DESIGN REPORT - SITE, GRADING, STORMWATER & EROSION PLAN

For Jerrod and Kiley Fournier

RPP36990010080A and RPP36990010090A aka Ponderay Business Park Block 1 Lot 8 and 9 in Section 2, Township 57 North, Range 2 West, Boise Meridian, Bonner County, City of Ponderay, Idaho.

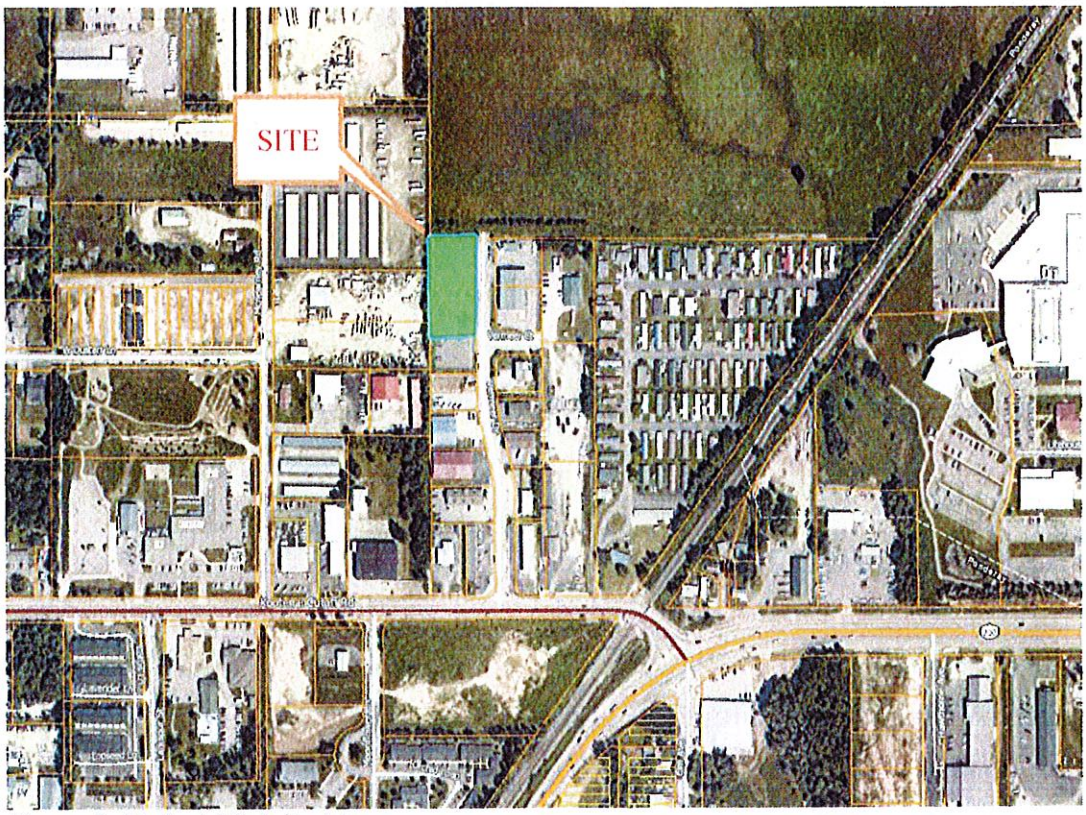

Figure 1: Project Vicinity Map

FEBRUARY 2

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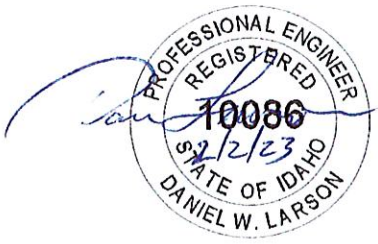

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Introduction

This report has been prepared to address design considerations for a site plan application on Lots 8 and 9 of on Vermeer Drive for Jerrod and Kiley Fournier. More specifically, this Site, Stormwater, and Erosion Control Plan addresses site changes to construct a new industrial/commercial building 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 Vermeer Drive in Ponderay Idaho.

Property Identification Numbers (705) *RPP36990010080A;* (805) *RPP36990010090A* aka, Lots 8 & 9 Vermeer Dr, City of Ponderay, Bonner County, Idaho. Section 2, Township 57 North, Range 2 West, Boise Meridian.

Property owner:	**Location:**	**Size of Lot:**
Jerrod and Kiley Fournier	Section 2, T57N, R2W	0.834 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

Vermeer Drive is a public and maintained road.

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: 0.10
- Pre-developed Peak Runoff Rate: 0.17 cfs
- New Impervious Area: 30,122 SF
- Required Stormwater Treatment Area: 1,882.63 SF at 8" depth (1,255.08 CF)
- Proposed Stormwater Treatment Area: 3,334 SF at 8" depth (2,224 CF)
- Developed Rational Runoff Method Coefficient: 0.76
- Critical Intensity/Duration Storm: (105-Minute) (0.58 inches/hr)
- Release Rate: 0.154 cfs
- Soil Infiltration Rate Assumed: 2.0 in/hr (0.154 cfs)

Summary of Calculations

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

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

- **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 5 min time of concentration.
2. Using this release rate, the critical 25-Year storm event was found to be at the 105-minute duration storm. This event was used to calculate the volume required (1,374 CF) to fully contain the **peak runoff volume** for a 25-Year, 24-hour storm event.
3. 2 in/hr infiltration rate was used as an estimate of performance over a long period of time without regular maintenance.

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 8-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 pre-silting 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	Mar-23
Excavation and grading	Mar-23
Rough grade landscape areas and bioswales	Mar-23
Excavate and Pour Building Foundations	Mar-23
Utility Construction	Apr-23
Begin Framing	Apr-23
Finish grade landscape areas	Oct-23
Reseed slopes and distrubed areas	Oct-23

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 feasible along the east side of the property which would be the desired location to ensure the existing stormwater facility on the west side of the property is not damaged. As construction progresses, the south/north ends of the parking lot/driveway would be a desired location for staging equipment/materials.

BMP 38: Preserve Topsoil and Vegetation

Construction fencing (orange or green) should be placed around 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.

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