“Final” Response Action Plan

Proposed Red Alder Residences
2200 Henderson Street
Helena, Montana 59601

Prepared For

Rocky Mountain Development Council, Inc.

Valley Bank of Helena, a Division of Glacier Bank

and

Snowy Mountain Development Corporation

July 17, 2019
Project B1900572.01

Braun Intertec Corporation

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July 17, 2019 Project B1900572.01

Ms. Liz Mogstad
Director of Affordable Housing
Rocky Mountain Development Council, Inc.
200 South Cruse Street
Helena, Montana 59601

Re: "Final" Response Action Plan
Proposed Red Alder Residences
2200 Henderson Street
Helena, Montana 59601

Dear Ms. Mogstad:

Enclosed is the "Final" Response Action Plan (RAP) related to the environmental cleanup of the above-referenced site (Site). The Final RAP addresses comments from the June 13, 2019 letter issued by Jason Seyler of the Montana Department of Environmental Quality (DEQ) following his review of the original "draft" June 6, 2019 RAP document. The attached RAP outlines the proposed methods and procedures to remediate contaminated surface/topsoil areas to facilitate the residential redevelopment of the Site. The RAP also describes associated environmental monitoring, testing and documentation requirements.

We appreciate the opportunity to provide our professional services to you for this project. If you have any questions regarding this document, please call please contact Steve Jansen at 952.995.2645.

Sincerely,

BRAUN INTERTEC CORPORATION

Beth L. Johnson
Senior Scientist

Stephen T. Jansen, MS
Principal – Principal Scientist

Attachment:
Response Action Plan

c: Mr. Jason Seyler, Montana DEQ, Hazardous Substance Brownfields Program
Ms. Kathie Bailey, Snowy Mountain Development Corporation

AA/EOE

Table of Contents

Description **Page**

Figures

Appendices

A. Introduction

On behalf of the Rocky Mountain Development Council, Inc., Braun Intertec Corporation prepared this Response Action Plan (RAP) for the proposed Red Alder Residences redevelopment project located at 2200 Henderson Street, Helena, Montana (Site). A Site location map is included as Figure 1. Rocky Mountain Development Council, Inc. intends to purchase the 9.6-acre property for redevelopment.

A.1. Proposed Development and Site Cleanup

Rocky Mountain Development Council, Inc. will be redeveloping the Site into multi-family housing with associated paved parking and drive areas, a playground, a community garden and community center. Proposed development plans are included in Appendix A.

In preparation for redevelopment, a Phase I Environmental Site Assessment (ESA) and Phase II ESA have been recently completed of the Site. The results the Phase II ESA indicated that surface/topsoil on a portion of the Site is impacted with lead and barium above state and/or federal soil screening levels. Figures and analytical results of the Phase II ESA are provided in Appendix B and discussed in Section B.2.

Response actions will be taken in accordance with this RAP to clean-up and prepare the Site for redevelopment/construction. The response actions will generally include remediating contaminated surface/topsoil, properly assessing and remediating regulated wastes encountered during existing building demolition, performing confirmation sampling, and properly abandoning the existing domestic well and septic system on the Site. This RAP provides a description of the Site location and land use history, a summary of previous investigations at the Site, a description of the known soil impacts at the Site, the identification of potential risks to human health and the environment by the known contamination, and a discussion of the planned response actions.

This RAP will be submitted to the Montana Department of Environmental Quality (DEQ) Hazardous Substance Brownfields Program. Rocky Mountain Development Council, Inc. is requesting that the Montana DEQ approve this RAP prior to purchase of the Site. This RAP will also be used to support a request for cleanup funding from an U.S. Environmental Protection Agency (EPA) Revolving Loan Fund (RLF) administered by the Snowy Mountain Development Corporation, in conjunction with the Central Montana Brownfields Coalition (CMBC). The RAP will be implemented prior to the start of construction to prepare the Site for redevelopment. Following completion of the response actions, a RAP implementation report will be submitted to Montana DEQ and a No Further Action letter will be requested.

A.2. Project Organization

The following are the key project personnel and their responsibilities:

Rocky Mountain Development Council, Inc. – Liz Mogstad: is the project developer/future owner and will hire the remediation contractor and Qualified Environmental Professional (QEP) to implement the DEQ-approved RAP.

Montana DEQ Brownfields Coordinator - Jason Seyler: provides state regulatory oversight of Montana Hazardous Substance Brownfields sites.

EPA Delegated Quality Assurance (QA) Project Manager – Greg Davis: provides technical assistance and approves sampling plans.

CMBC Grantee Program Coordinator – Sara Hudson: responsible for project decision making, budgeting, grant/loan management, and reviews project planning documents.

CMBC Chair – Kathie Bailey: responsible for coordination between CMBC stakeholders and approving project documents.

Braun Intertec Corporation – Steve Jansen: is the QEP Project Manager and will hire necessary subcontractors for RAP implementation including the analytical laboratory. Responsible for project coordination as the liaison with CMBC, EPA, Montana DEQ and QEP team members and has ability to stop work if conditions become unsafe.

QEP QA Officer – Micky Hubanks: responsible for providing QA/QC during project activities and preparation of documents. This position reviews analytical data to meet current standards for accuracy and precision. Although employed by same entity, the QEP QA Officer is independent of the QEP Project Manager and any data generating activities.

QEP Health and Safety Officer – Imants Pone: documents compliance with federal Occupational Safety and Health Administration (OSHA) safety requirements and maintaining training and safety records.

Because it is anticipated that response actions will be funded by an EPA loan, the sampling activities conducted under this RAP will be part of a site-specific Sampling and Analysis Plan (SAP) currently being prepared by Braun Intertec which includes a site-specific Health and Safety Plan (HASP) and follows existing plans developed for CMBC: *Industrial Hygiene Cleanup Projects, Sampling and Analysis Plan* (revision date: January 12, 2017) (IH SAP) and *Final Project-Wide Quality Assurance Project Plan* (revision date: July 27, 2016; signed: August 11, 2016) (QAPP). An Analysis of Brownfields Cleanup Alternatives (ABCA) and Community Relations Plan (CRP) will also be submitted to EPA with the site-specific SAP.

B. Project Background

B.1. Site Location and Description

The Site is located at 2200 Henderson Street in the city of Helena, Lewis and Clark County, Montana (see Figure 1). The Site consists of an irregular shaped parcel totaling approximately 9.62 acres developed with an approximately 200 square foot concrete block building located on the central north part of the Site and a small wooden structure on the central east part of the Site (see Figure 2). There is a concrete pad in the vicinity of the wooden structure. It appears that this may have been an antenna pad associated with a radio tower that was present on the Site from 1964 through 2014. The existing buildings are associated with the radio tower and reportedly housed electrical equipment. A depressed area, which is interpreted to be a former borrow pit, is present to the west of the concrete block building and filled primarily with concrete debris. At the time of the site reconnaissance, some vehicle and equipment storage were present on the southwest corner of the Site, which appeared to be related to the residences to the west.

Based on the available historical information, it appears that the Site may have been developed with a small structure by the 1950s. This structure was located on the south-central part of the Site. An additional structure, a mobile home trailer, appears to have been added in the mid-1970s. These apparent residential structures were removed by the early 2000s, but an associated water well remains. The well pit is present on the central south part of the Site in the area where the mobile trailers were formerly located. The pit contained some household type debris and a small burn pile was present in this area. Reportedly a septic system was also associated with these structures.

B.2. Previous Site Investigations

Various investigations have been completed to date at the Site, the results of which are presented in the following reports and summarized in the sections below:

- *Phase I Environmental Site Assessment, 2200 Henderson Street, Helena, Montana,* prepared by Morrison Maierle, dated July 2018 (2018 Phase I ESA).
- *Phase I Environmental Site Assessment, Proposed Red Alder Residences, 2200 Henderson Street, Helena, Montana,* prepared by Braun Intertec, dated March 6, 2019 (2019 Phase I ESA).

- *Red Alder Housing Geotechnical Report, Helena, Montana,* prepared by Pioneer Technical Services, Inc., dated May 3, 2019 (2019 Geotechnical Report).

- *Phase II Environmental Site Assessment, Proposed Red Alder Residences, 2200 Henderson Street, Helena, Montana,* prepared by Braun Intertec, dated May 31, 2019 (2019 Phase II ESA).

B.2.a. 2018 Phase I ESA

A Phase I ESA of the Site was completed in July 2018 by Morrison Maierle. The Site was mostly vacant land at the time of the site reconnaissance; however, previous use as a residential property that included a radio or meteorological tower with associated structures was noted. No recognized environmental conditions (RECs) were identified in the 2018 Phase I ESA; however, it was noted that costs associated with the disposition of debris and structures present at the Site would be incurred during the development.

B.2.b. 2019 Phase I ESA

An additional Phase I ESA of the Site was completed in March 2019 by Braun Intertec. Regulated environmental sites were identified in the Site vicinity that could potentially be sources of contaminants at the Site via aerial deposition. The following REC was identified in the 2019 Phase I ESA:

- Based on the available information, lead and arsenic have been identified at a historic metal ore mill located approximately 0.22 mile west of the Site and arsenic, cadmium, selenium, and polynuclear aromatic hydrocarbons (PAHs) were identified at a MDOT (Montana Department of Transportation) maintenance facility located approximately 0.25 mile north of the Site. While it appears that some investigations and remediation have been completed and some of the regulatory database information suggests that no further remedial investigations are planned, both facilities do have restrictive covenants suggesting that contamination remains. The contaminants identified at these facilities can become airborne and distributed over a larger area, which creates a potential that some contamination related to these facilities could be present at the Site. While there is no evidence to suggest that contamination has been detected at or adjoining the Site, this potential does represent a recognized environmental condition.

B.2.c. 2019 Geotechnical Report

A geotechnical investigation of the Site was completed by Pioneer Technical Services, Inc., (Pioneer Technical) based on a development plan that includes the construction of 26 multi-unit residential buildings (i.e., duplex, triplex and four-plex configurations) and associated roads, utilities, and parking area infrastructure on 9.6 acres of vacant land. The geotechnical investigation explored subsurface conditions at the Site to provide information on soil characteristics, groundwater conditions, soil bearing capacity, lateral loadings, potential soil consolidation/swell properties, percolation test data, foundation design recommendations, compaction requirements, seismic class, and pavement typical sections. Sixteen test pits and 2 percolation holes were excavated as part of the geotechnical investigation from April 8 to 9, 2019.

The surficial geology encountered at the Site during test pit excavation included a thin layer of topsoil overlying clayey gravel, clayey sand and sandy lean clay containing various amounts of gravel. Soils graded into very weathered bedrock in a clayey sand matrix in test pits excavated on the western portion of the Site. Groundwater was not encountered in any test pit excavated during the investigation.

The final project design will reportedly set finished floors, street grades and lawn areas as close to existing grades as possible, minimizing the need for cut and fill. It was recommended that topsoil and vegetation be removed from the footprints of all structures, walkways, roads and parking areas. Debris, rubble (including the concrete rubble in the existing borrow pit/depression at the Site), and existing foundation/structure elements were to be disposed off-Site. General or structural fill will be placed in the borrow pit and other areas requiring fill at the Site to design subgrade. Structural fill was recommended for placement under spread footings, backfill for foundation walls, and under slab-on-grade foundation systems. Base course was recommended for placement under sidewalks and driveways and the use of Type I bedding soils was recommended in utility trenches.

B.2.d. 2019 Phase II ESA

A Phase II ESA was conducted in April 2019 to evaluate current soil conditions at the Site related to the potential aerial deposition of contaminants from off-site sources, which was identified as a REC by the 2019 Phase I ESA. The field investigation activities for the 2019 Phase II ESA were conducted concurrently with Pioneer Technical geotechnical investigation. Tables of analytical data and a figure depicting the soil sampling locations associated with 2019 Phase II ESA are included in Appendix B.

PAHs were detected in all surface soil samples at relatively low concentrations at the Site but were not detected in subsurface soil samples collected at the Site. Metals concentrations were higher in surface soil samples as compared to subsurface soil samples. Overall, metals and PAH concentrations in the

surface soils are relatively low and do not indicate that a major release has occurred at the Site, or that aerial deposition of contaminants of an off-site source is a widespread issue at the Site.

Benzo(a)pyrene, arsenic, lead and barium concentrations exceeded state or federal screening levels in at least one surface soil (topsoil) sample collected at the Site. Upon further evaluation of the sampling results, arsenic and benzo(a)pyrene were not considered constituents of concern (COCs) for the Site because the arsenic concentrations in topsoil were shown to be consistent with local background conditions and benzo(a)pyrene was detected at a concentration below a state screening level that was adjusted for Site conditions. Due to exceedance of state and federal screening levels, lead and barium were identified as COCs for the Site. Topsoil impacted by lead and barium at the Site warrants further evaluation and/or remediation.

Based on the results of the 2019 Phase II ESA, the following was recommended:

- The identified lead and barium impacts to soil at the Site should be reported to the Montana DEQ.
- A RAP should be developed for review and approval by the Montana DEQ that includes proposed soil cleanup levels and a soil remediation plan. Additional evaluation should be conducted to confirm and further refine the extent of soil impacts and estimate the amount of soil to be remediated at the Site.
- The Montana DEQ-approved RAP should be implemented to insure proper disposition of barium and lead impacted surface/topsoil prior to Site development. A final implementation report should be prepared following construction to document the remediation activities completed at the Site.
- The existing water well and former septic system at the Site should be sealed/abandoned in accordance with any applicable local and state regulations.

C. Site Conceptual Model

A site conceptual model that envisions redevelopment of the Site is provided below, which incorporates historic Site information, results of the 2019 Phase II ESA, and the proposed development plan summarized in Sections A and B, the Site physical setting and stratigraphy, a characterization of impacts to the Site from COCs, and a discussion of potential receptors and exposure pathways.

C.1. Physical Setting and Stratigraphy

Existing grades range from 3,915 feet mean sea level in the southeast corner of the Site to 3,897 feet on the north end of the Site (Appendix B). Approximately 7 feet of relief occurs at a depression interpreted to be a former borrow pit, which is located in the north central portion of the Site.

The Site stratigraphy consists of topsoil underlain by native soil deposits. According to the 2019 Geotechnical Report, soils at the Site consist of the following:

- Topsoil (approximately 6 to 10 inches thick).
- Clayey gravel, clayey sand and sandy lean clay containing various amounts of gravel (mapped as alluvial or older pediment soils).
- Very weathered bedrock (encountered at depths ranging from 2 to 7.5 feet in western portion of Site).

Topsoil is darker in color as compared to the underlying soils and the contact between units is visually apparent in the field.

C.2. Constituents of Concern (COC) and Location of Impacts

Barium and lead were identified as COCs at the Site in the 2019 Phase II ESA. These COCs were detected above federal and/or state screening levels in samples of surface soil (topsoil) collected at the Site. No COCs were detected above screening levels in the underlying clayey gravel, clayey sand and sandy lean clay soils.

Barium exceeded the U.S. EPA soil screening level (SSL) for protection of groundwater in topsoil at test pit TP-13. Lead was detected above the State of Montana residential screening level (RSL) and U.S. EPA SSL for protection of groundwater in topsoil at test pits TP-06, TP-09, and TP-13 (Figure 2). The lead concentration in a surface sample collected from TP-07 slightly exceeded the U.S. EPA SSL for protection of groundwater, but not the State of Montana RSL. Lead concentrations in soil samples collected from the soils underlying topsoil at test pit locations TP-06 and TP-09 were well below the U.S. EPA SSL and State of Montana RSL (samples TP-06D and TP-09D; Appendix B). These sampling results indicate that lead is not leaching from topsoil to underlying soils (and to groundwater) at the Site.

Arsenic was generally detected in Site surface/topsoil above the State of Montana (statewide) background threshold value (BTV), which is the default screening level for this COC. However, a statistical evaluation conducted for the 2019 Phase II ESA showed that the arsenic concentrations in topsoil at the Site were consistent with arsenic concentrations considered to be representative of background conditions in the vicinity of the nearby Joslyn Street Tailings Facility. Because arsenic concentrations in topsoil are representative of local background conditions, arsenic was not identified as a COC for the Site.

C.3. Potential Receptors, Exposure Pathways and Proposed Soil Cleanup Levels

Direct exposure to soils impacted by COCs is the predominant exposure pathway at the Site based on the results of the 2019 Phase II ESA. Such exposure may be via ingestion, inhalation or dermal contact. The potential receptors via direct soil exposure include the residential users of the Site and construction and utility workers (short term exposure) during Site construction.

Lead was the COC that exceeded screening levels for both direct contact and protection of groundwater; barium concentrations in topsoil only exceeded the screening level for protection of groundwater. We propose that the State of Montana RSL for lead (154 mg/kg) be used as the soil cleanup level for lead, and that the U.S. EPA SSL for residential soil for barium (1,500 mg/kg) be used as the soil cleanup level for barium.

The proposed soil cleanup levels for lead and barium are greater than the U.S. EPA SSLs for protection of groundwater for these metals. If lead or barium concentrations are below the soil cleanup level, but still above the U.S. EPA SSL for protection of groundwater in confirmation samples, the vertical extent of elevated lead or barium concentrations in soil will be delineated or leaching modeling will be performed using Synthetic Precipitation Leaching Procedure (SPLP) results as part of the proposed response action (see Section D.3.b).

D. Proposed Response Actions

The proposed response actions have been selected based on review of the existing conditions to address the known environmental issues and cleanup/prepare the Site for the planned residential redevelopment. The proposed response actions include the following:

1. Conducting a pre-demolition asbestos inspection of the existing concrete block building that was used for commercial purposes at the Site to identify any asbestos-containing materials (ACM) that require abatement prior to demolition.

2. Demolition and abatement (if necessary) of existing Site structures, including the well pit associated with the former residences and the concrete block building and wood shed associated with operation of the former radio tower.

3. Conducting confirmation sampling and analysis of:

    a. Potential contaminated topsoil excavation areas to further define the volume of topsoil to be excavated and removed (i.e., soil volume confirmation sampling and analysis);

    b. Excavation sidewalls and base of each contaminated topsoil excavation to confirm removal of contaminated topsoil (i.e., soil excavation confirmation sampling and analysis); and

    c. Stockpiled topsoil in the depressed area to determine whether it can be reused on-Site or requires off-Site disposal.

4. Excavation and disposal of surface/topsoil contaminated above the cleanup levels.

5. Abandonment of the existing domestic well and septic system at the Site in accordance with applicable local and/or state regulations. Out-of-service wells may pose potential safety hazard and threat to groundwater quality if not correctly maintained or abandoned (http://wellowner.org/water-well-maintenance/old-unused-wells/).

These actions are described in more detail in the following sections.

D.1. Pre-Demolition Asbestos Inspection

A pre-demolition asbestos inspection will be performed of the entire concrete block building used in association with the former radio antenna at the Site by Northern Industrial Hygiene, Inc. of Billings, Montana. The inspection will be performed prior to demolition of the building in accordance with federal and state regulations by persons from Helena, Montana, with current accreditation by the Montana DEQ. The asbestos inspection will follow requirements outlined in 40 CFR Part 763. The following sampling requirements will be adhered to during the asbestos inspection:

- In areas where homogeneous suspected regulated asbestos containing material (RACM) (surfacing) is less than 1,000 square feet (SF), three randomly selected bulk samples will be collected from each area;

- In areas where homogeneous suspected RACM (surfacing) is at least 1,000 SF but less than 5,000 SF, five randomly selected bulk samples will be collected from each area;

- In areas where homogeneous suspected RACM (surfacing) is at least 5,000 SF, seven randomly selected bulk samples will be collected from each area;

- At least one bulk sample will be collected from each area of patched thermal systems insulation (TSI) that is not assumed to be ACM;

- Three random bulk samples will be collected from TSI that is not assumed to be ACM;

- No bulk samples where the accredited inspector has determined that the TSI is fiberglass, foam, glass, rubber, or other non-ACM; however, three random bulk samples will be collected from any adhesive applying the non-ACM insulations, if present;

- Three random bulk samples will be collected from all mechanical system insulation and fittings, such as tees, elbows, and valves, that are not assumed to be ACM;

- Three random bulk samples will be collected from each type of suspect or non-suspect miscellaneous material that is not assumed to be ACM, with the exception of wood, glass, and metal; and

- Three random bulk samples will be collected from any type of non-friable suspected ACM that is not assumed to be ACM.

All bulk samples of suspect ACM will be analyzed by EMSL Analytical, Inc. of Phoenix, Arizona, which is part of the National Voluntary Laboratory Accreditation Program.

D.2. Abatement and Demolition

The existing concrete block building including foundations and any buried utilities, any concrete slabs remaining from previous structures at the Site, and the well pit will be demolished as part of RAP

implementation. If ACM is identified in the concrete block building during the asbestos inspection, an Asbestos Project Permit from Montana DEQ's Asbestos Control Program will be obtained, and the asbestos will be abated by a licensed contractor prior to demolition. Braun Intertec recommends that the contract for demolition and abatement include specifications to ensure that city, county and/or state permit conditions and rules are followed. An environmental consultant will not oversee demolition of Site structures unless environmental conditions are identified that necessitate field oversight.

The abated ACM will be transported for disposal at a facility specifically permitted to receive asbestos. The concrete generated during demolition, as well as concrete piled in the borrow pit area or found in other areas of the Site, will be either be reclaimed and re-used or disposed of in accordance with local, state and federal requirements. Any remaining solid waste debris at the Site, such as miscellaneous debris and wood, including that contained in the well pit, will be recycled/disposed off-site in accordance with local, state and federal requirements.

D.3. Soil Volume Confirmation Sampling and Analysis

Confirmation sampling and analysis will be conducted around previous test pit locations TP-06, TP-07, TP-09 and TP-13 to confirm that soil needs to be excavated from these locations and disposed off-site, or confirm that the topsoil at these previous test pit locations can remain at the Site without presenting an unacceptable risk to human health or the environment (Figure 2).

Soil samples will be sieved to 250 microns with a No. 60 sieve prior to analysis by the laboratory and analyzed for metals by Method 6010 to maintain consistency with soil sampling results from the 2019 Phase II ESA. The analysis of samples at the test pit areas will proceed in a step-wise fashion starting with the sample collected closest to the former test pit location and progressively moving outward to minimize analytical costs and the generation of unnecessary analytical data.

The sampling and analysis plan for each test pit area involves initial sampling near the center of the previous test pit, and at 50-foot offsets. Grids of off-set sampling locations extend beyond each test pit area. Off-set grid sampling locations associated with one previous test pit may encroach on or overlap off-set grid sampling locations for another previous test pit location. Care are will be taken to ensure the sampling and analysis protocols for both test pit areas are followed. The off-set grid sampling locations are illustrated on Figure 2.

The sampling and analysis program for each test pit area is described in the following sections.

D.3.a. Test Pit TP-13 Area

Because the lead concentration in topsoil at previous test pit TP-13 substantially exceeded state and federal screening levels, additional pre-excavation soil sampling and analysis will be conducted to delineate the excavation extents and further define soil removal volumes at this location.

Soil samples will be collected from the following depths and locations:

- One sample will be collected of topsoil from a depth of 0 to 2-inches from a point near the center of test pit TP-13 that has not been disturbed due to previous test pitting activities and 4 samples will be collected from 0 to 2-inches on 50-foot off-sets from the sample collected from the center of the previous test pit (5 samples total); and

- One sample will be collected of the soil underlying the topsoil sample collected near the center of test pit TP-13 from an approximate depth of 10 to 12-inches and 4 samples will be collected of soil underlying the topsoil samples collected at the 50-foot offsets at an approximate depth of 10 to 12 inches (5 samples total).

The sample collection procedure will be repeated at the additional off-set grid sampling locations located in the area of previous test pit TP-13.

Upon sample receipt by the laboratory, the samples of topsoil collected near the center of the previous test pit and at the 50-foot offset locations will be composited, sieved to 250 microns with a No. 60 sieve, and analyzed for total lead and barium by Method 6010 at the laboratory. The same will be completed for the soil samples underlying topsoil at these locations.

If the lead and barium concentrations are below soil cleanup levels in both the composite samples of topsoil and underlying native materials, topsoil in an approximate 100-square-foot area around previous test pit TP-13 will be excavated and disposed (see Section D.2.). If the lead and barium concentrations are above soil cleanup levels in any composite sample, the analytical protocol will be repeated with the samples of topsoil and native materials from the adjacent off-set grid sampling locations. Analytical results will be compared to soil cleanup levels to determine whether samples from additional off-set grid locations need to be analyzed to delineate excavation extents and estimate soil removal volumes.

D.3.b. Test Pit Areas TP-06, TP-07, and TP-09

Lead concentrations at previous test pits TP-06, TP-07, and TP-09 only slightly exceeded state and/or federal screening levels, and barium concentrations met state and federal screening levels. Soil sampling and analysis will either be used to delineate the excavation extents for lead-impacted soil at these

locations and estimate soil removal volumes or confirm that the lead in topsoil does not pose an unacceptable risk to human health or the environment and can be re-used/remain at the Site. Soil sample collection will follow the protocol outlined in Section D.3.a., which specified sample collection near the center of the previous test pit location and at off-set grid sampling locations as depicted on Figure 2.

The analysis of samples will proceed in a stepwise fashion as outlined in Section D.3.a; however, the analytical protocol will differ as follows:

- Samples will be analyzed only for total lead by Method 6010.
- Composite samples may also be leached using the SPLP by Method 1312 and analyzed for lead by Method 6010.

If the lead concentrations are below soil cleanup level in the topsoil and underlying soils at that test pit location, these soils can be re-used/remain at the Site.

If the lead concentrations are above soil cleanup level in either the composite samples of topsoil or underlying soils in any test pit area, the soils that exceed the soil cleanup level in the off-set grid sampling area will need to be excavated and disposed. The analytical protocol will be repeated with the samples of topsoil and underlying soils from the adjacent off-set grid sampling locations. Analytical results will be compared to soil cleanup levels to determine whether samples from additional off-set locations need to be analyzed in order to delineate excavation extents and estimate soil removal volumes.

Alternatively, if lead concentrations are below the soil cleanup level, but are still above the U.S. EPA SSL for protection of groundwater, in the initial composite samples analyzed, or composite samples from subsequent off-set sampling grid locations, samples may be re-analyzed for lead using SPLP. The results from the SPLP will be used to estimate the leachate concentration of lead in soil solution under natural conditions. This estimated leachate concentration will then be compared to an appropriate leachate criterion to determine whether the lead-impacted soil represents a potential threat to groundwater quality. If soil concentrations exceed generic protection of groundwater SSLs then a site-specific leaching to groundwater screening level (i.e., soil cleanup level protective of groundwater) may be calculated using a State of Montana-approved method to show that the estimated leachate concentration is protective of groundwater based on site-specific conditions.

D.4. Contaminated Surface/Topsoil Excavation

Soil will be potentially remediated in the areas of previous test pit locations TP-06, TP-07, TP-09 and TP-13 as depicted on Figure 3, based on the results of the soil volume confirmation sampling and analysis (see Section D.3). An environmental consultant will be on-site to document topsoil excavations in the previous test pit locations and perform confirmation sampling after excavation. It is anticipated that a remediation contractor will perform the topsoil excavation activities. These areas will be remediated as follows:

- The approximate lateral extent of excavation at each previous test pit location requiring topsoil excavation and disposal will be staked based on soil volume confirmation sampling results.

- Contaminated topsoil will be removed from the staked area(s) by excavation/scraping, to a depth based upon the results from soil volume confirmation sampling. The depths of the excavation are anticipated to range from 0.5 to 0.8 feet (6 to 10 inches) in depth, or to the base of the topsoil/top of underlying native soils.

- Immediately following removal/scraping, representative soil samples from the base and sidewalls of the excavation will be field screened for total lead using a portable handheld Niton Model XLP703A X-Ray Florescence (XRF) analyzer, equipped with a 40-milcurie CD-109 source. Each soil sample will be placed within a polyethylene bag and homogenized, then multiple XRF readings will then be taken of the sample and recorded on a project log. If the initial data appears to be affected moisture content, the bagged samples will be prepped further through drying/sieving and reanalyzed to determine the total lead content.

- The XRF field screening results will be compared to the lead soil cleanup level of 154 mg/kg (i.e. the Montana RSL). If the XRF field screening results indicate the lead soil cleanup level has not been achieved, additional soil excavation/scraping will be conducted, and the field screening of excavation base/sidewall samples repeated. If a failing sample is from the base of the excavation, the base will be excavated an additional 0.5 feet and re-screened; if it is from an excavation sidewall, that sidewall will be excavated a minimum of 20 feet laterally and re-screened.

- Once favorable XRF field screening results for lead are achieved, final soil confirmation sampling will be conducted of the excavation area as outlined in Section D.5 to verify that lead and barium concentrations are below soil cleanup levels.

D.4.a. Disposal

Prior to soil disposal, a waste profile will be completed, and disposal acceptance will be obtained from the landfill selected for the project. It is anticipated that the existing analytical data obtained as part of the 2019 Phase II ESA will be sufficient to obtain disposal approval, if not additional soil characterization will be conducted as required.

Excavated contaminated soil will be direct loaded and transported to the selected disposal facility the same day it is excavated or as soon as feasible. All soil designated for disposal will be handled and disposed of in accordance with all local, state, and federal regulations. Each truckload of contaminated soil will be manifested prior to transport as non-hazardous waste.

If direct loading of the contaminated soil is not possible, the material will be temporarily stockpiled on-site until off-site disposal can be coordinated. Stockpiles of contaminated soil will be placed on and covered with at least 10-mil reinforced polyethylene sheeting until removed from the Site.

D.4.b. Backfilling

Given the shallow depths of excavation (i.e., 1 – 2 feet), it is not anticipated that excavation areas will be backfilled following removal of the contaminated soil and completion of excavation confirmation sampling/analysis. These areas of the Site will ultimately be excavated and re-graded as part of construction activities for the redevelopment.

D.5. Final Soil Confirmation Sampling and Analysis

As indicated in Section D.3, once favorable XRF field screening results are achieved final soil confirmation samples will be collected from the excavation base and sidewalls to verify that the soil with lead and/or barium concentrations above the soil cleanup levels has been removed.

The number of soil confirmation samples collected from a 50-foot by 50-foot excavation will be as follows:

- A 5-point composite soil sample will be collected from each sidewall in intervals not to exceed 100 lineal feet.
- A 5-point composite soil sample will be collected from the base of the excavation.

An additional 5-point composite soil sample will be collected from the excavation base for every 50-foot by 50-foot increase in excavation extent.

A 5-point composite soil sample will be collected from the stockpiled topsoil in the depressed area at the Site to confirm that this soil can be reused at the Site.

Confirmation samples will be submitted for analysis of total barium and/or lead using EPA Method 6010, as applicable.

D.6. Quality Assurance/Quality Control (QA/QC)

Field personnel will follow Braun Intertec standard operating procedures (SOPs) when collecting soil samples and quality control samples (Appendix C). Subcontracted field personnel will follow the protocols for asbestos sampling, supplemental inspections for ACM, and clearance monitoring in the IH SAP. QA/QC procedures will follow the project wide QAPP. The IH SAP and QAPP are available under separate cover. In the event of differences between the IH SAP, QAPP and this RAP, the RAP takes precedence.

Laboratory analysis will be performed using standard methods and properly operated and calibrated equipment and conducted by trained personnel. Pace Analytical of Billings, Montana will perform the laboratory analysis of soil samples and associated quality control samples in order to maintain consistency with regard to previous Phase II ESA results. EMSL Analytical, Inc. of Phoenix, Arizona will perform the asbestos testing.

Data quality will be addressed in terms of precision, accuracy, representativeness, completeness, and sensitivity (PARCCS). The PARCCS components specific to this RAP are summarized below. Details regarding the evaluation of PARCCS components are provided in the QAPP.

D.6.a. Precision

Field precision will be assessed during confirmation soil volume sampling through the collection and analysis of a field duplicate sample. The relative percent difference (RPD) between the investigative sample and field duplicate will be calculated. The duplication of soil samples is much more difficult due to their nonhomogeneous nature. In addition, soil samples may not be prepared (i.e., sieved and composited) in the field. Due to this difficulty, an RPD of 50% will be used as an advisory limit for analytes detected in both the investigative and field duplicate samples at concentrations greater than or equal to 5 times its quantitation limit. Professional judgment will also be relied upon when assessing field precision.

Laboratory precision will be based upon laboratory matrix spike/matrix spike duplicate (MS/MSD) analyses. The frequency of MS/MSD analysis and RPD acceptance limits will be in accordance with laboratory standard operating procedures.

D.6.b. Accuracy

The objective for accuracy of field sample collection procedures will be to ensure that samples are not affected by sources external to the sample, such as equipment decontamination procedures.
An equipment blank will be collected during each confirmation sampling event by pouring laboratory-prepared water or distilled water over or through the sampling equipment and collecting the rinsate in the proper analytical containers. A blank of the water used in the generate the equipment blank will also be submitted for laboratory analysis. The results of the field quality control samples will be used to assess field sampling accuracy.

Locations of grab samples will be initially located using a global positioning system (GPS) device. The accuracy of the sample location will be verified by GPS upon sample collection. Excavation extents will also be verified using a GPS device.

Laboratory accuracy will be assessed by determining percent recoveries from the analysis of laboratory control samples (LCS) and the matrix spike (MS).

D.6.c. Representativeness

Representativeness with regard to sample collection will be achieved by following this RAP with regard to sample frequency, sampling depth, and sample preparation. Grab samples collected from grid areas will be composited and sieved by the laboratory to help ensure representative samples area collected and analyzed. Laboratory blanks, field blanks, and equipment rinsate blanks will be used to assess representativeness.

Suspected ACM samples will be collected to ensure that enough materials are collected to accurately represent the bulk sample, and frequency of sample collection will follow requirements in Section D.1. Representativeness will also be achieved by ensuring sample locations are properly selected.

D.6.d. Completeness and Comparability

The field personnel will take measures to ensure that the samples collected result in the generation of valid data. While a completeness goal of 100% is desirable, and overall completeness goal of 90% may be realistically achieved under normal field sampling and laboratory analytical conditions. Therefore, field and analytical completeness goals for this project will be 90% of the samples to be analyzed following the stepwise analytical procedure described in Section D.3.

Sample collection and preparation (e.g., compositing and sieving) will be completed in a consistent manner to satisfy the comparability of data generated as part of the RAP, as well as data generated previously during the 2019 Phase II ESA. Analytical method quality specifications will be followed to help ensure that data will produce comparable results.

D.6.e. Sensitivity

Laboratory analyses will be sensitive such that COC concentrations can be compared to the proposed soil cleanup levels and ACM standard of 1%. Standard laboratory reporting limits are substantially lower than the soil cleanup levels. If analytical methods are deemed to be insufficiently sensitive, alternative analytical methods may be utilized.

D.6.f. Data Validation

The laboratory will perform data validation on the raw analytical data following the National Functional Guidelines and in accordance with analytical method requirements. Analytical data and the associated QA/QC package provided by the laboratory will be reviewed and data evaluated for usability. Additional qualifiers may be applied to the data as necessary based on the precision and accuracy of results, blank contamination, or other quality control issues. Field procedures and field QA/QC data will be reviewed and qualifiers applied as necessary.

D.7. Domestic Well and Septic System Abandonment

If present, liquid/septic wastes will be removed from the tank of the septic system as well as excess sewage effluent (liquid) from the drainfield (where feasible). The waste will be removed and disposed by a licensed septic maintenance business. The septic tank and drainfield will either be abandoned in place or removed in accordance with applicable rules and regulations. All electrical devices associated with the system will be removed and disposed according to applicable regulations. If the drain field is removed to facilitate Site grading, the drain field should be dry to ensure that no liquid sewage effluent is present and to minimize the potential for direct human contact and help prevent spills or leakage.

The domestic well will be abandoned by a water well driller or contractor licensed by the State of Montana in accordance with local and state regulations. Well abandonment will have to be coordinated with debris removal and demolition of the well pit. All electrical devices associated with the well will be removed and disposed according to applicable regulations. A Montana Well Abandonment Report will be filed upon completion with the State of Montana.

E. Reporting

Upon completion of remediation activities and documentation sampling, a RAP Implementation Report will be prepared documenting methods and results of the soil remediation activities. The report will be submitted to the Montana DEQ Brownfields Program and will request issuance of a No Further Action letter and approval of the response actions. The documentation report will include the following at a minimum:

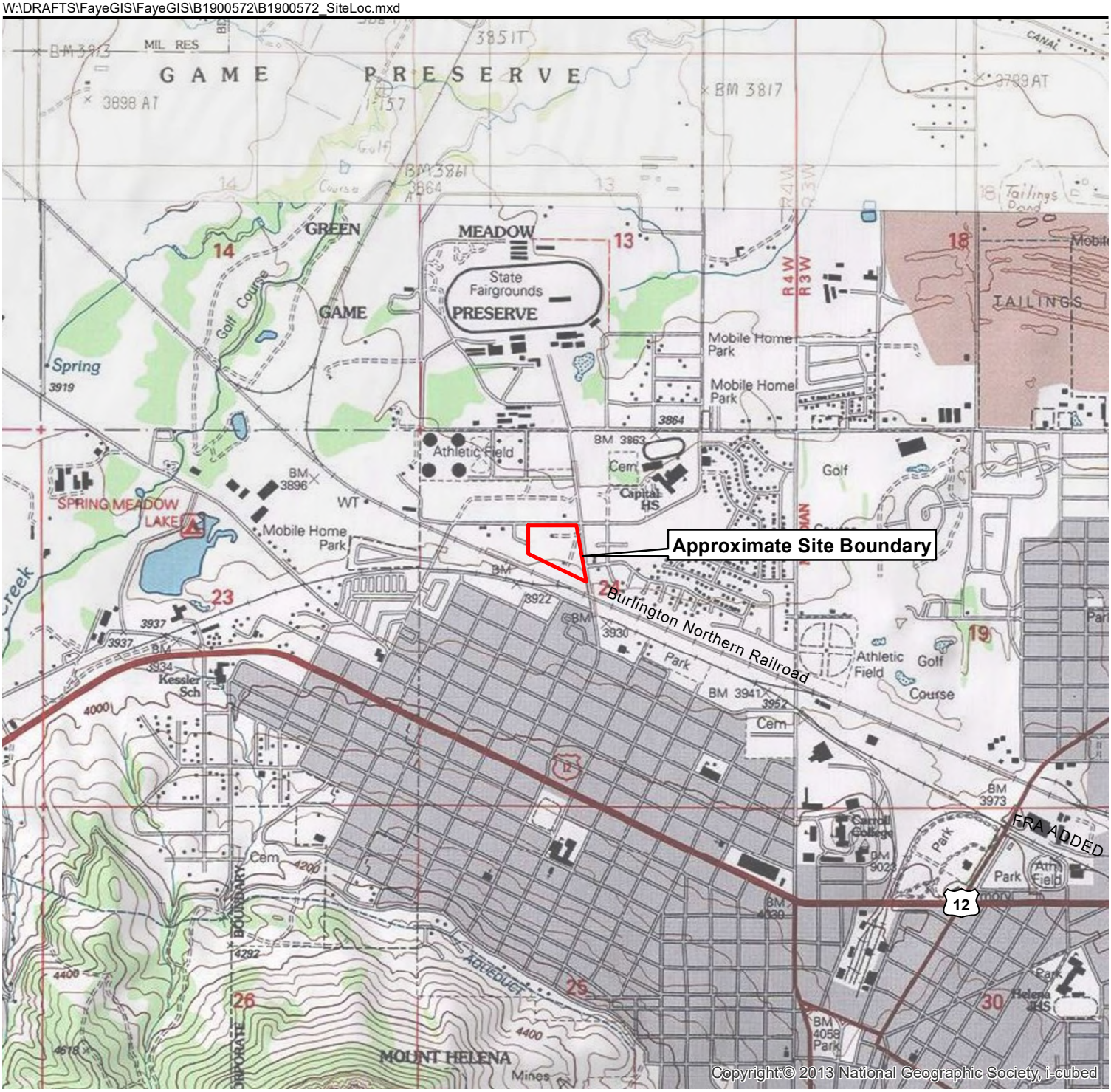
- Overview of the environmental response actions performed.
- Figure showing the locations of contaminated soil excavated.
- Documentation for final disposition of contaminated soil (including manifests and weigh tickets).
- Documentation of confirmation soil sampling results used to delineate excavation extents and estimates of soil volumes for disposal and to verify contaminated soil removal from excavations.
- Documentation of data validation and data usability evaluation.
- Descriptions and documentation related to any contingency actions (if any) completed during implementation of the RAP.

F. Standard of Care

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

Figures

W:\DRAFTS\FayeGIS\FayeGIS\B1900572\B1900572_SiteLoc.mxd



Approximate Site Boundary

Data Source:
USGS Quadrangle

N

0 1,000 2,000
Feet

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The Science You Build On.

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Minneapolis, MN 55438
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Project No:
B1900572

Drawing No:
B1900572_SiteLoc

Drawn By:	FER
Date Drawn:	1/22/2019
Checked By:	JES
Last Modified:	1/22/2019

Proposed Red Alder Residences

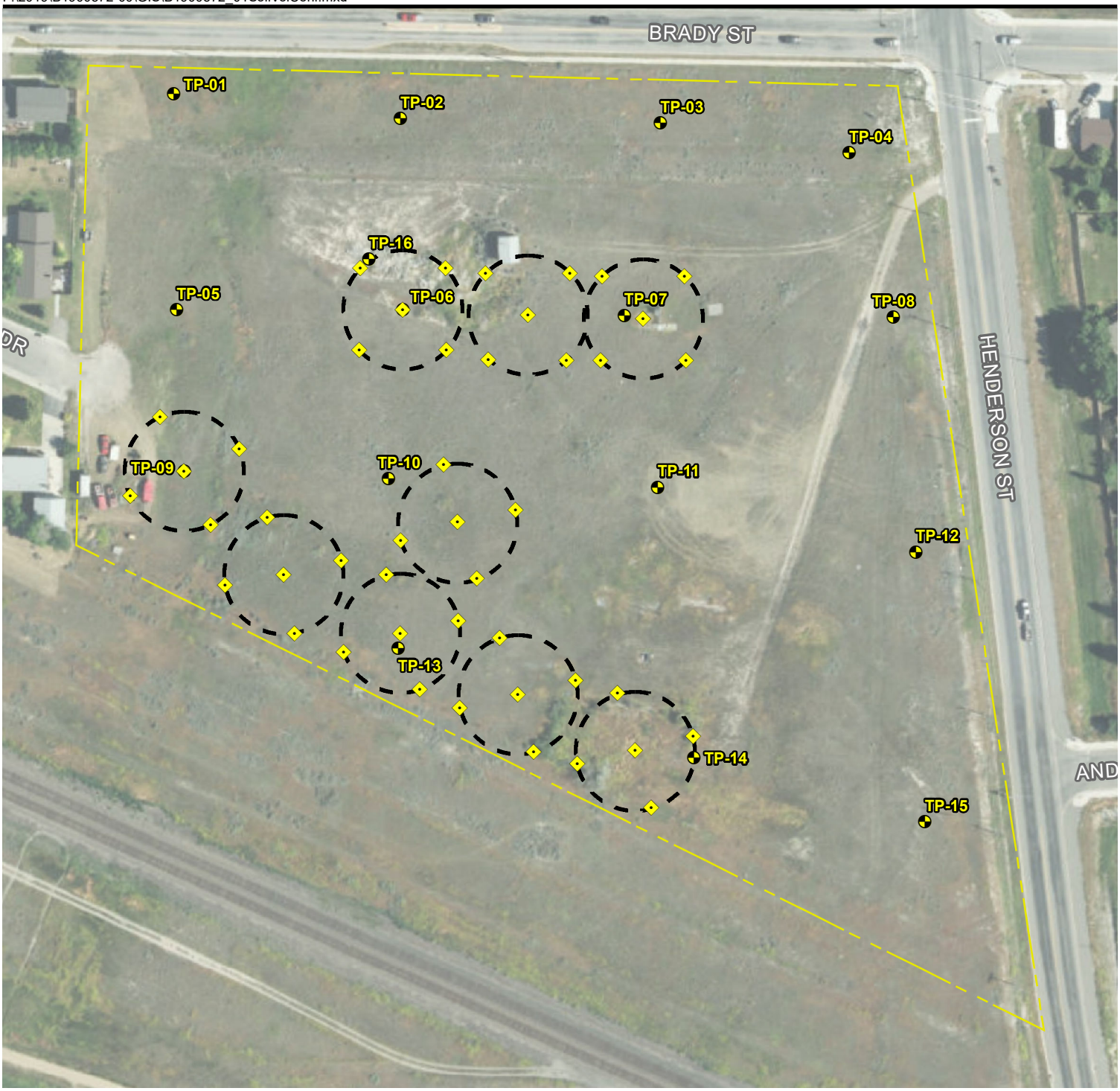
2200 Henderson Street

Helena, Montana

Site Location Map

Figure 1

F:\2019\B1900572-00\GIS\B1900572_01SoilVolConf.mxd



Denotes Proposed Grab Sample Location

Denotes Proposed 5-Point Composite Sample Area

Denotes Previous Sample Location at Test Pit (Approximate)

Approximate Site Boundary

Sampling locations (TP-XX) surveyed by Pioneer Technical Services, Inc. using a hand-held global positioning system device.

N

0 60 120 Feet

1 inch = 120 feet

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Project No: B1900572.01

Drawing No: B1900572_01SoilVolConf

Drawn By:	CMF
Date Drawn:	5/2/2019
Checked By:	BJ
Last Modified:	6/19/2019

Proposed Red Alder Residences

2200 Henderson Street

Helena, Montana

Soil Volume Confirmation Sample Location Map

Figure 2

F:\2019\B1900572-00\GIS\B1900572_01SoilExcavAreas.mxd

Potential Soil Excavation Areas

Denotes Previous Sample Location at Test Pit (Approximate)

Approximate Site Boundary

Sampling locations (TP-XX) surveyed by Pioneer Technical Services, Inc. using a hand-held global positioning system device.

N

0 60 120 Feet

1 inch = 120 feet

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Date Drawn:	5/2/2019
Checked By:	BJ
Last Modified:	6/6/2019

Proposed Red Alder Residences

2200 Henderson Street

Helena, Montana

Potential Soil Excavation Areas

Figure 3

Appendix A

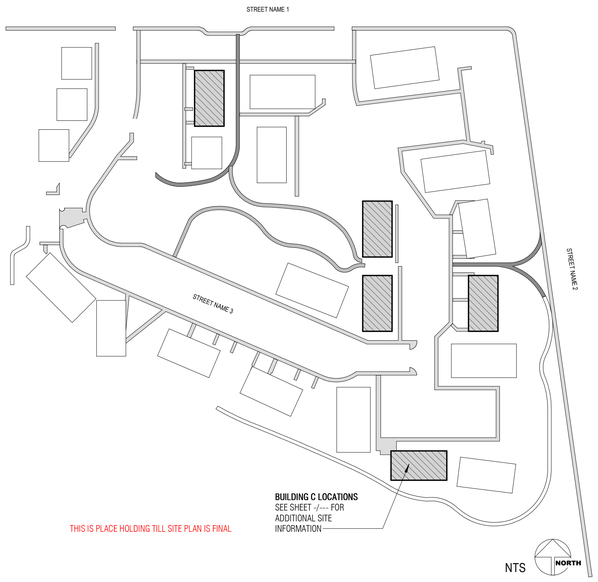
Development Plans

BRAUN INTERTEC

RED ALDER RESIDENCES

1400- 1599 RED ALDER HOUSING
HELENA, MT

KEY MAP



SHEET INDEX

PROJECT REVIEWED UNDER 2012 CODES:
2012 INTERNATIONAL BUILDING CODE (IBC)
2012 INTERNATIONAL FUEL GAS CODE (IFGC)
2012 INTERNATIONAL MECHANICAL CODE (IMC)
2012 UNIFORM PLUMBING CODE (IAMP)
2011 NATIONAL ELECTRIC CODE (NEC)
2012 INTERNATIONAL ENERGY CONSERVATION CODE(IECC)
2012 INTERNATIONAL FIRE CODE (IFC)

CODES HAVE BEEN AMENDED AND MODIFIED BY STATE OF MONTANA ADMINISTRATIVE RULES (ARM'S), TITLE 24, CHAPTER 301.

REQUIRED DEFERRED SUBMITTALS:

1. ENGINEERED ROOF TRUSSES

REQUIRED SPECIAL INSPECTIONS:

IN ADDITION TO REGULAR INSPECTIONS, THE FOLLOWING ITEMS WILL ALSO REQUIRE SPECIAL INSPECTIONS AND TESTING IN ACCORDANCE WITH SECTION 1704, 1707, AND 1708 OF THE 2016 INTERNATIONAL BUILDING CODE.

a) SPECIAL INSPECTIONS (1704):
- INSPECTION OF FABRICATORS (1704.2.5)
- CONCRETE CONSTRUCTION (1705.3)
- SOILS (1705.6)
- SPECIAL CASES (1705.1)
  - EPOXY SET ANCHORS
  - POWDER-ACTUATED FASTENERS
  - CONCRETE EXPANSION ANCHORS

COORDINATION WITH OTHER BUILDINGS IN PROJECT:
THESE DRAWINGS ARE TO BE USED IN CONJUNCTION WITH DRAWINGS FOR BUILDINGS A, B, C, E, AND F. IT IS THE INTENTION OF THE PROJECT THAT THE MATERIALS AND DETAILS OF THE PROJECT ARE CONSISTENT FROM BUILDING TO BUILDING. THEREFORE, DETAILS FOR THIS STRUCTURE MAY RESIDE IN BUILDING A DRAWINGS. IF A DETAIL OF CONDITION IS NOT FULLY EXPLAINED IN THIS SET, CCONTRACTOR SHALL REFER TO BUILDING A SIMILAR CONDITIONS TO DETERMIN DESIGN INTENT.

PROJECT REQUIREMENTS STANDARD NOTES AND STANDARD DETAILS ON DRAWING SHEETS FOR BUILDING A ALSO APPLY TO THIS BUILDING. FOR STANDARD CONDITIONS NOT SHOWN IN "C" DRAWINGS, REFER TO "A" BUILDING DRAWINGS.

THESE DRAWINGS WERE PREPARED BY MOSAIC ARCHITECTURE, P.C. FOR CONSTRUCTION OF THE "RED ALDER HOUSING" PROJECT DESCRIBED HEREIN. AS SUCH, THEY ARE THE PROPERTY OF MOSAIC ARCHITECTURE, P.C. AND MAY NOT BE REPRODUCED, COPIED OR USED IN ANY WAY WITHOUT PRIOR APPROVAL FROM MOSAIC ARCHITECURE, P.C.

DATE STAMP: 5/8/2019 10:06:50 AM

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CITY STAMP

DD_NOT FOR CONSTRUCTION

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RED ALDER HOUSING

Project Address

TITLE SHEET

DATE: 05/08/2019

SHEET: G001

SUMMARY CODE REVIEW FOR RESIDENTIAL BUILDINGS

BUILDING SUMMARY

Project Description:
Building A: A duplex containing (1) 1-bedroom unit and (1) 2-bedroom unit
Building B: A triplex containing (3) 2-bedroom units
Building C: A triplex containing (2) 1-bedroom units and (1) 2-bedroom unit
Building D: A four-plex containing (2) 1-bedroom units and (2) 2-bedroom units
Building E: A four-plex containing (2) 1-bedroom units and (2) 3-bedroom units
Building F: A four-plex containing (2) 1-bedroom units, (1) 2-bedroom unit and (1) 3-bedroom unit

Definitions:
Duplex: Dwelling. A building that contains one or two dwelling units used, intended or designed to be used, rented, leased, let or hired out to be occupied for living purposes. Single family houses and duplexes fall under the definition of dwelling.

Triplex: Townhouse. A single-family dwelling unit constructed in a group of three or more attached units in which each unit extends from foundation to roof and with a yard of public way on at least two sides.

4plex: Townhouse. A single-family dwelling unit constructed in a group of three or more attached units in which each unit extends from foundation to roof and with a yard of public way on at least two sides.

Fire Separation Distance: The distance measured from the building face to one of the following:
1. To the closest interior lot line
2. To the centerline of a street, alley or public way
3. To an imaginary line between two buildings on the lot
The distance shall be measured at a right angle from the face of the wall

The duplex buildings are reviewed under the IRC as a Two-Family Dwelling.
The triplex and four-plex buildings are reviewed under the IRC provisions for Townhouses.

FIRE-RESISTANT CONSTRUCTION, R302:
Exterior wall construction, projections, openings and penetrations shall comply with Table R302.1(1)
Exceptions:
1. Walls, projections, openings or penetrations in walls perpendicular to the line used to determine the fire separation distance.
2. Walls of dwellings and accessory structure located on the same lot.

Table R302.1(1) requires: Fire-resistant construction of walls < 5' fire separation
Fire-resistance rated projections 2' to <5' fire separation
Openings in walls not allowed < 3', 25% maximum at 3', unlimited at 5' fire separation
Penetrations <5' must comly with Section R302.4, at 5' fire separation none required

TOWNHOUSES, R302.2:
Each townhouse shall be considered a separate building and shall be separated by fire-resistance-rated wall assemblies meeting the requirements of Section R302.1 for exterior walls.
Montana Amendment to exception:
A common two-hour fire-resistance-rated wall assembly tested in accordance with ASTM E119 or UL 263 is permitted for townhouses if such walls do not contain plumbing or mechanical equipment, ducts, or vents in the cavity of the common wall. The wall shall be rated for fire exposure from both sides and shall extend to and be tight against exterior walls and the underside of the roof sheathing. Electrical installations shall be installed in accordance with the adopted electrical code. Penetrations of electrical outlet boxes shall be in accordance with Section R302.4.

R302.2.2 Parapets. Parapets constructed in accordance with Section R302.2.3 shall be constructed for townhouses as an extension of exterior walls or common walls in accordance with the following:
1. Where roof surfaces adjacent to the wall or walls are at the same elevation, the parapet shall extend not less than 30 inches (762 mm) above the roof surfaces.
2. Where roof surfaces adjacent to the wall or walls are at different elevations and the higher roof is not more than 30 inches (762 mm) above the lower roof, the parapet shall extend not less than 30 inches (762 mm) above the lower roof surface.

Exception: A parapet is not required in the two cases above when the roof is covered with a minimum **class C roof covering**, and the roof decking or sheathing is of noncombustible materials or approved fire-retardant-treated wood for distance of 4 feet on each side of the walls or walls, or one layer of 5/8-inch Type X gypsum board is installed directly beneath the roof decking or sheathing, supported by a minimum of nominal 2-inch ledgers attached to the sides of the roof framing members, for a minimum distance of 4 feet on each side of the wall or walls and there are no openings or penetrations in the roof within 4 feet of the common walls.

3. A parapet is not required where roof surfaces adjacent to the wall or walls are at different elevations and the higher roof is more than 30 inches (762 mm) above the lower roof. The common wall construction from the lower roof to the underside of the higher roof deck shall have not less than a 1-hour fire-resistance rating. The wall shall be rated for exposure from both sides.

R302.2.4 Structural Independence. Each individual townhouse shall be structurally independent.
Applicable Exception:
5. Townhouses separated by a common two-hour fire-resistance-rated wall as provided in Section R302.2

TWO-FAMILY DWELLINGS, R302.3:
Dwelling units in two-family dwellings shall be separated from each other by wall and/or floor assemblies having not less than a 1-hour fire-resistance rating when tested in accordance with ASTM E 119 or UL 263. Fire-resistance-rated floor/ceiling and wall assemblies shall extend to and be tight against the exterior wall, and wall assemblies shall extend from teh foundation to the underside of the roof sheathing.

Exceptions:
1. A fire-resistance rating of ½ hour shall be permitted in buildings equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13.
2. Wall assemblies need not extend through HYPERLINK "https://up.codes/viewer/montana/irc-2012/chapter/2/definitions#attic"attic spaces when the ceiling is protected by not less than ½-inch (15.9 mm) Type X gypsum board and an HYPERLINK "https://up.codes/viewer/montana/irc-2012/chapter/2/definitions#attic"attic HYPERLINK "https://up.codes/viewer/montana/irc-2012/chapter/2/definitions#draft_stop"draft stop constructed as specified in HYPERLINK "https://up.codes/viewer/montana/irc-2012/chapter/3/building-planning#R302.12.1"Section R302.12.1 is provided above and along the wall assembly separating the *HYPERLINK "https://up.codes/viewer/montana/irc-2012/chapter/2/definitions#dwelling"*dwellings. The structural framing supporting the ceiling shall also be protected by not less than ½-inch (12.7 mm) gypsum board or equivalent.

THROUGH PENETRATIONS, R302.4.1:
Through penetrations of fire-resistance-rated wall or floor assemblies shall comply with Section R302.4.1.1 or R302.4.1.2.
Exception: Where the penetrating items are steel, ferrous or copper pipes, tubes or conduits, the annular space shall be protected as follows:

1. In concrete or masonry wall or floor assemblies, concrete, grout or mortar shall be permitted where installed to the full thickness of the wall or floor assembly or the thickness required to maintain the fire-resistance rating, provided:
   1.1 The nominal diameter of the penetrating item is a maximum of 6 inches (152 mm); and
   1.2. The area of the opening through the wall does not exceed 144 square inches (92 900 mm2).
2. The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E 119 or UL 263 time temperature fire conditions under a minimum positive pressure differential of 0.01 inch of water (3 Pa) at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated.

R302.4.1.1 Fire-Resistance-Rated Assembly
Penetrations shall be installed as tested in the approved fire-resistance-rated assembly

R302.4.1.2 Penetration Firestop System
Penetrations shall be protected by an approved penetration firestop system installed as tested in accordance with ASTM E814 or UL 1479, with a minimum positive pressure differential of 0.01 inch of water (3 Pa) and shall have an F rating of not less than the required fire-resistance rating of the wall or floor/ceiling assembly penetrated.

MEMBRANE PENETRATIONS, R302.4.2:
Membrane penetrations shall comply with Section R302.4.1. Where walls are required to have a fire-resistance rating, recessed fixtures shall be installed so that the required fire-resistance rating will not be reduced.

1. Membrane penetrations of maximum 2-hour fire-resistance-rated walls and partitions by steel electrical boxes that do not exceed 16 square inches (0.0103 m2) in area provided the aggregate area of the openings through the membrane does not exceed 100 square inches (0.0645 m2) in any 100 square feet (9.29 m2) of wall area. The annular space between the wall membrane and the box shall not exceed 1/8 inch (3.1 mm). Such boxes on opposite sides of the wall shall be separated by one of the following:

   1.1. By a horizontal distance of not less than 24 inches (610 mm) where the wall or partition is constructed with individual noncommunicating stud cavities;

   1.2. By a horizontal distance of not less than the depth of the wall cavity when the wall cavity is filled with cellulose loose-fill, rockwool or slag mineral wool insulation;

   1.3. By solid fire blocking in accordance with Section R302.11;

   1.4. By protecting both boxes with listed putty pads; or

   1.5. By other listed materials and methods.

2. Membrane penetrations by listed electrical boxes of any materials provided the boxes have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing. The annular space between the wall membrane and the box shall not exceed 1/8 inch (3.1 mm) unless listed otherwise. Such boxes on opposite sides of the wall shall be separated by one of the following:

   2.1. By the horizontal distance specified in the listing of the electrical boxes;

   2.2. By solid fireblocking in accordance with Section R302.11; 2.3. By protecting both boxes with listed putty pads; or 2.4. By other listed materials and methods. 3. The annular space created by the penetration of a fire sprinkler provided it is covered by a metal escutcheon plate.

R302.7 UNDER-STAIR PROTECTION:
Enclosed accessible space under stairs shall have walls, under-stair surface and any soffits protected on the enclosed side with 1/2" gypsum board.

R302.9 FLAME SPREAD INDEX:
Wall and ceiling finishes shall have a flame spread index of not greater than 200.
Exceptions: Flame spread index requirements for finishes shall not apply to trim defined as picture molds, chair rails, baseboards and handrails; to doors and windows or their frames; or to materials that are less than 1/28" in thickness cemented to the surface of walls or ceilings of these materials exhibit flame spread index values no greater than those of paper of this thickness cemented to a noncombustible backing.

R302.9.2 SMOKE DEVELOPED INDEX:
Wall and ceiling finishes shall have a smoke-developed index of not greater than 450.

R302.10 FLAME SPREAD INDEX AND SMOKE-DEVELOPED INDEX FOR INSULATION
Insulations used shall comply with this section.

R302.11 FIREBLOCKING
In combustible construction, fireblocking shall be provided to cut off all concealed draft openings (both vertical and horizontal) and to form an effective fire barrier between stories, and between a top story and the roof space.
Fireblocking shall be provided in wood-frame construction in the following locations:

1. In concealed spaces of stud walls and partitions, including furred spaces and parallel rows of studs or staggered studs, as follows:
   1.1. Vertically at the ceiling and floor levels.
   1.2. Horizontally at intervals not exceeding 10 feet (3048 mm).
2. At all interconnections between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings and cove ceilings.
3. In concealed spaces between stair stringers at the top and bottom of the run. Enclosed spaces under stairs shall comply with Section R302.7.
4. At openings around vents, pipes, ducts, cables and wires at ceiling and floor level, with an approved material to resist the free passage of flame and products of combustion. The material filling this annular space shall not be required to meet the ASTM E 136 requirements.
5. For the fireblocking of chimneys and fireplaces, see Section R1003.19.
6. Fireblocking of cornices of a two-family dwelling is required at the line of dwelling unit separation.

R302.12 DRAFTSTOPPING
In combustible construction where there is usable space both above and below the concealed space of a floor/ceiling assembly, draftstops shall be installed so that the area of the concealed space does not exceed 1,000 square feet (92.9 m2). Draftstopping shall divide the concealed space into approximately equal areas. Where the assembly is enclosed by a floor membrane above and a ceiling membrane below, draftstopping shall be provided in floor/ceiling assemblies under the following circumstances:
1. Ceiling is suspended under the floor framing.
2. Floor framing is constructed of truss-type open-web or perforated members.

R302.12.1 MATERIALS
Draftstopping materials shall not be less than 1/2-inch (12.7 mm) gypsum board, 3/8-inch (9.5 mm) wood structural panels or other approved materials adequately supported. Draftstopping shall be installed parallel to the floor framing members unless otherwise approved by the building official. The integrity of the draftstops shall be maintained

R303.1 HABITABLE ROOMS
All habitable rooms shall have an aggregate glazing area of not less than 8% of the floor area of such rooms. The minimum openable area to the outdoors shall be 4% of the floor area being ventilated.
Exceptions:
1. The glazed areas need not be openable where the opening is not required by Section R310 and a whole-house mechanical ventilation system is installed in accordance with Section M1507.
2. The glazed areas need not be installed in rooms where Exception 1 above is satisfied and artificial light is provided capable of producing an average illumination of 6 footcandles (65 lux) over the area of the room at a height of 30 inches (762 mm) above the floor level.
3. Use of sunroom and patio covers, as defined in Section R202, shall be permitted for natural ventilation if in excess of 40 percent of the exterior sunroom walls are open, or are enclosed only by insect screening.

R303.3 BATHROOMS
Bathrooms, water closet compartments and other similar rooms shall be provided with aggregate glazing area in windows of not less than 3sf, one-half of which must be openable.
Exception: The glazed areas shall not be required where artificial light and a local exhaust system are provided. The minimum local exhaust rates shall be determined in accordance with Section M1507. Exhaust air from the space shall be exhausted directly to the outdoors.

R303.4 - R303.6 MECHANICAL VENTILATION, OPENINGS AND OUTSIDE OPENING PROTECTION
Mechanical ventilation, opening locations and outside opening protections shall comply with this section.

R303.7 STAIRWAY ILLUMINATION
Stairway illumination shall comply with this section.

R303.8 REQUIRED GLAZED OPENINGS
Required glazed openings shall open directly onto a street or public alley, or a yard or court located on the same lot as the building.
Exceptions:
1. Required glazed openings may face into a roofed porch where the porch abuts a street, yard or court and the longer side of the porch is at least 65 percent unobstructed and the ceiling height is not less than 7 feet (2134 mm).
2. Eave projections shall not be considered as obstructing the clear open space of a yard or court.
3. Required glazed openings may face into the area under a deck, balcony, bay or floor cantilever provided a clear vertical space at least 36 inches (914 mm) in height is provided.

R304 MINIMUM ROOM AREAS
Minimum room areas and dimensions shall comply with this section.

R305 CEILING HEIGHT
Habitable spaces, hallways, bathrooms, toilet rooms, laundry rooms and portions of basements containing these spaces shall have a ceiling height of not less than 7'.

R308 GLAZING
Except as indicated in Section 308.1.1 each pane of glazing installed in hazardous locations as defined in Section 308.4 shall be provided with a manufacturer's designation specifying who applied the designation, designating the type of glass and the safety glazing standard with which it complies, which is visible in the final installation.

R308.4 HAZARDOUS LOCATIONS
308.4.1 Glazing in Doors
308.4.2 Glazing Adjacent to Doors
308.4.3 Glazing in Windows
Glazing in an individual fixed or operable panel that meets all of the following conditions shall be considered a hazardous location:
1. The exposed area of an individual pane is larger than 9 square feet (0.836 m2);
2. The bottom edge of the glazing is less than 18 inches (457 mm) above the floor;
3. The top edge of the glazing is more than 36 inches (914 mm) above the floor; and
4. One or more walking surfaces are within 36 inches (914 mm), measured horizontally and in a straight line, of the glazing.
Some exceptions apply.
308.4.4 Glazing in Guards and Railings
308.4.5 Glazing and Wet Surfaces
308.4.6 Glazing Adjacent Stairs and Ramps
Glazing where the bottom exposed edge of the glazing is less than 36" above the plane of the adjacent walking surface of stairways, landings between flights of stairs and ramps shall be considered a hazardous location.
Some exceptions apply.
308.4.7 Glazing Adjacent to the Bottom Stair Landing
Glazing adjacent to the landing at the bottom of a stairway where the glazing is less than 36" above the landing and within 60" horizontally of the bottom tread shall be considered a hazardous location.
One exception applies.

R310 EMERGENCY ESCAPE AND RESCUE OPENINGS
Basements, habitable attics and every sleeping room shall have at least one operable emergency escape and rescue opening.
Where emergency escape and rescue openings are provided they shall have a sill height of not more than 44" A.F.F..
All emergency escape and rescue openings shall have a minimum net clear opening of 5.7 sf
Exception: Grade floor openings shall have a minimum net clear opening of 5sf
The minimum net clear opening height shall be 24".
The minimum net clear opening width shall be 20".
Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys, tools or special knowledge.

R311 MEANS OF EGRESS
All dwellings shall be provided with a means of egress as provided in this section. The means of egress shall provide a continuous and unobstructed path of vertical and horizontal egress travel from all portions of the dwelling to the exterior of the dwelling at the required egress door without requiring travel through a garage.

R311.2 EGRESS DOOR
At least one egress door shall be provided for each dwelling unit. The egress door shall be side-hinged and shall provide a minimum clear width of 32" when measured between the face of the door and the stop, with the door open 90 degrees. The minimum clear height shall be 78". Egress doors shall be readily openable from inside the dwelling unit without the use of a key or special knowledge or effort.

R311.3 FLOORS AND LANDINGS AT EXTERIOR DOORS
There shall be a landing or floor on each side of each exterior door. The width of each landing shall not be less than the door served. Every landing shall have a minimum dimension of 36 inches (914 mm) measured in the direction of travel. Exterior landings shall be permitted to have a slope not to exceed 1/4 unit vertical in 12 units horizontal (2-percent).

R311.6 HALLWAYS
The minimum width of a hallway shall be not less than 3'.

R311.7 STAIRWAYS
Stairways shall comply with this section.

R312 GUARDS AND WINDOW FALL PROTECTION
R312.1.1 Guards shall be located along open-sided walking surfaces, including stairs, ramps and landings, that are located more than 30" measured vertically to the floor or grade below.
R312.12 Required guards shall not be less than 36" high.
R312.1.3 Guard openings shall comply with this section.

R312.2 WINDOW FALL PROTECTION
In dwelling units, where the opening of an operable window is located more than 72" above the finished grade or surface below, the lowest part of the clear opening of the window shall be a minimum of 24" above the finished floor of the room in which the window is located.

R314.3 SMOKE ALARM LOCATIONS
Smoke alarms shall be installed in the following locations:
1. In each sleeping room.
2. Outside each separate sleeping area in the immediate vicinity of the bedrooms.
3. On each additional story of the dwelling, including basements and habitable attics but not including crawl spaces and uninhabitable attics. In dwellings or dwelling units with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full story below the upper level.

R315 CARBON MONOXIDE ALARMS
For new construction, an approved carbon monoxide alarm shall be installed outside of each separate sleeping area in the immediate vicinity of the bedrooms in dwelling units within which fuel-fired appliances are installed and in dwelling units that have attached garages.
Dwelling units in this project do not contain any fuel-fired appliances or attached garages, therefore carbon monoxide alarms are not required.

R316 FOAM PLASTIC
Any foam plastic use shall comply with this section.

R317 PROTECTION OF WOOD AND WOOD BASED PRODUCTS AGAINST DECAY
Protection of wood and wood based products from decay shall be provided in the following locations:
1. Wood joists or the bottom of a wood structural floor when closer than 18 inches (457 mm) or wood girders when closer than 12 inches (305 mm) to the exposed ground in crawl spaces or unexcavated area located within the periphery of the building foundation.
2. All wood framing members that rest on concrete or masonry exterior foundation walls and are less than 8 inches (203 mm) from the exposed ground.
3. Sills and sleepers on a concrete or masonry slab that is in direct contact with the ground unless separated from such slab by an impervious moisture barrier.
4. The ends of wood girders entering exterior masonry or concrete walls having clearances of less than 1/2 inch (12.7 mm) on tops, sides and ends.
5. Wood siding, sheathing and wall framing on the exterior of a building having a clearance of less than 6 inches (152 mm) from the ground or less than 2 inches (51 mm) measured vertically from concrete steps, porch slabs, patio slabs, and similar horizontal surfaces exposed to the weather.
6. Wood structural members supporting moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, unless separated from such floors or roofs by an impervious moisture barrier.
7. Wood furring strips or other wood framing members attached directly to the interior of exterior masonry walls or concrete walls below grade except where an approved vapor retarder is applied between the wall and the furring strips or framing members.

R319.1 ADDRESS NUMBERS
Buildings shall have approved address numbers, building numbers, or approved building identification placed in a position that is plainly legible and visible from teh street or road fronting the property. These numbers shall contrast with their background. Numbers shall be a minimum of 4" high with a minimum stroke width of 1/2".

COMMERCIAL BUILDING CODE REVIEW

SEE COMMUNITY BUILDING DRAWING SET FOR CODE REVIEW FOR COMMUNITY BUILDING

ACCESSIBILITY REVIEW

R320 ACCESSIBILITY
Where there are four or more dwelling units or sleeping units in a single structure, the provisions of Chapter 11 of the International Building Code for Group R-3 shall apply.

IBC CHAPTER 11, GROUP R-3
1106.2 GROUPS R-2 and R-3
At least 2%, but not less than one, of each type of parking space provided for occupancies of Groups R-2 and R-2, which are required to have Accessible, Type A or Type B dwelling or sleeping units, shall be accessible.

1107.6.3 GROUP R-3
In Group R-3 occupancies where there are four or more dwelling units or sleeping units intended to be occupied as a residence in a single structure, every dwelling unit and sleeping unit intended to be occupied as a residence shall be a Type B unit.
Exception: The number of Type B units is permitted to be reduced in accordance with Section 1107.7.

1107.7.2 MULTISTORY UNITS
A multistory dwelling or sleeping unit which is not provided with elevator service is not required to be a Type B unit. Where a multistory unit is provided with external elevator service to only one floor, the floor provided with elevator service shall be the primary entry to the unit, shall comply with the requirements for a Type B unit and a toilet facility shall be provided on that floor.

1107.2 DESIGN
Dwelling units that are required to be Accessible units, Type A units and Type B units shall comply with the applicable portions of Chapter 10 of ICC A117.1. Units required to be Type A units are permitted to be designed and constructed as Accessible units. Units required to be Type B units are permitted to be designed and constructed as Accessible units or as Type A units.

1107.3 ACCESSIBLE SPACES
Rooms and spaces available to the general public or available for use by residents and service Accessible units, Type A units or Type B units shall be accessible. Accessible spaces shall include toilet and bathing rooms, kitchen, living and dining areas and any exterior spaces, including patios, terraces and balconies.
This provision applies to the Community Building.

THIS PROJECT WILL EXCEED MINIMUM CODE-REQUIRED ACCESSIBILITY REQUIREMENTS

THIS PROJECT SHALL COMPLY WITH THE LATEST EDITION OF CODES ADOPTED THE DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD):

Uniform Federal Accessibility Standards (UFAS)
2012 International Residential Code (IRC)
2012 International Building Code (IBC) *Safe Harbor*
1998 ICC/ANSI A117.1 *Safe Harbor*

Total number of units: 85
HUD required accessible units for persons with mobility impairments (minimum 5%) = 5
HUD required units accessible for persons with hearing or vision impairments (minimum 2%) = 2
Number of accessible units for persons with mobility impairments provided: 32. Of these 32, 2 units will also provide for persons with hearing or vision impairments.
All other units are required to be Type B compliant or better.

COMPONENTS OF ACCESSIBLE UNITS (32 UNITS TOTAL)

1002.2 Primary entrance on an accessible route from public and common areas.
10002.3.1 At least one accessible route shall connect all spaces and elements that are a part of the unit.
1002.3.2 All rooms served by an accessible route shall provide a turning space complying with Section 304 (circle or T-shaped).
Exceptions:
1. A turning space shall not be required in toilet rooms and bathrooms that are not required to comply with Section 1002.11.2. (At least one facility in each dwelling unit shall comply)
2. A turning space is not required within closets or pantries that are 48" max. in depth.

1002.5 Primary entrance door to the unit and all other doorways intended for user passage shall comply with **Section 404**.
Section 404:
Clear opening width
Manuvering clearances around doors
Floor surface within manuvering clearances not steeper than 1:48
Thresholds shall be 1/2" maximum in height.
Door hardware
Door surface within 10" of floor shall be a smooth surface on the push side
1002.9 Operable Parts. Lighting controls, electrical switches and receptacle outlets, environmental controls, appliance controls, operating hardware for operable windows, plumbing fixture controls and user controls for security or intercome systems shall comply with **Section 309**.
Section 309:
A clear floor space requirement
Operable parts paced within one or more of the reach ranges specified in Section 308.
Operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts shall be 5 pounds maximum.
1002.10 Washing machines and clothes dryers shall comply with **Section 611.**
Section 611:
Clear floor space positioned for parallel approach shall be provided.
For top loading machines, the clear floor space shall be centered on the appliance.
For front loading machines, the centerline of the clear floor space shall be offset 24" maximum from the centerline of the door opening
Operable parts shall comply with Section 309.
Top loading machines shall have the door to the laundry compartment 36" maximum above the floor.
Front loading machines shall have the bottom of the opening to the laundry compartment 15" minimum and 36" maximum above the floor.
In accordance with HUD requirements, front loading accessible washing machines and clothes dryers may be required in accessible dwelling units as a reasonable accommodation for individuals with disabilities.
1002.11 At least one toilet and bathing facility shall comply with Section 1002.11.2. All other toilet and bathing facilities shall comply with **Section 1002.11.1**.
See graphic diagrams for toilet and bathing facilities within these documents
1002.12 Kitchens and kitchenettes shall comply with Section 804. At least one work surface, 30" minimum in length shall comply with **Section 902**.
See graphic diagrams for kitchens within these documents.
1002.13.1 Operable windows required to provide natural ventilation shall comply with **Sections 309.2 and 309.3**.
309.2 and 309.3:
Clear floor space provided
Operable parts within one or more of the reach ranges specified in Section 308.
1002.13.2 Operable windows required to provide an emergency escape and rescue opening shall comply with Section 309.2.
1002.14 Where storage facilities are provided, at least one of each type shall comply with **Section 905**.
Section 905:
A clear floor space shall be provided
Accessible storage elements shall comply with at least one of the reach ranges specified in Section 308.
Operable parts of storage facilities shall comply with Section 309
1002.15 In at least one sleeping area one bed shall have a clear floor space complying with Section 305 on both sides of the bed. Clear floor space shall be positioned for parallel approach to the side of the bed.
Exception: Where a single clear floor space complying with Section 305 positioned for parallel approach is provided between two beds, a clear floor space shall not be required on both sides of the bed.

SECTION 305 CLEAR FLOOR SPACE:

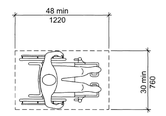


FIG. 305.3
SIZE OF CLEAR FLOOR SPACE

SECTION 308 REACH RANGES:

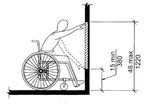
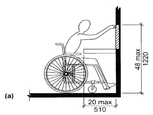


FIG. 308.2.1
UNOBSTRUCTED FORWARD REACH



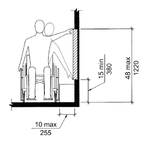


FIG. 308.3.1
UNOBSTRUCTED SIDE REACH

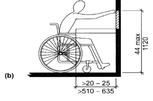


FIG. 308.2.2
OBSTRUCTED HIGH FORWARD REACH

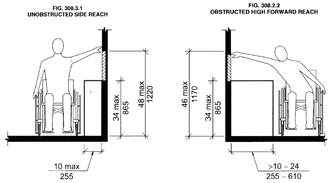


FIG. 308.3.2
OBSTRUCTED HIGH SIDE REACH

THIS PROJECT LOCATED IN: HELENA, MONTANA
CLIMATE ZONE 6

2012 IECC REQUIREMENTS
RESIDENTIAL BUILDING

TABLE R402.1.2 INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT CLIMATE ZONE 6

CEILING R-VALUE:	49
WOOD FRAME WALL R-VALUE:	21 OR 13+10
MASS WALL R-VALUE:	15/20
FLOOR R-VALUE:	30
BASEMENT WALL R-VALUE:	15/19
SLAB R-VALUE & DEPTH:	10, 4 FT
CRAWLSPACE WALL:	15/19
FENESTRATION U-FACTOR:	.32
GLAZED FENESTRATION SHGC:	NR

PROJECT INSULATION SCHEDULE

BUILDING ENVELOPE INSULATION SPECIFICATIONS

CEILING ATTIC AREA:	49
WOOD FRAME EXTERIOR WALLS:	21+5ci
MASS WALL R-VALUE:	N/A
FLOOR R-VALUE:	N/A
BASEMENT WALL R-VALUE:	N/A
SLAB R-VALUE & DEPTH:	N/A
CRAWLSPACE WALL:	15/19
FENESTRATION U-FACTOR:	.32
GLAZED FENESTRATION SHGC:	NR

IN ACCORDANCE WITH 2015 IECC, THE BUILDING SHALL BE TESTED AND VERIFIED AS HAVING AN AIR LEAKAGE RATE NOT EXCEEDING THREE AIR CHANGES PER HOUR. TESTING SHALL BE CONDUCTED IN ACCORDANCE WITH ASTM E 779 OR ASTM E 1827 AND REPORTED AT A PRESSURE OF 0.2 inch w.g. (50 Pascals). A WRITTEN REPORT OF THE RESULTS OF THE TEST SHALL BE SIGNED BY THE PARTY CONDUCTING THE TEST AND PROVIDED TO THE ARCHITECT. TESTING SHALL BE PERFORMED AT ANY TIME AFTER CREATION OF ALL PENETRATIONS OF THE BUILDING THERMAL ENVELOPE.

COMPONENTS OF ALL OTHER UNITS (NOT FULLY ACCESSIBLE, BUT EXCEEDING MINIMUM REQUIREMENTS OF TYPE B UNITS)

The following are allowances in Type B units that differ from fully accessible units and may be employed in this project.
1004.4.2 Changes in level shall comply with Section 303.
Exception: Where exterior deck, patio or balcony surface materials are impervious, the finished exterior impervious surface shall be 4" maximum below the floor level of the adjacent interior spaces of the unit.
1004.5.2.2 Thresholds at exterior sliding doors shall be permitted to be 3/4" maximum in height, provided they are beveled with a slope not steeper than 1:2.
1004.9 Operable Parts: Lighting controls, electrical switches and receptacle outlets, environmental controls, electrical panelboards and user controls for security or intercom systems shall comply with Sections 309.2 and 309.3.
Exceptions which may apply:
Where two or more receptacle outlets are provided in a kitchen above a length of countertop that is uninterrupted by a sink or appliance, one receptacle outlet shall not be required to comply with Section 309.
Within kitchens and bathrooms, lighting controls, electrical switchens and receptacle outlets are permitted to be located over cabinets with countertops 36" maximum in height and 25-1/2" maximum in depth.
1004.11.1 Grab Bar and Shower Seat Reinforcement
Reinforcement shall be provided for the future installation of grab bars and shower seats at water closets, bathtubs, and shower compartments. Where walls are located to permit the installation of grab bars and seats complying with Section 604.5 at water closets; grab bars compuying with Section 607.4 at bathtubs; and for grab bars and shower seats complying with Sections 608.3, 608.2.1.3, 608.2.2.3 and 608.2.3.2 at shower compartments; reinforcement shall be provided for the future installation of grab bars and seats complying with those requirements.
Exceptions:
1. In a room containing only a lavatory and a water closet, reinforcement is not required provided the room does not contain the only lavatory or water closet on the accessible level of the unit.
2. At water closets where wall space will not permit a grab bar complying with Section 604.5.2, reinforcement for a rear wall grab bar 24" minimum in length centered on the water closet shall be provided.
3. At water closets where a side wall is not available for a 42" grab bar complying with Section 604.5.1, reinforcement for a sidewall grab bar, 24" minimum in length, located 12" maximum from the rear wall, shall be provided.
4. At water closets where a side wall is not available for a 42" grab bar complying with Section 604.5.1 reinforcement for a swing-up grab bar complying with Section 1004.11.1.1 shall be permitted.
5. At water closets where a side wall is not available for a 42" grab bar complying with Section 604.5.1 reinforcement for two swing-up grab bars complying with Section 1004.11.1.1 shall be permitted to be installed in lieu of reinforcement for rear wall and side wall grab bars.
6. In shower compartments larger than 36" in width and 36" in depth, reinforcement for a shower seat is not required.

1004.11.3.1.1 Lavatory
A clear floor space complying with Section 305.3 positioned for a parallel approach shall be provided at a lavatory. The clear floor space shall be centered on the lavatory.
Exception: A lavatory complying with Section 606 shall be permitted. Cabinetry shall be permitted under the lavatory provided the following criteria are met:
a) The cabinetry can be removed without removal or replacement of the lavatory; and
b) The floor finish extends under the cabinetry; and
c) The walls behind the surrounding the cabinetry are finished.

1004.11.3.1.2 Water Closets are allowed reduced clearances in this section.
1004.11.3.2.1 Lavatories shall still be at a maximum 34" height.

PROVISIONS FOR UNITS WITH ACCESSIBLE COMMUNICATIONS FEATURES (2 UNITS TOTAL)

809.5.2 Residential dwelling unit smoke detection systems shall comply with NFPA 72 (1999 or 2002 edition)
809.5.2.1 All visible alarm appliances provided within the residential dwelling unit for smoke detection notification shall be actived upon smoke detection.
809.5.3 The same visible alarm appliances shall be permitted to provide notification of residential dwelling unit smoke detection and building fire alarm activiation.
809.5.4 Visible alarm appliances used to indicate residential dwelling unit smoke detection or building fire alarm activation shall not be used for any other purpose within the residential dwelling unit.
809.5.5.1 A hard-wired electric doorbell shall be provided. A button or switch shall be provided outside the residential dwelling unit primary entrance. Activation of the button or switch shall initiate an audible tone and visible signal within the residential dwelling unit. Where visible doorbell signals are located in sleeping areas, they shall have controls to deactivate the signal.
809.5.5.2 A means for visually identifying a visitor without opening the residential dwelling unit entry door shall be provided and shall allow for a minimum 180 degree range of view.

APPLICABLE BUILDING CODES

THIS PROJECT SHALL COMPLY WITH THE LATEST EDITION OF CODES ADOPTED BY THE STATE OF MONTANA AND THE CITY OF HELENA:

2012 International Building Code (IBC)
2012 International Residential Code (IRC)
2012 International Mechanical Code (IMC)
2012 International Fuel Gas Code (IFGC)
2012 Uniform Plumbing Code (UPC)
2014 National Electrical Code (NEC) NFPA 70
2012 International Fire Code (IFC)
2012 International Energy Conservation Code (IECC)

CITY STAMP

DATE STAMP: 5/9/2019 10:06:51 AM

#	DATE	REVISION

mosaic
architecture-planning-design
428 N. Last Chance Gulch
Helena, Montana
59601
406.449.2013phone
406.449.2036fax
www.mosaicarch.com

RED ALDER HOUSING

Project Address

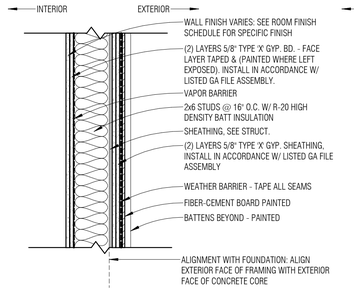
CODE REVIEW

DATE: 05/08/2019

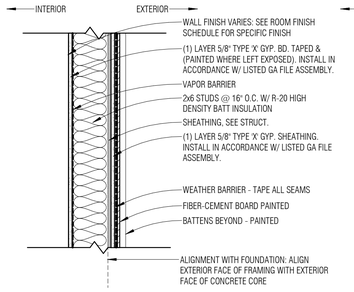
DD_NOT FOR CONSTRUCTION

SHEET: G003

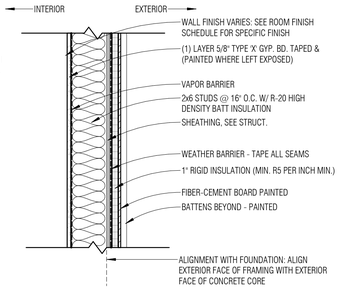
EXTERIOR WALL ASSEMBLIES



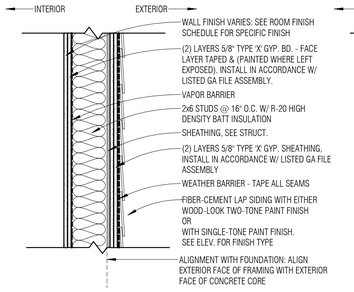
e1 **BOARD & BATTEN SIDING - 2HR FIRE RATING**
GA FILE NO. WP 8415



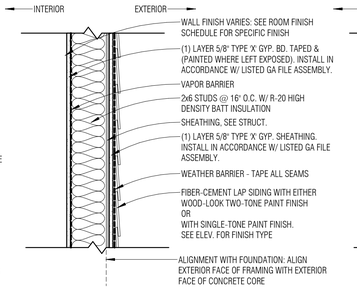
e2 **BOARD & BATTEN SIDING - 1HR FIRE RATING**
GA FILE NO. WP 8105



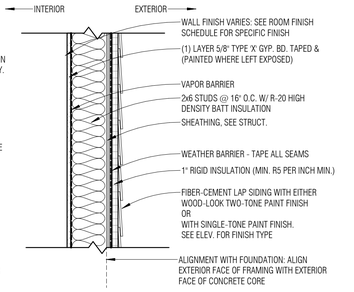
e3 **BOARD & BATTEN SIDING - NO FIRE RATING**



e4 **LAP SIDING - 2HR FIRE RATING**
GA FILE NO. WP 8415



e5 **LAP SIDING - 1HR FIRE RATING**
GA FILE NO. WP 8105

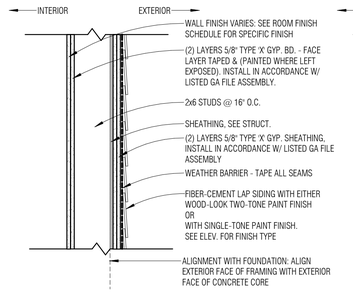


e6 **LAP SIDING - NO FIRE RATING**

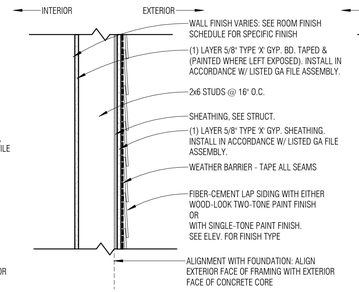
FOR ALL EXTERIOR WALL ASSEMBLIES

* SEE STRUCTURAL FOR ADDITIONAL INFORMATION FOR ALL WALL TYPES

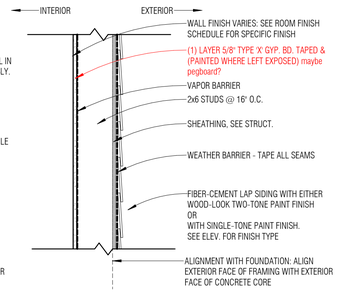
EXTERIOR WALLS WITH WOOD SHEATHING MUST BE FIRE BLOCKED AT 10'-0" INTERVALS HORIZONTAL AND VERTICAL.



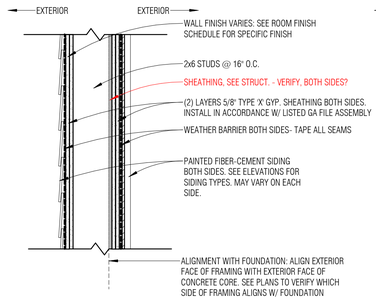
e7 **LAP SIDING - 2HR FIRE RATING - UNINSULATED**
GA FILE NO. WP 8415



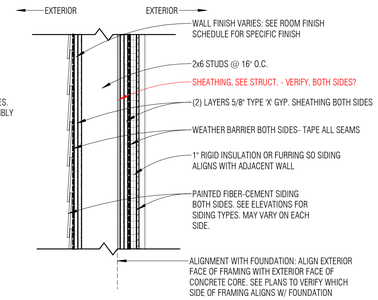
e8 **LAP SIDING - 1HR FIRE RATING - UNINSULATED**
GA FILE NO. WP 8105



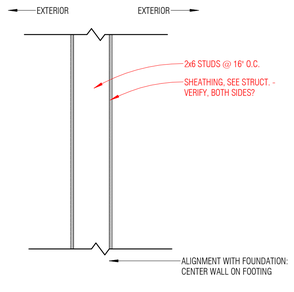
e9 **LAP SIDING - NO FIRE RATING - UNINSULATED**



e10 **SIDING BOTH SIDES - 2HR FIRE RATING - UNINSULATED**
GA FILE NO. WP 8415



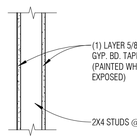
e11 **SIDING BOTH SIDES - NO FIRE RATING - EXT. INSUL. ONLY ONE SIDE**



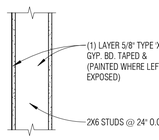
e12 **CRAWLSPACE PONY WALL**

INTERIOR WALL ASSEMBLIES

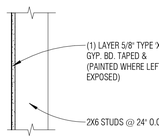
GENERAL NOTES:
1. SEE ACOUSTIC BATT PLAN FOR LOCATIONS OF ACOUSTICAL INSULATION
2. SEE SHEAR PANEL PLAN FOR DESIGNATED SIDE OF INSTALLATION OF SHEAR WALL PANEL
3. SEE STRUCTURAL FOR SHEAR WALL PANEL & FASTENING REQUIREMENTS.
4. ADD 1/2" PLYWOOD SHEATHING TO BOTH SIDES OF WALLS THAT ARE PARTIAL HEIGHT AND DO NOT REACH THE ROOF STRUCTURE ABOVE.
5. WALL ASSEMBLIES DO NOT SHOW FINISHES. SEE FINISH SCHEDULES AND ELEVATION VIEWS FOR COMPLETE DESCRIPTION AND EXTENT OF FINISHES.



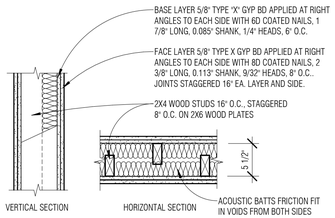
i1 2x4 STUD PARTITION WALL



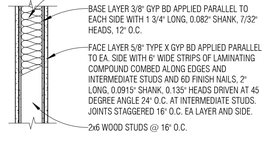
i2 2x6 STUD PARTITION WALL



i3 2x6 STUD FUR WALL

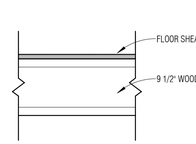


i4_R **TYPICAL TOWNHOUSE COMMON WALL**
GA FILE NO. WP 3910
2-HOUR FIRE-RATED
50-54 STC SOUND-RATED

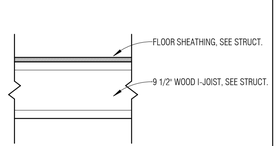


i5_R **TYPICAL DUPLEX COMMON WALL**
GA FILE NO. WP 3360
1-HOUR FIRE-RATED
45-49 FSTC SOUND-RATED

FLOOR ASSEMBLIES

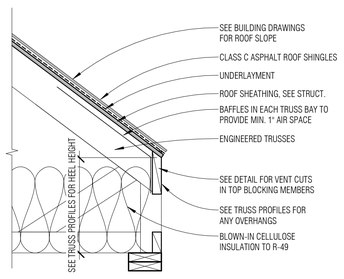


FA1 MAIN FLOOR ASSEMBLY

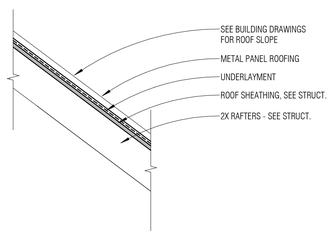


FA2 2ND LEVEL FLOOR ASSEMBLY

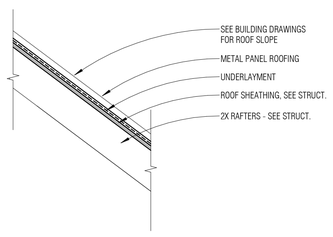
ROOF ASSEMBLIES



RA-1 TYPICAL BUILDING ROOF ASSEMBLY



RA-2 TYPICAL CANOPY ROOF ASSEMBLY



RA-3 TYPICAL CANOPY ROOF ASSEMBLY

CITY STAMP

DATE REVISION

DD_NOT FOR CONSTRUCTION

mosaic
architecture-planning-design
428 N. Last Chance Gulch
Helena, Montana
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RED ALDER HOUSING

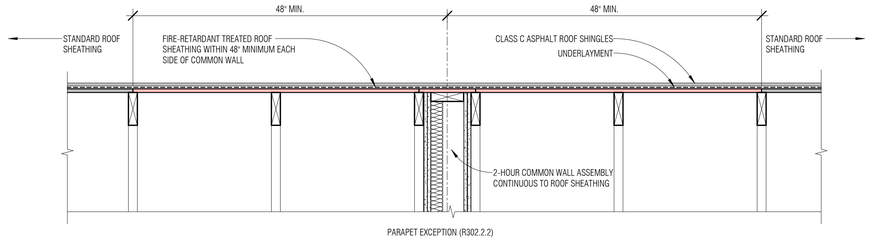
Project Address

TYPICAL ASSEMBLIES

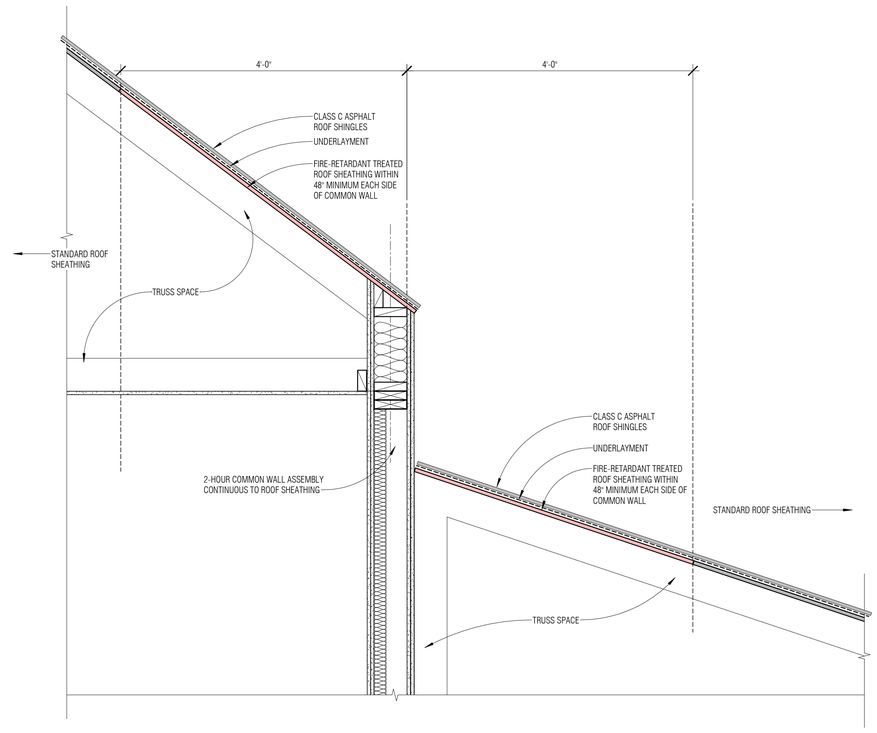
DATE: 05/08/2019

SHEET: G010

DATE STAMP: 5/8/2019 10:06:52 AM



PARAPET EXCEPTION (R302.2.2)



1 **07 RF-TYP. ROOF DETAILS**
1" = 1'-0"

CITY STAMP

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#	DATE	REVISION

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RED ALDER HOUSING

Project Address

TYPICAL DETAILS

DATE: 05/08/2019

SHEET: G011

DATE STAMP: 5/9/2019 10:06:53 AM

BUILDING D_DOOR TOTALS

BUILDING A DOOR TYPES	COUNT	HEIGHT	WIDTH	THICKNESS	HRDWR GROUP	COMMENTS
BATHROOM DOOR	16	6'-8"	3'-0"	1 3/8"		
BEDROOM DOOR	24	6'-8"	3'-0"	1 3/8"		
EXTERIOR STORAGE DOOR	8	6'-8"	3'-0"	1 3/8"		
FRONT ENTRY DOOR	16	6'-8"	3'-0"	1 3/8"		Safety Glass
INTERIOR STORAGE DOOR	8	6'-8"	3'-0"	1 3/8"		
LAUNDRY CLOSET DOOR	8	6'-8"	5'-0"	1 3/8"		
MECH. RM DOOR 2	16	6'-8"	2'-6"	1 3/8"		
SIDE OR REAR ENTRY DOOR 2' LITE	8	6'-8"	5'-0"	3"		Safety Glass
SIDE OR REAR ENTRY DOOR 3' LITE	8	6'-8"	6'-0"	1 3/4"		Safety Glass
TRIMMED 4' OPENING	16	6'-8"	4'-0"			
TRIMMED 6' OPENING	8	6'-8"	6'-0"			
Grand total: 136	136					

BUILDING A_DOOR TOTALS

BUILDING A DOOR TYPES	COUNT	HEIGHT	WIDTH	THICKNESS	HRDWR GROUP	COMMENTS
BATHROOM DOOR	12	6'-8"	3'-0"	1 3/8"		
BEDROOM DOOR	18	6'-8"	3'-0"	1 3/8"		
EXTERIOR STORAGE DOOR	12	6'-8"	3'-0"	1 3/8"		
FRONT ENTRY DOOR	12	6'-8"	3'-0"	1 3/8"		Safety Glass
LAUNDRY CLOSET DOOR	12	6'-8"	5'-0"	1 3/8"		
MECH. RM DOOR 2	12	6'-8"	2'-6"	1 3/8"		
SIDE OR REAR ENTRY DOOR 3' LITE	12	6'-8"	6'-0"	1 3/4"		Safety Glass
TRIMMED 4' OPENING	6	6'-8"	4'-0"			
TRIMMED 5' OPENING	6	6'-8"	5'-0"			
TRIMMED 6' OPENING	6	6'-8"	6'-0"			
Grand total: 108	108					

BUILDING E_DOOR TOTALS

BUILDING A DOOR TYPES	COUNT	HEIGHT	WIDTH	THICKNESS	HRDWR GROUP	COMMENTS
BATHROOM DOOR	30	6'-8"	3'-0"	1 3/8"		
BEDROOM DOOR	40	6'-8"	3'-0"	1 3/8"		
EXTERIOR STORAGE DOOR	10	6'-8"	3'-0"	1 3/8"		
FRONT ENTRY DOOR	20	6'-8"	3'-0"	1 3/8"		Safety Glass
INTERIOR STORAGE DOOR	10	6'-8"	3'-0"	1 3/8"		
LAUNDRY CLOSET DOOR	10	6'-8"	5'-0"	1 3/8"		
MECH. RM DOOR	10	6'-8"	3'-0"	1 3/8"		
MECH. RM DOOR 2	10	6'-8"	2'-6"	1 3/8"		
SIDE OR REAR ENTRY DOOR 2' LITE	10	6'-8"	5'-0"	3"		Safety Glass
SIDE OR REAR ENTRY DOOR 3' LITE	10	6'-8"	6'-0"	1 3/4"		Safety Glass
TRIMMED 4' OPENING	40	6'-8"	4'-0"			
Grand total: 200	200					

BUILDING B_DOOR TOTALS

BUILDING A DOOR TYPES	COUNT	HEIGHT	WIDTH	THICKNESS	HRDWR GROUP	COMMENTS
BATHROOM DOOR	9	6'-8"	3'-0"	1 3/8"		
BEDROOM DOOR	18	6'-8"	3'-0"	1 3/8"		
EXTERIOR STORAGE DOOR	9	6'-8"	3'-0"	1 3/8"		
FRONT ENTRY DOOR	9	6'-8"	3'-0"	1 3/8"		Safety Glass
LAUNDRY CLOSET DOOR	9	6'-8"	5'-0"	1 3/8"		
MECH. RM DOOR 2	9	6'-8"	2'-6"	1 3/8"		
SIDE OR REAR ENTRY DOOR 2' LITE	3	6'-8"	5'-0"	1 3/4"		
SIDE OR REAR ENTRY DOOR 3' LITE	6	6'-8"	6'-0"	1 3/4"		Safety Glass
TRIMMED 4' OPENING	9	6'-8"	4'-0"			
TRIMMED 5' OPENING	9	6'-8"	5'-0"			
Grand total: 90	90					

BUILDING F_DOOR TOTALS

BUILDING A DOOR TYPES	COUNT	HEIGHT	WIDTH	THICKNESS	HRDWR GROUP	COMMENTS
BATHROOM DOOR	20	6'-8"	3'-0"	1 3/8"		
BEDROOM DOOR	28	6'-8"	3'-0"	1 3/8"		
EXTERIOR STORAGE DOOR	4	6'-8"	3'-0"	1 3/8"		
EXTERIOR STORAGE DOOR (W)	4	6'-8"	3'-0"	1 3/4"		
FRONT ENTRY DOOR	16	6'-8"	3'-0"	1 3/8"		Safety Glass
INTERIOR STORAGE DOOR	8	6'-8"	3'-0"	1 3/8"		
LAUNDRY CLOSET DOOR	8	6'-8"	5'-0"	1 3/8"		
MECH. RM DOOR	4	6'-8"	3'-0"	1 3/8"		
MECH. RM DOOR 2	12	6'-8"	2'-6"	1 3/8"		
SIDE OR REAR ENTRY DOOR 2' LITE	8	6'-8"	5'-0"	3"		Safety Glass
SIDE OR REAR ENTRY DOOR 3' LITE	8	6'-8"	6'-0"	1 3/4"		Safety Glass
TRIMMED 4' OPENING	12	6'-8"	4'-0"			
TRIMMED 5' OPENING	8	6'-8"	5'-0"			
TRIMMED 6' OPENING	8	6'-8"	6'-0"			
Grand total: 148	148					

BUILDING C_DOOR TOTALS

BUILDING A DOOR TYPES	COUNT	HEIGHT	WIDTH	THICKNESS	HRDWR GROUP	COMMENTS
BATHROOM DOOR	12	6'-8"	3'-0"	1 3/8"		
BEDROOM DOOR	16	6'-8"	3'-0"	1 3/8"		
EXTERIOR STORAGE DOOR	12	6'-8"	3'-0"	1 3/8"		
FRONT ENTRY DOOR	12	6'-8"	3'-0"	1 3/8"		Safety Glass
LAUNDRY CLOSET DOOR	12	6'-8"	5'-0"	1 3/8"		
MECH. RM DOOR 2	12	6'-8"	2'-6"	1 3/8"		
SIDE OR REAR ENTRY DOOR 3' LITE	12	6'-8"	6'-0"	1 3/4"		Safety Glass
TRIMMED 4' OPENING	8	6'-8"	4'-0"			
TRIMMED 6' OPENING	8	6'-8"	6'-0"			
Grand total: 104	104					

DOOR SCHEDULE_TOTALS

Type	Count	Height	Width	Thickness	Door Hardware Group	Comments
36" x 80"	1	6'-8"	3'-0"	1 3/8"		
36" x 84"	4	7'-0"	3'-0"	1 3/4"		
92x92	1	7'-0"	7'-0"			
96 x 96	2	8'-0"	8'-0"	2"		
BATHROOM DOOR	100	6'-8"	3'-0"	1 3/8"		
BEDROOM DOOR	144	6'-8"	3'-0"	1 3/8"		
EXTERIOR STORAGE DOOR	55	6'-8"	3'-0"	1 3/8"		
EXTERIOR STORAGE DOOR (W)	4	6'-8"	3'-0"	1 3/4"		
FRONT ENTRY DOOR	85	6'-8"	3'-0"	1 3/8"		Safety Glass
INTERIOR STORAGE DOOR	26	6'-8"	3'-0"	1 3/8"		
LAUNDRY CLOSET DOOR	59	6'-8"	5'-0"	1 3/8"		
MECH. RM DOOR	14	6'-8"	3'-0"	1 3/8"		
MECH. RM DOOR 2	71	6'-8"	2'-6"	1 3/8"		
SIDE OR REAR ENTRY DOOR 2' LITE	29	6'-8"	5'-0"			
SIDE OR REAR ENTRY DOOR 3' LITE	57	6'-8"	6'-0"	1 3/4"		
SIDE OR REAR ENTRY DOOR SNGL	1	6'-8"	3'-0"	1 3/8"		
TRIMMED 4' OPENING	91	6'-8"	4'-0"			
TRIMMED 5' OPENING	23	6'-8"	5'-0"			
TRIMMED 6' OPENING	30	6'-8"	6'-0"			
Grand total: 797	797					

WINDOW SCHEDULE_TOTALS

TYPE MARK	Type	COUNT	HEIGHT	WIDTH	HEAD HEIGHT	COMMENTS
24	36" x 36" 2	1	3'-0"	3'-0"	14'-0"	
a	30"x30"	4	2'-6"	2'-6"	6'-8"	
A-W1	W1	24	5'-0"	5'-4"	6'-8"	
A-W2	W2	24	5'-0"	3'-0"	6'-8"	
A-W3	W3	6	2'-0"	2'-0"	6'-0"	
A-W5	W5	6	2'-6"	2'-6"	6'-2"	
B-W1	W1	21	5'-0"	5'-4"	6'-8"	
B-W2	W2	15	5'-0"	3'-0"	6'-8"	
B-W3	W3	9	2'-0"	2'-0"	6'-0"	
B-W5	W5	3	2'-6"	2'-6"	6'-2"	
C-W1	W1	28	5'-0"	5'-4"	6'-8"	
C-W2	W2	8	5'-0"	3'-0"	6'-8"	
C-W3	W3	4	2'-0"	2'-0"	6'-0"	
C-W5	W5	8	2'-6"	2'-6"	6'-2"	
D-W1	W1	40	5'-0"	5'-4"	6'-8"	
D-W3	W3	8	2'-0"	2'-0"		
D-W5	W5	16	2'-6"	2'-6"	6'-2"	
E-W1	W1	60	5'-0"	5'-4"		
E-W3	W3	30	2'-0"	2'-0"	7'-10"	
E-W4	W4	10	6'-0"	2'-0"	6'-8"	
E-W5	W5	10	2'-6"	2'-6"	6'-0"	
F-W1	W1	44	5'-0"	5'-4"	6'-8"	
F-W2	W2	8	5'-0"	3'-0"	6'-8"	
F-W3	W3	4	2'-0"	2'-0"	6'-0"	
F-W4	W4	4	6'-0"	2'-0"	6'-8"	
F-W5	W5	8	2'-6"	2'-6"	6'-8"	
W1	W1	4	5'-0"	5'-4"		
W3	24" x 24"	1	2'-0"	2'-0"	11'-4"	
W4	24" x 60"	4	5'-0"	2'-0"	6'-8"	
W5	W5	5	2'-6"	2'-6"	6'-8"	
W6	W2	8	5'-0"	3'-0"	6'-8"	
X-L1	L1	1	2'-0"	2'-6"	3'-6"	
X-W1	W1	1	5'-0"	5'-4"	6'-8"	
X-W2	W2	1	5'-0"	3'-0"	6'-8"	
X-W3	W3	1	2'-0"	2'-0"	6'-0"	
X-W4	W4	1	6'-0"	2'-0"	6'-8"	
X-W5	W5	1	2'-6"	2'-6"	6'-2"	
Grand total: 431						

BUILDING A_WINDOW TOTALS

Type	COUNT	HEIGHT	WIDTH	HEAD HEIGHT	COMMENTS
W1	24	5'-0"	5'-4"	6'-8"	
W2	24	5'-0"	3'-0"	6'-8"	
W3	6	2'-0"	2'-0"	6'-0"	
W5	6	2'-6"	2'-6"	6'-2"	
Grand total: 60					

BUILDING B_WINDOW TOTALS

Type	COUNT	HEIGHT	WIDTH	HEAD HEIGHT	COMMENTS
W1	21	5'-0"	5'-4"	6'-8"	
W2	15	5'-0"	3'-0"	6'-8"	
W3	9	2'-0"	2'-0"	6'-0"	
W5	3	2'-6"	2'-6"	6'-2"	
Grand total: 48					

BUILDING C_WINDOW TOTALS

Type	COUNT	HEIGHT	WIDTH	HEAD HEIGHT	COMMENTS
W1	28	5'-0"	5'-4"	6'-8"	
W2	8	5'-0"	3'-0"	6'-8"	
W3	4	2'-0"	2'-0"	6'-0"	
W5	8	2'-6"	2'-6"	6'-2"	
Grand total: 48					

BUILDING D_WINDOW TOTALS

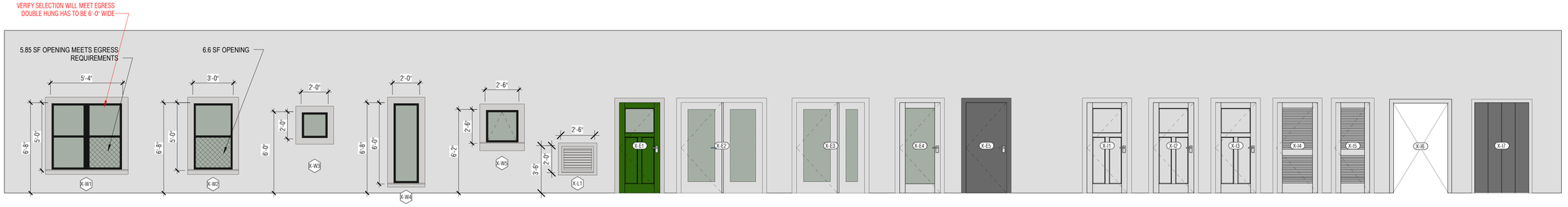
Type	COUNT	HEIGHT	WIDTH	HEAD HEIGHT	COMMENTS
W1	40	5'-0"	5'-4"	6'-8"	
W3	8	2'-0"	2'-0"		
W5	16	2'-6"	2'-6"	6'-2"	
Grand total: 64					

BUILDING E_WINDOW TOTALS

Type	COUNT	HEIGHT	WIDTH	HEAD HEIGHT	COMMENTS
W1	60	5'-0"	5'-4"		
W3	30	2'-0"	2'-0"	7'-10"	
W4	10	6'-0"	2'-0"	6'-8"	
W5	10	2'-6"	2'-6"	6'-0"	
Grand total: 110					

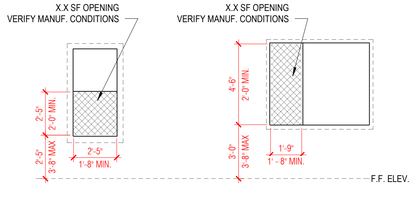
BUILDING F_WINDOW TOTALS

Type	COUNT	HEIGHT	WIDTH	HEAD HEIGHT	COMMENTS
W1	44	5'-0"	5'-4"	6'-8"	
W2	8	5'-0"	3'-0"	6'-8"	
W3	4	2'-0"	2'-0"	6'-0"	
W4	4	6'-0"	2'-0"	6'-8"	
W5	8	2'-6"	2'-6"	6'-8"	
Grand total: 68					



1 **WINDOW & DOORS TYPES**
1/4" = 1'-0"

UPDATE ELEVATIONS FOR FINAL EGRESS WINDOW TYPES



MEANS OF EGRESS - WINDOWS: REF. IRC R310:

1. MINIMUM OPENING AREA: 5.7 SF
2. 24" MIN. CLR. HEIGHT
3. 20" MIN. CLR. WIDTH
4. BOTTOM OF EMERGENCY ESCAPE CLEAR OPENING 44" MAX.

NOTE: CONTRACTOR SHALL VIF AND SUBMIT WINDOW SYSTEMS INCLUDING EGRESS DATA ABOVE FOR REVIEW BY ARCHITECT.

DATE STAMP: 5/8/2019 10:07:23 AM

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DATE REVISION

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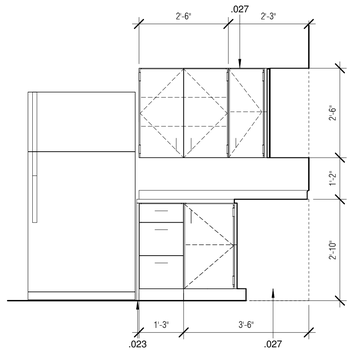
RED ALDER HOUSING

Project Address

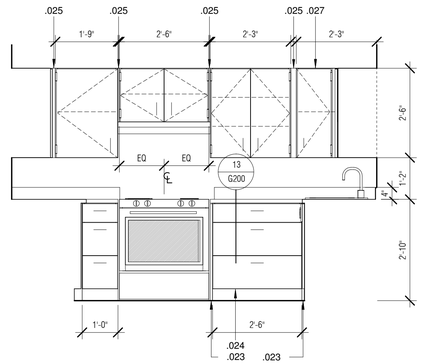
WINDOW AND DOOR TYPES

DATE: 05/08/2019

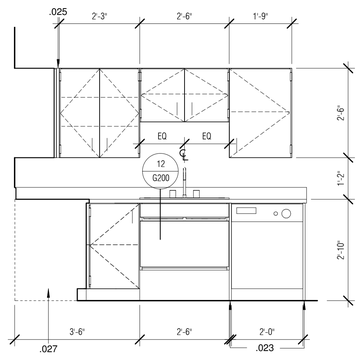
SHEET: G013



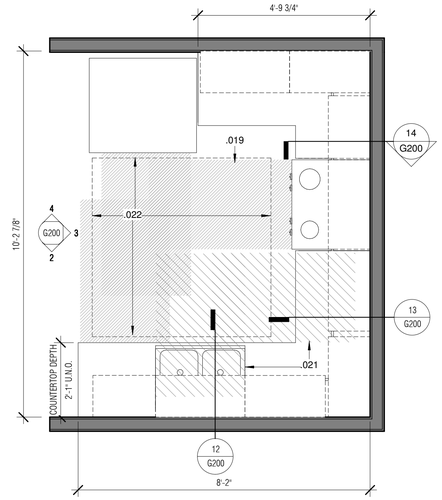
4 TYPE U ADA - ELEVATION @ FRIDGE
1/2" = 1'-0"



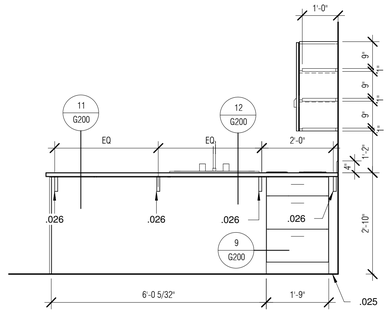
3 TYPE U ADA - ELEVATION @ STOVE
1/2" = 1'-0"



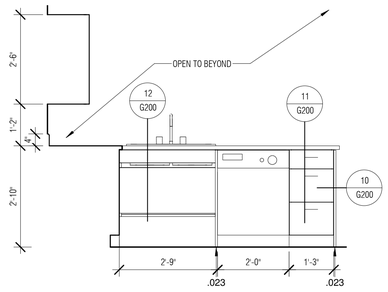
2 TYPE U ADA - ELEVATION @ SINK
1/2" = 1'-0"



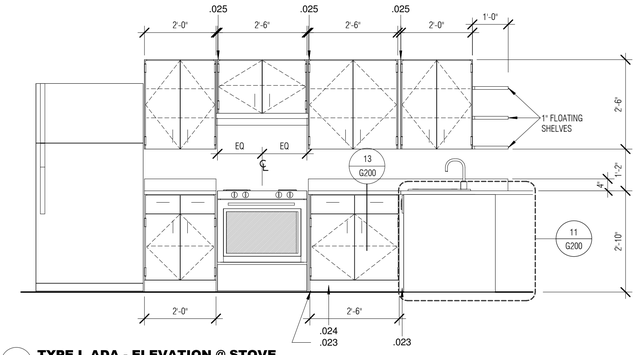
1 KITCHEN TYPE U ADA - ENLARGED PLAN
1/2" = 1'-0"



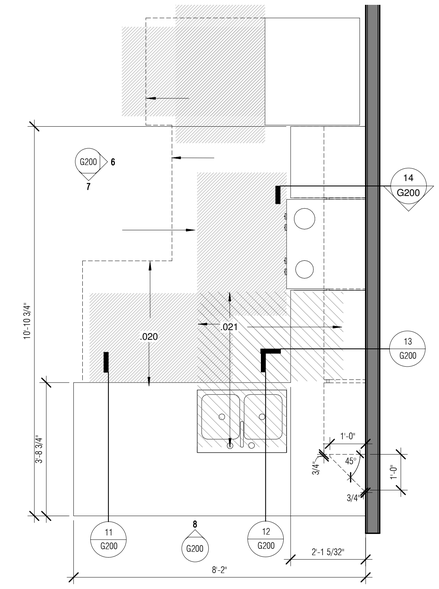
8 TYPE L ADA - ELEVATION @ SEATING
1/2" = 1'-0"



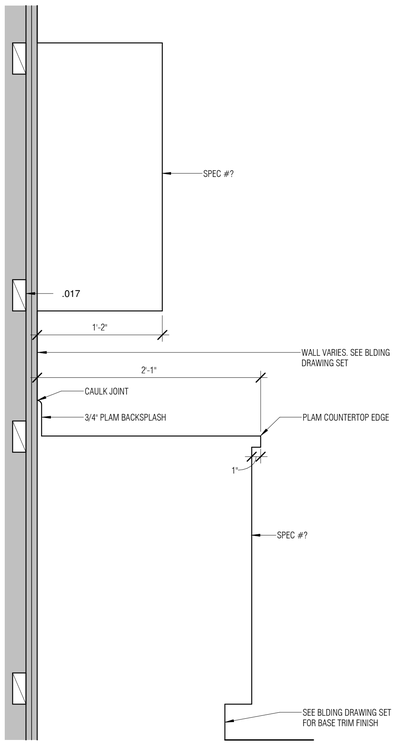
7 TYPE L ADA - ELEVATION @ SINK
1/2" = 1'-0"



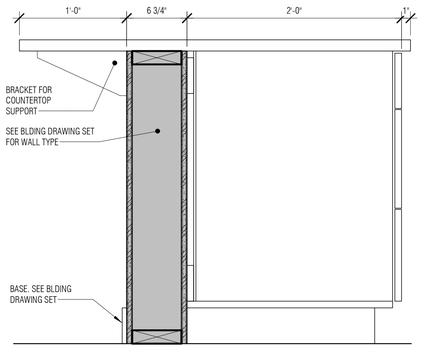
6 TYPE L ADA - ELEVATION @ STOVE
1/2" = 1'-0"



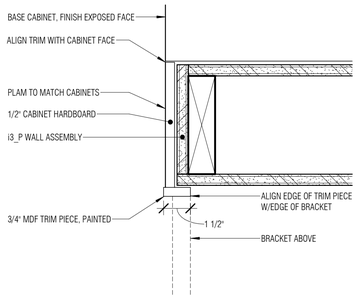
5 KITCHEN TYPE L ADA - ENLARGED PLAN
1/2" = 1'-0"



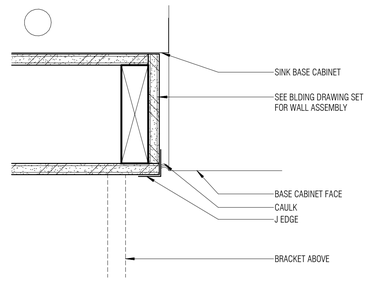
14 KITCHEN BASE & UPPERS, TYP
1 1/2" = 1'-0"



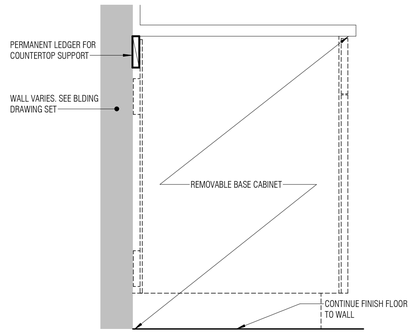
11 KITCHEN PENISULA SECTION
1 1/2" = 1'-0"



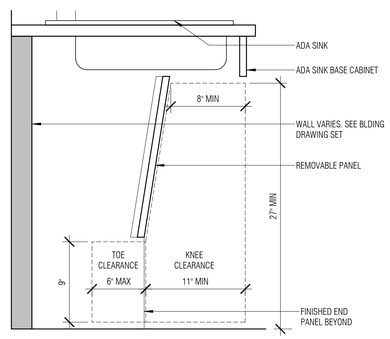
10 KITCHEN PLAN DETAIL @ LOW WALL EDGE
3" = 1'-0"



9 KITCHEN PLAN DETAIL - LOW WALL @ CABINET
3" = 1'-0"



13 WORK SURFACE SECTION
1 1/2" = 1'-0"



12 TOE & KNEE CLEARANCE @ SINK
1 1/2" = 1'-0"

GENERAL KITCHEN NOTES

1. WOOD GRAIN FINISH PANEL ON ALL EXPOSED CABINET SURFACES.
2. ALL KITCHEN COUNTERTOP TO BE 1 1/2" PLAM LAMINATED WATERFALL EDGE W/TOP MOUNTED PLAM BACKSPLASH 3/4" X 3 1/2"

DRAWING NOTE LEGEND

.017	BLOCKING TO BE INSTALLED PER MANUFACTURER'S RECOMMENDATION
.019	CLEAR FLOOR SPACE SHALL BE 48" X 30" MIN. AT ALL KITCHEN APPLIANCES UNLESS OTHERWISE SPECIFIED, THE CLEAR FLOOR SPACE SHALL BE POSITIONED FOR EITHER FORWARD OR PARALLEL APPROACH TO AN ELEMENT PER ICCA117.1.2009 SECTION 305
.020	PASS THROUGH KITCHEN SHALL MAINTAIN 40" CLEARANCES AT MINIMUM PER ICCA117.1.2009 SECTION 804
.021	REQUIRED 48" X 30" CLEAR SPACE FOR FRONT SINK AND WORK SURFACE SHALL BE FRONT APPROACH. CLEAR SPACE MAY INCLUDE UNDER-PROJECTION SURFACE UP TO 19" PER UFAS SECTION 4.34.6.5
.022	U STYLE KITCHEN SHALL MAINTAIN 60" CLEARANCE AT MINIMUM PER ICCA117.1.2009 SECTION 804
.023	FIXED FINISHED END PANEL FOR COUNTERTOP SUPPORT
.024	REMOVABLE BASE CABINET. WHEN REMOVED, ALL ADJACENT SURFACES TO HAVE FINISHED SURFACES NO ABRASIVE CORNERS.
.025	CABINET FILLER STRIP
.026	BRACKET FOR COUNTERTOP SUPPORT
.027	BLIND CORNER CABINET

CITY STAMP

DATE REVISION

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RED ALDER HOUSING

Project Address

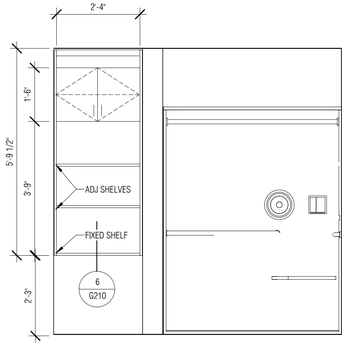
KITCHEN TYPES - ENLARGED PLANS & ELEVATIONS

DATE: 05/08/2019

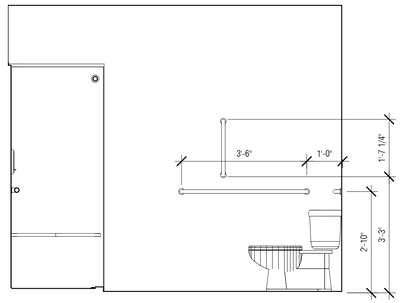
SHEET: G200

DD_NOT FOR CONSTRUCTION

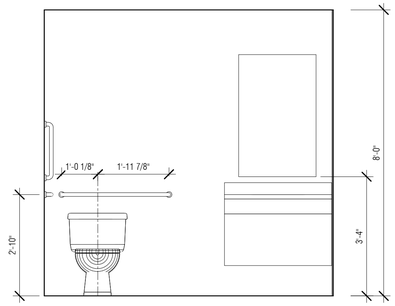
DATE STAMP: 5/9/2019 10:07:26 AM



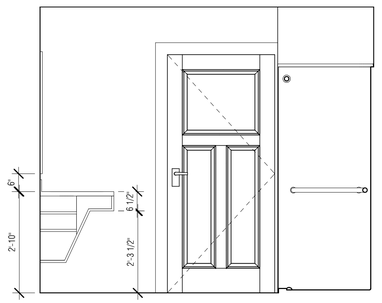
2 ELEVATION @ TUB
1/2" = 1'-0"



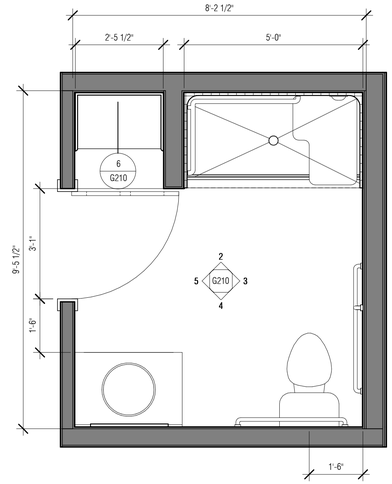
3 ELEVATION GRAB BARS
1/2" = 1'-0"



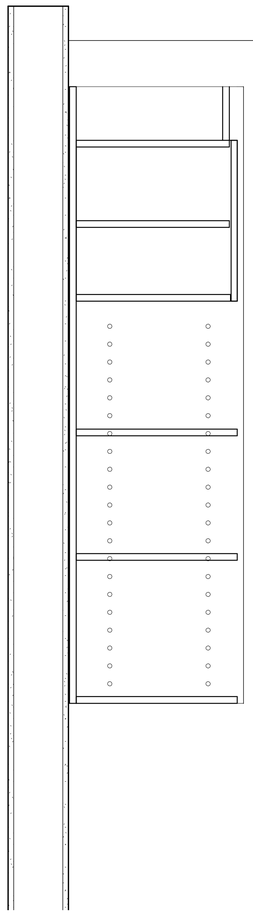
4 ELEVATION @ TOILET
1/2" = 1'-0"



5 ELEVATION @ DOOR
1/2" = 1'-0"



1 BATHROOM ENLARGED PLAN
1/2" = 1'-0"



6 BATHROOM CABINET DETAIL
1 1/2" = 1'-0"

DRAWING NOTE LEGEND

DATE STAMP: 5/8/2019 10:07:29 AM

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BATHROOM ADA

DATE: 05/08/2019

SHEET: G210

1 **SITE PLAN- DD OVERALL**
1" = 40'-0"

DRAWING NOTE LEGEND

LEGEND

- A: DUPLEX (1) 1-BEDROOM UNIT, (1) 2-BEDROOM UNIT
- B: TRIPLEX (3) 2-BEDROOM UNITS
- C: TRIPLEX (2) 1-BEDROOM UNITS, (1) 2-BEDROOM UNIT
- D: 4-PLEX (2) 1-BEDROOM UNITS, (2) 2-BEDROOM UNIT
- E: 4-PLEX (2) 1-BEDROOM UNITS, (2) 3-BEDROOM UNITS
- F: 4-PLEX (2) 1-BEDROOM UNITS, (1) 2-BEDROOM UNIT, (1) 3-BEDROOM UNIT

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OVERALL SITE PLAN

DATE: 05/08/2019

SHEET: A110

RED ALDER RESIDENCE
TOTAL UNITS: 85
1-BEDROOM UNITS: 40
2-BEDROOM UNITS: 31
3-BEDROOM UNITS: 14

ACCESSIBILITY GOALS:
1-BEDROOM UNITS: 50%
2-BEDROOM UNITS: 20%
3-BEDROOM UNITS: 20%

ACCESSIBLE UNITS
TOTAL UNITS: 32
1-BEDROOM UNITS: 20 (50%)
2-BEDROOM UNITS: 8 (25.8%)
3-BEDROOM UNITS: 4 (28.5%)

4% PROJECT
TOTAL UNITS: 48 (11_A)
1-BEDROOM UNITS: 20 (6_A)
2-BEDROOM UNITS: 18 (3_A)
3-BEDROOM UNITS: 10 (2_A)
TOTAL BUILDINGS: 14
A: 2 A-A: 0 B: 3 C: 1
D: 2 E: 4 F: 2

9% PROJECT
TOTAL UNITS: 37 (21_A)
1-BEDROOM UNITS: 20 (14_A)
2-BEDROOM UNITS: 13 (5_A)
3-BEDROOM UNITS: 4 (2_A)
TOTAL BUILDINGS: 12
A: 0 A-A: 4 B: 0 C: 3
D: 2 E: 1 F:2

LEGEND

- **A: DUPLEX (1) 1-BEDROOM UNIT, (1) 2-BEDROOM UNIT**
- **A-A: DUPLEX (1) 1-BEDROOM UNIT_A, (1) 2-BEDROOM UNIT**
- **B: TRIPLEX (3) 2-BEDROOM UNITS**
- **C: TRIPLEX (2) 1-BEDROOM UNITS_A, (1) 2-BEDROOM UNIT_A**
- **D: 4-PLEX (2) 1-BEDROOM UNITS, (2) 2-BEDROOM UNIT**
- **E: 4-PLEX (2) 1-BEDROOM UNITS, (2) 3-BEDROOM UNITS**
- **F: 4-PLEX (2) 1-BEDROOM UNITS_A, (1) 2-BEDROOM UNIT_A, (1) 3-BEDROOM UNIT_A**

_A = ACCESSIBLE UNIT

PARKING

TOTAL PARKING SPOTS: 131
TOTAL ADA SPOTS: 25

1 **SITE PLAN- SD INGRESS,EGRESS, PARKING**
1" = 40'-0"

APPLICABLE BUILDING CODES

THIS PROJECT SHALL COMPLY WITH THE LATEST EDITION OF CODES ADOPTED THE DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD):

Uniform Federal Accessibility Standards (UFAS)
2012 International Residental Code (IRC)
2012 International Building Code (IBC) Safe Harbor
1998 ICC/ANSI A117.1 Safe Harbor

2012 International Residential Code (IRC)
R320.1 Scope. Where there are four or more dwelling units or sleeping units in a single structure, the provisions of Chapther 11 of the International Building Code for Group R-3 shall apply. Chapter 11 states 100% of dwelling units in Group R-3 to be Type B units.

Accessibility standards for project exceed these standards.
Number of accessible units: 32

PARKING:
Total Parking Spaces Provided: 131 spots
Reqd min. number of accessible spaces: 5 spots
Accessible spaces Provided: 25 OK

Reqd min. number of "Van Spaces": 1 spots
Provided "Van Spaces": 16 spots

TABLE 1107.6.1.1
ACCESSIBLE DWELLING UNITS & SLEEPING UNITS
Total number of units provided: 85
Min reqd number of accessible units w/out roll-in showers: 4
Min reqd number of accessible units with roll-in showers: 1
Total number of required accessible units: 5

R-1
Number of accessible units w/out roll in-showers: 31
Number of accessible units w/roll-in showers: 1
Total number of accessible units: 32

DRAWING NOTE LEGEND

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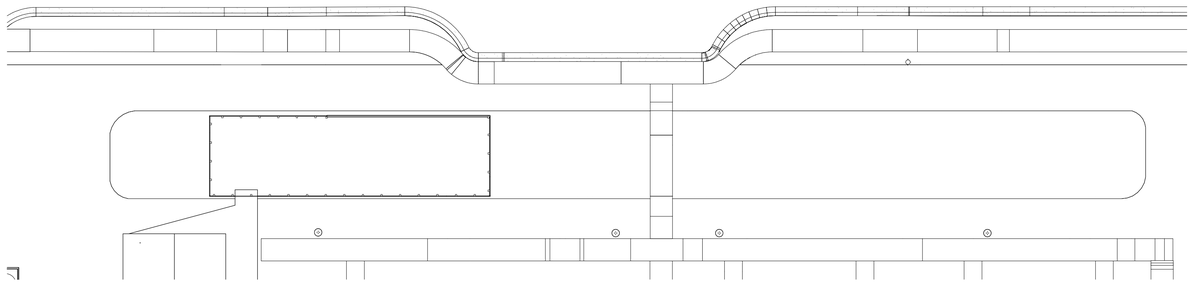
ACCESSIBILITY SITE PLAN

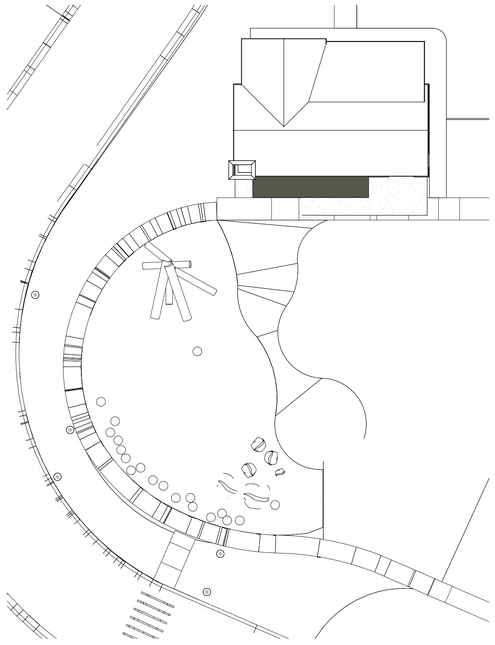
DATE: 05/08/2019

SHEET: A112

DATE STAMP: 5/9/2019 10:06:28 AM



2 **ENLARGED PLAN COMMUNITY GARDENS**
1/16" = 1'-0"



1 **ENLARGED PLAN COMMUNITY BUILDING/PLAYGROUND**
1/16" = 1'-0"

DRAWING NOTE LEGEND

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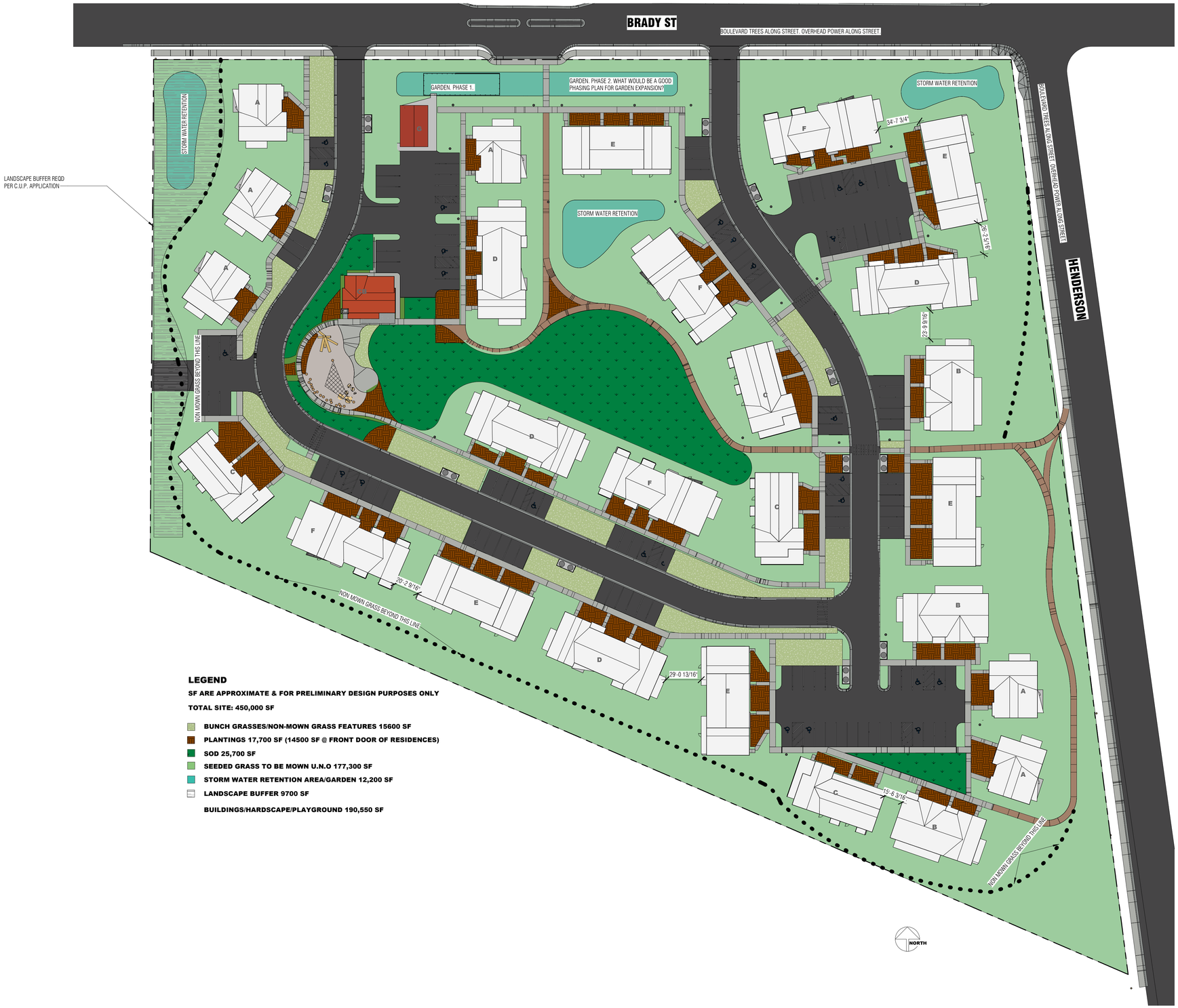
Project Address

ENLARGED SITE PLANS

DATE: 05/08/2019

SHEET: A115



LEGEND

SF ARE APPROXIMATE & FOR PRELIMINARY DESIGN PURPOSES ONLY

TOTAL SITE: 450,000 SF

- **BUNCH GRASSES/NON-MOWN GRASS FEATURES 15600 SF**
- **PLANTINGS 17,700 SF (14500 SF @ FRONT DOOR OF RESIDENCES)**
- **SOD 25,700 SF**
- **SEEDED GRASS TO BE MOWN U.N.O 177,300 SF**
- **STORM WATER RETENTION AREA/GARDEN 12,200 SF**
- **LANDSCAPE BUFFER 9700 SF**

BUILDINGS/HARDSCAPE/PLAYGROUND 190,550 SF

1 SITE PLAN- DD Landscaping Features
1" = 40'-0"

DATE STAMP: 5/9/2019 10:26:49 AM

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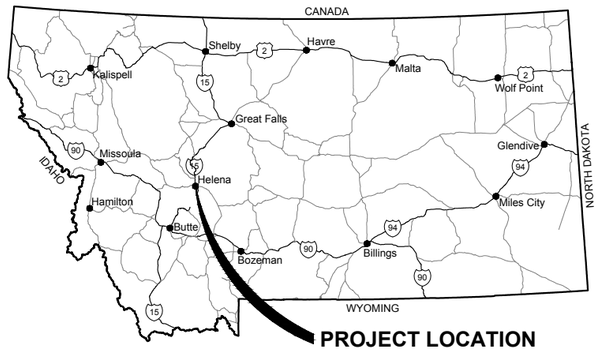
RED ALDER HOUSING

Project Address

LANDSCAPING

DATE: 05/08/2019

SHEET: AL101



RED ALDER RESIDENCES

DESIGN DEVELOPMENT

SECTION 24, TOWNSHIP 10 NORTH, AND RANGE 4 WEST

INSERT NOT TO SCALE

SHEET INDEX

PROJECT: 1911-RALD

DATE: APRIL 30, 2019

PLANS REVIEWED BY:

CITY OF HELENA - PUBLIC WORKS DIRECTOR

CITY OF HELENA CITY ENGINEER/PROJECT MANAGER

CITY OF HELENA MONTANA GUARDIAN OF THE GULCH

ENGINEER OF RECORD:

GREG WIRTH, P.E.

STAHLY ENGINEERING & ASSOCIATES

QA/QC REVIEW:

BYRON STAHLY, P.E.

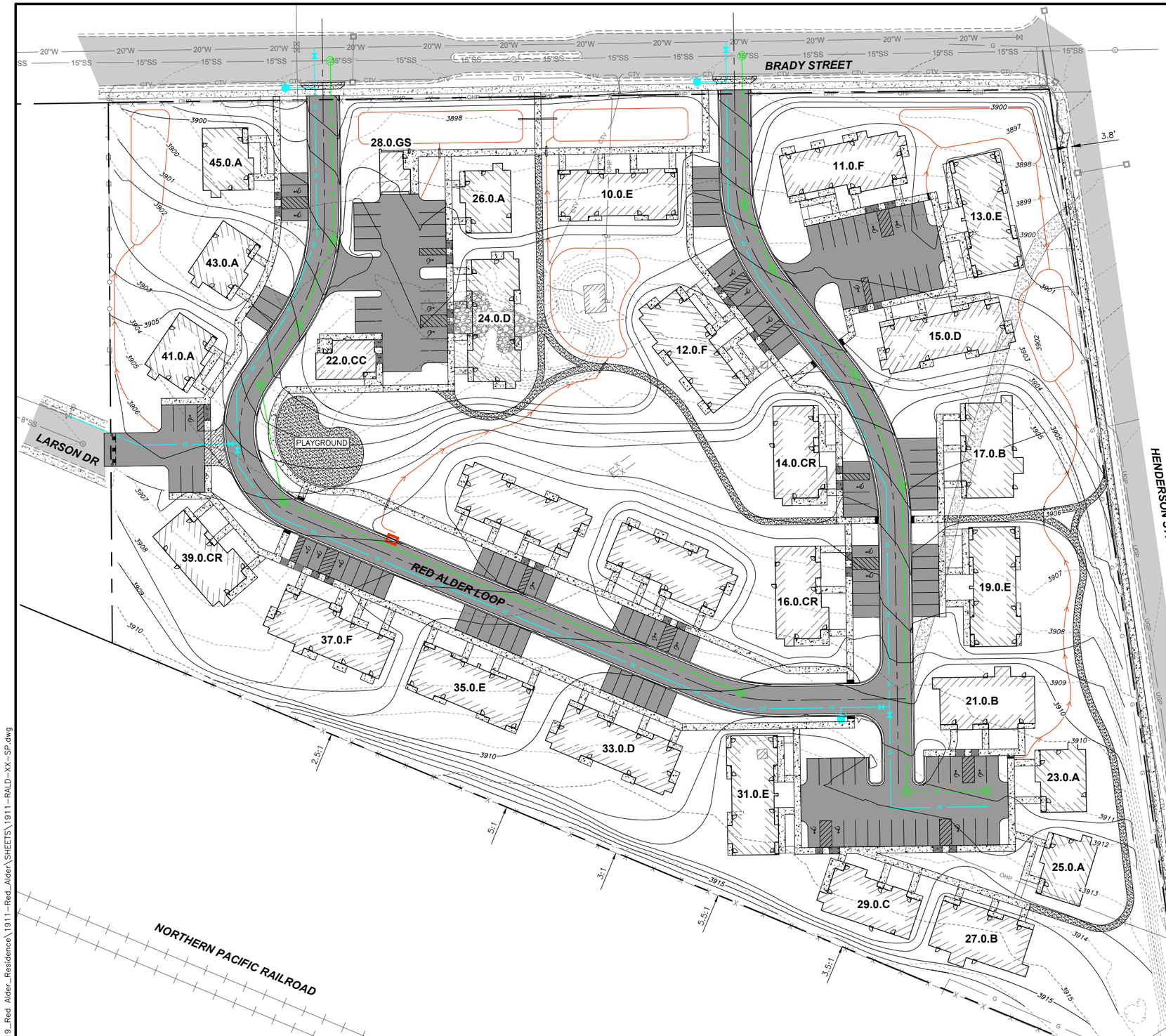
STAHLY ENGINEERING & ASSOCIATES

NO.	REVISION DESCRIPTION	BY	DATE
1			
2			
3			
4			
5			
6			

SET NO.

SHEET NO. 1

N:\1238-07819_Red Alder_Residence\1911-Red_Alder\SHEETS\1911-RALD-01-CVR.dwg



OVERALL SITE PLAN

0 40 80

SCALE IN FEET

NORTH

STORM WATER RETENTION

RETENTION VOLUME REQUIRED = 26,350 CUBIC FEET

RETENTION VOLUME PROVIDED = 26,900 CUBIC FEET

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 1911-RALD
DESIGNED: GDW
DRAWN: JDM
CHECKED: CHECKED
APPROVED: GDW
DATE: APRIL 30, 2019

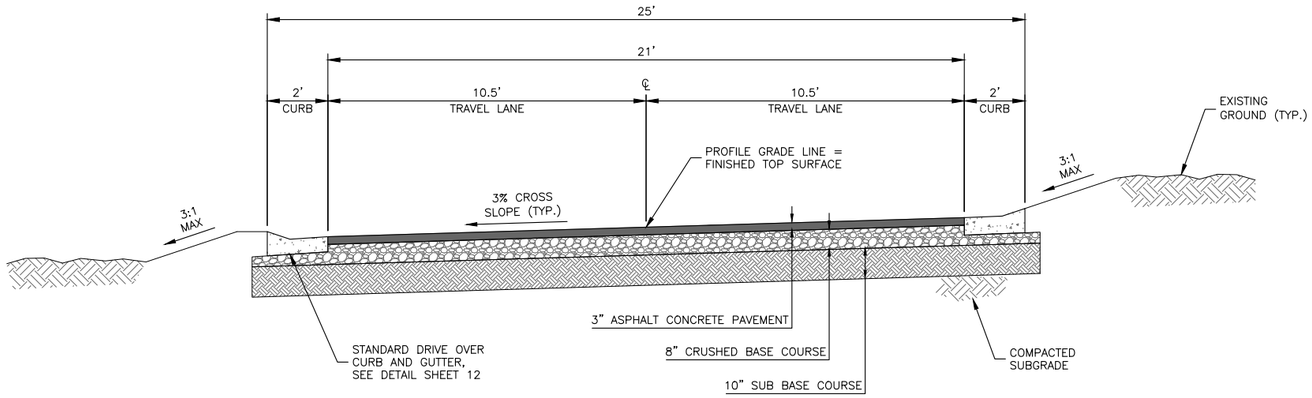
STAHLY ENGINEERING & SURVEYING, INC.

RED ALDER RESIDENCES
HELENA, MT

OVERALL SITE PLAN

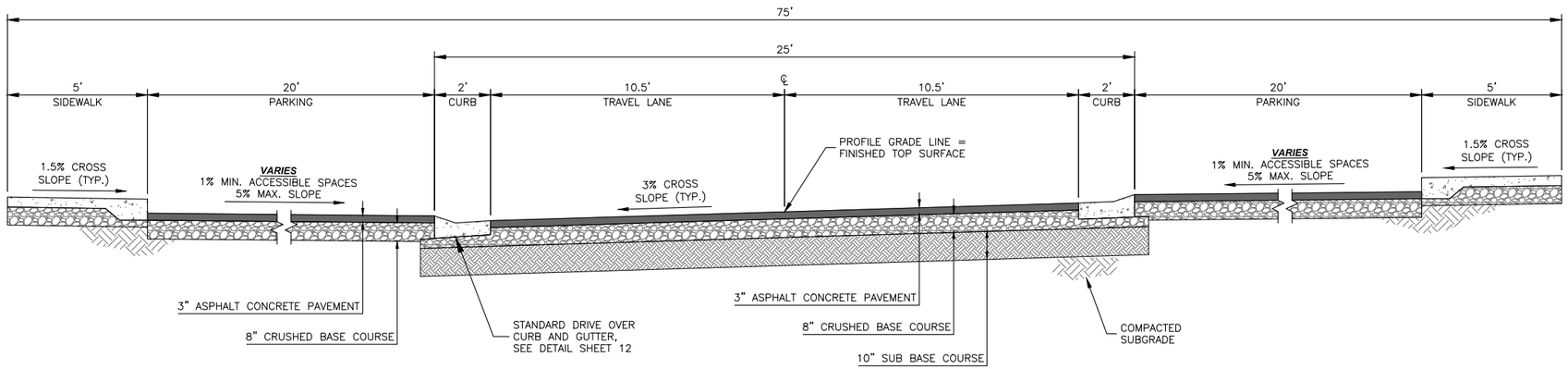
SHEET NO.
2
OF 14

N:\1238-07819_Red Alder_Residence\1911-Red_Alder\SHEETS\1911-RALD-XX-SP.dwg



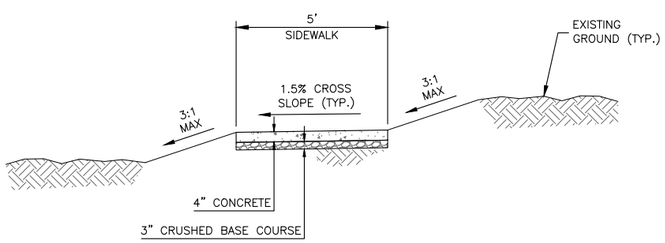
RED ALDER LOOP SECTION

NO SCALE



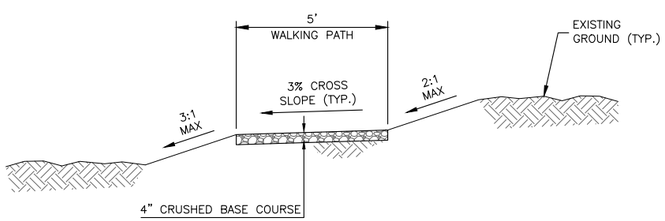
RED ALDER LOOP SECTION - WITH PARKING

NO SCALE



SIDEWALK SECTION

NO SCALE



WALKING PATH SECTION

NO SCALE

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 1911-RALD
DESIGNED: GDW
DRAWN: JDM
CHECKED: CHECKED
APPROVED: GDW
DATE: APRIL 30, 2019

STAHLY ENGINEERING & SURVEYING, INC.

RED ALDER RESIDENCES
HELENA, MT

TYPICAL SECTIONS

SHEET NO.
3
OF 14

N:\1238-07819_Red Alder_Residence\1911-Red_Alder\SHEETS\1911-RALD-XX-TS.dwg

GRADING PLAN

0 40 80

SCALE IN FEET

N:\1238-07819_Red Alder_Residence\1911-Red_Alder\SHEETS\1911-RALD-XX-GP.dwg

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 1911-RALD
DESIGNED: GDW
DRAWN: JDM
CHECKED: CHECKED
APPROVED: GDW
DATE: APRIL 30, 2019

STAHLY ENGINEERING & ASSOCIATES, INC. EST. 1970

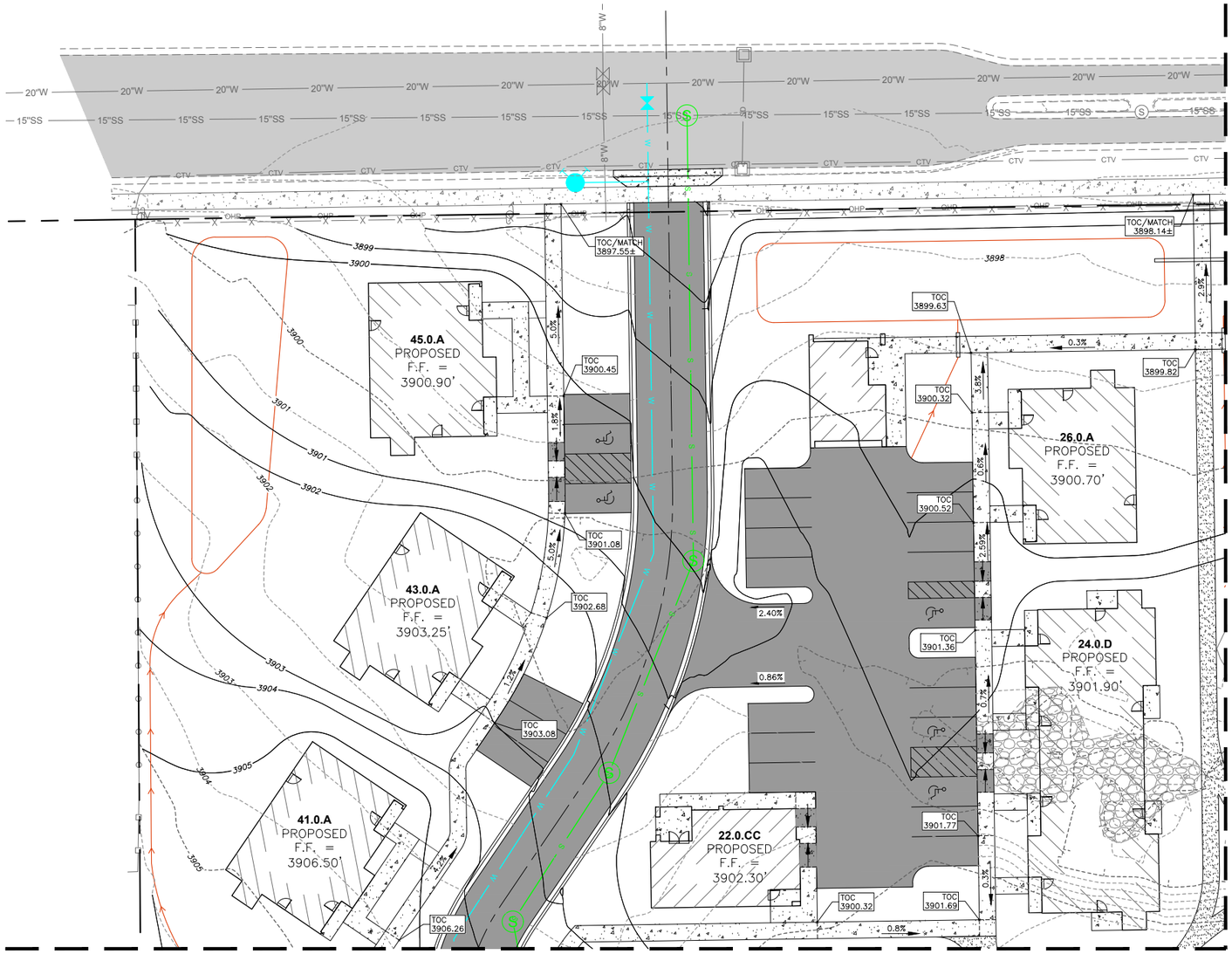
RED ALDER RESIDENCES
HELENA, MT

GRADING PLAN

SHEET NO.

4

OF 14



GRADING DETAIL (NORTHWEST QUADRANT)

0 20 40
SCALE IN FEET

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 1911-RALD
DESIGNED: GDW
DRAWN: JDM
CHECKED: CHECKED
APPROVED: GDW
DATE: APRIL 30, 2019

STAHLY ENGINEERING & SURVEYING INC. EST. 1947

RED ALDER RESIDENCES
HELENA, MT
GRADING DETAIL (NORTHWEST QUADRANT)

SHEET NO.
5
OF 14

N:\1238-07819_Red Alder_Residence\1911-Red_Alder\SHEETS\1911-RALD-XX-GP.dwg

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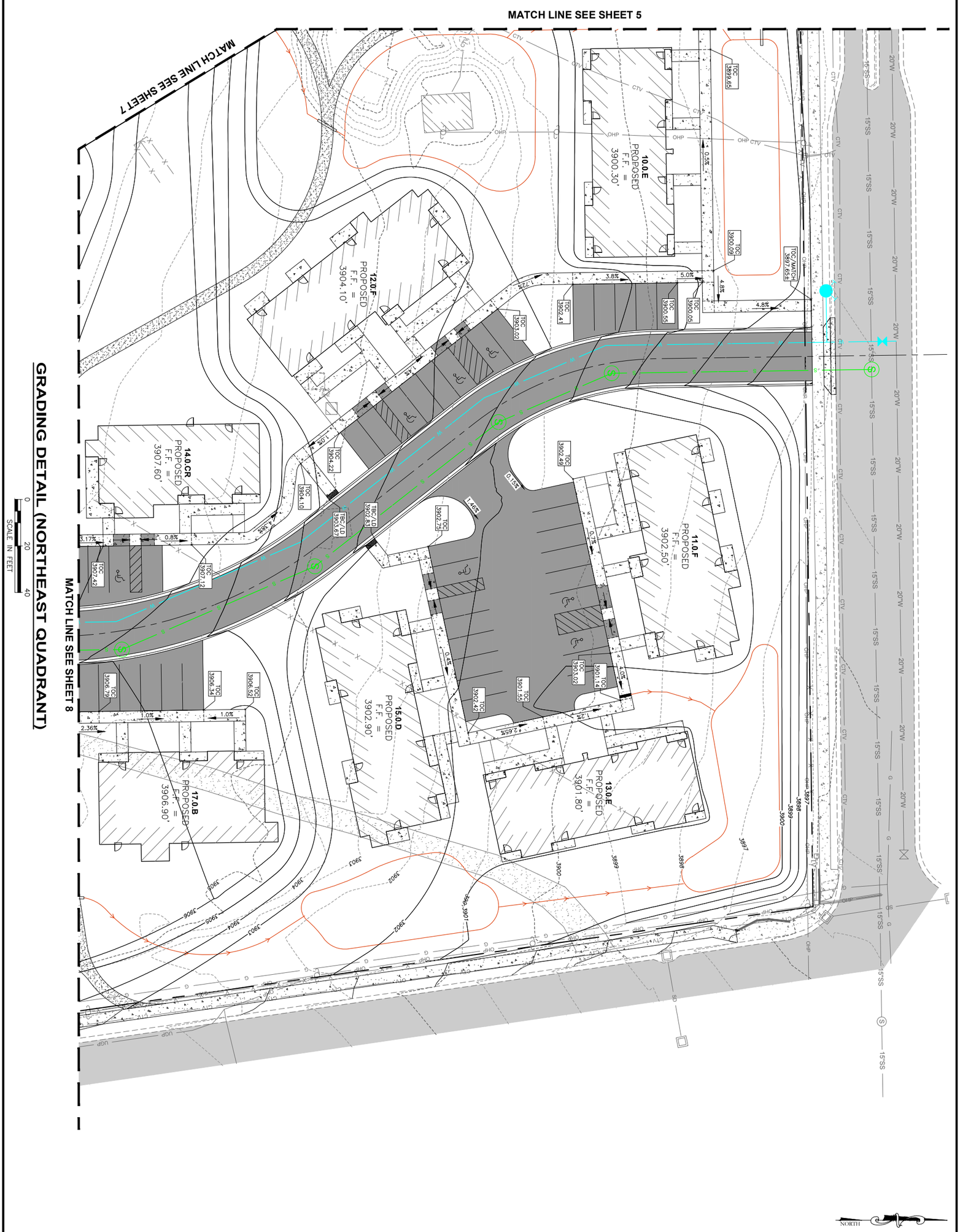


GRADING DETAIL (NORTHEAST QUADRANT)

SHEET NO.	6
OF	14

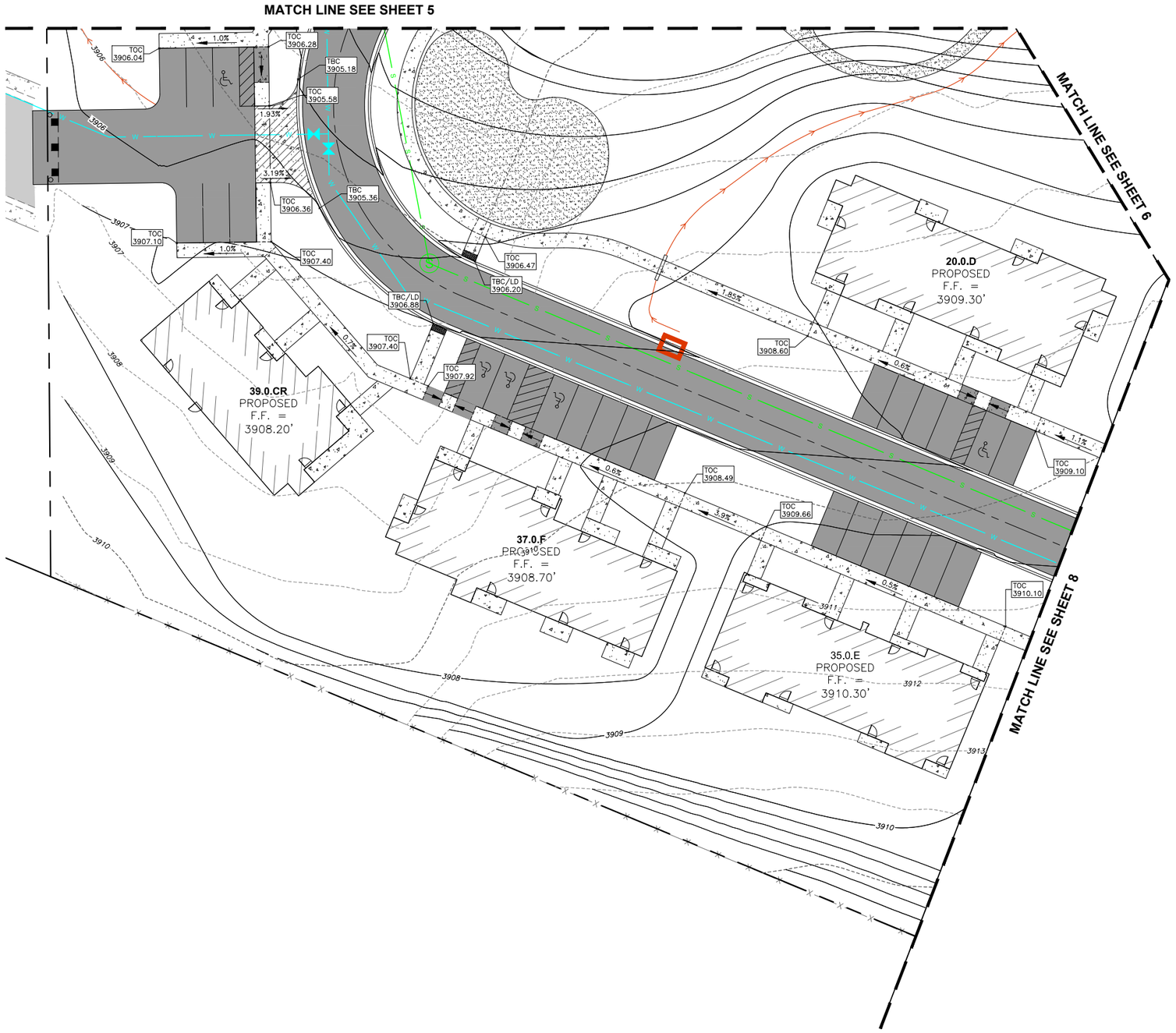
RED ALDER RESIDENCES
HELENA, MT

GRADING DETAIL (NORTHEAST QUADRANT)

ENGINEERING EST 1976 STAHLY & ASSOCIATES, INC.

PROJECT:	1911-RALD
DESIGNED:	GDW
DRAWN:	JDM
CHECKED:	CHECKED
APPROVED:	GDW
DATE:	APRIL 30, 2019

NO.	REVISION DESCRIPTION	BY	DATE



GRADING DETAIL (SOUTHWEST QUADRANT)

0 20 40
SCALE IN FEET

NORTH

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 1911-RALD
DESIGNED: GDW
DRAWN: JDM
CHECKED: CHECKED
APPROVED: GDW
DATE: APRIL 30, 2019

STAHLY ENGINEERING & SURVEYING, INC.

RED ALDER RESIDENCES
HELENA, MT

GRADING DETAIL (SOUTHWEST QUADRANT)

SHEET NO.
7
OF 14

N:\1238-07819_Red Alder_Residence\1911-Red_Alder\SHEETS\1911-RALD-XX-GP.dwg

MATCH LINE SEE SHEET 6

MATCH LINE SEE SHEET 7

NORTH

18.0.F
PROPOSED
F.F. =
3910.40'

16.0.CR
PROPOSED
F.F. =
3909.30'

19.0.E
PROPOSED
F.F. =
3908.60'

21.0.B
PROPOSED
F.F. =
3911.60'

33.0.D
PROPOSED
F.F. =
3911.50'

31.0.E
PROPOSED
F.F. =
3912.90'

23.0.A
PROPOSED
F.F. =
3911.90'

25.0.A
PROPOSED
F.F. =
3913.00'

29.0.C
PROPOSED
F.F. =
3913.80'

27.0.B
PROPOSED
F.F. =
3915.00'

TOC 3909.52
TOC 3910.18
TOC 3910.91
TOC 3911.31
TOC 3908.01
TOC 3907.85
TOC 3908.37
TOC 3910.04
TOC 3910.04
TOC 3910.42
TBC/LD 3909.91
TBC/LD 3910.68
TOC 3911.18
TOC 3911.21
TOC 3910.82
TOA 3911.98
TOC 3912.39
TOC 3913.09
TOC 3913.52
TOC 3910.54
TOC 3910.91
TOC 3912.25
TBC/LD 3906.21
TBC/LD 3907.09
TOC 3907.16
TOC 3908.32
TOC 3913.64
TOC 3914.45
TOC 3914.81

GRADING DETAIL (SOUTHEAST QUADRANT)

0 20 40
SCALE IN FEET

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 1911-RALD
DESIGNED: GDW
DRAWN: JDM
CHECKED: CHECKED
APPROVED: GDW
DATE: APRIL 30, 2019

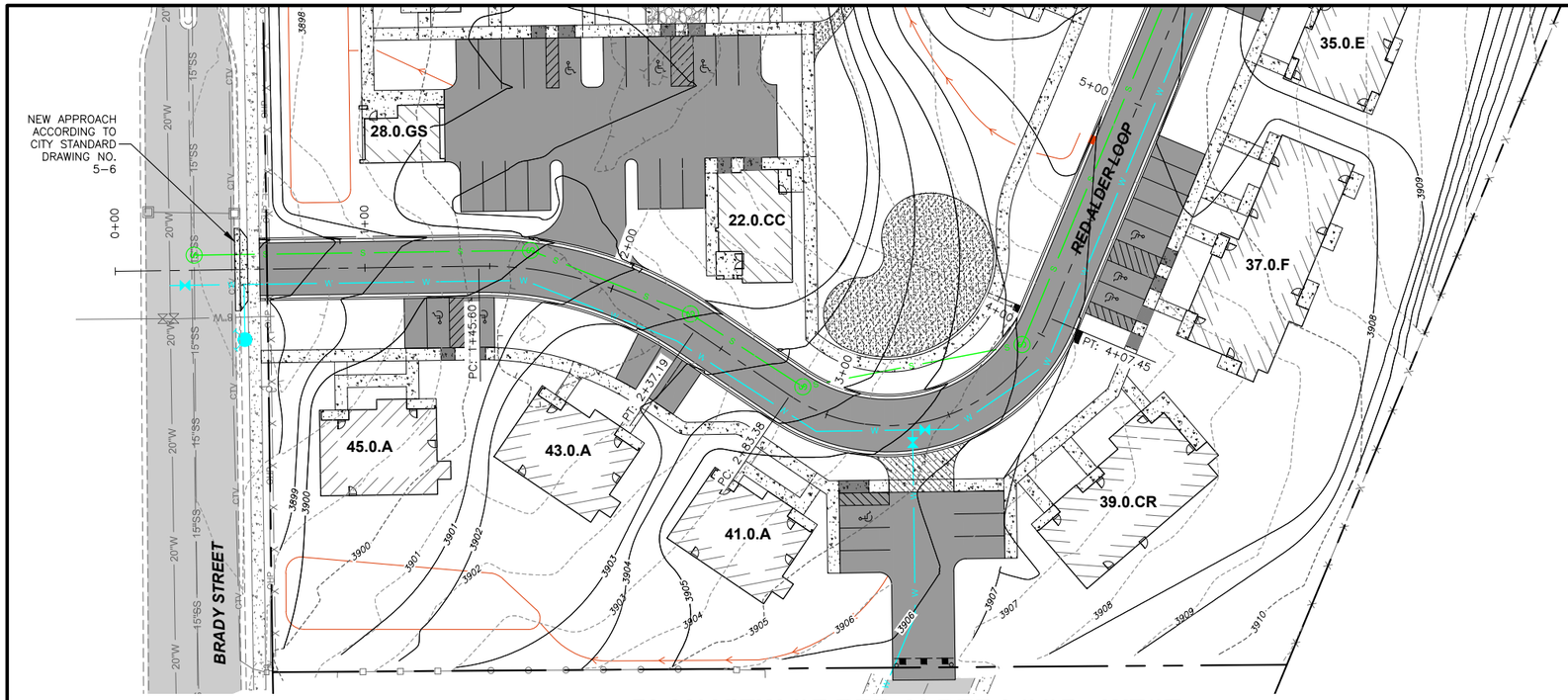
STAHLY ENGINEERING & ASSOCIATES, INC.

RED ALDER RESIDENCES
HELENA, MT

GRADING DETAIL (SOUTHEAST QUADRANT)

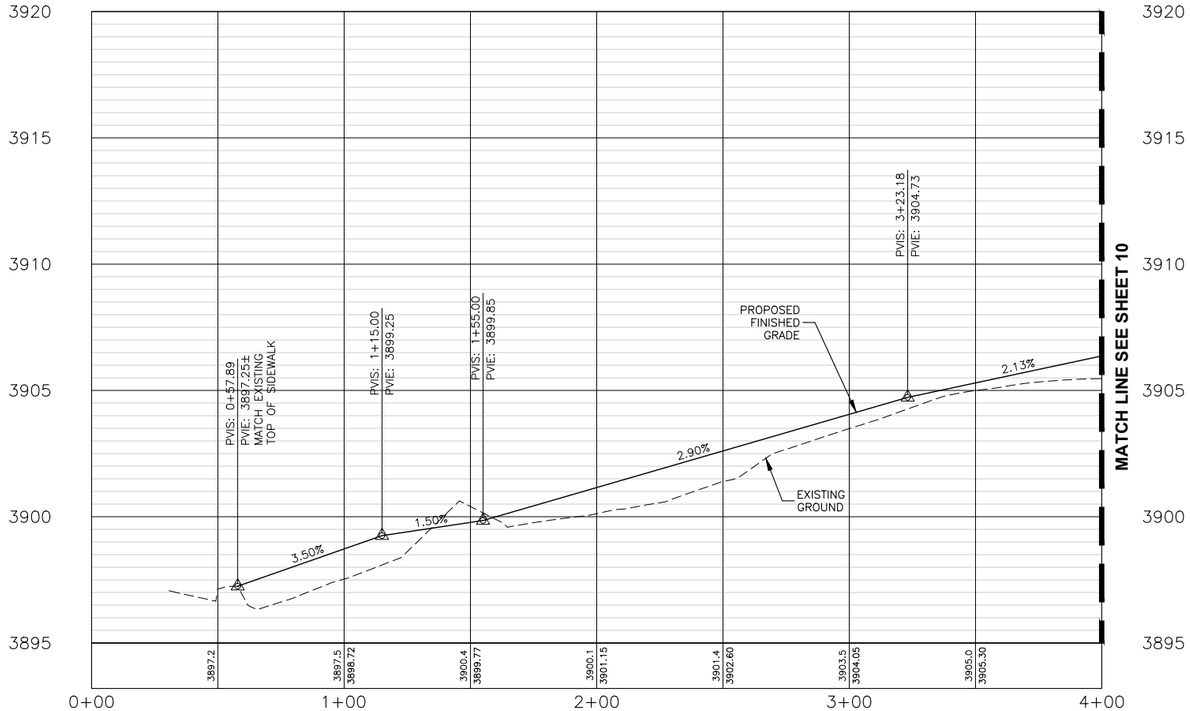
SHEET NO.
8
OF 14

N:\1238-07819_Red Alder_Residence\1911-Red_Alder\SHEETS\1911-RALD-XX-GP.dwg



PLAN VIEW OF RED ALDER LOOP - WEST

0 30 60
SCALE IN FEET



PROFILE VIEW OF RED ALDER LOOP - STA. 0+00 TO STA. 4+00

HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 1" = 6'

N:\1238-07819_Red Alder_Residence\1911-Red_Alder\SHEETS\1911-RALD-XX-PP.dwg

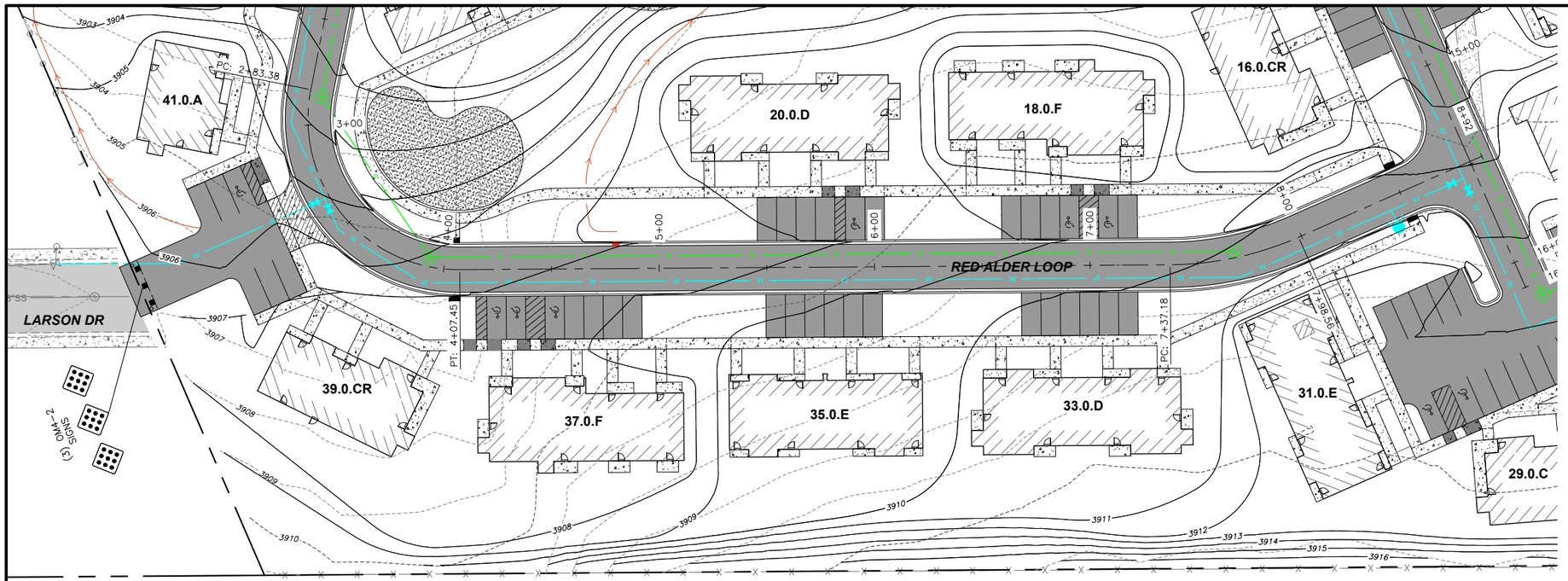
NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 1911-RALD
DESIGNED: GDW
DRAWN: JDM
CHECKED: CHECKED
APPROVED: GDW
DATE: APRIL 30, 2019

STAHLY ENGINEERING & SURVEYING, INC. EST. 1947

RED ALDER RESIDENCES
HELENA, MT
RED ALDER LOOP-WEST

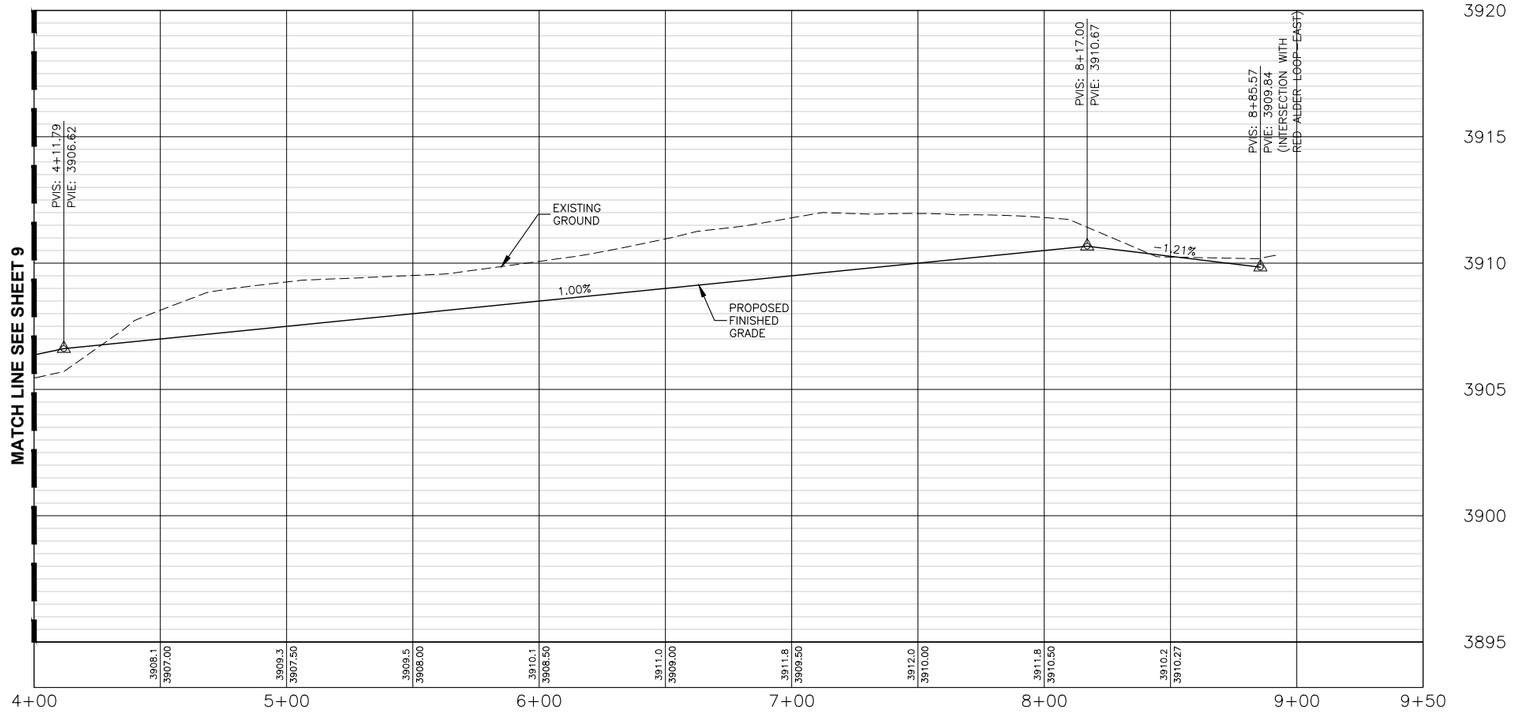
SHEET NO.
9
OF 14



NORTH

PLAN VIEW OF RED ALDER LOOP - SOUTH

0 30 60
SCALE IN FEET



PROFILE VIEW OF RED ALDER LOOP - STA. 4+00 TO STA. 9+50

HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 1" = 6'

NO.	REVISION DESCRIPTION	BY	DATE

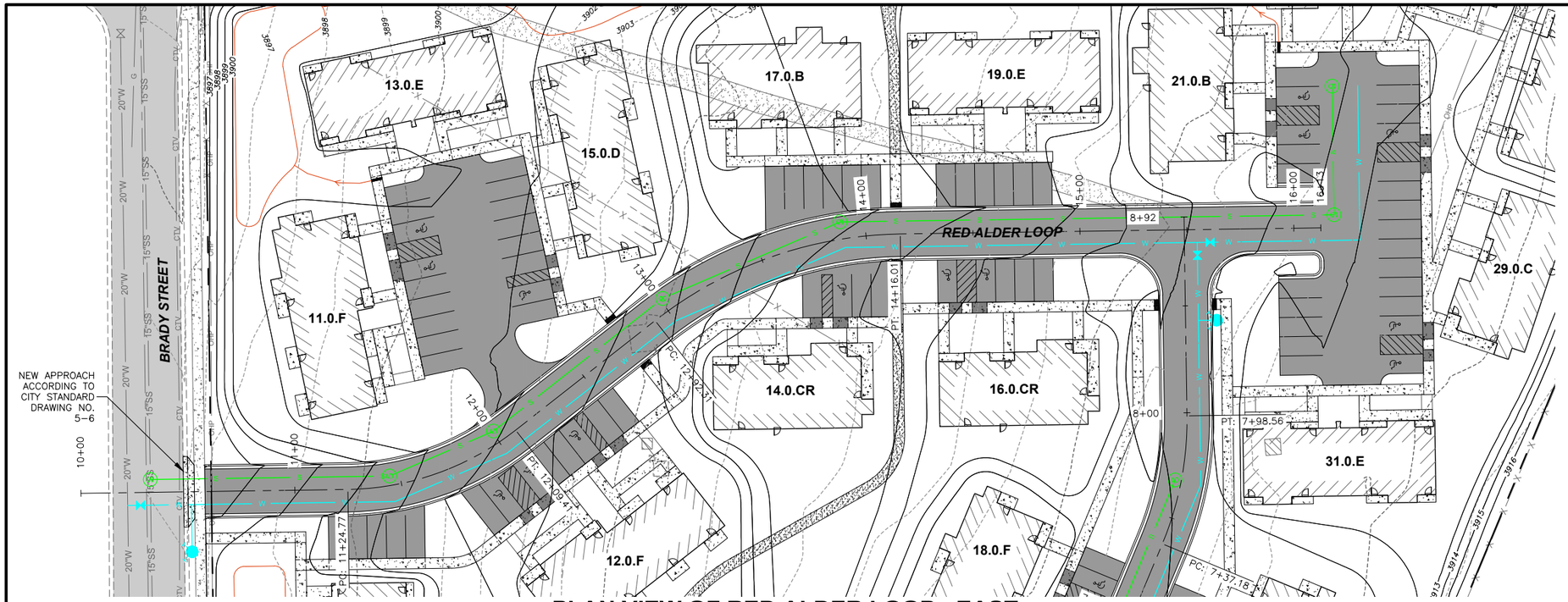
PROJECT: 1911-RALD
DESIGNED: GDW
DRAWN: JDM
CHECKED: CHECKED
APPROVED: GDW
DATE: APRIL 30, 2019

STAHLY ENGINEERING & SURVEYING INC. EST. 1969

RED ALDER RESIDENCES
HELENA, MT
RED ALDER LOOP-SOUTH

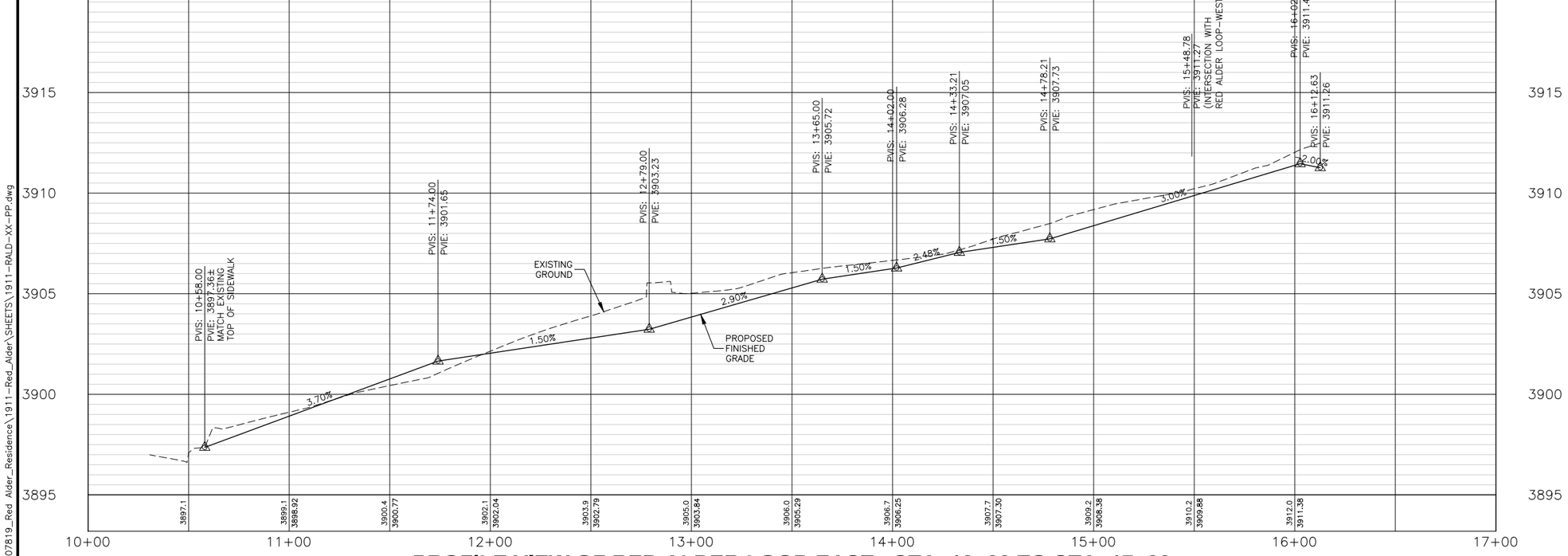
SHEET NO.
10
OF 14

N:\1238-07819_Red Alder_Residence\1911-Red_Alder\SHEETS\1911-RALD-XX-PP.dwg



PLAN VIEW OF RED ALDER LOOP - EAST

0 30 60
SCALE IN FEET



PROFILE VIEW OF RED ALDER LOOP-EAST - STA. 10+00 TO STA. 17+00

HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 1" = 6'

NO.	REVISION DESCRIPTION	BY	DATE

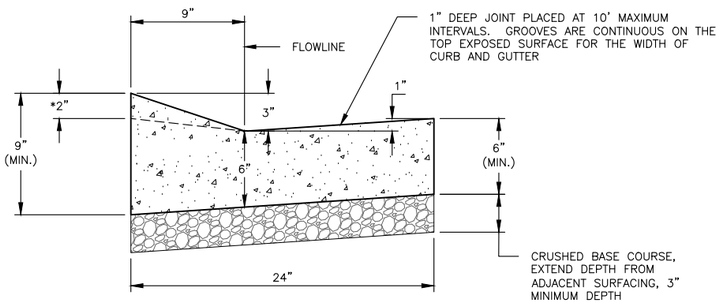
PROJECT: 1911-RALD
DESIGNED: GDW
DRAWN: JDM
CHECKED: CHECKED
APPROVED: GDW
DATE: APRIL 30, 2019

ENGINEERING SURVEYING PLANNING
STAHLY

RED ALDER RESIDENCES
HELENA, MT
RED ALDER LOOP-EAST

SHEET NO.
11
OF 14

N:\1238-07819_Red Alder_Residence\1911-Red_Alder\SHEETS\1911-RALD-XX-PP.dwg

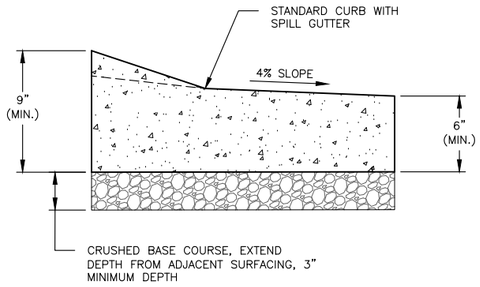


LAYDOWN CURB HEIGHTS

LD1 – 2" AT ACCESSIBLE RAMPS

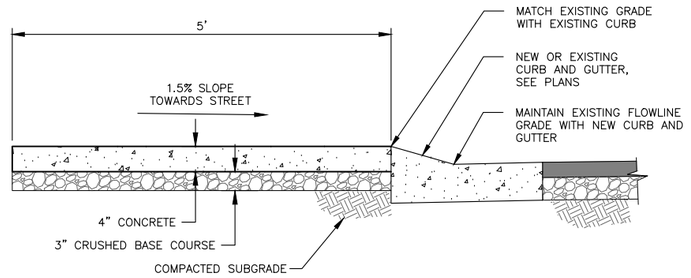
STANDARD DRIVE OVER CURB AND GUTTER DETAIL

NO SCALE



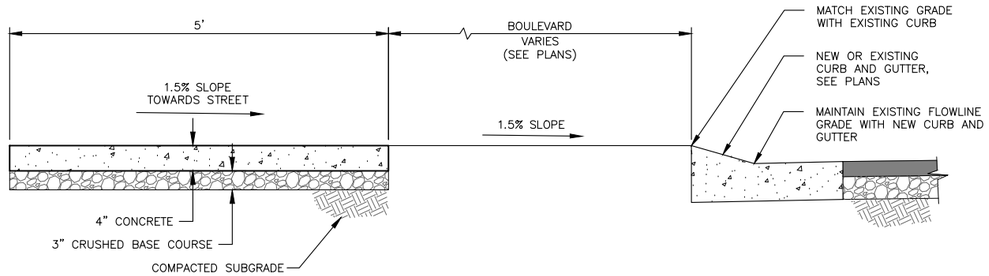
DRIVE OVER SPILL CURB AND GUTTER DETAIL

NO SCALE



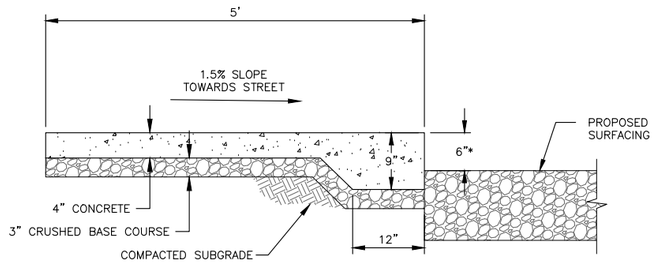
CONCRETE CURB SIDEWALK SECTION

NO SCALE



BOULEVARD SIDEWALK SECTION

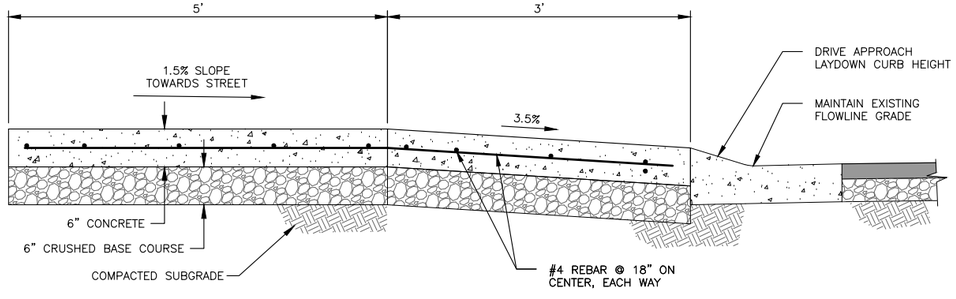
NO SCALE



* 0" AT ACCESSIBLE RAMP (FLUSH WITH SURFACING)

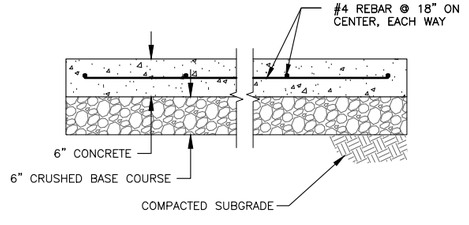
THICKENED EDGE SIDEWALK SECTION

NO SCALE



BOULEVARD SIEWALK APPROACH SECTION

NO SCALE



TRAFFIC RATED CONCRETE SECTION

NO SCALE

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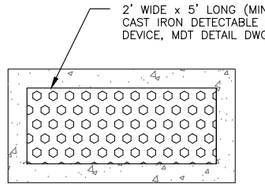
DRAWN: JDM
CHECKED: CHECKED
APPROVED: GDW
DATE: APRIL 30, 2019

STAHLY ENGINEERING & SURVEYING, INC. EST. 1946

RED ALDER RESIDENCES
HELENA, MT
DETAILS

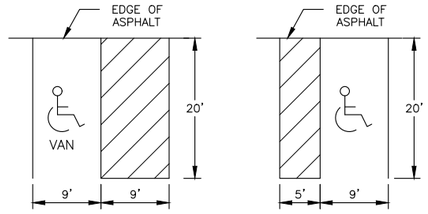
SHEET NO.
12
OF 14

N:\1238-07819_Red Alder_Residence\1911-Red_Alder\SHEETS\1911-RALD-XX-DT.dwg



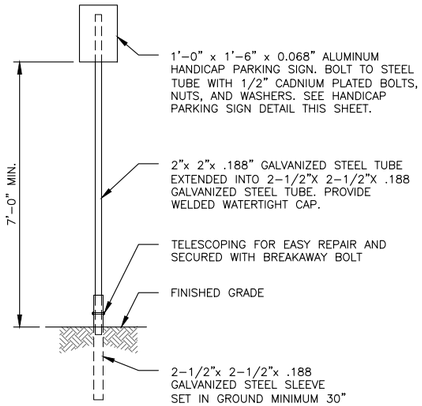
NOTES:
1. OMIT 0.5' CONCRETE BORDER ADJACENT TO CURB.
2. SEE CURB SIDEWALK SECTION ON SHEET Cx.x FOR SURFACING SECTIONS.

DETECTABLE WARNING DEVICE DETAIL
NO SCALE



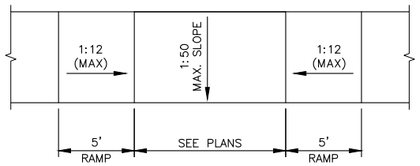
NOTE:
STRIPING TO BE 4" WHITE, WATERBOURNE PAVEMENT MARKING PAINT.

ACCESSIBLE STRIPING DETAIL
NO SCALE

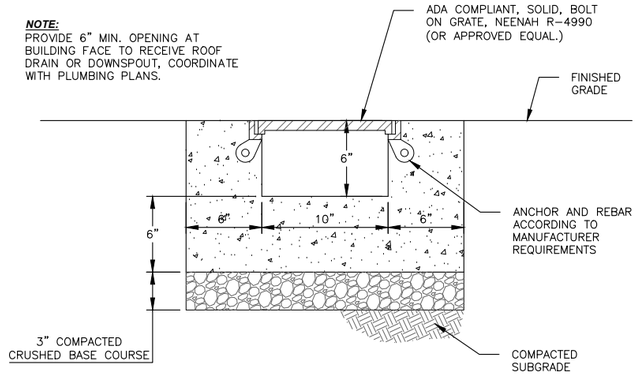


SIGN DETAIL
NO SCALE

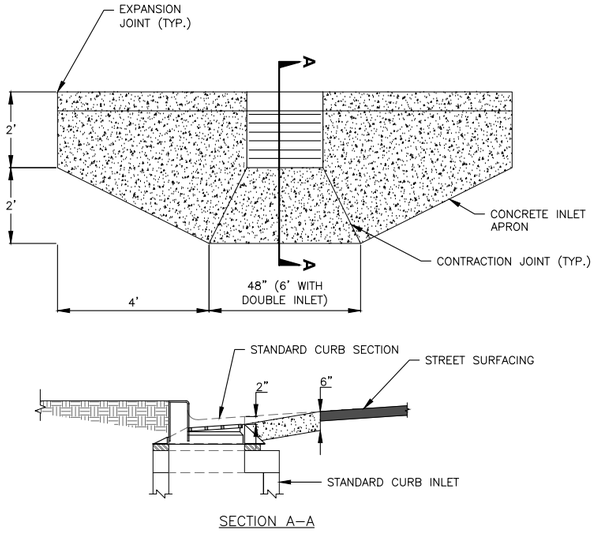
HANDICAP PARKING DETAIL
NO SCALE



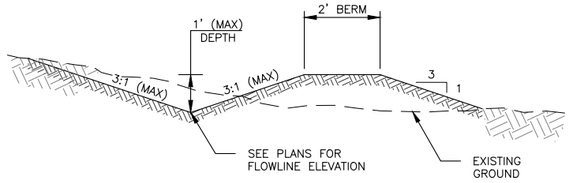
ACCESSIBLE RAMP PLAN
NO SCALE



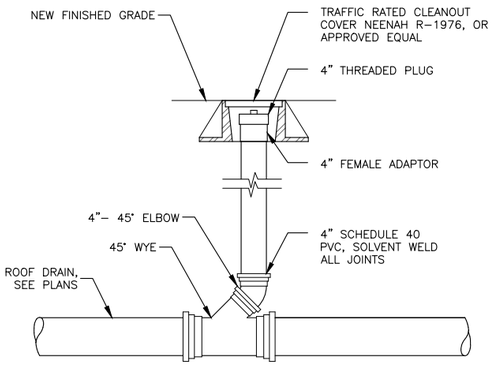
TRENCH DRAIN SECTION
NO SCALE



CURB INLET APRON DETAIL
NO SCALE



DRAINAGE SWALE
NO SCALE



CLEANOUT DETAIL
NO SCALE

NO.	REVISION DESCRIPTION	BY	DATE

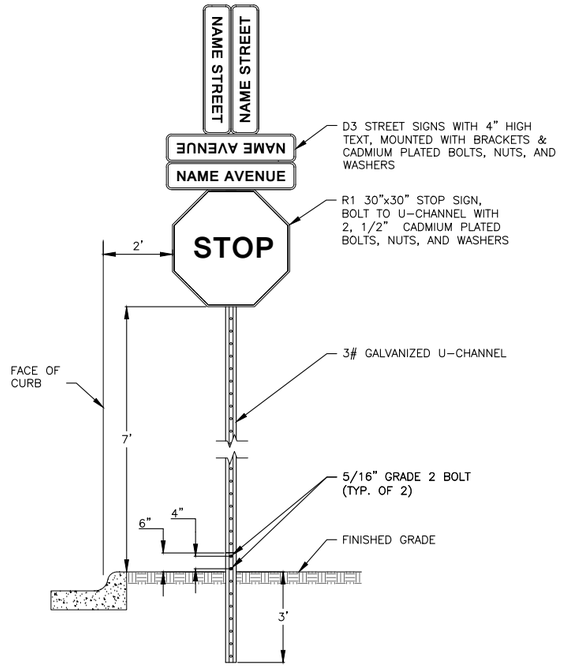
PROJECT: 1911-RALD
DESIGNED: GDW
DRAWN: JDM
CHECKED: CHECKED
APPROVED: GDW
DATE: APRIL 30, 2019

STAHLY ENGINEERING & SURVEYING INC. EST. 1946

RED ALDER RESIDENCES
HELENA, MT
DETAILS

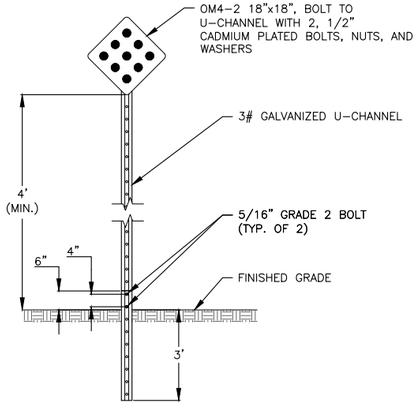
SHEET NO.
13
OF 14

N:\1238-07819_Red Alder_Residence\1911-Red_Alder\SHEETS\1911-RALD-XX-DT.dwg



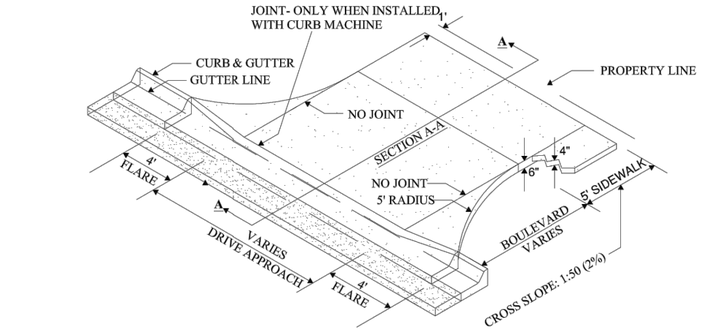
STOP & STREET SIGN DETAIL

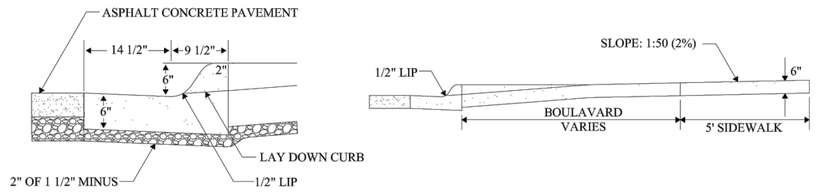
NO SCALE



END-OF-ROADWAY MARKER DETAIL

NO SCALE





-CLASS 5 (1 1/2" MINUS AGGREGATE) CONCRETE SHALL BE USED.

-COMMERCIAL DRIVE APPROACHES SHALL USE REINFORCED CONCRETE.

-BASE SHALL BE 2" OF 1 1/2" MINUS MATERIAL COMPACTED TO 95% AND SHALL COMPLY WITH AASHTO T99 OR ASTM D698.

-DRIVE APPROACH TO BE INSTALLED BEFORE ASPHALT CONCRETE PAVEMENT.

-APPROACH WILL BE PLACED MONOLITHICALLY EXCEPT WHEN CURB MACHINE IS ALLOWED BY THE ENGINEER WITH DOWELING 2ft. ON CENTER, #4 REBAR 2ft. (60cm) IN LENGTH.

-JOINTS SHALL BE 1/2"MASTIC OR AS DIRECTED BY THE ENGINEER.

-PROVIDE RECTANGULAR JOINT PATTERN DEPENDENT ON WIDTH OF SLABS (NOT TO EXCEED 100 S.F. (9 sq.m.) SURFACE.

-WHERE DRIVEWAYS EXCEED 16' IN WIDTH, A 1/2" MASTIC JOINT SHALL BE PLACED LONGITUDINALLY ALONG THE CENTER LINE.

-DRIVE APPROACHES WHERE THE BOULAVARD EXCEEDS 12' (3.7m) IN DEPTH REQUIRE A TRANVERSE JOINT AT THE TOP OF THE FLARE.

-FLARES SHALL BE 4' (1.2m) IN WIDTH. STANDARD DRIVEWAY WIDTH DOES NOT CHANGE.

-ALL DRIVE APPROACHES SHALL COMPLY WITH CURRENT ADA STANDARDS.

CITY OF HELENA ENGINEERING STANDARDS		***BOULEVARD DRIVEWAY APPROACH DETAIL (WITH FLAIR SECTIONS)***	***STANDARD DRAWING:***
REVISED: 2/12/13	***SCALE:*** NONE		***5-6***

NO.	REVISION DESCRIPTION	BY	DATE

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DESIGNED: GDW
DRAWN: JDM
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STAHLY ENGINEERING & SURVEYING, INC. EST. 1946

RED ALDER RESIDENCES
HELENA, MT
DETAILS

SHEET NO.
14
OF 14

N:\1238-07819_Red Alder_Residence\1911-Red_Alder\SHEETS\1911-RALD-XX-DT.dwg

GENERAL STRUCTURAL NOTES

STAHLY JOB # XXXX-XXXXX

01 GENERAL REQUIREMENTS

CRITERIA

ALL MATERIALS, WORKMANSHIP, DESIGN AND CONSTRUCTION SHALL CONFORM TO THE DRAWINGS, SPECIFICATIONS AND THE INTERNATIONAL BUILDING CODE (IBC), 2012 EDITION

LOAD TYPE	DESIGN LOAD	ENGINEERING CRITERIA
LIVE LOAD:		
RESIDENTIAL	15 PSF	
DEAD LOAD:		
ROOF	15 PSF	
FLOOR	15 PSF	
ROOF SNOW LOAD		PG = 26 PSF
		CE = 1.0
	30 PSF	IS=1.0
		CT=1.0
		PF=18.2 PSF
WIND DESIGN DATA		ULTIMATE DESIGN WIND SPEED = 115 MPH (3-SECOND GUST)
		NOMINAL DESIGN WIND SPEED = 90 MPH
		EXPOSURE: C
		Iw = 1.0
		GCpi = ±0.18 (INTERNAL PRESSURE COEFF.)
SEISMIC DESIGN DATA		SEISMIC USE GROUP 1
		SITE CLASS: D
		RISK CATEGORY: II
		Ss = 0.546 g Sds = 0.496 g
		S1 = 0.157 g Sd1 = 0.277 g
		SEISMIC DESIGN CATEGORY: D
		SEISMIC-FORCE-RESISTING-SYSTEM: -A13 (LIGHT-FRAMED BEARING WALLS WITH SHEAR PANELS)
		R= 6.5
		Ie= 1.0
		Cs= 0.0784
		DESIGN BASE SHEAR=VARIES

GENERAL CONDITIONS

STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH ARCHITECTURAL DRAWINGS FOR BIDDING AND CONSTRUCTION. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS WITH ARCHITECT'S DRAWINGS FOR COMPATIBILITY AND SHALL NOTIFY ARCHITECT OF ALL DISCREPANCIES PRIOR TO CONSTRUCTION.

IN THE EVENT OF CONFLICTS BETWEEN THE STRUCTURAL DRAWINGS AND THE PROJECT SPECIFICATIONS, THE STRUCTURAL DRAWINGS SHALL CONTROL. THE ENGINEER SHALL BE NOTIFIED OF ALL CONFLICTS.

SEE ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS AND DIMENSIONS OF DOOR AND WINDOW OPENINGS IN ALL WALLS. SEE MECHANICAL DRAWINGS FOR SIZE AND LOCATION OF MISCELLANEOUS MECHANICAL OPENINGS THROUGH WALLS AND FLOORS. SEE ARCHITECTURAL DRAWINGS FOR ALL GROOVES, NOTCHES, CHAMFERS, FEATURE STRIPS, COLOR, TEXTURE AND OTHER FINISH DETAILS.

CONTRACTOR SHALL PROVIDE TEMPORARY BRACING FOR THE STRUCTURE AND STRUCTURAL COMPONENTS UNTIL ALL FINAL CONNECTIONS HAVE BEEN COMPLETED IN ACCORDANCE WITH THESE DRAWINGS. THE CONTRACTOR IS RESPONSIBLE FOR ALL SAFETY PRECAUTIONS AND METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES REQUIRED TO PERFORM WORK.

DRAWINGS INDICATE GENERAL AND TYPICAL DETAILS OF CONSTRUCTION. WHERE CONDITIONS ARE NOT SPECIFICALLY INDICATED BUT ARE OF SIMILAR CHARACTER TO DETAILS SHOWN, SIMILAR DETAILS OF CONSTRUCTION SHALL BE USED, SUBJECT TO REVIEW AND APPROVAL BY THE ARCHITECT AND THE STRUCTURAL ENGINEER.

MATERIAL SUBSTITUTIONS FOR PRODUCTS SPECIFIED IN THE PLANS AND NOTES MAY BE SUBMITTED BY THE CONTRACTOR FOR APPROVAL BY THE ARCHITECT AND STRUCTURAL ENGINEER. SUBSTITUTION SUBMITTALS SHALL IDENTIFY EXACTLY WHAT PRODUCTS ARE TO BE SUBSTITUTED AND INCLUDE AN ICC EVALUATION SERVICE REPORT DEMONSTRATING EQUIVALENT OR GREATER LOAD CAPACITIES THAN THE SUBSTITUTED PRODUCT.

CONTRACTOR-INITIATED CHANGES SHALL BE SUBMITTED IN WRITING TO THE ARCHITECT AND STRUCTURAL ENGINEER FOR APPROVAL PRIOR TO FABRICATION OR CONSTRUCTION. CHANGES SHOWN ON SHOP DRAWINGS ONLY WILL NOT SATISFY THIS REQUIREMENT.

THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE OSHA REGULATIONS. SHORING AND RE-SHORING SHALL BE DESIGNED BY A QUALIFIED DESIGNER AND THE ERECTED SHORING SHALL BE INSPECTED BY A REGISTERED STRUCTURAL ENGINEER, EXPERIENCED IN THE DESIGN OF SHORING SYSTEMS, WHO SHALL SUBMIT AN INSPECTION REPORT TO THE ARCHITECT. FORMWORK SHALL NOT BE REMOVED UNTIL THE CONCRETE HAS REACHED ITS DESIGN STRENGTH AS INDICATED IN THE CONCRETE NOTES.

QUALITY ASSURANCE PLAN

QUALITY ASSURANCE FOR SEISMIC RESISTANCE. FOR THE BUILDING'S MAIN-LATERAL-FORCE-RESISTING SYSTEM SHALL BE PROVIDED BY SPECIAL INSPECTION AND MATERIAL TESTING OF THE FOLLOWING:

SHEAR WALLS, HOLDOWNS, DIAPHRAGMS, DRAG CONNECTIONS AND STEEL FRAMES.

THE SPECIAL INSPECTION AND MATERIAL TESTING SHALL BE OF THE TYPE AND FREQUENCY INDICATED IN THE QUALITY CONTROL SECTION OF THE GENERAL STRUCTURAL NOTES.

EACH SPECIAL INSPECTION AND MATERIAL TESTING REPORT SHALL BE DISTRIBUTED TO THE OWNER, ARCHITECT, ENGINEER AND BUILDING OFFICIAL WITHOUT DELAY BY CONTRACTOR.

STRUCTURAL OBSERVATION BY THE ENGINEER-OF-RECORD, PER IBC SECTION 1704, IS NOT REQUIRED FOR THIS PROJECT.

QUALITY CONTROL

SHOP DRAWINGS FOR THE FOLLOWING ITEMS SHALL BE SUBMITTED TO THE ARCHITECT AND STRUCTURAL ENGINEER FOR REVIEW TWO WEEKS PRIOR TO FABRICATION:

SUBMITTAL	SUBMITTAL REQUIRED	STAMPED BY REGISTERED ENGINEER	ENGINEERING CALCULATIONS
CONCRETE AND MASONRY REINFORCING	YES	NOT REQUIRED	NOT REQUIRED
STRUCTURAL STEEL	YES	NOT REQUIRED	NOT REQUIRED
ENGINEERED JOISTS	YES	YES	YES
MANUFACTURED LUMBER	YES	YES	NOT REQUIRED
PRE-ENGINEERED TRUSSES	YES	YES	YES

SHOP DRAWINGS OF BIDDER-DESIGN AND PRE-ENGINEERED COMPONENTS SHALL INCLUDE THE DESIGNING PROFESSIONAL ENGINEER'S STAMP, AS INDICATED ABOVE. THE ENGINEER SHALL BE REGISTERED IN THE STATE WHERE THE PROJECT OCCURS. THE SUBMITTAL WILL BE SUBJECT TO A CURSORY REVIEW BY THE ENGINEER OF RECORD FOR LOADS IMPOSED ON THE BASIC STRUCTURE. THE COMPONENT DESIGNER IS RESPONSIBLE FOR CODE CONFORMANCE AND ALL NECESSARY CONNECTIONS NOT SPECIFICALLY CALLED OUT ON THE ARCHITECTURAL OR STRUCTURAL DRAWINGS.

SHOP DRAWING REVIEW: DIMENSIONS AND QUANTITIES ARE NOT REVIEWED BY THE ENGINEER OF RECORD AND THEREFORE MUST BE VERIFIED BY THE CONTRACTOR. THE CONTRACTOR SHALL REVIEW AND STAMP DRAWINGS PRIOR TO REVIEW BY THE ENGINEER OF RECORD. SUBMITTALS SHALL INCLUDE A REPRODUCIBLE AND ONE COPY. THE REPRODUCIBLE WILL BE MARKED AND RETURNED.

IN THE EVENT OF DEVIATIONS, DISCREPANCIES, OR CONFLICTS BETWEEN APPROVED SHOP DRAWING SUBMITTALS AND THE CONTRACT DOCUMENTS, THE DESIGN DRAWINGS AND SPECIFICATIONS SHALL CONTROL.

ALL STRUCTURAL SYSTEMS COMPOSED OF COMPONENTS TO BE FIELD ERECTED SHALL BE SUPERVISED BY THE SUPPLIER DURING MANUFACTURING, DELIVERY, HANDLING, STORAGE AND ERECTION IN ACCORDANCE WITH INSTRUCTIONS PREPARED BY THE SUPPLIER.

INSPECTION: SPECIAL INSPECTION IN ACCORDANCE WITH IBC SECTIONS 1704 AND 1705 SHALL BE PROVIDED FOR THE FOLLOWING WORK ITEMS:

ITEM	SPECIAL INSPECTION REQUIRED FOR:	FREQUENCY
WOOD / TIMBER	NAILING OF SHEAR WALLS AND DIAPHRAGMS	PERIODIC
	DRAG STRUTS AND HOLDOWNS	PERIODIC
STRUCTURAL STEEL	MATERIAL VERIFICATION OF HIGH-STRENGTH BOLTS, NUTS AND WASHERS	PERIODIC
	HIGH-STRENGTH BOLTING	PERIODIC
	MATERIAL VERIFICATION OF STRUCTURAL STEEL AND COLD-FORMED DECK	PERIODIC
	MATERIAL VERIFICATION OF WELD FILLER MATERIALS	PERIODIC
	WELDING OF STRUCTURAL STEEL:	
	GROOVE WELDS	CONTINUOUS
	MULTI-PASS FILLET WELDS	CONTINUOUS
	FILLET WELDS >5/16"	CONTINUOUS
	FILLET WELDS ≤5/16"	PERIODIC
	DECK WELDS	PERIODIC
	WELDED STUDS	PERIODIC
	DETAILS	PERIODIC
REINFORCED CONCRETE	REINFORCING STEEL, MATERIALS AND PLACEMENT	PERIODIC
	BOLTS INSTALLED IN CONCRETE	CONTINUOUS
	USE OF CORRECT DESIGN MIX	PERIODIC
	PLACEMENT OF CONCRETE	CONTINUOUS
	CURING TEMPERATURE AND TECHNIQUE	PERIODIC
MASONRY	PROPORTIONS OF SITE-PREPARED MORTAR	PERIODIC
	CONSTRUCTION OF MORTAR JOINTS	PERIODIC
	LOCATION OF REINFORCEMENT, CONNECTORS, AND ANCHORAGES	PERIODIC
	GROUT SPACE	PERIODIC
	GRADE, TYPE AND SIZE OF REINFORCEMENT AND ANCHOR BOLTS	PERIODIC
	PLACEMENT OF REINFORCEMENT AND CONNECTORS	PERIODIC
	PROPORTIONS OF SITE-PREPARED MORTAR	PERIODIC
	SIZE AND LOCATION OF STRUCTURAL ELEMENTS	PERIODIC
	TYPE,SIZE,AND LOCATION OF ANCHORS INCLUDING ANCHORAGE OF MASONRY TO STRUCTURAL MEMBERS, FRAMES, OR OTHER CONSTRUCTION	PERIODIC
	WELDING OF REINFORCEMENT	CONTINUOUS
	PREPARATION, CONSTRUCTION, AND PROTECTION OF MASONRY DURING COLD OR HOT WEATHER	PERIODIC
	PLACEMENTS OF GROUTS IN COMPLIANCE	CONTINUOUS

TESTING: MATERIALS TESTING IN ACCORDANCE WITH IBC SECTION 1705 SHALL BE PROVIDED FOR THE FOLLOWING WORK ITEMS.

ITEM	MATERIAL TESTING	FREQUENCY
STRUCTURAL STEEL	WELDING OF STRUCTURAL STEEL GROOVE WELDS	CONTINUOUS
REINFORCED CONCRETE	REINFORCING STEEL CERTIFIED MILL TESTS	CONTINUOUS
	CONCRETE SPECIMENS	CONTINUOUS
MASONRY	REINFORCING STEEL CERTIFIED MILL TESTS	CONTINUOUS
	GROUT AND MORTAR SPECIMENS	CONTINUOUS

THE SPECIAL INSPECTION AND TESTING SHALL BE PERFORMED BY A QUALIFIED TESTING AGENCY DESIGNATED BY THE CONTRACTOR. THE ARCHITECT AND STRUCTURAL ENGINEER SHALL BE FURNISHED WITH COPIES OF ALL INSPECTION REPORTS AND TEST RESULTS.

GEOTECHNICAL

ALLOWABLE SOIL PRESSURES AND LATERAL EARTH PRESSURES HAVE BEEN ASSUMED PER IBC 1806. IF THE UNDISTURBED NATIVE SOILS VARY FROM THOSE ASSUMED, IF CLAY IS PRESENT, OR IF GROUND WATER IS PRESENT, THE SOIL LOAD BEARING VALUES SHALL BE VERIFIED BY A QUALIFIED GEOTECHNICAL ENGINEER OR APPROVED BY THE BUILDING OFFICIAL.

GEOTECHNICAL REPORT REFERENCE: REPORT #XXXX
COMPANY
ADDRESS
ADDRESS

THE DESIGN SHOWN IN THESE DRAWINGS SHALL BE REVIEWED BY THE GEOTECHNICAL ENGINEER FOR COMPLIANCE WITH THE ABOVE REFERENCED SOILS REPORT.

IN THE EVENT OF CONFLICTS, THE GEOTECHNICAL ENGINEER'S RECOMMENDATIONS SHALL CONTROL. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE STRUCTURAL ENGINEER FOR POSSIBLE REDESIGN.

FOOTINGS SHALL BEAR ON UNDISTURBED NATIVE SOILS AT LEAST 48" BELOW ADJACENT FINISHED GRADE, U.N.O. FOOTINGS SHALL BE CENTERED BELOW COLUMNS OR WALLS.

BACKFILL ALL BASEMENT AND RETAINING WALLS WITH FREE DRAINING, GRANULAR FILL AND PROVIDE FOR SUBSURFACE DRAINAGE.

PER IBC TABLE 1806.2
ASSUMED CLASS OF MATERIALS: SAND, SILTY SAND AND SILTY GRAVEL (ML & MH)
ALLOWABLE SOIL BEARING PRESSURE: 2000 PSF
PASSIVE EARTH PRESSURE: 250 PCF
ACTIVE EARTH PRESSURE (RESTRAINED): 35 PCF
ACTIVE EARTH PRESSURE (UNRESTRAINED): 50 PCF

03 CONCRETE

ALL CONCRETE CONSTRUCTION SHALL BE PER THE ADOPTED EDITION OF ACI 318. TOLERANCES FOR CONCRETE CONSTRUCTION AND MATERIALS SHALL BE PER THE ADOPTED EDITION OF ACI 117.

CONCRETE SHALL BE MIXED, PROPORTIONED, CONVEYED AND PLACED IN ACCORDANCE WITH ACI 318 AND ACI 301. STRENGTHS AT 28 DAYS AND MIX CRITERIA SHALL BE AS FOLLOWS:

TYPE OF CONCRETE CONSTRUCTION	MIN. COMPRESSIVE STRENGTH, f'c AT 28 DAYS	MAX. W/C RATIO
FOOTINGS	3000PSI	0.45
SLABS	4000PSI	0.45
FOUNDATION WALLS	3000PSI	0.45
CONCRETE WALLS AND COLUMNS	4000PSI	0.45

CEMENT TYPE SHALL BE AS FOLLOWS:
CONCRETE EXPOSED TO SOIL: TYPE II
ALL OTHER: TYPE I

ALL CONCRETE EXPOSED TO FREEZING-AND-THAWING SHALL BE AIR-ENTRAINED WITH AN AIR-CONTENT CONFORMING TO ACI 318 TABLE 4.4.1

FIBERMESH SHALL BE 100% VIRGIN POLYPROPYLENE, FIBRILLATED FIBERS AS MANUFACTURED BY FIBERMESH CO. PER ASTM C-1116 TYPE 111 4.1.3 AND ASTM C-1116 PERFORMANCE LEVEL ONE, 1.5 LB. PER CUBIC YARD.

REINFORCING STEEL SHALL CONFORM TO ASTM A615 (INCLUDING SUPPLEMENT S1), GRADE 60, FY = 60,000 PSI. GRADE 60 REINFORCING BARS TO BE WELDED SHALL CONFORM TO ASTM A706. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185. LONGITUDINAL REINFORCEMENT IN DUCTILE FRAME MEMBERS AND IN BOUNDARY MEMBERS SHALL COMPLY WITH ASTM A706.

REINFORCING STEEL SHALL BE DETAILED (INCLUDING HOOKS AND BENDS) IN ACCORDANCE WITH THE LATEST EDITIONS OF ACI 315 AND 318. REINFORCEMENT MAY BE SPLICED ONLY WHERE INDICATED ON THE DRAWINGS, EXCEPT THAT REINFORCING INDICATED "CONTINUOUS" MAY BE SPLICED AS REQUIRED BY THE CONTRACTOR FOR CONSTRUCTABILITY. DEVELOPMENT AND SPLICE LENGTHS SHALL BE AS FOLLOWS: (DB REFERS TO BAR DIAMETER, LD REFERS TO DEVELOPMENT LENGTH)

CONCRETE PROTECTION (COVER) FOR REINFORCING STEEL SHALL BE PER THE DRAWINGS. ADDITIONAL CONCRETE COVER MAY BE REQUIRED FOR FIRE PROTECTION - SEE PLAN NOTES WHERE APPROPRIATE.

NON-SHRINK GROUT SHALL BE FURNISHED BY AN APPROVED MANUFACTURER AND SHALL BE MIXED AND PLACED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. GROUT STRENGTH SHALL BE AT LEAST EQUAL TO THE MATERIAL ON WHICH IT IS PLACED (4,000 PSI MINIMUM).

ANCHORAGE TO CONCRETE OR MASONRY

CAST-IN-PLACE (CIP) ANCHORS SHALL HAVE A 90-DEGREE HOOK WITH AN INSIDE RADIUS OF 3 DB PLUS AN EXTENSION OF 1.5 DB AT THE FREE END. CIP ANCHORS IN MASONRY SHALL BE SECURED IN PLACE PRIOR TO GROUTING. PROVIDE 1" GROUT MINIMUM AROUND ALL BOLTS IN MASONRY.

EXPANSION BOLTS INTO CONCRETE SHALL BE "KWIK BOLT TZ", AND THREADED EXPANSION INSERTS INTO CONCRETE SHALL BE SLEEVE ANCHORS, AS MANUFACTURED BY HILTI CORPORATION. INSTALL IN STRICT ACCORDANCE WITH ICC-ES EVALUATION REPORT ESR-1917, INCLUDING MINIMUM EMBEDMENT REQUIREMENTS.

MECHANICAL SCREW ANCHORS INTO MASONRY SHALL BE "TITEN HD" AS MANUFACTURED BY SIMPSON STRONG-TIE COMPANY. INSTALL IN STRICT ACCORDANCE WITH ICC-ES EVALUATION REPORT ESR-2713 OR ESR-1056, INCLUDING MINIMUN EMBEDMENT AND SPACING REQUIREMENTS

EPOXY-GROUTED ANCHORS (THREADED ROD OR REINFORCING BAR) SHALL BE GROUTED WITH HIT-RE 500-SD EPOXY BY HILTI CORPORATION. INSTALL IN STRICT ACCORDANCE WITH ICC-ES EVALUATION REPORT ESR-2322.

SHOT PINS AND OTHER POWDER-ACTUATED FASTENERS SHALL BE HILTI CORPORATION, SERIES X-DS, 0.177" DIAMETER. INSTALL IN STRICT ACCORDANCE WITH ICC-ES EVALUATION REPORT ESR-1663.

ALL THREADED ROD ANCHORS SHALL CONFORM TO ASTM SPECIFICATION A36 (FY = 36 KSI).

06 WOOD, PLASTICS, AND COMPOSITES

FRAMING LUMBER SHALL BE SPF #2, HF #2 OR DF #2 AND HAVE A MOISTURE CONTENT EQUAL TO OR LESS THAN 19% U.N.O., AND GRADED AND MARKED IN CONFORMANCE WITH WWPA STANDARD GRADING RULES FOR WEST COAST LUMBER, LATEST EDITION AND FURNISHED TO THE STANDARDS INDICATED ON THE PLANS, SCHEDULES AND DETAILS. THE DESIGN SHOWN IN THESE DRAWINGS IS BASED ON THE CURRENT EDITION OF THE NATIONAL DESIGN SPECIFICATIONS FOR WOOD CONSTRUCTION PUBLISHED BY THE AMERICAN FOREST AND PAPER ASSOCIATION. ALL SHIMS SHALL BE SEASONED AND DRIED AND THE SAME SPECIES AND GRADE AS MEMBERS CONNECTED.

GLUED LAMINATED MEMBERS SHALL BE FABRICATED IN CONFORMANCE WITH ASTM AND AITC STANDARDS. EACH MEMBER SHALL BEAR AN AITC IDENTIFICATION MARK AND SHALL BE ACCOMPANIED BY AN AITC CERTIFICATE OF CONFORMANCE. ALL BEAMS SHALL BE DOUGLAS-FIR COMBINATION 24F-V4, U.N.O. CAMBER ALL GLULAM BEAMS TO 2,000' RADIUS. GLUED LAMINATED MEMBERS EXPOSED TO WEATHER OR MOISTURE SHALL BE TREATED WITH APPROVED PRESERVATIVE.

MANUFACTURED LUMBER PRODUCTS SPECIFIED IN THESE DRAWINGS ARE BASED ON LUMBER MANUFACTURED BY THE TRUSS-JOIST CORPORATION. ALTERNATE MANUFACTURERS MAY BE USED SUBJECT TO REVIEW AND APPROVAL BY THE ARCHITECT AND STRUCTURAL ENGINEER. ALL JOIST HANGERS AND OTHER HARDWARE NOT SHOWN SHALL BE DESIGNED AND SUPPLIED BY THE MANUFACTURER.

MANUFACTURED LUMBER PRODUCTS SPECIFIED IN THESE DRAWINGS ARE BASED ON LUMBER MANUFACTURED BY THE TRUSS-JOIST CORPORATION. ALTERNATE MANUFACTURERS MAY BE USED SUBJECT TO REVIEW AND APPROVAL BY THE ARCHITECT AND STRUCTURAL ENGINEER. ALL JOISTS AND MULTIPLE JOIST BEAMS SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

MANUFACTURED LUMBER PRODUCTS SHALL BE MANUFACTURED UNDER A PROCESS APPROVED BY THE NATIONAL RESEARCH BOARD. EACH PIECE SHALL BEAR A STAMP OR STAMPS NOTING THE NAME AND PLANT NUMBER OF THE MANUFACTURER, THE GRADE, THE NER REPORT NUMBER, AND THE QUALITY CONTROL AGENCY. ALL MEMBERS SHALL BE MANUFACTURED WITH WATERPROOF ADHESIVE MEETING THE REQUIREMENTS OF ASTM D2259 WITH ALL STRANDS ORIENTED PARALLEL WITH THE LENGTH OF THE MEMBER.

PREFABRICATED PLYWOOD WEB JOISTS SHALL BE DESIGNED BY THE MANUFACTURER FOR THE SPANS AND CONDITIONS SHOWN ON THE DRAWINGS AND SHALL BE FURNISHED AND INSTALLED IN CONFORMANCE WITH THE MANUFACTURER'S INSTRUCTIONS. THESE PRODUCTS SHALL BE MANUFACTURED TO THE STANDARDS SET FORTH IN THE ICC-ES EVALUATION REPORT ESR-1153.

PREFABRICATED OPEN WEB WOOD FLOOR TRUSSES SHALL BE DESIGNED BY THE MANUFACTURER FOR THE SPANS AND CONDITIONS SHOWN ON THE DRAWINGS AND SHALL BE FURNISHED AND INSTALLED IN CONFORMANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

PREFABRICATED CONNECTOR PLATE WOOD ROOF TRUSSES SHALL BE DESIGNED BY THE MANUFACTURER IN ACCORDANCE WITH THE ANSI/TPI-1 BY THE TRUSS PLATE INSTITUTE FOR THE SPANS AND CONDITIONS SHOWN ON THE DRAWINGS. LOADING SHALL BE AS FOLLOWS:

TOP CHORD DEAD LOAD	10 PSF
BOTTOM CHORD DEAD LOAD	5 PSF
WIND UPLIFT (TOP CHORD)	10 PSF
*(BOTTOM CHORD LIVE LOAD)	10 PSF

*BOTTOM CHORD LIVE LOAD (NON-SIMULTANEOUS WITH TOP CHORD LIVE LOAD) SHALL BE APPLIED TO ATTIC ACCESSIBLE AREAS.

WOOD TRUSSES SHALL UTILIZE APPROVED CONNECTOR PLATES (HANGNAIL OR EQUAL). PROVIDE FOR SHAPES, BEARING POINTS, INTERSECTIONS, HIPS, VALLEYS, ETC., AS SHOWN ON THE DRAWINGS. EXACT COMPOSITION OF SPECIAL HIP, VALLEY AND INTERSECTION AREAS (USE OF GIRDER TRUSSES, JACK TRUSSES, STEP-DOWN TRUSSES, ETC.,) SHALL BE DETERMINED BY THE MANUFACTURER. PROVIDE ALL TRUSS-TO-TRUSS AND TRUSS-TO-BEAM CONNECTION DETAILS AND REQUIRED CONNECTION MATERIALS. PROVIDE DETAILS FOR ALL TEMPORARY AND PERMANENT TRUSS BRACING AND BRIDGING.

ALL COMMON WIRE NAILS AND SPIKES, BOX NAILS AND THREADED, HARDENED-STEEL NAILS AND SPIKES SHALL CONFORM TO THE NOMINAL SIZES SPECIFIED IN ASTM F1667. ALL NAILS SPECIFIED ON THE DRAWINGS, EITHER DRIVEN WITH A HAMMER OR PNEUMATIC DEVICE, SHALL BE COMMON WIRE NAILS WITH THE PROPERTIES SHOWN IN THE FOLLOWING TABLE:

PENNY-WEIGHT	8d	10d	12d	16d	20d
DIAMETER (INCHES)	.131	.148	.148	.162	.192
LENGTH (INCHES)	2 1/2	3	3 1/4	3 1/2	4

INSTALLATION OF TIMBER FASTENERS SHALL CONFORM TO THE CURRENT EDITION OF THE NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION, PUBLISHED BY THE AMERICAN FOREST AND PAPER ASSOCIATION.

WOOD CONSTRUCTION CONNECTORS CALLED OUT BY LETTERS AND NUMBERS SHALL BE "STRONG-TIE" BY SIMPSON COMPANY, AS SPECIFIED IN THEIR CATALOG (LATEST EDITION), OR APPROVED EQUAL. PROVIDE NUMBER AND SIZE OF FASTENERS AS SPECIFIED BY MANUFACTURER. CONNECTORS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. ALL JOISTS AND MULTIPLE JOIST BEAMS SHALL BE CONNECTED TO FLUSH BEAMS WITH "U" SERIES JOIST HANGERS.

CONNECTIONS FOR WOOD MEMBERS SHALL CONFORM TO IBC SECTION 2301.2 AND THE NUMBER AND SIZE OF FASTENERS CONNECTING WOOD MEMBERS SHALL NOT BE LESS THAN THAT SET FORTH IN IBC TABLE 2304.9.1.

FOR SAWN LUMBER ROOF AND FLOOR FRAMING, PROVIDE DOUBLE JOISTS UNDER ALL PARALLEL PARTITIONS THAT EXTEND OVER MORE THAN HALF THE JOIST SPAN AND AROUND ALL OPENINGS. PROVIDE BRIDGING @ 8'-0" OC AND FULL DEPTH SOLID BLOCKING AT ALL BEARING POINTS. NAIL ALL MULTI-JOIST BEAMS TOGETHER WITH (3) 16D @ 12" OC.

FOR MANUFACTURED LUMBER ROOF AND FLOOR FRAMING, ALL NECESSARY BRIDGING, BLOCKING, BLOCKING PANELS, STIFFENERS, ETC., SHALL BE DETAILED AND FURNISHED BY THE MANUFACTURER. INSTALLATION OF THE ABOVE ITEMS SHALL BE IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

ROOF, FLOOR AND WALL SHEATHING SHALL BE APA RATED, EXTERIOR OR EXPOSURE 1. GLUE FLOOR SHEATHING TO ALL SUPPORTING MEMBERS WITH ADHESIVE CONFORMING TO APA SPECIFICATION AFG-01. SHEATHING SHALL BE AS FOLLOWS U.N.O.:

WALL SHEATHING: 7/16" CDX PLYWOOD, APA 24/16, BLOCKED AND NAILED
FLOOR SHEATHING: ¾" APA TONGUE AND GROOVE, GLUED AND NAILED
ROOF SHEATHING: 19/32" CDX PLYWOOD, APA 32/16, NAILED

ROOF AND FLOOR SHEATHING SHALL BE LAID UP WITH GRAIN PERPENDICULAR TO SUPPORTS. PROVIDE APPROVED PANEL EDGE CLIPS CENTERED BETWEEN RAFTERS OR TRUSSES AT UNBLOCKED ROOF SHEATHING EDGES. ALL FLOOR SHEATHING SHALL HAVE APPROVED TONGUE AND GROOVE JOINTS OR SHALL BE SUPPORTED WITH SOLID BLOCKING. ALLOW1/8" SPACING AT ALL PANEL EDGES AND ENDS OF FLOOR AND ROOF SHEATHING.

NAIL ALL WALL SHEATHING WITH 8D NAILS AT 6" OC AT PANEL EDGES AND 12" OC TO INTERMEDIATE FRAMING, U.N.O. NAIL ALL FLOOR AND ROOF SHEATHING WITH 10D NAILS AT 6" OC AT PANEL EDGES AND 12" OC TO INTERMEDIATE FRAMING U.N.O.

STUD WALL FRAMING SHALL BE 2X4 STUDS AT 16" OC AT INTERIOR WALLS AND 2X6 STUDS AT 16" OC AT EXTERIOR WALLS U.N.O. STUD WALLS SHALL HAVE DOUBLE 2X TOP PLATES AND 2X SOLE OR SILL PLATES MATCHING STUD SIZE. SPECIES AND GRADE. ALL LOWER WOOD SOLE PLATES SHALL BE ATTACHED TO WOOD FRAMING BELOW WITH 16D NAILS AT 12" OC STAGGERED. WOOD SILL PLATES SHALL BE BOLTED TO CONCRETE WITH 5/8" DIAMETER ANCHOR BOLTS (EMBED 7" MIN.) AT 4'-0" OC WITH 3X3X1/4 THICK WASHERS. THERE SHALL BE A MINIMUM OF (2) BOLTS PER PIECE WITH (1) BOLT LOCATED NOT MORE THAN 12" OR LESS 4" FROM EACH END OF EACH PIECE.

TWO STUDS (MINIMUM) SHALL BE PROVIDED AT THE ENDS OF WALLS, AT EACH SIDE OF ALL OPENINGS, AND AT THE ENDS OF ALL BEAMS AND HEADERS. POSTS OF BUILT-UP 2X STUDS SHALL BE NAILED TO EACH OTHER PER IBC TABLE 2304.9.1. SOLID BLOCKING FOR WOOD POSTS SHALL BE PROVIDED THROUGH ALL FLOORS TO SUPPORTING MEMBERS (FOUNDATION) BELOW. (2) 2X8 BOX HEADERS SHALL BE PROVIDED OVER ALL OPENINGS U.N.O.

ENGINEER OF RECORD: _____

QUALITY CONTROL REVIEWER: _____

NEED TO UPDATE WITH AAL SHEETS

SHEET INDEX

CITY STAMP

#	DATE	REVISION

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RED ALDER RESIDENCE

GENERAL STRUCTURAL NOTES

DATE: 5.1.2019

SHEET: SG100

PRELIMINARY - DD

DATE STAMP: 4/30/2019 5:08:44 PM

IBC TABLE 2304.9.1 FASTENING SCHEDULE

CONNECTION	FASTENING A,M	LOCATION
JOIST TO SILL OR GIRDER	3 - 8d COMMON 3 - 3"X0.131" NAIL 3 - 3" 14 GAGE STAPLE	TOENAIL
BRIDGING TO JOIST	2 - 8d COMMON 2 - 3"X0.131" NAIL 2 - 3" 14 GAGE STAPLE	TOENAIL EACH END
1" X 6" SUBFLOOR OR LESS TO EACH JOIST	2-8d COMMON	FACE NAIL
WIDER THAN 1 " X 6" SUBFLOOR TO EACH JOIST	3-8d COMMON	FACE NAIL
2" SUBFLOOR TO JOIST OR GIRDER	2-16d COMMON	BLIND AND FACE NAIL
SOLE PLATE TO JOIST OR BLOCKING	16d @ 16"O.C. 3"X0.131" NAIL @ 8"O.C. 3" 14 GAGE STAPLE @ 12"O.C.	TYPICAL FACE NAIL
SOLE PLATE TO JOIST OR BLOCKING AT BRACED WALL PANEL	3-16d @ 16"O.C. 3"X0.131" NAIL @ 16"O.C. 3" 14 GAGE STAPLE @ 16"O.C.	BRACED WALL PANELS
TOP PLATE TO STUD	2-16d COMMON 3-3"X0.131" NAIL 3-3" 14 GAGE STAPLE	END NAIL
STUD TO SOLE PLATE	4-8d COMMON 4-3"X0.131" NAIL 3-3" 14 GAGE STAPLE	TOENAIL
	2-16d COMMON 3-3"X0.131" NAIL 3-3" 14 GAGE STAPLE	END NAIL
DOUBLE STUDS	16d @ 24"O.C. 3"X0.131" NAIL @ 8"O.C. 3" 14 GAGE STAPLE @ 8"O.C.	FACE NAIL
DOUBLE TOP PLATES	16d @ 24"O.C. 3"X0.131" NAIL @ 8"O.C. 3" 14 GAGE STAPLE @ 8"O.C.	TYPICAL FACE NAIL
DOUBLE TOP PLATES	8-16d COMMON 12-3"X0.131" NAIL 12-3" 14 GAGE STAPLE	LAP SPLICE
BLOCKING BETWEEN JOISTS OR RAFTERS TO TOP PLATE	3-8d COMMON 3-3"X0.131" NAIL 3-3" 14 GAGE STAPLE	TOENAIL
RIM JOIST TO TOP PLATE	8d @ 6" O.C. 3"X0.131" NAIL @ 6"O.C. 3" 14 GAGE STAPLE @ 6"O.C.	TOENAIL
TOP PLATES, LAPS AND INTERSECTIONS	2-16d COMMON 3-3"X0.131" NAIL 3-3" 14 GAGE STAPLE	FACE NAIL
CONTINUOUS HEADER, TWO PIECES	16d COMMON	16' O.C. ALONG EDGE
CEILING JOISTS TO PLATE	3-8d COMMON 5-3"X0.131" NAIL 5-3" 14 GAGE STAPLE	TOENAIL
CONTINUOUS HEADER TO STUD	4-8d COMMON	TOENAIL
CEILING JOISTS, LAPS OVER PARTITIONS (SEE SECTION 2308.10.4.1, TABLE 2308.10.4.1)	3-16d COMMON MIN., TABLE 2308.10.4.1 4-3"X0.131" NAIL 4-3" 14 GAGE STAPLE	FACE NAIL
CEILING JOISTS TO PARALLEL RAFTERS (SEE SECTION 2308.10.1, TABLE 2308.10.4.1)	3-16d COMMON MIN., TABLE 2308.10.4.1 4-3"X0.131" NAIL 4-3" 14 GAGE STAPLE	FACE NAIL
RAFTER TO PLATE (SEE SECTION 2308.10.1, TABLE 2308.10.1)	3-8d COMMON 3-3"X0.131" NAIL 3-3" 14 GAGE STAPLE	TOENAIL

CONNECTION	FASTENING A,M		LOCATION
1" DIAGONAL BRACE TO EACH STUD AND PLATE	2-8d COMMON		
	2-3"X0.131" NAIL		FACE NAIL
	2-3" 14 GAGE STAPLE		
1" X 8" SHEATHING TO EACH BEARING	2-8d COMMON		FACE NAIL
WIDER THAN 1" X 8" SHEATHING TO EACH BEARING	3-8d COMMON		FACE NAIL
BUILT-UP CORNER STUDS	16d COMMON		24" O.C.
	3"X0.131" NAIL		16" O.C.
	3" 14 GAGE STAPLE		16" O.C.
BUILT-UP GIRDER BEAMS	20d COMMON @ 32"O.C.		FACE NAIL AT TOP AND BOTTOM, STAGGERED ON OPP. SIDES
	3"X0.131" NAIL @ 24"O.C.		
	3" 14 GAGE STAPLE @ 24"O.C.		
	2-20d COMMON		FACE NAIL AT ENDS AND AT EACH SPLICE
	3-3"X0.131" NAIL		
	3-3" 14 GAGE STAPLE		
2" PLANKS	16d COMMON		AT EACH BEARING
COLLAR TIE TO RAFTER	3-10d COMMON		
	4-3"X0.131" NAIL		FACE NAIL
	4-3" 14 GAGE STAPLE FACE NAIL		
JACK RAFTER TO HIP	3-10d COMMON		
	4-3"X0.131" NAIL		TOE NAIL
	4-3" 14 GAGE STAPLE		
	2-16d COMMON		
	3-3"X0.131" NAIL		FACE NAIL
	3-3" 14 GAGE STAPLE		
ROOF RAFTER TO 2-BY RIDGE BEAM	2-16d COMMON		
	3-3"X0.131" NAIL		TOE NAIL
	3-3" 14 GAGE STAPLE		
	2-16d COMMON		
	3-3"X0.131" NAIL		FACE NAIL
	3-3" 14 GAGE STAPLE		
JOIST TO BAND JOIST	3-16d COMMON		
	5-3"X0.131" NAIL		FACE NAIL
	5-3" 14 GAGE STAPLE		
LEDGER STRIP	3-16d COMMON		
	4-3"X0.131" NAIL		FACE NAIL AT EACH JOIST
	4-3" 14 GAGE STAPLE		
WOOD STRUCTURAL PANELS AND PARTICLE BOARDB SUBFLOOR, ROOF AND WALL SHEATHING (TO FRAMING)	1/2" AND LESS	6dC,L	
		2 3/8"X0.113" NAILN	
	19/32" TO 3/4"	1 3/4" 16 GAGEO	
		8dD OR 6dE	
		2 3/8"X0.113" NAILP	
	7/8" TO 1"	2" 16 GAGEP	
		8dC	
		10dD OR 8dE	
SINGLE FLOOR (COMBINATION SUBFLOOR-UNDERLAYMENT TO FRAMING)	1 1/8" TO 1 1/4"		
	3/4" AND LESS	6dE	
	7/8" TO 1"	8dE	
	1 1/8" TO 1 1/4"	10dD OR 8dE	
PANEL SIDING (TO FRAMING)	1/2" OR LESS	6dF	
	5/8"	8dF	
FIBERBOARD SHEATHING	1/2"	NO. 11 GAGEH ROOFING NAIL	
		6d COMMON NAIL	
		NO. 16 GAGE STAPLEI	
	25/32"	NO. 11 GAGEH ROOFING NAIL	
		8d COMMON NAIL	
		NO. 16 GAGE STAPLE	
INTERIOR PANELING	1/4"	4dJ	
	3/8"	6dK	

FASTENING NOTES:

A. COMMON OR BOX NAILS MAY BE USED EXCEPT WHERE OTHERWISE STATED.

B. NAILS SPACED @ 6" O.C. @ EDGES, 12" @ INTERMEDIATE SUPPORTS EXCEPT 6" @ ALL SUPPORTS WHERE SPANS ARE 48" OR MORE. FOR NAILING OF WOOD STRUCTURAL PANEL & PARTICLEBOARD DIAPHRAGMS & SHEARWALLS, REFER TO SECTION 2305. NAILS FOR WALL SHEATHING MAY BE COMMON, BOX OR CASING

C. COMMON OR DEFORMED SHANK

D. COMMON

E. DEFORMED SHANK

F. CORROSION-RESISTANT SIDING OR CASING NAILS CONFORMING TO THE REQ. OF SECTION 2304.3

G. FASTENERS SPACED 3" O.C. @ EXTERIOR EDGES & 6" O.C. AT INTERMEDIATE SUPPORTS

H. CORROSION-RESISTANT ROOFING NAILS W/ 7/16"ø HEAD & 11/2" LENGTH FOR 1/2" SHEATHING & 13/4" LENGTH FOR 25/32"

I. CORROSION-RESISTANT STAPLES W/ NOMINAL 7/16" CROWN & 11/8" LENGTH FOR 1/2" SHEATHING AND 13/4" LENGTH FOR 25/32" SHEATHING. PANEL SUPPORTS @ 16" (20" IF STRENGTH AXIS IN THE LONG DIRECTION OF THE PANEL, UNLESS OTHERWISE MARKED).

J. CASING OR FINISH NAILS SPACED 6" ON PANEL EDGES, 12" @ INTERMEDIATE SUPPORTS

K. PANEL SUPPORTS @ 24". CASING OR FINISH NAILS SPACED 6" ON PANEL EDGES, 12" @ INTERMEDIATE SUPPORTS

L. FOR ROOF SHEATHING APPLICATIONS, 8d NAILS ARE THE MINIMUM REQUIRED FOR WOOD STRUCTURAL PANELS.

M. STAPLES SHALL HAVE A MINIMUM CROWN WIDTH OF 7/16".

N. FOR ROOF SHEATHING APPLICATIONS, FASTENERS SPACED 4" O.C. EDGES, 8" @ INTERMEDIATE SUPPORTS.

O. FASTENERS SPACED 4" O.C. AT EDGES, 8" @ INTERMEDIATE SUPPORTS FOR SUBFLOOR AND WALL SHEATHING AND 3" O.C. AT EDGES, 6" @ INTERMEDIATE SUPPORTS FOR ROOF SHEATHING.

P. FASTENERS SPACED 4" O.C. AT EDGES, 8" @ INTERMEDIATE SUPPORTS.

CONCRETE PROTECTION FOR REINFORCING		
CONDITION	**BAR SIZES**	**CLEAR COVER**
UNFORMED SURFACES CAST AGAINST EARTH	ALL	3 INCHES
FORMED AND FINISHED SURFACES EXPOSED TO EARTH OR WEATHER	#5 OR SMALLER	1 1/2 INCHES
	#6 OR LARGER	2 INCHES
COLUMN AND BEAM REINFORCEMENT INCLUDING TIES AND STIRRUPS		
	ALL	1 1/2 INCHES
INTERIOR SURFACES OF WALLS AND SLABS	#11 OR SMALLER	3/4 INCHES

REINFORCING BAR DEVELOPMENT/SPLICE LENGTH SCHEDULE 1,2

BAR SIZE	CONCRETE STRENGTH				MASONRY		
	f'c = 3000 PSI		f'c = 4000 PSI		f'm = 1500 PSI		
	DEV. & SPLICE 3,4,5	HOOKED	DEV. & SPLICE 3,4,5	HOOKED	DEVELOPMENT	SPLICE	HOOKED
#3	21 in	8 in	19 in	7 in	19 in	18 in	5 in
#4	29 in	25 in	25 in	10 in	34 in	24 in	7 in
#5	36 in	31 in	31 in	12 in	53 in	30 in	8 in
#6	43 in	38 in	38 in	14 in	98 in	36 in	10 in
#7	63 in	54 in	54 in	17 in	134 in	42 in	10 in
#8	72 in	62 in	62 in	19 in	202 in	48 in	13 in
#9	81 in	70 in	70 in	21 in	256 in	54 in	15 in
#10	90 in	78 in	78 in	24 in	316 in	60 in	16 in
#11	99 in	85 in	85 in	26 in	382 in	66 in	18 in

NOTES:

1. DEVELOPMENT AND SPLICE LENGTHS SHALL BE PER ABOVE UNLESS NOTED OTHERWISE ON PLANS OF DETAILS.
2. DEVELOPMENT LENGTH FOR EPOXY-COATED REINFORCING BARS SHALL BE MULTIPLIED BY 1.5
3. SPLICE LENGTH ASSUMES A CLASS B SPLICE PER ACI 318-12.5.1. CLASS A SPLICE LENGTHS SHALL BE MULTIPLIED BY 0.78.
4. DEVELOPMENT LENGTHS IN CONCRETE COLUMNS MAY BE MULTIPLIED BY 0.5.
5. SPLICE LENGTHS IN CONCRETE COLUMNS MAY BE MULTIPLIED BY 0.70.
6. DEVELOPMENT LENGTH ASSUMES STEEL REINFORCING WITH fy=60KSI. DEVELOPMENT LENGTHS FOR STEEL WITH fy=40KSI MAY BE MULTIPLIED BY 0.66.

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FOUNDATION COMMON SYMBOLS:

F1 = FOOTING MARK, SEE FOOTING SCHEDULE

XX'-XX" = TOP OF WALL ELEVATION

XX'-XX" = TOP OF FOOTING ELEVATION

XX'-XX" = TOP OF PIER ELEVATION

= COLUMN TO BELOW

HDU = HOLDOWN, SEE DETAIL 1/SG200

FRAMING COMMON SYMBOLS:

= ARCHITECTURAL WALL

= BEARING WALL

= OVERFRAMING, SEE DETAIL 9/SG200

= WALL TYPE A

= WALL TYPE B

= WALL TYPE C

= SHEAR WALL @ THIS LEVEL TO BELOW

6 = SHEAR WALL MARK, SEE SCHEDULE

D1 = DIAPHRAGM MARK, SEE SCHEDULE

A11 = HEADER, SEE SCHEDULE

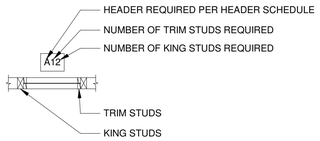
X = BEAM MARK, SEE SCHEDULE

SLOPE X:12 = DIRECTION OF DOWNWARD SLOPE

FOOTING SCHEDULE		
FOOTING	SIZE	REINFORCEMENT

HEADER SCHEDULE	
TYPE	SIZE

- TRIM STUDS AND KING STUDS TO BE DF#2, NUMBER REQUIRED AS FOLLOWS
- EXAMPLE SHOWN IS A (2) 2X8 DF#2 HEADER W/ (1) TRIM STUD AND (2) KING STUDS @ EA. END.
- KING STUDS AND TRIM STUDS NOT APPLICABLE @ LOG HEADERS



BEAM SCHEDULE		
BEAM	SIZE	HANGER

FRAMING MEMBERS SCHEDULE			
MEMBER	SIZE	SPACING (O.C.)	HANGER

DIAPHRAGM SCHEDULE					
MARK	SHEATHING APA - RATED [1,2,12,13]	BLOCKED	DIAPHRAGM BOUNDARIES	SUPPORTED PANEL EDGES	FIELD NAILING	SHEAR CAPACITY LBS/FT (w/ DF LARCH FRAMING)
D1	19/32" APA APPROVED CDX PLYWOOD; INDEX 24/0	NO	10d @ 6" O.C.	10d @ 6" O.C.	10d @ 12" O.C.	285
D4	3/4" T&G APA APPROVED CDX PLYWOOD; INDEX 40/20	NO	10d @ 6" O.C.	10d @ 6" O.C.	10d @ 12" O.C.	285

DIAPHRAGM SCHEDULE NOTES:

1. NAILING SPACING BASED ON COMMON NAILS.
2. APA RATED O.S.B. MAY BE SUBSTITUTED FOR CDX PLYWOOD WITH NO STRENGTH REDUCTION.
3. PLYWOOD SHALL BE INSTALLED WITH THE FACE OF GRAIN PERPENDICULAR TO THE FRAMING MEMBERS BELOW WITH THE END JOINTS STAGGERED.
4. ALLOWABLE SHEAR CAPACITIES MAY BE INCREASED 40% FOR WIND LOADING.

SHEAR WALL SCHEDULE - WOOD STUD						
MARK	WALL SHEATHING APA - RATED [1,2,11]	BLOCKING & STUD SIZE @ ADJOINING PANEL EDGES [3,6,12]	NAIL SIZE & SPACING @ ALL PANEL EDGES [4,5]	RIM JOIST OR BLOCKING CONNECTION TO TOP PLATE BELOW [7,8]	2x PLATE NAILING TO WOOD BELOW [9]	SILL PLATE ATTACHMENT ANCHOR ROD TO CONCRETE BELOW [10,13]
G8	1/2" GYP	NOT REQ'D.	5d @ 7" O.C.	16d TOENAIL @ 6" O.C.	12d @ 6" O.C.	5/8" @ 48" O.C.
6U	7/16"	NOT REQ'D.	8d @ 6" O.C.	16d TOENAIL @ 6" O.C.	12d @ 6" O.C.	5/8" @ 48" O.C.
6	7/16"	2x	8d @ 6" O.C.	16d TOENAIL @ 6" O.C.	12d @ 6" O.C.	5/8" @ 48" O.C.

SHEAR WALL SCHEDULE NOTES:

1. ALL EXTERIOR WALLS, NOT DESIGNATED AS SHEAR WALLS, TO HAVE 7/16" SHEATHING w/ 8d @ 6" O.C. @ EDGES, 12" O.C. FIELD. WALLS PERMITTED TO BE UNBLOCKED. ANCHOR BOLTS TO BE PER NOTE [10] AND SPACED @ 48" O.C.
2. CONNECTORS AND FASTENERS IN CONTACT WITH PRESERVATIVE-TREATED WOOD MEMBERS SHALL BE SELECTED BY THE CONTRACTOR WITH APPROPRIATE COATINGS FOR THE PRESERVATIVE TO PREVENT CORROSION.
3. BLOCKING IS REQUIRED AT ALL PANEL EDGES U.N.O.
4. PROVIDE SHEAR WALL SHEATHING AND NAILING FOR THE ENTIRE LENGTH OF WALLS INDICATED ON PLANS. ENDS OF FULL HEIGHT WALLS ARE DESIGNATED BY WINDOWS, OR DOORWAYS OR AS DESIGNATED ON PLANS. FOR HOLDOWN REQUIREMENTS, REFERENCE PLANS. (ALTERNATE NOTE: WALLS DESIGNATED AS PERFORATED SHEAR WALLS REQUIRE SHEATHING, SHEAR WALL NAILING, ETC. ABOVE AND BELOW ALL OPENINGS.)
5. SHEATHING EDGE NAILING IS REQUIRED AT ALL HOLDOWN POSTS. EDGE NAILING MAY ALSO BE REQUIRED TO EACH STUD USED IN BUILT-UP HOLDOWN POSTS. FOR ADDITIONAL INFORMATION, REFERENCE THE HOLDOWN DETAILS.
6. INTERMEDIATE FRAMING TO BE WITH 2x MINIMUM MEMBERS. ATTACH SHEATHING TO INTERMEDIATE FRAMING WITH 8d NAILS AT 12" O.C. WHERE STUDS ARE SPACED AT 16" O.C. AND 8d NAILS AT 6" O.C. WHERE STUDS ARE SPACED AT 24" O.C.
7. BASED ON 0.131Øx 1 1/2" NAILS USED TO ATTACH FRAMING CLIPS DIRECTLY TO FRAMING. USE 8d NAILS WHERE INSTALLED OVER SHEATHING.
8. FRAMING CLIPS: SIMPSON A35 OR LTP5 OR APPROVED EQUIVALENT.
9. WHERE BOTTOM PLATE ATTACHMENT SPECIFIES (2) ROWS OF NAILS, PROVIDE DOUBLE JOIST, RIM JOIST OR EQUAL BELOW. STAGGER NAILS IN ROWS 1 1/2" APART, MINIMUM.
10. ANCHOR RODS SHALL BE PROVIDED WITH 3"x 3"x 0.229" STEEL PLATE WASHERS. EMBED ANCHOR RODS 7" MINIMUM INTO CONCRETE. ANCHOR BOLT SHALL BE 2" FROM FACE OF SHEATHING, STAGGERED @ DOUBLE SIDED WALLS.
11. WHERE WOOD SHEATHING IS APPLIED OVER GYPSUM SHEATHING, CONTACT THE ENGINEER OF RECORD FOR ALTERNATE NAILING REQUIREMENTS.
12. AT ADJOINING PANEL EDGES, (2) 2x STUDS NAILED TOGETHER MAY BE USED IN PLACE OF A SINGLE 3x STUD. DOUBLE 2x STUDS MAY BE CONNECTED TOGETHER BY NAILING AT ADJOINING PANEL EDGES, (2) 2x STUDS NAILED TOGETHER MAY BE USED IN PLACE OF A SINGLE 3x STUD. DOUBLE 2x STUDS MAY BE CONNECTED TOGETHER BY NAILING THE STUDS TOGETHER WITH 3" LONG NAILS OF THE SAME SPACING AND DIAMETER AS THE PLATE NAILING.
13. CONTACT THE STRUCTURAL ENGINEERS OF RECORD FOR ADHESIVE OR EXPANSION BOLT ALTERNATIVES TO CAST-IN-PLACE ANCHOR RODS. SPECIAL INSPECTION MAY BE REQUIRED

WHAT TO DO WITH THIS SHEET?
ALL SCHEDULES ARE POPULATED WITH EACH BUILDING PLANSET.
NO SHEARWALL OR DIAPHRAGM SCHEDULES SHOWN

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STRUCTURAL SCHEDULES

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SHEET: SG102

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1 SG103 BUILDING LOCATION MAP
1" = 40'-0"

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BUILDING LOCATION MAP

DATE: 5.1.2019

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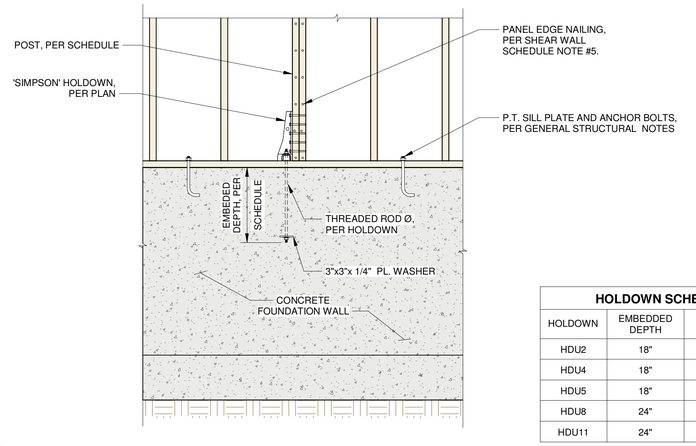
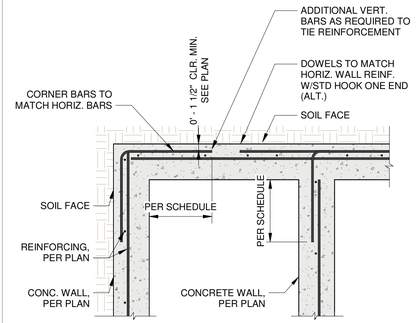
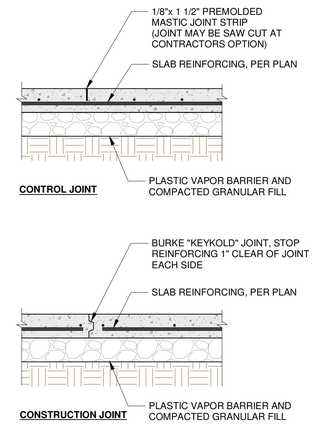


HOLDOWN SCHEDULE		
HOLDOWN	EMBEDDED DEPTH	POST
HDU2	18"	(2) 2x6 DF#2
HDU4	18"	(2) 2x6 DF#2
HDU5	18"	(2) 2x6 DF#2
HDU8	24"	(3) 2x6 DF#2
HDU11	24"	(4) 2x6 DF#2

1 SG200 TYPICAL HOLDDOWN
N.T.S.



2 SG200 TYPICAL CORNER REINFORCING
N.T.S.



3 SG200 TYPICAL SLAB JOINT
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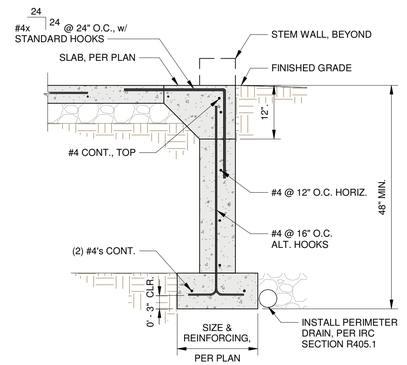

4 SG200 TYPICAL CONCRETE BLOCKOUT
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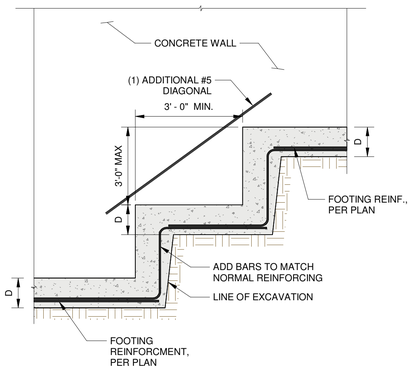

5 SG200 TYPICAL FOOTING STEP
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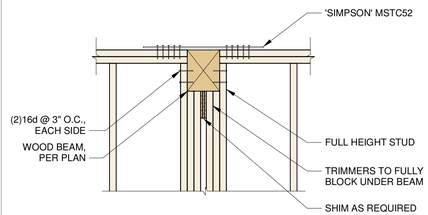
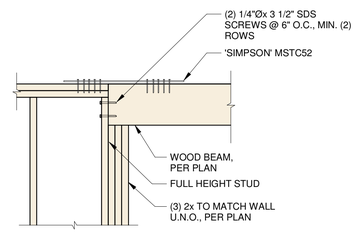
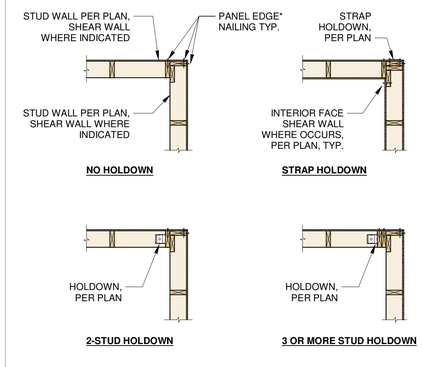


6 SG200 TYPICAL BEAM POCKET PERPINDICULAR
N.T.S.

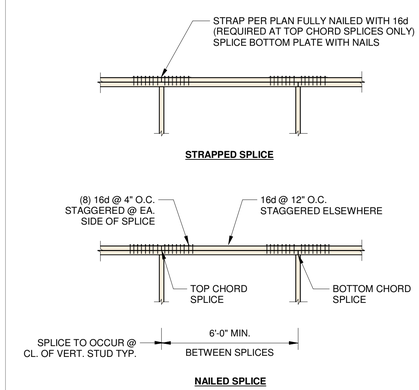


TYPICAL BEAM POCKET PARALLEL
3/4" = 1'-0"



* PANEL EDGE NAILING PER SHEAR WALL SCHEDULE OR G.S.N. - ONE ROW PER FRAMING MEMBER PER FACE, NAIL SPACING OF ALL ROWS TO MEET THE REQUIREMENTS OF THE HIGHER STRENGTH SHEAR WALL.

7 SG200 TYPICAL CORNER DETAILS
N.T.S.



8 SG200 TYPICAL CHORD SPLICE
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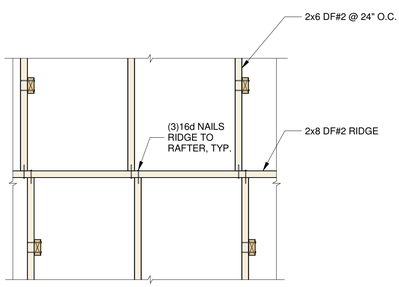
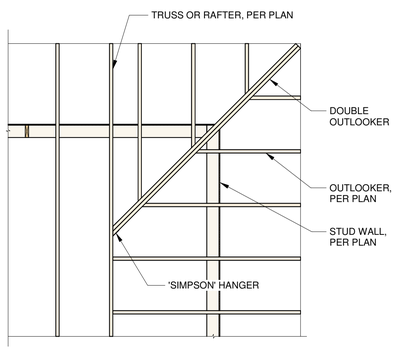


PROVIDE 2x4 DF#2 VERTICAL SUPPORTS TO TRUSS OR RAFTER BELOW @ 4'-0" O.C. STAGGERED GRID, NAIL WITH (2) 16d NAILS EACH END, TYP.

9 SG200 TYPICAL OVERFRAMING
N.T.S.



10 SG200 TYPICAL CORNER FRAMING
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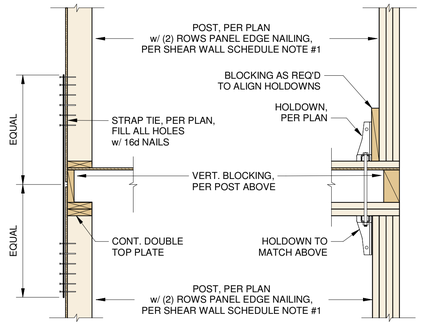

11 SG200 TYPICAL POST-TO-POST
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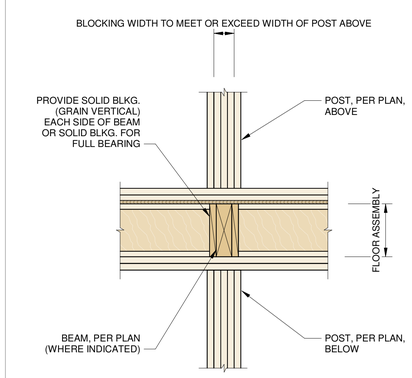
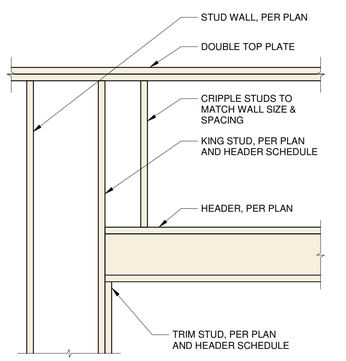


12 SG200 TYPICAL POST TRANSFER THROUGH FLOOR
N.T.S.



13 SG200 TYPICAL HEADER DETAIL
N.T.S.

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TYPICAL STRUCTURAL DETAILS

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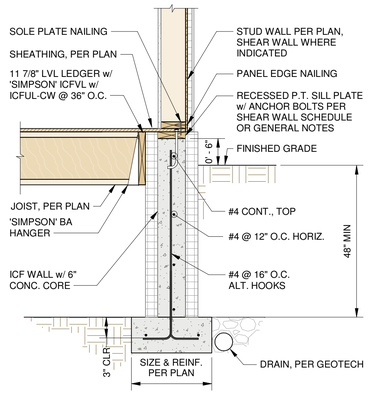
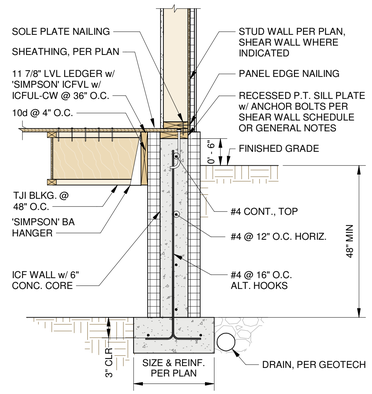


1 SG201 ICF FOUNDATION AT CRAWLSPACE PERPENDICULAR
3/4" = 1'-0"



2 SG201 ICF FOUNDATION AT CRAWLSPACE PARALLEL
3/4" = 1'-0"

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FOUNDATION DETAILS

DATE: 5.1.2019

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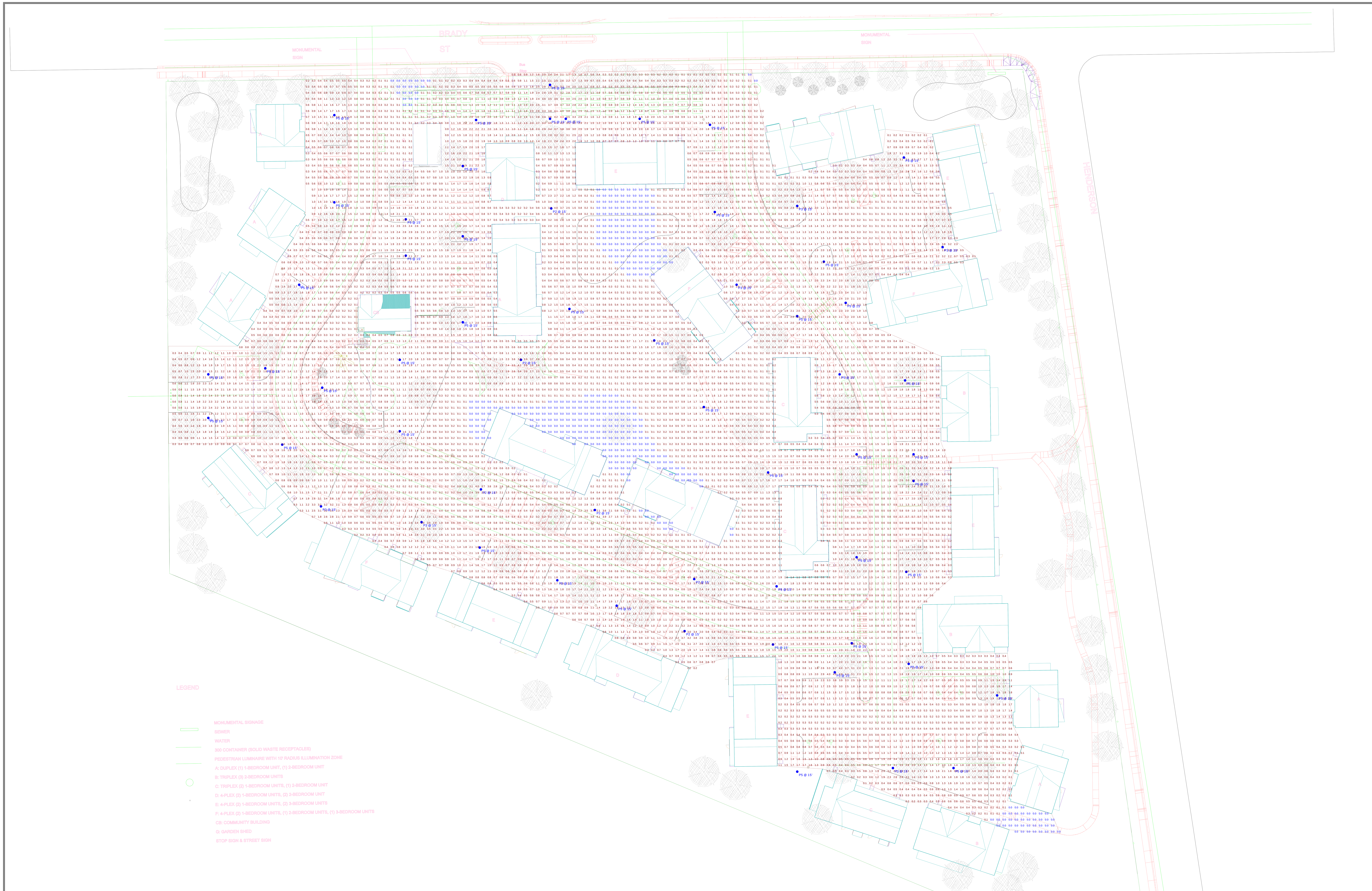


Symbol	Label	Quantity	Manufacturer	Catalog Number	Description	Light Loss Factor	Wattage
	P5	46	Lumec	PBDP103-50W64LED3K-MP-PC-C-LE5	TownGuide LED Classic T Post Top (PBDP103)	0.85	50.3
	P3	8	Lumec	PBDP103-50W64LED3K-MP-PC-C-LE3	TownGuide LED Classic T Post Top (PBDP103)	0.85	50.3
	P2	6	Lumec	PBDP103-50W64LED3K-MP-PC-C-LE2	TownGuide LED Classic T Post Top (PBDP103)	0.85	50.3

Schedule

Plan View
Scale - 1" = 25ft

Statistics

Description	Symbol	Avg	Max	Min	Max/Min	Avg/Min
Ground	+	0.9 fc	4.3 fc	0.0 fc	N/A	N/A

NORTHERN ROCKIES AGENCY, INC.
Representing the Electrical Manufacturer
246 Timberline Drive Bozeman, MT 59718
Telephone 406-587-0513

Red Alder Complete Site Lighting

Designer
Billy DeBuse
Date
4/30/2019
Scale
Not to Scale
Drawing No.

Summary

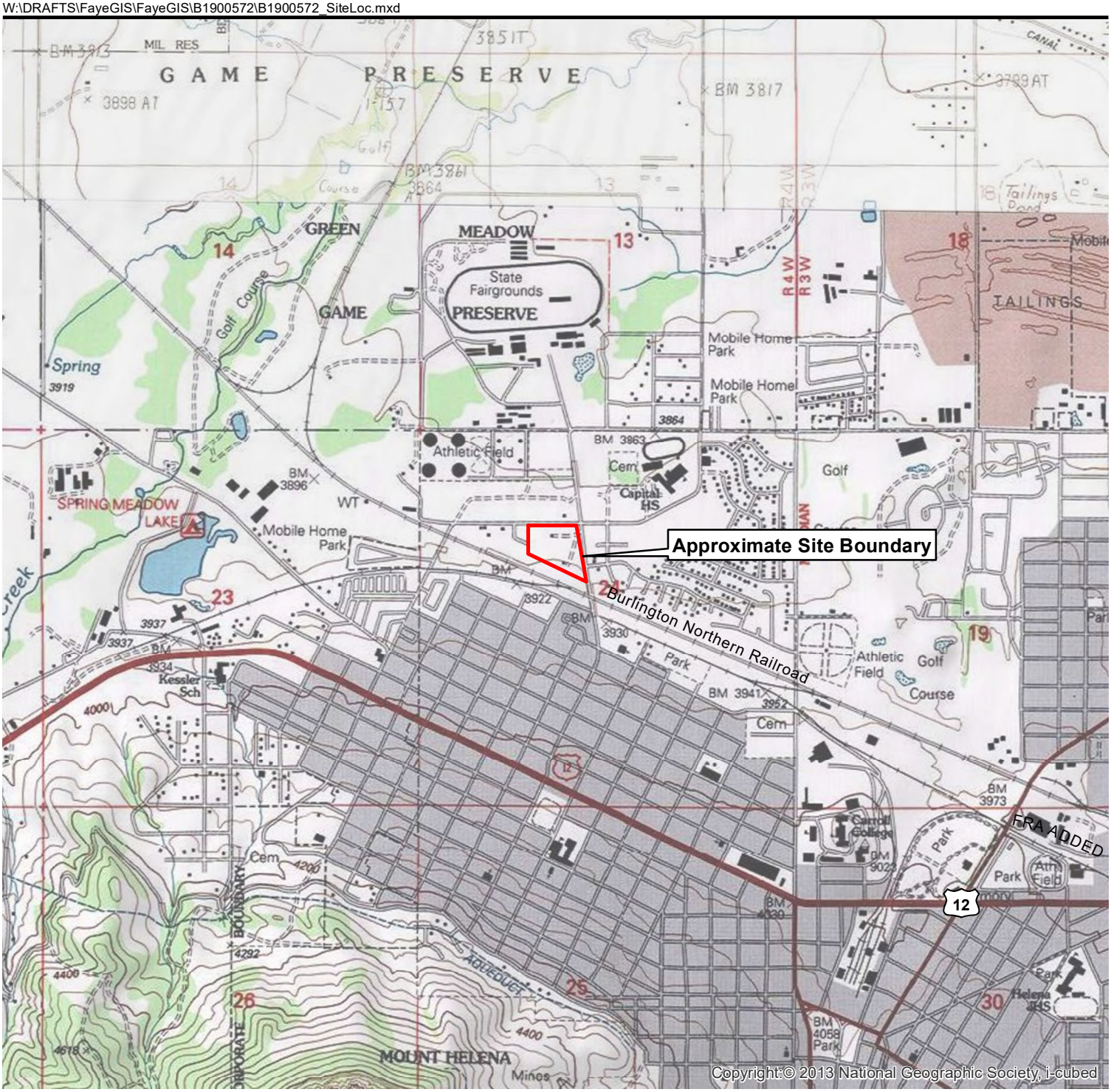
Appendix B

Previous Investigation Data

BRAUN INTERTEC

Figures

W:\DRAFTS\FayeGIS\FayeGIS\B1900572\B1900572_SiteLoc.mxd



Approximate Site Boundary

Data Source:
USGS Quadrangle

N

0 1,000 2,000
Feet

BRAUN INTERTEC
The Science You Build On.

11001 Hampshire Avenue S
Minneapolis, MN 55438
952.995.2000
braunintertec.com

Project No:
B1900572

Drawing No:
B1900572_SiteLoc

Drawn By:	FER
Date Drawn:	1/22/2019
Checked By:	JES
Last Modified:	1/22/2019

Proposed Red Alder Residences

2200 Henderson Street

Helena, Montana

Site Location Map

Figure 1

F:\2019\B1900572-00\GIS\B1900572_SmplLoc.mxd

Denotes Approximate Sample Location

Approximate Site Boundary

Sampling locations surveyed by Pioneer Technical Services, Inc. using a hand-held global positioning system device.

N

0 75 150 Feet

1 inch = 150 feet

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The Science You Build On.

11001 Hampshire Avenue S
Minneapolis, MN 55438
952.995.2000
braunintertec.com

Project No: B1900572.00

Drawing No: B1900572_SmplLoc

Drawn By:	FER
Date Drawn:	5/2/2019
Checked By:	BJ
Last Modified:	5/7/2019

Proposed Red Alder Residences

2200 Henderson Street

Helena, Montana

Sample Location Map

Figure 2

Tables

Table 1
Sampling and Analysis Plan
2200 Henderson Street
Helena, Montana

Sample Location	Sample Matrix	Sample ID	Sample Collection Depth (feet)	Soil Type[2]	Analytes			
					RCRA Metals	PAHs	VPH	EPH
TP-01	Surface Soil	TP-01S	0-2 in	brown sandy lean clay (topsoil)	X	X		
	Subsurface Soil	TP-01D	2 ft	very pale brown sandy lean clay (native)	X	X		
TP-02	Surface Soil	TP-02	0-2 in	brown sandy lean clay (topsoil)	X	X		
TP-03	Surface Soil	TP-03	0-2 in	brown sandy silt (topsoil)	X	X		
TP-04	Surface Soil	TP-04	0-2 in	brown clayey sand (topsoil)	X	X		
TP-05	Surface Soil	TP-05	0-2 in	brown sandy silt (topsoil)	X	X		
TP-06	Surface Soil	TP-06S	0-2 in	dark brown lean clay (topsoil)	X	X		
	Subsurface Soil	TP-06D	1.5 ft	very pale brown sandy lean clay (native)	X	X		
TP-07	Surface Soil	TP-07	0-2 in	dark brown lean clay (topsoil)	X	X		
TP-08	Surface Soil	TP-08	0-2 in	brown sandy silt (topsoil)	X	X		
TP-09	Surface Soil	TP-09S	0-2 in	very dark gray lean clay (topsoil)	X	X		
	Subsurface Soil	TP-09D	1 ft	grayish brown lean clay (native)	X	X		
TP-10	Surface Soil	TP-10	0-2 in	very dark grayish brown clay (topsoil)	X	X		
TP-11	Surface Soil	TP-11S	0-2 in	black sandy silt (topsoil)	X	X		
	Subsurface Soil	TP-11D	2 ft	very pale brown sandy lean clay (native)	X	X		
TP-12	Surface Soil	TP-12	0-2 in	very dark grayish brown sandy silt (topsoil)	X	X		
TP-13	Surface Soil	TP-13	0-2 in	black sandy silt (topsoil)	X	X		
TP-14	Surface Soil	TP-14	0-2 in	dark grayish brown sandy lean clay (topsoil/fill)	X	X		
	Subsurface Soil	TP-14_0.5	0.5 ft	black silt (topsoil/fill)			X	X
TP-15	Surface Soil	TP-15S	0-2 in	dark grayish brown sandy lean clay (topsoil)	X	X		
TP-16	Surface Soil	TP-16	0-2 in	grayish brown lean clay (topsoil)	X	X		

Notes:
in. = inches
ft = feet
RCRA = Resource Conservation Recovery Act
PAHs = polycyclic aromatic hydrocarbons
VPH = volatile petroleum hydrocarbons
EPH = extractable petroleum hydrocarbons

Table 2
Soil Analytical Results - Metals
2200 Henderson Street
Helena, Montana

	U.S. EPA		State of Montana		TP-01S		TP-01D		TP-02	
	Soil Screening Level (SSL) [1]		Residential Screening Level (RSL) [2]	Background Threshold Value (BTV) [3,4]	4/9/2019		4/9/2019		4/8/2019	
	Resident Soil	Protection of Groundwater			10470518001	10470518002	10470518003	10470518004	10470518005	10470518006
Parameter					unsieved	sieved [5]	unsieved	sieved [5]	unsieved	sieved [5]
Percent Moisture	---	---	---	---	19.3	1.5	14.4	0.86	16.2	1.4
RCRA Metals in mg/kg [6]										
Arsenic	0.68	2.9	---	22.5	**22.4**	**26.4**	**13.6**	**11.8**	**35.3**	**34.5**
Barium	1,500	421	---	429	**171**	**172**	**111**	**120**	**149**	**151**
Cadmium	7.1	3.8	---	0.7	**1.7**	**1.2**	<0.85	<0.73	**1.5**	**1.5**
Chromium	12,000	1,800,000	---	41.7	**11.5**	**12.8**	**6.2**	**8.6**	**10.3**	**12.2**
Lead	400	140	154	29.8	**114**	**78.9**	**8.2**	**7.8**	**97.8**	**112**
Mercury	1.1	1.0	---	<0.05	**0.071**	**0.075**	<0.022	<0.020	**0.072**	**0.098**
Selenium	39	2.6	---	0.7	<6.0	<1.0	<5.7	<4.8	<1.1	<1.0
Silver	39	8.5	---	0.3	<3.0	<0.50	<2.8	<2.4	**1.3**	**0.68**
Toxic Characteristic Leaching Procedure (TCLP) - Metals (mg/L)										
Lead	---	---	---	---	NA	NA	NA	NA	NA	NA

	U.S. EPA		State of Montana		TP-03		TP-04		TP-05	
	Regional Screening Level [1]		Residential Screening Level (RSL) [2]	Background Threshold Value (BTV) [3,4]	4/8/2019		4/8/2019		4/9/2019	
	Resident Soil	Protection of Groundwater			10470518007	10470518008	10470518009	10470518010	10470518011	10470518012
Parameter					unsieved	sieved [5]	unsieved	sieved [5]	unsieved	sieved [5]
Percent Moisture	---	---	---	---	16.2	1.5	15.7	1.8	19.0	1.7
RCRA Metals in mg/kg [6]										
Arsenic	0.68	2.9	---	22.5	**31.2**	**25.2**	**18.1**	**18.1**	**45.9**	**20.6**
Barium	1,500	421	---	429	**172**	**139**	**123**	**144**	**225**	**134**
Cadmium	7.1	3.8	---	0.7	**1.9**	**0.87**	**0.28**	**0.50**	**1.5**	**0.44**
Chromium	12,000	1,800,000	---	41.7	**10.7**	**12.8**	**11.2**	**14.6**	**11.5**	**15.3**
Lead	400	140	154	29.8	**118**	**66.1**	**22.1**	**28.5**	**99.7**	**27.8**
Mercury	1.1	1.0	---	<0.05	**0.080**	**0.069**	**0.051**	**0.044**	**0.099**	**0.043**
Selenium	39	2.6	---	0.7	<1.1	<1.0	<1.1	<0.94	<1.2	<0.93
Silver	39	8.5	---	0.3	<0.56	<0.50	<0.55	<0.47	<0.60	<0.46
Toxic Characteristic Leaching Procedure (TCLP) - Metals (mg/L)										
Lead	---	---	---	---	NA	NA	NA	NA	NA	NA

Table 2
Soil Analytical Results - Metals
2200 Henderson Street
Helena, Montana

	U.S. EPA		State of Montana		TP-06S		TP-06D		TP-07	
	Soil Screening Level (SSL) [1]		Residential Screening Level (RSL) [2]	Background Threshold Value (BTV) [3,4]	4/9/2019		4/9/2019		4/9/2019	
	Resident Soil	Protection of Groundwater			10470518013	10470518014	10470518015	10470518016	10470518017	10470518018
Parameter					unsieved	sieved [5]	unsieved	sieved [5]	unsieved	sieved [5]
Percent Moisture	---	---	---	---	26.6	2.3	10.1	1.4	21.7	2.4
RCRA Metals in mg/kg [6]										
Arsenic	0.68	2.9	---	22.5	**41.9**	***50.6***	**9.7**	**16.9**	**42.9**	**39.8**
Barium	1,500	421	---	429	**303**	**342**	**124**	**164**	**324**	**301**
Cadmium	7.1	3.8	---	0.7	**3.4**	**3.0**	<0.33	<0.30	**1.5**	**2.5**
Chromium	12,000	1,800,000	---	41.7	**13.8**	**15.8**	**7.1**	**17.6**	**13.8**	**13.4**
Lead	400	140	154	29.8	**216**	**193**	**8.4**	**11.0**	**94.8**	**150**
Mercury	1.1	1.0	---	<0.05	**0.16**	**0.17**	<0.020	<0.018	**0.063**	**0.15**
Selenium	39	2.6	---	0.7	<1.3	<1.9	<2.2	<2.0	<2.4	<0.95
Silver	39	8.5	---	0.3	**1.0**	<0.96	<1.1	<1.0	<1.2	**0.83**
Toxic Characteristic Leaching Procedure (TCLP) - Metals (mg/L)										
Lead	---	---	---	---	NA	NA	NA	NA	NA	NA

	U.S. EPA		State of Montana		TP-08		TP-09S		TP-09D	
	Soil Screening Level (SSL) [1]		Residential Screening Level (RSL) [2]	Background Threshold Value (BTV) [3,4]	4/9/2019		4/9/2019		4/9/2019	
	Resident Soil	Protection of Groundwater			10470518019	10470518020	10470518021	10470518022	10470518023	10470518024
Parameter					unsieved	sieved [5]	unsieved	sieved [5]	unsieved	sieved [5]
Percent Moisture	---	---	---	---	20.9	2.0	25.3	2.6	15.9	1.7
RCRA Metals in mg/kg [6]										
Arsenic	0.68	2.9	---	22.5	**15.6**	**18.3**	**30.0**	**34.6**	**13.9**	**17.0**
Barium	1,500	421	---	429	**150**	**153**	**231 J+**	**279**	**129**	**154**
Cadmium	7.1	3.8	---	0.7	**0.39**	**1.4**	**1.0**	**1.9**	**0.21**	**0.24**
Chromium	12,000	1,800,000	---	41.7	**13.6**	**14.4**	**16.2**	**12.4**	**8.1**	**11.4**
Lead	400	140	154	29.8	**26.8**	**82.7**	**73.3**	**161**	**11.6**	**12.3**
Mercury	1.1	1.0	---	<0.05	**0.040**	**0.077**	**0.074**	**0.18**	<0.023	**0.027**
Selenium	39	2.6	---	0.7	<1.2	<0.95	<6.7	<1.0	<1.1	<1.0
Silver	39	8.5	---	0.3	<0.62	<0.48	<3.3	**0.90**	<0.55	<0.50
Toxic Characteristic Leaching Procedure (TCLP) - Metals (mg/L)										
Lead	---	---	---	---	NA	NA	NA	NA	NA	NA

Table 2
Soil Analytical Results - Metals
2200 Henderson Street
Helena, Montana

Parameter	U.S. EPA Soil Screening Level (SSL) [1] Resident Soil	U.S. EPA Soil Screening Level (SSL) [1] Protection of Groundwater	State of Montana Residential Screening Level (RSL) [2]	State of Montana Background Threshold Value (BTV) [3,4]	TP-10 4/9/2019 10470518025 unsieved	TP-10 4/9/2019 10470518026 sieved [5]	TP-11S 4/9/2019 10470518027 unsieved	TP-11S 4/9/2019 10470518028 sieved [5]	TP-11D 4/9/2019 10470518029 unsieved	TP-11D 4/9/2019 10470518030 sieved [5]
Percent Moisture	NA	NA	NA	NA	20.5	2.0	20.9	2.2	17.2	1.4
RCRA Metals in mg/kg [6]										
Arsenic	0.68	2.9	---	22.5	**30.1**	**16.5**	**23.0**	**35.5**	**21.9**	**17.3**
Barium	1,500	421	---	429	**318 J+**	**172**	**173**	**265**	**302**	**417**
Cadmium	7.1	3.8	---	0.7	**1.7**	**0.58**	**1.0**	**1.8**	<0.84	<0.74
Chromium	12,000	1,800,000	---	41.7	**15.4**	**14.1**	**9.1**	**10.8**	**10.6**	**8.4**
Lead	400	140	154	29.8	**112 J+**	**33.4**	**62.3**	**124**	**14.2**	**8.3**
Mercury	1.1	1.0	---	<0.05	**0.096**	**0.058**	**0.53**	**0.17**	<0.023	<0.019
Selenium	39	2.6	---	0.7	<6.2	<0.93	<1.2	<0.93	<5.6	<4.9
Silver	39	8.5	---	0.3	<3.1	<0.46	<0.61	**0.67**	<2.8	<2.5
Toxic Characteristic Leaching Procedure (TCLP) - Metals (mg/L)										
Lead	---	---	---	---	NA	NA	NA	NA	NA	NA

Parameter	U.S. EPA Soil Screening Level (SSL) [1] Resident Soil	U.S. EPA Soil Screening Level (SSL) [1] Protection of Groundwater	State of Montana Residential Screening Level (RSL) [2]	State of Montana Background Threshold Value (BTV) [3,4]	TP-12 4/9/2019 10470518031 unsieved	TP-12 4/9/2019 10470518032 sieved [5]	TP-13 4/9/2019 10470518033 unsieved	TP-13 4/9/2019 10470518034 sieved [5]	TP-14 4/9/2019 10470518035 unsieved	TP-14 4/9/2019 10470518036 sieved [5]
Percent Moisture	---	---	---	---	24.4	2.2	27	3.6	10.6	2.1
RCRA Metals in mg/kg [6]										
Arsenic	0.68	2.9	---	22.5	**24.9**	**39.0**	***52.1***	***57.1***	**15.5**	**24.0**
Barium	1,500	421	---	429	**162**	**269**	**613**	**581**	**128**	**240**
Cadmium	7.1	3.8	---	0.7	**0.78**	**1.8**	**3.8**	**3.3**	**1.0**	**1.4**
Chromium	12,000	1,800,000	---	41.7	**11.1**	**12.1**	**16**	**15.2**	**10.2**	**13.2**
Lead	400	140	154	29.8	**46.5**	**107**	**711**	**697**	**61**	**110**
Mercury	1.1	1.0	---	<0.05	**0.22**	**0.13**	**0.28**	**0.63**	**0.079**	**0.17**
Selenium	39	2.6	---	0.7	<1.3	<0.98	<1.4	<0.96	<1.1	<1.0
Silver	39	8.5	---	0.3	<0.65	**0.57**	**1.9**	**2.4**	<0.53	**0.66**
Toxic Characteristic Leaching Procedure (TCLP) - Metals (mg/L)										
Lead	---	---	---	---	NA	NA	<0.50	<0.50	NA	NA

Table 2
Soil Analytical Results - Metals
2200 Henderson Street
Helena, Montana

Parameter	U.S. EPA Soil Screening Level (SSL) [1]		State of Montana		TP-15S 4/9/2019		TP-16 4/9/2019	
	Resident Soil	Protection of Groundwater	Residential Screening Level (RSL) [2]	Background Threshold Value (BTV) [3,4]	10470518038 unsieved	10470518039 sieved [5]	10470518042 unsieved	10470518043 sieved [5]
Percent Moisture	---	---	---	---	15.2	1.8	23.0	2.1
RCRA Metals in mg/kg [6]								
Arsenic	0.68	2.9	---	22.5	**15.5**	**15.7**	**17.8**	**19.8**
Barium	1,500	421	---	429	**131**	**155**	**166**	**201**
Cadmium	7.1	3.8	---	0.7	**0.39**	**0.79**	**2.1**	**2.1**
Chromium	12,000	1,800,000	---	41.7	**10.4**	**11.8**	**9.5**	**11.1**
Lead	400	140	154	29.8	**26.6**	**54.7**	**132**	**133**
Mercury	1.1	1.0	---	<0.05	**0.027**	**0.056**	**0.087**	**0.11**
Selenium	39	2.6	---	0.7	<1.1	<0.97	<1.3	<1.0
Silver	39	8.5	---	0.3	<0.57	<0.48	**0.76**	**0.69**
Toxic Characteristic Leaching Procedure (TCLP) - Metals (mg/L)								
Lead	---	---	---	---	NA	NA	NA	NA

Notes:
mg/kg = milligram per kilogram
--- = not applicable
mg/L = milligram per liter
NA = not analyzed

Exceeds BTV & both SSLs
Exceeds BTV, RSL & both SSLs
Exceeds BTV, RSL & groundwater SSL .
Exceeds BTV and groundwater SSL.

Concentrations in bold are detected above laboratory report limits. Shaded concentrations exceed one or more screening levels.
Arsenic concentrations in italics exceed the Joslyn Street Tailings Facility site-specific cleanup level (SSCL) for arsenic of 49.6 mg/kg.

1 - U.S. EPA soil screening levels (SSLs) obtained from the November 2018 Regional Screening Level (RSL) Summary Tables where (TR=1E06, HQ=0.1) was used for non-carcinogenic metals and where (TR=1E06, HQ=1) was used for carcinogenic metals (i.e., arsenic) . SSLs for protection of groundwater were multiplied by the State of Montana dilution attenuation factor (DAF) of 10 for those metals where the SSL was based on the U.S EPA Maximum Contaminant Level (MCL) that is equal to the Montana Department of Equality (MT DEQ) human health standard (HHS; MT DEQ Circular DEQ-7, Montana Numeric Water Quality Standards, May 2017). SSLs for protection of groundwater for barium and silver were adjusted based on their HHS using the equation in MT DEQ's Surface and Subsurface Soil Screening Flowchart -Part 2 -Leaching to Groundwater.
2 - State of Montana residential screening level (RSL) for lead of 154 mg/kg obtained from MT DEQ's October 2018 "Evaluating Lead in Soil" Memorandum.
3 - Background Threshold Values (BTVs) obtained from Background Concentrations of Inorganic Constituents in Montana Surface Soils (Hydrometrics, 2013).
4 - Per MT DEQ guidance, if the screening levels are less than the background threshold value, then the background threshold value is used as the screening level.
5 - Sample sieved (#60) prior to analysis.
6 - Arsenic, barium, cadmium, chromium, lead, selenium, and silver were analyzed by Method 6010; mercury was analyzed by Method 7471. Leach method for TCLP analysis was Method 1311.

Table 3

Soil Analytical Results - Polycyclic Aromatic Hydrocarbons

2200 Henderson Street

Helena, Montana

Parameter	State of Montana Risk-Based Screening Level (RBSL) [1]				TP-01S	TP-01D	TP-02	TP-03
	Residential Direct Contact	Leaching			04/09/19	4/9/2019	4/8/2019	4/8/2019
		< 10 feet [2]	10 - 20 feet [2]	> 20 feet [2]	10470518001	10470518003	10470518005	10470518007
Polycyclic Aromatic Hydrocarbons (PAHs) in mg/kg [3]								
Acenaphthene	450	27	91	140	<0.0124	<0.0117	<0.0119	<0.0119
Acenaphthylene	NE	NE	NE	NE	<0.0124	<0.0117	<0.0119	<0.0119
Anthracene	2,200	2,600	8,800	14,000	<0.0124	<0.0117	<0.0119	<0.0119
Benzo(a)anthracene	1.3	6.8	23	35	<0.0124	<0.0117	**0.0270**	<0.0119
Benzo(a)pyrene	0.13	2.3	7.5	12	<0.0124	<0.0117	**0.0293**	<0.0119
Benzo(b)fluoranthene	1.3	23	76	120	**0.0133**	<0.0117	**0.0623**	**0.0193**
Benzo(g,h,i)perylene	NE	NE	NE	NE	<0.0124	<0.0117	**0.0295**	<0.0119
Benzo(k)fluoranthene	13	230	750	1,200	<0.0124	<0.0117	**0.0231**	<0.0119
Chrysene	130	690	2,300	3,500	<0.0124	<0.0117	**0.0456**	**0.0141**
Dibenz(a,h)anthracene	0.13	7.5	24	38	<0.0124	<0.0117	<0.0119	<0.0119
Fluoranthene	300	85	280	440	**0.0177**	<0.0117	**0.0501**	**0.0218**
Fluorene	300	35	120	180	<0.0124	<0.0117	<0.0119	<0.0119
Indeno(1,2,3-cd)pyrene	1.3	77	250	380	<0.0124	<0.0117	**0.0272**	<0.0119
Naphthalene	4.3	12	40	62	<0.0124	<0.0117	<0.0119	<0.0119
Phenanthrene	NE	NE	NE	NE	<0.0124	<0.0117	<0.0119	<0.0119
Pyrene	220	83	280	430	**0.0140**	<0.0117	**0.0380**	**0.0182**

Notes:

mg/kg = milligrams per kilogram NE = Not established

Exceeds Residential Direct Contact RBSL

1 - Residential Risk-Based Screening Levels (RBSLs) obtained from Table 4, Master Table, All Potential Tier 1 RBSLs for Soil (mg/kg), Montana Risk-Based Corrective Action Guidance for Petroleum Releases, Montana Department of Environmental Quality, Final May 2018.

2 - Distance between contamination and groundwater. Depth to groundwater is not known at the Site.

3 - PAHs analyzed by Method 8270 SIM.

Table 3

Soil Analytical Results - Polycyclic Aromatic Hydrocarbons

2200 Henderson Street

Helena, Montana

Parameter	State of Montana Risk-Based Screening Level (RBSL) [1]				TP-04	TP-05	TP-06S	TP-06D
	Residential Direct Contact	Leaching			4/8/2019	4/9/2019	4/9/2019	4/9/2019
		< 10 feet [2]	10 - 20 feet [2]	> 20 feet [2]	10470518009	10470518011	10470518013	10470518015
Polycyclic Aromatic Hydrocarbons (PAHs) in mg/kg [3]								
Acenaphthene	450	27	91	140	<0.0118	<0.0123	<0.0136	<0.0111
Acenaphthylene	NE	NE	NE	NE	<0.0118	<0.0123	<0.0136	<0.0111
Anthracene	2,200	2,600	8,800	14,000	<0.0118	<0.0123	<0.0136	<0.0111
Benzo(a)anthracene	1.3	6.8	23	35	<0.0118	**0.0126**	**0.0138**	<0.0111
Benzo(a)pyrene	0.13	2.3	7.5	12	<0.0118	**0.0177**	**0.0193**	<0.0111
Benzo(b)fluoranthene	1.3	23	76	120	<0.0118	**0.0298**	**0.0277**	<0.0111
Benzo(g,h,i)perylene	NE	NE	NE	NE	<0.0118	**0.0175**	**0.0149**	<0.0111
Benzo(k)fluoranthene	13	230	750	1,200	<0.0118	<0.0123	<0.0136	<0.0111
Chrysene	130	690	2,300	3,500	<0.0118	**0.0210**	**0.0176**	<0.0111
Dibenz(a,h)anthracene	0.13	7.5	24	38	<0.0118	<0.0123	<0.0136	<0.0111
Fluoranthene	300	85	280	440	<0.0118	**0.0337**	**0.0311**	<0.0111
Fluorene	300	35	120	180	<0.0118	<0.0123	<0.0136	<0.0111
Indeno(1,2,3-cd)pyrene	1.3	77	250	380	<0.0118	<0.0123	<0.0136	<0.0111
Naphthalene	4.3	12	40	62	<0.0118	<0.0123	<0.0136	<0.0111
Phenanthrene	NE	NE	NE	NE	<0.0118	**0.0167**	<0.0136	<0.0111
Pyrene	220	83	280	430	<0.0118	**0.0272**	**0.0283**	<0.0111

Notes:

mg/kg = milligrams per kilogram NE = Not established

Exceeds Residential Direct Contact RBSL

1 - Residential Risk-Based Screening Levels (RBSLs) obtained from Table 4, Master Table, All Potential Tier 1 RBSLs for Soil (mg/kg), Montana Risk-Based Corrective Action Guidance for Petroleum Releases, Montana Department of Environmental Quality, Final May 2018.

2 - Distance between contamination and groundwater. Depth to groundwater is not known at the Site.

3 - PAHs analyzed by Method 8270 SIM.

Table 3

Soil Analytical Results - Polycyclic Aromatic Hydrocarbons

2200 Henderson Street

Helena, Montana

Parameter	State of Montana Risk-Based Screening Level (RBSL) [1]				TP-07	TP-08	TP-09S	TP-09D
	Residential Direct Contact	Leaching			4/9/2019	4/9/2019	4/9/2019	4/9/2019
		< 10 feet [2]	10 - 20 feet [2]	> 20 feet [2]	10470518017	10470518019	10470518021	10470518023
Polycyclic Aromatic Hydrocarbons (PAHs) in mg/kg [3]								
Acenaphthene	450	27	91	140	<0.0127	<0.0126	<0.0133	<0.0119
Acenaphthylene	NE	NE	NE	NE	<0.0127	<0.0126	<0.0133	<0.0119
Anthracene	2,200	2,600	8,800	14,000	<0.0127	<0.0126	<0.0133	<0.0119
Benzo(a)anthracene	1.3	6.8	23	35	<0.0127	<0.0126	**0.0278**	<0.0119
Benzo(a)pyrene	0.13	2.3	7.5	12	<0.0127	<0.0126	**0.0399**	<0.0119
Benzo(b)fluoranthene	1.3	23	76	120	**0.0158**	**0.0180**	**0.0556**	<0.0119
Benzo(g,h,i)perylene	NE	NE	NE	NE	<0.0127	<0.0126	**0.0299**	<0.0119
Benzo(k)fluoranthene	13	230	750	1,200	<0.0127	<0.0126	**0.0252**	<0.0119
Chrysene	130	690	2,300	3,500	<0.0127	<0.0126	**0.0357**	<0.0119
Dibenz(a,h)anthracene	0.13	7.5	24	38	<0.0127	<0.0126	<0.0133	<0.0119
Fluoranthene	300	85	280	440	**0.0173**	**0.0157**	**0.0611**	<0.0119
Fluorene	300	35	120	180	<0.0127	<0.0126	<0.0133	<0.0119
Indeno(1,2,3-cd)pyrene	1.3	77	250	380	<0.0127	<0.0126	**0.0265**	<0.0119
Naphthalene	4.3	12	40	62	<0.0127	<0.0126	<0.0133	<0.0119
Phenanthrene	NE	NE	NE	NE	<0.0127	<0.0126	**0.0215**	<0.0119
Pyrene	220	83	280	430	**0.0151**	**0.0136**	**0.0548**	<0.0119

Notes:

mg/kg = milligrams per kilogram NE = Not established

Exceeds Residential Direct Contact RBSL

1 - Residential Risk-Based Screening Levels (RBSLs) obtained from Table 4, Master Table, All Potential Tier 1 RBSLs for Soil (mg/kg), Montana Risk-Based Corrective Action Guidance for Petroleum Releases, Montana Department of Environmental Quality, Final May 2018.

2 - Distance between contamination and groundwater. Depth to groundwater is not known at the Site.

3 - PAHs analyzed by Method 8270 SIM.

Table 3

Soil Analytical Results - Polycyclic Aromatic Hydrocarbons

2200 Henderson Street

Helena, Montana

Parameter	State of Montana Risk-Based Screening Level (RBSL) [1]				TP-10	TP-11S	TP-11D	TP-12
	Residential Direct Contact	Leaching			4/9/2019	4/9/2019	4/9/2019	4/9/2019
		< 10 feet [2]	10 - 20 feet [2]	> 20 feet [2]	10470518025	10470518027	10470518029	10470518031
Polycyclic Aromatic Hydrocarbons (PAHs) in mg/kg [3]								
Acenaphthene	450	27	91	140	<0.0125	<0.0126	<0.0121	<0.0132
Acenaphthylene	NE	NE	NE	NE	<0.0125	**0.0534**	<0.0121	<0.0132
Anthracene	2,200	2,600	8,800	14,000	<0.0125	**0.0465**	<0.0121	<0.0132
Benzo(a)anthracene	1.3	6.8	23	35	<0.0125	**0.0594**	<0.0121	**0.0251**
Benzo(a)pyrene	0.13	2.3	7.5	12	**0.0133**	**0.102**	<0.0121	**0.0397**
Benzo(b)fluoranthene	1.3	23	76	120	**0.0193**	**0.240**	<0.0121	**0.0638**
Benzo(g,h,i)perylene	NE	NE	NE	NE	<0.0125	**0.0936**	<0.0121	**0.0297**
Benzo(k)fluoranthene	13	230	750	1,200	<0.0125	**0.0702**	<0.0121	**0.0196**
Chrysene	130	690	2,300	3,500	<0.0125	**0.114**	<0.0121	**0.0364**
Dibenz(a,h)anthracene	0.13	7.5	24	38	<0.0125	**0.0226**	<0.0121	<0.0132
Fluoranthene	300	85	280	440	**0.0213**	**0.1500**	<0.0121	**0.0625**
Fluorene	300	35	120	180	<0.0125	<0.0126	<0.0121	<0.0132
Indeno(1,2,3-cd)pyrene	1.3	77	250	380	<0.0125	**0.0901**	<0.0121	**0.0268**
Naphthalene	4.3	12	40	62	<0.0125	<0.0126	<0.0121	<0.0132
Phenanthrene	NE	NE	NE	NE	<0.0125	**0.0297**	<0.0121	**0.0228**
Pyrene	220	83	280	430	**0.0187**	**0.130**	<0.0121	**0.0556**

Notes:

mg/kg = milligrams per kilogram NE = Not established

Exceeds Residential Direct Contact RBSL

1 - Residential Risk-Based Screening Levels (RBSLs) obtained from Table 4, Master Table, All Potential Tier 1 RBSLs for Soil (mg/kg), Montana Risk-Based Corrective Action Guidance for Petroleum Releases, Montana Department of Environmental Quality, Final May 2018.

2 - Distance between contamination and groundwater. Depth to groundwater is not known at the Site.

3 - PAHs analyzed by Method 8270 SIM.

Table 3

Soil Analytical Results - Polycyclic Aromatic Hydrocarbons

2200 Henderson Street

Helena, Montana

Parameter	State of Montana Risk-Based Screening Level (RBSL) [1]				TP-13	TP-14	TP-15S	TP-16
	Residential Direct Contact	Leaching			4/9/2019	4/9/2019	4/9/2019	4/9/2019
		< 10 feet [2]	10 - 20 feet [2]	> 20 feet [2]	10470518033	10470518035	10470518038	10470518042
Polycyclic Aromatic Hydrocarbons (PAHs) in mg/kg [3]								
Acenaphthene	450	27	91	140	<0.0136	<0.0112	<0.0118	<0.0130
Acenaphthylene	NE	NE	NE	NE	**0.183**	<0.0112	<0.0118	<0.0130
Anthracene	2,200	2,600	8,800	14,000	**0.144**	<0.0112	<0.0118	<0.0130
Benzo(a)anthracene	1.3	6.8	23	35	**0.425**	<0.0112	<0.0118	<0.0130
Benzo(a)pyrene	0.13	2.3	7.5	12	**0.599**	<0.0112	<0.0118	**0.0165**
Benzo(b)fluoranthene	1.3	23	76	120	**0.929**	**0.0126**	<0.0118	**0.0264**
Benzo(g,h,i)perylene	NE	NE	NE	NE	**0.375**	<0.0112	<0.0118	<0.0130
Benzo(k)fluoranthene	13	230	750	1,200	**0.316**	<0.0112	<0.0118	<0.0130
Chrysene	130	690	2,300	3,500	**0.542**	<0.0112	<0.0118	**0.0153**
Dibenz(a,h)anthracene	0.13	7.5	24	38	**0.117**	<0.0112	<0.0118	<0.0130
Fluoranthene	300	85	280	440	**0.901**	**0.0120**	<0.0118	**0.0246**
Fluorene	300	35	120	180	<0.0136	<0.0112	<0.0118	<0.0130
Indeno(1,2,3-cd)pyrene	1.3	77	250	380	**0.393**	<0.0112	<0.0118	<0.0130
Naphthalene	4.3	12	40	62	**0.0332**	<0.0112	<0.0118	<0.0130
Phenanthrene	NE	NE	NE	NE	**0.191**	<0.0112	<0.0118	<0.0130
Pyrene	220	83	280	430	**0.735**	<0.0112	<0.0118	**0.0217**

Notes:

mg/kg = milligrams per kilogram NE = Not established

Exceeds Residential Direct Contact RBSL

1 - Residential Risk-Based Screening Levels (RBSLs) obtained from Table 4, Master Table, All Potential Tier 1 RBSLs for Soil (mg/kg), Montana Risk-Based Corrective Action Guidance for Petroleum Releases, Montana Department of Environmental Quality, Final May 2018.

2 - Distance between contamination and groundwater. Depth to groundwater is not known at the Site.

3 - PAHs analyzed by Method 8270 SIM.

Table 4

Soil Analytical Results - Petroleum Hydrocarbons

2200 Henderson Street

Helena, Montana

Parameter	State of Montana Risk-Based Screening Level (RBSL) [3]				TP-14-0.5
	Residential Direct Contact	Leaching			4/9/2019
		< 10 feet [4]	10 - 20 feet [4]	> 20 feet [4]	10470518037
Volatile Organic Compounds (VOCs) in mg/kg [1]					
Benzene	1.3	0.07	0.21	0.33	<0.029
Ethylbenzene	6.4	26	84	130	<0.058
Methyl-tert-butyl ether (MTBE)	52	0.078	0.16	0.25	<0.058
Naphthalene	4.3	12	40	62	<0.70
Toluene	610	21	65	100	<0.058
Xylene (Total)	72	320	1,000	1,600	<0.23
m&p-Xylene	NE	NE	NE	NE	<0.12
o-Xylene	NE	NE	NE	NE	<0.12
Volatile Petroleum Hydrocarbons (VPH) in mg/kg [1]					
Total Purgeable Hydrocarbons	NE	NE	NE	NE	<11.6
Aliphatic, Adjusted (C05-C08)	52	220	770	1,200	<5.8
Aliphatic, Adjusted (C09-C12)	77	11,000	40,000	60,000	<5.8
Aromatic (C09-C10)	130	130	470	720	<1.2
Extractable Petroleum Hydrocarbons (EPH) in mg/kg [2]					
Total Extractable Hydrocarbons	200 [5]	200 [5]	200 [5]	200 [5]	<69.2

Notes:

mg/kg = milligrams per kilogram

NE = Not established

1 - VOCs and VPH measured using the Massachusetts Method for Volatile Petroleum Hydrocarbons

2 - EPH measured using the Massachusetts Method for Extractable Petroleum Hydrocarbons.

3 - Residential Risk-Based Screening Levels (RBSLs) obtained from Table 4, Master Table, All Potential Tier 1 RBSLs for Soil (mg/kg), Montana Risk-Based Corrective Action Guidance for Petroleum Releases, Montana Department of Environmental Quality, Final May 2018.

4 - Distance between contamination and groundwater. Depth to groundwater is not known at the Site.

5 - EPH screening limit for silica gel cleanup and fractionation.

Table 5

Adjusted Risk-Based Screening Level for Benzo(a)pyrene

2200 Henderson Street

Helena, Montana

Compound	Cancer/ Non-Cancer	Tier 1 RBSL [1] Residential Direct Contact	Concentration in Topsoil at TP-13 (mg/kg)	Cancer Level Risk	Hazard Quotient	Adjustment Factor [2]	Tier 2 Adjusted RBSL [3] (mg/kg)
Benzo(a)pyrene	Cancer	0.13	**0.599**	1×10^{-6}	---	10	1.3
Total	---	---	**---**	1×10^{-6}	---	---	---

Notes:

mg/kg = milligrams per kilogram

RBSL = Risk-Based Screening Level

NA - not applicable

Exceeds Residential Direct Contact RBSL (Tier 1)

1 - Residential Risk-Based Screening Levels (RBSLs) obtained from Table 4, Master Table, All Potential Tier 1 RBSLs for Soil (mg/kg), Montana Risk-Based Corrective Action Guidance for Petroleum Releases, Montana Department of Environmental Quality, Final May 2018.

2 - Adjustment Factor is an excess lifetime cancer risk acceptable in State of Montana of 1×10^{-5} divided by the cumulative cancer level risk in soil for carcinogenic compounds at the Site.

3 - Adjusted Tier 2 RBSL is equal to the Tier 1 RBSL multiplied by the adjustment factor.

Appendix C

Standard Operating Procedures

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A. Purpose

The objective of this Standard Operating Procedure (SOP) is to establish a consistent method and format for the use and control of documentation generated during field activities. Field notes, records, and photographs are intended to provide sufficient information that can be used to recreate the field activities and collection of environmental data. The information placed in these documents and/or records should be factual, detailed, and free of personal opinions.

A.1. Scope and Applicability

This SOP is applicable to Phase I Environmental Site Assessments (ESAs), Phase II ESAs, remedial investigations, and Response Action Plan (RAP) implementation. Documentation includes Field Report Form, additional field forms that are part of method SOPs, and photographs.

A.2. Personnel Responsibilities

The project manager (or designee) is responsible for properly preparing field personnel to perform the field work and to oversee that field documentation is collected in accordance with this SOP, site-specific or project-specific planning documents, and other applicable SOPs.

Field personnel are responsible for understanding and implementing this SOP during field activities, as well as completing appropriate Field Report Form to properly document the field activities. Field observations should be discussed with the project manager on a daily basis. If conditions change from initial expectations, a call should also be made to the project manager. Field personnel should document field activities and record field measurements as they occur and complete documentation prior to leaving the site. Field personnel are responsible for tracking the location of field documentation. Field personnel are responsible for preserving original documentation until it is provided to the project manager and placed into the permanent file or archived. Field personnel are responsible for distributing copies (or electronically preserving copies) of the documentation in a timely manner.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP), if applicable.

C. Referenced SOPs

- None

D. Equipment and Supplies

- Field Report Form (see Attachment A) or field logbook
- Waterproof and/or indelible ink pens
- Cell phone camera or digital camera

E. Procedure

This SOP primarily addresses documentation using the Field Report Form (see Attachment A) or field logbook. However, procedures discussed in this SOP are applicable to other types of field documentation collected. Other field records and forms (e.g., soil boring logs, Chain-of-Custody records, water sample collection records, soil vapor monitoring forms) are discussed in the specific SOP associated with that particular activity and are not described in this SOP.

E.1. Field Report Form

Field personnel will keep accurate written records of their daily activities in chronological order on a Field Report Form that will be sufficient to recreate the project field activities without reliance on memory. Entries should be legible and written in black, waterproof or indelible ink. Each page should be numbered sequentially, dated, and signed by the field author. There should be no blank lines on a page. If only part of a page is used, the remainder of the page should have an "X" drawn over it. The completion of each day's work and the end of the field project should be clearly indicated with "END DAY" or "END FIELD INVESTIGATION."

If pre-printed adhesive labels or other added information are glued or taped onto a Field Report Form, the note taker should sign the addition. The signature should begin on the addition and extend onto the Field Report Form page so that the addition cannot be removed without detection.

At a minimum the following information should be recorded for <u>each project</u>:

- Site/project name
- Site location
- Site project number
- Name of project manager
- Full name of Field Report Form author
- Names of other Braun Intertec personnel on site and their role (full name and initials)
- Name of subcontractors performing work for Braun Intertec (or whose work Braun Intertec is monitoring) and the full name and phone number of their site superintendent

At a minimum, the following information should be recorded <u>each day</u>:

- Date
- Purpose of the day's activities
- Pertinent weather conditions (temperature, precipitation events, wind direction and speed, general air quality, particularly any ambient odors). Significant weather changes during the day should be noted
- Full name and initials of Field Report Form author, if different from previous day
- Full name and initials of other Braun Intertec personnel on site and their role, if different from previous day
- Documentation of exclusion zone setup and decontamination procedures, if applicable
- Record safety related monitoring information, including the time and location of the measurements or observations
- If not Level D, record the Personal Protective Equipment (PPE) level in which work is conducted and change in levels and the reason for the change

- Names, phone numbers, and affiliation of all site visitors and their reason for visiting, as well as their time of arrival(s) and departure(s). The project manager should be notified immediately if regulators (e.g., Minnesota Pollution Control Agency [MPCA], Environmental Protection Agency [EPA], Occupational Safety & Health Administration [OSHA]) visit the site. [Note: "all site visitors" means those who are inspecting or observing our work or the work we are overseeing. It is not intended to include unrelated site activities or personnel.]
- Persons contacted, name, and reason for contact, and decisions made. If the person contacted is not Braun Intertec personnel, also record the phone number.

E.2. Environmental Media Sampling Data

The information below should be recorded on specific forms if they are required by the data collection method SOP, but use of the form should be documented on the Field Report Form. The following information should be recorded:

- A chronological description of field observations and sampling events (i.e., date and time)
- Sampling locations (referenced/scaled drawings or global positioning system [GPS] coordinates, if not logged) should be identified. The project manager should provide the sample nomenclature system to the field personnel for consistency and continuity on sites with multiple rounds of data collection.
- Specific data associated with sample acquisition (e.g., field parameter measurements, field screening data, and HASP monitoring data)
- Source of samples, matrix, sample identification, sample container types and preservatives (including ice), field quality assurance/quality control sample collection, preparation, and origin
- Conditions that could adversely impact samples, such as smoke, wind, rain, or dust
- Make, model, and serial number of field instruments should be recorded in the Field Report Form or in a separate calibration log along with calibration data
- Deviations from the work plan and/or SOPs
- Sketches or scaled diagrams
- Process diagrams
- Waste generated and management methods (i.e., investigation derived waste [IDW]).

E.3. Sketches and Scaled Diagrams

Draw a site map using accurate measurements or make notes on a photocopy of an existing site map. The site map should include:

- Site boundaries (or features such as street curbs, fence lines, etc., that can later be related to site boundaries)
- Street names or other references that can be related to a site location map
- Investigation and well locations with dimensions to site landmarks
- Major structures with dimensions
- North arrow
- Scale
- Date
- Initials of field personnel

E.4. Photographs

Subject

Photographs should be taken to document existing conditions pertinent to the subject evaluation or remediation at a project site. Except when specifically required, it is unnecessary to photograph processes that are described by SOPs, but rather photograph the results of the process. **Note: Some restrictions may apply regarding Site photographic documentation.**

Composition

The three most common mistakes to avoid in providing photographic documentation are (1) too few photographs, (2) poor quality photographs, and (3) lack of subject identification in photographs. Photographic documentation should tell the story with as little need for narrative as possible.

When photographing several similar subjects or details that are not necessarily well identified in an establishing shot, such as a test excavations or test excavation spoil piles, it is recommended that you place a clip board with an identifying description in at least the first in the sequence of photographs of that subject or detail.

Scale

Where there are insufficient objects of widely known scale in a photograph, one should be placed in the photograph to provide scale. Some examples include a coin, ruler, clipboard, or cell phone.

Photographic Log

The following information should be recorded in the Field Report Form or field logbook:

- Site name, location, and field task
- Name of photographer
- Date and time the photograph was taken (verify the date/time stamp is correct if using a digital camera)
- Sequential number of the photograph
- Brief description of the subject of the photograph
- Site plan or site sketch showing the location from which the photograph was taken and the direction the photographer was facing.

E.5. Additional Field Forms/Records

Additional field records may be required for some field events. As an example, these may include soil boring logs during drilling, well construction and development records, groundwater purge and sample collection records, water level measurement records, instrument calibration records, sample container labels, sample container security tags and seals, Chain-of-Custody forms, field equipment calibration and maintenance logs and commercial shipping manifests. Use of these records described in the SOPs associated with the particular activity.

Prior to beginning field activities, field personnel will coordinate with the project manager, or designee, to determine which SOPs will be used and identify additional field forms that are required. These additional records will be maintained in a field file throughout the duration of the field activities. Copies of the records will be forwarded to the project manager (or designee) on a daily basis, if practical to do so.

E.6. Corrections

If an error is made in an entry in the field records, corrections will be made by drawing a SINGLE straight line through the error, entering the correct information, initialing, and dating the change. Materials that obliterate the original information, such as correction fluids, tapes or markers are prohibited. If the reason for the change is not obvious, provide a brief explanation.

E.7. Data and Records Management

Field records should be forwarded to the project manager or designated staff on a daily basis, if practical. The project manager should review progress and results in detail on a daily basis and evaluate the quality of the documentation. The field personnel should scan the field records and place them in the project folder in OnBase. This preserves documentation in the event that the Field Report Form is lost, stolen, or damaged. Copies of the field notes should be maintained in accordance with the Braun Intertec Records Retention Policy and Procedures. Photographs should be uploaded to the EnCon DRAFTS project folder as soon as possible.

Individual logbooks may be assigned to large projects. These logbooks will be returned to the project manager at the completion of field work and archived with the project file. Logbooks assigned to individual personnel for recording multiple project information from multiple projects should be provided to the designated EnCon project assistant for archiving when the logbooks are filled. Each logbook should have a table of contents (TOC) and be kept up to date by the personnel to which the book is assigned.

The TOC for each logbook should list the project names and locations, project numbers, inclusive dates and logbook page numbers.

E.8. Quality Assurance/Quality Control

All personnel that perform field work will be trained in the use of this SOP. Project managers or project staff who use the field notes for interpreting data and preparing reports should provide immediate feedback to those recording field information to reinforce conformance with the SOP and correct deficiencies. Periodic random audits of all field personnel documentation will be performed by the quality assurance (QA) manager or designees.

F. References

U.S. Environmental Protection Agency, Region 4, Science and Ecosystem Support Division, Athens, Georgia, Operating Procedure: Logbooks, SESDPROC-010-R3, October 31, 2007.

BRAUN INTERTEC

Field Report Form

Project No.:

Date:

Project Name:

Personnel:

Location:

Time On Site:

Time Off Site:

☐ Photos taken and documented.

Project Manager:

Other Braun Intertec Staff:

Weather (temperature, wind speed and direction, etc.):

Other Personnel (subcontractors, site superintendent, etc.; include time on site and time off site):

PPE and Field Equipment Used (e.g., PID; include ID numbers, calibration information, etc.):

Work Completed (include field scope, unexpected issues, action items, log of communication, and site sketch):

Signature:

BRAUN INTERTEC

Field Report Form

Project No.:		Date:	
Project Name:		Personnel:	
Location:		Project Manager:	

Work Completed (include field scope, unexpected issues, action items, log of communication, and site sketch):

Signature:

BRAUN INTERTEC

Field Report Form

Project No.:

Date:

Project Name:

Personnel:

Location:

Time On Site:

Time Off Site:

☐ Photos taken and documented.

Project Manager:

Other Braun Intertec Staff:

Weather (temperature, wind speed and direction, etc.):

Other Personnel (subcontractors, site superintendent, etc.; include time on site and time off site):

PPE and Field Equipment Used (e.g., PID; include ID numbers, calibration information, etc.):

Work Completed (include field scope, unexpected issues, action items, log of communication, and site sketch):

Signature:

BRAUN INTERTEC

Field Report Form

Project No.:		Date:	
Project Name:		Personnel:	
Location:		Project Manager:	

Work Completed (include field scope, unexpected issues, action items, log of communication, and site sketch):

Signature:

A. Purpose

This Standard Operating Procedure (SOP) is designed to provide guidelines for the collection of soil samples using a hand auger or soil core sampler. If soil samples are to be collected for laboratory analysis, the SOP for the selected sampling methods and parameters should be employed.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

In addition to potential exposure to hazardous materials, buried utilities and heavy equipment present safety risks.

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation
- SOP 201 – Classification of Soil
- SOP 202 – Organic Vapor Soil Screening
- SOP 203 – Soil Boring Observation and Sampling
- SOP 208 – Soil Grab Sample Collection
- SOP 209 – Soil Composite Sample Collection
- SOP 701 – Decontamination of Sampling Equipment
- SOP 702 – Management of Investigation Derived Waste

D. Equipment and Supplies

- Soil Boring Log Form (see Attachment A)
- Global Positioning System (GPS) unit or measuring tape
- Photoionization detector (PID) with appropriate lamp (see SOP 202 – Organic Vapor Soil Screening)
- Soil sampling equipment (see SOP 208 – Soil Grab Sample Collection and SOP 209 – Soil Composite Sample Collection)
- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- Waterproof and/or indelible ink pens
- Cell phone camera or digital camera
- Personal Protective Equipment (PPE)
- Field test equipment per appropriate SOP (see SOP 202 – Organic Vapor Soil Screening)
- Appropriate sample containers and preservatives (see applicable Sampling and Analysis Plan)
- Decontamination products (see SOP 701 – Decontamination of Sampling Equipment)
- Steel bucket auger
- Extension shafts
- Cross handle
- Impermeable plastic liner for excavated soil

E. Procedure

E.1. Underground Utility Locates

Perform underground utility clearance in accordance with the Braun Intertec Corporate Utility Clearance Process.

Ensure that utilities are marked and the hand auger borings are located a safe distance from any buried utility.

E.2. Boring Location and Numbering

A day or two before the field work begins, review the written scope of work with the technical project manager. The scope should define the boring numbering scheme, boring locations, depths, sample intervals, and types of samples to be collected. Make sure that all required field equipment is prepared and in good working condition. If required, determine the appropriate place to dispose of cuttings or provide an appropriate container per SOP 702 – Management of Investigation Derived Waste.

Once on site, identify the boring locations. Review planned sampling procedures to ensure they meet the scope of work. In particular, review sample intervals and sampling depths, if appropriate. Use the GPS unit or measuring tape to determine the location of hand auger borings.

E.3. Bottle Order and Cooler Preparation

Several days before field work is scheduled to begin, call or email the laboratory to order sample containers. It is a good idea to order extra bottles to allow for breakage, extra samples, etc. If you are unsure of the required sample volumes or proper laboratory sample containers for specific analytical parameters, ask that a written description be included with the bottle order clarifying sample container requirements.

Before you leave for the field, be sure that you have the appropriate sample containers (including appropriate preservatives) and that extra containers are included, if requested. **Be sure you are aware of sample volume and container requirements (discuss with analytical laboratory or project manager if unsure).**

Place ice into each sample cooler before collecting any samples. Double-bag the ice in sealable gallon bags or sealed garbage bags to avoid potential contact of water in the cooler with sample containers.

Place a temperature blank in each cooler and under the ice. If any samples will be analyzed for gasoline range organics (GRO), benzene, ethylbenzene, toluene and xylenes (BETX), or volatile organic compounds (VOCs), include a trip blank in each cooler.

E.4. Procedures

Field personnel are responsible for making field observations of the soil, screening soil samples for volatile organic vapors, and collecting soil samples both for laboratory analysis and geotechnical classification by a Braun Intertec Geotechnical Engineer.

- Be aware of safety. Don appropriate PPE, as prescribed by the HASP.
- Decontaminate the auger bucket and soil core sampler prior to initial use (see SOP 701 – Decontamination of Sampling Equipment for decontamination procedures).
- If using a bucket auger, attach the auger bucket to one end of an extension shaft and attach a cross handle to the other end of the extension shaft.
- Turning the handle clockwise, auger down until the auger bucket or core sampler is full of soil.
- Lift the auger/sampler out of the bore hole and deposit the excavated soil on an impermeable plastic liner to prevent any leaching of possible contaminants.

- Soil from the hand auger borings should be described in accordance with SOP 201 – Classification of Soil. Record the soil descriptions on the Soil Boring Log (Attachment A).
- Soil from the hand auger boring should be screened in the field for indications of organic vapors in accordance with SOP 202 – Organic Vapor Soil Screening. Record the results of the vapor screening on the boring log.
- Attach additional extension shafts as needed.
- After auguring down to the desired sampling depth, decontaminate the auger/sampler bucket prior to advancing auger to next sampling interval.
- Place the auger back in the bore hole and advance it to the desired sampling depth.
- To collect soil samples for chemical analyses as specified in the project specific work plan, Sampling and Analysis Plan or QAPP, refer to SOP 203 – Soil Boring Observation and Sampling, SOP 208 – Soil Grab Sample Collection for collection of grab samples, and SOP 209 – Soil Composite Sample Collection for collection of composite samples.
- Label the sample container and place it on ice in a cooler until delivery to the laboratory.
- Repeat the above steps for the desired number of soil samples.
- Decontaminate all equipment prior to moving to next location (see SOP 701 – Decontamination of Sampling Equipment).
- Dispose of excess soil cuttings in accordance with SOP 702 – Management of investigation Derived Waste.

E.5. Documentation

Logs of borings are required in investigation reports. Use the Soil Boring Log form (Attachment A). Boring log preparation is described in SOP 201 – Classification of Soil.

Photographs should be taken of the boring location in accordance with SOP 101 – Field Notes and Documentation. A photographic log should be included with the field notes. If there is something specific personnel would like the viewer to note, be sure it is specified in the description.

E.6. Backfilling/Restoration

The boring should be backfilled with bentonite grout or excess soil cuttings to seal off the hand auger boring. Disposal of cuttings should be discussed with the technical project manager.

E.7. Data and Records Management

Observations should be documented in accordance with SOP 101 – Field Notes and Documentation.

E.8. Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

Project Name/Project Number:		Log of Boring No.	
Boring Location Notes:		Surface Elevation:	Total Depth:
Drilling Contractor/Drilling Method:		Date/Time Started:	Date/Time finished:
Sampling Equipment (i.e., Macro-Core, split spoon):		Depth to Water:	Measuring Point:
Field Personnel:	Responsible Prof./Reg. No.:	Surface Cover (asphalt, concrete etc.)	

Depth (Feet)	Sample Recovery	PID (ppm)	DESCRIPTION Name (USCS Symbol), color, moisture, grain size, amount of gravel, sand, or fines, plasticity, consistency, structure, inclusions or debris present, geologic interpretation (fill, native, till, lacustrine etc.)	Analytical Sample Interval	Remarks (odors, blow counts, debris, analytical sample IDs, temp well details etc.)

BRAUN INTERTEC

Project Name/Project Number:	Log of Boring No. (Cont.)

Depth (Feet)	Sample Recovery	PID (ppm)	DESCRIPTION Name (USCS Symbol), color, moisture, grain size, amount of gravel, sand, or fines, plasticity, consistency, structure, inclusions or debris present, geologic interpretation (fill, native, till, lacustrine etc.)	Analytical Sample Interval	Remarks (odors, blow counts, debris, analytical sample IDs, temp well details etc.)

BRAUN INTERTEC

A. Purpose

The following Standard Operating Procedure (SOP) for the collection of grab soil samples is intended to be used by Braun Intertec field personnel for the purposes of soil sample collection. Grab sampling techniques should always be used to collect samples for volatile organic compounds (VOC), gasoline range organics (GRO), diesel range organics (DRO) or other analyses that require collection of a generally undisturbed portion of soil. Grab sampling techniques may also be used to collect other analytes such as semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and metals. Grab samples should be collected prior to collection of other sample aliquots as soon as possible after the sampling interval is retrieved. Soil samples collected in the field during investigations for characterization and/or documentation of site conditions are integral to the services provided to clients and regulatory agencies.

This SOP is applicable for soil samples collected from soil borings (SOP 203 – Soil Boring Observation and Sampling), test pits and test trenches (SOP 211 – Test Pit and Test Trench Observation and Sampling), stockpiles (SOP 210 – Soil Stockpile Sampling), and/or excavations.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP), if applicable.

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation
- SOP 203 – Soil Boring Observation and Sampling
- SOP 210 – Soil Stockpile Sampling
- SOP 211 – Test Pit and Test Trench Observation and Sampling
- SOP 308 – Trip Blanks
- SOP 602 – Chain-of-Custody Procedures
- SOP 603 – Sample Shipping

D. Equipment and Supplies

- Coring device (one for each soil sample collected)
- Portable digital scale, if necessary
- Appropriate laboratory-supplied container and preservative (when applicable)
- Sample labels
- Sample coolers
- Ice
- Temperature blanks (one per sample cooler)
- Trip blanks, if necessary (see SOP 308 – Trip Blanks)
- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- Chain-of-Custody (COC) forms (see SOP 602 – Chain-of-Custody Procedure)
- Custody seals
- Cell phone camera or digital camera
- Personal Protective Equipment (PPE)

The following table provides details regarding analytical parameters and the type of laboratory-supplied containers and applicable preservative.

Analytical Parameter (holding time)	Bottle Type and Preservation Type
DRO (10 days)*	4-oz. glass jar, pre-weighed and unpreserved
8 RCRA Metals or 13 Priority Pollutant Metals (6 Months, except mercury 28 days)	4-oz. glass jar, unpreserved
GRO (14 days)**	40-milliliter (mL) glass vial, with 10 mL methanol pre-weighed
PCBs (14 days)***	4-oz. glass jar unpreserved
SVOCs (14 days)****	4-oz. glass jar unpreserved
VOCs (14 days)**	40-mL glass vial, with 10 mL methanol, pre-weighed

*DRO soil samples collected in 60-mL pre-weighed containers must be filled with 25 to 35 grams or soil.
**VOC and GRO soil samples collected in 40-mL pre-weighed containers should contain between 8 to 11 grams of soil.
***PCBs – Polychlorinated Biphenyls
****SVOCs – Semi-volatile Organic Compounds

All soil samples must have a single unpreserved sample collected (5-10 gram minimum) for dry weight analysis (i.e., moisture sample).

E. Procedure

E.1. Bottle Order

Several days before field work is scheduled to begin contact the laboratory to order sample containers and soil coring devices by phone or email. It may be a good idea to order extra bottles to allow for breakage, extra samples, etc. If you are unsure of the required sample volumes or proper laboratory sample containers for specific analytical parameters, ask that a written description be included with the bottle order which clarifies sample requirements.

Upon receipt of the sample coolers and before you leave for the field, check the contents of the cooler to be sure that you have the appropriate sample containers and that extra containers are included, if requested. Be sure you are aware of sample volume and container requirements.

E.2. Cooler Preparation

Place ice or a frozen cold pack into each sample cooler before collecting any samples. Double-bag the ice in sealable gallon bags or sealed garbage bags to avoid potential contact of water in the cooler with sample containers.

Place a temperature blank into each cooler and under the sealed bags of ice. If the cooler will contain VOCs samples ensure that a trip blank is placed into the cooler with the samples.

E.3. Labeling Sample Containers

Prior to collecting soil grab samples, complete the sample label for the laboratory-supplied containers. The sample label must have the following information:

- Project Number (listed under "Client")
- Sample Name (listed under "Sample ID")
- Date Sample Collected (listed under "Collection Date")
- Sampler's Initials (listed under "Collected by")
- Time Sample Collected (listed under "Time")

Additionally, some laboratory-supplied sample containers (e.g., DRO, GRO, and VOCs) have been pre-weighed by the laboratory. It is important to make sure that the pre-weighed sample containers have their weight listed on the sample label and that the weight is visible.

E.4. Soil Sampling

Select sample location/interval per the Work/Sampling Plan. Don new disposable gloves and expose a fresh surface of soil, if necessary. Follow procedures listed below for each specific parameter. If VOCs and GRO samples are to be collected as part of the Work/Sampling Plan, these parameters are to be collected first from undisturbed soil or freshly exposed soil surfaces to minimize volatilization.

E.5. VOCs and GRO Soil Grab Sample Collection

- Place an electronic scale, which has been verified that day prior to use, on a flat surface and turn it on. A weighted standard shall be used to determine acceptable precision.
- Before filling the first jar, verify the accuracy of the scale. Place a pre-weighed sample container on the scale. Compare the reading to the weight on the container. If within 5 grams, the scale can be used for the rest of the day. If not within 5 grams, remove the container, turn the scale off, then on, and repeat the test. If still not within 5 grams, use a different scale.
- Remove cap from pre-weighed, pre-preserved 40-milliliter (mL) sample vial.
- Place 40-mL vial on electronic scale and press "tare" button to zero electronic scale.
- Electronic scale should read 0.0g – leave sample vial on electronic scale.
- Use the lab provided Terra Core® sampler (5- or 10-gram) or 10-mL syringe with the top cut off (approximately 10 grams when full) for collecting a sample. The laboratory may provide a different sampling device than described above; whichever device is provided, the goal is to have **8-11 grams** of soil in the sample jar for VOC/GRO analysis.
- Scrape off upper layer of soil to expose underlying soil. Remove the syringe cap and push the syringe into the freshly exposed soil until the soil column entering the syringe has forced the top of the plunger to the stopping point against the top of the syringe cradle.
- Wipe all debris from the outside of the syringe and remove any soil that extends outside the mouth of the syringe, so the soil sample is flush with the mouth of the syringe.
- Carefully place the mouth of the syringe against the top of the open 40-mL vial and gently extrude the sample into the vial. (Note: to prevent the methanol preservative from splashing out of the bottle, hold the syringe against the top of the vial until the sample has fallen into the preservative.) Try to avoid getting soil on the threads of the vial. Clean the threads if necessary and cap the vial immediately.

- Weigh the sample bottle. Tolerances and field actions required are presented in the table below:

Actual Sample Weight	Volume of Methanol	Field Action
< 8 grams	10 mL	Add soil to reach 10 grams
8-11 grams	10 mL	None required
> 11 to < 20 grams	10 mL	None required. Laboratory will add methanol to reach 1:1 ratio
20 or > grams	10 mL	Discard bottle and resample

- Cap the sample container. Gently swirl, do not shake, sample vial to fully immerse soil into methanol.
- Fill out the label on the vial completely, including project number, sample I.D., date, time and sampler's initials. Record the information on the Chain-of-Custody form and in the field notebook.
- Collect at least two vials of soil sample for each analysis (VOCs or GRO). Therefore, if the work plan requires only VOCs then you will fill two vials; if the work plan calls for VOCs and GRO you will fill four vials (two vials for each analyte).
- Manually fill a plastic snap-top tube (or similar unpreserved bottle) with soil from the same sampling interval/matrix as each sample. Remove soil particles from the rim of the snap tube so the cap will close securely and close the cap. This jar is for moisture calculation to be submitted with VOCs/GRO soil sample containers and should be labeled the same as the VOC/GRO sample jars. All soil samples for VOCs or GRO analysis require an accompanying moisture calculation jar. Only one moisture jar is required per soil sample (i.e., one moisture jar is sufficient for both VOCs and GRO analysis).
- Place a trip blank into the cooler with the VOCs/GRO samples; see SOP 308 – Trip Blanks.
- Store, transport, and maintain sample custody per SOP 602 – Chain-of-Custody Procedures.

E.6. DRO Soil Grab Sample Collection

- Place an electronic scale, which has been verified that day prior to use, on a flat surface and turn it on. A weighted standard shall be used to determine acceptable precision.
- Before filling the first jar, verify the accuracy of the scale. Place a pre-weighed sample container on the scale. Compare the reading to the weight on the container. If within 5 grams, the scale can be used for the rest of the day. If not within 5 grams, remove the container, turn the scale off, then on, and repeat the test. If still not within 5 grams, use a different scale.
- Remove cap from pre-weighed, unpreserved sample container.
- Place empty DRO bottle on electronic scale and press "tare" button to zero electronic scale.
- Electronic scale should read 0.0g – leave DRO bottle on electronic scale.
- Use the laboratory provided coring device such as a Terra Core® sampler (5- or 10-gram) or 10-mL syringe with the top cut off (approximately 10 grams when full) for collecting a sample. The laboratory may provide a different coring device than described above; whichever coring device is provided, the goal is to have **25 to 35 grams** of soil in a 4-oz. sample jar for the Wisconsin DRO method and Environmental Protection Agency (EPA) Method 8015, Total Petroleum Hydrocarbon (50 to 70 grams in an 8-oz. jar).
- Scrape off upper layer of soil to expose underlying soil. Push the coring device into the freshly exposed soil until the soil column entering the coring device has filled to the top of the plunger (Terra Core) or the 10-mL line (cut off Syringe).
- Wipe all debris from the outside of the coring device and remove any soil that extends outside the mouth of the coring device, so the soil sample is flush with the mouth of the coring device.
- Extrude soil sample from the coring device into the DRO bottle. Collected soil sample should have a cumulative weight between **25 and 35 grams (4-oz. jar)**. Repeat the steps above as necessary to achieve necessary soil sample weight. If more than 35 grams of soil are collected, discard all the soil

in sample jar and recollect the sample. Try to avoid getting soil on the threads of the sample jar. Clean the threads if necessary and cap the sample jar immediately after sample collection.

- Repeat the above steps to fill a second DRO sample container. Two soil sample jars may be required for this analytical method.
- Fill one unpreserved sample container (typically a small plastic jar provided by the lab) with soil from the same sampling interval/matrix as each sample. This jar is for moisture calculation to be submitted with DRO soil sample containers and should be labeled the same as the DRO sample jars. All soil samples for DRO analysis require an accompanying moisture calculation jar.

E.7. Metals Soil Grab Sample Collection

- One open-top, 4- or 8-oz. unpreserved jar.
- Using a clean stainless-steel spoon, scoopula, or gloved hand, thoroughly mix or homogenize the interval to be sampled, and fill the unpreserved sample containers with the collected soil sample. Avoid filling the sample containers with gravel or rocks.
- Wipe soil from the container threads. Close the flip-top of the unpreserved sample container.
- Note: if several analyses are being performed for a single soil sample, the collection and submission of one moisture calculation jar is sufficient for all of the analyses for that one soil sample.

E.8. PCBs/SVOCs Soil Grab Sample Collection

- Open 4-oz., unpreserved sample container.
- Using a clean stainless-steel spoon, scoopula, or gloved hand, thoroughly mix or homogenize the interval to be sampled, and fill the unpreserved sample containers with the collected soil sample. Try to fill the sample containers with soil and not gravel or rocks.
- Wipe soil from the container threads. Reseal the 4-oz. sample container with the lid.
- Note: if several analyses are being performed for a single soil sample, the collection and submission of one moisture calculation jar is sufficient for all of the analyses for that one soil sample.

E.9. Sample Delivery

Arrange for pick-up/drop-off of soil samples in laboratory-provided coolers to the analytical laboratory. If shipping of soil samples to the analytical laboratory is required, follow SOP 603 – Sample Shipping.

E.10. Data and Records Management

Soil samples collected in the field should be recorded in the Field Report Form or field logbook (see SOP 101 – Field Notes and Documentation), on the field log, soil boring log, test trench log, etc., and on the COC (see SOP 602 – Chain-of-Custody Procedures). Information recorded in the Field Report Form or field logbook and on the COC should be identical to the information listed on the sample container label(s). Additionally, it is useful to note how many soil sample containers were filled for each uniquely identified soil grab sample.

Note the presence of any pieces of bituminous in the samples, no matter how small, particularly in samples to be analyzed for DRO or SVOCs.

E.11. Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

A. Purpose

The following Standard Operating Procedure (SOP) for the collection of composite soil samples is intended to be used by Braun Intertec field personnel for the purposes of composite soil sample collection. This SOP establishes a reproducible process for composite soil sample collection with the intent of maintaining integrity of the subsequent laboratory analytical procedures.

Compositing is the process of physically combining and homogenizing several individual soil aliquots of the same volume or weight.

This SOP is applicable to soil samples collected for the purposes of documenting the presence and/or concentration of regulated compounds in soil. Check the work plan or consult the project manager to determine if composite samples are required. This SOP is applicable for soil samples collected from soil borings (SOP 203 – Soil Boring Observation and Sampling), test pits and test trenches (SOP 211 – Test Pit and Test Trench Observation and Sampling), stockpiles (SOP 210 – Soil Stockpile Sampling), and/or excavations.

Specifically, this SOP is applicable for soil samples that might be analyzed for non-volatile parameters, including, but not limited to:

- Metals
- Semi-volatile organic compounds (SVOCs)
- Polychlorinated biphenyls (PCBs)
- Pesticides or herbicides

This SOP is not applicable to sampling volatile organic compounds (VOCs), gasoline range organics (GRO), diesel range organics (DRO), or other volatile analytes. VOCs, GRO, and DRO should be collected as grab samples, see SOP 208 – Soil Grab Sample Collection.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation
- SOP 203 – Soil Boring Observation and Sampling
- SOP 208 – Soil Grab Sample Collection
- SOP 210 – Soil Stockpile Sampling
- SOP 211 – Test Pit and Test Trench Observation and Sampling
- SOP 602 – Chain-of-Custody Procedures
- SOP 603 – Sample Shipping
- SOP 701 – Decontamination of Sampling Equipment

D. Equipment and Supplies

- Shovel, if necessary
- Gallon-size plastic bag or stainless-steel bowl
- Stainless-steel spoon or scoopula, if necessary
- Plastic cups or quart-sized plastic bags
- Appropriate laboratory-supplied containers
- Sample labels

- Sample coolers
- Ice
- Temperature blanks (one per sample cooler)
- Chain-of-Custody (COC) forms (see SOP 602 – Chain-of-Custody Procedure)
- Custody seals
- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- Waterproof and/or indelible ink pens
- Decontamination equipment (see SOP 701 – Decontamination of Sampling Equipment)
- Cell phone camera or digital camera
- Personal Protective Equipment (PPE)

The following table provides details regarding analytical parameters and the type of laboratory-supplied containers.

Analytical Parameter (holding time)	Bottle Type and Preservation Type	Number of Containers
8 RCRA Metals or 13 Priority Pollutant Metals (6 Months)	40-mL Plastic Flip cap, unpreserved	1
PCBs (14 days)	4-oz. Glass jar, unpreserved	1
SVOCs (14 days)	4-oz. Glass jar, unpreserved	1
Pesticides (14 days)	4-oz. Glass jar, unpreserved	1
Herbicides (14 days)	4-oz. Glass jar, unpreserved	1

All soil samples must have an unpreserved sample collected in a separate unpreserved container for dry weight analysis.

E. Procedure

E.1. Bottle Order

Several days before field work is scheduled to begin contact the laboratory to order sample containers by phone or email. It is a good idea to order extra bottles to allow for breakage, extra samples, etc. If you are unsure of the required sample volumes or proper laboratory sample containers for specific analytical parameters, ask that a written description be included with the bottle order which clarifies sample requirements.

Upon receipt of the sample coolers and before you leave for the field, check the contents of the cooler to be sure that you have the appropriate sample containers and that extra containers are included, if requested. Be sure you are aware of sample volume and container requirements.

E.2. Cooler Preparation

Place ice or a frozen cold pack into each sample cooler before collecting any samples. Double-bag the ice in sealable gallon bags or sealed garbage bags to avoid potential contact of water in the cooler with sample containers.

Place a temperature blank into each cooler and under the sealed bags of ice.

E.3. Labeling Sample Containers

Prior to collecting soil composite samples, complete the sample label for the laboratory-supplied containers. The sample label must have the following information:

- Project Number (listed under “Client”)

- Sample Name (listed under "Sample ID")
- Date Sample Collected (listed under "Collection Date")
- Sampler's Initials (listed under "Collected by")
- Time Sample Collected (listed under "Time")

If not already present, affix the appropriate sample label to the laboratory-supplied sample container.

E.4. Soil Sampling

- Assess and approximate the size of soil from which the composite soil sample will be collected.
- Identify the number aliquots and splitting protocol using the work plan or consult the project manager.
- Prior to sampling, decontaminate the shovel, spoon or scoopula, and stainless-steel bowl or other appropriate container following SOP 701 – Decontamination of Sampling Equipment. In addition, decontaminate all sampling and compositing equipment before collecting each additional sample.
- Don new disposable gloves. Using a gloved hand or decontaminated shovel, spoon or scoopula, acquire the appropriate number of aliquots. The aliquots should be approximately the same size and weight. Place aliquots in the decontaminated stainless-steel bowl or appropriate container that will not introduce contaminants to the samples. Mix the aliquots until thoroughly homogenized, removing rocks or gravel.
- Using a gloved hand, spoon or scoopula, fill unpreserved sample containers with the collected soil sample.
- Fill one open flip-top (or similar), unpreserved jar with the remaining homogenized soil for the percent moisture calculation sample.
- Note: if several analyses are being performed for a single soil sample, the collection and submission of one moisture calculation jar is sufficient for all of the analyses for that one soil sample.
- Place the homogenized soil into the appropriate sample containers. Wipe the threads clean, close the jar, and place the sample on ice.

E.5. Sample Delivery

Arrange for pick-up/drop-off of soil samples in laboratory-provided coolers to the analytical laboratory. If shipping of soil samples to the analytical laboratory is required, follow SOP 603 – Sample Shipping.

E.6. Data and Records Management

Soil samples collected in the field should be recorded in the Field Report Form or field logbook (see SOP 101 – Field Notes and Documentation), on the field log, soil boring log, test trench log, etc., and on the COC (see SOP 602 – Chain-of-Custody Procedures). Information recorded in the Field Report Form or field logbook and on the COC should be identical to the information listed on the sample container label(s). Additionally, it is useful to note how many soil sample containers were filled for each uniquely identified soil composite sample.

Note the presence of any pieces of bituminous in the samples, no matter how small, particularly in samples to be analyzed for SVOCs.

E.7. Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

A. Purpose

The purpose of this Standard Operating Procedure (SOP) is to establish a consistent method and format for stockpile sampling. If samples are to be collected for laboratory analysis, the SOP for the selected sampling methods and parameters should be employed (i.e., soil grab or soil composite).

A.1. Scope and Applicability

This procedure should be used to characterize and evaluate stockpiled material for reuse or disposal options.

A.2. Summary of Method

Determine the approximate volume of the stockpile. Determine an appropriate number of soil samples based on the approved work plan, site-specific conditions, and/or the appropriate regulatory program guidelines. Equally divide the stockpile into segments equaling the number of samples to be collected. Grab samples are collected from representative portions of the stockpile, typically for volatile and sometimes semi-volatile organic compound analysis in accordance with SOP 208 – Soil Grab Sample Collection. Composite samples are collected in accordance with SOP 209 – Soil Composite Sample Collection, for non-volatile and for most semi-volatile organic compound analyses.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

In addition to potential exposure to hazardous substances, stockpile sampling presents safety risks due to working near excavating equipment, potential stockpile sloughing, and slip hazards while climbing on the stockpile to collect samples.

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation
- SOP 201 – Classification of Soil
- SOP 202 – Organic Vapor Soil Screening
- SOP 208 – Soil Grab Sample Collection
- SOP 209 – Soil Composite Sample Collection
- SOP 701 – Decontamination of Sampling Equipment

D. Equipment and Supplies

- Shovel/hand auger
- Permanent marker
- Wire Flags or wooden stakes
- Global Positioning System (GPS) unit and measuring tape
- Photoionization detector (PID) with appropriate lamp (see SOP 202 – Organic Vapor Soil Screening)
- Soil sampling equipment (see SOP 208 – Soil Grab Sample Collection and SOP 209 – Soil Composite Sample Collection)
- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- Waterproof and/or indelible ink pens
- Cell phone camera or digital camera
- Personal Protective Equipment (PPE)

E. Procedure

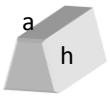
E.1. Volume of Stockpile

Speak with the project manager or contractor to get the estimated cubic yards of the stockpile. Use the following information to estimate the volume if it is unknown or to confirm estimates by others.

- For an elongated stockpile, determine the shape of the end face and calculate the area of the face in square feet.

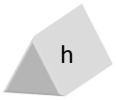
area of a semicircle face = $1/2\ \pi r^2$

OR



area of a trapezoid face = (h * [a+b]) / 2

OR



area of a triangle face = 1/2 bh

- Measure the length (L) of the stockpile in feet.
- Multiply length by area of face (in square feet) and divide by 27 to calculate volume in cubic yards.
- For a cone-shaped stockpile, the volume is calculated by the following formula: $(1/3)\ \pi r^2 h$. Then divide by 27 to convert to cubic yards.

Note: Although there are many variables such as soil type, moisture conditions, presence of debris, etc., as a rule of thumb, to convert cubic yards to tons, 1 cubic yard of soil weighs about 1.5 tons. One cubic yard of concrete weighs about 2 tons.

E.2. Number of Samples

The project work plan, regulatory guidance, and site-specific circumstances should be taken into account when determining the appropriate number of samples to collect from the stockpile. If more than one sample will be collected, divide the stockpile into equal sections and collect the samples from each section. Use paint or stakes to mark divisions of the stockpile.

E.3. Soil Description

The material encountered in the stockpile should be documented (see SOP 201 – Classification of Soil). Describe the type and approximate percentage of soil fill (matrix) and non-soil fill (debris) types present. Photoionization detector (PID) screening should be conducted on all samples collected from the stockpile (see SOP 202 – Organic Vapor Soil Screening).

E.4. Soil Sampling

- Don new disposable gloves. Use a clean/decontaminated shovel or hand auger to dig approximately 0.5 to 1 foot into the stockpile at each location to obtain a fresh soil sample (see SOP 701 – Decontamination of Sampling Equipment). Excavation equipment or drilled soil borings can be used to collect samples from larger stockpiles.
- The project work plan and site-specific circumstances should be taken into account when determining sampling techniques. Refer to the project manager, approved work plan, or landfill requirements for sampling parameters.
- Soil samples collected for volatile organic compounds (VOCs), diesel range organics (DRO), and gasoline range organics (GRO) require collection of grab samples from representative portions of the stockpile. Soil samples collected for all other analysis requires collection of composite samples. Soil samples for chemical analysis should be collected in accordance with SOP 208 – Soil Grab Sample Collection and SOP 209 – Soil Composite Sample Collection.
- Mark each sample location on a map and mark each location with a flag. Use the GPS unit and/or measuring tape to determine the location of stockpiles and each sample location.

E.5. Cautions

Stockpiles should be constructed and maintained to prevent erosion and impacts to storm water and surface water.

Stockpiles should be clearly labeled and identified by use of stakes, lathe, flagging, temporary fencing, etc. to avoid inadvertent mismanagement of the stockpiled material. A site sketch showing the approximate locations of stockpiles should be maintained and photographs should be used where helpful.

E.6. Interferences

Once a stockpile is sampled, additional soil should not be added to the stockpile. If additional soil is added, the initial sample is no longer representative of the stockpile.

E.7. Data and Records Management

Observations should be documented in accordance with SOP 101 – Field Notes and Documentation.

E.8. Quality Assurance Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

A. Purpose

The purpose of this Standard Operating Procedure (SOP) is to detect contamination that may have been introduced in the field by the sampling equipment, sampling procedures, or inadequate decontamination of field equipment.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation
- SOP 602 – Chain-of-Custody Procedures
- SOP 701 – Decontamination of Sampling Equipment

D. Equipment and Supplies

- Deionized and filtered water. If not available, distilled water can be used. The water source must be noted in the field notes. Do not use tap water.
- Appropriate laboratory-supplied containers
- Chain-of-Custody (COC) forms (see SOP 602 – Chain-of-Custody Procedure)
- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- Waterproof and/or indelible ink pens
- Decontamination equipment (see SOP 701 – Decontamination of Sampling Equipment)
- Personal Protective Equipment (PPE)

E. Procedure

- Prepare equipment blanks in the field by drawing deionized water into or through decontaminated sampling equipment such as a pump. Collection of equipment blanks should simulate actual field sampling methods in a manner that would detect the presence of contamination in sampling equipment. Record sample collection procedures, equipment, and sampling order in the field report form or field logbook.
- Collect the rinsate in appropriate laboratory-supplied sampling containers. Equipment blanks should be preserved and handled in the same manner as other investigative samples.
- Label the containers with the identifier “EB,” “EB-#,” or a blind identifier, as necessary. Include a sample called “EB,” “EB-#” or “Equipment Blank” on the COC Form (see SOP 602 – Chain-of-Custody Procedures).
- Analyze equipment blanks for the parameters specified in the site-specific work plan.

E.1. Data and Records Management

Observations should be documented in accordance with SOP 101 – Field Notes and Documentation.

E.2. Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

A. Purpose

The purpose of this Standard Operating Procedure (SOP) is to detect cross-contamination that occurred during sample collection, preservation, and shipment, as well as in the laboratory. It can also help verify use of appropriate sample containers and preservatives.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation
- SOP 602 – Chain-of-Custody Procedures

D. Equipment and Supplies

The following materials are required:

- Deionized and filtered water. If not available, distilled water can be used. The water source must be noted in the field notes. Do not use tap water.
- Appropriate laboratory-supplied containers
- Chain-of-Custody (COC) forms (see SOP 602 – Chain-of-Custody Procedure)
- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- Waterproof and/or indelible ink pens
- Personal Protective Equipment (PPE)

E. Procedure

- Collect field blanks by pouring deionized, filtered, or distilled water into appropriate sample containers at one of the site sampling locations. Record the sample location in the field report form or field logbook. The field blank water should be exposed to air on-site for an amount of time equal to the amount of time for filling and closing an investigative sample container. Preserve and handle field blanks in the same manner as investigative samples.
- Label sample containers using the identifier “FB,” “FB-#,” or a blind identifier, as necessary. Include a sample called “FB,” “FB-#” or “Field Blank” on the COC Form (see SOP 602 – Chain-of Custody Procedures).
- Analyze field blanks for the parameters specified in the site-specific work plan.

E.1. Data and Records Management

Observations should be documented in accordance with SOP 101 – Field Notes and Documentation.

E.2. Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

A. Purpose

The purpose of the Chain-of-Custody (COC) Standard Operating Procedure (SOP) is to control environmental samples from the time they are collected until custody of the samples is accepted by the laboratory sample custodian. COC documentation serves three main purposes:

- Communicates the analytical instructions from the sampler to the analytical laboratory.
- Provides a permanent record of samples provided to the laboratory.
- Documents that samples were handled only by authorized personnel and were not available for tampering prior to analysis.

A.1. Scope and Applicability

Although few environmental samples will ever be used in criminal or civil litigation cases, most samples are collected in support of government-regulated activities. In addition, it is possible that the results of the sample analyses will be used in future litigation even if none was contemplated at the time the samples were collected. Therefore, it is important that a record of sample possession (i.e., COC) be maintained, so that control of the samples from the time of collection to the time of sample laboratory check-in can be demonstrated.

Laboratory-related sample control is described in laboratory operating and quality-control documents and is not discussed in this standard operating procedure (SOP).

This procedure should be used for control of environmental samples that include, but are not limited to those of groundwater (see SOP 311 – Groundwater Sample Collection), surface water (see SOP 314 – Surface Water Sampling), soil (see SOP 208 – Soil Grab Sample Collection and SOP 209 – Soil Composite Sample Collection), air (see SOP 402 – Indoor Air Sampling), soil vapor (see SOP 403 – Soil Vapor Sampling from a Borehole and with a Hand Probe and SOP 405 – Sub-Slab Soil Vapor Sampling), and waste.

A.2. Summary of Method

Environmental samples are collected using methods specified in the work plan or other SOPs. The samples are collected in sampling containers for the desired analyses, preserved as appropriate, and a label is affixed to each container specifying the project name and number, sample identification, date and time of collection, and sample collector. The information is entered onto the COC form and the desired analyses are indicated on the form, which also serves as the analytical request. Sample custody (possession) is maintained individually until the samples are delivered to the laboratory sample check-in. Transfer of custody is documented on the COC form by printed name, signature, date and time.

A.3. Personnel Qualifications and Responsibilities

The sampler is responsible for understanding, implementing and documenting activities related to this SOP during field activities. The sampler is responsible for transmitting a copy of field notes that have not been forwarded to the project manager or designee, as well as a copy of the COC form(s) immediately after sample check-in. If there is more than one sampler, the lead field sampler assumes these responsibilities.

A.4. Definitions

Chain-of-Custody Procedure: A procedure whereby a sample or set of samples is maintained under physical possession or control.

Custody: Samples and data are considered to be in your custody when:

- They are in your physical possession,
- They are in your view, after being in your physical possession,
- They are in your physical possession and then locked in a room or vehicle so that tampering cannot occur, or
- They are kept in a secured area, with access restricted to authorized personnel only.

Chain-of-Custody Form: Form used to record sample identification information, test(s) requested, result reporting instructions, and sample custody.

Sample: A portion of an environmental or source matrix that is collected and used to characterize the matrix.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

Department of Transportation (DOT), United States Postal Service (USPS), and Federal Aviation Administration (FAA) shipping/labeling regulations must be followed for shipped samples.

C. Referenced SOPs

- SOP 208 – Soil Grab Sample Collection
- SOP 209 – Soil Composite Sample Collection
- SOP 314 – Surface Water Sampling
- SOP 402 – Indoor Air Sampling
- SOP 403 – Soil Vapor Sampling from a Borehole and with a Hand Probe
- SOP 405 – Sub-Slab Soil Vapor Sampling

D. Equipment and Supplies

- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- Waterproof or indelible ink pens
- Sample labels
- Custody seals
- Chain-of-Custody (COC) forms (see SOP 602 – Chain-of-Custody Procedure)

E. Procedure

E.1. General Guidelines

- Keep the number of people involved in collecting and handling samples and data to a minimum.
- Only personnel associated with the project should handle samples and data.
- Always document the transfer of samples and data from one person to another on the COC form.
- Always accompany samples and data with the COC form.
- Samples should be uniquely identified, legibly, in permanent ink.
- Fill out the COC form as completely as possible. The sample identification information on the sample containers must match the COC form.
- Use a separate COC form for each cooler.

E.2. Completing COC Form

The COC form should be filled out by the sampler or designee as the samples are being collected and containerized.

E.3. Securing Samples

If you cannot maintain personal possession of the samples prior to sample check-in, they may be secured. A locked vehicle is considered controlled access (i.e., secured). A cooler sitting on the tailgate of a pickup truck or under an unlocked topper, out of direct view of the custodian is not secure. An unsecured cooler in a locked hotel room is also not within controlled access as hotel staff have access to the room. In this case, the cooler could be padlocked or custody seals could be used to secure the samples or cooler.

E.4. Data and Records Management

The original COC form is maintained by the laboratory in accordance with their file retention guidance. A copy of the record should be provided to the project manager or designee with a copy of the sampling field notes by the sampler immediately after sample check-in.

E.5. Quality Assurance Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

The project manager or designee should review the COC form as soon as possible after sample check-in to verify that the information on the COC form is correct.

A. Purpose

The purpose of this Standard Operating Procedure (SOP) is to describe the procedure used for proper packaging methods and shipment of samples by overnight carrier via Chain-of-Custody (COC) procedures (see SOP 602 – Chain-of-Custody Procedures).

A.1. Scope and Applicability

If samples cannot be delivered to the laboratory in person and must be shipped, the following procedures should be used.

This procedure should be used for shipping of environmental samples that include, but are not limited to those of groundwater (see SOP 311 – Groundwater Sample Collection), surface water (see SOP 314 – Surface Water Sampling), soil (see SOP 208 – Soil Grab Sample Collection and SOP 209 – Soil Composite Sample Collection), air (see SOP 402 – Indoor Air Sampling), soil vapor (see SOP 403 – Soil Vapor Sampling from a Borehole and with a Hand Probe and SOP 405 – Sub-Slab Soil Vapor Sampling), and waste.

A.2. Summary of Method

Environmental samples are collected using methods specified in the work plan or other SOPs. The samples are collected in sampling containers for the desired analyses, preserved as appropriate, and a label is affixed to each container specifying the project name and number, sample identification, date and time of collection, and sample collector. The information is entered onto the COC form and the desired analyses are indicated on the record, which also serves as the analytical request. Sample custody (possession) is maintained individually until the samples are delivered to the laboratory sample check-in. Transfer of custody is documented on the COC form by printed name, signature, date, and time.

A.3. Personnel Qualifications and Responsibilities

The sampler is responsible for understanding, implementing, and documenting activities related to this SOP during field activities. The sampler is responsible for transmitting a copy of field notes that have not been forwarded to the project manager or designee, as well as a copy of the COC form(s) immediately after samples are shipped. If there is more than one sampler, the lead sampler assumes these responsibilities.

A.4. Definitions

Chain-of-Custody Procedure: A procedure whereby a sample or set of samples is maintained under physical possession or control.

Custody: Samples and data are considered to be in your custody when:

- They are in your physical possession.
- They are in your view, after being in your physical possession.
- They are in your physical possession and then locked up so that tampering cannot occur.
- They are kept in a secured area, with access restricted to authorized personnel only.

Chain-of-Custody Form: Form used to record sample identification information, test(s) requested, result reporting instructions and sample custody.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

Department of Transportation (DOT), United States Postal Service (USPS), and Federal Aviation Administration (FAA) shipping/labeling regulations must be followed for shipped samples.

C. Referenced SOPs

- SOP 208 – Soil Grab Sample Collection
- SOP 209 – Soil Composite Sample Collection
- SOP 308 – Trip Blanks
- SOP 314 – Surface Water Sampling
- SOP 402 – Indoor Air Sampling
- SOP 403 – Soil Vapor Sampling from a Borehole and with a Hand Probe
- SOP 405 – Sub-Slab Soil Vapor Sampling
- SOP 602 – Chain-of-Custody Procedures

D. Equipment and Supplies

- Sample coolers or similar shipping containers (solid or liquid samples)
- Sturdy cardboard boxes (steel air canister)
- Protective wrapping and packaging materials
- Ice
- Appropriate laboratory-supplied containers and preservatives (when applicable)
- Sample labels
- Temperature blanks (one per sample cooler)
- Trip blanks, if necessary (see SOP 308 – Trip Blanks)
- Gallon-size plastic bags
- Waterproof and/or indelible ink pens
- COC forms (see SOP 602 – Chain-of-Custody Procedure)
- Custody seals
- Clear packing tape
- Shipping labels for the exterior of the shipping container
- Bill of lading for selected carrier

E. Procedure

E.1. General Guidelines

- Sample containers with solids or liquids should be placed inside of sealable plastic bags to reduce the potential for cross contamination, breakage, and melted ice getting into the samples.
- The drain plug on the cooler, if present, should be taped shut from the inside and outside.
- A layer of protective material such as bubble wrap should be placed in the bottom of the cooler.

E.2. Cooler Guidelines

- If possible, place all contents of the cooler into a large plastic bag that is tied or taped shut to avoid melted ice from leaking out of the cooler during shipping.
- Sample containers should be placed upright in the cooler, and protective material such as bubble wrap should be placed around the sample containers. Do not stack glass containers or lay them on their side, as doing so increases the chance of them breaking.
- Fill the cooler no more than 50 percent with sample containers. Fill all the remaining void space in the cooler with protective material and ice to avoid breakage during transport. At least 1/3 of total cooler space should be taken up by ice. When in doubt, use more ice.
- Ice that is double bagged in sealable plastic bags should be distributed over the top of the samples.
- Additional protective material should then be added to the cooler.
- Ensure that a temperature blank bottle and trip blank (if needed) is in each cooler and included on the COC form.
- Total weight must be less than 30 pounds.

E.3. Air Canister Guidelines

- If possible, reuse the cardboard box provided by the laboratory. If not possible, use a sturdy cardboard box to contain the air canister and associated regulator.
- Include bubble wrap as necessary to reduce movement of the canister and regulator during shipment.
- Use clear packing tape to secure the box during shipment.

E.4. COC Guidelines

- The sampler should relinquish the samples by signing and indicating the date and time that the samples were relinquished to the shipper. The shipping company agent is not required to sign the COC form.
- Field personnel should retain a copy of the COC form and attach it to the field notes.
- The COC form should be placed in a sealable plastic bag and taped to the inside of the cooler lid or placed inside the cardboard box. At least one COC form should be placed in each cooler that is sent to the laboratory.

E.5. Custody Seal Guidelines

- Close the top of the cooler and rotate/shake the cooler to verify that the contents are packed so that they do not move. Add additional protective material if needed and reclose.
- Place one custody seal on the front and on the back of the cooler in such a way that the opening of the cooler will destroy the seal. If shipping air canisters, place the custody seal where the cardboard box flaps meet.
- Tape the cooler or the cardboard box shut with clear packing tape, wrapping all the way around each end. Be sure to tape over the custody seals.

E.6. Shipping Guidelines

- Samples sent by private carrier (UPS, FedEx, etc.) will be accompanied by a bill of lading or other shipping document. Shipping documentation should be saved as part of the permanent record. DOT, USPS, and FAA shipping/labeling regulations must be followed. The contents should be described on the shipping documents as "non-hazardous environmental samples" unless the samples are known to be hazardous such as methane gas samples. If hazardous, contact the laboratory for special shipping instructions. Fill out the correct shipping paperwork with the correct shipping address for the laboratory and tape to the top of the cooler or shipping box. Wrap packing tape around the entire cooler or shipping box. Retain copies of all shipment records as provided by the shipper.
- The cooler or shipping box should be shipped to "Laboratory Sample Receiving" marked "Deliver to addressee only," and the laboratory should be notified of its approximate delivery date and time.
- Deliver the cooler or have the cooler picked up by an overnight carrier that guarantees 24-hour delivery. Consideration should be given to the expected delivery date and the weather. The preferred carriers are shown below in order of preference.
  - Contract shipper such as Speedee (Minnesota only).
  - UPS through Braun Intertec Document Center or front desk (Minneapolis only).
  - UPS through retail outlet.
  - FedEx – may require an explanation stating the container is non-hazardous or the canister is not a cylinder, contains air, is non-flammable, and is not under pressure.
  - US mail – no special marking required.

E.7. Data and Records Management

The original request for COC form is maintained by the laboratory in accordance with their file retention guidance. A copy of the record should be provided to the project manager or designee with a copy of the sampling field notes by the field personnel immediately after sample check-in.

E.8. Quality Assurance Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

The project manager or designee should review the COC form as soon as possible after sample check-in to verify that the information on the COC form is correct.

A. Purpose

The purpose of the Standard Operating Procedure (SOP) is the procedure of decontaminating reusable equipment involved in soil, groundwater, and soil vapor activities. Reusable equipment must be properly decontaminated to provide chemical analysis results which are reflective of the actual concentrations present at sampling locations, and to minimize the potential for cross-contamination between sampling locations and the transfer of contamination off-site.

Applicable soil SOPs include SOP 203 – Soil Boring Observation and Sampling, SOP 208 – Soil Grab Sample Collection, SOP 209 – Soil Composite Sample Collection, SOP 210 – Soil Stockpile Sampling, and SOP 211 – Test Pit and Test Trench Observation and Sampling.

Applicable water SOPs include SOP 301 – Water Level Measurement, SOP 302 – LNAPL Level Measurement, SOP 303 – Monitoring Well Development, SOP 304 – Slug Testing, SOP 309 – Field Filtering of Groundwater Samples, SOP 310 – Monitoring Well and Piezometer Installation, SOP 311 – Groundwater Sample Collection, SOP 312 – Well Purging and Stabilization, SOP 314 – Surface Water Sampling, and SOP 316 – Calibration of Water Meters.

The applicable soil vapor SOP includes SOP 405 – Sub-Slab Soil Vapor Sampling.

Be sure to follow the site-specific sampling plan that may require special cleaning or rinsing methods, and/or special handling and disposal of wash and rinse water (also see SOP 702 – Management of Investigation Derived Waste). Additional rinses with solvents such as hexane, acetone, or acid may be required by the site-specific sampling plan, but are not covered in this SOP.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

Nitrile gloves should be worn during decontamination activities to reduce the incidence of skin contact with potentially contaminated soil/groundwater and to reduce the risk of cross-contamination. In certain situations, long-sleeved rubber gloves may be needed to prevent contact.

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation
- SOP 203 – Soil Boring Observation and Sampling
- SOP 208 – Soil Grab Sample Collection
- SOP 209 – Soil Composite Sample Collection
- SOP 210 – Soil Stockpile Sampling
- SOP 211 – Test Pit and Test Trench Observation and Sampling
- SOP 301 – Water Level Measurement
- SOP 302 – LNAPL Level Measurement
- SOP 303 – Monitoring Well Development
- SOP 304 – Slug Testing
- SOP 309 – Field Filtering of Groundwater Samples
- SOP 310 – Monitoring Well and Piezometer Installation
- SOP 311 – Groundwater Sample Collection
- SOP 312 – Well Purging and Stabilization
- SOP 314 – Surface Water Sampling
- SOP 316 – Calibration of Water Meters

- SOP 405 – Sub-Slab Soil Vapor Sampling
- SOP 702 – Management of Investigation Derived Waste

D. Equipment and Supplies

- Clean tap water (for washing and rinsing soil sampling equipment)
- Distilled or deionized water (for washing and rinsing groundwater sampling equipment)
- Clean container for wash water (bucket, spray bottle, etc.)
- Phosphate-free detergent (i.e., Alconox or Liquinox in bulk containers or individual packets)
- Scrub brush (soil sampling equipment decontamination)
- Paper towels
- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- Personal Protective Equipment (PPE)

E. Procedures

E.1. Soil Sampling Equipment

E.1.a. Hand Tools

Hand tools used for sampling include shovels, hand trowels, hand augers, etc. Before collecting each new soil sample, clean the equipment as follows:

- Remove loose or attached soil from the tool with a gloved hand, paper towel, or brush.
- Wash and brush the tool in a solution of phosphate-free detergent in tap water.
- Rinse the tool with tap water.
- Inspect for remaining particles or surface film, and repeat cleaning and rinsing procedures if necessary.

E.1.b. Direct-Push Sampling Equipment and Split Spoon Sampler

The drilling contractor is responsible for cleaning reusable sampling equipment; however, field personnel must ensure that proper procedures are followed. Prior to collecting each sample the reusable sampling equipment should be cleaned as follows:

- Remove loose or attached soil from the sampler components.
- Wash the sampler components in a solution of phosphate-free detergent in tap water.
- Rinse the sampler components with tap water.
- Inspect for remaining particles or surface film, and repeat cleaning and rinsing procedures if necessary.

E.1.c. Drill Rig Auger Flights

The drilling contractor is responsible for providing clean auger equipment; however, field personnel must ensure that proper procedures are followed. Prior to each use the auger flights should be cleaned as follows:

- Remove loose or attached soil from the auger flight.
- Wash the auger flight with a pressure washer and clean tap water.
- Inspect for remaining particles or surface film, and repeat cleaning and rinsing procedures if necessary.

E.2. Groundwater Sampling Equipment

E.2.a. Groundwater Measuring and Sampling Equipment

This procedure applies to all reusable equipment that will be placed into a well (including water level indicators, transducers, slugs, groundwater sample equipment, and pumps). Groundwater measuring and sampling equipment should be decontaminated after use at each well or sampling point as follows:

- Wash the exterior with a solution of phosphate-free detergent in distilled or deionized water.
- Rinse with distilled or deionized water.
- Inspect for remaining particles or surface film and repeat cleaning and rinsing procedures if necessary.
- Do not wipe dry.

E.3. Product Interface Probe

The product interface probe is only used in wells that may contain light non-aqueous phase liquid (LNAPL). Prior to each use the product interface probe should be cleaned as follows:

- After fluid levels in each well are measured, wipe the probe and tape with a paper towel.
- After returning to the office, clean the probe and tape in a solution of phosphate-free detergent and tap water. Allow the probe and tape to soak in the solution up to 24 hours, if possible.

E.4. Vapor Sampling Equipment

E.4.a. Vapor Pins® – Used for Sub-Slab Soil Gas Sampling

This office-only procedure applies solely to the Vapor Pin® itself that will be used to obtain a soil gas sample. Once the Vapor Pin® has been used it will be brought back to the office and cleaned as follows:

- Remove the silicone sleeve and discard.
- Wash the Vapor Pin® in a hot water and phosphate-free detergent wash.
- Bake in an oven to a temperature of 130°C (266°F) for at least one hour.

E.5. Data and Records Management

Observations should be documented in accordance with SOP 101 – Field Notes and Documentation.

E.6. Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

A. Purpose

In the process of collecting environmental samples during field investigation activities, several different types of waste may be generated. These wastes are referred to as investigation derived waste (IDW). Some of these waste materials may be hazardous wastes and must be properly managed in accordance with Environmental Protection Agency (EPA) regulations. Materials which may become IDW requiring proper management include:

- Used Personal Protective Equipment (PPE) such as gloves, boots, Tyvek® clothing, spent respirator cartridges, etc.
- Disposable sampling equipment including bailers, filters, rope, sleeves from soil probes, tubing, sealable plastic bags, etc.
- Soil cuttings from drilling, probing, hand augering, or test trenching.
- Drilling mud or water used for rotary drilling.
- Groundwater obtained through well development or purging.
- Light non-aqueous phase liquid (LNAPL) combined with groundwater obtained through well development or purging.

B. Health and Safety

Field work should be performed in accordance with the *Braun Intertec Corporate Health and Safety Manual Standard Operating Procedures* and the site-specific health and safety plan (HASP).

C. Referenced SOPs

- SOP 101 – Field Notes and Documentation

D. Equipment and Supplies

Some or all of the following materials may be needed for the proper management of IDW:

- Plastic or galvanized tubs or pails
- Plastic garbage bags
- 55-gallon drums
- Drum wrench
- Roll-off dumpster
- Poly-sheeting (10 mil or thicker)
- Self-adhesive labels and permanent marker
- Field Report Form (see SOP 101 – Field Notes and Documentation) or field logbook
- PPE

E. Procedure

E.1. Characterization of IDW

IDW must be characterized in accordance with applicable state and federal hazardous waste regulations. In some cases, wastes are hazardous waste regardless of test results (i.e., listed hazardous wastes). Characterization of IDW includes activities performed before, during, and after the wastes are generated. IDW characterization may include:

- **Historical Research** – A Phase I Environmental Site Assessment (ESA), Phase II ESA, prior analytical data, and/or environmental permits can provide information regarding potential and existing

contaminants of concern. In cases where prior investigations and/or analytical data are not available, additional steps should be taken to properly characterize IDW.

- **Visual and Olfactory Observations** – Some contaminants of concern can be detected using visual and/or olfactory observations such as the presence of staining and odors, respectively. However, visual and olfactory observations should only be used as a qualitative determination regarding the presence or absence of contamination.
- **Field Screening** – Field screening equipment such as a photoionization detector (PID), Draeger tubes, and/or colorimetric tubes can provide an approximation of the magnitude of contamination present. Appropriate field screening equipment should be selected based on historical research and applicable site-specific work plans.
- **Laboratory Analysis** – Analytical data provides the highest degree of accuracy regarding the magnitude of contamination present. Analytical parameters should be selected based on historical research and analytical data from site investigations. Disposal facilities may require toxicity characteristic leaching procedure (TCLP) analysis if elevated contaminants are present in IDW.

E.2. Temporary Storage of IDW

IDW may require temporary storage pending characterization. Containers should be selected based on the physical and chemical characteristics of the contaminants of concern being investigated using available characterization data. Other considerations include weather conditions, security of the storage facility, mobility of the container, and duration of storage. Commonly used waste disposal containers include 55-gallon drums, garbage bags, and roll-off dumpsters. IDW containers must be labeled with the following information:

- Date of generation
- Description of contents
- Emergency contact information

IDW may also be stockpiled on site by placing the material on polyethylene sheeting or an impermeable surface such as asphalt or concrete, covering the material with polyethylene sheeting, and anchoring polyethylene sheeting to prevent infiltration of contaminants of concern from precipitation.

When containing IDW in drums, solids and liquids must be kept in separate drums. Each drum should be labeled with:

- “Braun Intertec” and a contact phone number,
- A unique identification number,
- Date(s) material was containerized,
- Source locations (if applicable), and
- Collector’s initials.

Secure the drum cover and take precautions to ensure that the drum will not be disturbed.

Appropriate characterization must precede disposal of contained materials. The site-specific Sampling and Analysis Plan or project manager will determine the appropriate testing based on the anticipated contaminants of concern in the IDW and the anticipated disposal method.

E.3. Disposal of IDW

IDW should be managed as described in Attachments A and B or as determined by the project manager and/or the site-specific Sampling and Analysis Plan. Field personnel should consult with the project manager to assess if leaving IDW on-site has the potential to endanger human health or the environment. More conservative IDW management methods may be appropriate if the client does not own the property where field activities are performed and during winter conditions.

Information regarding IDW requiring off-site disposal should be recorded in the field logbook or on the field report form, including the drum number or stockpile identifier, a description of the waste including location generated and estimated volume, and a list of samples collected for characterization of the IDW.

If the IDW is classified as non-hazardous waste or petroleum, or as potentially hazardous, it should be disposed of promptly where permitted (see Attachment A and Attachment B).

If the IDW is classified as hazardous waste, it must be labeled, stored, handled, transported and treated/disposed according to state and federal hazardous waste regulations and the generator's classification (large, small, or very-small quantity generator).

In all cases, IDW must be properly disposed in 90 days or fewer. Braun Intertec field personnel should not sign waste profiles or shipping documents on behalf of clients or as an "agent" for clients unless a formal agreement has been executed with the client.

E.4. Data and Records Management

Observations should be documented in accordance with SOP 101 – Field Notes and Documentation.

E.5. Quality Assurance/Quality Control

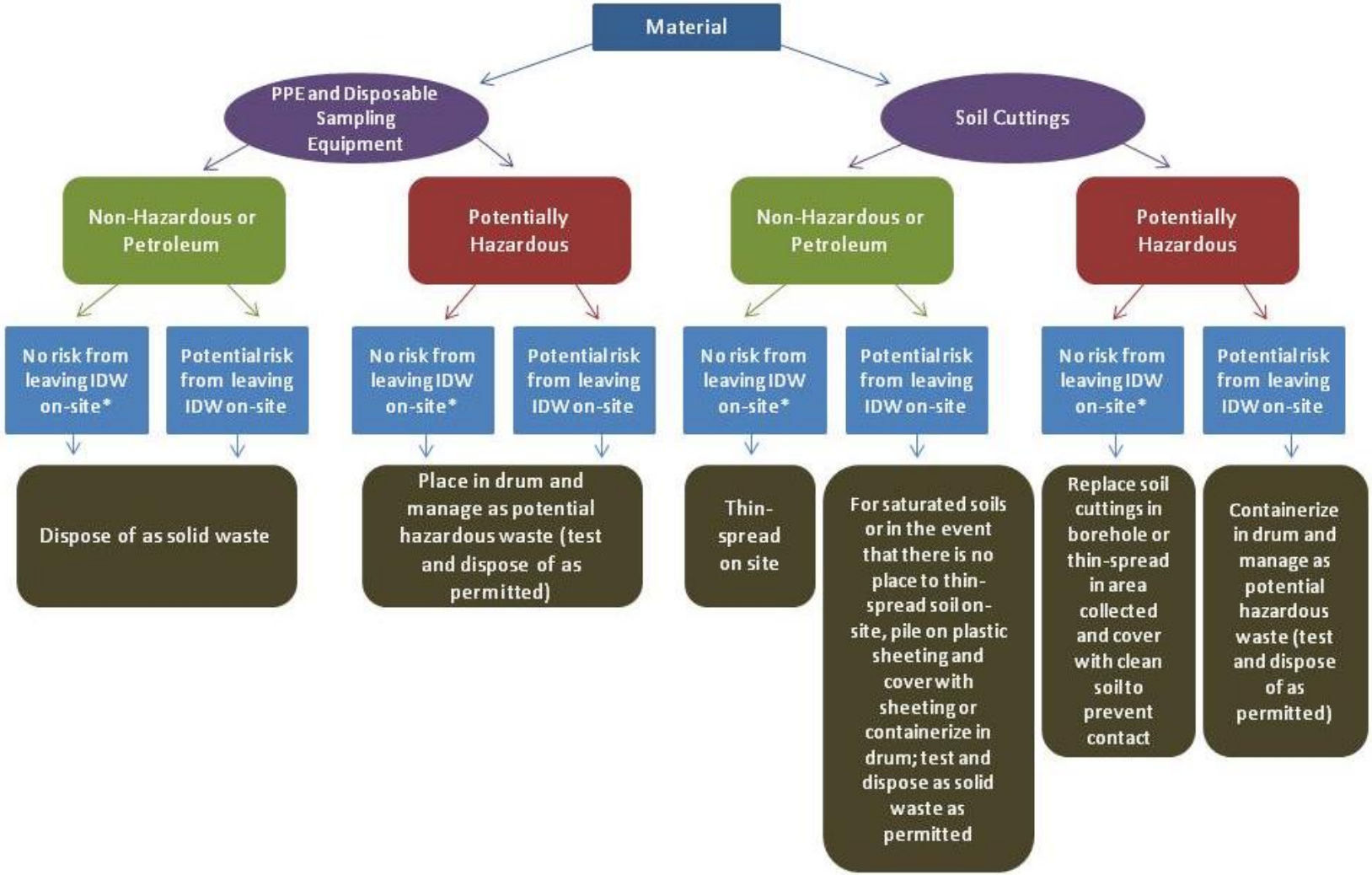
Quality assurance/quality control (QA/QC) procedures described in the work plan should be followed.

F. References

United States Environmental Protection Agency, July 3, 2014, Region 4, Science and Ecosystem Support Division Operating Procedure, Management of Investigation Derived Waste, SESDPROC-202-R3, Athens, GA.

BRAUN INTERTEC

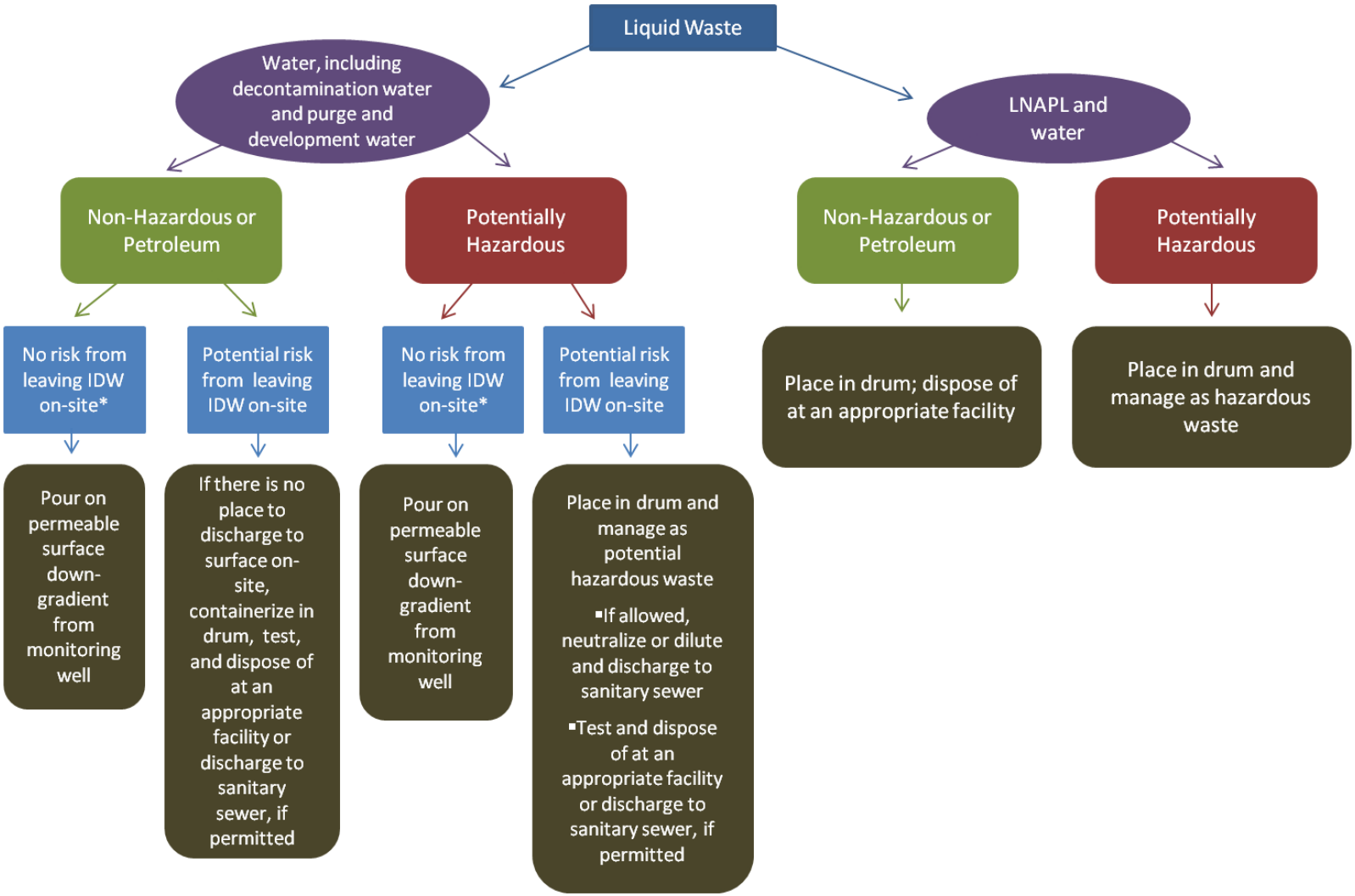
Attachment A
Management of Solid Investigation Derived Waste



* Management method for IDW at sites with no known areas of significant contamination and no known hazardous waste issues and where leaving IDW on-site will not endanger human health or the environment. Use more conservative method if the site history or regulatory status warrants. Field personnel should consult with the project manager before thin-spreading soil.

BRAUN INTERTEC

Attachment B
Management of Liquid Investigation Derived Waste



* Management method for IDW at sites with no known areas of significant contamination and no known hazardous waste issues and where leaving IDW on-site will not endanger human health or the environment. Use more conservative method if the site history or regulatory status warrants. Field personnel should consult with the project manager before pouring liquids on permeable ground surfaces.