DESIGN REPORT - SITE, GRADING, STORMWATER & EROSION PLAN

For Phil McNearney

RPP39050000040A aka McNearney Mill, Lot 6
Ponderay Idaho, 83852

Figure 1: Project Vicinity Map

PROFESSIONAL ENGINEER
REGISTERED
10086
11/18/21
STATE OF IDAHO
DANIEL W. LARSON

Revised
RECEIVED

NOV 17 2021

PLANNING OFFICE
CITY OF PONDERAY

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Introduction

This report has been prepared to address design considerations for a site plan application on Lot 6 of the McNearney Mill Subdivision for Phil McNearney. More specifically, this Site, Stormwater, and Erosion Control Plan addresses site changes to construct a new industrial building (Shop) as well as provide stormwater controls for improvements planned for the site at this time.

The property will be modified and regraded to direct runoff away from the proposed building. Stormwater runoff will be directed to modified existing drainage ditches or pervious grassed areas (swales) to disconnect and reduce the impervious footprint (Idaho Catalog of Storm Water Best Management Practices, 2020)).

This report, calculations, and drawings are for review by the City of Ponderay and shall become the property of the Owner when approved for construction. All other requirements for any future building permits must be met by the Owner. This report addresses design decisions and calculations that will aid the City, the Contractor, and the Owner in the review of this proposal.

Project Location

The site is located off McNearney Mill Lane in Ponderay Idaho.

Property Identification Numbers *RPP39050000060A* aka Lot 6, McNearney Mill, City of Ponderay, Bonner County, Idaho. Section 2, Township 57 North, Range 2 West, Boise Meridian.

Property owner:	**Location:**	**Size of Lot:**
Phil McNearney	Section 2, T57N, R2W	0.6 Acres

Geotechnical

The USDA NRCS Web Soil Survey was used to categorize the soil characteristics at this site. A site visit confirmed the findings of the NRCS and the soils appeared to be consistent with the Survey. In general, the site consists of Odenson silt loams, soils in Hydrologic group B/D. These soils have a low infiltration rate (high runoff potential), are very deep and very poorly drained. These consist chiefly of volcanic ash and loess.

Soil amendment and underdrains (where feasible) are recommended for any infiltration treatment design. All required testing and inspections will be coordinated by the Owner and Contractor and/or his representative and will be submitted to the Engineer if required at the completion of construction.

Water System

The city of Sandpoint supplies water to the site.

Sewer System

The site is currently served by the Kootenai-Ponderay Sewer District.

Road Specifications

McNearney Mill Lane is a privately owned and maintained shared driveway.

Stormwater Facility Calculations

Treatment System

All new impervious surface areas are required to be treated per the standards of Ponderay Idaho. The Idaho Catalog of Storm Water Best Management Practices manual allows for a variety of treatment methods to be considered. To treat the increased impervious runoff area from the development, grassed infiltration areas (BMP 10) or Bioretention Basin (BMP 18) are proposed. Per the Manual, both methods are volume based treatments designed to treat the first ½" of runoff for all impervious surface areas.

Collection, Conveyance, and Disposal System

Hydrologic Model Used

Modified Rational Method - Bowstring

Assumptions Made

- Intensity-Duration-Frequency Curve: Zone C
- Design Storm Return Period: 25-Year, 24- hour
- Pre-Developed Rational Method Runoff Coefficient: 0.55
- Pre-developed Outflow Rate: 0.02 cfs
- New Impervious Area: 9,916 SF
- Required Stormwater Treatment Area: 620 SF at 6" depth (413 CF)
- Proposed Stormwater Treatment Area: 694 SF at 6" depth (458 CF)
- Developed Rational Runoff Method Coefficient: 0.69
- Critical Intensity/Duration Storm: (24-Hour) (0.11 inches/hr)
- Designed Outflow Rate: 0.02 cfs
- Soil Infiltration Rate Assumed: 0.125 in/hr (0.020 cfs)

Summary of Calculations

- **Treatment Volume** is calculated with the following equation:

$$(V_{treatment}\ cf) = (A_{impervious}\ sf) \times \left[\left(\frac{1}{2} in \text{ of runoff}\right) \times \left(\frac{1ft}{12in}\right)\right]$$

- **Infiltration Disposal Rate** was calculated with the following equation:

$$(Q_{infiltrate}\ CFS) = (A_{treatment}\ sf) \times (f_s\ \frac{in}{hr}) \times \left(\frac{1\ ft}{12\ in}\right) \times \left(\frac{1\ hr}{360\ sec}\right)$$

where f_s is the Infiltration Rate assumed or proposed for a given soils (~0.125 in/hr).

1. A pre-developed **peak runoff rate** was calculated for the 25-year storm event using the Rational Method (ITD IDF Curve for Idaho, Zone C) and Time of Concentration. The maximum release rate for the post-developed 25-Year peak storm event was the predeveloped runoff rate assuming a 10 min time of concentration.
2. Using this release rate, the critical 25-Year storm event was found to be at the 1440-minute (24 hour) duration storm. This event was used to calculate the volume required (432 CF) to fully contain the **peak runoff volume** for a 25-Year, 24-hour storm event.

Stormwater Facility Construction and Maintenance

The storm water treatment and retention solution for this site is a biofiltration facility.

Constructions considerations

BMP 10: Bioinfiltration Swale & BMP 18: Bioretention Basin

Landscaped areas that are generally flat and combine grasses, vegetation, and soils remove storm water pollutants through filtration, soil sorption, and plant uptake. They require little or no maintenance (unless obvious failure occurs) but are more expensive to construct. Storm water flows greater than the design flow overflow to the natural drainage channels or facilities shown on the plans. This takes advantage of existing natural surface depressions. Bioinfiltration is suitable on soils with infiltration rates of 0.5 to 2.4 inches/hour. Higher soil infiltration rates will require additional mitigation to slow transmissivity.

1) Scarify or till native soil at subgrade. If shrubs and trees are to be incorporated and soil amendments are needed place 18-inches of sand at the bottom of the facility.
2) Topsoil should be less than 25% clay, 8-9% organic material, and at least 60% sand 2 ft to 4 ft thick.
3) Place a 3-inch layer of mulch over the topsoil and till to 6-inch depth.to line the facility before planting.
4) A mixture of trees, shrubs, and grass is preferred.
5) Water-loving plantings should be chosen (Alder, Willow, Ash, Dogwood, Sedges, etc.) or ponding depth should be limited to 6 inches.
6) Grass or sod may be used but should be a species adapted to permeable soils. Avoid grass intended for clay soils or sod grown on clay.
7) If a grass species for mowing is chosen, grass height should be kept at 3 inches to 9 inches and all grass clippings removed.
8) Infiltration rates should not exceed 9 inches per hour. Undesirable ponding may occur on some native soils and soil amendments or underdrains may be required.

BMP 31: Topsoiling

Topsoiling places material suitable for vegetative growth over disturbed lands (2:1 slopes or less) and in areas not planned for landscaping and may include native seeds and propagules in the plant growth mix. Soils from off site may be imported but reusing the existing topsoil that has been stripped and stockpiled during earlier site development activities is preferred.

Topsoiling adds biofiltration capacity; increases storm water retention and, through a more established root zone, results in less watering, fertilizing, and pesticide applications.

1) Protect topsoil stockpiles from erosion (BMP 44).
2) Topsoil should not be applied over a subsoil of contrasting permeability or when subsoil is frozen or saturated.
3) Topsoil that has been stockpiled should be amended prior to placement.
4) Place topsoil at a compacted depth of 4 inches on slopes 3:1 or steeper. Place 8 inches or deeper on flatter slopes.
5) Topsoil placed should be free of debris, sticks, large roots, weeds, and stones larger than 1.5 inches.

6) Before placing, it is recommended to have a lab sample the topsoil. A pH of 6.0 – 7.5 is recommended and an organic content of not less than 1.5% by weight. Apply lime or gypsum to raise pH and loosen high clay content soils. Do not use soils with soluble salt content over 500 ppm.
7) For topsoil pH 6.0 or below, consider landscaping with woody species instead of grasses.
8) Scarify the subgrade 4-inches deep prior to placement. On slopes, track a bulldozer vertically over the slope to create slots for bonding of subgrade to topsoil.
9) Stabilize topsoil with landscaping (BMP 32), mulching (BMP 52), matting (BMP 54) or using soil binders (BMP 55).

BMP 32: Landscaping

Establish vegetative cover over all disturbed areas by following the landscaping plans. Methods include seeding, sodding, planting perennial grasses, legumes, native shrubs, wild flowers, bushes, and trees. Native vegetation is strongly encouraged for all landscaping efforts. See Bonner County Title 12; Appendix B: Native Plant List for additional information and guidance.

Maintenance Requirements
Before landscape and stormwater facility sites are fully constructed and established, inspect topsoil periodically and after major storm events for signs of erosion (rills or gullies). Repair damaged areas with additional topsoil, add additional erosion control measures, and reseed as needed.

After construction, monitor soil stability and vegetation. Adjust the soil with amendments, enhancements, microbial inoculants, irrigation, fertilizers, pesticides, and herbicides as needed. Replanting may be required during the first 2 years.

If non-native plants are used in the final landscape plantings, carefully monitor turn, shrubs, and perennial plantings. Add irrigation to water throughout the lifecycle of non-native species not accustomed to drought.

Native species require less maintenance, minimal watering after establishment, and need little or no chemical fertilizers or pesticides.

Grow plantings into dense groupings to reduce or eliminate unwanted weeds and invasive species. Mulch landscape areas with clean straw, bark chips, or wood shavings to preserve soils moisture and block weeds. Cut weeds or use herbicides to prevent damage to landscape plantings from pulling.

Inspect facilities monthly and after large storm events for the first two years. Clear outlets and pipes of sediment and debris. Once the facilities are functioning as designed and no sediment problems exist, reduce inspections to semiannually and after large storm events. Check for functional inlets, erosion, vegetation health, ponding, debris, and general conformance with the design.

Sediment should be removed after construction and before planting. Prevent presilting of facilities during construction by practicing good erosion control measures. Avoid over-compacting soils during construction. Remove sediment from landscape areas in early spring if it begins to inhibit the growth of grass. Avoid over irrigation (don't saturate the soils).

Erosion and Sediment Control BMP's

To properly construct this project, one-half acre of the site will be disturbed, including:

- Tree and brush removal
- Stripping and stockpiling of topsoil
- Driveway grading
- Building construction
- Fine grading of landscape and stormwater facilities
- Landscaping and planting

All disturbed exposed areas will be covered with suitable topsoil, mulched, and either landscaped or re-vegetated on slopes 2:1 or less. Slopes steeper than 2:1 will be stabilized with stone mulch, riprap or boulders.

Temporary Erosion and Sediment Controls

All temporary erosion control features shall be installed and maintained as detailed and shall prevent stormwater runoff or sediment migration off-site. Barriers shall be placed perpendicular to the direction of flow and shall be deployed before construction begins. Leave all temporary stormwater and erosion control measures in place until vegetation has been re-established. Construct fiber rolls as shown on plans or where overland flow may allow runoff to leave the construction site or enter the neighboring properties. Mulching of disturbed, final graded areas can be done with hay, straw, or grass clippings (8-10 pounds per 100 sf).

BMP 36: Constructing Timing

Construction activities for this site grading will proceed as follows:

Construction Schedule	Timing
Install Temporary Erosion Controls	Dec-21
Excavation and grading	Dec-21
Rough grade landscape areas and bioswales	Dec-21
Excavate and Pour Building Foundations	Mar-21
Utility Construction	Apr-21
Begin Framing	Apr-22
Finish grade landscape areas	Oct-22
Reseed slopes and distrubed areas	Oct-22

By constructing in the dry season, the risk of sediment laden runoff is minimized and the sequence of construction will occur during optimal conditions. The Owner and Contractor shall continually monitor the site conditions and progress of the work, keeping erosion control measures in good repair.

BMP 37: Staging Areas

Construction staging areas are limited by the site topography and available space on or adjacent to the property. The existing driveway will be utilized for staging until it is fully removed during construction. Additional staging areas along the developed private road network above the property will be required.

BMP 38: Preserve Topsoil and Vegetation

Construction fencing (orange or green) should be placed around all trees to be protected (see Plans) and areas of topsoil or natural areas to remain undisturbed to minimize bare soil exposure. Grading activity areas shall be limited to those shown on the Plan. Keep all construction equipment, materials, and waste within the areas designated on the Plan and out of areas to be preserved.

BMP 39: Clearing Limits

Minimize the total area of bare soil exposed to 1 acre and cover with straw or stone mulch within 14 days of disturbance. Mulch slopes and cover exposed driveway surfaces with rock as grading progresses to reduce dust and erosion potential. Do not disturb areas outside of the grading limits established by the Plan. At the end of construction, prepare all slopes and landscape areas for seeding or include seed in the erosion control mulch used.

BMP 40: Vehicle Sediment Control

A pad of coarse aggregate or a construction mat should be installed at the entry/exit of the project. If tracking onto the existing pavement is a problem, additional measures such as rattle plates, a wheel wash, or rumble strips should be included.

BMP 41: Stabilize Construction Roads and Staging Areas

A pad of coarse aggregate should be laid for staging areas if not already graveled or otherwise impervious.

BMP 42: Erosion Prevention on Construction Roads

Prevent erosion on the access road with waterbars, road sloping, or rolling dips to direct stormwater away from the road surface.

BMP 43: Dust Control

Control dust and wind erosion by roughening the disturbed surface areas to reduce with velocity. Seed, sod, mulch, roughen surface, use sprinklers, or us soil binders on disturbed areas to be stabilized. For construction roadways, stabilize (BMP 41), sprinkle, or use chemical tackifiers to eliminate dust. Do not overwater roadways, creating erosion. Additional dust control measures to consider:

- Minimize disturbed surface area by limiting the amount of bare soil exposed at one time.
- Limit work on exposed soils on windy days.
- Clean up dusty spills immediately and plan ahead to limit dust.
- Establish vegetation on disturbed areas already graded.
- Consider using wind barriers (berms, silt fence, or similar)
- Roughen surface using tilling, disking, furrows across prevailing wind, rip or scarify to an irregular surface (BMP 58).
- Water or sweep often.
- Spray-on chemical soil treatments (palliatives), including mineral salts, petroleum resins, asphalt emulsion, acrylics, and adhesives.
- Reduce speed limits on unpaved surfaces (never exceed 25 mph).
- Prevent transport of dusty materials uncovered.

- Enclose storage and handling areas in storage silos, three-sided bunkers, or open-ended buildings. Wind fencing may be used in temporary situations. Use of water or foam spay bars may also be used to reduce emissions.
- Keep dusty storage piles covered.

BMP 44: Stockpile Management

Cover stockpiles of erodible materials, particularly topsoil, sawdust, landscaping bark, compost, mulch, sand, fly ash, stucco, hydrated lime or gypsum, aggregates, cold mix asphalt, pressure treated wood, or sediments. Use plastic sheeting, pervious fabrics, or tarps and weight or stake down to prevent wind removal. Tie-down ropes, large rocks, tires, or other heavy objects may also be used. For long-term stockpiling, mulch, vegetation, or soil binders should be considered.

Additional erosion control measures around the stockpile may be required to reduce storm water runoff damage from the impervious surface of the stockpile. Use a sediment control barrier around the stockpile perimeter such as berms (BMP 70), dikes (BMP 69), fiber rolls (BMP 64), silt fences (BMP 65), or biofilter bags (BMP 63).

Locate stockpile 50 feet from storm water flows, drainages, inlets, outlets, lakes, or wetlands. Avoid placing in streets or paved areas if possible.

BMP 52: Mulching

Apply straw, grass, grass hay, compost, wood chips, or wood fibers onto exposed soils leaving no more than 1 acre exposed for no more than 14 days. Driveway graded surfaces should be mulched or covered by aggregate as soon as practical to prevent erosion and reduce dust. Slopes steeper than 2:1 may require netting or tacking agents to hold mulch in place.

If wood chips or fibers are used, especially if obtained by chipping trees or stumps on the site, limit use to slopes under 6%. If vegetation is desired, treat chipped areas with a nitrogen fertilizer to aid plant germination and growth – otherwise wood chips tent to reduce growth of undesirable plants.

Use wood or stone mulches in areas that are not desirable to mowed or maintain. Bark chips in particular should not be used on sloped areas as they tend to be carried away by spring runoff.

Gravel or crushed rock placed as mulch should be placed at 10 tons / 0.10 acre (4,400 sf) at a depth of 3 inches (average). Use where subject to traffic or on slopes where maintenance of vegetation is not desired.

Hay or straw mulch should be free of unwanted seeds and applied at 2 or 3 bales per 1,100 sf of exposed soil at a depth of 2 to 3 inches in a uniform mat. No more than 40% of the original ground or exposed soils should be visible through the mat. Netting or tacking agents may be needed on slopes exposed to wind or steeper than 2:1.

Wood fiber mulches should be used where plant growth is to be inhibited, particularly on slopes steeper than 3:1 where mowing or maintenance of vegetation is not desired. If used in areas where growth is to be encouraged, nitrogen treatment will be needed. Apply to an average depth of 3 inches or about 25 lbs per 1,000 sf.

Compost used as mulching should be applied to the Grassed Infiltration Area and any other areas where growth (grasses) is desired. Apply compost at a depth of 3 inches over areas where seeding is to be done.

Inspect all mulched areas weekly and repair any damaged or exposed soils immediately. Mulching should cease once vegetation is re-established.

BMP 64: Fiber Rolls

A Fiber Roll (wattle/compost-filled socks) consists of straw, flax, or other similar materials bound into a biodegradable tubular plastic or similar encasing material. Fibers rolls should be placed along a contour unless otherwise shown in plans. For slope inclinations 2:1 or greater, fiber rolls should be placed a maximum interval of 10 ft. When placing, turn the ends of the fiber roll up slope to prevent runoff from going around the roll. If more than one wattle is placed in a row, the rolls shall be overlapped a minimum of 12 inches. Maintain rolls daily during extended rain events, after rain events, and two-week intervals during dry season. Sediment shall be removed when sediment accumulation reaches one-half of the exposed height of the roll.

BMP 70 Temporary Berms

A berm or ridge of compacted soil, compost, or sandbags which is created to intercept and divert runoff from small construction areas. They are often constructed along the top edge of a fill slope but may also be constructed along a roadway, across a roadway (a transverse berm) at an angle with the centerline.

Temporary berms are used to direct or divert runoff flow from newly constructed slopes until vegetation is established or other permanent measures are in place. They intercept the stormwater flow from the construction area and direct it to temporary slopes drains or protected outlets for safe discharge. They can also be used as barriers to collect and store runoff. They can be used at storm drain inlets, across minor ditches or swales, or other areas where the structure is temporary.

Soil berms have an approximate height of 12 to 20 inches with a minimum top width of 2 to 3 feet and side slopes of 2:1 or flatter. Berms should be high enough to prevent flow from overtopping and are normally constructed of embankment materials. Grade to drain to a slope or drain inlet. Compact the entire width of the berm with a bulldozer or loader/grader wheels.

Compost berms act as filter berms and are most effective when constructed 1 foot high by 2 feet wide or 1.5 feet high and 3 feet wide. Construct with 25-100% organic matter with particles not to exceed 3-inches thick or 6-inches long. Particle gradation should also be 90-100% passing a 1-in. filter, 70-100% passing the ¾ inch filter, and 30%-75% passing the ¼ inch filter.

Sandbag berms have the following dimensions

- Height: 20 in. minimum
- Top Width: 20 in. minimum
- Bottom Width: 4-1/4 to 5 feet
- Sandbag size – length 2 -2.6 ft, width 16-20 in., depth or thickness 6-8 inches. and weight 88 to 132 lbs.

Install so that flow between bags is prevented. Stack bags in an interlocking fashion but no more than 3 bags high without widening the base. Can be used to impound the volume of the design storm.

Operation and Maintenance Plan

Temporary and Permanent Erosion and Stormwater control measures will be the responsibility of the Owner:

Inspection Schedule & Maintenance Activities

As described above, both temporary and permanent erosion and sediment control measures should be inspected by the Owner and/or Contractor. Below is an inspection schedule table for convenience.

Stormwater Feature or Erosion Control Measure	Inspection Frequency	Maintenance Activities
Mulching	Weekly & following major rain event	Mulch exposed soil
Fiber Rolls or Compost Berms	Weekly & following major rain event	Repair and remove sediment
Treatment and Detention Facilities	Monthly the first year and bi-annually thereafter	Repair rivulets and damaged flow spreaders

In conclusion, I find that the proposed permanent improvements if properly constructed and maintained as described herein and shown on the plans, will treat and detain the additional runoff to be generated with the future construction on this property.

References

Idaho Catalog of Storm Water Best Management Practices. (2020, April). *Idaho Catalog of Storm Water Best Management Practices.* Retrieved from deq.idaho.gov/water-quality/wastewater/storm-water/: https://www2.deq.idaho.gov/admin/LEIA/api/document/download/14968

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Kennedy Engineers. (1992). *Stormwater Management Plan Criteria and Engineering Standards.* Spokane, WA: Interagency Stormwater Committee.

NOAA Atlas 2. (1973). *Precipitation Frequency Isopluvials.* NOAA.

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Soil Map—Bonner County Area, Idaho, Parts of Bonner and Boundary Counties

Map Scale: 1:357 if printed on A portrait (8.5" x 11") sheet.

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Meters: 0 5 10 20 30

Feet: 0 15 30 60 90

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Bonner County Area, Idaho, Parts of Bonner and Boundary Counties
Survey Area Data: Version 17, Sep 9, 2021

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

Date(s) aerial images were photographed: Aug 15, 2010—Aug 23, 2016

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
34	Odenson silt loam, 0 to 2 percent slopes	0.6	100.0%
Totals for Area of Interest		**0.6**	**100.0%**

Bonner County Area, Idaho, Parts of Bonner and Boundary Counties

34—Odenson silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 5465
Elevation: 2,000 to 3,000 feet
Mean annual precipitation: 25 to 38 inches
Mean annual air temperature: 43 to 46 degrees F
Frost-free period: 80 to 130 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Odenson and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Odenson

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Volcanic ash and loess over silty glaciolacustrine deposits

Typical profile

A - 0 to 9 inches: silt loam
2Bg - 9 to 18 inches: silty clay loam
2Bgk - 18 to 35 inches: silty clay loam
3Cg - 35 to 46 inches: silt loam
4Cgk - 46 to 57 inches: silty clay
5Cg - 57 to 60 inches: very fine sandy loam
6Cgk - 60 to 62 inches: silty clay
7Cg - 62 to 65 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: R043AY512ID - Warm-Frigid, Aquic-Udic, Loamy Floodplains (wet,DECA/CAREX)
Hydric soil rating: Yes

Minor Components

Pywell

Percent of map unit: 5 percent
Landform: Basin floors
Hydric soil rating: Yes

Colburn

Percent of map unit: 5 percent
Other vegetative classification: western redcedar/queencup beadlily (CN530)
Hydric soil rating: No

Selle

Percent of map unit: 5 percent
Other vegetative classification: western redcedar/queencup beadlily (CN530)
Hydric soil rating: No

Mission

Percent of map unit: 5 percent
Other vegetative classification: western redcedar/queencup beadlily (CN530)
Hydric soil rating: No

Wrencoe

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Hoodoo

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Bonner County Area, Idaho, Parts of Bonner and Boundary Counties
Survey Area Data: Version 17, Sep 9, 2021

Stormwater Management Calculations
Rational Method

25-Year Storms **Post-Developed**

Post-Developed Runoff and Developed "C" Factor

		Area(ft^2)	Area(acres)	Runoff	C*A
Graveled		5509	0.13	0.90	0.12
Building		4607	0.11	0.90	0.10
Landscape		3930	0.10	0.20	0.02
	Totals	13846	0.3400	2.00	0.24

	Developed "C"	0.69
Time increment	5 min	
Time of concentration	5 min	
Outflow (Infiltration)	0.0020 cfs	Exifiltration through engineered soils
Design year	25	1) input outflow (0.3 cfs 600 gal drywell,
Area (sqft)	13846 sqft	1.0 cfs 1000 gal drywell)
Area (acres)	0.32 Ac	2) input surface area for basin (in sqft)
Area x "C"	0.22	3) input the basins "C" factor
Developed "C" factor	0.69	Weighted value

Time Inc. (min)	Time Inc. (sec)	Intensity (in / hr)	Q dev (cfs)	V in	Q pre (cfs)	V pre	Predeveloped Release Storage No Infiltration	V infl	Controlled Release Combined Storage Required
5	300	2.80	0.62	248	0.49	196	52	0.60	51
10	600	2.10	0.46	325	0.37	294	31	1.20	30
11	660	2.00	0.44	336	0.35	306	31	1.33	29
12	720	1.90	0.42	345	0.33	310	34	1.45	33
13	780	1.85	0.41	360	0.32	321	39	1.57	37
14	840	1.75	0.39	364	0.31	322	41	1.69	40
15	900	1.70	0.38	376	0.30	331	45	1.81	43
20	1200	1.60	0.35	460	0.28	395	64	2.41	62
25	1500	1.40	0.31	495	0.24	419	76	3.01	73
30	1800	1.20	0.26	504	0.21	422	82	3.61	78
35	2100	1.10	0.24	534	0.19	444	90	4.22	86
40	2400	0.95	0.21	524	0.17	433	91	4.82	86
45	2700	0.90	0.20	556	0.16	458	99	5.42	93
50	3000	0.87	0.19	595	0.15	488	107	6.02	101
55	3300	0.85	0.19	638	0.15	521	117	6.63	110
60	3600	0.78	0.17	637	0.14	519	118	7.23	111
65	3900	0.75	0.17	662	0.13	538	124	7.83	116
70	4200	0.70	0.15	664	0.12	539	125	8.43	117
75	4500	0.69	0.15	701	0.12	567	133	9.04	124
80	4800	0.67	0.15	725	0.12	586	139	9.64	129
85	5100	0.65	0.14	746	0.11	603	143	10.24	133
90	5400	0.63	0.14	765	0.11	617	148	10.84	137
95	5700	0.60	0.13	768	0.10	619	149	11.45	138
100	6000	0.59	0.13	794	0.10	639	155	12.05	143
105	6300	0.58	0.13	819	0.10	659	160	12.65	148
110	6600	0.55	0.12	813	0.10	654	160	13.25	146
115	6900	0.52	0.11	803	0.09	645	158	13.86	144
120	7200	0.5	0.11	806	0.09	647	159	14.46	145
125	7500	0.49	0.11	814	0.08	653	161	15.06	146
130	7800	0.48	0.10	829	0.08	665	164	15.66	149
135	8100	0.48	0.10	860	0.08	689	171	16.27	155
140	8400	0.46	0.10	856	0.08	685	170	16.87	154
145	8700	0.45	0.10	867	0.08	694	173	17.47	156
150	9000	0.44	0.10	877	0.08	702	175	18.07	157
155	9300	0.43	0.09	886	0.07	709	177	18.68	159
160	9600	0.42	0.09	894	0.07	715	179	19.28	160
165	9900	0.41	0.09	900	0.07	720	181	19.88	161
170	10200	0.40	0.09	905	0.07	723	182	20.48	161
175	10500	0.39	0.09	909	0.07	726	183	21.09	162
180	10800	0.38	0.08	912	0.07	728	184	21.69	162
360	21600	0.25	0.06	1197	0.04	951	246	43.38	203
720	43200	0.17	0.04	1632	0.03	1293	339	86.75	252
1440	86400	0.11	0.02	2067	0.02	1636	432	173.50	258

25 year design	(store or infiltrate 25 year peak flow and volume)	
24 Hour Storm Volume	2067	cu ft
24 Hour Infiltration	174	cu ft
Peak Storm	1440.00	Min
Peak Storm Volume	2067	cu ft

Developed Runoff	0.02	cfs	no discharge control structure req
Required Storage	432		no Infiltration
Infiltration Rate	0.1205	CFM	discharge rate through infiltration
Required Storage with Controled Release	258	cu ft	with a discharge control structure

Selected method

Overall Treatment Req and Soil Infiltraion Rate

Impervious Area	9,916	SF
Req Treatment	413.15	CF
Req Treatment Area (8" depth)	619.72	SF
Proposed Infiltration Area	694	SF
Proposed Volume	458	CF
Design Infiltration Rate	0.125	in/hr
Infiltration Outflow Rate	0.0020	CFS

Proposed Grassed Infiltration Area for Controlled Release

694	Proposed Area (SF)
0.66	Depth (ft)
458	Proposed Volume (CF)

Soil Infiltration Rate	0.125	in/hr
Infiltration Outflow Rate	0.0020	CFS

Stormwater Management Calculations
Rational Method
Pre-Developed 25 Year

Pre-Developed Runoff from Table 6-2 kennedy report

		Area(ft^2)	Area(acres)	CN	Runoff C	CA
Existing Driveway		1336	0.04	90	0.90	0.04
Industrial Areas Light	Flat	12510	0.29	88	0.50	0.15
	Totals	13846	0.330	178	1.40	0.18

	Predeveloped "C"	0.55	
Time increment	5	min	
Time of concentration	**10.6252886**	min	
Outflow	0	cfs	1) input outflow (0.3 cfs 600 gal drywell, 1.0 cfs 1000 gal drywell)
Design year	25		
Area (sqft)	13846	sqft	2) input surface area for basin (in sqft)
Area (acres)	0.32		3) input the basins "C" factor
Area x "C"	0.17		
Developed "C" factor	0.55		

Time Inc. (min)	Time Inc. (sec)	Intensity (in / hr)	Q (cfs)	Volume (cf)	
5	300	2.80	0.49	196	
10	600	2.10	0.37	294	
11	660	2.00	0.35	306	
12	720	1.90	0.33	310	
13	780	1.85	0.32	321	
14	840	1.75	0.31	322	
15	900	1.70	0.30	331	
20	1200	1.60	0.28	395	
25	1500	1.40	0.24	419	
30	1800	1.20	0.21	422	
35	2100	1.10	0.19	444	
40	2400	0.95	0.17	433	
45	2700	0.90	0.16	458	
50	3000	0.87	0.15	488	
55	3300	0.85	0.15	521	
60	3600	0.78	0.14	519	
65	3900	0.75	0.13	538	
70	4200	0.70	0.12	539	
75	4500	0.69	0.12	567	
80	4800	0.67	0.12	586	
85	5100	0.65	0.11	603	
90	5400	0.63	0.11	617	
95	5700	0.60	0.10	619	
100	6000	0.59	0.10	639	
105	6300	0.58	0.10	659	
110	6600	0.55	0.10	654	
115	6900	0.52	0.09	645	
120	7200	0.5	0.09	647	
125	7500	0.49	0.08	653	
130	7800	0.48	0.08	665	
135	8100	0.48	0.08	689	
140	8400	0.46	0.08	685	
145	8700	0.45	0.08	694	
150	9000	0.44	0.08	702	
155	9300	0.43	0.07	709	
160	9600	0.42	0.07	715	
165	9900	0.41	0.07	720	
170	10200	0.40	0.07	723	
175	10500	0.39	0.07	726	
180	10800	0.38	0.07	728	
360	21600	0.25	0.04	951	
720	43200	0.17	0.03	1293	
1440	86400	0.11	0.02	1636	24 Hr Storm

25 year design (store or discharge 25 year / 2-hour storm event)
24-Hour Volume (pre-developed) 1636 cu ft

Time of concentration calculation

n = manning roughness(Gravel)	0.035	USDA
p=2 year, 24 hour rainfall	2	
Slope (S)	0.01	
Length (L)	250	feet
Tc=[0.007(nL)^0.8] / (((P)^0.50)*S^0.4))*60	10.6252886	min