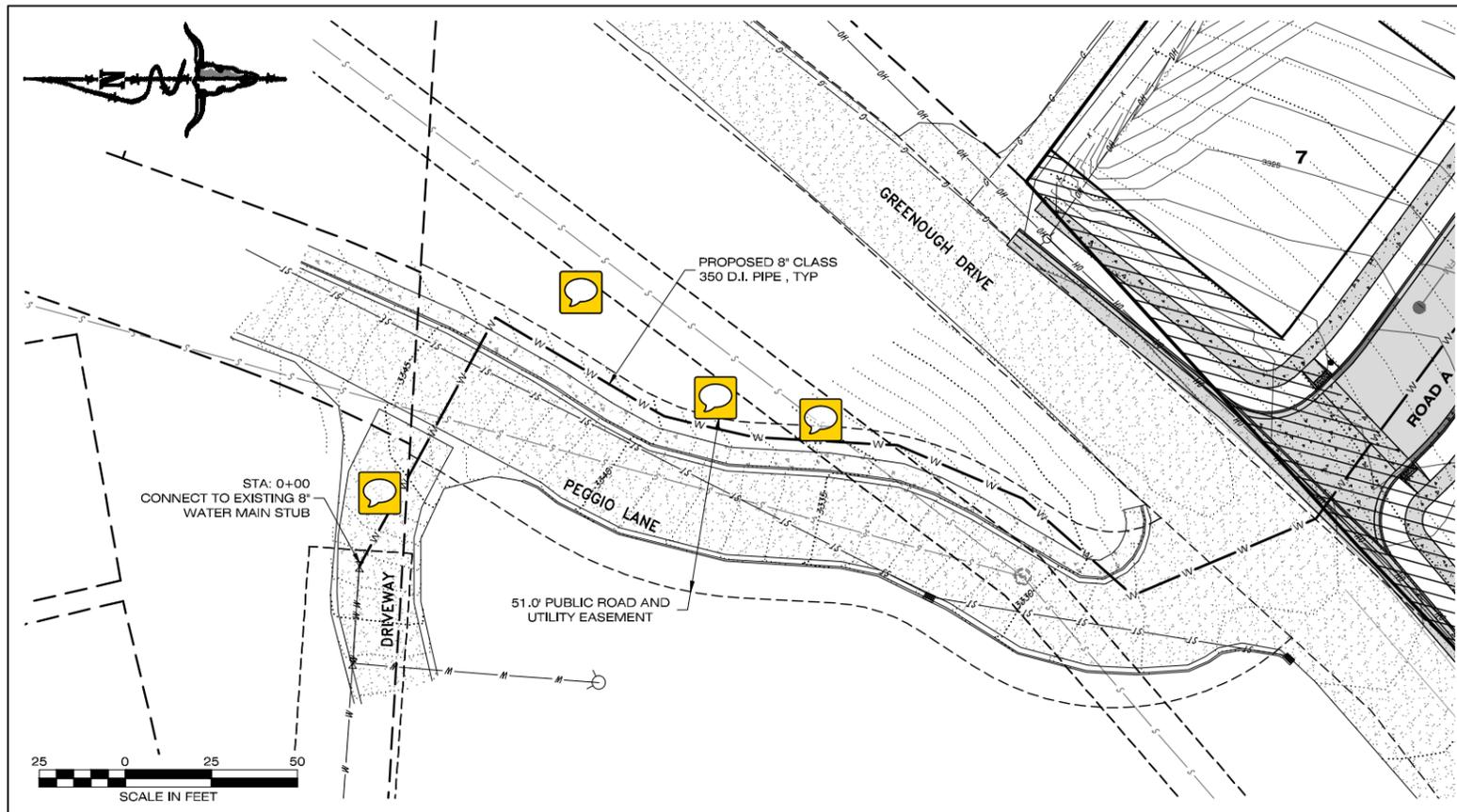
2 OF 5

PREPARED FOR:

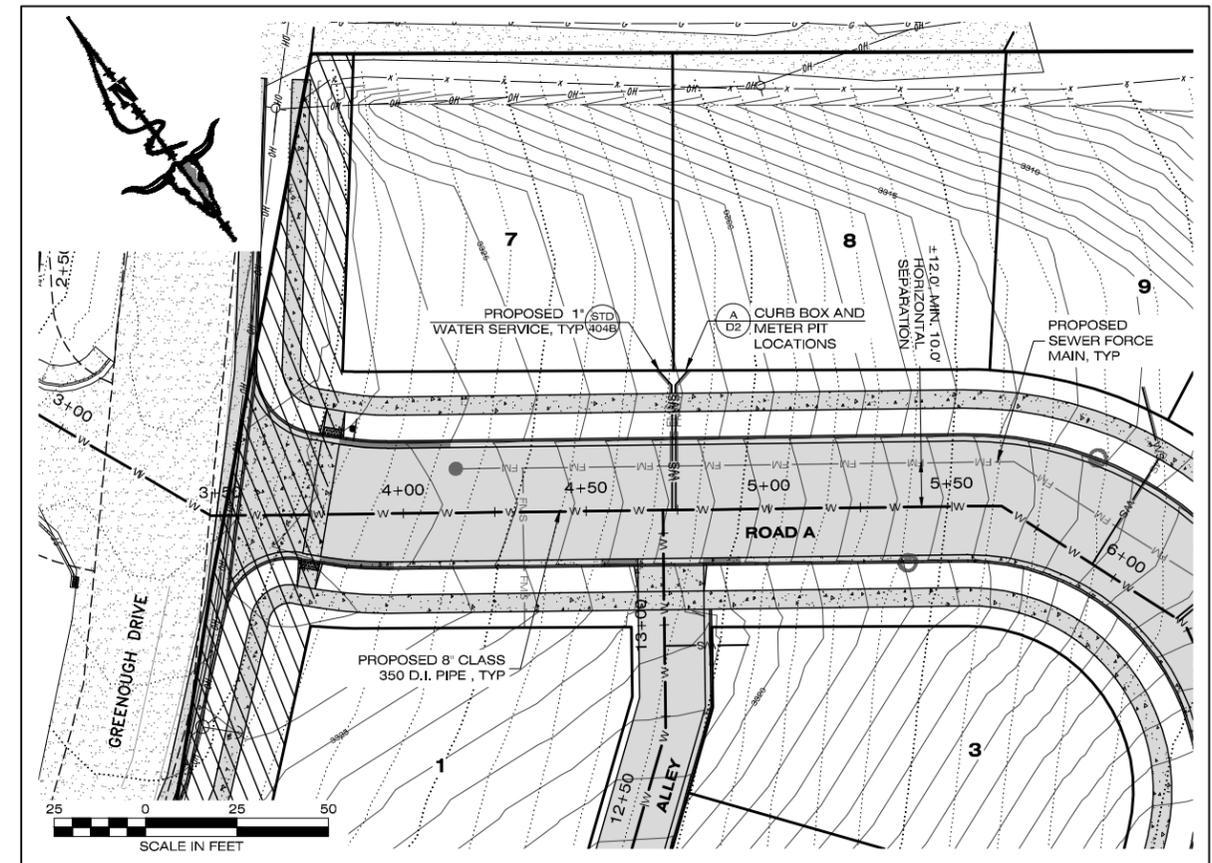
CHRISTIAN KORKALO

PRELIMINARY

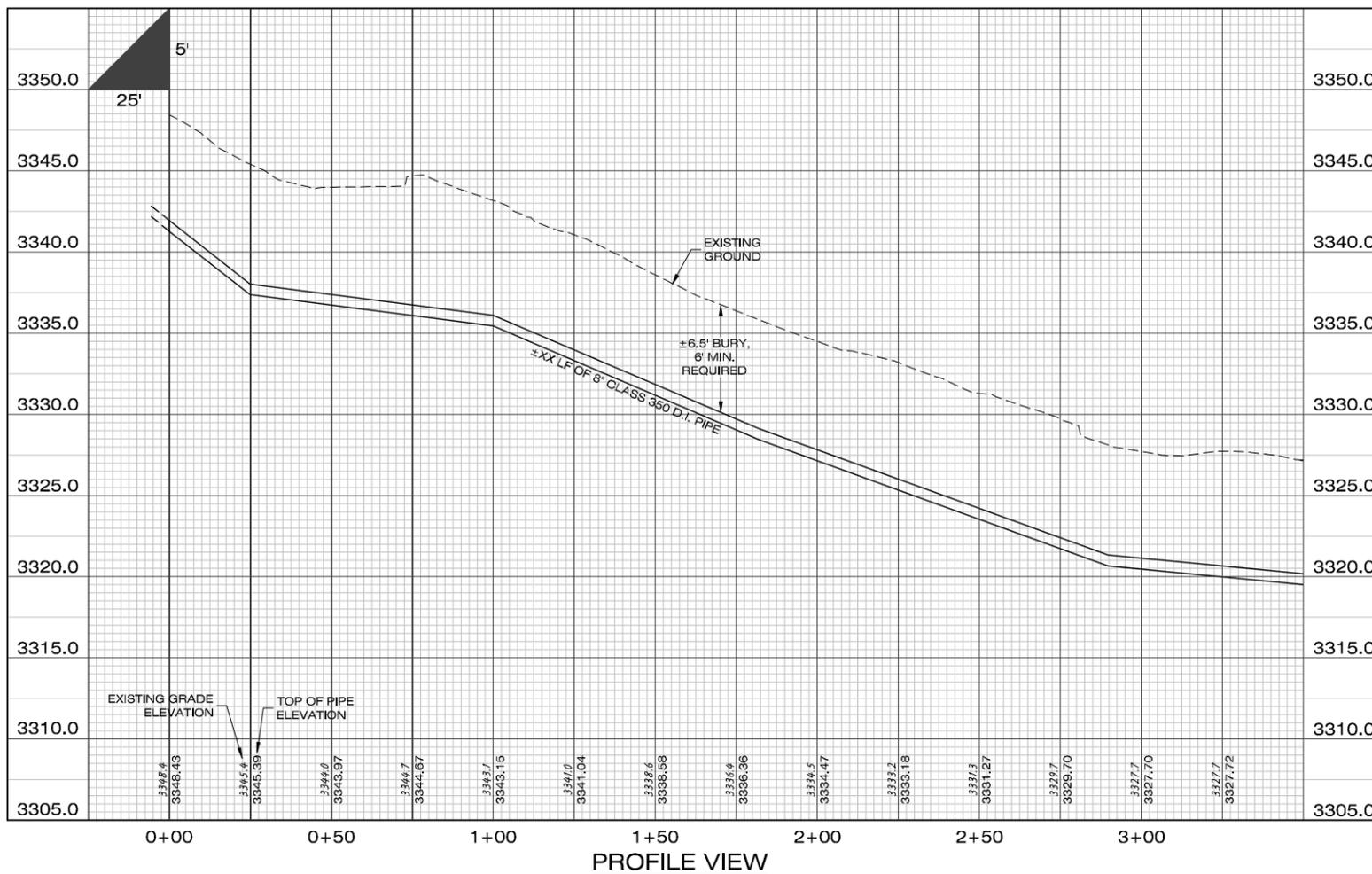
DRAWN: J. KORKALO, CHECKED: J. KORKALO, DATE: 07/15/2021, PROJECT: 2000421, SHEET: 2 OF 5, TITLE: WATER MAIN EXTENSION PLANS LEGEND AND NOTES SHEET



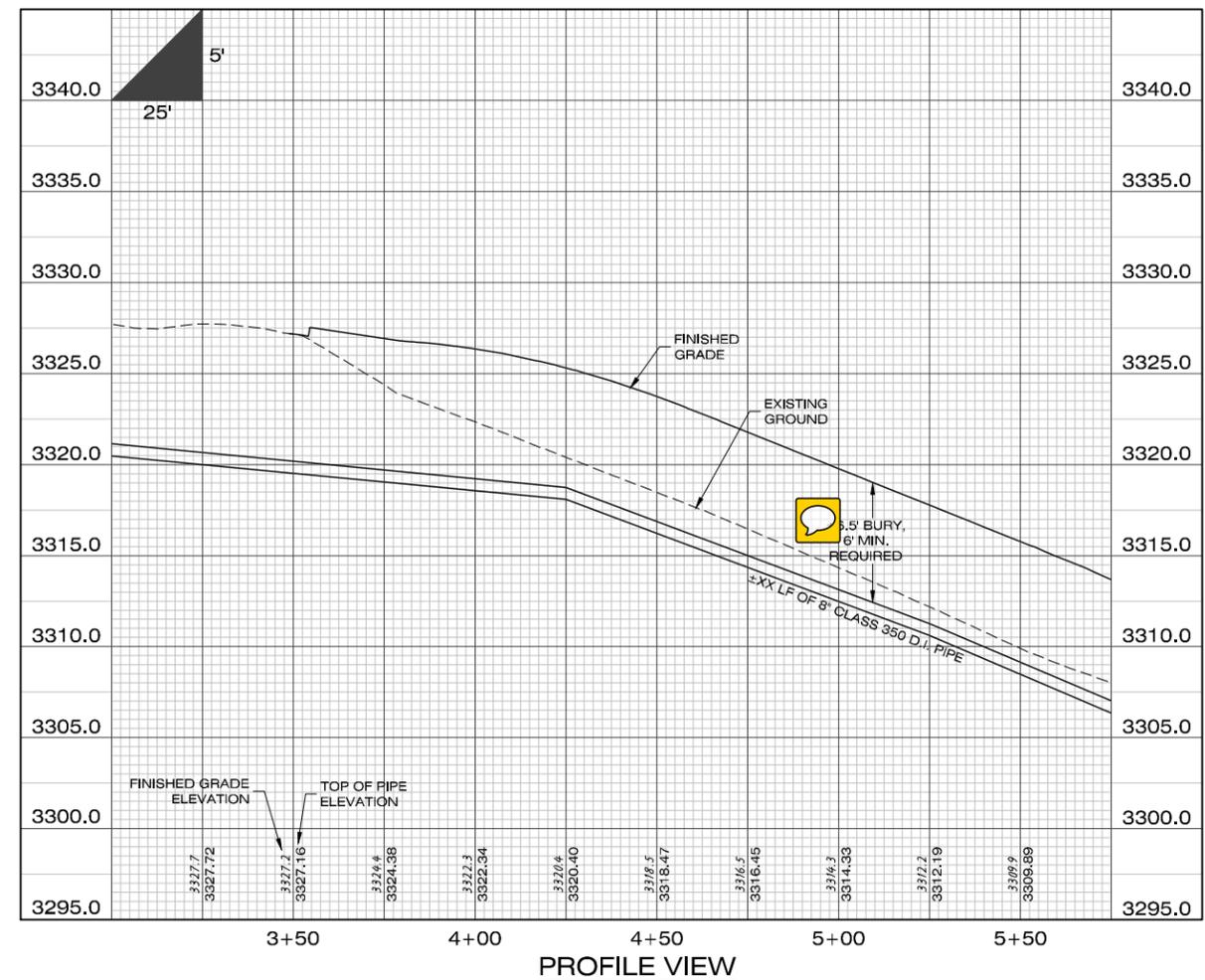
PLAN VIEW



PLAN VIEW



PROFILE VIEW



PROFILE VIEW

DATE	
REVISIONS	
DESIGNED: CM	
DRAFTED: JW	
CHECKED: CP	
DATE: JULY, 2021	

LOCATION:
 1006 GREENOUGH DR, COS PLAT M
 SECTION 22, T13N, R19W, P.M.M.
 MISSOULA, MISSOULA COUNTY, MT

PREPARED FOR:
 CHRISTIAN KORKALO

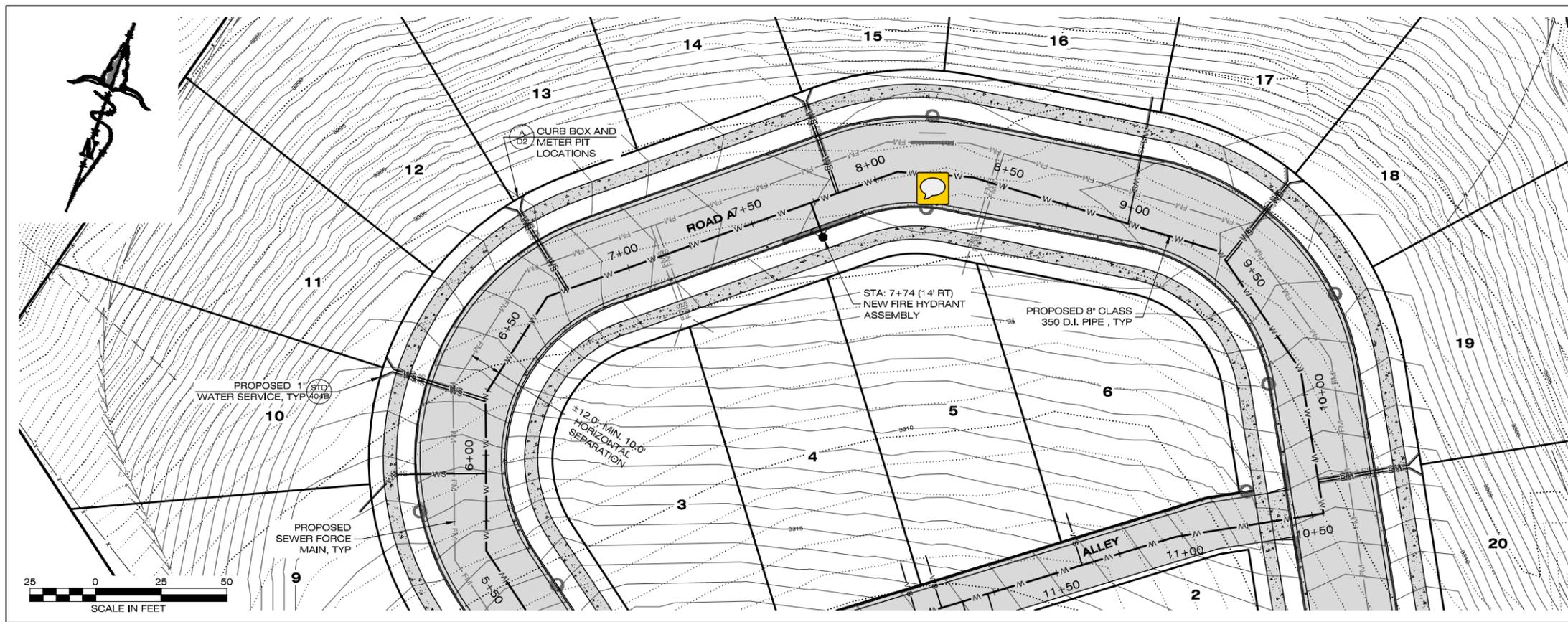
PROJECT NAME:
 GREENOUGH HEIGHTS SUBDIVISION

SHEET TITLE:
 WATER MAIN EXTENSION PLANS
 PLAN AND PROFILE SHEET

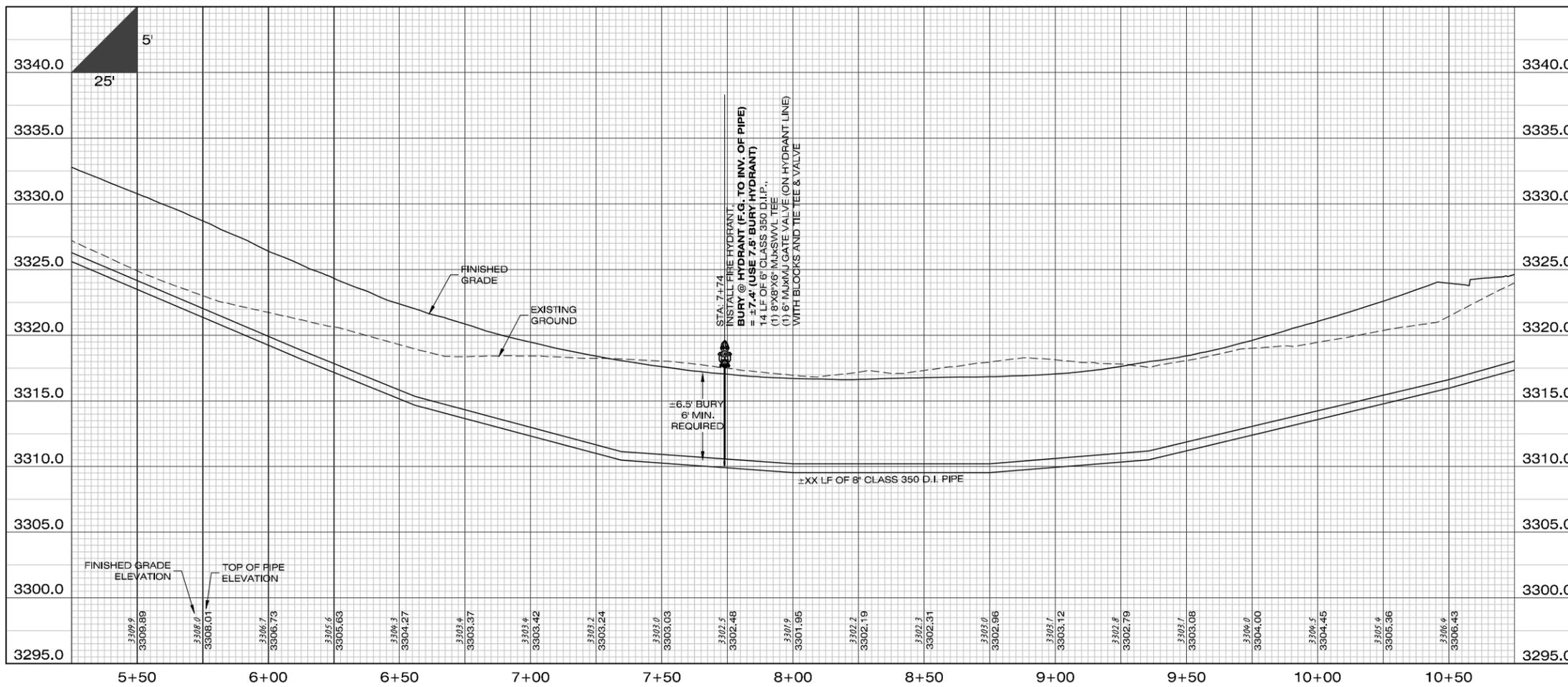
PROJECT NO:
 20004211

SHEET:
 3 OF 5

PRELIMINARY



PLAN VIEW



PROFILE VIEW

DATE	
REVISIONS	

DESIGNED: *CM*
 DRAFTED: *JW*
 CHECKED: *CP*
 DATE: *JULY, 2021*

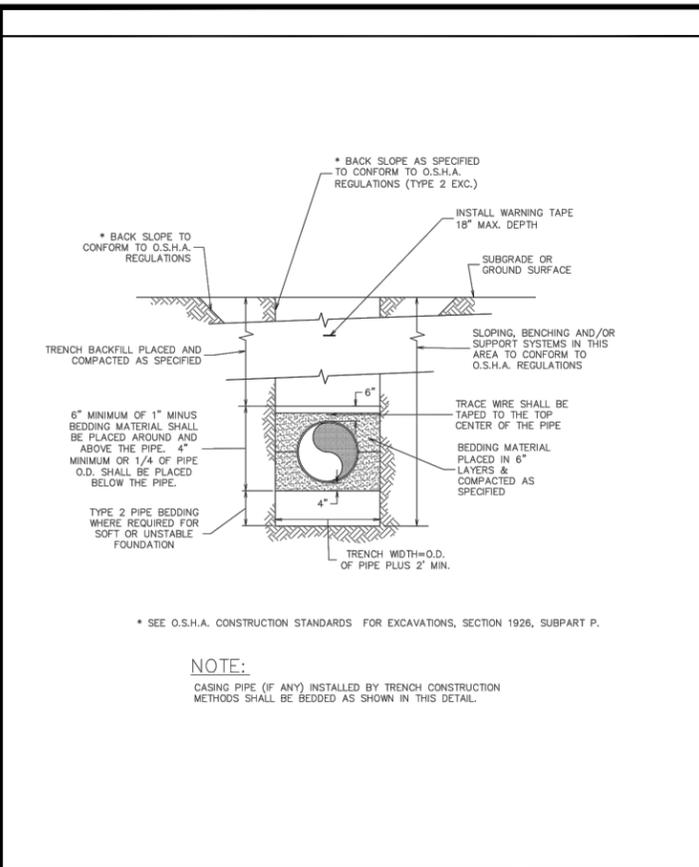
LOCATION:
 1006 GREENOUGH DR, COS PLAT M
 SECTION 22, T13N, R19W, P.M.M.
 MISSOULA, MISSOULA COUNTY, MT
 PREPARED FOR:
 CHRISTIAN KORKALO

PROJECT NAME:
 GREENOUGH HEIGHTS SUBDIVISION
 SHEET TITLE:
 WATER MAIN EXTENSION PLANS
 PLAN AND PROFILE SHEET

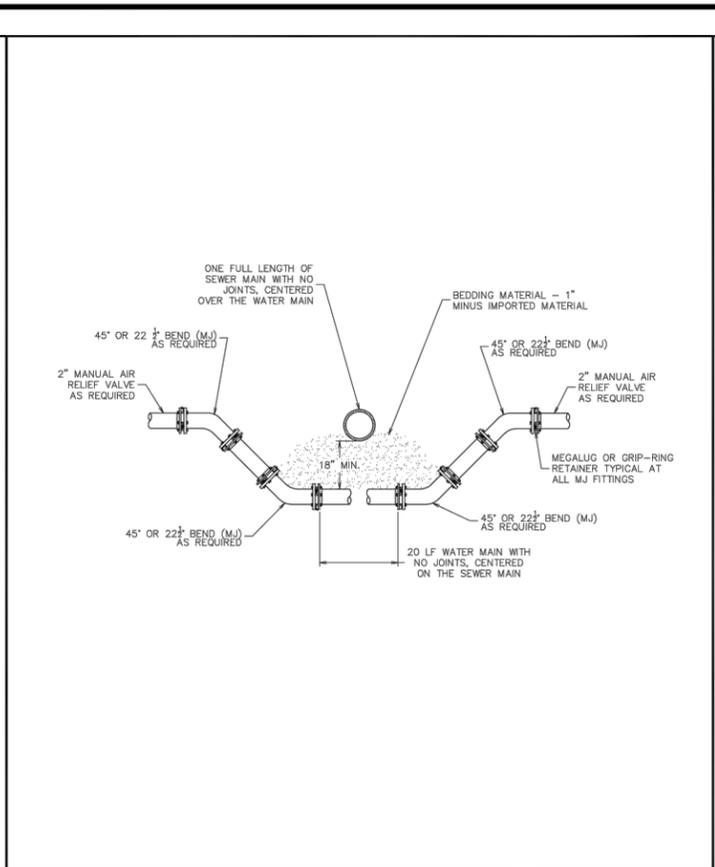
PROJECT NO.
 20004211
 SHEET:
 4 OF 5

PRELIMINARY

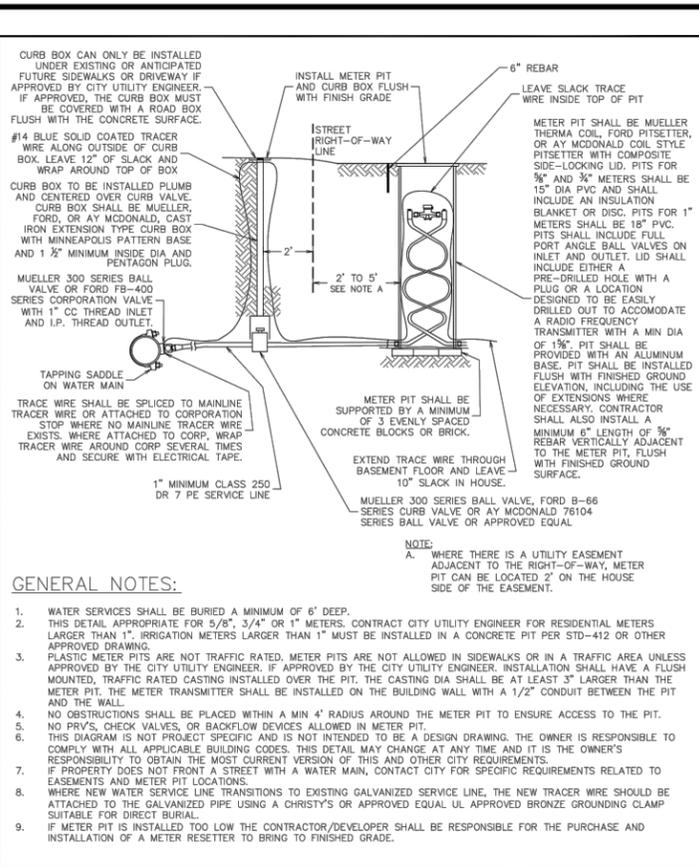
DRAWN LOCATION: C:\MSOFT\2000\PROJECTS\20004211\KORKALO GREENOUGH HEIGHTS SUBDIVISION\WATERMAIN\PLAN\WATERMAIN.PLT DATE: 7/16/2021 11:22 AM



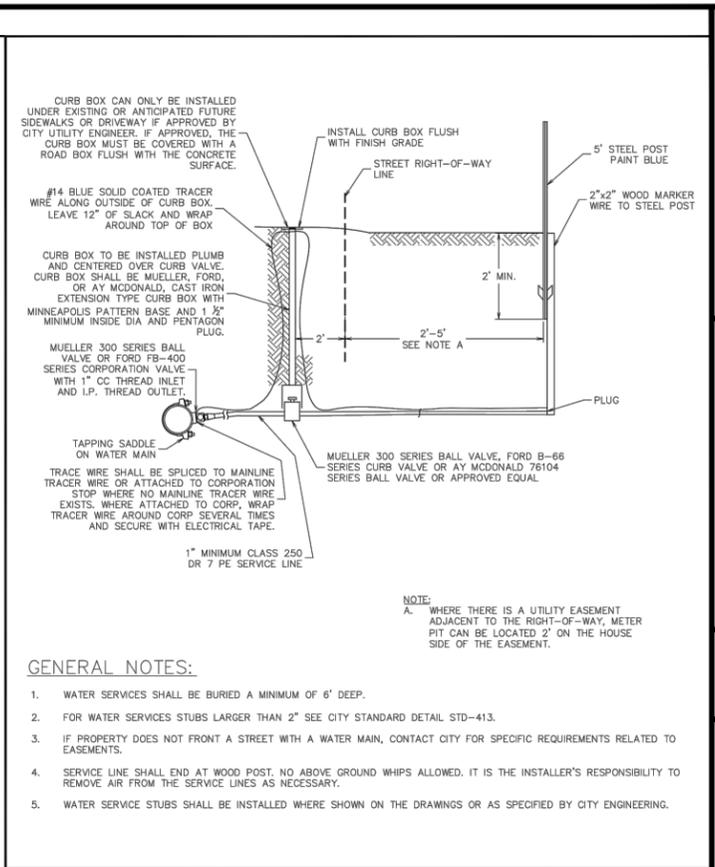
	Typical Utility Trench Detail	Approved By Utilities Engineer Logan McInnis, PE	Revised: 09/28/2020	STD - 401
--	-------------------------------	--	---------------------	-----------



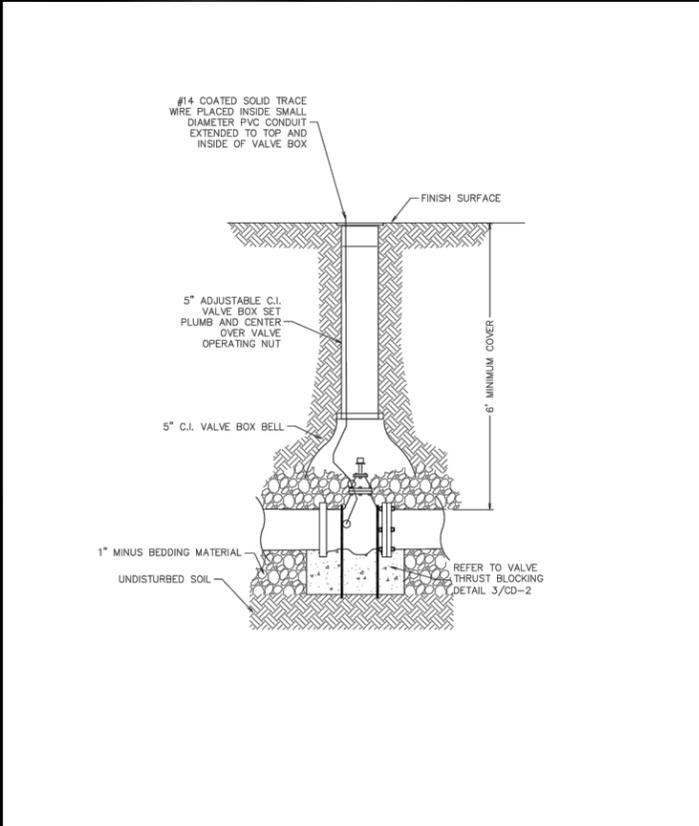
	Typical Water Line Crossing @ Sewer Mains	Approved By Utilities Engineer Logan McInnis, PE	Revised: 09/28/2020	STD - 402
--	---	--	---------------------	-----------



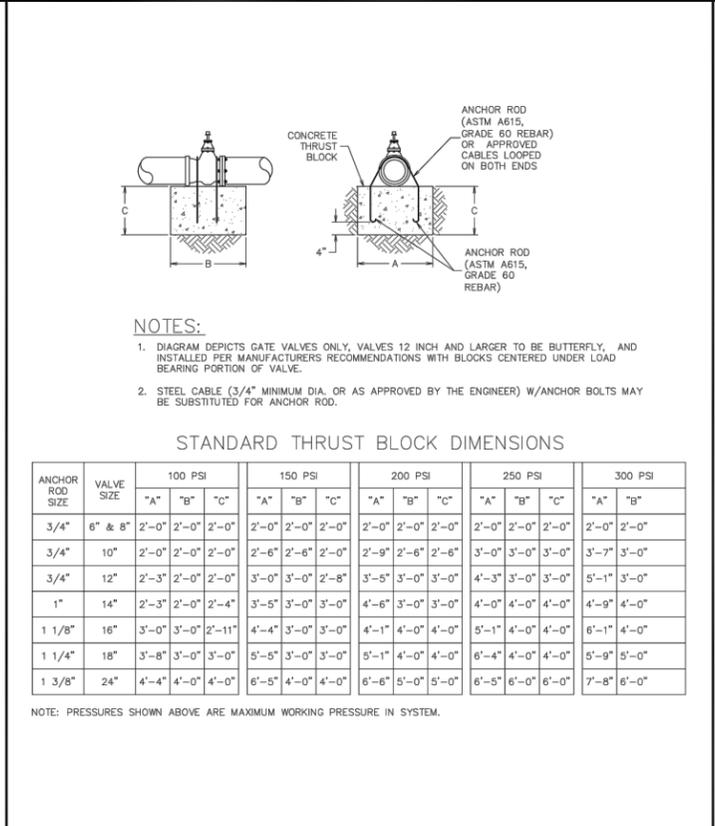
	Typical Residential Water Service Detail	Approved By Utilities Engineer Logan McInnis, PE	Revised: 09/28/2020	STD - 404A
--	--	--	---------------------	------------



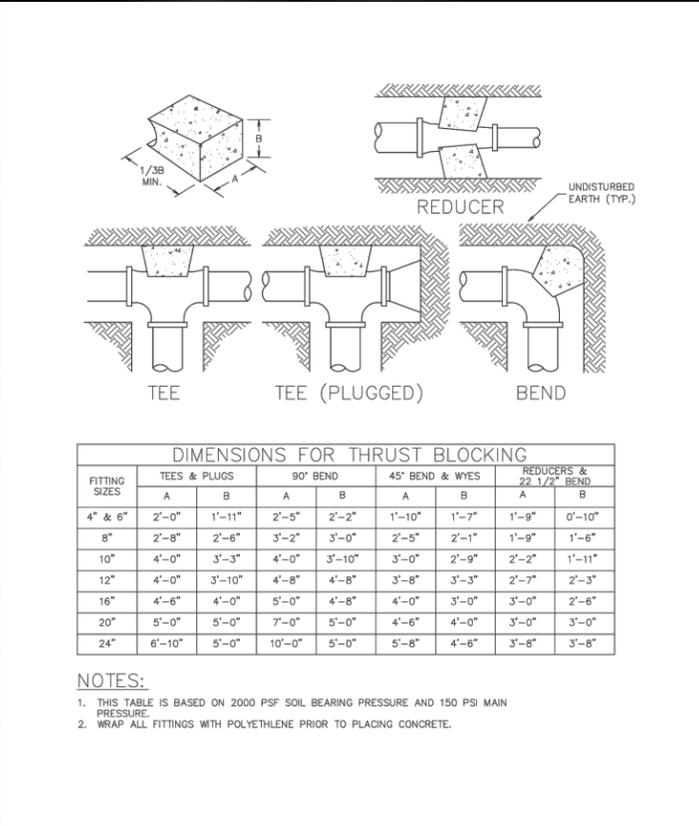
	Typical Residential Water Service Stub Detail	Approved By Utilities Engineer Logan McInnis, PE	Revised: 09/28/2020	STD - 404B
--	---	--	---------------------	------------



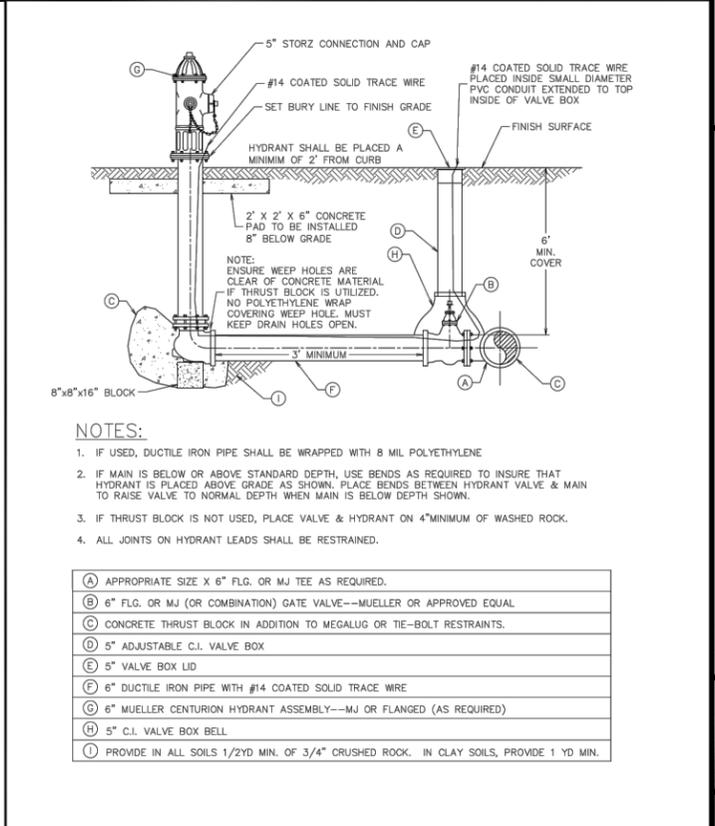
	Valve Detail	Approved By Utilities Engineer Logan McInnis, PE	Revised: 09/28/2020	STD - 405
--	--------------	--	---------------------	-----------



	Valve Thrust Blocking Detail	Approved By Utilities Engineer Logan McInnis, PE	Revised: 09/28/2020	STD - 406
--	------------------------------	--	---------------------	-----------



	Thrust Block Detail	Approved By Utilities Engineer Logan McInnis, PE	Revised: 09/28/2020	STD - 407
--	---------------------	--	---------------------	-----------



	Hydrant Detail	Approved By Utilities Engineer Logan McInnis, PE	Revised: 09/28/2020	STD - 408
--	----------------	--	---------------------	-----------

IMEG
1817 SOUTH AVE. W. STE. A
MISSOULA, MT 59801
PH: 406.721.0142
FAX: 406.721.5222
WWW.IMEGCON.COM

DATE: _____

REVISIONS: _____

DESIGNED: CM
DRAFTED: JW
CHECKED: CD
DATE: JULY, 2021

LOCATION:
1006 GREENOUGH DR, COS PLAT M
SECTION 22, T13N, R19W, P.M.M.
MISSOULA, MISSOULA COUNTY, MT

PREPARED FOR:
CHRISTIAN KORKALO

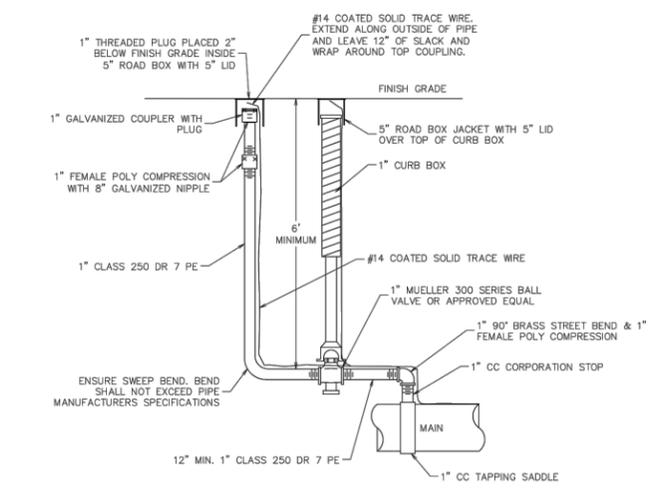
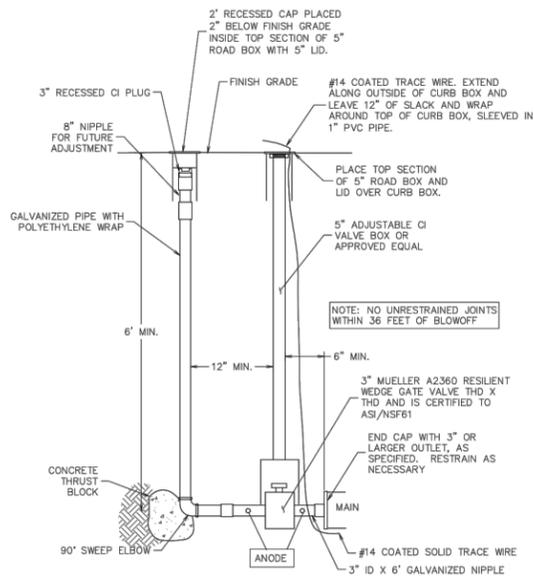
PROJECT NAME:
GREENOUGH HEIGHTS SUBDIVISION

PROJECT NO:
20004211

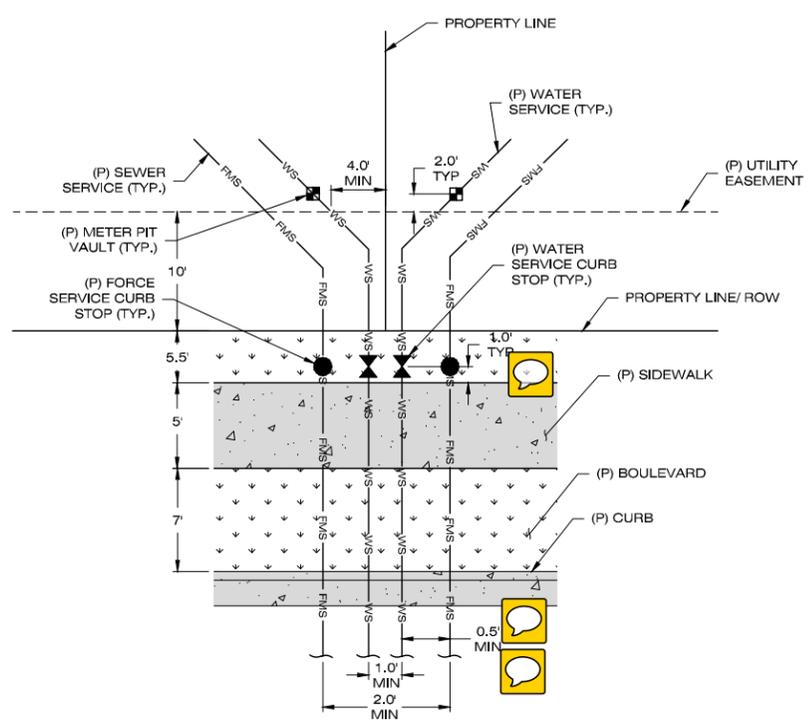
SHEET TITLE:
WATER MAIN EXTENSION PLANS
DETAIL SHEET

SHEET:
D1 OF D2

PRELIMINARY



NOTES:
 1. WHERE AIR RELIEF VALVES (ARVs) ARE IDENTIFIED ON THE PLANS AS TEMPORARY, TRACER WIRE IS NOT REQUIRED AND ALL MATERIALS CAN BE SALVAGED AFTER THE CORP IS CLOSED, THE LINE IS CAPPED WITH A BRASS CAP AND FITTINGS ARE WRAPPED IN 10-MIL TAPE.



A WATER/SEWER SERVICES SHARED LOT LINE DETAIL
 NOT TO SCALE

	Typical Blow-Off Assembly		
	Approved By <i>Logan McInnis</i> Utilities Engineer Logan McInnis, PE	Revised: 09/28/2020	

	Manual Air Relief Detail		
	Approved By <i>Logan McInnis</i> Utilities Engineer Logan McInnis, PE	Revised: 09/28/2020	

DATE	
REVISIONS	

DESIGNED: *CM*
 DRAFTED: *JW*
 CHECKED: *CP*
 DATE: JULY, 2021

LOCATION:
 1006 GREENOUGH DR, COS PLAT M
 SECTION 22, T13N, R19W, P.M.M.
 MISSOULA, MISSOULA COUNTY, MT
 PREPARED FOR:
 CHRISTIAN KORKALO

PROJECT NAME
GREENOUGH HEIGHTS SUBDIVISION

SHEET TITLE:
**WATER MAIN EXTENSION PLANS
 DETAIL SHEET**

PROJECT NO.
20004211

SHEET:
D2 OF D2

PRELIMINARY

DWG LOCATION: O:\MISSOULA\PROJECTS\2021\ACTIVE FILES\2021 PROJECTS\2021 - KORKALO GREENOUGH HEIGHTS SUBDIVISION\DWG\WATER MAIN EXTENSION PLANS\WATER MAIN EXTENSION PLANS DETAIL SHEET.DWG

SEWER FORCE MAIN CONSTRUCTION PLANS

GREENOUGH HEIGHTS SUBDIVISION
 LOCATED IN SECTION 22, T13N, R19W, P.M.M., MISSOULA COUNTY, MONTANA



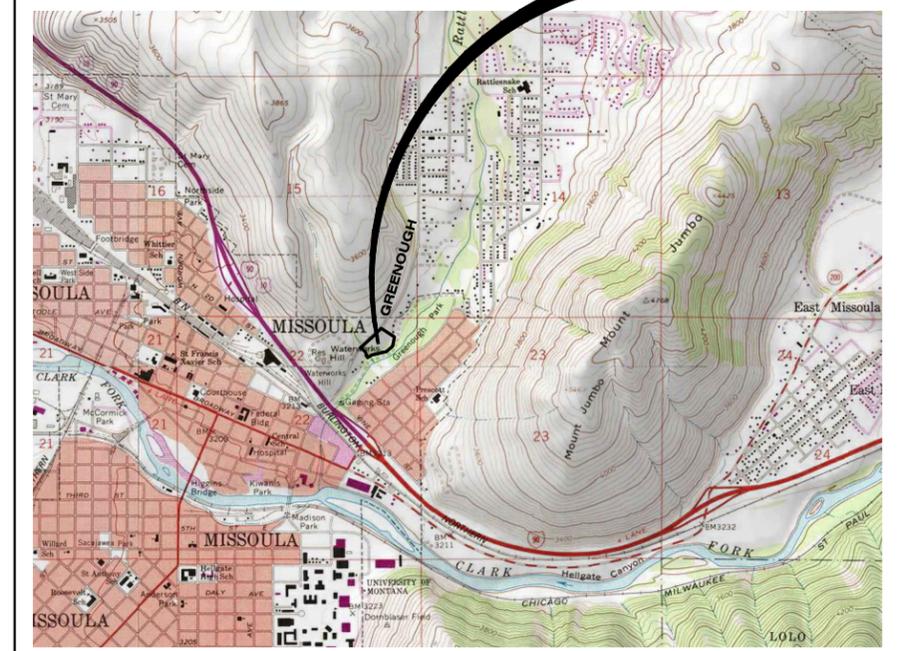
CALL UTILITY NOTIFICATION
 CENTER OF MONTANA
1-800-424-5555
 CALL FOR THE MARKING OF
 UNDERGROUND UTILITIES
2 BUSINESS DAYS BEFORE
 YOU DIG, GRADE, OR EXCAVATE



SHEET INDEX

DESCRIPTION	SHEET NO.
LEGEND AND NOTES SHEET	SHEET 2 OF 4
SEWER PLAN & PROFILE SHEET	SHEET 3 OF 4
SEWER PLAN & PROFILE SHEET	SHEET 4 OF 4
DETAIL SHEET	SHEET D1 OF D2
DETAIL SHEET	SHEET D2 OF D2

VICINITY MAP



MISSOULA, MISSOULA COUNTY



DATE	2/10/2021
REVISIONS	CITY MSLSA STAGE 3 COMMENTS

DESIGNED:	CM
DRAFTED:	JW
CHECKED:	CP
DATE:	JULY, 2021

LOCATION:	1006 GREENOUGH DR, COS PLAT M SECTION 22, T13N, R19W, P.M.M., MISSOULA, MISSOULA COUNTY, MT
PREPARED FOR:	CHRISTIAN KORKALO

PROJECT NAME	GREENOUGH HEIGHTS SUBDIVISION
PROJECT NO.	20-5651
SHEET TITLE:	SEWER MAIN CONSTRUCTION PLANS COVER SHEET
SHEET:	1 OF 4

PROJECT STATUS

THESE PLANS REQUIRE, AT A MINIMUM, APPROVAL FROM THE AGENCIES LISTED BELOW. THEREFORE, THE OWNER & CONTRACTOR ARE ADVISED THAT BIDS & CONTRACTS SHOULD NOT BE FINALIZED UNTIL INDICATED BELOW.

AGENCIES REVIEW STATUS:	REFERENCE #	APPROVAL DATE
MONTANA DEPT. OF ENV. QUALITY	EQ#:	
CITY OF MISSOULA	2021-009	

PLAN SET IS READY FOR CONSTRUCTION YES NO

AS-BUILT DATE:
 PROJECT HAS BEEN CONSTRUCTED IN GENERAL CONFORMANCE WITH THE ABOVE APPROVALS, STATED SPECIFICATIONS, AND SHOWN HERE IN, UNLESS OTHERWISE SPECIFIED.

PROJECT NOTES:

PRELIMINARY

LEGEND

Table with columns for EXISTING and PROPOSED. Lists various utility lines (e.g., Water Line, Sewer Line, Storm Drain Pipe) and structures (e.g., Sewer Manhole, Septic Tank, Well) with their corresponding symbols and abbreviations.

Table containing ABBREVIATIONS (e.g., E for ELEVATION, STA for STATION) and SYMBOLS (e.g., DETAIL SECTION, DETAIL CALLOUT, KEYED NOTE CALLOUT, SPOT ELEVATION CALLOUT, SLOPE GRADE, FLOW DIRECTION).

NOTE: NOT ALL FEATURES SHOWN IN LEGEND WILL BE PRESENT ON PLANS

GENERAL CONDITIONS OF CONSTRUCTION:

- 1. The Standard General Conditions of the Contract prepared by the Engineers Joint Contract Documents Committee (Copyright 2007)...
- 2. Wherever used in these Drawings, the terms, whether printed with initial capital letters or not, as listed in the Standard General Conditions of the Construction Contract (General Conditions), Article 1 - Definitions and Terminology...
- 3. By proceeding with the Work as shown on these Drawings, the Contractor makes the following representations:

STANDARD SPECIAL PROVISIONS:

- 1. The Contractor shall be responsible for all permits, licenses and fees required for completion of this project unless specifically noted otherwise.
- 2. The Contractor shall provide the Owner with a 24 hour phone number of a party responsible and capable of immediate local response to emergency maintenance for the duration of the Work.
- 3. Unless noted otherwise, the contractor shall be responsible for any necessary traffic control on and off-site including obtaining any applicable permits.

UTILITY NOTES:

- 1. The Contractor shall notify appropriate personnel for utility locations and notice of construction commencement at least two business days prior to proceeding with the Work.
- 2. The Contractor shall support and protect all exposed utilities in conformance with the utility owners standards.
- 3. The information and data shown or indicated in the Drawings with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities...

SUBMITTALS, QUALITY CONTROL & ASSURANCE, INSPECTIONS, AND TESTING

- 1. Contractor is responsible to comply with the Contractor Quality Control and Owner Quality Assurance, Section 01400 MPWSS.
- 2. Contract shall complete trench excavation and backfill in accordance with Section 02221 MPWSS.
- 3. The Contractor shall coordinate with Engineer to obtain samples of trench backfill material to be used on-site.
- 4. Contractor will be responsible for coordination with a material testing company of the Engineer's selection to complete compaction testing of trench backfill.

SEWER CONSTRUCTION NOTES:

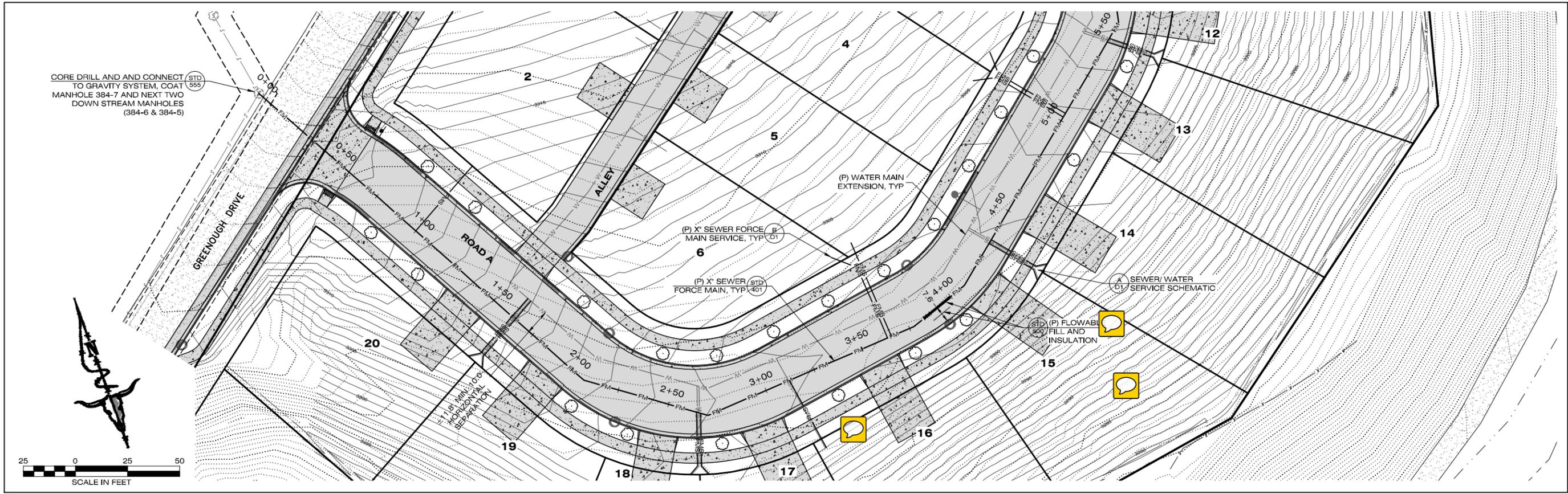
- 1. All Work shall be in accordance with the Montana Public Works Standard Specifications (MPWSS) (Sixth Edition, dated April 2010) and City of Missoula Public Works Standards and Specifications Manual (dated November 18, 2020).
- 2. Invert elevations are provided from center of manhole, unless noted otherwise.
- 3. Manhole stations are provided from center of manhole, unless noted otherwise.

CONSTRUCTION STAKING:

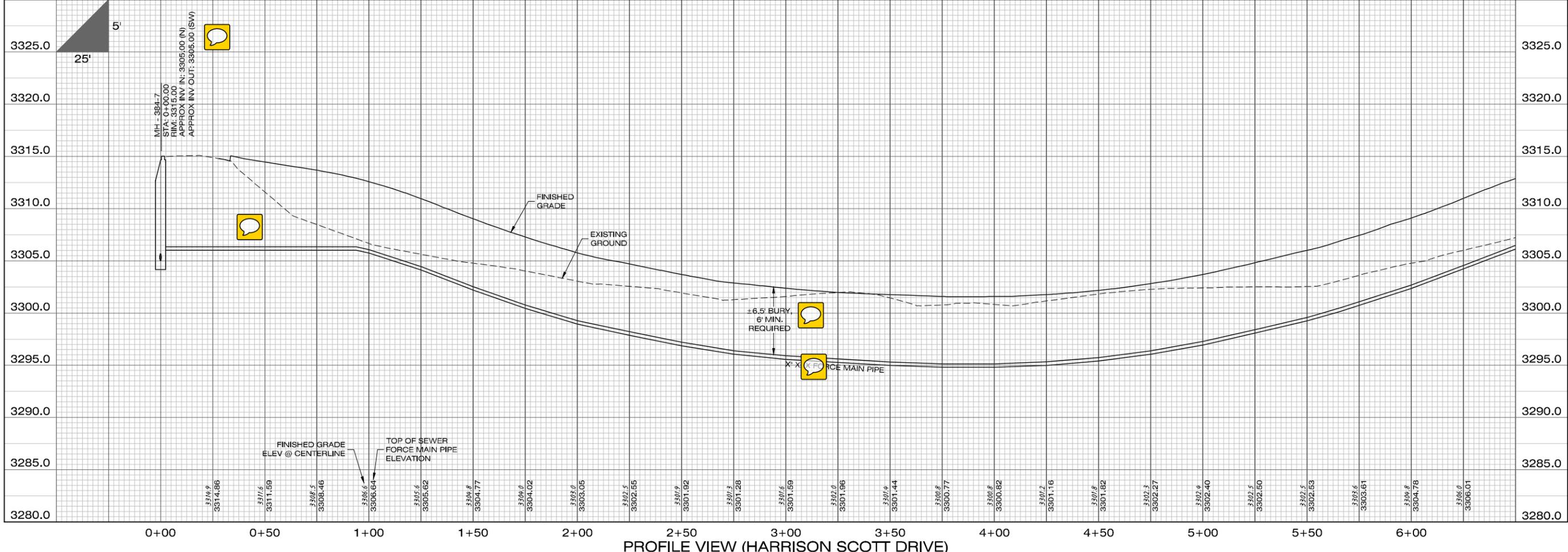
- 1. The owner will provide construction staking one time. Additional staking will be the responsibility of the contractor for scheduling and payment.
- 2. Contractor is responsible to coordinate and request staking at least five days in advance, unless otherwise agreed upon in writing by Engineer.
- 3. Staking will be provided as follows: a. Manholes: Center of Manholes and two offset stakes.

Vertical sidebar containing project information: PROJECT NAME (GREENOUGH HEIGHTS SUBDIVISION), PROJECT NO. (20-5651), SHEET (2 OF 4), LOCATION (1006 GREENOUGH DR, COS PLAT M SECTION 22 T13N, R19W, P.M.M. MISSOULA, MISSOULA COUNTY, MT), PREPARED FOR (CHRISTIAN KORKALO), and company logo (IMEG).

PRELIMINARY



PLAN VIEW



PROFILE VIEW (HARRISON SCOTT DRIVE)

CORE DRILL AND AND CONNECT TO GRAVITY SYSTEM, COAT MANHOLE 384-7 AND NEXT TWO DOWN STREAM MANHOLES (384-6 & 384-5)

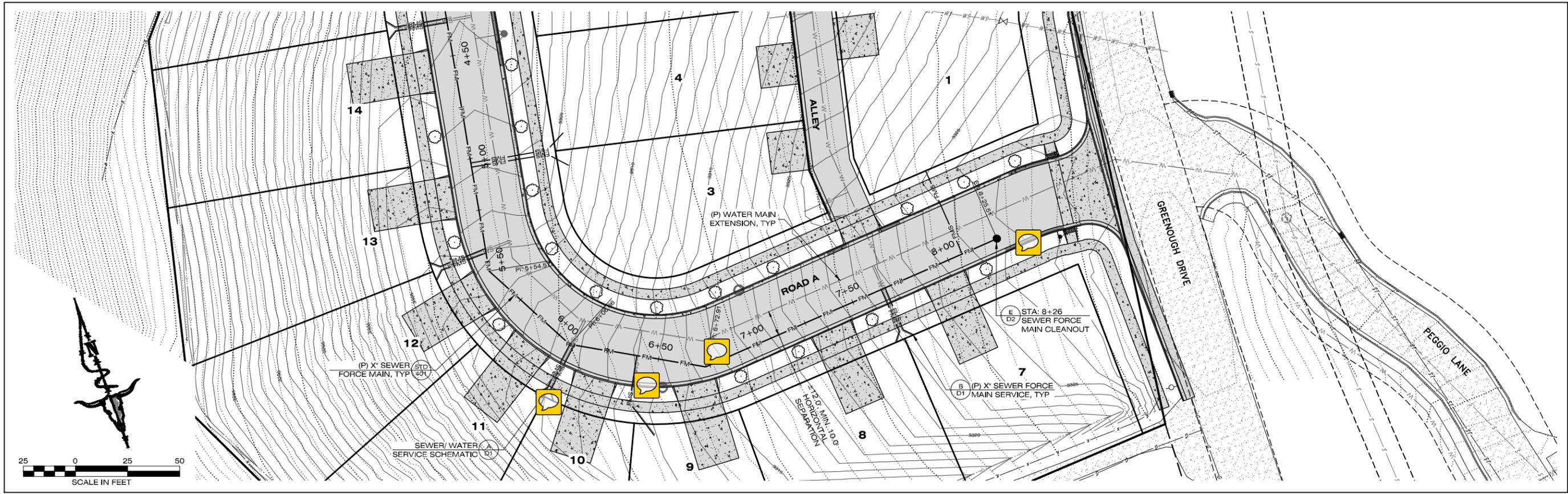


DATE	2/10/2021
REVISIONS	
CITY/MSLA STAGE 3 COMMENTS	
DESIGNED:	CM
DRAFTED:	JW
CHECKED:	CP
DATE:	JULY, 2021

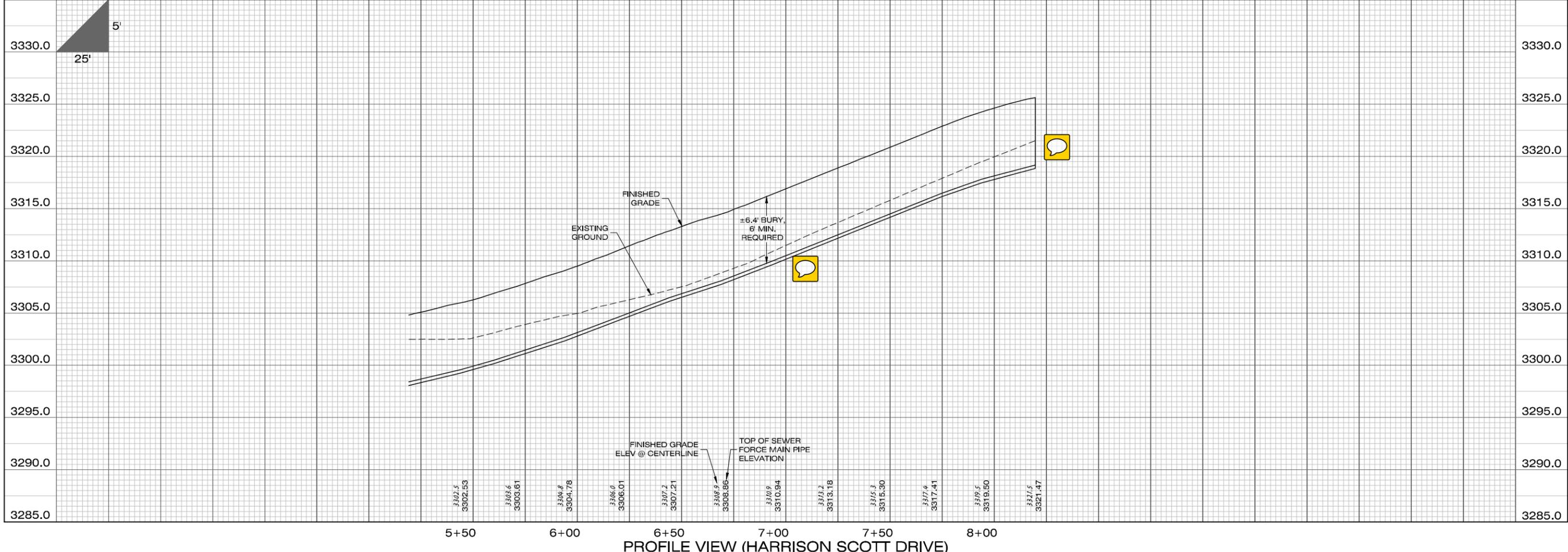
LOCATION:
 1006 GREENOUGH DR, COS PLAT M
 SECTION 22, T13N, R19W, P.M.M.
 MISSOULA, MISSOULA COUNTY, MT
 PREPARED FOR: CHRISTIAN KORKALO

PROJECT NAME: GREENOUGH HEIGHTS SUBDIVISION
 PROJECT NO: 20-5651
 SHEET TITLE: SEWER MAIN CONSTRUCTION PLANS
 SHEET: 3 OF 4

PRELIMINARY



PLAN VIEW



PROFILE VIEW (HARRISON SCOTT DRIVE)



DATE	2/10/2021
REVISIONS	CITY/MSLA STAGE 3 COMMENTS
DESIGNED:	CM
DRAFTED:	JW
CHECKED:	CP
DATE:	JULY, 2021

LOCATION:
1006 GREENOUGH DR, COS PLAT M
SECTION 22, T13N, R19W, P.M.M.
MISSOULA, MISSOULA COUNTY, MT

PREPARED FOR:
CHRISTIAN KORKALO

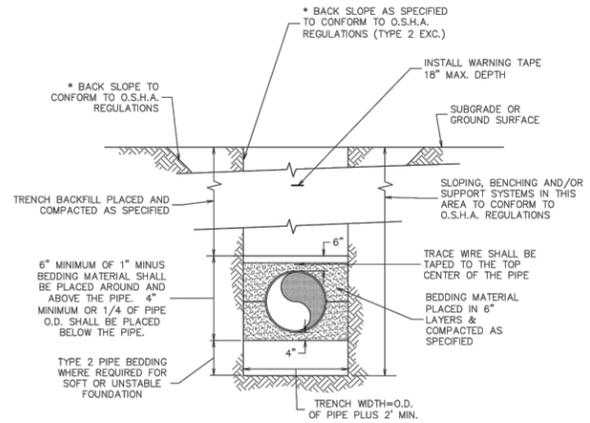
PROJECT NAME:
GREENOUGH HEIGHTS SUBDIVISION

SHEET TITLE:
SEWER MAIN CONSTRUCTION PLANS
PLAN AND PROFILE SHEET

PROJECT NO:
20-5651

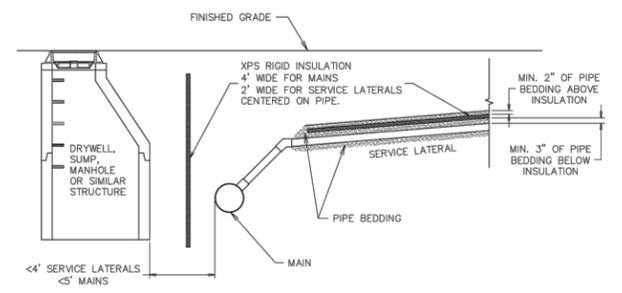
SHEET:
4 OF 4

PRELIMINARY



* SEE O.S.H.A. CONSTRUCTION STANDARDS FOR EXCAVATIONS, SECTION 1926, SUBPART P.

NOTE:
CASING PIPE (IF ANY) INSTALLED BY TRENCH CONSTRUCTION METHODS SHALL BE BEDDED AS SHOWN IN THIS DETAIL.

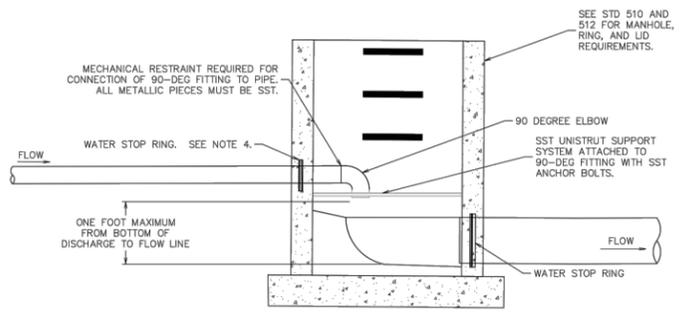


GENERAL NOTES:

- INSULATION IS REQUIRED WHEN A SANITARY SEWER PIPE IS LESS THAN 4 FEET FOR A SERVICE LATERAL AND LESS THAN 5 FEET FOR A SEWER MAIN, FROM FINISHED GRADE, A DRYWELL SUMP, IRRIGATION PIPE OR ANY STRUCTURE THAT HAS THE POTENTIAL TO TRANSFER COLD OR PROMOTE FREEZING.
- PROVIDE TWO INCHES OF INSULATION THICKNESS, EQUIVALENT TO AN R-VALUE OF 10, PER FOOT OF MISSING COVER OR VOID SPACE LESS THAN FIVE FEET.
- USE A HIGH DENSITY, RIGID INSULATION (PINK BOARD) WITH 35 PSI OR GREATER RATING IN TRAFFIC AREAS.

NOTES:

- FORCE MAIN SHALL HAVE BOTH MECHANICAL RESTRAINERS AND THRUST BLOCKS.
- ALIGN THE 90-DEGREE BEND WITH THE CENTER OF THE GRAVITY PIPE CHANNEL.
- ENTIRE MANHOLE, AS WELL AS TWO MANHOLES DOWNSTREAM, SHALL BE COATED WITH SHERWIN WILLIAMS DURA-PLATE 6000 OR APPROVED AS PER PUBLIC WORKS MANUAL.
- STAINLESS STEEL LINK SEALS SHALL BE USED WHEN CORING A FORCE MAIN INTO AN EXISTING MANHOLE.



FORCE MAIN TERMINATION DETAIL

Approved By Utility Project Manager - Ross Mollenhauer, PE

Revised: 09/28/2020

STD - 555

Typical Utility Trench Detail

Approved By Utilities Engineer Logan McInnis, PE

Revised: 09/28/2020

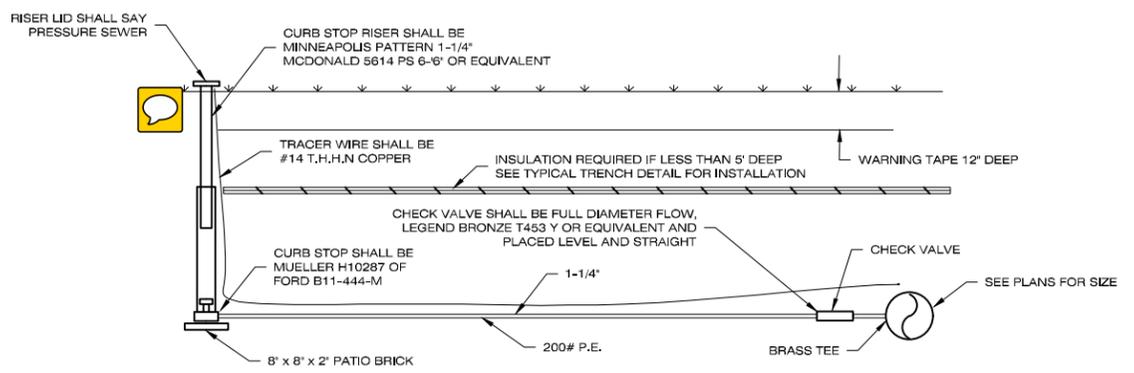
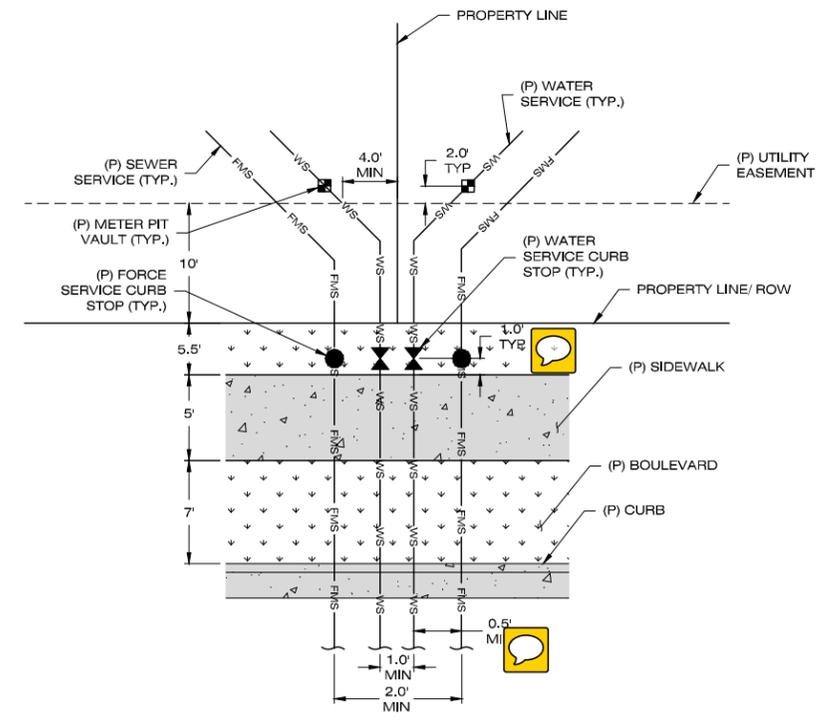
STD - 401

Sanitary Sewer Service and Main Insulation Requirements

Approved By Utility Project Manager - Ross Mollenhauer, PE

Revised: 09/28/2020

STD - 500



FORCE MAIN SEWER SERVICE DETAIL

NOT TO SCALE

WATER/SEWER SERVICES SHARED LOT LINE DETAIL

NOT TO SCALE

DATE	2/10/2021
REVISIONS	CITY MSLA STAGE 3 COMMENTS
DESIGNED:	CM
DRAFTED:	JW
CHECKED:	CP
DATE:	JULY, 2021

LOCATION:
1006 GREENOUGH DR, COS PLAT M SECTION 22, T13N, R19W, P.M.M. MISSOULA, MISSOULA COUNTY, MT

PREPARED FOR:
CHRISTIAN KORKALO

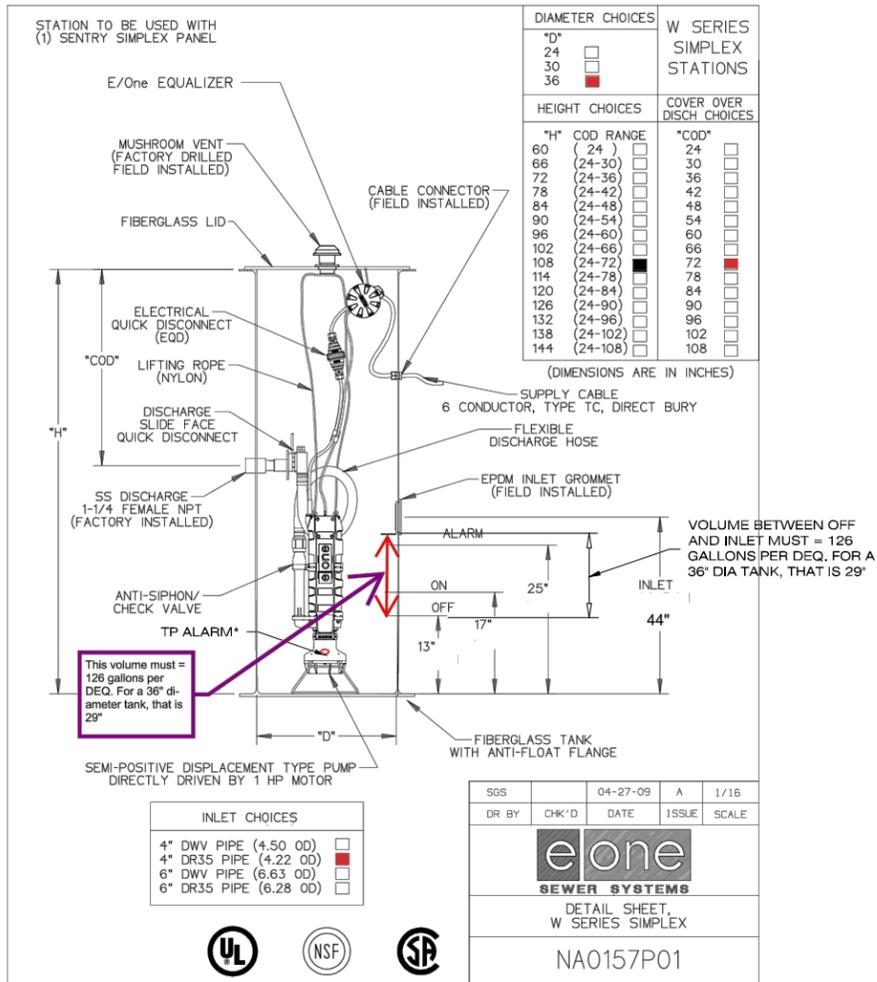
PROJECT NAME:
GREENOUGH HEIGHTS SUBDIVISION

PROJECT NO:
20-5651

SHEET TITLE:
SEWER MAIN CONSTRUCTION PLANS

SHEET:
D1 OF D2

PRELIMINARY



A E/ONE GRINDER PUMP STATION

NOT TO SCALE

DETAIL A NOTE:

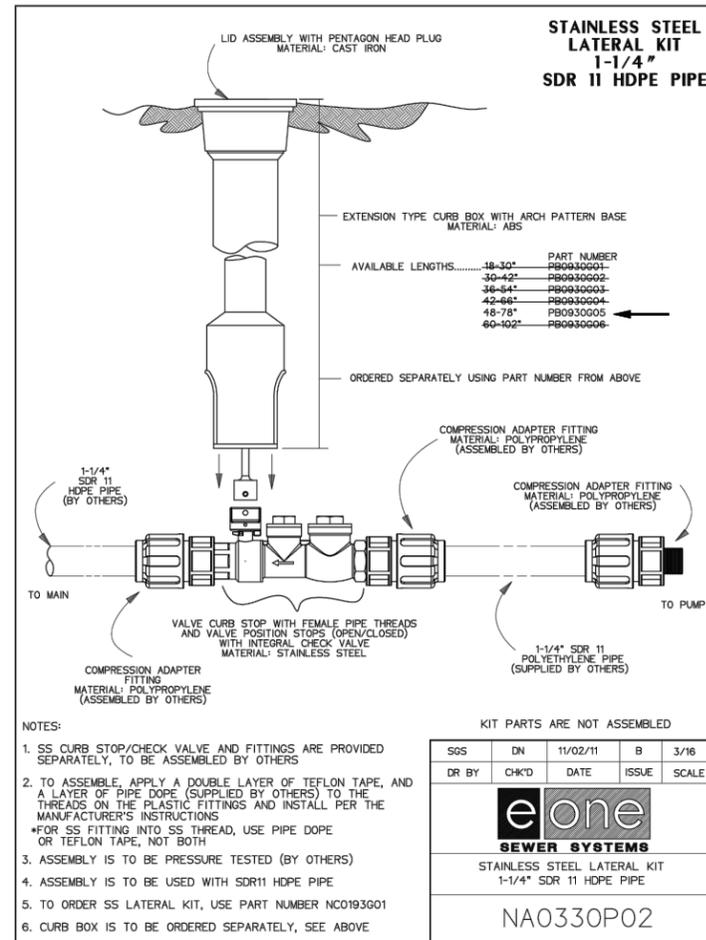
*E-ONE PUMP MUST BE EQUIPT WITH THERMAL SENSOR PROTECTION WITH REDUNDANT SHUT OFF/LOW LEVEL ALARM.

**E-ONE PUMP TO BE CAPABLE OF MEETING DEQ-2 C.721 *STEP AND GP UNITS RECEIVING WASTEWATER FROM PRIVATE SEWERS MUST BE PROVIDED WITH PUMPS AND CONTROLS THAT ARE CORROSION RESISTANT AND ARE LISTED BY UNDERWRITERS LABORATORIES, CANADIAN STANDARDS ASSOCIATION, OR OTHER APPROVED TESTING AND/OR ACCREDITING AGENCY AS MEETING THE REQUIREMENTS FOR NATIONAL ELECTRIC CODE FOR SUCH UNITS. IN ADDITION, THE DESIGN MUST PROVIDE FOR THE PUMPS AND MOTORS TO BE TOTALLY SUBMERGED AT ALL TIMES.

***CONTRACTOR IS REQUIRED TO PROVIDE TESTING ON THE SEWER MAINS IN ACCORDANCE WITH MPVSS 02730. TESTING SHALL INCLUDE LEAK TEST. PERFORM LEAK TEST AFTER PUMP VAULT HAS BEEN INSTALLED AND SEALED. SEAL ALL INLETS & OUTLETS, FILL TANK TO 6" ABOVE OUTLET, & ALLOW THE TANK TO STAND FOR AT LEAST 8 HOURS. IF THERE IS A MEASURABLE LOSS (1 INCH OR MORE), REFILL & LET STAND FOR ANOTHER 8 HOURS. IF THERE IS AGAIN MEASURABLE LOSS OR GAIN, THE TANK WILL BE REJECTED.

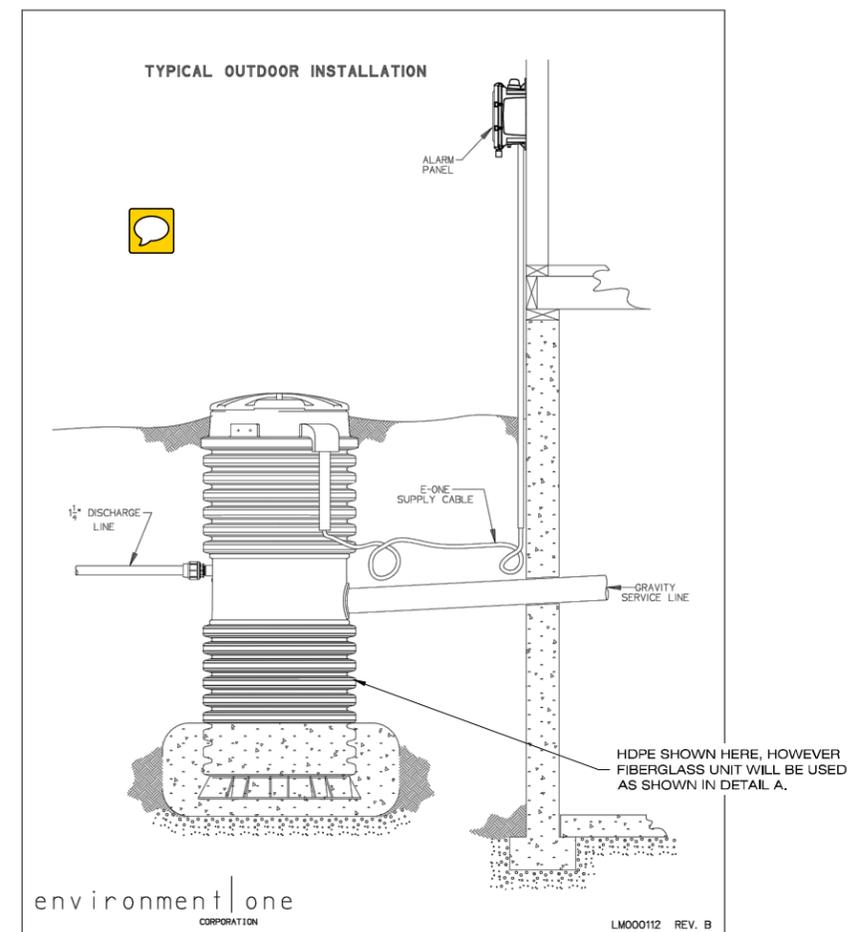
CONTRACTOR REQUIRED TO COORDINATE WITH SYSTEM OPERATOR AND COUNTY INSPECTOR FOR WITNESSING OF ALL TESTING. PRESSURE TESTING OF SERVICE LINES MUST BE COMPLETED WITH THE BALL VALVE AT THE MAINLINE IN THE CLOSED POSITION. PRESSURE TESTING OF THE MAINLINE MUST BE COMPLETED WITH THE SERVICE LINE BALL VALVES IN THE OPEN POSITION TO VERIFY THE EFFECTIVENESS OF CHECK VALVES.

NOTE:
 THE DRAWINGS SHOWN HERE AND PROVIDED BY ENVIRONMENT ONE ARE SUBJECT TO CHANGE AT ANY TIME. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONFIRM CURRENT DRAWINGS AND STANDARDS AND BRING TO THE ENGINEER'S ATTENTION SHOULD DIFFERENCES OR CHANGES OCCUR.



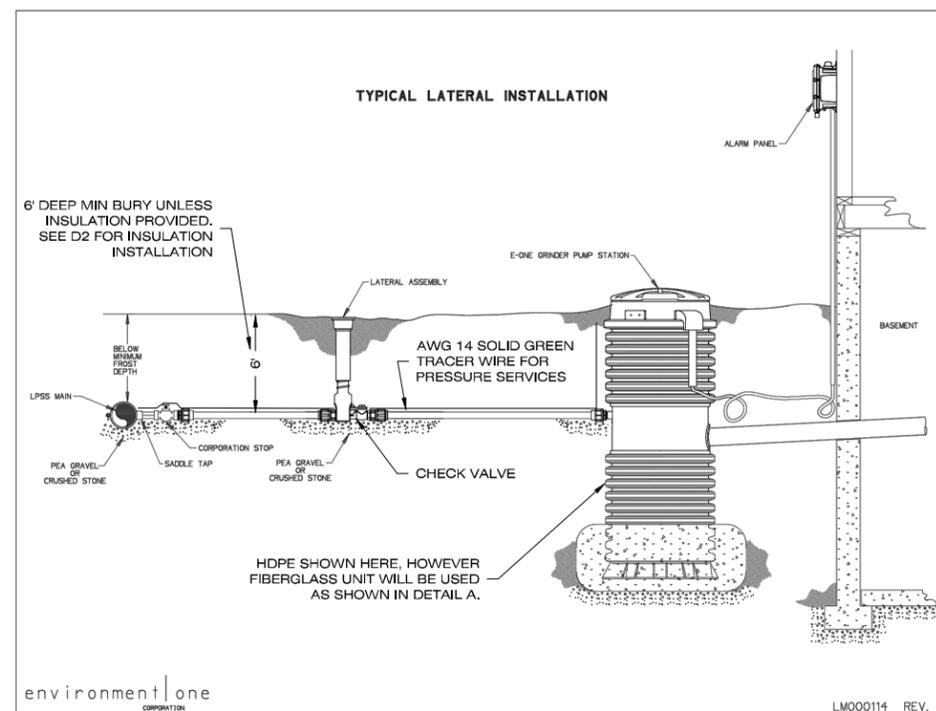
B E/ONE LATERAL ASSEMBLY KIT

NOT TO SCALE



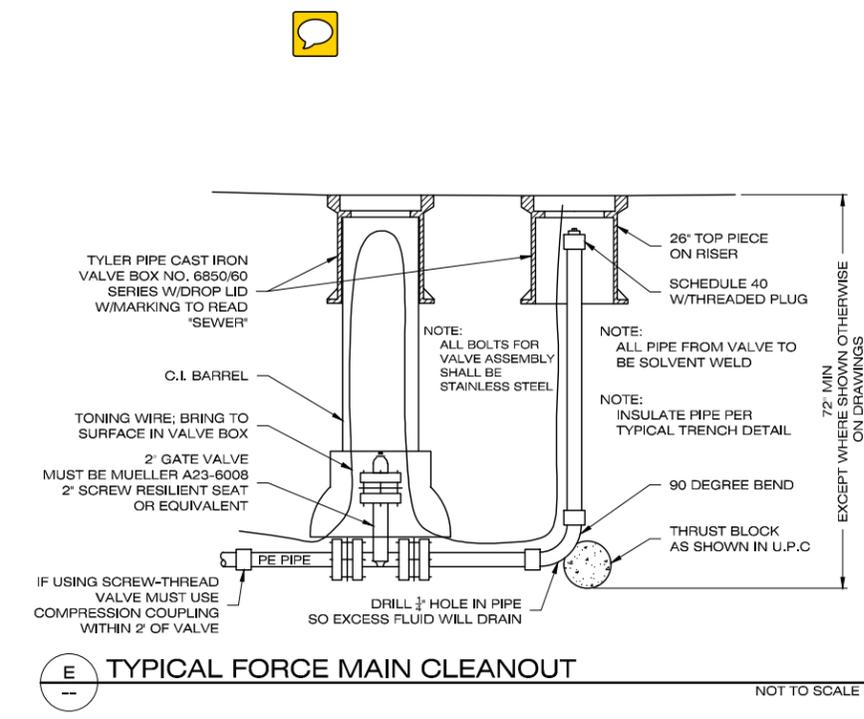
C E/ONE TYPICAL OUTDOOR INSTALLATION

NOT TO SCALE



D E/ONE TYPICAL LATERAL INSTALLATION

NOT TO SCALE



E TYPICAL FORCE MAIN CLEANOUT

NOT TO SCALE