Conceptual Storm Water Management Report
Special Use Permit Submittal

Sand Creek Ridge
Development

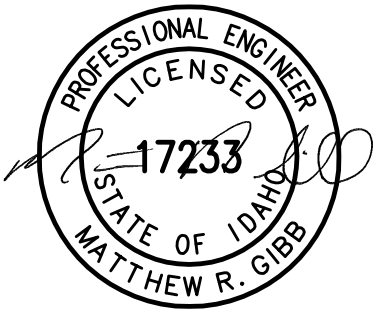
US 95 & Bonner Mall Way
Ponderay, Idaho 83852

Prepared for:
Sand Creek Crossing LLC
SOK Design Studio

Prepared by:

DCI ENGINEERS
707 W. 2nd Avenue • Spokane, WA 99201
Tele: (509) 455-4448 • FAX: (509) 455-7492

This report has been prepared by the staff of DCI Engineers under the direction of the undersigned professional engineer whose stamp and signature appears hereon.



DCI Job No.: #21042-0088
Date: January 7, 2022

The methods, descriptions, and design calculations shown in this design report conform to the City of Ponderay design standards, unless noted otherwise, and are under the jurisdiction of the City of Ponderay relative to the collection, treatment, and disposal of stormwater runoff.

DCI ENGINEERS

Table of Contents

Sand Creek Ridge Development
Ponderay, Idaho

Conceptual Storm Water Design Report

1.0 Project Overview

The proposed project development includes the construction of four multi-story, mixed-use buildings, three of which will be constructed on a below-grade parking structure. The buildings will include a mix of residential condominiums, retail, and office space uses. The buildings will vary between two and four stories, and the parking structure will have one level of below-grade parking and surface parking on the top deck. The lower parking level will be accessed from the "daylighted" northern side of the structure.

2.0 Project Location

The project property consists of 2 separate lots addressed as 476422 and 476516 US-95 in Ponderay, Idaho (Bonner County Tax Parcel Nos. RPP00000107502A and RPP00000107401A). The properties are located between Bonner Mall Way and Tibbets Lane (north and south) and between Sand Creek and US-95 (west and east). The properties are 4.65 and 5.81 acres in area (10.46 acres in total).

3.0 Site and Soil Characteristics

The project properties are accessed from US-95 which runs along, and adjacent to, the east side of the properties. The southern lot is flat in grade from the highway to the west for approximately 120 feet where it then slopes severely down towards Sand Creek (elevation drop of approximately 40 feet). The northern lot is flat in grade from the highway to the west for approximately 70 feet where it then slopes severely down towards Sand Creek.

The soils present on the project properties are primarily silt and clay. The draft geotechnical investigation report for the project (attached in Appendix II) for the project identifies uncontrolled fill located throughout the site ranging from 5 feet to 20 feet in depth. Deep foundation systems are recommended for the proposed buildings in the development. Storm water infiltration is not feasible on the site.

4.0 Erosion & Sedimentation Control

Erosion and sedimentation control implementation and management will be a critical component of the project development, especially during construction. The existing soils present on the site, steep slopes, and proximity to Sand Creek will require the contractor to be vigilant and proactive in implementing and maintaining Best Management Practices (BMPs) on the site to prevent erosion and manage construction storm water. A Construction Storm Water General Permit (CSWGP) will be obtained for the project (administered by the Idaho Department of Environmental Quality) and a Storm Water Pollution Prevention Plan (SWPPP) will be developed and adhered to by the contractor during construction. All BMPs will be installed prior to commencement of construction. All temporary BMPs will remain in place and maintained until the storm water system is complete and vegetation is established on the development.

5.0 Storm Water System Design

This storm water report has utilized the rational method to design on-site facilities. This method calculates the pre- and post-development runoff based on anticipated lot coverage of buildings, parking and landscape. A storm drainage system (grassed detention area) will be installed to accommodate the storm water runoff generated by the impervious areas. Off-site discharges to Sand Creek west of the property will be restricted to the pre-development flow rates using appropriately sized orifices on the discharge pipes from the swale catch basins.

As stated above, the geotechnical report identifies that storm water infiltration is not feasible on the project property. City of Ponderay regulations state that post-developed off-site storm water discharge may not exceed the 25-year pre-developed peak flow rate. In addition, the first 1/2 inch of all storm water runoff generated from impervious surfaces in the development (pavements and building roofs) must be treated prior to discharge from the site. DCI expects to implement storm water treatment swales/ponds around the perimeter of the project development that will function as both storm water treatment and detention facilities. The ponds will be designed to treat the first 1/2 inch of runoff and detain storm water to limit the off-site discharge to the pre-developed 25-yr peak flow rate. We anticipate that the storm water ponds will likely discharge to Sand Creek due to existing and anticipated post-development site elevations. Rip-rap channels will be installed at curb inlet and pipe discharge locations to prevent erosion and slopes. Please see the Conceptual Storm Water Plan accompanying this application for estimated storm water facility locations and sizing relative to the site development.

Foundation drainage systems are recommended by the project's geotechnical engineer. Foundation drainage systems should be installed completely around the perimeter of all project structures and will be directed to drain to daylight away from the structures.

6.0 Preliminary Storm Water System Design Calculations

The Rational Method with a 25-year return period was used for calculating the pre- and post-development peak flow rates.

25-yr Intensity= 2.90 in/hr
Landscaping C= 0.30
Gravel Area C= 0.80
Impervious Area C= 0.90
Area= 1.42 acres

Pre-Development Flow Rate for the
Developed Impervious Areas= (0.3 * 2.90 in/hr * 1.10 acres) + (0.8 * 2.90 in/hr * 0.32 acres) = **1.70 cfs**

Post-Development Flow rate for the
Developed Impervious Area= 0.9 * 2.90 in/hr * 1.42 acres = **3.70 cfs**

****Off-Site Discharge from the Developed Impervious Areas will be Restricted to 1.70 cfs maximum from the impervious areas developed on the site***

Storm Water Discharge Calculations for each individual Basin Area are included in Appendices IV and V.

Storm Water Treatment Volume Required for First 1/2" of Runoff:

65,790 sf of development impervious area * 0.5 in/12 in/ft = **2,740 cu ft** treatment volume required

Approximately **5,480 sq ft** of swale treatment area is required for the development's impervious area.

Appendix I


Sand Creek Ridge
US 95 & Bonner Mall Way
Ponderay, Idaho 83852
Legend
Ponderay
The Home Depot
Walmart Supercenter
Ponderay
Ponderay
Hoot Owl Cafe
The CO-OP Gas & Supply Co., Inc
Sandpoint Elks Golf Course
PROJECT PROPERTY
VICINITY MAP
N
4000 ft
Google Earth

Appendix II

September 3, 2021

Sand Creek Crossing, LLC
c/o SOK Design Studio
534 Pine Street
Sandpoint, Idaho 83864

Attention: Mr. Paul Delay

RE: DRAFT Geotechnical Evaluation
Ponderay Mixed-Use Lots
Parcels #RPP00000107502A and RPP00000107401A
Ponderay, Idaho
ALLWEST Project Nos. 120-311G

Mr. Delay,

ALLWEST has completed the authorized geotechnical evaluation for the proposed mixed-use buildings located on Parcels #RPP00000107502A and RPP00000107401A in Ponderay, Idaho. The purpose of this evaluation was to characterize the soil and geologic conditions on the property. The attached report presents the results of the field evaluation and our recommendations to assist with design and construction of the proposed project.

We appreciate the opportunity to work with you on this project. If you have any questions or need additional information, please do not hesitate to call us at (208) 762-4721.

Sincerely,
ALLWEST

Adam Richter, G.I.T.
Project Geologist

Samuel P. Sommers, P.E.
Engineering Services Manager

DRAFT GEOTECHNICAL EVALUATION
PONDERAY MIXED-USE LOTS
PARCELS #RPP00000107502A AND RPP00000107401A
PONDERAY, IDAHO
ALLWEST PROJECT NO. 120-311G

September 3, 2021

Prepared for:
Sand Creek Crossing, LLC
c/o SOK Design Studio
534 Pine Street
Sandpoint, Idaho 83864

Prepared by:
ALLWEST
690 West Capstone Court
Hayden, Idaho 83835

TABLE OF CONTENTS
DRAFT Geotechnical Evaluation
Ponderay Mixed-Use Lots
Parcels #RPP00000107502A and RPP00000107401A
Ponderay, Idaho

EXECUTIVE SUMMARY

ALLWEST has completed the authorized geotechnical evaluation for the Ponderay Mixed-Use Lots located at Parcels #RPP00000107502A and RPP00000107401A in Ponderay, Idaho. The purpose of the evaluation was to assess the subsurface conditions on the property with respect to the proposed design and construction. This report details the results of the field evaluation and laboratory testing and presents our recommendations to assist the design and construction of the proposed project. The following geotechnical considerations were identified:

- Based on analyses of bearing capacity, slope stability, and our understanding of the proposed construction and therefore the anticipated loading conditions, it does not appear a shallow foundation system is feasible. Therefore, we recommend the buildings be supported on a deep foundation system, or be relocated further from the existing slope.
- The uncontrolled fill and native soils are unsuitable for re-use as structural fill.
- For light-duty pavement: A pavement section of 2½-inches asphaltic concrete over a minimum of 4-inches crushed aggregate base over 12 inches of structural fill is recommended.
- For heavy-duty pavement: A pavement section of 3-inches asphaltic concrete over a minimum of 4-inches of crushed aggregate base over 12 inches of structural fill is recommended.
- We recommend a permanent foundation drainage system be designed and constructed around the perimeter of the structures.

Our services were provided in general accordance with our proposals 120-311P dated September 16, 2020, and 120-345P dated May 26, 2021. Close monitoring of the construction operations discussed herein will be critical in achieving the design subgrade support. If we are not retained to provide required construction observation and materials testing services, we cannot be responsible for soil engineering related construction errors or omissions. This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **8.0 EVALUATION LIMITATIONS** should be read for an understanding of the report limitations.

DRAFT Geotechnical Evaluation
Ponderay Mixed-Use Lots
Parcels #RPP00000107502A and RPP00000107401A
Ponderay, Idaho

1.0 PROJECT DESCRIPTION

We understand the proposed project will consist of constructing multiple 4-story mixed-use buildings. We estimate the structure will have continuous footing loads of up to 3 kips/lineal foot with column loads up to 250 kips. An asphalt parking lot and miscellaneous landscaping improvements may also be constructed. **If the proposed design or loads vary from those stated, we should be notified to review our recommendations.**

2.0 EVALUATION PROCEDURES

To complete this evaluation, we reviewed soil and geologic literature for the project area. We evaluated the subsurface conditions at the site by advancing eight geotechnical borings supplemented by excavating four test pits throughout the project site. The approximate locations of the borings and test pits are shown on Figure A-1, Site and Exploration Plan included in Appendix A. Information obtained from the field evaluation, laboratory testing, and geotechnical analyses was utilized to develop the recommendations presented in this report.

3.0 SITE CONDITIONS

The project site is comprised of two parcels approximately 10.5 acres in total size. The eastern area of the properties is relatively flat, then slopes steeply down to the east to Sand Creek. The western area of the site sits approximately 40 to 50 feet lower in elevation, adjacent to Sand Creek. The site is bordered by U.S. Highway 95 to the east and Sand Creek to the west. A developed retail property exists to the north and a developed office structure borders the south side of the property. The ground coverage within the proposed development area consists of mostly grass and small shrubs. The site is currently partially developed with a gravel parking lot and an operational shed and trailer dealership.

4.0 SUBSURFACE CONDITIONS

4.1 Published Geologic Information

The geologic conditions on the property are mapped on the Geologic Map of the Sandpoint Quadrangle, Bonner County, Idaho, by S. Lewis, F. Burmester, M.

Breckenridge, E. Box, and D. McFadden, 2006. The project site is mapped as glaciolacustrine deposits (Pleistocene to Holocene), which is described as massive to finely laminated clay, silt, and sand deposited in ice marginal and post glacial lakes in the Purcell Trench.

The USDA Natural Resources Conservation Service (NRCS) has mapped the soils on and around the property predominately as the Mission Silt Loam. The Mission silt loam is described as volcanic ash and loess over silty glaciolacustrine deposits. The soil profile is described as silt, silty clay and very fine sandy loam. The permeability is slow and run-off is slow. A seasonal high water table is reported at a depth of 12 inches from February through May.

4.2 Subsurface Investigation

Four test pits were excavated at the southern parcel on September 23, 2020, followed by five geotechnical borings drilled at the site on October 1 and 2, 2020. Three additional borings were drilled on the northern parcel on June 9, 2021. The test pits were excavated with a John Deere 180LC with a 46-inch smooth excavation bucket. The borings were drilled using a trailer-mounted drill rig and 6-inch hollow-stem augurs. The drilling and test pit excavations were performed on the eastern portion of both parcels, adjacent to Highway 95. The approximate locations of the borings and test pits are shown on Figure A-1, Site and Exploration Plan in Appendix A. The soil conditions observed in the borings and test pits were visually described and classified in general accordance with ASTM D2487 and D2488 and the subsurface profiles were logged.

Detailed descriptions of the soil observed in the borings and test pits are presented on the Boring Logs and Test Pit Logs in Appendix B of this report. The descriptive soil terms used on the boring logs, test pit logs, and in this report, can be referenced by the Unified Soil Classification System (USCS). A summary of the USCS is included in Appendix B. The subsurface conditions may vary between boring and test pit locations. Such changes in conditions would not be apparent until construction.

The near surface geologic profile appears to consist of silt and clay units overlying silty sands and poorly-graded sands overlying clay. Uncontrolled fill was encountered in borings B-2 and B-3, and in test pits TP-1 and TP-4. Descriptions of the soil types observed follow:

Uncontrolled fill – Uncontrolled fill was encountered in borings B-2 and B-3, and in test pits TP-1 and TP-4. The depth of fill varied from 5 to 6 feet in boring B-2 and test pits TP-1 and TP-4, to 20 feet in boring B-3. It consisted of silt and clay soils with a variable amount of construction and organic debris. The color ranged from gray-green to black to brown and the unit was damp to moist and medium stiff to stiff.

Silt / Sandy Silt – Silt and sandy silt units were encountered in most borings and test pits to depths of up to 10 feet. These units appeared light brown to brown, damp, and medium stiff to very stiff.

Lean Clay – The silt and sandy silt soils were underlain by a unit of lean clay. This unit appeared light brown, moist, and medium stiff to stiff and extended to a depth of 15 feet.

Silty Sand / Poorly-graded Sand – Units of silty sand and poorly-graded sand were encountered underlying the lean clay. These units were gray to brown, moist to wet, and medium dense to dense.

Lean Clay – The silty sand and poorly-graded sand units were underlain by another unit of lean clay. This unit appeared gray, moist to wet, and soft to medium stiff to stiff. This unit extended beyond the depth of exploration of 51 ½ feet.

4.3 Groundwater Conditions

Groundwater was encountered while drilling to depths between 24 and 26 feet in borings B-1 through B-5. We did not observe surface water within the proposed development area on the property during our evaluation. Changes in precipitation, irrigation, construction, or other factors may impact depth to groundwater and the surface water flow on the property and therefore, conditions may be different during construction.

5.0 LABORATORY TESTING

Laboratory testing was performed to supplement field classifications and to assess some of the soil engineering parameters. The laboratory testing included particle size distribution/gradation tests (ASTM D6913), Liquid Limit and Plastic Limit tests (ASTM D4318), and a Direct Shear test (AASHTO T236). The laboratory test results are in Appendix C of this report and presented on the boring logs and test pit logs in Appendix B. The laboratory testing was performed by ALLWEST.

6.0 CONCLUSIONS AND RECOMMENDATIONS

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

6.1 Site Preparation

Over-Excavation: Once temporary erosion and sediment control (TESC) measures are installed, we expect site preparation to continue with over-excavation of the uncontrolled fill.

Subgrade Preparation: Once over-excavation is complete, all areas that are at design subgrade elevation or areas that will receive new structural fill should be moisture conditioned to a moisture content within plus or minus two percent of the optimum moisture content for compaction. The subgrade should then be compacted to a firm and unyielding condition.

In the event the exposed subgrade becomes unstable, yielding, or unable to be compacted due to high moisture conditions or construction traffic, we recommend that the materials be removed to a sufficient depth in order to develop stable subgrade soils that can be compacted to the minimum recommended levels. The severity of construction problems will be dependent, in part, on the precautions that are taken by the contractor to protect the subgrade soils.

Once compacted, subgrades should be evaluated through either density testing or proof rolling with a loaded dump truck or heavy rubber-tired construction equipment weighing at least 20 tons, to assess the subgrade adequacy and to detect soft and/or yielding soils. In the event that compaction fails to meet the specified criteria, the upper 12 inches of subgrade should be scarified, and moisture conditioned as necessary to obtain at least 95 percent of the maximum laboratory dry density (per ASTM D1557). Those soils which are soft, yielding, or unable to be compacted to the specified criteria should be over-excavated and replaced with suitable material as recommended in the Structural Fill section of this report.

6.2 Excavation

Based on the conditions observed in our explorations, we anticipate excavation of the on-site soil can be achieved with typical excavation equipment. Temporary excavation slope stability is a function of many factors, including:

- The presence and abundance of groundwater;
- The type and density of the various soil strata;
- The depth of cut;
- Surcharge loadings adjacent to the excavation; and
- The length of time the excavation remains open.

It is exceedingly difficult under the variable circumstances to pre-establish a safe and “maintenance-free” temporary cut slope angle. Therefore, it is the responsibility of the contractor to maintain safe temporary slope configurations since the contractor is continuously at the job site, able to observe the nature and condition of the cut

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

We recommend that all permanent cut or fill slopes constructed in native soils be designed at a 2H:1V (Horizontal:Vertical) inclination or flatter. All permanent cut and fill slopes should be adequately protected from erosion both temporarily and permanently.

6.3 Materials

The uncontrolled and native soils are unsuitable for re-use as structural fill. Select structural fill will need to be imported to the site.

Import materials should be well-graded granular soil, free of organics, debris, and other deleterious material and meet the following recommendations. Import materials should be approved by the Geotechnical Engineer prior to delivery to the site.

Fill Type	Recommendations
Structural Fill	Maximum size ≤ 3 inches; Retained on ¾-inch sieve <30% Passing No. 200 Sieve ≤ 10%; Non-plastic
Utility Trench Backfill	Maximum size ≤ 2 inches; Passing No. 200 Sieve ≤ 15%; Non-plastic

6.4 Fill Placement and Compaction

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

6.5 Wet Weather Construction

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

We recommend earthwork for this site be scheduled for the drier seasons of the year. If construction is undertaken in wet periods of the year, it will be important to slope the ground surface to provide drainage away from construction.

6.6 Cold Weather Construction

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

6.7 Foundation Recommendations

Based on analyses of slope stability, and our understanding of the proposed construction and therefore the anticipated loading conditions, we were unable to achieve a Factor of Safety (FOS) above 1.5. Given these results, it does not appear a shallow foundation system is feasible. Therefore, we recommend the buildings should be supported on a deep foundation system or be designed further way from the existing slope.

6.8 Concrete Slabs-on-Grade

Concrete slabs-on-grade should be underlain by at least 4 inches of crushed base course. The crushed base course below the slabs should be compacted to at least 95 percent of the maximum dry density established by modified Proctor (ASTM D1557). The slab subgrade should be prepared as previously recommended which includes over-excavation of the uncontrolled fill.

From a geotechnical perspective, a vapor barrier is not considered necessary beneath the slab-on-grade floor unless moisture sensitive floor coverings and/or adhesives are used. If a vapor barrier is used, we recommend using a 15-mil, puncture-resistant proprietary product such as Stego Wrap, or an approved equivalent that is classified as a Class A vapor barrier in accordance with ASTM E 1745. Overlap lengths and the appropriate tape used to seal the laps should be in accordance with the vapor retarder manufacturer's recommendations. To avoid

puncturing of the vapor barrier, a thin sand layer placed over the crushed gravel is recommended. When conditions warrant the use of a vapor retarder, the slab designer and slab contractor should refer to ACI 302 and ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder/barrier.

6.9 Lateral Earth Pressures

Below-grade building walls should be designed to resist lateral earth pressures. The lateral earth pressures for structural fill should be calculated using the following equivalent fluid pressures:

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

The above values are for level backfill only and do not account for hydrostatic forces. Walls should be provided with adequate drainage so hydrostatic forces do not adversely affect the walls. We recommend placement of gravel behind walls and/or weep holes to assist with drainage and reduce the potential for the buildup of hydrostatic pressures. Walls that are braced in a manner that does not allow any rotational movement (rigid) (e.g. basement walls) should be designed using the given “at-rest” equivalent fluid pressure.

6.10 Slope Stability

Proposed construction activities include areas on or near the approximate 70 percent slope that borders the western bench of the site. This area is composed of uncontrolled fill and native silt, sand, and clay soils. These soils pose a potential risk of slope instability. We conducted slope stability analyses for Section A-A’ (alignment shown on Figure A-1 in Appendix A). The analyses were completed via Rocscience Slide 7.0 Slope Stability software. The program utilized the Bishop Simplified Method to evaluate non-circular failure surfaces to estimate the minimum factor of safety (FOS) for the both the existing conditions and estimated developed conditions at the site. The model estimated a minimum FOS of 1.15 for the existing conditions, and a minimum FOS of 1.37 for the proposed conditions utilizing the Bishop method. The slope stability analyses are shown in Appendix D.

6.11 Seismicity

We anticipate the 2018 International Building Code (IBC) will be used as the basis for design of the proposed structures. The soil at the site can be characterized as Site Class D for seismic design.

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

Latitude (degrees)	Longitude (degrees)	Spectral Accelerations		Site Coefficients	
		S_s	S_1	F_a	F_v
48.3000	-116.5479	0.332g	0.112g	1.534	2.376

6.12 Flexible (Hot Mix Asphalt) Pavement

SUBGRADE

We recommend that the moisture content and density of the top 12 inches of the subgrade be evaluated and that the pavement subgrades be proof-rolled within two days prior to commencement of actual paving operations. Areas not in compliance with the required ranges of moisture or density should be moisture conditioned and recompacted. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the materials with properly compacted structural fills. If a significant precipitation event occurs after the evaluation or if the surface becomes disturbed, the subgrade should be reviewed by qualified personnel immediately prior to paving. The subgrade should be in its finished form at the time of the final review.

DESIGN PARAMETERS

Design Parameter	Value
Assumed: Subgrade California Bearing Ratio (CBR)	5%
Estimated: Equivalent Single Axle Loads (ESALs) Light / Heavy Duty	30,000 / 75,000
Assumed: Pavement reliability	85%
Assumed: Pavement design life	20-year

PAVEMENT SECTION

MINIMUM LIGHT-DUTY PAVEMENT SECTION (CARS ONLY)	
Layer	**Thickness (inches)**
Asphalt Surface	2.5
Crushed Aggregate Base	4.0
Structural Fill	12.0
Total Pavement Section	18.5

MINIMUM HEAVY-DUTY PAVEMENT SECTION	
Layer	**Thickness (inches)**
Asphalt Surface Course	3.0
Crushed Aggregate Base	4.0
Structural Fill	12.0
Total Pavement Section	19.0

We also recommend a concrete apron in areas where you expect frequent truck loading, unloading, turning, starting, and stopping such as around loading docks and dumpster pads. Concrete aprons should be underlain by a minimum of 4 inches of crushed aggregate base.

MATERIALS

We recommend specifying crushed aggregate base meeting the requirements of the Idaho Standards for Public Works Construction (ISPWC) Section 802, Type I for crushed aggregate for base gradations. We recommend the asphalt concrete pavement meet the requirements of ITD Standard Specification 405 for plant mix asphalt concrete pavements.

We recommend the crushed aggregate base be compacted to a minimum of 95 percent of the maximum dry density established by ASTM D1557 (modified Proctor). We recommend the asphaltic concrete surface be compacted to minimum of 92 percent of the Rice density.

DRAINAGE

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade

should be graded to provide positive drainage within the crushed aggregate base section.

We recommend drainage be included at the bottom of the crushed aggregate base layer at the storm structures to aid in removing water that may enter this layer. Drainage could consist of small diameter weep holes excavated around the perimeter of the storm structures. The weep holes should be excavated at the elevation of the crushed aggregate base and soil interface. The excavation should be covered with crushed aggregate which is encompassed in Mirafi 140NL or approved equivalent which will aid in reducing fines from entering the storm system.

MAINTENANCE

The pavement sections provided in this report represent minimum recommended thicknesses. Therefore, preventive maintenance should be planned and provided for through an on-going pavement management program. Preventive maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment. Preventive maintenance consists of both localized maintenance (e.g., crack, and joint sealing and patching) and global maintenance (e.g., surface sealing). Preventive maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements. Prior to implementing any maintenance, additional engineering observation is recommended to determine the type and extent of preventive maintenance. Even with periodic maintenance, some movements and related cracking may still occur, and repairs may be required.

6.13 Stormwater and Drainage

We recommend a permanent foundation drainage system be designed and constructed around the perimeter of the structure. The drainage system should consist of a four-inch diameter, Schedule 40 or ADS, perforated pipe surrounded with a free draining aggregate. The pipe should be located at the lowest elevation of the footing trench excavation such that gravity drainage may be achieved. Water collected in the drains should be discharged down-gradient of the structure.

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

Soil conditions at this site are not suitable for stormwater infiltration. All stormwater should be tightlined and distributed to an appropriate facility, it should not be allowed to penetrate into the ground on the site as this may cause instability of the slope.

7.0 ADDITIONAL RECOMMENDED SERVICES

We recommend ALLWEST be retained to provide construction materials testing and observation to verify the soil and geologic conditions and the report recommendations are incorporated into the actual construction. The design engineer of record should determine applicable testing and special inspection requirements in accordance with the governing code documents. If we are not retained to provide required construction observation and materials testing services, we cannot be responsible for soil engineering related construction errors or omissions.

8.0 EVALUATION LIMITATIONS

This report has been prepared to assist the planning and design for the Ponderay Mixed-Use Lots located at Parcels #RPP00000107502A and RPP00000107401A in Ponderay, Idaho. Reliance by any other party is prohibited without the written authorization of ALLWEST. Our services consist of professional opinions and conclusions made in accordance with generally accepted geotechnical engineering principles and practices in the local area at the time this report was prepared. This acknowledgement is in lieu of all warranties, express or implied.

The following appendices complete this report:

Appendix A – Site and Exploration Plan
Appendix B – Test Pit Logs, Boring Logs, Unified Soil Classification System
Appendix C – Laboratory Test Results
Appendix D – Slope Stability Analyses

Appendix A

Site and Exploration Plan

BASEMAP SOURCE: SATELLITE IMAGERY FROM GOOGLE EARTH PRO, JULY 28, 2021

LEGEND:

TP-1 — TEST PIT NUMBER AND APPROXIMATE LOCATION

B-1 — BORING NUMBER AND APPROXIMATE LOCATION

A — A' — APPROXIMATE SLOPE STABILITY ANALYSES CROSS SECTION

ALLWEST

690 W Capstone Court
Hayden, Idaho 83835
(208) 762-4721
www.allwesttesting.com

FIGURE A-1: SITE AND EXPLORATION PLAN

PROJECT:	120-311G/345G PONDERAY MIXED-USE LOTS		
LOCATION:	PARCELS RP00000107502A & RPP00000107401A		
CLIENT NAME:	SAND CREEK CROSSING, LLC		
DATE:	JULY, 2021	SCALE:	NOT TO SCALE

Appendix B

Test Pit Logs
Boring Logs
Unified Soil Classification System

ALLWEST
HAYDEN, IDAHO
GEOTECHNICAL SECTION

TEST PIT LOG

DATE STARTED: 9/23/2020
DATE FINISHED: 9/23/2020
OPERATOR: Harvey Lippert
COMPANY: Lippert Excavating
LOGGER: Adam Richter
WEATHER:

TEST PIT TP-1

EXCAVATOR: John Deere 180LC
EXCAVATION METHOD: Smooth Excavation Bucket

PROJECT: 120-311G Ponderay Mixed-Use

NOTES:

TOTAL DEPTH: 10'

DEPTH (ft)	USCS	DESCRIPTION	GRAPHIC LOG	NOTES
0	FILL	Sandy SILT, brown, stiff, damp. Contains abundant costruction debris / concrete. (Fill)		
5	ML	SILT, light brown, damp, medium stiff.		
10		Test pit TP-1 terminated at 10 feet. No caving observed. No groundwater observed.		

WATER LEVELS
▽ WHILE EXCAVATING
▼ AT COMPLETION
▼ AFTER EXCAVATING

ALLWEST
HAYDEN, IDAHO
GEOTECHNICAL SECTION

TEST PIT LOG

DATE STARTED: 9/23/2020
DATE FINISHED: 9/23/2020
OPERATOR: Harvey Lippert
COMPANY: Lippert Excavating
LOGGER: Adam Richter
WEATHER:

TEST PIT TP-2

EXCAVATOR: John Deere 180LC
EXCAVATION METHOD: Smooth Excavation Bucket

PROJECT: 120-311G Ponderay Mixed-Use

NOTES:

TOTAL DEPTH: 5'

DEPTH (ft)	USCS	DESCRIPTION	GRAPHIC LOG	NOTES
0	FILL	Poorly-graded GRAVEL, gray, damp, dense. (Fill)		
1	CL-ML	Silty CLAY, light brown, damp, medium stiff.		
5		Test pit TP-2 terminated at 5 feet. No caving observed. No groundwater observed.		

WATER LEVELS
▽ WHILE EXCAVATING
▼ AT COMPLETION
▼ AFTER EXCAVATING

ALLWEST
HAYDEN, IDAHO
GEOTECHNICAL SECTION

TEST PIT LOG

DATE STARTED: 9/23/2020
DATE FINISHED: 9/23/2020
OPERATOR: Harvey Lippert
COMPANY: Lippert Excavating
LOGGER: Adam Richter
WEATHER:

TEST PIT TP-3

EXCAVATOR: John Deere 180LC
EXCAVATION METHOD: Smooth Excavation Bucket

PROJECT: 120-311G Ponderay Mixed-Use

NOTES:

TOTAL DEPTH: 4'

DEPTH (ft)	USCS	DESCRIPTION	GRAPHIC LOG	NOTES
0	CL-ML	Silty CLAY, light brown, damp, medium stiff.		
4		Test pit TP-3 terminated at 4 feet. No caving observed. No groundwater observed.		

WATER LEVELS
▽ WHILE EXCAVATING
▼ AT COMPLETION
▼ AFTER EXCAVATING

ALLWEST
HAYDEN, IDAHO
GEOTECHNICAL SECTION

TEST PIT LOG

DATE STARTED: 9/23/2020
DATE FINISHED: 9/23/2020
OPERATOR: Harvey Lippert
COMPANY: Lippert Excavating
LOGGER: Adam Richter
WEATHER:

TEST PIT TP-4

EXCAVATOR: John Deere 180LC
EXCAVATION METHOD: Smooth Excavation Bucket

PROJECT: 120-311G Ponderay Mixed-Use

NOTES:

TOTAL DEPTH: 4'

DEPTH (ft)	USCS	DESCRIPTION	GRAPHIC LOG	NOTES
0	FILL	Sandy SILT, brown, stiff, damp. Contains abundant costruction debris / concrete. (Fill)		
2	CL-ML	Silty CLAY, light brown, damp, medium stiff.		
4		Test pit TP-4 terminated at 4 feet. No caving observed. No groundwater observed.		
5				
6				
7				
8				
9				
10				
11				
12				

WATER LEVELS
▽ WHILE EXCAVATING
▼ AT COMPLETION
▼ AFTER EXCAVATING

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-311G Ponderay Mixed-Use

DATE STARTED: 10/1/2020
DATE FINISHED: 10/1/2020
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Clear

BORING B-1

DRILL: Trailer Drill
HAMMER: Manual
DRILLING METHODS: Hollow Stem Augur

NOTES:

TOTAL DEPTH: 50'

DEPTH (ft)	DESCRIPTION	SAMPLE #	FIELD BLOW COUNT (Recovery)
0	Sandy SILT, light brown to brown, damp, stiff to very stiff.		
1			
2			
3	-2.5' Pocket Penetrometer Values = 1.75 - 2.25	B-1@2.5'	11-10-9 (12" = 67%)
4			
5	-5' Pocket Penetrometer Values = 2.5 - 3		
6	Particle-Size Disribution Test at 5 feet. Gravel = 2% Sand = 28% Silt / Clay = 70%	B-1@5'	7-5-4 (16" = 89%)
7	Moisture Content Test at 5 feet = 25.1% -7.5' Pocket Penetrometer Values = 2 - 2.5		
8	Silty SAND, brown, damp, loose. Fines Content Test at 8 feet. Silt / Clay = 20%	B-1@7.5'	4-5-4 (16" = 89%)
9			
10			
11	CLAY, light brown, moist, medium stiff to stiff. -11' Pocket Penetrometer Values = 1 - 1.5 Plasticity Test at 11 feet. Liquid Limit = 34 Plastic Limit = 24 Plasticity Index = 10	B-1@10'	1-2-3 (18" = 100%)
12			
13	Moisture Content Test at 11 feet = 26%		
14			
15	Poorly-graded SAND, gray, moist to wet, dense. Fines Content Test at 15 feet. Silt / Clay = 8.1%	B-1@15'	6-8-9 (14" = 78%)
16			
17			
18			
19			
20			

WATER CONTENT (%)
PLASTIC LIMIT ⟝ LIQUID LIMIT
FIELD "N" VALUE

0 20 40 60

0.0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0 18.0 20.0

WATER LEVELS
20' ▽ WHILE DRILLING
▼ AT COMPLETION
▼ AFTER DRILLING

Hollow Stem Auger
2" OD Split Spoon (SPT)

0 50 100
RQD (%)
RECOVERY (%)

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-311G Ponderay Mixed-Use

DATE STARTED: 10/1/2020
DATE FINISHED: 10/1/2020
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Clear
NOTES:

BORING B-1

DRILL: Trailer Drill
HAMMER: Manual
DRILLING METHODS: Hollow Stem Augur

TOTAL DEPTH: 50'

DEPTH (ft)	DESCRIPTION	GRAPHIC LOG	SAMPLE #	SAMPLER	FIELD BLOW COUNT (Recovery)
20	Poorly-graded SAND, gray, moist to wet, dense (Cont'd)		B-1@20'		6-9-8 (12" = 67%)
24	-24' groundwater encountered while drilling.				
25	Sandy SILT, gray-brown, wet, medium dense. Fines Content Test at 25 feet. Silt / Clay = 56%		B-1@25'		4-5-6 (18" = 100%)
30	Poorly-graded SAND, gray, wet, medium dense.		B-1@30'		8-9-11 (18" = 100%)
35			B-1@35'		6-6-7 (18" = 100%)
40					

▼ WATER CONTENT (%)
PLASTIC LIMIT ⊢—⊣ LIQUID LIMIT
● FIELD "N" VALUE

0 20 40 60

DEPTH (ft): 20.0, 22.0, 24.0, 26.0, 28.0, 30.0, 32.0, 34.0, 36.0, 38.0, 40.0

0 50 100
RQD (%)
RECOVERY (%)

WATER LEVELS
20' ▽ WHILE DRILLING
▼ AT COMPLETION
▼ AFTER DRILLING

Hollow Stem Auger
2" OD Split Spoon (SPT)

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-311G Ponderay Mixed-Use

DATE STARTED: 10/1/2020
DATE FINISHED: 10/1/2020
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Clear

BORING B-1

DRILL: Trailer Drill
HAMMER: Manual
DRILLING METHODS: Hollow Stem Augur

NOTES:

TOTAL DEPTH: 50'

DEPTH (ft)	DESCRIPTION	GRAPHIC LOG	SAMPLE # / SAMPLER	FIELD BLOW COUNT (Recovery)
40	CLAY, gray, moist to wet, soft to medium stiff.			
	-40' Pocket Penetrometer Values = 0.25 - 0.5			
	Plasticity Test at 40 feet.			
	Liquid Limit = 37			
	Plastic Limit = 24			
	Plasticity Index = 13			
	Moisture Content Test at 40 feet = 37%		B-1@40'	2-2-3 (18" = 100%)
45	-45' Pocket Penetrometer Values = 0.25 - 0.5		B-1@45'	2-2-3 (18" = 100%)
50	-50' Pocket Penetrometer Values = 0.25 or less		B-1@50'	2-2-2 (18" = 100%)
51.5	Boring B-1 terminated at 51.5 feet.			

WATER CONTENT (%)
PLASTIC LIMIT ⟝ LIQUID LIMIT
FIELD "N" VALUE

0 20 40 60

DEPTH (ft): 40.0, 42.0, 44.0, 46.0, 48.0, 50.0, 52.0, 54.0, 56.0, 58.0, 60.0

0 50 100
RQD (%)
RECOVERY (%)

WATER LEVELS
20' ▽ WHILE DRILLING
▽ AT COMPLETION
▽ AFTER DRILLING

Hollow Stem Auger
2" OD Split Spoon (SPT)

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-311G Ponderay Mixed-Use

DATE STARTED: 10/2/2020
DATE FINISHED: 10/2/2020
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Clear

BORING B-2

DRILL: Trailer Drill
HAMMER: Manual
DRILLING METHODS: Hollow Stem Augur

NOTES:

TOTAL DEPTH: 30'

DEPTH (ft)	DESCRIPTION	GRAPHIC LOG	SAMPLE #	SAMPLER	FIELD BLOW COUNT (Recovery)
0	Sandy SILT with organics and wood debris, brown, damp, medium stiff to stiff. (Uncontrolled Fill)				
6	Silty SAND with gravel, gray, damp, medium stiff. (Relic Topsoil)		B-2@5'		
7	SILT, light brown to brown, damp, stiff to very stiff.				
10	CLAY, light brown, moist, medium stiff. -10' Pocket Penetrometer Values = 0.5 - 0.75 Plasticity Test at 10 feet. Liquid Limit = 31 Plastic Limit = 23 Plasticity Index = 8 Moisture Content Test at 10 feet = 31%		B-2@10'		1-1-2 (18" = 100%)
15	Silty SAND, gray to brown, moist to wet, medium dense to dense. Fines Content Test at 15 feet. Silt / Clay = 14%		B-2@15'		9-10-10 (12" = 67%)
20					

▼ WATER CONTENT (%)
PLASTIC LIMIT ⊢—⊣ LIQUID LIMIT
● FIELD "N" VALUE

0 20 40 60

DEPTH (ft): 0.0, 2.0, 4.0, 6.0, 8.0, 10.0, 12.0, 14.0, 16.0, 18.0, 20.0

0 50 100
RQD (%)
RECOVERY (%)

WATER LEVELS
20' ▽ WHILE DRILLING
▼ AT COMPLETION
▼ AFTER DRILLING

Hollow Stem Auger
3" Shelby Tube
2" OD Split Spoon (SPT)

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-311G Ponderay Mixed-Use

DATE STARTED: 10/2/2020
DATE FINISHED: 10/2/2020
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Clear
NOTES:

BORING B-2

DRILL: Trailer Drill
HAMMER: Manual
DRILLING METHODS: Hollow Stem Augur

TOTAL DEPTH: 30'

DEPTH (ft)	DESCRIPTION	GRAPHIC LOG	SAMPLE #	SAMPLER	FIELD BLOW COUNT (Recovery)
20	Silty SAND, gray to brown, moist to wet, dense (Cont'd)		B-2@20'		5-10-10 (12" = 67%)
24	-24' groundwater encountered while drilling.		B-2@25'		8-4-4 (16" = 89%)
30	Poorly-graded SAND, gray-brown, wet, medium dense.		B-2@30'		4-6-8 (18" = 100%)
31.5	Boring B-2 terminated at 31.5 feet.				

WATER CONTENT (%)
PLASTIC LIMIT ⟝ LIQUID LIMIT
FIELD "N" VALUE

0 20 40 60

DEPTH (ft): 20.0, 22.0, 24.0, 26.0, 28.0, 30.0, 32.0, 34.0, 36.0, 38.0, 40.0

WATER LEVELS
20' ▽ WHILE DRILLING
▼ AT COMPLETION
▼ AFTER DRILLING

Hollow Stem Auger
3" Shelby Tube
2" OD Split Spoon (SPT)

0 50 100
RQD (%)
RECOVERY (%)

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-311G Ponderay Mixed-Use

DATE STARTED: 10/2/2020
DATE FINISHED: 10/2/2020
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Clear

BORING B-3

DRILL: Trailer Drill
HAMMER: Manual
DRILLING METHODS: Hollow Stem Augur

NOTES:

TOTAL DEPTH: 50'

DEPTH (ft)	DESCRIPTION	GRAPHIC LOG	SAMPLE #	SAMPLER	FIELD BLOW COUNT (Recovery)
0	Interbedded Sandy SILT and Silty CLAY soils with organics, dark gray-green to black, damp to moist, medium stiff to stiff. Contains remnant wood debris in upper 15 feet (Uncontrolled Fill).				
8	-7.5' Pocket Penetrometer Values = 1 - 2		B-3@7.5'		2-3-3 (12" = 67%)
10	-10' Pocket Penetrometer Values = 1 - 1.25		B-3@10'		2-3-8 (16" = 89%)
15	-15' Pocket Penetrometer Values = 1 - 1.75		B-3@15'		2-3-4 (18" = 100%)

WATER CONTENT (%)
PLASTIC LIMIT ⟝—⟞ LIQUID LIMIT
● FIELD "N" VALUE

0 20 40 60

DEPTH (ft): 0.0, 2.0, 4.0, 6.0, 8.0, 10.0, 12.0, 14.0, 16.0, 18.0, 20.0

0 50 100
RQD (%)
RECOVERY (%)

WATER LEVELS
26' ▽ WHILE DRILLING
▼ AT COMPLETION
▼ AFTER DRILLING

Hollow Stem Auger
2" OD Split Spoon (SPT)

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-311G Ponderay Mixed-Use

DATE STARTED: 10/2/2020
DATE FINISHED: 10/2/2020
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Clear

BORING B-3

DRILL: Trailer Drill
HAMMER: Manual
DRILLING METHODS: Hollow Stem Augur

NOTES:

TOTAL DEPTH: 50'

DEPTH (ft)	DESCRIPTION	GRAPHIC LOG	SAMPLE #	SAMPLER	FIELD BLOW COUNT (Recovery)
20	Silty SAND, gray, moist to wet, medium dense. Fines Content Test at 20 feet. Silt / Clay = 18%		B-3@20'		5-6-7 (18" = 100%)
26 ▽	-26' groundwater encountered while drilling.		B-3@25'		5-5-6 (18" = 100%)
30			B-3@30'		4-5-7 (18" = 100%)
35			B-3@35'		5-9-13 (18" = 100%)
40					

▼ WATER CONTENT (%)
PLASTIC LIMIT ⊢—⊣ LIQUID LIMIT
● FIELD "N" VALUE

0 20 40 60

DEPTH (ft): 20.0, 22.0, 24.0, 26.0, 28.0, 30.0, 32.0, 34.0, 36.0, 38.0, 40.0

0 50 100

RQD (%)
RECOVERY (%)

WATER LEVELS
26' ▽ WHILE DRILLING
▼ AT COMPLETION
▼ AFTER DRILLING

Hollow Stem Auger
2" OD Split Spoon (SPT)

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-311G Ponderay Mixed-Use

DATE STARTED: 10/2/2020
DATE FINISHED: 10/2/2020
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Clear

BORING B-3

DRILL: Trailer Drill
HAMMER: Manual
DRILLING METHODS: Hollow Stem Augur

NOTES:

TOTAL DEPTH: 50'

DEPTH (ft)	DESCRIPTION	GRAPHIC LOG	SAMPLE #	SAMPLER	FIELD BLOW COUNT (Recovery)
40	CLAY, gray, moist to wet, soft.				
	-40' Pocket Penetrometer Values = 0.25 - 0.5				
	Plasticity Test at 40 feet.				
	Liquid Limit = 38				
	Plastic Limit = 24				
	Plasticity Index = 14				
42	Moisture Content Test at 40 feet = 37%		B-3@40'		2-2-3 (18" = 100%)
45	-45' Pocket Penetrometer Values = 0.25 - 0.5		B-3@45'		2-2-2 (18" = 100%)
50	-50 Pocket Penetrometer Values = 0.25 - 0.75		B-3@50'		2-3-4 (18" = 100%)
51	Boring B-3 terminated at 51.5 feet.				

WATER CONTENT (%)
PLASTIC LIMIT ⟝ LIQUID LIMIT
FIELD "N" VALUE

0 20 40 60

DEPTH (ft): 40.0, 42.0, 44.0, 46.0, 48.0, 50.0, 52.0, 54.0, 56.0, 58.0, 60.0

0 50 100
RQD (%)
RECOVERY (%)

WATER LEVELS
26' ▽ WHILE DRILLING
▽ AT COMPLETION
▽ AFTER DRILLING

Hollow Stem Auger
2" OD Split Spoon (SPT)

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-311G Ponderay Mixed-Use

DATE STARTED: 10/2/2020
DATE FINISHED: 10/2/2020
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Clear

BORING B-4

DRILL: Trailer Drill
HAMMER: Manual
DRILLING METHODS: Hollow Stem Augur

NOTES:

TOTAL DEPTH: 30'

DEPTH (ft)	DESCRIPTION	SAMPLE #	FIELD BLOW COUNT (Recovery)
0	SILT, light brown, damp, medium stiff.		
5	-5' Pocket Penetrometer Values = 0.75 - 1	B-4@5'	2-2-3 (12" = 67%)
10	CLAY, light brown, moist, soft. -10' Pocket Penetrometer Values = 0.25 - 0.75 Plasticity Test at 10 feet. Liquid Limit = 31 Plastic Limit = 24 Plasticity Index = 7 Moisture Content Test at 10 feet = 37%	B-4@10'	1-1-2 (18" = 100%)
15	Poorly-graded SAND, gray-brown, moist to wet, medium dense. Fines Content Test at 15 feet. Silt / Clay = 4.7%	B-4@15'	6-7-9 (12" = 67%)
20			

GRAPHIC LOG
SAMPLER

▼ WATER CONTENT (%)
PLASTIC LIMIT ⊢—⊣ LIQUID LIMIT
● FIELD "N" VALUE

0 20 40 60

DEPTH (ft): 0.0, 2.0, 4.0, 6.0, 8.0, 10.0, 12.0, 14.0, 16.0, 18.0, 20.0

WATER LEVELS
24' ▽ WHILE DRILLING
▼ AT COMPLETION
▼ AFTER DRILLING

Hollow Stem Auger
2" OD Split Spoon (SPT)

0 50 100
RQD (%)
RECOVERY (%)

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-311G Ponderay Mixed-Use

DATE STARTED: 10/2/2020
DATE FINISHED: 10/2/2020
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Clear
NOTES:

BORING B-4

DRILL: Trailer Drill
HAMMER: Manual
DRILLING METHODS: Hollow Stem Augur

TOTAL DEPTH: 30'

DEPTH (ft)	DESCRIPTION	GRAPHIC LOG	SAMPLE #	SAMPLER	FIELD BLOW COUNT (Recovery)
20	Poorly-graded SAND, gray-brown, moist to wet, medium dense (Cont'd)				
21			B-4@20'		5-10-11 (18" = 100%)
22					
23					
24	-24' groundwater encountered while drilling.				
25	Silty SAND, gray-brown, wet, loose.				
26			B-4@25'		2-3-3 (14" = 78%)
27					
28					
29					
30	Poorly-graded SAND, gray-brown, wet, medium dense.				
31			B-4@30'		4-5-6 (18" = 100%)
32	Boring B-4 terminated at 31.5 feet.				
33					
34					
35					
36					
37					
38					
39					
40					

WATER CONTENT (%)
PLASTIC LIMIT ⟝ LIQUID LIMIT
FIELD "N" VALUE

0 20 40 60

DEPTH (ft): 20.0, 22.0, 24.0, 26.0, 28.0, 30.0, 32.0, 34.0, 36.0, 38.0, 40.0

WATER LEVELS
24' ▽ WHILE DRILLING
▼ AT COMPLETION
▼ AFTER DRILLING

Hollow Stem Auger
2" OD Split Spoon (SPT)

0 50 100
RQD (%)
RECOVERY (%)

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-311G Ponderay Mixed-Use

DATE STARTED: 10/2/2020
DATE FINISHED: 10/2/2020
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Clear

BORING B-5

DRILL: Trailer Drill
HAMMER: Manual
DRILLING METHODS: Hollow Stem Augur

NOTES:

TOTAL DEPTH: 50'

DEPTH (ft)	DESCRIPTION	GRAPHIC LOG	SAMPLE #	SAMPLER	FIELD BLOW COUNT (Recovery)
0	SILT, light brown, damp, very stiff.				
5	-5' Pocket Penetrometer Values = 1.75 - 2.5		B-5@5'		5-4-4 (12" = 67%)
10	CLAY, light brown, moist, medium stiff to stiff. -10' Pocket Penetrometer Values = 1.5 - 2 Plasticity Test at 10 feet. Liquid Limit = 35 Plastic Limit = 25 Plasticity Index = 10 Moisture Content Test at 10 feet = 30%		B-5@10'		2-3-4 (18" = 100%)
15	Silty SAND, gray-brown, moist to wet, medium dense.		B-5@15'		
20					

▼ WATER CONTENT (%)
PLASTIC LIMIT ⊢——⊣ LIQUID LIMIT
● FIELD "N" VALUE ——

0 20 40 60

DEPTH (ft): 0.0, 2.0, 4.0, 6.0, 8.0, 10.0, 12.0, 14.0, 16.0, 18.0, 20.0

WATER LEVELS
24' ▽ WHILE DRILLING
▼ AT COMPLETION
▼ AFTER DRILLING

Hollow Stem Auger
3" Shelby Tube
2" OD Split Spoon (SPT)

0 50 100
RQD (%)
RECOVERY (%)

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-311G Ponderay Mixed-Use

DATE STARTED: 10/2/2020
DATE FINISHED: 10/2/2020
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Clear

BORING B-5

DRILL: Trailer Drill
HAMMER: Manual
DRILLING METHODS: Hollow Stem Augur

NOTES:

TOTAL DEPTH: 50'

DEPTH (ft)	DESCRIPTION	GRAPHIC LOG	SAMPLE #	SAMPLER	FIELD BLOW COUNT (Recovery)
20	Silty SAND, gray-brown, moist to wet, medium dense (Cont'd). Fines Content Test at 20 feet. Silt / Clay = 24%		B-5@20'		5-5-6 (18" = 100%)
24	-24' groundwater encountered while drilling.		B-5@25'		4-7-7 (12" = 67%)
30			B-5@30'		7-8-12 (14" = 78%)
35			B-5@35'		5-13-13 (14" = 78%)
40					

WATER CONTENT (%)
PLASTIC LIMIT ⟝ LIQUID LIMIT
FIELD "N" VALUE

0 20 40 60

DEPTH (ft): 20.0, 22.0, 24.0, 26.0, 28.0, 30.0, 32.0, 34.0, 36.0, 38.0, 40.0

WATER LEVELS
24' ▽ WHILE DRILLING
▼ AT COMPLETION
▼ AFTER DRILLING

Hollow Stem Auger
3" Shelby Tube
2" OD Split Spoon (SPT)

0 50 100
RQD (%)
RECOVERY (%)

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-311G Ponderay Mixed-Use

DATE STARTED: 10/2/2020
DATE FINISHED: 10/2/2020
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Clear

BORING B-5

DRILL: Trailer Drill
HAMMER: Manual
DRILLING METHODS: Hollow Stem Augur

NOTES:

TOTAL DEPTH: 50'

DEPTH (ft)	DESCRIPTION	GRAPHIC LOG	SAMPLE #	SAMPLER	FIELD BLOW COUNT (Recovery)
40	CLAY, gray, wet, soft. Plasticity Test at 40 feet. Liquid Limit = 35 Plastic Limit = 24 Plasticity ndex = 11 Moisture Content test at 40 feet = 37%		B-5@40'		1-2-2 (18" = 100%)
45			B-5@50'		2-2-2 (18" = 100%)
50			B-5@50'		2-3-3 (18" = 100%)
52	Boring B-5 terminated at 51.5 feet.				

▼ WATER CONTENT (%)
PLASTIC LIMIT ⊢—⊣ LIQUID LIMIT
● FIELD "N" VALUE

0 20 40 60

DEPTH (ft): 40.0, 42.0, 44.0, 46.0, 48.0, 50.0, 52.0, 54.0, 56.0, 58.0, 60.0

WATER LEVELS
24' ▽ WHILE DRILLING
▼ AT COMPLETION
▼ AFTER DRILLING

Hollow Stem Auger
3" Shelby Tube
2" OD Split Spoon (SPT)

0 50 100
RQD (%)
RECOVERY (%)

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-345G Ponderay Mixed-Use Lot 2

DATE STARTED: 6/9/2021
DATE FINISHED: 6/9/2021
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Overcast

BORING B-6

DRILL: Trailer Drill
HAMMER:
DRILLING METHODS: Hollow Stem Augur

NOTES:

TOTAL DEPTH: 36.5'

DEPTH (ft)	DESCRIPTION	SAMPLE #	FIELD BLOW COUNT (Recovery)
0	SILT, light brown, damp, stiff. to very stiff. (Undocumented Fill)		
5	@5' Pocket Penetrometer Values = 2.75-3.5	S-1	7-8-10 (0" = 0%)
		S-2	3-3-4 (18" = 100%)
8	Sandy SILT, light brown, wet, soft. (Undocumented Fill) @7.5' Pocket Penetrometer Value = 0.5 or less	S-3	1-2-1 (18" = 100%)
10	Silty SAND, tan-gray, damp, medium dense. Particle-Size Dsitribution Test at 10 feet. Sand = 78% Silt / Clay = 22%	S-4	2-4-4 (18" = 100%)
		S-5	
15	Lean CLAY, light brown, moist, medium stiff. @15' Pocket Penetrometer Values = 1.0-1.5 Lab Testing at 15 feet. Liquid Limit = 45 Plastic Limit = 23 Plasticity Index = 21 Moisture Content = 33%	S-6	2-2-7 (18" = 100%)
17	Poorly-graded Fine SAND with silt, tan-gray, moist, medium dense. Sand was fine-grained.		
20			

▼ WATER CONTENT (%)
PLASTIC LIMIT ⊢—⊣ LIQUID LIMIT
● FIELD "N" VALUE

0 20 40 60

DEPTH (ft): 0.0, 2.0, 4.0, 6.0, 8.0, 10.0, 12.0, 14.0, 16.0, 18.0, 20.0

0 50 100
RQD (%)
RECOVERY (%)

WATER LEVELS
33' ▽ WHILE DRILLING
▼ AT COMPLETION
▼ AFTER DRILLING

Hollow Stem Auger
3" Shelby Tube
2" OD Split Spoon (SPT)

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-345G Ponderay Mixed-Use Lot 2

DATE STARTED: 6/9/2021
DATE FINISHED: 6/9/2021
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Overcast

BORING B-6

DRILL: Trailer Drill
HAMMER:
DRILLING METHODS: Hollow Stem Augur

NOTES:

TOTAL DEPTH: 36.5'

DEPTH (ft)	DESCRIPTION	GRAPHIC LOG	SAMPLE #	SAMPLER	FIELD BLOW COUNT (Recovery)
20	Lean CLAY, light brown, moist, medium stiff. @20' Pocket Penetrometer Values = 0.5-0.75		S-7		1-2-6 (18" = 100%)
22	Sandy SILT, tan-gray, wet, medium dense.				
25	Particle-Size Distribution Test at 25 feet. Sand = 35% Silt / Clay = 6%		S-8		4-4-4 (18" = 100%)
30	Poorly-graded Fine to Medium SAND, tan-gray, wet, medium dense.		S-9		4-5-6 (18" = 100%)
35			S-10		7-9-13 (18" = 100%)
37	Boring B-6 terminated at 36.5 feet. Groundwater encountered while drilling at approximately 33 feet.				

WATER CONTENT (%)
PLASTIC LIMIT ⟝ LIQUID LIMIT
FIELD "N" VALUE

0 20 40 60

DEPTH (ft): 20.0, 22.0, 24.0, 26.0, 28.0, 30.0, 32.0, 34.0, 36.0, 38.0, 40.0

WATER LEVELS
33' ▽ WHILE DRILLING
▼ AT COMPLETION
▼ AFTER DRILLING

Hollow Stem Auger
3" Shelby Tube
2" OD Split Spoon (SPT)

0 50 100
RQD (%)
RECOVERY (%)

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-345G Ponderay Mixed-Use Lot 2

DATE STARTED: 6/9/2021
DATE FINISHED: 6/9/2021
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Overcast

BORING B-7

DRILL: Trailer Drill
HAMMER:
DRILLING METHODS: Hollow Stem Augur

NOTES:

TOTAL DEPTH: 31.5'

DEPTH (ft)	DESCRIPTION	GRAPHIC LOG	SAMPLE #	SAMPLER	FIELD BLOW COUNT (Recovery)
0	SILT with sand, brown, damp, stiff. (Undocumented Fill)				
3	Hollow Concrete Box encountered.		S-1		5-50/1 (0" = 0%)
8	Interbedded Sandy SILT and Lean CLAY, brown to light brown with orange mottling, moist, soft to medium stiff. Contained trace organics. (Undocumented Fill) @7.5' Pocket Penetrometer Values = 0.5-2.0		S-3		1-2-1 (18" = 100%)
10			S-4		1-1-1 (18" = 100%)
15	No Recovery - Shelby Sample Fell Out		S-5		

▼ WATER CONTENT (%)
PLASTIC LIMIT ⟝ LIQUID LIMIT
● FIELD "N" VALUE

0 20 40 60

DEPTH (ft): 0.0, 2.0, 4.0, 6.0, 8.0, 10.0, 12.0, 14.0, 16.0, 18.0, 20.0

0 50 100
RQD (%)
RECOVERY (%)

WATER LEVELS
WHILE DRILLING
AT COMPLETION
AFTER DRILLING

Hollow Stem Auger
3" Shelby Tube
2" OD Split Spoon (SPT)

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-345G Ponderay Mixed-Use Lot 2

DATE STARTED: 6/9/2021
DATE FINISHED: 6/9/2021
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Overcast
NOTES:

BORING B-7

DRILL: Trailer Drill
HAMMER:
DRILLING METHODS: Hollow Stem Augur

TOTAL DEPTH: 31.5'

DEPTH (ft)	DESCRIPTION	GRAPHIC LOG	SAMPLE #	SAMPLER	FIELD BLOW COUNT (Recovery)
20	Lean CLAY, light brown, lgiht brown, moist, medium stiff. Lab Testing at 20 feet. Sand = 14.2% Silt / Clay = 85.8% Liquid Limit = 32 Plastic Limit = 23 Plasticity Index = 9		S-6		
21					
22	Poorly-graded Fine SAND with silt, gray, wet, medium dense.				
23					
24					
25					
26			S-7		2-4-5 (18" = 100%)
27					
28					
29					
30					
31			S-8		4-6-7 (18" = 100%)
32	Boring B-7 terminated at 31.5 feet. No measurable groundwater encountered.				
33					
34					
35					
36					
37					
38					
39					
40					

▼ WATER CONTENT (%)
PLASTIC LIMIT ⊢——⊣ LIQUID LIMIT
● FIELD "N" VALUE ——

0 20 40 60

DEPTH (ft): 20.0, 22.0, 24.0, 26.0, 28.0, 30.0, 32.0, 34.0, 36.0, 38.0, 40.0

0 50 100

RQD (%)
RECOVERY (%)

WATER LEVELS
▽ WHILE DRILLING
▼ AT COMPLETION
▼ AFTER DRILLING

Hollow Stem Auger
3" Shelby Tube
2" OD Split Spoon (SPT)

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-345G Ponderay Mixed-Use Lot 2

DATE STARTED: 6/9/2021
DATE FINISHED: 6/9/2021
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Overcast

BORING B-8

DRILL: Trailer Drill
HAMMER:
DRILLING METHODS: Hollow Stem Augur

NOTES:

TOTAL DEPTH: 31.5'

DEPTH (ft)	DESCRIPTION	SAMPLE #	FIELD BLOW COUNT (Recovery)
0	SILT, light brown with gray, orange, and black mottling, moist, stiff. Contains trace organics. (Undocumented Fill)		
5	@5' Pocket Penetrometer Values = 1.75-2.0	S-2	1-3-3 (18" = 100%)
8	Interbedded Sandy SILT and Silty CLAY, light brown, moist, stiff. (Undocumented Fill) @7.5' Pocket Penetrometer Value = 1.75	S-3	2-2-3 (18" = 100%)
10	Lab Testing at 10 feet. Liquid Limit = 30 Plastic Limit = 21 Plasticity Index = 9 Moisture Content = 34%	S-4	1-1-1 (18" = 100%)
15	No Recovery - Shelby Sample Fell Out	S-5	

GRAPHIC LOG

SAMPLER

WATER CONTENT (%)
PLASTIC LIMIT ⟝ LIQUID LIMIT
FIELD "N" VALUE

0 20 40 60

DEPTH (ft): 0.0, 2.0, 4.0, 6.0, 8.0, 10.0, 12.0, 14.0, 16.0, 18.0, 20.0

0 50 100

RQD (%)
RECOVERY (%)

WATER LEVELS
WHILE DRILLING
AT COMPLETION
AFTER DRILLING

Hollow Stem Auger
3" Shelby Tube
2" OD Split Spoon (SPT)

ALLWEST TESTING & ENGINEERING
HAYDEN, IDAHO
GEOTECHNICAL SECTION

BORING LOG (US Customary Units)

PROJECT: 120-345G Ponderay Mixed-Use Lot 2

DATE STARTED: 6/9/2021
DATE FINISHED: 6/9/2021
DRILLER: Andy
COMPANY: Geologic Drill
LOGGER: Adam Richter
WEATHER: Overcast
NOTES:

BORING B-8

DRILL: Trailer Drill
HAMMER:
DRILLING METHODS: Hollow Stem Augur

TOTAL DEPTH: 31.5'

DEPTH (ft)	DESCRIPTION	SAMPLE #	FIELD BLOW COUNT (Recovery)
20	Poorly-graded Fine SAND, tan-gray, wet, medium dense.		
21	Lean CLAY, light brown, wet, soft.	S-6	6-11-13 (18" = 100%)
	Poorly-graded Fine SAND, tan-gray, wet, medium dense.		
25	Silty SAND, gray-brown, wet, loose.	S-7	2-2-3 (18" = 100%)
30	Poorly-graded SAND, tan-gray, wet, medium dense.	S-8	4-6-7 (18" = 100%)
32	Boring B-8 terminated at 31.5 feet. No measureable groundwater encountered.		

GRAPHIC LOG: SAMPLER

WATER CONTENT (%)
PLASTIC LIMIT ⟝ LIQUID LIMIT
FIELD "N" VALUE

0 20 40 60

DEPTH (ft): 20.0, 22.0, 24.0, 26.0, 28.0, 30.0, 32.0, 34.0, 36.0, 38.0, 40.0

WATER LEVELS
WHILE DRILLING
AT COMPLETION
AFTER DRILLING

Hollow Stem Auger
3" Shelby Tube
2" OD Split Spoon (SPT)

0 50 100
RQD (%)
RECOVERY (%)

Unified Soil Classification System

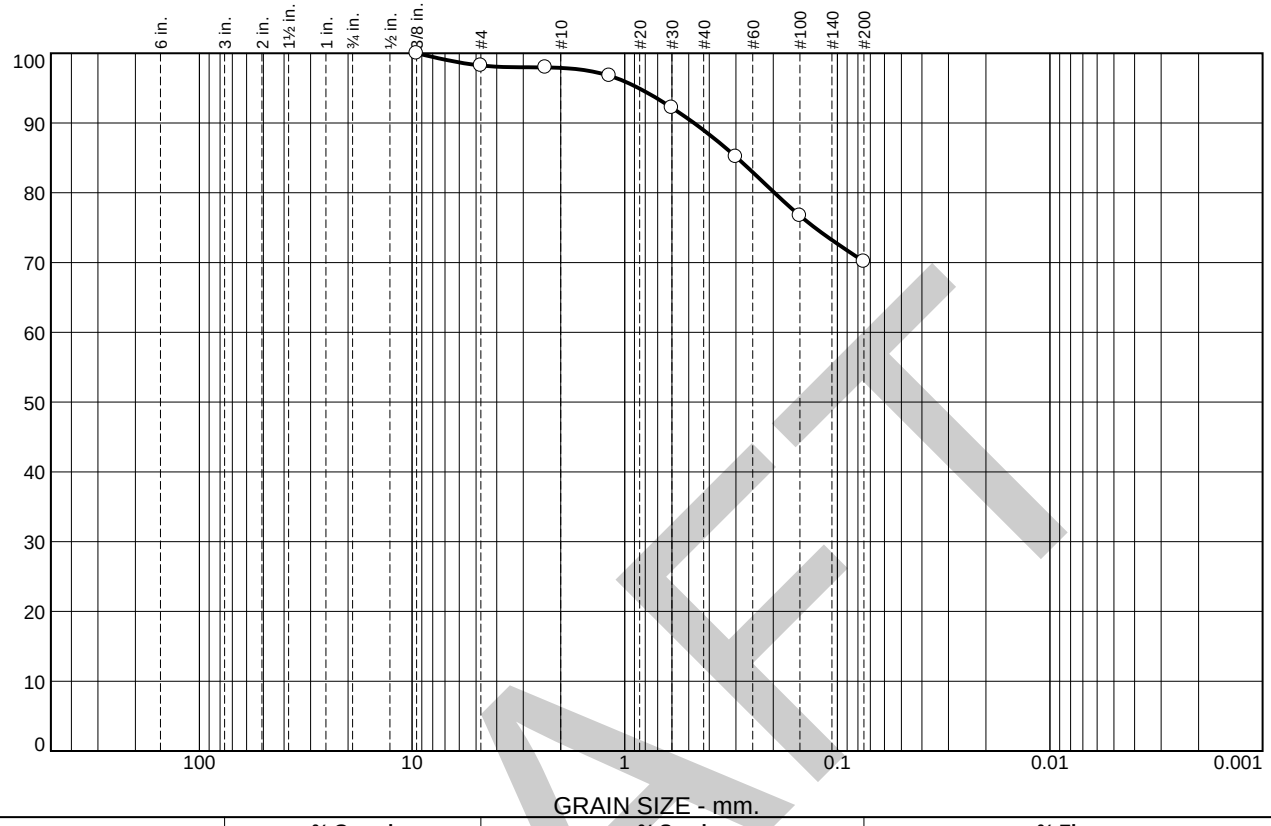
MAJOR DIVISIONS			SYMBOL	TYPICAL NAMES
COARSE GRAINED SOILS	GRAVELS	CLEAN GRAVELS	GW	Well-Graded Gravel, Gravel-Sand Mixtures.
			GP	Poorly-Graded Gravel, Gravel-Sand Mixtures.
		GRAVELS WITH FINES	GM	Silty Gravel, Gravel-Sand-Silt Mixtures.
			GC	Clayey Gravel, Gravel-Sand-Clay Mixtures.
	SANDS	CLEAN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

ALLWEST

Appendix C

Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	2	0	9	19	70	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	98		
#8	98		
#16	97		
#30	92		
#50	85		
#100	77		
#200	70		

* (no specification provided)

Material Description

Sandy SILT

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.4724 D_{85}= 0.2959 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Sampled By: A.Richer
Sample Date: 10/26/20
Natural Moisture Content: 25.1%

Location: B-1
Sample Number: S120-1049 **Depth:** -5' **Date:** 10/30/20

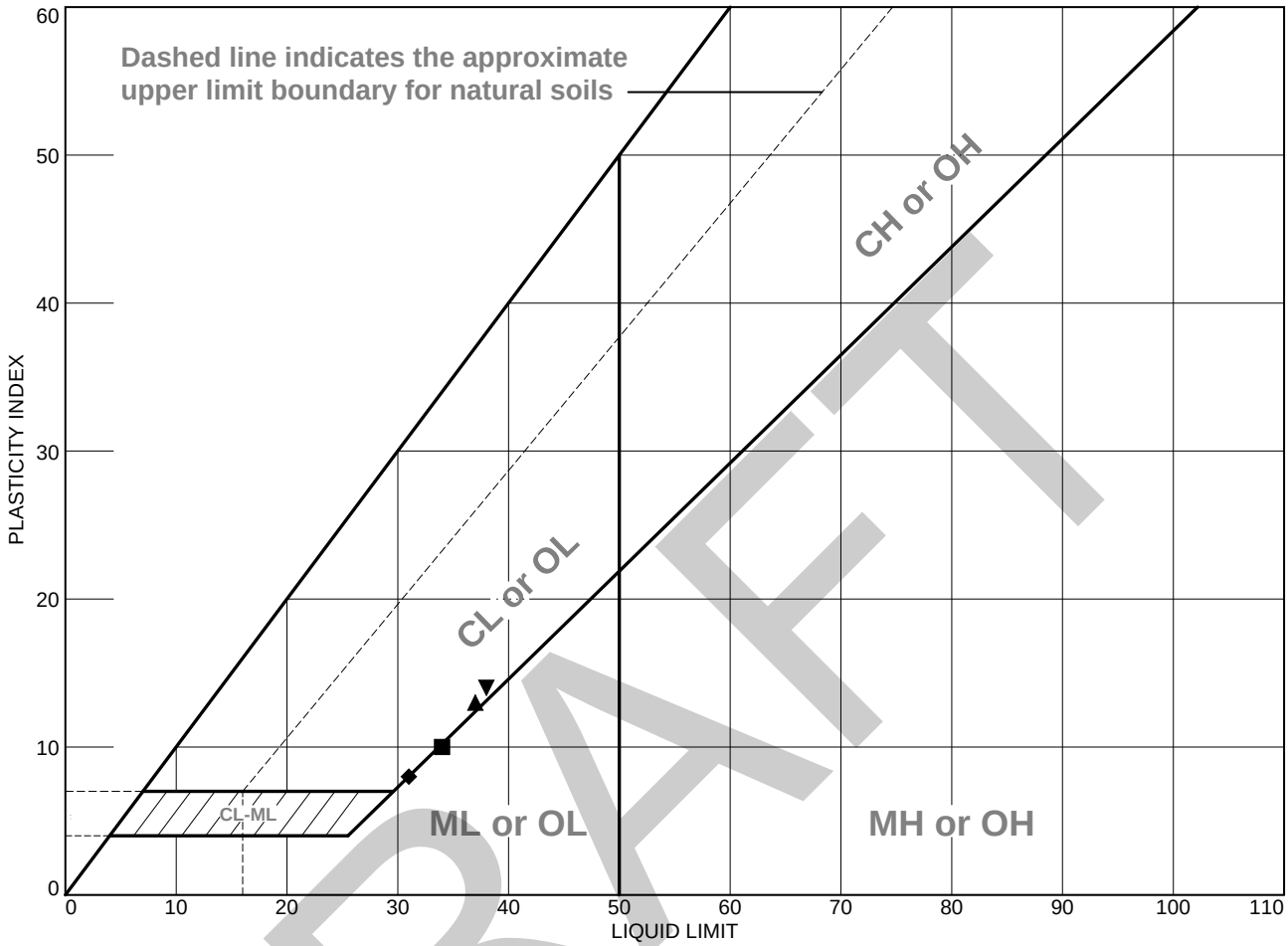
ALLWEST

Client: Sayler Owens Kerr Architecture Design Studio
Project: Ponderay Multi-use Commercial Property

Project No: 120-311G **Figure C-1**

Tested By: Noah White **Checked By:** Chris McKissen

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sandy SILT	NV	NP	NP	89	70	ML
■	Lean CLAY / SILT	34	24	10			CL / ML
▲	Lean CLAY / SILT	37	24	13			CL / ML
◆	Lean CLAY / SILT	31	23	8			CL / ML
▼	Lean CLAY / SILT	38	24	14			CL / ML

Project No. 120-311G **Client:** Sayler Owens Kerr Architecture Design Studio

Project: Ponderay Multi-use Commercial Property

●**Location:** B-1 **Depth:** -5' **Sample Number:** S120-1049
■**Location:** B-1 **Depth:** -11' **Sample Number:** S120-1051
▲**Location:** B-1 **Depth:** -40' **Sample Number:** S120-1054
◆**Location:** B-2 **Depth:** -10' **Sample Number:** S120-1055
▼**Location:** B-3 **Depth:** -40' **Sample Number:** S120-1058

ALLWEST

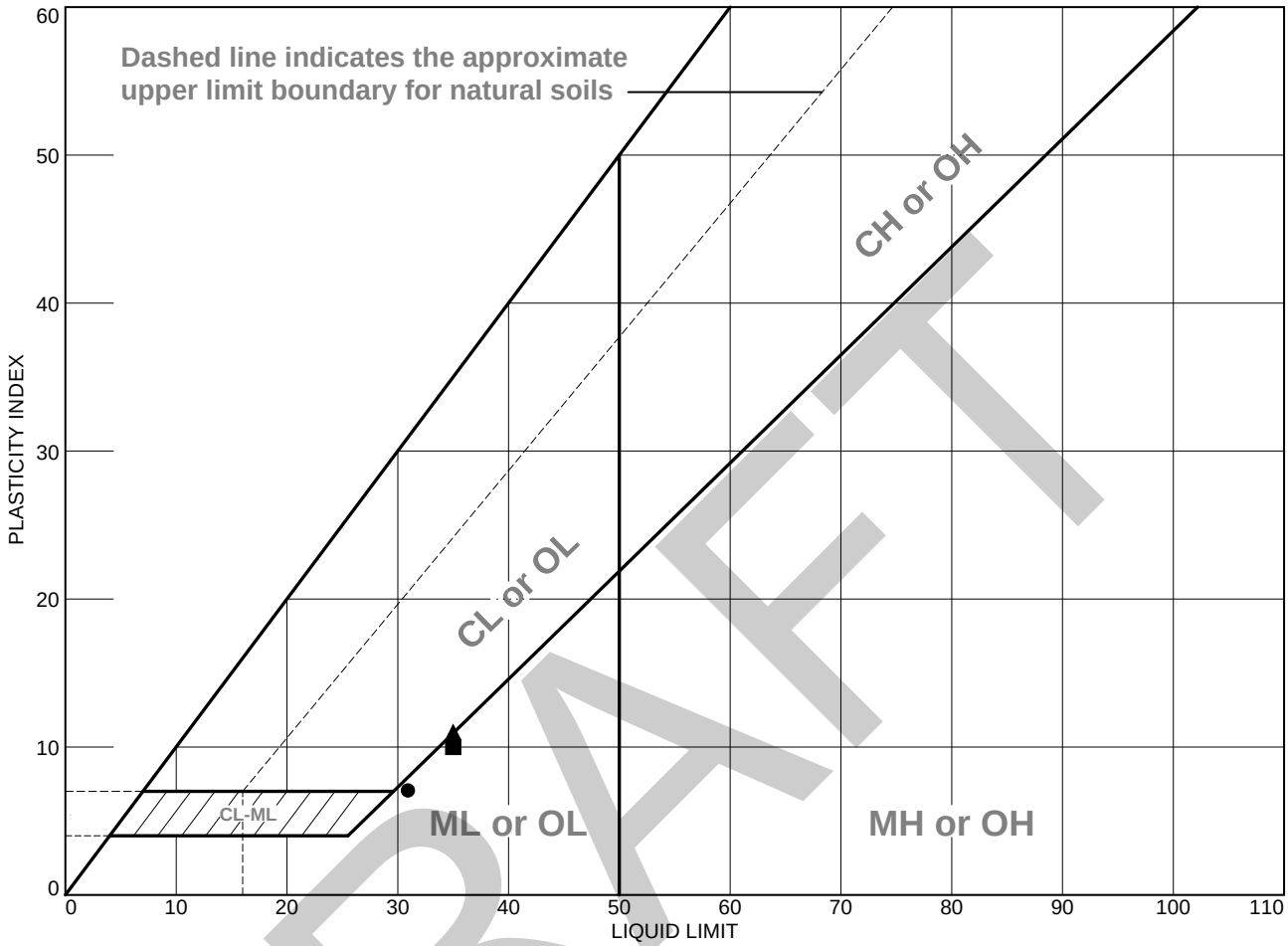
Remarks:

■All Sampled By: A.Richter
All Sampled On: 10/26/20
Natural Moisture Content: 26%
▲Natural Moisture Content: 37%
◆Natural Moisture Content: 31%
▼Natural Moisture Content: 37%

Figure C-2

Tested By: Noah White **Checked By:** Chris McKissen

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY / SILT	31	24	7			CL / ML
■	Lean CLAY / SILT	35	25	10			CL / ML
▲	Lean CLAY / SILT	35	24	11			CL / ML

Project No. 120-311G **Client:** Sayler Owens Kerr Architecture Design Studio

Project: Ponderay Multi-use Commercial Property

●**Location:** B-4 **Depth:** -10' **Sample Number:** S120-1059

■**Location:** B-5 **Depth:** -10' **Sample Number:** S120-1061

▲**Location:** B-5 **Depth:** -40' **Sample Number:** S120-1063

Remarks:

●Sampled By: A.Richter
Sample Date: 10/26/20
Natural Moisture Content: 37%

■Sampled By: A.Richter
Sample Date: 10/26/20
Natural Moisture Content: 30%

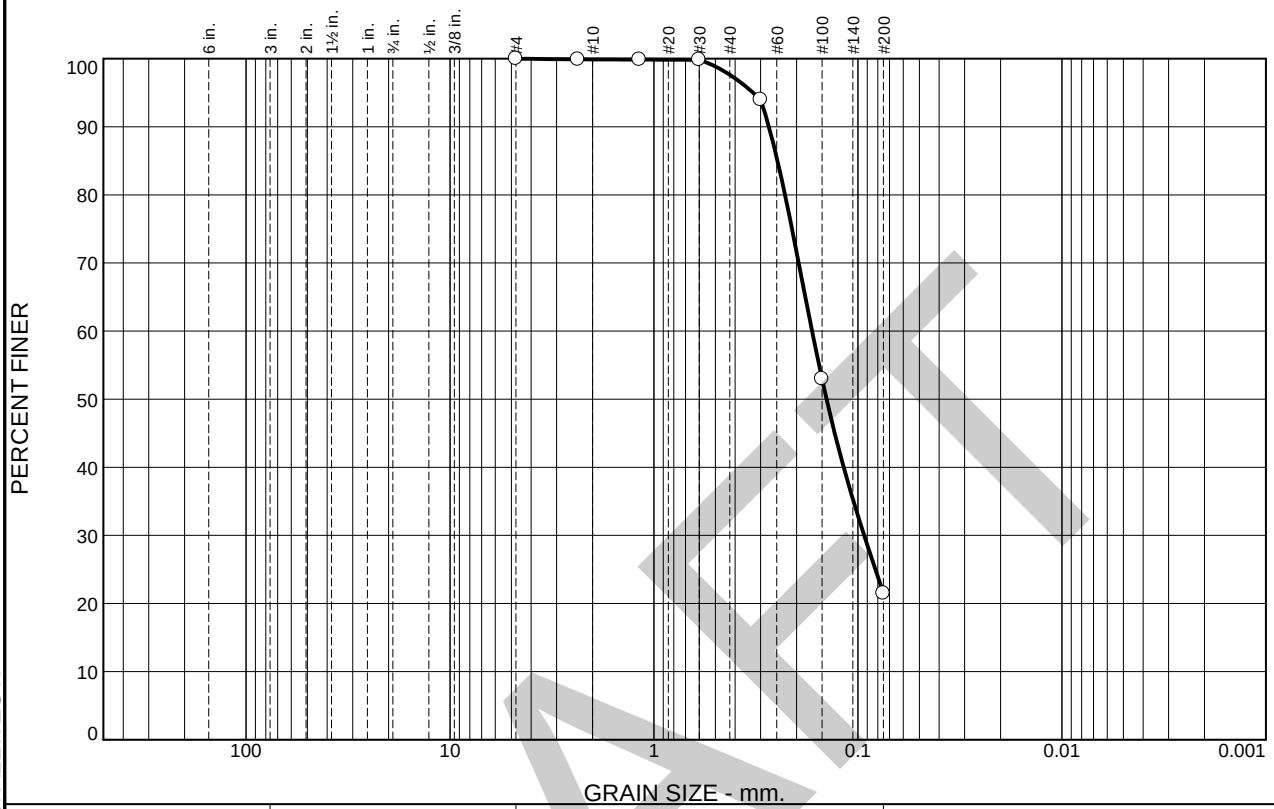
▲Sampled By: A.Richter
Sample Date: 10/26/20
Natural Moisture Content: 37%

ALLWEST

Figure C-3

Tested By: Noah White **Checked By:** Chris McKissen

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	2	76	22	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#8	100		
#16	100		
#30	100		
#50	94		
#100	53		
#200	22		

* (no specification provided)

Material Description

Silty SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2731 D_{85}= 0.2480 D_{60}= 0.1678
D_{50}= 0.1425 D_{30}= 0.0933 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sampled By: Adam Richter
Sample Date: 6/9/21

Location: B-6
Sample Number: S121-0586 **Depth:** -10' **Date:** 6/14/21

ALLWEST

Client: Sand Creek Crossing, LLC
Project: Ponderay Mixed Use Lot 2

Project No: 120-345G **Figure C-4**

Tested By: Christian Kreiger **Checked By:** Chris McKissen

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	0	35	65	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#8	100		
#16	100		
#30	100		
#50	100		
#100	98		
#200	65		

* (no specification provided)

Material Description

Sandy SILT

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1195 D_{85}= 0.1073 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Sampled By: Adam Richter
Sample Date: 6/9/21

Location: B-6
Sample Number: S121-0588 **Depth:** -25' **Date:** 6/14/21

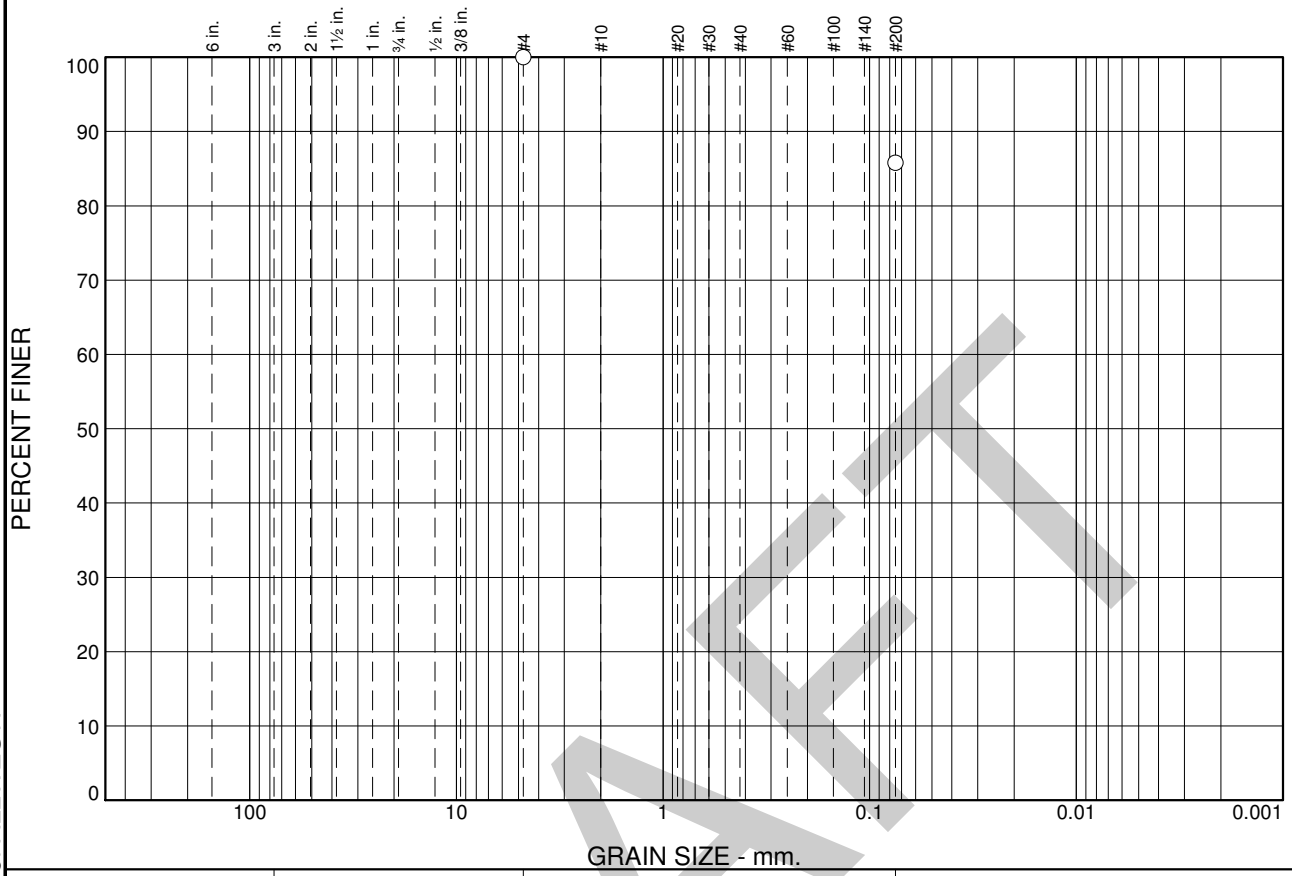
ALLWEST

Client: Sand Creek Crossing, LLC
Project: Ponderay Mixed Use Lot 2

Project No: 120-345G **Figure C-5**

Tested By: Christian Kreiger **Checked By:** Chris McKissen

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	3.0	5.3	5.9	85.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#200	85.8		

* (no specification provided)

Soil Description

Lean CLAY

Atterberg Limits

PL= 23 LL= 32 PI= 9

Coefficients

D_{90}= 0.2557 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-4(7)

Remarks

A. Richter sampled 6/9/21

Location: B-7
Sample Number: S121-0591 **Depth:** @ 20.0' **Date:** 7/12/21

ALLWEST

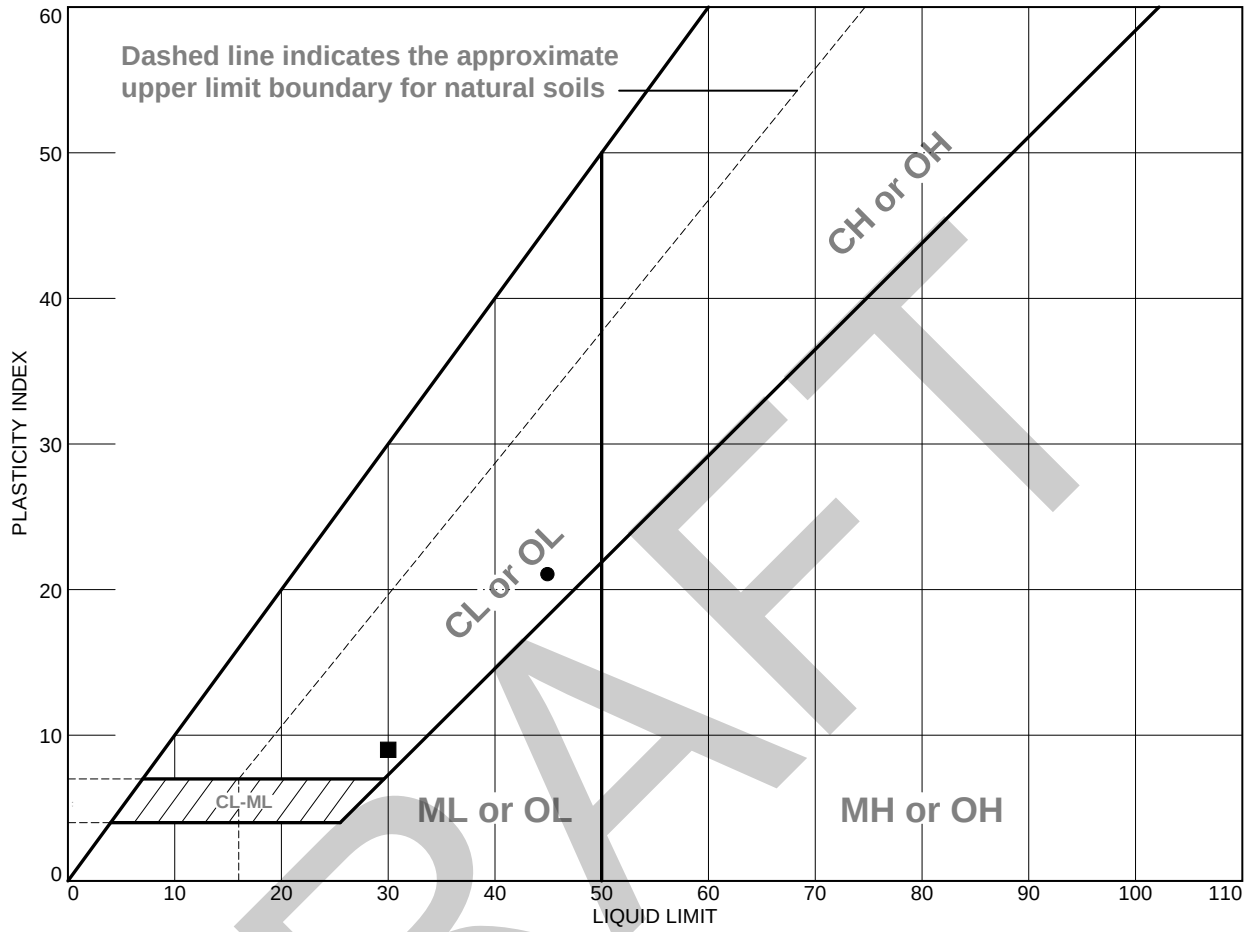
Client: Sand Creek Crossing, LLC
Project: Ponderay Mixed-Use Lot 2

Project No: 120-345G

Figure C-6

Tested By: K.Semanko **Checked By:** D.Schmitz

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY	45	24	21			
■	Lean CLAY	30	21	9			

Project No. 120-345G **Client:** Sand Creek Crossing, LLC

Project: Ponderay Mixed Use Lot 2

●**Location:** B-6 **Depth:** -15' **Sample Number:** S121-0587

■**Location:** B-8 **Depth:** -10' **Sample Number:** S121-0589

Remarks:

●Sampled By: Adam Richter
Sample Date: 6/9/21
Moisture As Received: 33%

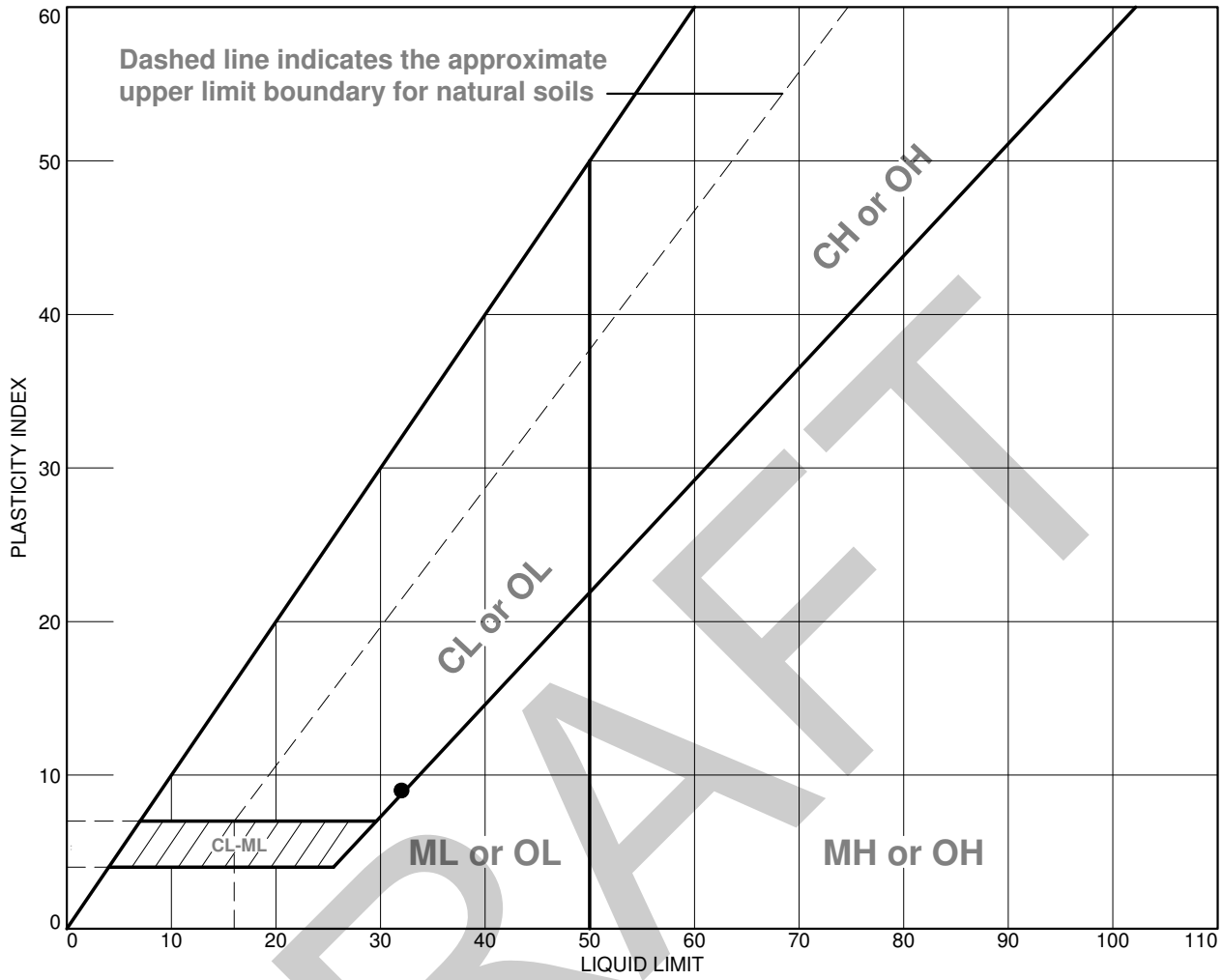
■Sampled By: Adam Richter
Sample Date: 6/9/21
Moisture As Received: 34%

ALLWEST

Figure C-7

Tested By: Christian Kreiger **Checked By:** Chris McKissen

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY	32	23	9	91.7	85.8	CL

Project No. 120-345G **Client:** Sand Creek Crossing, LLC

Project: Ponderay Mixed-Use Lot 2

● **Location:** B-7 **Depth:** @ 20.0' **Sample Number:** S121-0591

Remarks:

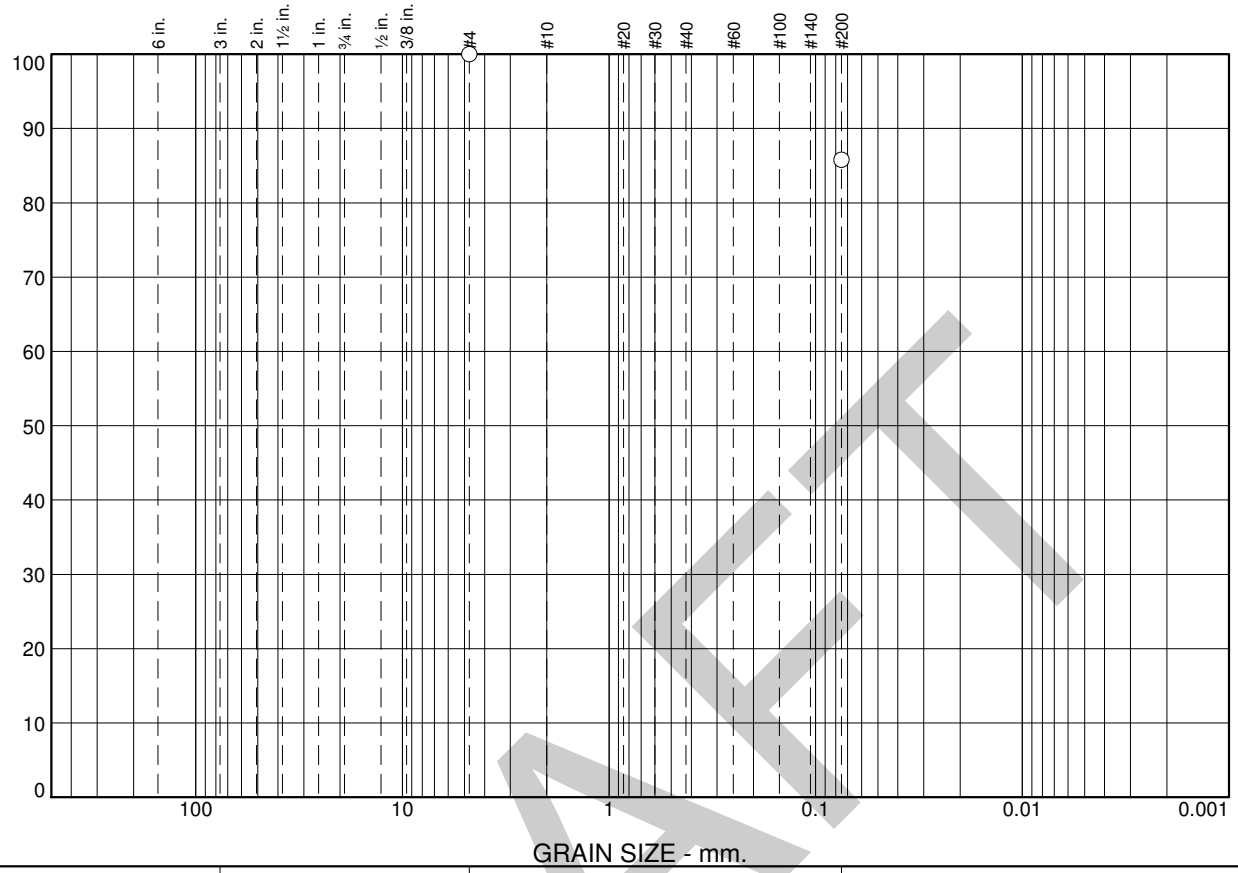
● A.Richter sampled 6/9/21

ALLWEST

Figure C-8

Tested By: K.Semanko **Checked By:** D.Schmitz

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	3.0	5.3	5.9	85.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#200	85.8		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 23 LL= 32 PI= 9

Coefficients

D_{90}= 0.2557 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-4(7)

Remarks

A. Richter sampled 6/9/21

Location: B-2
Sample Number: S121-0591 **Depth:** @ 20.0' **Date:** 7/12/21

ALLWEST

Client: Sand Creek Crossing, LLC
Project: Ponderay Mixed-Use Lot 2

Project No: 120-345G

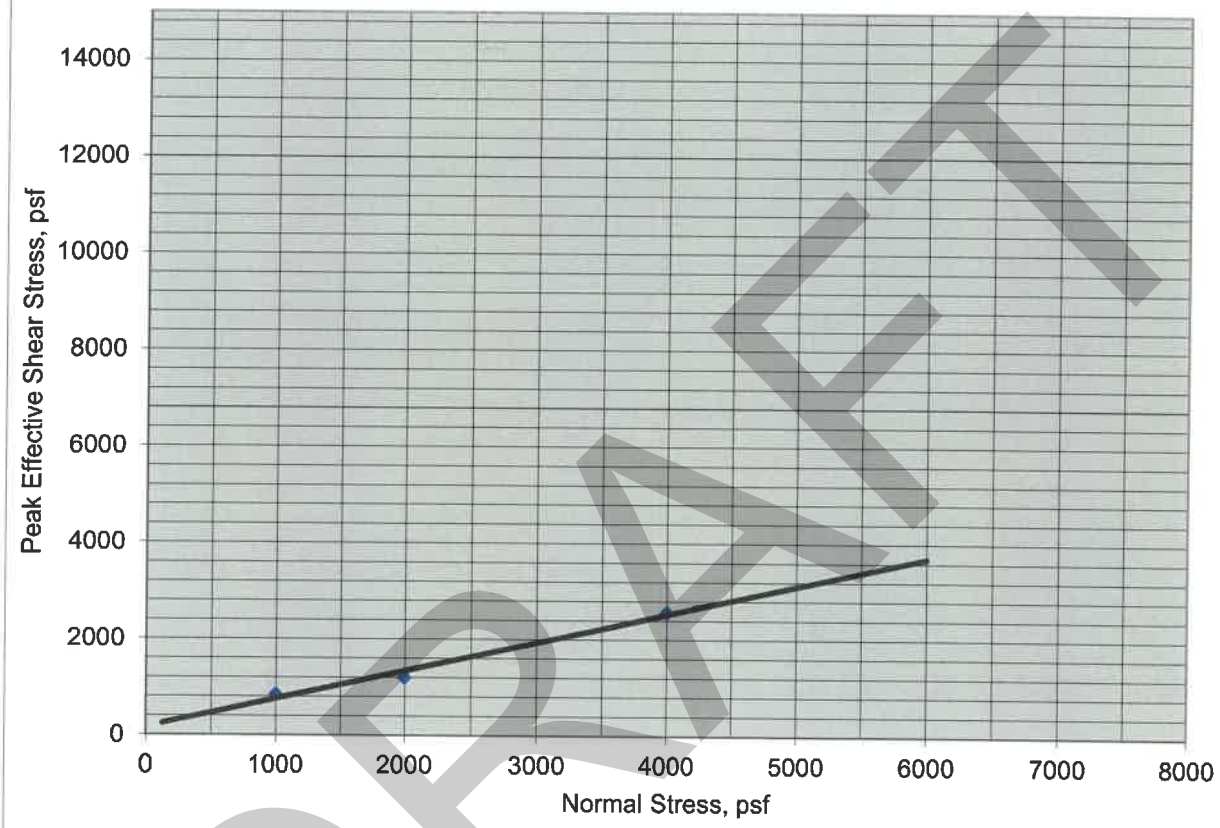
Tested By: K.Semanko **Checked By:** D.Schmitz

Direct Shear

AASHTO T-236

Project: Ponderay Mixed-Use Lot 2
Client: Sand Creek Crossing, LLC
Date Tested: 7/8/21 & 7/9/21
Tested By: D. Schmitz

Project No.: 120-345G
Sample No.: S121-0591
Sample Location: B-2 @ 20.0'
Classification: Lean clay



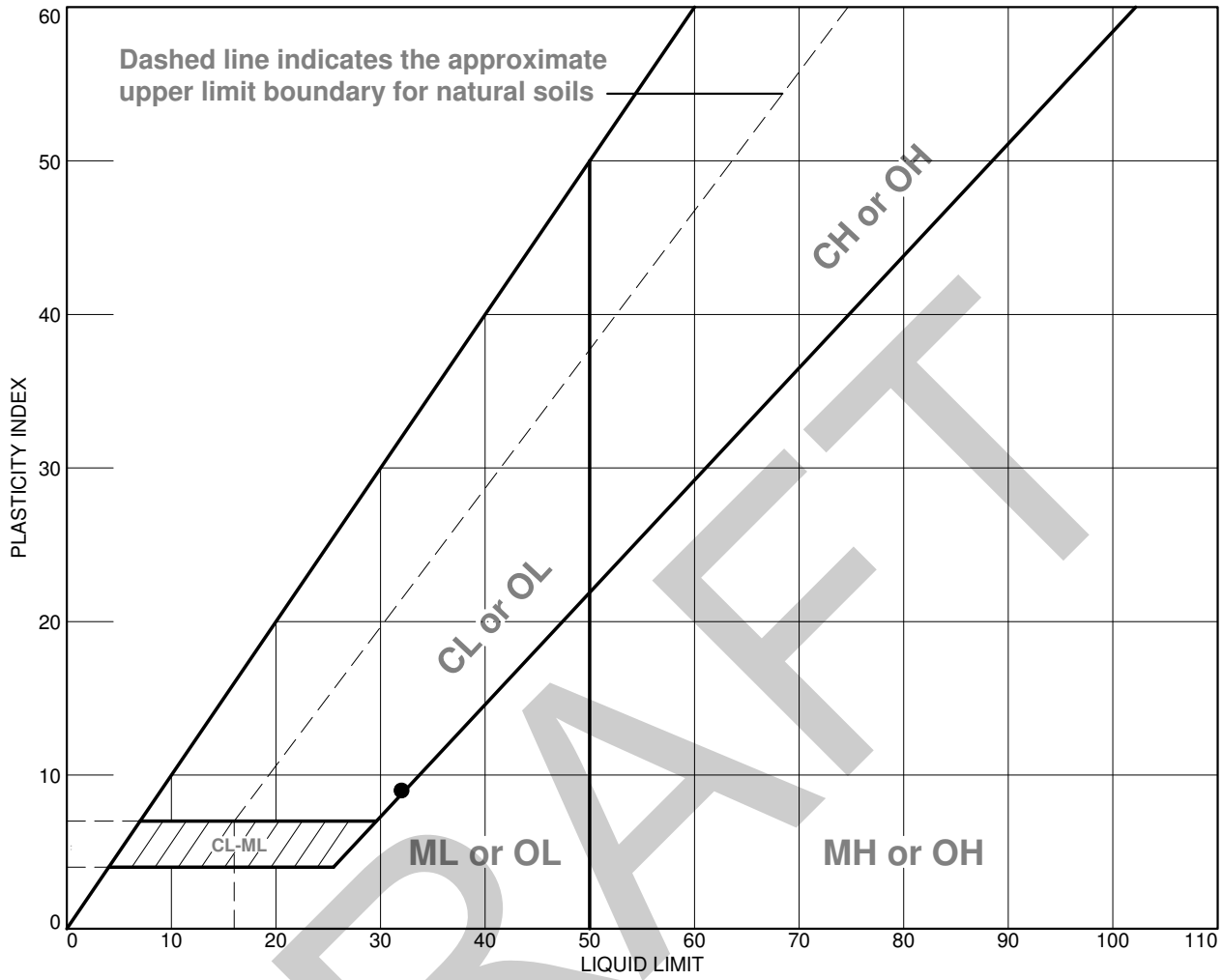
Angle of Internal Friction (ø'):	30
Cohesion Intercept (psf):	167
Dry Unit Weight (pcf)	95
Water Content (%)	29.1
Shear Box Diameter (inches)	2.4

Reviewed by: _____

ALLWEST Testing & Engineering

255 N Linder Rd, Suite 100 • Meridian, ID 83642 • (208) 895-7898 • Fax (208) 898-3959
www.allwesttesting.com

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean clay	32	23	9	91.7	85.8	CL

Project No. 120-345G **Client:** Sand Creek Crossing, LLC

Project: Ponderay Mixed-Use Lot 2

● **Location:** B-2 **Depth:** @ 20.0' **Sample Number:** S121-0591

Remarks:

● A.Richter sampled 6/9/21

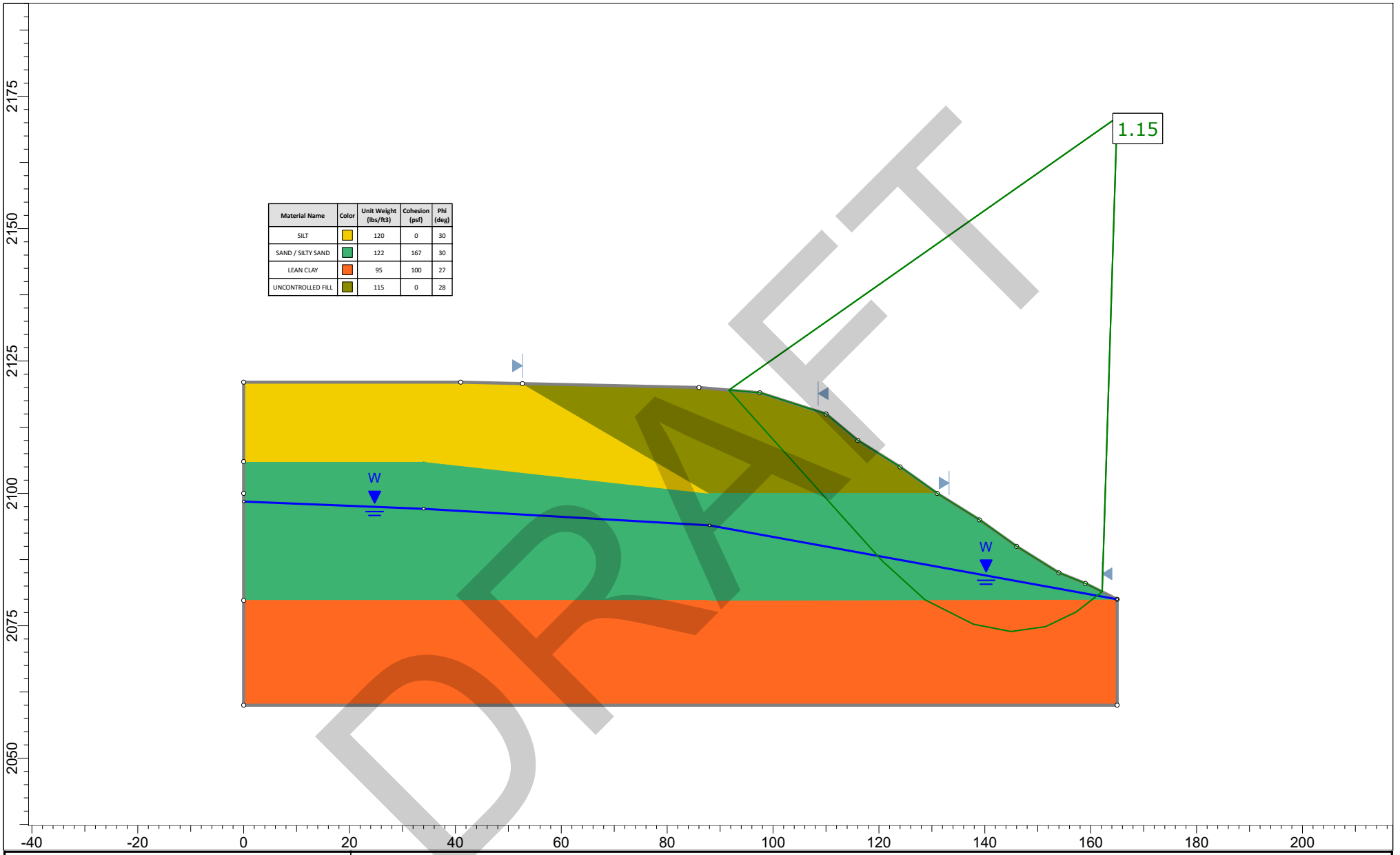
ALLWEST

Tested By: K.Semanko **Checked By:** D.Schmitz

Appendix D

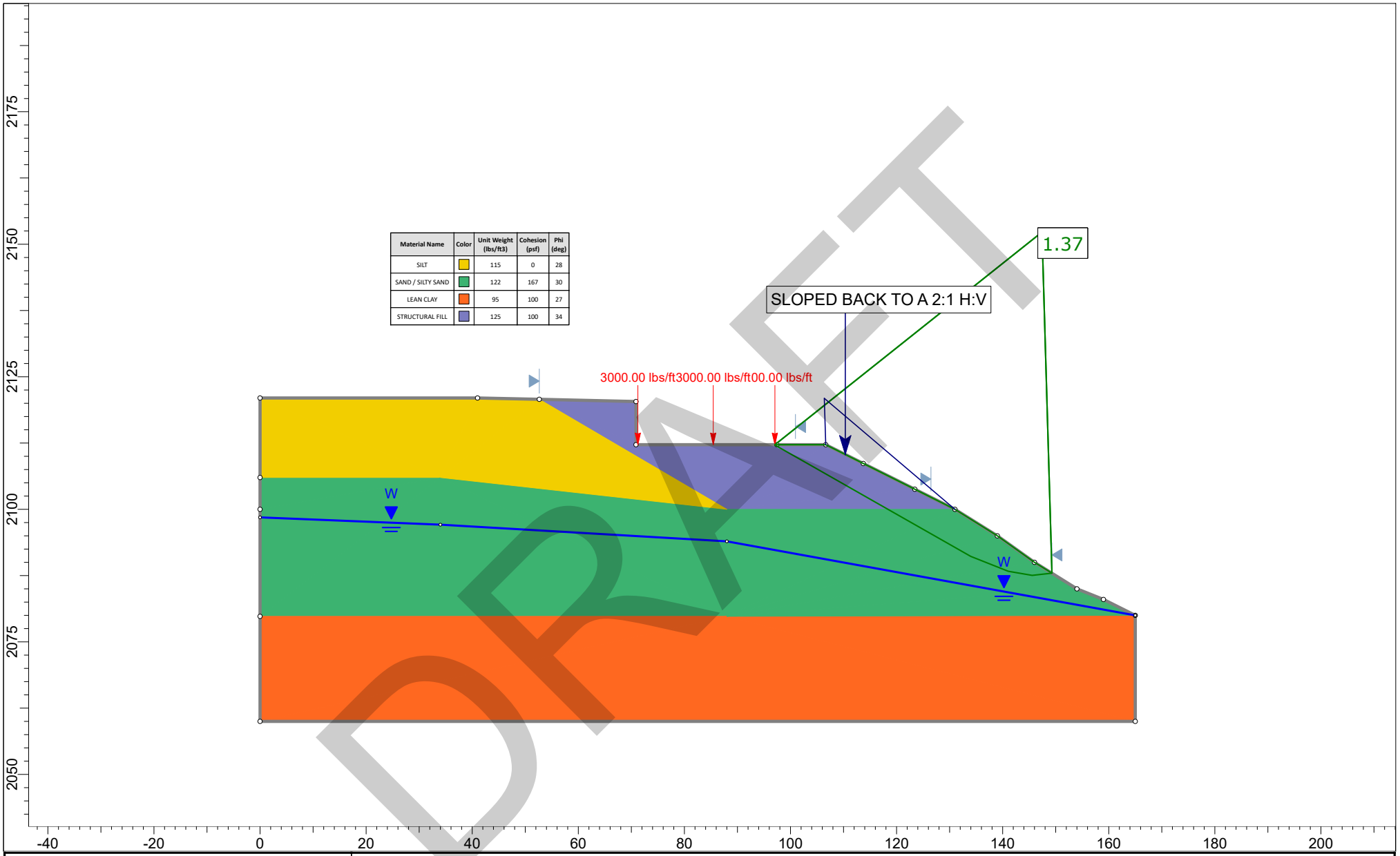
Slope Stability Analyses

ALLWEST



rocscience	Project	Ponderay Mixed-Use Lots		
	Analysis Description	A-A' Existing Conditions		
	Drawn By	AKR	Scale 1:300	Company ALLWEST
	Date			File Name A-A' Existing Updated.slim

SLIDEINTERPRET 7.018



rocscience	*Project* Ponderay Mixed-Use Lots		
	Analysis Description A-A' Existing Conditions		
	Drawn By AKR	*Scale* 1:300	*Company* ALLWEST
	Date		*File Name* A-A' Proposed.slim

SLIDEINTERPRET 7.018

Appendix III

DCI ENGINEERS
707 W. 2ND AVENUE
SPOKANE, WASHINGTON 99201
PHONE: (509) 455-4448 ● FAX: (509) 455-7492
WEBSITE: www.dci-engineers.com
CIVIL / STRUCTURAL

LICENSED PROFESSIONAL ENGINEER — 17233 — STATE OF IDAHO — MATTHEW R. BIBB — 01/03/2022

REVISED: | REVISED: | REVISED: | REVISED:

DRAWN BY: WMG

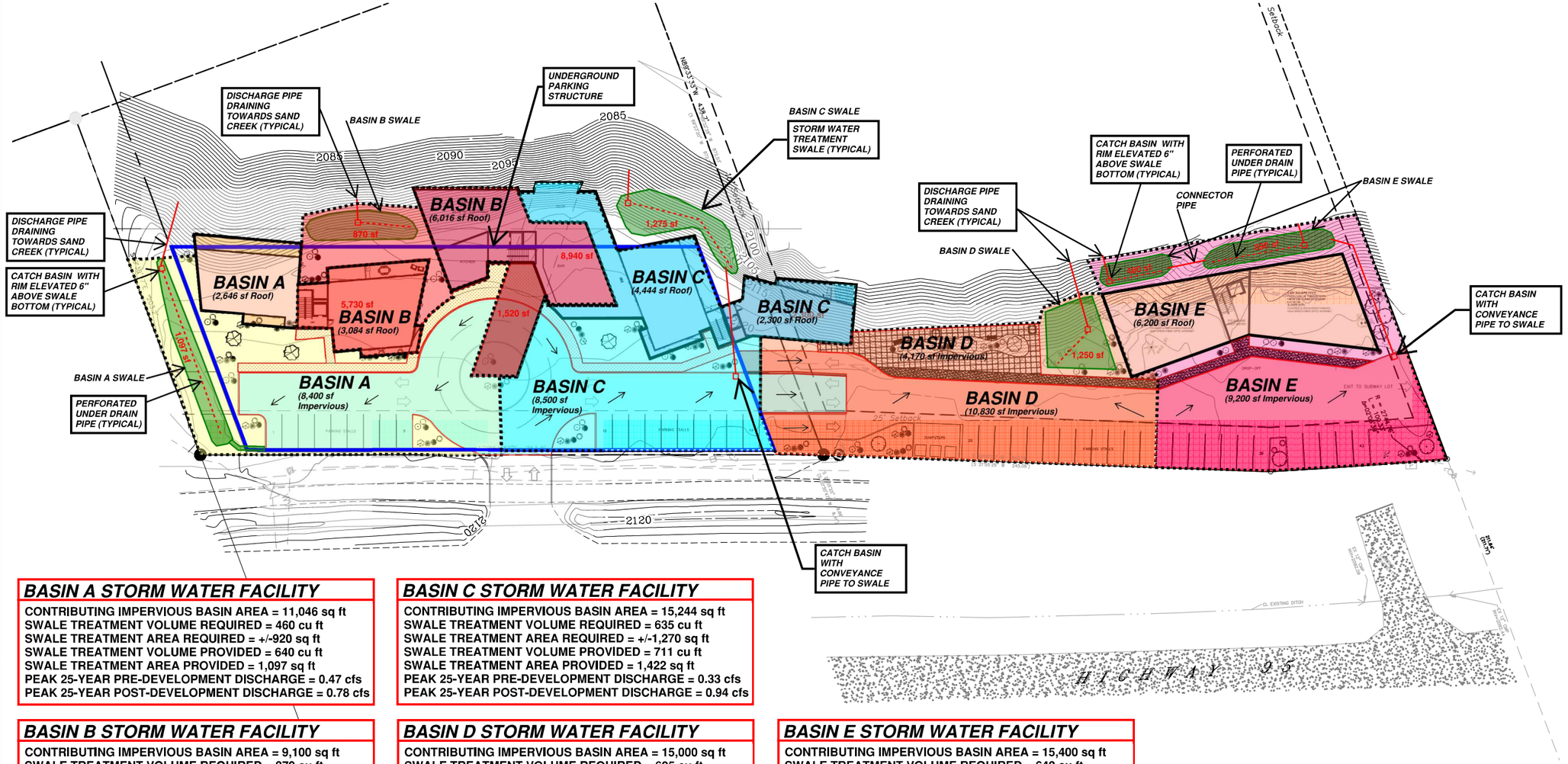
DATE: 3 JAN 2022

SANDCREEK RIDGE
RPP00000107502A + RPP00000107401A

CIVIL SITE PLAN

CONCEPTUAL POST-DEVELOPMENT BASIN MAP

C.U.P. APPLICATION SET ONLY. NOT FOR CONSTRUCTION



BASIN A STORM WATER FACILITY

CONTRIBUTING IMPERVIOUS BASIN AREA = 11,046 sq ft
SWALE TREATMENT VOLUME REQUIRED = 460 cu ft
SWALE TREATMENT AREA REQUIRED = +/-920 sq ft
SWALE TREATMENT VOLUME PROVIDED = 640 cu ft
SWALE TREATMENT AREA PROVIDED = 1,097 sq ft
PEAK 25-YEAR PRE-DEVELOPMENT DISCHARGE = 0.47 cfs
PEAK 25-YEAR POST-DEVELOPMENT DISCHARGE = 0.78 cfs

BASIN B STORM WATER FACILITY

CONTRIBUTING IMPERVIOUS BASIN AREA = 9,100 sq ft
SWALE TREATMENT VOLUME REQUIRED = 379 cu ft
SWALE TREATMENT AREA REQUIRED = +/-758 sq ft
SWALE TREATMENT VOLUME PROVIDED = 492 cu ft
SWALE TREATMENT AREA PROVIDED = 870 sq ft
PEAK 25-YEAR PRE-DEVELOPMENT DISCHARGE = 0.23 cfs
PEAK 25-YEAR POST-DEVELOPMENT DISCHARGE = 0.59 cfs

BASIN C STORM WATER FACILITY

CONTRIBUTING IMPERVIOUS BASIN AREA = 15,244 sq ft
SWALE TREATMENT VOLUME REQUIRED = 635 cu ft
SWALE TREATMENT AREA REQUIRED = +/-1,270 sq ft
SWALE TREATMENT VOLUME PROVIDED = 711 cu ft
SWALE TREATMENT AREA PROVIDED = 1,422 sq ft
PEAK 25-YEAR PRE-DEVELOPMENT DISCHARGE = 0.33 cfs
PEAK 25-YEAR POST-DEVELOPMENT DISCHARGE = 0.94 cfs

BASIN D STORM WATER FACILITY

CONTRIBUTING IMPERVIOUS BASIN AREA = 15,000 sq ft
SWALE TREATMENT VOLUME REQUIRED = 625 cu ft
SWALE TREATMENT AREA REQUIRED = +/-1,250 sq ft
SWALE TREATMENT VOLUME PROVIDED = 680 cu ft
SWALE TREATMENT AREA PROVIDED = 1,250 sq ft
PEAK 25-YEAR PRE-DEVELOPMENT DISCHARGE = 0.32 cfs
PEAK 25-YEAR POST-DEVELOPMENT DISCHARGE = 0.92 cfs

BASIN E STORM WATER FACILITY

CONTRIBUTING IMPERVIOUS BASIN AREA = 15,400 sq ft
SWALE TREATMENT VOLUME REQUIRED = 642 cu ft
SWALE TREATMENT AREA REQUIRED = +/-1,284 sq ft
SWALE TREATMENT VOLUME PROVIDED = 785 cu ft
SWALE TREATMENT AREA PROVIDED = 1,774 sq ft
PEAK 25-YEAR PRE-DEVELOPMENT DISCHARGE = 0.41 cfs
PEAK 25-YEAR POST-DEVELOPMENT DISCHARGE = 1.02 cfs

GRAPHIC SCALE
30 0 15 30
(IN FEET)
1 inch = 30 ft.

PROGRESS PRINT
(NOT FOR CONSTRUCTION)
THESE DRAWINGS HAVE BEEN RELEASED AT THE REQUEST OF THE CLIENT AND ARE NOT INTENDED FOR THE PURPOSES OF BIDDING, PERMITTING, OR CONSTRUCTION.

CONTRACTOR NOTE
ALL EXISTING UTILITIES SHOWN ON PLANS ARE TO BE VERIFIED HORIZONTALLY AND VERTICALLY PRIOR TO ANY CONSTRUCTION. ALL EXISTING FEATURES INCLUDING BURIED UTILITIES ARE SHOWN AS INDICATED ON RECORD MAPS AND SURVEYS FURNISHED BY OTHERS. WE ASSUME NO LIABILITY FOR THE ACCURACY OF THOSE RECORDS AND SURVEYS. CONTACT THE UTILITY OWNER/AGENCY FOR THE FINAL LOCATION OF EXISTING UTILITIES IN AREAS CRITICAL TO CONSTRUCTION.

UNDERGROUND SERVICE ALERT
ONE-CALL NUMBER
811
CALL TWO BUSINESS DAYS BEFORE YOU DIG

SAND CREEK RIDGE

SOK design studio
534 PINE STREET SANDPOINT IDAHO 83864
WWW.SOKDESIGNS.COM
INFO@SOKDESIGNS.COM
208.265.9160

C1

Appendix IV

Stormwater Facilities and Detention Basin Design

Bio-Infiltration Swale with Off-Site Discharge

Date: **1/7/2022**
Job No.: **21042-0088**
Arch. Name:
Project: **Sand Creek Ridge**

Description and Assumptions:
City of Ponderay
(See Project Location Map)
Design Frequency: 25 year
Basin Area < 10 acres, therefore use Rational Formula

$Q = C \times I \times A$ where Q = Runoff in cubic feet per second
C = Runoff Coefficient
I = Rainfall Intensity in inches per hour
A = Contributing Area in acres

1 Determine Weighted Runoff Coefficient, C and Area, A

Sub-Area: Basin A Pre-Development

Total Drainage Area (A):	16,889	s.f.	0.3877	ac.
Total PGIS:	-	s.f.	-	ac.

Surface Type	Area (s.f.)	Area (ac.)	C	C*Area in acres
Parking/Driveway (PGIS)	-	-	0.90	-
Sidewalk (PGIS)		-	0.90	-
Landscaping	12,889	0.30	0.30	0.09
Roof (NPGIS)	-	-	0.90	-
Gravel Parking Area	4,000	0.09	0.80	0.07
TOTAL	16,889	0.39		0.16

Weighted Runoff Coefficient (C) = (sum CA)/(sumA) = 0.42

2 Determine Rainfall Intensity, I

Duration (in minutes) is based on the Time of Concentration, Tc

Reach 1: Overland Flow

$$Tc = \frac{L}{K * \sqrt{(S)}}$$

where Tc = Time of Concentration in minutes of the longest route that the flow will take
L = Length in feet
K = Ground Cover Coefficient
S = Average Slope in ft/ft

L (ft)	K	S
165	420	0.01

Time of Concentration: 3.93 minutes

Tc shall not be less than 5 minutes, therefore:

Time of Concentration: 5.00 minutes

Intensity is calculated as: $I = \frac{m}{Tc^n}$

m	n
6.8	0.53

I = 2.90 in./hr.

3 Determine Peak Discharge, Q

Peak 25 yr Discharge = Q25 = CIA = 0.47 c.f.s.

707 W. Second Avenue
Spokane, WA 99201
(509) 455-4448

4 Determine Treatment Volume Required by Basin

Total PGIS Area: - sf

Required Volume Vs. Provided Volume

Treatment Method:	○ 1133A ◉ 1815A	Equal to first 1/2" of runoff	
Required Treatment Volume from Basin:		-	cu. ft.
Bioinfiltration Treatment Volume Provided:		640	cu. ft.

Bioinfiltration Area Bottom Width:	10.0	ft.	Width at treatment depth:	13.0	ft
Bioinfiltration Area Bottom Length:	110	ft.	Length at treatment depth:	113.0	ft
Bioinfiltration Treatment Depth:	0.5	ft.	(Bottom Elevation to Rim Elevation)		
Side Slope (X:1):	3				

Bioinfiltration Bottom Area:	1,097	sf
Bioinfiltration Top Area:	1,466	sf

Is the Bioinfiltration area large enough to hold the required treatment volume? **OK**

707 W. Second Avenue
Spokane, WA 99201
(509) 455-4448

Stormwater Facilities and Detention Basin Design

Bio-Infiltration Swale with Off-Site Discharge

Date: **1/7/2022**
Job No.: **21042-0088**
Arch. Name:
Project: **Sand Creek Ridge**

Description and Assumptions:
City of Ponderay
(See Project Location Map)
Design Frequency: 25 year
Basin Area < 10 acres, therefore use Rational Formula

$Q = C \times I \times A$ where Q = Runoff in cubic feet per second
C = Runoff Coefficient
I = Rainfall Intensity in inches per hour
A = Contributing Area in acres

1 Determine Weighted Runoff Coefficient, C and Area, A

Sub-Area: Basin B Pre-Development
Total Drainage Area (A): 11,600 s.f. 0.2663 ac.
Total PGIS: - s.f. - ac.

Surface Type	Area (s.f.)	Area (ac.)	C	C*Area in acres
Parking/Driveway (PGIS)	-	-	0.90	-
Sidewalk (PGIS)		-	0.90	-
Landscaping	11,600	0.27	0.30	0.08
Roof (NPGIS)	-	-	0.90	-
Gravel Parking Area	-	-	0.80	-
TOTAL	11,600	0.27		0.08

Weighted Runoff Coefficient (C) = (sum CA)/(sumA) = 0.30

2 Determine Rainfall Intensity, I

Duration (in minutes) is based on the Time of Concentration, Tc

Reach 1: Overland Flow where Tc = Time of Concentration in minutes of the longest route that the flow will take
L = Length in feet
K = Ground Cover Coefficient
S = Average Slope in ft/ft

$$Tc = \frac{L}{K * \sqrt{(S)}}$$

L (ft)	K	S
100	420	0.01

Time of Concentration: 2.38 minutes

Tc shall not be less than 5 minutes, therefore:

Time of Concentration: 5.00 minutes

Intensity is calculated as: $I = \frac{m}{Tc^n}$

m	n
6.8	0.53

I = 2.90 in./hr.

3 Determine Peak Discharge, Q

Peak 25 yr Discharge = Q25 = CIA = 0.23 c.f.s.

4 Determine Treatment Volume Required by Basin

Total PGIS Area: - sf

Required Volume Vs. Provided Volume

Treatment Method:	○ 1133A ◉ 1815A	Equal to first 1/2" of runoff	
Required Treatment Volume from Basin:		-	cu. ft.
Bioinfiltration Treatment Volume Provided:		492	cu. ft.

Bioinfiltration Area Bottom Width:	14.5	ft.	Width at treatment depth:	17.5	ft
Bioinfiltration Area Bottom Length:	60	ft.	Length at treatment depth:	63.0	ft
Bioinfiltration Treatment Depth:	0.5	ft.	(Bottom Elevation to Rim Elevation)		
Side Slope (X:1):	3				

Bioinfiltration Bottom Area:	870	sf
Bioinfiltration Top Area:	1,103	sf

Is the Bioinfiltration area large enough to hold the required treatment volume? **OK**

Stormwater Facilities and Detention Basin Design

Bio-Infiltration Swale with Off-Site Discharge

Date: **1/7/2022**
Job No.: **21042-0088**
Arch. Name:
Project: **Sand Creek Ridge**

Description and Assumptions:
City of Ponderay
(See Project Location Map)
Design Frequency: 25 year
Basin Area < 10 acres, therefore use Rational Formula

$Q = C \times I \times A$ where Q = Runoff in cubic feet per second
C = Runoff Coefficient
I = Rainfall Intensity in inches per hour
A = Contributing Area in acres

1 Determine Weighted Runoff Coefficient, C and Area, A

Sub-Area: Basin C Pre-Development

Total Drainage Area (A):	16,494	s.f.	0.3787	ac.
Total PGIS:	-	s.f.	-	ac.

Surface Type	Area (s.f.)	Area (ac.)	C	C*Area in acres
Parking/Driveway (PGIS)	-	-	0.90	-
Sidewalk (PGIS)		-	0.90	-
Landscaping	16,494	0.38	0.30	0.11
Roof (NPGIS)	-	-	0.90	-
Gravel Parking Area	-	-	0.80	-
TOTAL	16,494	0.38		0.11

Weighted Runoff Coefficient (C) = (sum CA)/(sumA) = 0.30

2 Determine Rainfall Intensity, I

Duration (in minutes) is based on the Time of Concentration, Tc

Reach 1: Overland Flow where Tc = Time of Concentration in minutes of the longest route that the flow will take
L = Length in feet
K = Ground Cover Coefficient
S = Average Slope in ft/ft

$$Tc = \frac{L}{K * \sqrt{(S)}}$$

L (ft)	K	S
100	420	0.01

Time of Concentration: 2.38 minutes

Tc shall not be less than 5 minutes, therefore:

Time of Concentration: 5.00 minutes

Intensity is calculated as: $I = \frac{m}{Tc^n}$

m	n
6.8	0.53

I = 2.90 in./hr.

3 Determine Peak Discharge, Q

Peak 25 yr Discharge = Q25 = CIA =	0.33 c.f.s.

4 Determine Treatment Volume Required by Basin

Total PGIS Area: - sf

Required Volume Vs. Provided Volume

Treatment Method:	○ 1133A ◉ 1815A	Equal to first 1/2" of runoff	
Required Treatment Volume from Basin:		-	cu. ft.
Bioinfiltration Treatment Volume Provided:		711	cu. ft.

Bioinfiltration Area Bottom Width:	15.9	ft.	Width at treatment depth:	18.9	ft
Bioinfiltration Area Bottom Length:	80	ft.	Length at treatment depth:	83.0	ft
Bioinfiltration Treatment Depth:	0.5	ft.	(Bottom Elevation to Rim Elevation)		
Side Slope (X:1):	3				

Bioinfiltration Bottom Area:	1,275	sf
Bioinfiltration Top Area:	1,572	sf

Is the Bioinfiltration area large enough to hold the required treatment volume? **OK**

Stormwater Facilities and Detention Basin Design

Bio-Infiltration Swale with Off-Site Discharge

Date: **1/7/2022**
Job No.: **21042-0088**
Arch. Name:
Project: **Sand Creek Ridge**

Description and Assumptions:
City of Ponderay
(See Project Location Map)
Design Frequency: 25 year
Basin Area < 10 acres, therefore use Rational Formula

$Q = C \times I \times A$ where Q = Runoff in cubic feet per second
C = Runoff Coefficient
I = Rainfall Intensity in inches per hour
A = Contributing Area in acres

1 Determine Weighted Runoff Coefficient, C and Area, A

Sub-Area: Basin D Pre-Development

Total Drainage Area (A):	15,900	s.f.	0.3650	ac.
Total PGIS:	-	s.f.	-	ac.

Surface Type	Area (s.f.)	Area (ac.)	C	C*Area in acres
Parking/Driveway (PGIS)	-	-	0.90	-
Sidewalk (PGIS)		-	0.90	-
Landscaping	15,900	0.37	0.30	0.11
Roof (NPGIS)	-	-	0.90	-
Gravel Parking Area	-	-	0.80	-
TOTAL	15,900	0.37		0.11

Weighted Runoff Coefficient (C) = (sum CA)/(sumA) = 0.30

2 Determine Rainfall Intensity, I

Duration (in minutes) is based on the Time of Concentration, Tc

Reach 1: Overland Flow where Tc = Time of Concentration in minutes of the longest route that the flow will take
L = Length in feet
K = Ground Cover Coefficient
S = Average Slope in ft/ft

$$Tc = \frac{L}{K * \sqrt{(S)}}$$

L (ft)	K	S
200	420	0.01

Time of Concentration: 4.76 minutes

Tc shall not be less than 5 minutes, therefore:

Time of Concentration: 5.00 minutes

Intensity is calculated as: $I = \frac{m}{Tc^n}$

m	n
6.8	0.53

I = 2.90 in./hr.

3 Determine Peak Discharge, Q

Peak 25 yr Discharge = Q25 = CIA =	0.32 c.f.s.

4 Determine Treatment Volume Required by Basin

Total PGIS Area: - sf

Required Volume Vs. Provided Volume

Treatment Method:	○ 1133A ◉ 1815A	Equal to first 1/2" of runoff	
Required Treatment Volume from Basin:		-	cu. ft.
Bioinfiltration Treatment Volume Provided:		377	cu. ft.

Bioinfiltration Area Bottom Width:	19.2	ft.	Width at treatment depth:	22.2	ft
Bioinfiltration Area Bottom Length:	35	ft.	Length at treatment depth:	38.0	ft
Bioinfiltration Treatment Depth:	0.5	ft.	(Bottom Elevation to Rim Elevation)		
Side Slope (X:1):	3				

Bioinfiltration Bottom Area:	670	sf
Bioinfiltration Top Area:	842	sf

Is the Bioinfiltration area large enough to hold the required treatment volume? **OK**

Stormwater Facilities and Detention Basin Design

Bio-Infiltration Swale with Off-Site Discharge

Date: **1/7/2022**
Job No.: **21042-0088**
Arch. Name:
Project: **Sand Creek Ridge**

Description and Assumptions:
City of Ponderay
(See Project Location Map)
Design Frequency: 25 year
Basin Area < 10 acres, therefore use Rational Formula

$Q = C \times I \times A$ where Q = Runoff in cubic feet per second
C = Runoff Coefficient
I = Rainfall Intensity in inches per hour
A = Contributing Area in acres

1 Determine Weighted Runoff Coefficient, C and Area, A

Sub-Area: Basin E Pre-Development

Total Drainage Area (A):	20,400	s.f.	0.4683	ac.
Total PGIS:	-	s.f.	-	ac.

Surface Type	Area (s.f.)	Area (ac.)	C	C*Area in acres
Parking/Driveway (PGIS)	-	-	0.90	-
Sidewalk (PGIS)		-	0.90	-
Landscaping	20,400	0.47	0.30	0.14
Roof (NPGIS)	-	-	0.90	-
Gravel Parking Area	-	-	0.80	-
TOTAL	20,400	0.47		0.14

Weighted Runoff Coefficient (C) = (sum CA)/(sumA) = 0.30

2 Determine Rainfall Intensity, I

Duration (in minutes) is based on the Time of Concentration, Tc

Reach 1: Overland Flow where Tc = Time of Concentration in minutes of the longest route that the flow will take
L = Length in feet
K = Ground Cover Coefficient
S = Average Slope in ft/ft

$$Tc = \frac{L}{K * \sqrt{(S)}}$$

L (ft)	K	S
200	420	0.01

Time of Concentration: 4.76 minutes

Tc shall not be less than 5 minutes, therefore:

Time of Concentration: 5.00 minutes

Intensity is calculated as: $I = \frac{m}{Tc^n}$

m	n
6.8	0.53

I = 2.90 in./hr.

3 Determine Peak Discharge, Q

Peak 25 yr Discharge = Q25 = CIA =	0.41 c.f.s.

4 Determine Treatment Volume Required by Basin

Total PGIS Area: - sf

Required Volume Vs. Provided Volume

Treatment Method:	○ 1133A ◉ 1815A	Equal to first 1/2" of runoff	
Required Treatment Volume from Basin:		-	cu. ft.
Bioinfiltration Treatment Volume Provided:		785	cu. ft.

Bioinfiltration Area Bottom Width:	11.4	ft.	Width at treatment depth:	14.4	ft
Bioinfiltration Area Bottom Length:	120	ft.	Length at treatment depth:	123.0	ft
Bioinfiltration Treatment Depth:	0.5	ft.	(Bottom Elevation to Rim Elevation)		
Side Slope (X:1):	3				

Bioinfiltration Bottom Area:	1,370	sf
Bioinfiltration Top Area:	1,774	sf

Is the Bioinfiltration area large enough to hold the required treatment volume? **OK**

Appendix V

Stormwater Facilities and Detention Basin Design

Bio-Infiltration Swale with Off-Site Discharge

Date: **1/7/2022**
Job No.: **21042-0088**
Arch. Name:
Project: **Sand Creek Ridge**

Description and Assumptions:
City of Ponderay
(See Project Location Map)
Design Frequency: 25 year
Basin Area < 10 acres, therefore use Rational Formula

$Q = C \times I \times A$ where Q = Runoff in cubic feet per second
C = Runoff Coefficient
I = Rainfall Intensity in inches per hour
A = Contributing Area in acres

1 Determine Weighted Runoff Coefficient, C and Area, A

Sub-Area: Basin A Post-Development
Total Drainage Area (A): 16,889 s.f. 0.3877 ac.
Total PGIS: 11,046 s.f. 0.25 ac.

Surface Type	Area (s.f.)	Area (ac.)	C	C*Area in acres
Parking/Driveway (PGIS)	8,400	0.19	0.90	0.17
Sidewalk (PGIS)		-	0.90	-
Landscaping	5,843	0.13	0.30	0.04
Roof (NPGIS)	2,646	0.06	0.90	0.05
		-		-
TOTAL	16,889	0.39		0.27

Weighted Runoff Coefficient (C) = (sum CA)/(sumA) = 0.69

2 Determine Rainfall Intensity, I

Duration (in minutes) is based on the Time of Concentration, Tc

Reach 1: Overland Flow where Tc = Time of Concentration in minutes of the longest route that the flow will take
L = Length in feet
K = Ground Cover Coefficient
S = Average Slope in ft/ft

$$Tc = \frac{L}{K * \sqrt{(S)}}$$

L (ft)	K	S
281	1200	0.01

Time of Concentration: 2.34 minutes

Tc shall not be less than 5 minutes, therefore:

Time of Concentration: 5.00 minutes

Intensity is calculated as: $I = \frac{m}{Tc^n}$

m	n
6.8	0.53

I = 2.90 in./hr.

3 Determine Peak Discharge, Q

Peak 25 yr Discharge = Q25 = CIA = 0.78 c.f.s.

4 Detention Basin Design using the Bowstring Method

Time Increment: 5 minutes
Time of Concentration: 5.00 minutes Single Depth Drywell(s)

707 W. Second Avenue
Spokane, WA 99201
(509) 455-4448

Desired Outflow: 0.47 cfs Double Depth Drywell(s)
Runoff Coefficient: 0.692
Area: 0.39 acres

Time (minutes)	Time (seconds)	Intensity (in/hr)	Q (cfs)	Volume In (cu.ft.)	Volume Out (cu.ft.)	Storage (cu.ft.)
0	0	-	-	-	-	-
2	120	2.90	0.78	101	83	18
5	300	2.90	0.78	241	208	**33**
10	600	2.01	0.54	328	415	(87)
15	900	1.62	0.43	395	623	(228)
20	1200	1.39	0.37	451	831	(380)
25	1500	1.23	0.33	500	1,039	(538)
30	1800	1.12	0.30	545	1,246	(702)
35	2100	1.03	0.28	585	1,454	(869)
40	2400	0.96	0.26	623	1,662	(1,039)
45	2700	0.90	0.24	658	1,870	(1,212)
50	3000	0.86	0.23	691	2,077	(1,386)
55	3300	0.81	0.22	722	2,285	(1,563)
60	3600	0.78	0.21	752	2,493	(1,740)
65	3900	0.74	0.20	781	2,700	(1,919)
70	4200	0.72	0.19	809	2,908	(2,100)
75	4500	0.69	0.19	835	3,116	(2,281)
80	4800	0.67	0.18	861	3,324	(2,463)
85	5100	0.65	0.17	886	3,531	(2,646)
90	5400	0.63	0.17	910	3,739	(2,830)
95	5700	0.61	0.16	933	3,947	(3,014)
100	6000	0.59	0.16	956	4,155	(3,199)

*Check formula depending on t < or > Tc

5 Determine Treatment Volume Required by Basin

Total PGIS Area: 11,046 sf

Required Volume Vs. Provided Volume

Treatment Method: ○ 1133A ◉ 1815A Equal to first 1/2" of runoff
Required Treatment Volume from Basin: 460 cu. ft.
Bioinfiltration Treatment Volume Provided: 640 cu. ft.

Bioinfiltration Area Bottom Width: 10.0 ft. Width at treatment depth: 13.0 ft
Bioinfiltration Area Bottom Length: 110 ft. Length at treatment depth: 113.0 ft
Bioinfiltration Treatment Depth: 0.5 ft. (Bottom Elevation to Rim Elevation)
Side Slope (X:1): 3

Bioinfiltration Bottom Area: 1,097 sf
Bioinfiltration Top Area: 1,466 sf

Is the Bioinfiltration area large enough to hold the required treatment volume? **OK**

707 W. Second Avenue
Spokane, WA 99201
(509) 455-4448

Stormwater Facilities and Detention Basin Design

Bio-Infiltration Swale with Off-Site Discharge

Date: **1/7/2022**
Job No.: **21042-0088**
Arch. Name:
Project: **Sand Creek Ridge**

Description and Assumptions:
City of Ponderay
(See Project Location Map)
Design Frequency: 25 year
Basin Area < 10 acres, therefore use Rational Formula

$Q = C \times I \times A$ where Q = Runoff in cubic feet per second
C = Runoff Coefficient
I = Rainfall Intensity in inches per hour
A = Contributing Area in acres

1 Determine Weighted Runoff Coefficient, C and Area, A

Sub-Area: Basin B Post-Development
Total Drainage Area (A): 11,600 s.f. 0.2663 ac.
Total PGIS: 9,100 s.f. 0.21 ac.

Surface Type	Area (s.f.)	Area (ac.)	C	C*Area in acres
Parking/Driveway (PGIS)	-	-	0.90	-
Sidewalk (PGIS)		-	0.90	-
Landscaping	2,500	0.06	0.30	0.02
Roof (NPGIS)	9,100	0.21	0.90	0.19
		-		-
TOTAL	11,600	0.27		0.21

Weighted Runoff Coefficient (C) = (sum CA)/(sumA) = 0.77

2 Determine Rainfall Intensity, I

Duration (in minutes) is based on the Time of Concentration, Tc

Reach 1: Overland Flow where Tc = Time of Concentration in minutes of the longest route that the flow will take
L = Length in feet
K = Ground Cover Coefficient
S = Average Slope in ft/ft

$$Tc = \frac{L}{K * \sqrt{(S)}}$$

L (ft)	K	S
281	1200	0.01

Time of Concentration: 2.34 minutes

Tc shall not be less than 5 minutes, therefore:

Time of Concentration: 5.00 minutes

Intensity is calculated as: $I = \frac{m}{Tc^n}$

m	n
6.8	0.53

I = 2.90 in./hr.

3 Determine Peak Discharge, Q

Peak 25 yr Discharge = Q25 = CIA =	0.59 c.f.s.

4 Detention Basin Design using the Bowstring Method

Time Increment:	5	minutes
Time of Concentration:	5.00	minutes
Desired Outflow:	0.23	cfs
Runoff Coefficient:	0.771	
Area:	0.27	acres

Single Depth Drywell(s)
Double Depth Drywell(s)

Time (minutes)	Time (seconds)	Intensity (in/hr)	Q (cfs)	Volume In (cu.ft.)	Volume Out (cu.ft.)	Storage (cu.ft.)
0	0	-	-	-	-	-
2	120	2.90	0.59	74	92	(18)
5	300	2.90	0.59	181	231	(50)
10	600	2.01	0.41	249	462	(213)
15	900	1.62	0.33	301	694	(393)
20	1200	1.39	0.29	344	925	(581)
25	1500	1.23	0.25	381	1,156	(775)
30	1800	1.12	0.23	415	1,387	(972)
35	2100	1.03	0.21	446	1,618	(1,172)
40	2400	0.96	0.20	475	1,850	(1,375)
45	2700	0.90	0.19	502	2,081	(1,579)
50	3000	0.86	0.18	527	2,312	(1,785)
55	3300	0.81	0.17	551	2,543	(1,992)
60	3600	0.78	0.16	574	2,774	(2,200)
65	3900	0.74	0.15	596	3,006	(2,409)
70	4200	0.72	0.15	617	3,237	(2,619)
75	4500	0.69	0.14	638	3,468	(2,830)
80	4800	0.67	0.14	657	3,699	(3,042)
85	5100	0.65	0.13	676	3,931	(3,254)
90	5400	0.63	0.13	695	4,162	(3,467)
95	5700	0.61	0.12	713	4,393	(3,680)
100	6000	0.59	0.12	730	4,624	(3,894)

*Check formula depending on t < or > Tc

5 Determine Treatment Volume Required by Basin

Total PGIS Area: 9,100 sf

Required Volume Vs. Provided Volume

Treatment Method:	○ 1133A ◉ 1815A	Equal to first 1/2" of runoff	
Required Treatment Volume from Basin:		379	cu. ft.
Bioinfiltration Treatment Volume Provided:		492	cu. ft.

Bioinfiltration Area Bottom Width:	14.5	ft.	Width at treatment depth:	17.5 ft
Bioinfiltration Area Bottom Length:	60	ft.	Length at treatment depth:	63.0 ft
Bioinfiltration Treatment Depth:	0.5	ft.	(Bottom Elevation to Rim Elevation)	
Side Slope (X:1):	3			

Bioinfiltration Bottom Area:	870	sf
Bioinfiltration Top Area:	1,103	sf

Is the Bioinfiltration area large enough to hold the required treatment volume? **OK**

Stormwater Facilities and Detention Basin Design

Bio-Infiltration Swale with Off-Site Discharge

Date: **1/7/2022**
Job No.: **21042-0088**
Arch. Name:
Project: **Sand Creek Ridge**

Description and Assumptions:
City of Ponderay
(See Project Location Map)
Design Frequency: 25 year
Basin Area < 10 acres, therefore use Rational Formula

$Q = C \times I \times A$ where Q = Runoff in cubic feet per second
C = Runoff Coefficient
I = Rainfall Intensity in inches per hour
A = Contributing Area in acres

1 Determine Weighted Runoff Coefficient, C and Area, A

Sub-Area: Basin C Post-Development
Total Drainage Area (A): 16,494 s.f. 0.3787 ac.
Total PGIS: 15,244 s.f. 0.35 ac.

Surface Type	Area (s.f.)	Area (ac.)	C	C*Area in acres
Parking/Driveway (PGIS)	8,500	0.20	0.90	0.18
Sidewalk (PGIS)		-	0.90	-
Landscaping	1,250	0.03	0.30	0.01
Roof (NPGIS)	6,744	0.15	0.90	0.14
		-		-
TOTAL	16,494	0.38		0.32

Weighted Runoff Coefficient (C) = (sum CA)/(sumA) = 0.85

2 Determine Rainfall Intensity, I

Duration (in minutes) is based on the Time of Concentration, Tc

Reach 1: Overland Flow where Tc = Time of Concentration in minutes of the longest route that the flow will take
L = Length in feet
K = Ground Cover Coefficient
S = Average Slope in ft/ft

$$Tc = \frac{L}{K * \sqrt{(S)}}$$

L (ft)	K	S
300	1200	0.01

Time of Concentration: 2.50 minutes

Tc shall not be less than 5 minutes, therefore:

Time of Concentration: 5.00 minutes

Intensity is calculated as: $I = \frac{m}{Tc^n}$

m	n
6.8	0.53

I = 2.90 in./hr.

3 Determine Peak Discharge, Q

Peak 25 yr Discharge = Q25 = CIA =	0.94 c.f.s.

4 Detention Basin Design using the Bowstring Method

Time Increment:	5	minutes	
Time of Concentration:	5.00	minutes	Single Depth Drywell(s)
Desired Outflow:	0.33	cfs	Double Depth Drywell(s)
Runoff Coefficient:	0.855		
Area:	0.38	acres	

Time (minutes)	Time (seconds)	Intensity (in/hr)	Q (cfs)	Volume In (cu.ft.)	Volume Out (cu.ft.)	Storage (cu.ft.)
0	0	-	-	-	-	-
2	120	2.90	0.94	119	103	16
5	300	2.90	0.94	288	256	**31**
10	600	2.01	0.65	394	513	(119)
15	900	1.62	0.52	475	769	(294)
20	1200	1.39	0.45	543	1,025	(483)
25	1500	1.23	0.40	602	1,282	(680)
30	1800	1.12	0.36	655	1,538	(883)
35	2100	1.03	0.33	704	1,795	(1,090)
40	2400	0.96	0.31	750	2,051	(1,301)
45	2700	0.90	0.29	792	2,307	(1,515)
50	3000	0.86	0.28	832	2,564	(1,732)
55	3300	0.81	0.26	870	2,820	(1,950)
60	3600	0.78	0.25	906	3,076	(2,170)
65	3900	0.74	0.24	941	3,333	(2,392)
70	4200	0.72	0.23	974	3,589	(2,615)
75	4500	0.69	0.22	1,006	3,845	(2,839)
80	4800	0.67	0.22	1,037	4,102	(3,065)
85	5100	0.65	0.21	1,067	4,358	(3,291)
90	5400	0.63	0.20	1,096	4,614	(3,519)
95	5700	0.61	0.20	1,124	4,871	(3,747)
100	6000	0.59	0.19	1,151	5,127	(3,976)

*Check formula depending on t < or > Tc

5 Determine Treatment Volume Required by Basin

Total PGIS Area: 15,244 sf

Required Volume Vs. Provided Volume

Treatment Method:	○ 1133A ◉ 1815A	Equal to first 1/2" of runoff	
Required Treatment Volume from Basin:		635	cu. ft.
Bioinfiltration Treatment Volume Provided:		711	cu. ft.

Bioinfiltration Area Bottom Width:	15.9 ft.		Width at treatment depth:	18.9 ft
Bioinfiltration Area Bottom Length:	80 ft.		Length at treatment depth:	83.0 ft
Bioinfiltration Treatment Depth:	0.5 ft.	(Bottom Elevation to Rim Elevation)		
Side Slope (X:1):	3			

Bioinfiltration Bottom Area:	1,275	sf
Bioinfiltration Top Area:	1,572	sf

Is the Bioinfiltration area large enough to hold the required treatment volume? **OK**

Stormwater Facilities and Detention Basin Design

Bio-Infiltration Swale with Off-Site Discharge

Date: **1/7/2022**
Job No.: **21042-0088**
Arch. Name:
Project: **Sand Creek Ridge**

Description and Assumptions:
City of Ponderay
(See Project Location Map)
Design Frequency: 25 year
Basin Area < 10 acres, therefore use Rational Formula

$Q = C \times I \times A$ where Q = Runoff in cubic feet per second
C = Runoff Coefficient
I = Rainfall Intensity in inches per hour
A = Contributing Area in acres

1 Determine Weighted Runoff Coefficient, C and Area, A

Sub-Area: Basin D Post-Development
Total Drainage Area (A): 15,900 s.f. 0.3650 ac.
Total PGIS: 15,000 s.f. 0.34 ac.

Surface Type	Area (s.f.)	Area (ac.)	C	C*Area in acres
Parking/Driveway (PGIS)	15,000	0.34	0.90	0.31
Sidewalk (PGIS)		-	0.90	-
Landscaping	900	0.02	0.30	0.01
Roof (NPGIS)	-	-	0.90	-
		-		-
TOTAL	15,900	0.37		0.32

Weighted Runoff Coefficient (C) = (sum CA)/(sumA) = 0.87

2 Determine Rainfall Intensity, I

Duration (in minutes) is based on the Time of Concentration, Tc

Reach 1: Overland Flow where Tc = Time of Concentration in minutes of the longest route that the flow will take
L = Length in feet
K = Ground Cover Coefficient
S = Average Slope in ft/ft

$$Tc = \frac{L}{K * \sqrt{(S)}}$$

L (ft)	K	S
300	1200	0.01

Time of Concentration: 2.50 minutes

Tc shall not be less than 5 minutes, therefore:

Time of Concentration: 5.00 minutes

Intensity is calculated as: $I = \frac{m}{Tc^n}$

m	n
6.8	0.53

I = 2.90 in./hr.

3 Determine Peak Discharge, Q

Peak 25 yr Discharge = Q25 = CIA =	0.92 c.f.s.

4 Detention Basin Design using the Bowstring Method

Time Increment:	5	minutes	
Time of Concentration:	5.00	minutes	Single Depth Drywell(s)
Desired Outflow:	0.33	cfs	Double Depth Drywell(s)
Runoff Coefficient:	0.866		
Area:	0.37	acres	

Time (minutes)	Time (seconds)	Intensity (in/hr)	Q (cfs)	Volume In (cu.ft.)	Volume Out (cu.ft.)	Storage (cu.ft.)
0	0	-	-	-	-	-
2	120	2.90	0.92	116	104	12
5	300	2.90	0.92	281	260	**21**
10	600	2.01	0.63	385	520	(135)
15	900	1.62	0.51	464	779	(315)
20	1200	1.39	0.44	530	1,039	(509)
25	1500	1.23	0.39	588	1,299	(711)
30	1800	1.12	0.35	640	1,559	(919)
35	2100	1.03	0.33	688	1,819	(1,131)
40	2400	0.96	0.30	732	2,078	(1,346)
45	2700	0.90	0.29	774	2,338	(1,565)
50	3000	0.86	0.27	813	2,598	(1,785)
55	3300	0.81	0.26	850	2,858	(2,008)
60	3600	0.78	0.25	885	3,118	(2,233)
65	3900	0.74	0.24	919	3,378	(2,459)
70	4200	0.72	0.23	951	3,637	(2,686)
75	4500	0.69	0.22	983	3,897	(2,914)
80	4800	0.67	0.21	1,013	4,157	(3,144)
85	5100	0.65	0.20	1,042	4,417	(3,375)
90	5400	0.63	0.20	1,070	4,677	(3,606)
95	5700	0.61	0.19	1,098	4,936	(3,839)
100	6000	0.59	0.19	1,125	5,196	(4,072)

*Check formula depending on t < or > Tc

5 Determine Treatment Volume Required by Basin

Total PGIS Area: 15,000 sf

Required Volume Vs. Provided Volume

Treatment Method: ○ 1133A ◉ 1815A	Equal to first 1/2" of runoff		
Required Treatment Volume from Basin:		625	cu. ft.
Bioinfiltration Treatment Volume Provided:		680	cu. ft.

Bioinfiltration Area Bottom Width:	32.9	ft.	Width at treatment depth:	35.9	ft
Bioinfiltration Area Bottom Length:	38	ft.	Length at treatment depth:	41.0	ft
Bioinfiltration Treatment Depth:	0.5	ft.	(Bottom Elevation to Rim Elevation)		
Side Slope (X:1):	3				

Bioinfiltration Bottom Area:	1,250	sf
Bioinfiltration Top Area:	1,472	sf

Is the Bioinfiltration area large enough to hold the required treatment volume? **OK**

Stormwater Facilities and Detention Basin Design

Bio-Infiltration Swale with Off-Site Discharge

Date: **1/7/2022**
Job No.: **21042-0088**
Arch. Name:
Project: **Sand Creek Ridge**

Description and Assumptions:
City of Ponderay
(See Project Location Map)
Design Frequency: 25 year
Basin Area < 10 acres, therefore use Rational Formula

$Q = C \times I \times A$ where Q = Runoff in cubic feet per second
C = Runoff Coefficient
I = Rainfall Intensity in inches per hour
A = Contributing Area in acres

1 Determine Weighted Runoff Coefficient, C and Area, A

Sub-Area: Basin E Post-Development
Total Drainage Area (A): 20,200 s.f. 0.4637 ac.
Total PGIS: 15,400 s.f. 0.35 ac.

Surface Type	Area (s.f.)	Area (ac.)	C	C*Area in acres
Parking/Driveway (PGIS)	9,200	0.21	0.90	0.19
Sidewalk (PGIS)		-	0.90	-
Landscaping	4,800	0.11	0.30	0.03
Roof (NPGIS)	6,200	0.14	0.90	0.13
		-		-
TOTAL	20,200	0.46		0.35

Weighted Runoff Coefficient (C) = (sum CA)/(sumA) = 0.76

2 Determine Rainfall Intensity, I

Duration (in minutes) is based on the Time of Concentration, Tc

Reach 1: Overland Flow where Tc = Time of Concentration in minutes of the longest route that the flow will take
L = Length in feet
K = Ground Cover Coefficient
S = Average Slope in ft/ft

$$Tc = \frac{L}{K * \sqrt{(S)}}$$

L (ft)	K	S
300	1200	0.01

Time of Concentration: 2.50 minutes

Tc shall not be less than 5 minutes, therefore:

Time of Concentration: 5.00 minutes

Intensity is calculated as: $I = \frac{m}{Tc^n}$

m	n

	6.8	0.53

I =	2.90	in./hr.

3 Determine Peak Discharge, Q

Peak 25 yr Discharge = Q25 = CIA = 1.02 c.f.s.

4 Detention Basin Design using the Bowstring Method

Time Increment:	5	minutes		
Time of Concentration:	5.00	minutes		Single Depth Drywell(s)
Desired Outflow:	0.41	cfs		Double Depth Drywell(s)
Runoff Coefficient:	0.757			
Area:	0.46	acres		

Time (minutes)	Time (seconds)	Intensity (in/hr)	Q (cfs)	Volume In (cu.ft.)	Volume Out (cu.ft.)	Storage (cu.ft.)
0	0	-	-	-	-	-
2	120	2.90	1.02	131	91	40
5	300	2.90	1.02	314	227	**87**
10	600	2.01	0.70	429	454	(26)
15	900	1.62	0.57	516	682	(165)
20	1200	1.39	0.49	590	909	(319)
25	1500	1.23	0.43	654	1,136	(482)
30	1800	1.12	0.39	712	1,363	(651)
35	2100	1.03	0.36	765	1,591	(826)
40	2400	0.96	0.34	814	1,818	(1,004)
45	2700	0.90	0.32	860	2,045	(1,185)
50	3000	0.86	0.30	904	2,272	(1,369)
55	3300	0.81	0.29	945	2,500	(1,555)
60	3600	0.78	0.27	984	2,727	(1,743)
65	3900	0.74	0.26	1,022	2,954	(1,932)
70	4200	0.72	0.25	1,058	3,181	(2,124)
75	4500	0.69	0.24	1,092	3,408	(2,316)
80	4800	0.67	0.23	1,126	3,636	(2,510)
85	5100	0.65	0.23	1,158	3,863	(2,705)
90	5400	0.63	0.22	1,190	4,090	(2,900)
95	5700	0.61	0.21	1,220	4,317	(3,097)
100	6000	0.59	0.21	1,250	4,545	(3,295)

*Check formula depending on t < or > Tc

5 Determine Treatment Volume Required by Basin

Total PGIS Area: 15,400 sf

Required Volume Vs. Provided Volume

Treatment Method: ○ 1133A ◉ 1815A	Equal to first 1/2" of runoff		
Required Treatment Volume from Basin:		642	cu. ft.
Bioinfiltration Treatment Volume Provided:		785	cu. ft.

Bioinfiltration Area Bottom Width:	11.4	ft.	Width at treatment depth:	14.4	ft
Bioinfiltration Area Bottom Length:	120	ft.	Length at treatment depth:	123.0	ft
Bioinfiltration Treatment Depth:	0.5	ft.	(Bottom Elevation to Rim Elevation)		
Side Slope (X:1):	3				

Bioinfiltration Bottom Area:	1,370	sf
Bioinfiltration Top Area:	1,774	sf

Is the Bioinfiltration area large enough to hold the required treatment volume? **OK**