



Notice of Application

Optional DNS Process

March 16, 2023

The City of Yelm has received a permit application for the following project.

Date of permit application: 11/16/2022 Date of determination of completeness: 3/3/2023

Date of notice of application: 3/16/2023 **Comment due date:** 3/30/2023 by 5 PM

Agency Contact: Yelm Public Services, planning@yelmwa.gov, (360) 400-5003

Agency File Number: 2022.0129

Proposal to develop an approximately 3.64-acre site into an industrial office (2,400 sf) and construction/material storage. Ingress and egress will be on Rhoton Rd. SE.

Location of proposal: 906 Rhoton Rd. SE, Yelm, WA 98597, Parcel number: 64300800303

Project Applicant: Nicholas D. Taylor, (360) 890-8955, Ntaylor@irisgroupconsulting.com

SEPA Environmental Review: The City of Yelm has reviewed the proposed project for probable adverse environmental impacts and expects to issue a Determination of Nonsignificance (DNS). This determination is based on the following findings and conclusions:

A gopher study, SEPA checklist, and drainage report were all included in the submission. The information included has shown little effect on the environment and surrounding traffic. Traffic is expected to be minimal based on 11th edition ITE Trip Generation Manual Land Use code 150.

The optional DNS process in WAC 197-11-355 is being used. **This may be your only opportunity to comment on the environmental impacts of the proposed project.**

Agencies, tribes, and the public are encouraged to review and comment on the proposed project and its probable environmental impacts. **Comments must be submitted by March 30, 2023 to the City of Yelm, 901 Rhoton Rd. NW, Yelm, WA 98597.**



The following conditions have been identified that may be used to mitigate the adverse environmental impacts of the proposal:

Required Permits: The following local, state and federal permits/approvals are needed for the proposed project:

Administrative Site Plan Review, Civil Review, Building Permit

Required Studies: Gopher study, and drainage report.

Existing Environmental Documents: 11th generation Trip Generation Manual from the Institute of Transportation Engineers (Land Use 150) was used to calculate the potential number of trips at PM peak hours for employees and the general public.

Preliminary determination of the development regulations that will be used for project mitigation and consistency: Yelm Municipal Code, Building and Fire Code, Yelm Development Guidelines, and Stormwater Manual

Public Hearing – A public hearing is not required for this project

This project will be required to be consistent with all applicable development regulations and the City's Comprehensive Plan. Information necessary to analyze this proposal are on file with the City of Yelm, Planning and Building Department and may be reviewed online at <https://www.ci.yelm.wa.us/>. If you have any questions about this proposal, please contact the Planning and Building Department at Planning@YelmWA.gov for information.

SEPA ENVIRONMENTAL CHECKLIST

Purpose of checklist:

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown. You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for Lead Agencies:

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

The help links in this checklist are intended to assist users in accessing guidance on the checklist questions. Links are provided to the specific sections of the guidance applicable to the questions. However, the links may not work correctly on all devices. If the links do not work on your device, open the guidance at www.ecy.wa.gov/programs/sea/sepa/apguide/EnvChecklistGuidance.html and navigate to the appropriate section.

Use of checklist for nonproject proposals:

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the [SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS \(part D\)](#). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

A. Background

1. Name of proposed project, if applicable:
906 Rhoton Rd.
2. Name of applicant:
MM Rhoton Rd, LLC Attn: Steve McClung
3. Address and phone number of applicant and contact person:
PO Box 1189
Buckley, WA 98321
(360) 761-7695
4. Date checklist prepared:
2/17/2023
5. Agency requesting checklist:
City of Yelm, WA
6. Proposed timing or schedule (including phasing, if applicable):
Site grading and stormwater infrastructure and other utility (e.g. water, sanitary sewer) improvements will be completed. spring/summer 2023. Building construction to follow or occur concurrently.
7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.
Not at this time
8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.
None at this time
9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.
None known
10. List any government approvals or permits that will be needed for your proposal, if known.
Department of Ecology Stormwater Permit; grading permit; right-of-way encroachment permit; land use and civil plan approvals
11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site.
96,000 sf combined office shop building along with site grading, stormwater improvements, and gravel surfacing for a construction equipment and materials storage yard area.
12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known.
NW ¼ of the NE ¼ of Section 19, Township 17 North, Range 2 East, W.M.
906 Rhoton Rd. SE
Yelm, WA 98597
Parcel Number: 64300800303

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site:

(circle one): Flat rolling, hilly, steep slopes, mountainous, other _____

b. What is the steepest slope on the site (approximate percent slope)?

Approximately 22% (isolated)

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.

Spanaway Gravelly Sandy Loam (HSG A) per the NRCS.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

None known

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.

Approximately 7,920 cubic yards of grading will be required to construct the currently proposed improvements (access & storage yard area, utility trenches, storm drainage improvements).

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Erosion can occur during construction of the proposed improvements. An erosion and sedimentation control plan will be prepared meeting City of Yelm requirements and Best Management Practices (BMP's) will be implemented during and after construction to prevent and control erosion.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Approximately 80% (access, storage yard areas, parking lot, building(s))

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

An erosion and sedimentation control plan will be prepared meeting City of Yelm requirements and Best Management Practices (BMP's) will be implemented during and after construction to prevent and control erosion.

2. Air

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.

Emissions from typical construction equipment and dust during construction; emissions from vehicles after the project is completed. Quantities are unknown.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

None known

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

None

3. Water

a. Surface Water:

- 1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.
No.
- 2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.
No.
- 3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.
None
- 4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.
No
- 5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.
No City of Yelm 2021 GIS indicates the subject parcel is entirely outside of any flood zones.
- 6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.
No

b. Ground Water:

- 1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known.
No
- 2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.
None.

c. Water runoff (including stormwater):

- 1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.
Stormwater runoff from the proposed access, gravel storage yard area, building, and parking lot area will be collected via a ditch or pipes and routed to an on-site stormwater treatment and detention/infiltration facility. All stormwater runoff generated by the proposed site improvements will be contained and fully infiltrated on-site.
- 2) Could waste materials enter ground or surface waters? If so, generally describe.
Not likely. A pollution source control plan will be a part of a storm drainage maintenance agreement that will be recored at the county auditor's office prior to final project approval. This

plan will outline the Best Management Practices to help reduce the potential for any waste materials to enter ground water.

- 3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.

No

- d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:

Stormwater runoff from the proposed access, gravel storage yard area, building, and parking lot area will be collected and routed to an on-site stormwater treatment and detention/infiltration facility. All stormwater runoff generated by the proposed site improvements will be contained and fully infiltrated on-site.

4. Plants

- a. Check the types of vegetation found on the site:

☐ deciduous tree: alder, maple, aspen

☐ evergreen tree: fir, cedar, pine, other

☒ shrubs

☒ grass

☒ pasture

☐ crop or grain

☐ Orchards, vineyards or other permanent crops.

☐ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other

☐ water plants: water lily, eelgrass, milfoil, other

☐ other types of vegetation

- b. What kind and amount of vegetation will be removed or altered?

Approximately 3.5-acres of vegetation (brush, grass) will be removed as needed to construct the proposed improvements.

- c. List threatened and endangered species known to be on or near the site.

None known

- d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

Street trees will be provided along the public roadway and perimeter landscaping will be provided per city requirements. Additional landscaping will be installed around the parking lot area as required by the city.

- e. List all noxious weeds and invasive species known to be on or near the site.

None known per Washington State Noxious Weed Data Viewer

5. Animals

- a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site.

Examples include:

birds: hawk, heron, eagle, songbirds, other:
mammals: deer, bear, elk, beaver, other:
fish: bass, salmon, trout, herring, shellfish, other _____

Deer, crows, robins, stellar jays, raccoons, squirrels, chipmunks, rabbits, bats

- b. List any threatened and endangered species known to be on or near the site.

None per WDFW Priority Habitats and Species (PHS) GIS

- c. Is the site part of a migration route? If so, explain.

The project site is located within the Pacific Flyway for migratory birds per the U.S. Fish & Wildlife Service

- d. Proposed measures to preserve or enhance wildlife, if any:

None

- e. List any invasive animal species known to be on or near the site.

None of the invasive animal species listed by the Washington Invasive Species Council have been observed on or near the site

6. Energy and Natural Resources

- a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Electricity will be used for heating and general electrical needs for the project.

- b. Would your project affect the potential use of solar energy by adjacent properties?

If so, generally describe.

Not likely

- c. What kinds of energy conservation features are included in the plans of this proposal?

List other proposed measures to reduce or control energy impacts, if any:

The building(s) will meet or exceed Washington State energy code requirements.

7. Environmental Health

- a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

None known

- 1) Describe any known or possible contamination at the site from present or past uses.

None known

- 2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.

None known

- 3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.

None

- 4) Describe special emergency services that might be required.

None

- 5) Proposed measures to reduce or control environmental health hazards, if any:

None

b. Noise

- 1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

No existing noises will affect the proposal.

- 2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Short-term: Construction equipment noise during construction

Long-term: Noises typical to vehicle traffic for a warehouse/office building with storage yard.

- 3) Proposed measures to reduce or control noise impacts, if any:

Construction hours will be limited to city approved hours

8. Land and Shoreline Use

- a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.

The site is undeveloped. Adjacent developed parcels are industrial and the parcel to the south is a city dog park. The proposal will not affect land uses on nearby or adjacent properties.

- b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?

Unknown but unlikely

- 1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:

No

- c. Describe any structures on the site.

None

- d. Will any structures be demolished? If so, what?

Not applicable

- e. What is the current zoning classification of the site?

Industrial

- f. What is the current comprehensive plan designation of the site?

Industrial

- g. If applicable, what is the current shoreline master program designation of the site?

Not applicable

- h. Has any part of the site been classified as a critical area by the city or county? If so, specify.

No

- i. Approximately how many people would reside or work in the completed project?

Up to approximately 12 people will work at the warehouse/office building.

j. Approximately how many people would the completed project displace?

None

k. Proposed measures to avoid or reduce displacement impacts, if any:

None

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

The project will meet City of Yelm zoning code requirements.

m. Proposed measures to ensure the proposal is compatible with nearby agricultural and forest lands of long-term commercial significance, if any:

None

9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

None

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

None

c. Proposed measures to reduce or control housing impacts, if any:

None

10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

Building code allows for up to a 40-foot building height. It is anticipated that the building will be sided with metal.

b. What views in the immediate vicinity would be altered or obstructed?

None

b. Proposed measures to reduce or control aesthetic impacts, if any:

None

11. Light and Glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

Exterior building and parking lot lighting from dusk to dawn

b. Could light or glare from the finished project be a safety hazard or interfere with views?

Not likely. Light fixtures will be shielded.

c. What existing off-site sources of light or glare may affect your proposal?

None known

d. Proposed measures to reduce or control light and glare impacts, if any:

Light fixtures will be shielded.

12. Recreation

- a. What designated and informal recreational opportunities are in the immediate vicinity?
The City of Yelm Park & Splash Pad is located approximately 1.1-mile away; Yelm Middle School is located 1-mile away; and a city dog park is located adjacent to the subject parcel.
- b. Would the proposed project displace any existing recreational uses? If so, describe.
No
- c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:
None proposed at this time. Mitigation fees will be paid, if required.

13. Historic and cultural preservation

- a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers located on or near the site? If so, specifically describe.
None listed per the Washington State Department of Archaeology & Historic Preservation website (WISAARD database).
- b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.
None observed on or near the site and no listings in the WISAARD database.
- c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.
Review of Washington State Department of Archaeology & Historic Preservation website (WISAARD database).
- d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.
None at this time.

14. Transportation

- a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.
Rhoton Rd. NW will provide access to the site.
- b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?
The nearest Intercity Transit stop is located at the intersection of Yelm Ave. and Edwards St. which is approximately 0.9-miles away from the project site.
- c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?
28 off-street parking spaces will be provided for the warehouse/office building(s).
- d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).
No. The City of Yelm has indicated that improvements to Rhoton Rd. NW can be deferred.

- e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.
No
- f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?
It is anticipated that the project will generate less than 20 vehicle trips per day.
- g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.
No
- h. Proposed measures to reduce or control transportation impacts, if any:
Traffic mitigation fees will be paid if required

15. Public Services

- a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.
No new public service facilities are proposed; however, the project will increase the need on existing public services.
- b. Proposed measures to reduce or control direct impacts on public services, if any.
Mitigation fees will be paid as required.

16. Utilities

- a. ~~Circle utilities currently available at the site:~~
electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other _____
- b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.
City of Yelm water and sanitary sewer, refuse/recycling service from Pacific Disposal; telecommunications from Fairpoint Communications and Comcast; electricity and natural gas from Puget Sound Energy

C. Signature

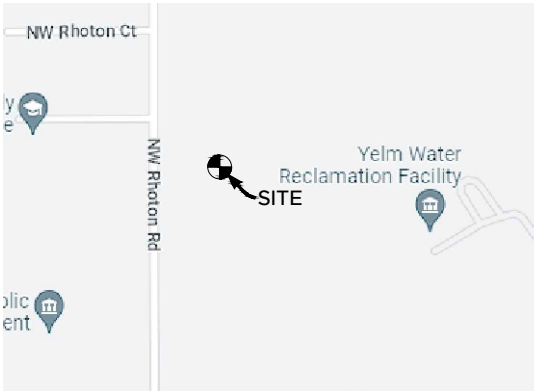
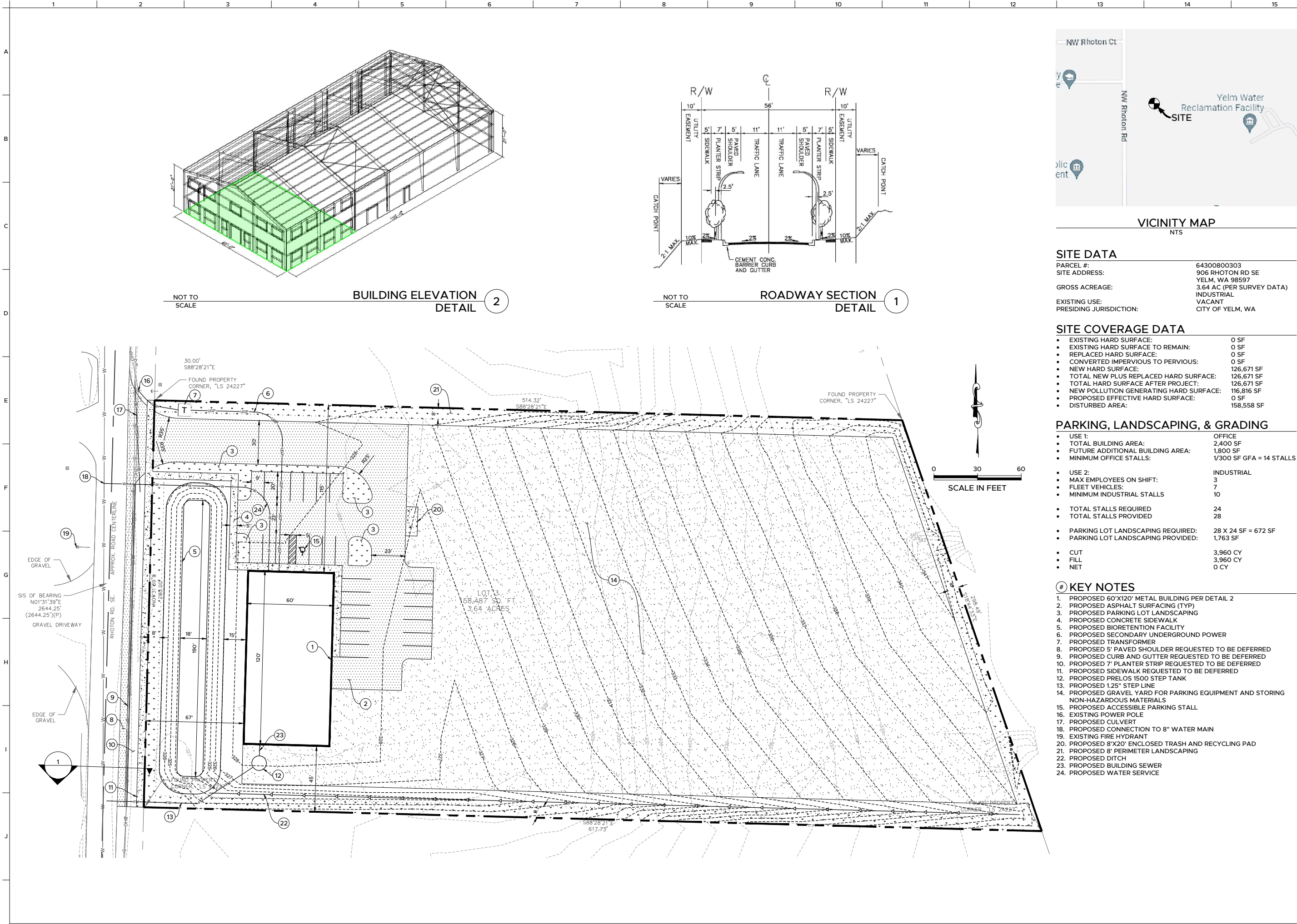
The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature:  _____

Name of signee Nicholas Taylor

Position and Agency/Organization The Iris Group PLLC

Date Submitted: 2/17/2023



VICINITY MAP
NTS

SITE DATA

PARCEL #:	64300800303
SITE ADDRESS:	906 RHOTON RD SE YELM, WA 98597 3.64 AC (PER SURVEY DATA)
GROSS ACREAGE:	INDUSTRIAL VACANT
EXISTING USE:	CITY OF YELM, WA
PRESIDING JURISDICTION:	

SITE COVERAGE DATA

• EXISTING HARD SURFACE:	0 SF
• EXISTING HARD SURFACE TO REMAIN:	0 SF
• REPLACED HARD SURFACE:	0 SF
• CONVERTED IMPERVIOUS TO PERVIOUS:	0 SF
• NEW HARD SURFACE:	126,671 SF
• TOTAL NEW PLUS REPLACED HARD SURFACE:	126,671 SF
• TOTAL HARD SURFACE AFTER PROJECT:	126,671 SF
• NEW POLLUTION GENERATING HARD SURFACE:	116,816 SF
• PROPOSED EFFECTIVE HARD SURFACE:	0 SF
• DISTURBED AREA:	158,558 SF

PARKING, LANDSCAPING, & GRADING

• USE 1:	OFFICE
• TOTAL BUILDING AREA:	2,400 SF
• FUTURE ADDITIONAL BUILDING AREA:	1,800 SF
• MINIMUM OFFICE STALLS:	1/300 SF GFA = 14 STALLS
• USE 2:	INDUSTRIAL
• MAX EMPLOYEES ON SHIFT:	3
• FLEET VEHICLES:	7
• MINIMUM INDUSTRIAL STALLS:	10
• TOTAL STALLS REQUIRED:	24
• TOTAL STALLS PROVIDED:	28
• PARKING LOT LANDSCAPING REQUIRED:	28 X 24 SF = 672 SF
• PARKING LOT LANDSCAPING PROVIDED:	1,763 SF
• CUT:	3,960 CY
• FILL:	3,960 CY
• NET:	0 CY

KEY NOTES

1. PROPOSED 60'X120' METAL BUILDING PER DETAIL 2
2. PROPOSED ASPHALT SURFACING (TYP)
3. PROPOSED PARKING LOT LANDSCAPING
4. PROPOSED CONCRETE SIDEWALK
5. PROPOSED BIORETENTION FACILITY
6. PROPOSED SECONDARY UNDERGROUND POWER
7. PROPOSED TRANSFORMER
8. PROPOSED 5' PAVED SHOULDER REQUESTED TO BE DEFERRED
9. PROPOSED CURB AND GUTTER REQUESTED TO BE DEFERRED
10. PROPOSED 7' PLANTER STRIP REQUESTED TO BE DEFERRED
11. PROPOSED SIDEWALK REQUESTED TO BE DEFERRED
12. PROPOSED PRELOS 1500 STEP TANK
13. PROPOSED 1.25" STEP LINE
14. PROPOSED GRAVEL YARD FOR PARKING EQUIPMENT AND STORING NON-HAZARDOUS MATERIALS
15. PROPOSED ACCESSIBLE PARKING STALL
16. EXISTING POWER POLE
17. PROPOSED CULVERT
18. PROPOSED CONNECTION TO 8" WATER MAIN
19. EXISTING FIRE HYDRANT
20. PROPOSED 8'X20' ENCLOSED TRASH AND RECYCLING PAD
21. PROPOSED 8' PERIMETER LANDSCAPING
22. PROPOSED DITCH
23. PROPOSED BUILDING SEWER
24. PROPOSED WATER SERVICE



Key Environmental Solutions, LLC.

October 15, 2022

City of Yelm
Community Development
Attn: Sara Sara Williams, Associate Planner , Associate Planner
106 2nd St SE
Yelm, WA 98597

Re: McClung Prairie Habitat Critical Area Recon and ESA No Effect Letter, Thurston County Parcels #64300800303. Located at 906 Rhoton Road SE, Yelm, Washington, Section 19, Township 17 North, Range 02 East, W.M., and in accordance with the *Thurston County Critical Areas Ordinance Title 24.03 (Definitions)*, *Interim Prairie Ordinance 14542*, *WDFW Management Recommendations for Washington Priority Habitats Oregon White Oak Woodlands and WDFW Habitat Management Recommendations for the Mazama Pocket Gophers*, following the 2018 USFWS Mazama Pocket Gopher Screening Protocol, Thurston County's 2021 survey protocol, and the City of Yelm Code; Title 14 environmental.

Dear Ms. Williams,

Key Environmental Solutions, LLC. (KES) has completed a Prairie Habitat Area Recon on the above referenced parcels located at 906 Rhoton Road SE, Yelm, Thurston County, Washington. Fieldwork was conducted on June 13, 2021, July 14, 2021, September 3, 2022, and October 4, 2022.

Project Description and Findings

The parcels reviewed are approximately 3.64 acres located in the eastern portion of the county near the town of Yelm. Parcel 64300800303 is currently undeveloped. The parcel is surrounded by an undeveloped parcel to the north, the City of Yelm waste management facility to the east, an industrial facility to the south, and Rhoton Road SE to the west. The parcel was reviewed for prairie habitat and Mazama Pocket Gophers. When the site is developed there will be not any "Take" of any state or federally listed species. There will be "**No Effect**" on prairie habitat, Mazama Pocket Gophers or any other critical areas or buffer impacted.

KES reviewed Washington Department of Fish and Wildlife's (WDFW) Priority Habitat Species (PHS) lists and maps and no listed species were found to occur onsite. Adjacent areas were also looked at for any critical areas or listed species, and none were found to occur.

The project area was required to be reviewed due to the presence of prairie soils (See Table below). KES reviewed the Natural Resource Conservation Service Soils (NRCS) maps and verified that prairie soils did not exist in the project area.

Soil Types	Prairie Soil
Spanaway gravelly sandy loam, 0-3% slopes	Yes

Mapped prairie soils do not necessarily mean that the area is a prairie –vegetation, landuse, development, and historical land practices may have changed the soil conditions. Current site conditions may or may not accurately reflect mapped soils. Conversely, prairies may be found in areas where the soils are not mapped as prairie soils.

Federal ESA Species, Habitats and No Effect

There are no Federal ESA species or habitats that exist within the parcel. There will be “No Effect” and/or “No Take” from the proposed project.

Historically, the parcel was most likely a Douglas fir stand. According to the 1990 Google Earth aerial, it appears the site was partially logged prior to 1990. The parcel immediately to the south was recently cleared by the City of Yelm.

KES has performed two site visits as required. KES determined that parcel does not meet the definition of prairie from USFWS and that there has been no Mazama Gopher occurrence found on adjacent parcels or anywhere in the vicinity.

Vegetation on the parcel consists of:

Common Name	Sc. Name	Status
bracken fern	<i>Pteridium aquilinum</i>	FACU
Camas (little)	<i>Camassia quamash</i>	FACW
Canadian thistle	<i>Cirsium arvense</i>	FACU
cherry	<i>Prunus emarginata</i>	FACU
common dandelion	<i>Taraxacum officinale</i>	FACU
cutleaf blackberry	<i>Rubus lactiniatus</i>	FACU
dock	<i>Rumex obtusifolius</i>	FAC
foxglove	<i>Digitalis purpurea</i>	FACU
hairy cat's ear	<i>Hypochaeris radicata</i>	FACU
hazelnut	<i>Corylus cornuta</i>	FACU
Himalayan blackberry	<i>Rubus armenicus</i>	FACU
Indian plum	<i>Oemleria cerasiformis</i>	FACU
Juniper haircap moss	<i>Polytrichum juniperinum</i>	FACU
Klamath weed	<i>Hypericum perforatum</i>	FACU
lamb's quarter	<i>Chenopodium album</i>	FACU
oat grass	<i>Avena sativa</i>	NI
various orchard trees		
orchardgrass	<i>Dactylis glomerata</i>	FACU
Oregon grape	<i>Mahonia nervosa</i>	FACU
pepper grass	<i>Lepidium densiflorum</i>	FACU
plantain	<i>Plantago lanceolata</i>	FAC
Queen's lace	<i>Daucus carota</i>	FACU

red fescue	<i>Festuca rubra</i>	FACU
Scotch broom	<i>Cytisus scoparius</i>	FACU
serviceberry	<i>Amelanchier alnifolia</i>	FAC
sheep sorrel	<i>Rumex acetosella</i>	FACU
snowberry	<i>Symphoricarpos albus</i>	FACU
vetch	<i>Vicia americana</i>	FACU

Based on physical, environmental, and biological conditions on and near the project site, KES has determined that no further site visits are necessary and that this project, will not result in take of the federally listed Mazama pocket gophers (*Thomomys mazama* ssp.). There were no Mazama Pocket Gopher mounds, or any other prairie species observed. There were only mole mounds found to occur onsite. No oaks were found to occur onsite.

It is KES's professional opinion that the parcels located at 906 Rhoton Road SE, near Yelm, have no endangered prairie species, and when the parcels are developed will not impact any prairie species or any other critical areas and should be permitted. KES concurs with the site plan.



Looking east. Typical vegetation.



Looking west. Typical vegetation.



Looking south. Typical vegetation.



Looking. Typical vegetation.



Looking SE at cleared parcel.



Looking southwest across parcel.

Professional Standard of Care:

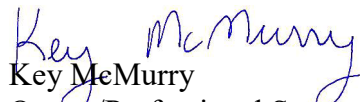
Please be advised that KES personnel has provided professional services that are in accordance with the degree of care and skill generally accepted in the performance of this environmental evaluation. Fish and Wildlife Habitat Assessments together with wetland delineations, mitigation plans, classifications, ratings, streamtyping, riparian planting plans, ordinary high-water line determinations, fish removal and other critical area analysis should be reviewed and approved by the agency with permitting authority and potentially other agencies with regulatory authority prior to extensive site design or development. No warranties are expressed or implied by this assessment until approved by the appropriate resource and permitting agency.

The findings expressed in this report are based on field investigations, best available data, best available science, and our professional judgement. The services described in this report were performed consistent with generally accepted professional consulting principles and practices.

The services performed were consistent with our agreement with our client. Key Environmental Solutions, LLC, (KES) is not responsible for the impacts of any changes in environmental standards, practices, or regulations after the date of this report. KES does not warrant the accuracy of supplemental information incorporated in this report that was supplied by others.

Thank you for the opportunity to evaluate this project and please contact us if you have any questions regarding this information, our findings, conclusions, or recommendations at (360) 562-5763.

Sincerely,


Key McMurry

Owner/Professional Stream and Wildlife Biologist, SPWS





Soils

Legend

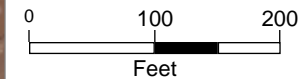
Gopher Indicator Soils

- Less Preferred
- More Preferred

Soils (USDA)

- Alderwood gravelly sandy loam, 0 to 3% slopes
- Alderwood gravelly sandy loam, 15 to 30% slopes
- Alderwood gravelly sandy loam, 3 to 15% slopes
- Alderwood gravelly sandy loam, 30 to 50% slopes
- Baldhill very stony sandy loam, 0 to 3% slopes
- Baldhill very stony sandy loam, 15 to 30% slopes
- Baldhill very stony sandy loam, 3 to 15% slopes
- Baldhill very stony sandy loam, 30 to 50% slopes
- Baumgard loam, 10 to 40% slopes
- Baumgard loam, 40 to 65% slopes
- Baumgard-Pheeneey Complex, 40 to 65% slopes
- Baumgard-Pheeneey complex, 10 to 40% slopes
- Baumgard-Rock outcrop complex, 40 to 65% slopes
- Bellingham silty clay loam
- Boisfort silt loam, 20 to 40% slopes
- Boisfort silt loam, 5 to 20% slopes
- Bunker gravelly silt loam, 30 to 65% slopes
- Bunker gravelly silt loam, 5 to 30% slopes
- Bunker-Boisfort complex, 40 to 65% slopes

Scale 1: 2,684



Map Created Using GeoData Public Website

Published: 6/6/2021

Note:



The information included on this map has been compiled by Thurston County staff from a variety of sources and is subject to change without notice. Additional elements may be present in reality that are not represented on the map. Ortho-photos and other data may not align. The boundaries depicted by these datasets are approximate. This document is not intended for use as a survey product. ALL DATA IS EXPRESSLY PROVIDED 'AS IS' AND 'WITH ALL FAULTS'. Thurston County makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. In no event shall Thurston County be liable for direct, indirect, incidental, consequential, special, or tort damages of any kind, including, but not limited to, lost revenues or lost profits, real or anticipated, resulting from the use, misuse or reliance of the information contained on this map. If any portion of this map or disclaimer is missing or altered, Thurston County removes itself from all responsibility from the map and the data contained within. The burden for determining fitness for use lies entirely with the user and the user is solely responsible for understanding the accuracy limitation of the information contained in this map. Authorized for 3rd Party reproduction for personal use only.



PHS Identify

Buffer Options:

Distance: Units:

0

Feet

Clear

Generate Report

Occurrence Name	Townsend's Big-eared Bat
Scientific Name	<i>Corynorhinus townsendii</i>
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release (360-902-2543) for obtaining information about masked sensitive species and habitats.
Federal Status	N/A
State Status	Candidate
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
SGCN	Y
Display Resolution	TOWNSHIP
Management Recommendations	Click for more info.

Occurrence Name	Yuma myotis
Scientific Name	<i>Myotis yumanensis</i>
	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS

Key Environmental Solutions, LLC.

1047 Summit Avenue

Raymond, WA 98577

Cell: 360-562-5763



key@keyenvironmentalsolutions.com

PHS Map

Steve McClung

No Effect Prairie/Gopher Survey

Thurston County,

Yelm, Washington

Sec. 19 Township 17 N, Range 02 E, W.M.

2022 Thurston County Critical Areas Ordinance (CAO) Prairie Screening Data Sheet

Parcel Number: 64300800303

Property Owner: Steve McClung

Surveyor(s): Key McMurry, Key Environmental Solutions, LLC.

Date: September 3, 2022

Composition of Vegetation:

CAO prairie criteria met? Yes or **No**

Mima mounds present? Yes or **No**

Oaks (*Quercus garryana*) present? Yes or **No**

Mature:

Sapling:

Seedling:

X	Target species	Class* (circle)
	<i>Apocynum androsaemifolium</i>	1 2 3 4 5 N/A
	<i>Balsamorhiza deltoidea</i>	Present / Absent
	<i>Bistorta bistortoides</i>	Present / Absent
	<i>Brodiaea coronaria</i>	1 2 3 4 5 N/A
	<i>Camassia leichtlinii</i>	1 2 3 4 5 N/A
	<i>Camassia quamash</i>	Present / Absent
	<i>Carex densa</i>	Present / Absent
	<i>Carex feta</i>	1 2 3 4 5 N/A
	<i>Carex inops</i> ssp. <i>inops</i>	1 2 3 4 5 N/A
	<i>Carex tumulicola</i>	1 2 3 4 5 N/A
	<i>Carex unilateralis</i>	1 2 3 4 5 N/A
	<i>Castilleja hispida</i>	1 2 3 4 5 N/A
	<i>Castilleja levisecta</i>	Present / Absent
	<i>Danthonia californica</i>	1 2 3 4 5 N/A
	<i>Delphinium menziesii</i>	1 2 3 4 5 N/A
	<i>Delphinium nuttallii</i>	1 2 3 4 5 N/A
	<i>Deschampsia cespitosa</i>	1 2 3 4 5 N/A
	<i>Deschampsia danthonioides</i>	1 2 3 4 5 N/A
	<i>Dodecatheon hendersonii</i>	1 2 3 4 5 N/A
	<i>Downingia yina</i>	1 2 3 4 5 N/A
	<i>Erigeron speciosus</i>	1 2 3 4 5 N/A

	<i>Lupinus albicaulis</i>	1 2 3 4 5 N/A
	<i>Lupinus lepidus</i> var. <i>lepidus</i>	1 2 3 4 5 N/A
	<i>Lupinus polyphyllus</i>	1 2 3 4 5 N/A
	<i>Micranthes integrifolia</i> (<i>Saxifraga</i> i.)	Present / Absent
	<i>Micranthes oregana</i> (<i>Saxifraga</i> o.)	1 2 3 4 5 N/A
	<i>Microseris laciniata</i>	Present / Absent
	<i>Perideridia gairdneri</i>	1 2 3 4 5 N/A
	<i>Plagiobothrys figuratus</i>	1 2 3 4 5 N/A
	<i>Plectritis congesta</i>	Present / Absent
	<i>Polemonium carneum</i>	Present / Absent
	<i>Potentilla gracillis</i>	Present / Absent
	<i>Ranunculus alismifolius</i>	1 2 3 4 5 N/A
	<i>Ranunculus occidentalis</i>	Present / Absent
	<i>Ranunculus orthorhynchus</i>	1 2 3 4 5 N/A
	<i>Sericocarpus rigidus</i>	Present / Absent
	<i>Sidalcea malviflora</i> var. <i>virgata</i>	Present / Absent
	<i>Silene scouleri</i>	Present / Absent
	<i>Sisyrinchium idahoense</i>	1 2 3 4 5 N/A
	<i>Solidago missouriensis</i>	1 2 3 4 5 N/A
	<i>Solidago simplex</i> (<i>S. spathulata</i>)	1 2 3 4 5 N/A
	<i>Toxicoscordion venenosum</i> var. <i>venenosum</i> (<i>Zigadenus venenosus</i>)	1 2 3 4 5 N/A

	<i>Eriophyllum lanatum</i>	Cover: ____ m ² N/A
	<i>Eryngium petiolatum</i>	Present / Absent
	<i>Festuca roemerii</i> (F. idahoensis)	1 2 3 4 5 N/A
	<i>Fragaria virginiana</i>	Cover: ____ m ² N/A
	<i>Fritillaria affinis</i>	1 2 3 4 5 N/A
	<i>Hieracium scouleri</i>	1 2 3 4 5 N/A
	<i>Hosackia pinnata</i> (<i>Lotus pinnatus</i>)	Present / Absent
	<i>Koeleria macrantha</i> (K. cristata)	1 2 3 4 5 N/A
	<i>Leptosiphon bicolor</i> (<i>Linanthus b.</i>)	1 2 3 4 5 N/A
	<i>Lomatium bradshawii</i>	Present / Absent
	<i>Lomatium nudicaule</i>	1 2 3 4 5 N/A
	<i>Lomatium triternatum</i>	1 2 3 4 5 N/A
	<i>Lomatium utriculatum</i>	Present / Absent

	<i>Trifolium willdenowii</i> (T. tridentatum)	1 2 3 4 5 N/A
	<i>Triteleia grandiflora</i>	1 2 3 4 5 N/A
	<i>Triteleia hyacinthina</i>	1 2 3 4 5 N/A
	<i>Veratrum californicum</i>	1 2 3 4 5 N/A
	<i>Veratrum viride</i>	1 2 3 4 5 N/A
	<i>Viola adunca</i>	1 2 3 4 5 N/A
	<i>Viola praemorsa</i> var. <i>nuttallii</i>	1 2 3 4 5 N/A

*Species Count Class:

1 = < 25

2 = 25 - 49

3 = 50 - 74

4 = 75 - 100

5 = >100

Prairie Plant Manual:

<https://www.thurstoncountywa.gov/planning/planningdocuments/cao-prairie-plant-manual-4.23.2018.pdf>

Non-CAO vegetation notes:

	Species	Notes
1	Sc. Name <i>Pteridium aquilinum</i> <i>Camassia quamash</i>	
2	<i>Cirsium arvense</i> <i>Prunus emarginata</i>	
3	<i>Taraxacum officinale</i> <i>Rubus lactiniatus</i>	
4	<i>Rumex obtusifolius</i> <i>Digitalis purpurea</i> <i>Hypochaeris radicata</i>	
5	<i>Corylus cornuta</i> <i>Rubus armenicus</i>	
6	<i>Oemleria cerasiformis</i> <i>Polytrichum juniperinum</i> <i>Hypericum perforatum</i>	
7	<i>Chenopodium album</i> <i>Avena sativa</i>	
8	<i>Dactylis glomerata</i> <i>Mahonia nervosa</i>	
9	<i>Lepidium densiflorum</i> <i>Plantago lanceolata</i> <i>Daucus carota</i>	
10	<i>Festuca rubra</i> <i>Cytisus scoparius</i> <i>Amelanchier alnifolia</i> <i>Rumex acetosella</i> <i>Symphoricarpos albus</i> <i>Vicia americana</i>	

Site Name and Parcel #	Parcel #: <u>64300800303</u> Project #: <u>845.01</u> Site/Landowner: <u>Steve McClung</u>
How were the data collected? (circle the method for each)	Transect: Trimble Garmin Aerial Mounds Trimble Garmin Aerial Notes: _____
Field Team Personnel: (Indicate all staff present, CIRCLE who filled out form)	Name: Key McMurry, Key Environmental Solutions, LLC. Name: Name:
Others onsite (name/affiliation)	
Site visit # (CIRCLE all that apply)	1st 2 nd Unable to screen Notes: _____
Do onsite conditions preclude the need for further visits?	Yes No Dense woody cover that encompasses the entire site (trees/shrubs) that appears to preclude any potential MPG use. Impervious Compacted Graveled Flooded Other _____ Notes: _____
Describe visibility for mound detection:	Poor Fair Good Notes: _____
Request mowing? (CIRCLE and DESCRIBE WHERE MOWING IS NEEDED and SHOW ON AERIAL PHOTO	Yes No N/A Notes: _____

Mounds observed over the whole site are characteristic of: Quantify or describe amount of each type and approx. # of mounds <i>Group = 3 mounds or more</i>	MPG Mounds	Likely MPG Mounds	Indeterminate	Likely Mole Mounds	Mole Mounds
	0	0	0	0	100+
	No MPG mounds (circle)				
MPG mounds in GPS? (CIRCLE and DESCRIBE) If MPG mounds present, entered in GPS?	None All Most Some Notes: Yes No N/A				
Does woody vegetation onsite match aerial photo?	Yes No - describe differences and show on parcel map/aerial:				
What portion(s) of the property was screened? (CIRCLE and DESCRIBE)	All Part - describe and show on parcel map/aerial:				
Notes -	Describe, and show on parcel map/aerial if applicable:				
Team reviewed and agreed to data recorded on form? (CIRCLE, and EXPLAIN if "No")	Yes No Reviewed by initials: <u>KM</u> _____ Notes:				



September 3, 2022

Wetland Types	
	Estuarine and Marine Deepwater
	Estuarine and Marine Wetland
	Freshwater Emergent Wetland
	Freshwater Forested/Shrub Wetland
	Freshwater Pond
	Lake
	Other
Google Earth	



2022 Thurston County Critical Areas Ordinance (CAO) Prairie Screening Data Sheet

Parcel Number: 64300800303

Property Owner: Steve McClung

Surveyor(s): Key McMurry, Key Environmental Solutions, LLC.

Date: October 4, 2022

Composition of Vegetation:

CAO prairie criteria met? Yes or **No**

Mima mounds present? Yes or **No**

Oaks (*Quercus garryana*) present? Yes or **No**

Mature:

Sapling:

Seedling:

X Target species	Class* (circle)
<i>Apocynum androsaemifolium</i>	1 2 3 4 5 N/A
<i>Balsamorhiza deltoidea</i>	Present / Absent
<i>Bistorta bistortoides</i>	Present / Absent
<i>Brodiaea coronaria</i>	1 2 3 4 5 N/A
<i>Camassia leichtlinii</i>	1 2 3 4 5 N/A
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<i>Carex densa</i>	Present / Absent
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<i>Carex tumulicola</i>	1 2 3 4 5 N/A
<i>Carex unilateralis</i>	1 2 3 4 5 N/A
<i>Castilleja hispida</i>	1 2 3 4 5 N/A
<i>Castilleja levisecta</i>	Present / Absent
<i>Danthonia californica</i>	1 2 3 4 5 N/A
<i>Delphinium menziesii</i>	1 2 3 4 5 N/A
<i>Delphinium nuttallii</i>	1 2 3 4 5 N/A
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<i>Dodecatheon hendersonii</i>	1 2 3 4 5 N/A
<i>Downingia yina</i>	1 2 3 4 5 N/A
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<i>Plagiobothrys figuratus</i>	1 2 3 4 5 N/A
<i>Plectritis congesta</i>	Present / Absent
<i>Polemonium carneum</i>	Present / Absent
<i>Potentilla gracillis</i>	Present / Absent
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<i>Sidalcea malviflora</i> var. <i>virgata</i>	Present / Absent
<i>Silene scouleri</i>	Present / Absent
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	<i>Eriophyllum lanatum</i>	Cover: ____ m ² N/A
	<i>Eryngium petiolatum</i>	Present / Absent
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Prairie Plant Manual:

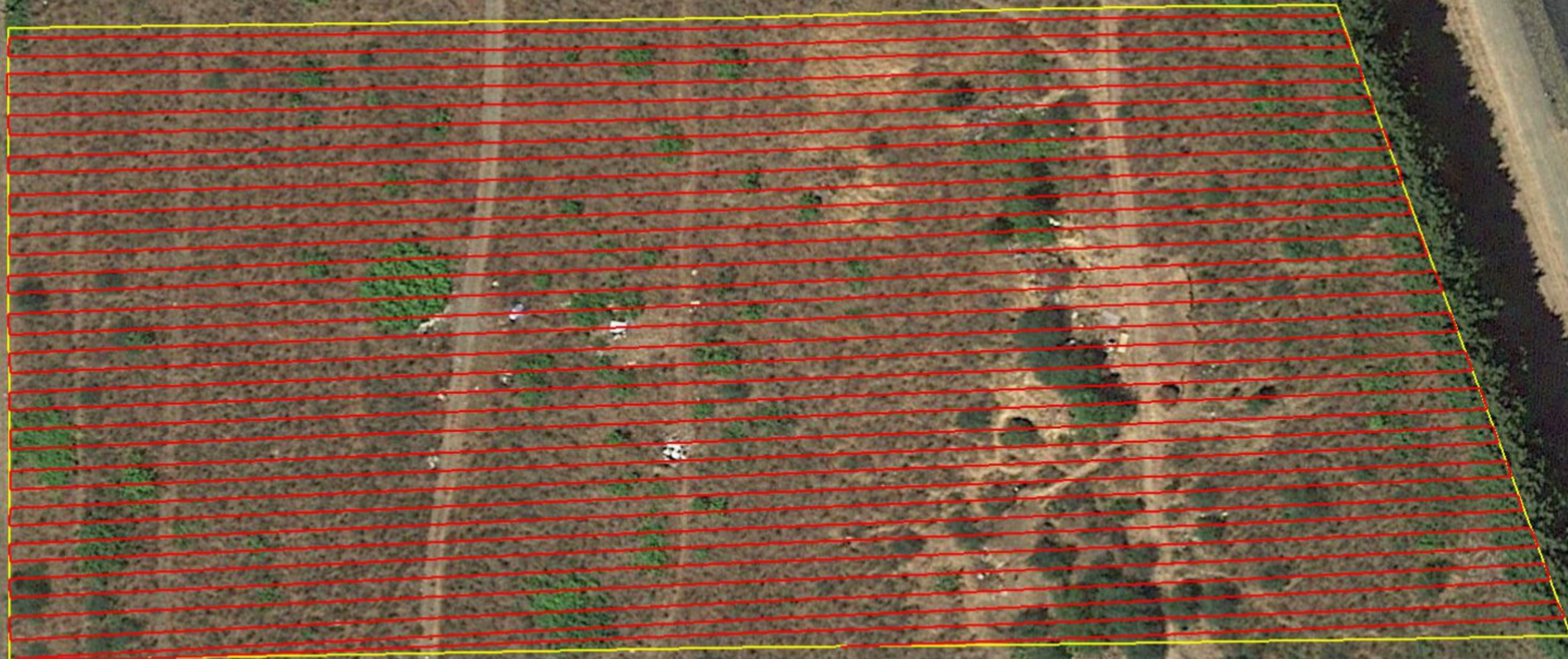
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Site Name and Parcel #	Parcel #: <u>64300800303</u> Project #: <u>845.01</u> Site/Landowner: <u>Steve McClung</u>
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What portion(s) of the property was screened? (CIRCLE and DESCRIBE)	All Part - describe and show on parcel map/aerial:				
Notes -	Describe, and show on parcel map/aerial if applicable:				
Team reviewed and agreed to data recorded on form? (CIRCLE, and EXPLAIN if "No")	Yes No Reviewed by initials: <u>KM</u> _____ _____ Notes:				

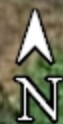


October 4, 2022

Wetland Types

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other

Google Earth



100 ft

Preliminary Drainage and Erosion Control Report

for

906 Rhoton Rd.

Yelm, WA

November 4, 2022



PO Box 12690
Olympia WA 98508
360.705.2474
www.olyeng.com

COVER SHEET

906 RHOTON RD.

Yelm, Washington
November 4, 2022

Owner/Applicant

Prepared for: MM Rhoton Rd, LLC
Contact: Steve McClung
PO Box 1189
Buckley, WA 98321
(360) 761-7695

Reviewing Agency

Jurisdiction: City of Yelm, Washington
Project Number: _____
Project Contact: _____
(360) 458-8496

Contractor

Contact:

References

WSDOE Stormwater Management Manual for Western Washington (SWMMWW),
2019 edition with Errata

Project Engineer

Prepared by: Olympic Engineering, Inc.
PO Box 12690
Olympia, WA 98508
(360) 705-2474
Contact: Chris Merritt, PE
Project Number: 22015

11/4/2022

"I hereby certify that this Preliminary Drainage and Erosion Control Plan and Report and Construction SWPPP for the **906 Rhoton Rd.** project has been prepared by me or under my supervision and meets the requirements of the City of Yelm Stormwater Standards and the standards of care and expertise which is usual and customary in this community for professional engineers. I understand that the City of Tumwater does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me."



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SECTION 1 – PROPOSED PROJECT DESCRIPTION

Permit

The applicant is applying for permits to construct a construction equipment and materials storage yard at this time. An office/warehouse building(s) and an outdoor RV storage area may be proposed in the future.

Project Location

See Vicinity Map on plans for reference.

Site Address: 906 Rhoton Rd.
Yelm, WA 98594

Tax Parcel Number(s): 64300800303

Section, Township, Range: Section 19
Township 17 North
Range 02 East, W.M.

Property Boundaries & Zoning

The zoning is Industrial (I). The parcel boundaries are shown on the drainage plans (see Appendix).

Project Description

The proposal is to construct a construction equipment and materials gravel storage yard. An office/warehouse building(s) with an associated paved and formal parking lot and an outdoor RV storage area may be constructed in the future.

Minimum Requirements

The Minimum Requirements for stormwater development and redevelopment sites are listed in Section I-2.4 of Volume I of the SWMMWW. The proposed project creates and/or replaces more than 5,000 square-feet of new hard surface area; therefore, the proposed project must address Minimum Requirements #1 through #9.

The Minimum Requirements have been addressed as follows:

Minimum Requirement #1 – Preparation of Stormwater Site Plans

Preliminary Drainage Plans have been prepared for this project (see Appendix).

Minimum Requirement #2 – Construction Stormwater Pollution Prevention (SWPP)

A Construction Stormwater Pollution Prevention (SWPP) Plan will be provided with the final Drainage Report.

Minimum Requirement #3 – Source Control of Pollution

A Permanent Source Control Plan will be provided with the storm drainage maintenance agreement prior to final project approval.

Minimum Requirement #4 – Preservation of Natural Drainage Systems and Outfalls

There are no existing natural drainage systems or outfalls located on or near the subject parcel; therefore, this Minimum Requirement is not applicable.

Minimum Requirement #5 – On-Site Stormwater Management

This project will meet the LID Performance Standard as the majority of hard surface areas are proposed to be fully infiltrated. The proposed BMP's are as follows:

Lawn and Landscape Areas:

- All disturbed and/or new lawn and landscape areas will contain soils meeting the Post-Construction Soil Quality and Depth (BMP T5.13) requirements.

Roof Areas:

- Not applicable at this time. Any future building(s) will be placed over gravel parking areas and the Bioretention facility (BMP T7.30) has been sized to accommodate that impervious surface area. Therefore, no revised or additional stormwater facilities would be needed to accommodate any future roof area(s).

Other Hard Surface Areas:

- Stormwater runoff from the new gravel storage yard will be routed to a Bioretention facility (BMP T7.30).
- Due to grades, some stormwater runoff from the driveway access immediately off Rhoton Rd. will inadvertently be sheet flow dispersed (BMP T5.12) over adjacent lawn area.
- Any future and formal paved parking lot area(s) will be placed over gravel parking areas and the Bioretention facility (BMP T7.30) has been sized to accommodate that impervious surface area. Therefore, no revised or additional stormwater facilities would be needed to accommodate any future parking lot area(s).

See Section 8 and the drainage plans for additional information.

Minimum Requirement #6 – Runoff Treatment

This project will create/replace more than 5,000 square-feet of new total effective pollution-generating hard surface (PGHS) area; therefore, Runoff Treatment is required.

See Minimum Requirement #5 above and Section 8 below for additional information along with the WWHM modeling results in the Appendix for the 15-minute water quality flow rate treatment requirement.

Minimum Requirement #7 – Flow Control

This project will have less than 10,000 square-feet of “effective” impervious surface area; will convert less than ¾-acre of vegetation to lawn/landscape; convert less than 2.5-acres of native vegetation to pasture; and cause less than a 0.15-cfs increase in the 100-year flow frequency; therefore, Flow Control is not required. Per WWHM, this project will meet the LID Performance Standard.

See Minimum Requirement #5 above and Section 8 below for additional information along with the WWHM modeling results in the Appendix for infiltration trench sizing.

Minimum Requirement #8 – Wetlands Protection

There are no known wetlands located on-site or within the immediate vicinity; therefore, this Minimum Requirement is not applicable.

Minimum Requirement #9 – Operation and Maintenance

A storm drainage maintenance agreement, including a pollution source control plan, will be prepared and recorded prior to final project approval.

Optional Guidance #1 – Financial Liability

A Financial Guarantee will be provided prior to final project approval, if required.

Optional Guidance #2 – Off-Site Analysis and Mitigation

See Section 8 below. No downstream impacts are anticipated as a result of this project.

Timing of the Project

It is anticipated that construction of the gravel storage yard area will begin in spring 2023 with substantial completion by summer 2023. Timing of the future building(s) and RV storage area are currently unknown.

SECTION 2 – EXISTING SITE CONDITIONS

Topography

Site topography in the western half of the site is flat and topography in the eastern half slopes down to the west at an average slope of approximately 5%.

Ground Cover

Site vegetation consists mainly of field grass, brush, and Scotch Broom.

Drainage

See drainage plan and Section 8 below.

Soils

The Natural Resources Conservation Service (NRCS) Soil Survey of Thurston County classifies the on-site soils as Spanaway Gravelly/Stony Sandy Loam (HSG A). A Geotechnical Services Report prepared by Quality Geo NW (see Appendix) indicates the site soils consisting of topsoil overlying sand with silt to depths of at least 7.5' below-grade. Seasonal groundwater was encountered in a test pit located on the lower western portion of the site at 7' below-grade.

Critical Areas

There are no known critical areas (i.e. wetlands, steep slopes, streams, etc.) located on-site or within the immediate vicinity of the site based on review of Thurston County critical areas maps and a site visit.

Adjacent Areas

The project site is bounded by industrial parcels to the north and east; by Rhoton Rd. to the west; and by a City of Yelm dog park to the south.

Precipitation Records

Precipitation data is included within the WWHM model.

Reports and Studies

A Geotechnical Services Report has been prepared by Quality Geo NW, dated April 27, 2022 (see Appendix).

SECTION 3 – GEOTECHNICAL REPORT

A Geotechnical Services Report has been prepared by Quality Geo NW, dated April 27, 2022 (see Appendix).

SECTION 4 – WELLS AND SEPTIC SYSTEMS

There are no known on-site wells or off-site wells within 200-feet of this project's boundaries.

SECTION 5 – FUEL TANKS

No fuel tanks were located during a site inspection or during the soils evaluation work. Olympic Engineering reviewed the latest "LUST" list (Leaking Underground Storage Tank) and found no listing for the subject site.

SECTION 6 – ANALYSIS OF THE 100-YEAR FLOOD

According to FEMA FIRM #53067C0353E dated October 16, 2012, portions of the project site and surrounding area are located in Zones AE and X. The City of Yelm was in the process of removing the flood designations from the subject parcel but the status of this is currently unknown. However, city GIS indicates the parcel is outside of any flood zones.

SECTION 7 – AESTHETIC CONSIDERATIONS FOR FACILITIES

The proposed Bioretention facility (BMP T7.30) will be landscaped. All disturbed pervious areas will be vegetated and/or landscaped and will contain soils that meet the Post-Construction Soil Quality and Depth (BMP T5.13) requirements.

SECTION 8 – FACILITY SIZING AND OFF-SITE ANALYSIS

Parcel Area: 158,487 sf (3.638 ac)
Off-Site: 913 sf (0.021 ac) (*new access*)
Project Area: 159,400 sf (3.659 ac)

Existing Development Coverage

Land Coverage Table – Pre-Developed (Acres)	
Pasture (off-site)	0.021
Pasture (on-site)	3.638
Total	3.659

Proposed Development Coverage

Land Coverage Table – Post-Developed (Acres)	
Paved Access (off-site)	0.021
Paved Access (on-site)	0.011
Gravel Storage Yard	2.870
Lawn/Landscape	0.757*
Total	3.659

*Approximately 0.403-acres of the perimeter lawn/landscape area will contribute runoff to the bioretention facility and this has been reflected in the model.

Proposed Permanent BMP's

The following Permanent BMP's have been incorporated into the design (see drainage plans):

1. BMP T7.30 Bioretention Facility (for gravel storage yard and future roof and RV storage areas)
2. BMP T5.13 Post-Construction Soil Quality and Depth (all disturbed, lawn/landscape, and stormwater dispersion areas)

Flow Control & Runoff Treatment Facilities

A Bioretention facility (BMP T7.30) will provide treatment and temporary detention of stormwater runoff from all pollution generating hard surface (PGHS) areas. Per WWHM modeling results, this project will treat and infiltrate 100% of the runoff volume.

The bioretention facility will provide for over 2' of freeboard. At a maximum ponding depth of 1', the facility will draw down in 1.5 hours ($(1' \times 12") / 8" / \text{hr} = 1.5 \text{ hours}$).

See WWHM modeling results in the Appendix for infiltration trench sizing.

Modeling & Assumptions

- Stormwater runoff from the hard surface areas will be infiltrated. These areas are considered “ineffective” and can be excluded from the impervious area threshold determination of Minimum Requirement #7.
- All infiltrated areas can be discounted from WWHM when comparing pre- to post-developed runoff rates.
- The existing ground cover has been modeled as it currently exists for comparing the pre- to post-developed runoff rates.
- For the LID analysis, all areas to be disturbed were modeled as forest.
- All lawn/landscape areas that meet the Post-Construction Soil Quality and Depth (BMP T5.13) requirements have been modeled as “pasture”.
- An 8”/hr design (corrected K_{sat}) infiltration rate has been used for the native subgrade beneath the Bioretention facility as recommended in the Geotechnical Services Report. A 12”/hr rate was used for the default bioretention soil mix.
- Approximately 0.403-acres of the perimeter lawn/landscape area will contribute runoff to the bioretention facility and this has been reflected in the model.
- The bioretention area in the model automatically receives rainfall; therefore, the area of the facility has been excluded from the contributing basin area.

Off-Site Analysis

Stormwater runoff generated from the new on-site improvements will be fully infiltrated on-site. Stormwater runoff from the Rhoton Rd. frontage currently sheet flows to a shallow roadside ditch with no apparent ultimate outfall point other than full infiltration. There does not appear to be any noticeable stormwater run-on from adjacent parcels.

Stormwater runoff will not be directly discharged off-site. Stormwater from a complete failure of the on-site infiltration system may temporarily overflow to the existing ditch along Rhoton Rd. No downstream impacts, including impacts to structures, are anticipated as a result of an emergency overflow. Based on the above, a quantitative off-site analysis or mitigation is not warranted.

SECTION 9 – COVENANTS, DEDICATIONS, EASEMENTS

No easements are required for the storm drainage system components.

SECTION 10 – PROPERTY OWNERS ASSOCIATION ARTICLES OF INCORPORATION

The property owner will be required to maintain the on-site stormwater systems.

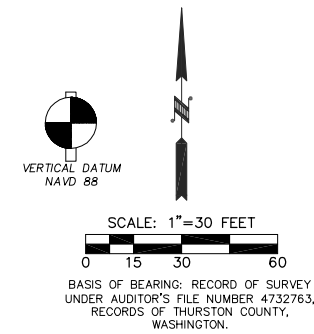
Appendix 1
Preliminary Drainage Plan

**SECTION 19, TOWNSHIP 17 NORTH, RANGE 2 EAST, W.M.
YELM, WASHINGTON**

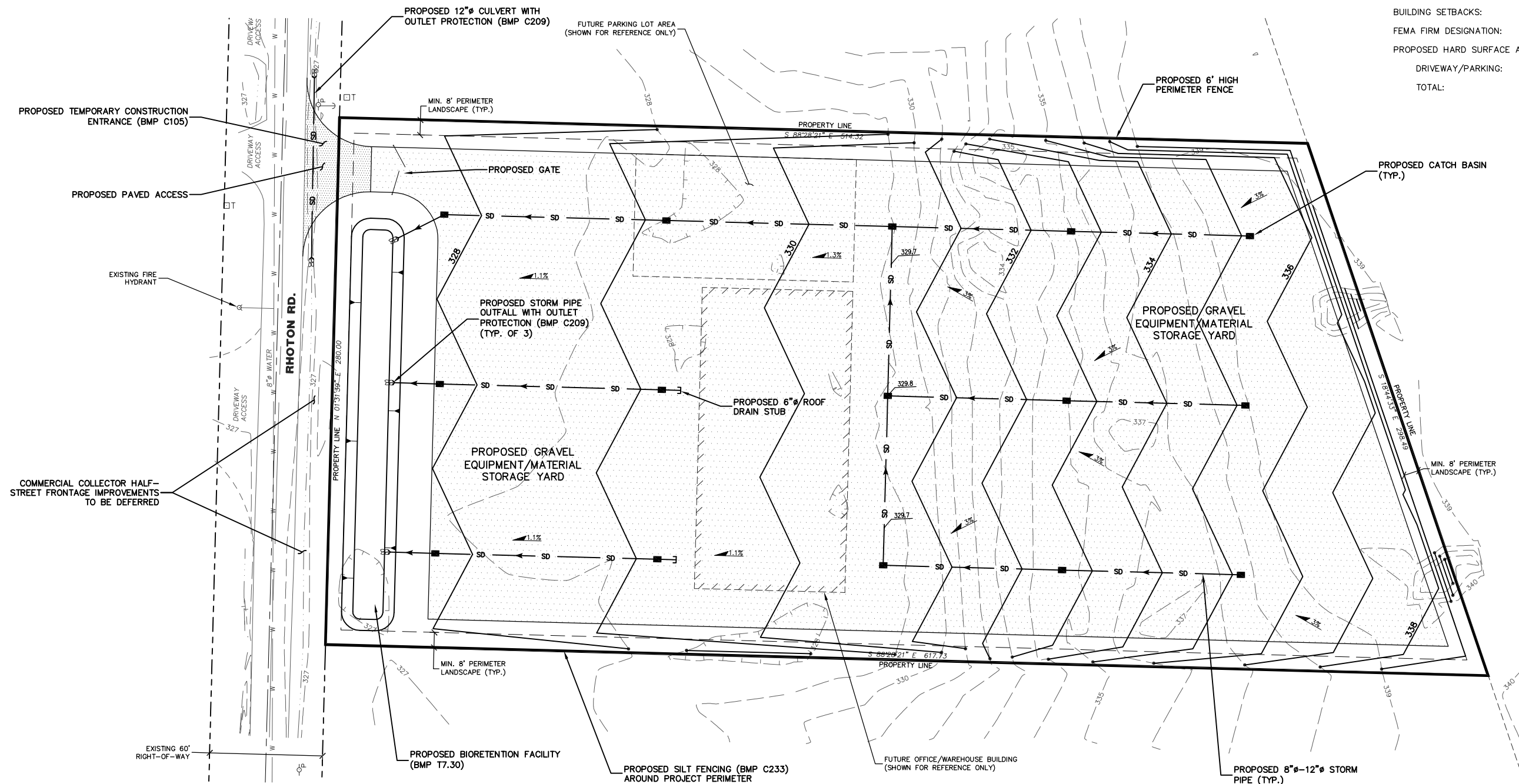
Map of the study area showing the location of the site. The map includes Crystal Springs St SE, View Dr SE, Quail Meadows, Photon Rd SE, and Northern Pacific Rd NW. A north arrow is present. A black rectangle indicates the site location, with an arrow pointing to it from the word 'SITE'.


THE BOUNDARY AND TOPOGRAPHIC SURVEY INFORMATION
DEPICTED HEREON WAS PROVIDED BY O'BUNCO ENGINEERING,
INC. AND OBTAINED FROM CITY RECORDS. THIS SURVEY
INFORMATION WAS NOT FIELD VERIFIED BY OLYMPIC
ENGINEERING AND OLYMPIC ENGINEERING ASSUMES NO LIABILITY
IN THE ACCURACY OF THIS INFORMATION OR FOR OMISSIONS
WHICH MAY HAVE BEEN INCORPORATED INTO THESE DRAWINGS
AS A RESULT.

THERE ARE NO KNOWN DOMESTIC WELLS LOCATED WITHIN 200' OF THIS PROJECT.



OWNER/APPLICANT:	MM RHOTON RD, LLC PO BOX 1189 BUCKLEY, WA 98321
PARCEL NO:	64300800303
SITE ADDRESS:	906 RHOTON RD. SE YELM, WA 98597
ZONING:	I, INDUSTRIAL
PARCEL AREA:	154,487 SF (3.64 AC)
SOILS:	SPANAWAY GRAVELLY SANDY LOAM (HSG A)
SANITARY SEWER/WATER:	CITY OF YELM
POWER/GAS:	PUGET SOUND ENERGY
TELECOMMUNICATIONS:	COMCAST & LUMEN
FIRE DISTRICT:	YELM
REFUSE/RECYCLING:	PACIFIC DISPOSAL
BUILDING SETBACKS:	15' FRONT, SIDE, & REAR
FEMA FIRM DESIGNATION:	ZONE X (53067C0353E)
PROPOSED HARD SURFACE AREAS:	
DRIVEWAY/PARKING:	3.638 ACRES (ON-SITE) <u>0.021 ACRES (OFF-SITE)</u>
TOTAL:	3.659 ACRES



<div><p>PO Box 12690 Olympia, WA 98508 360.705.2474 office www.olyeng.com</p><p>OLYMPIC ENGINEERING</p></div> <div><p><i>Paul Engelhardt, Lead Designer, Project Management</i></p></div>	JOB NUMBER: 22015	DESIGNED BY: CMM	SITE PLAN	906 RHOTON RD.	CITY OF YELM WASHINGTON	NO.	DATE	REVISION
	DRAWING NAME: 22015_SITE	DRAWN BY: CMM						
		CHECKED BY:						
		SCALE: 1" = 30'						
		DATE: 11/4/2022						
SHEET: 1 OF 1								

Appendix 2
Preliminary Drainage Calculations

WWHM2012

PROJECT REPORT

906 Rhoton Rd.

LID Analysis

General Model Information

Project Name: 22015_110322 LID
Site Name: MM Rhoton
Site Address: 906 Rhoton Rd. SE
City: Yelm
Report Date: 11/4/2022
Gage: Lake Lawrence
Data Start: 1955/10/01
Data End: 2008/09/30
Timestep: 15 Minute
Precip Scale: 0.857
Version Date: 2019/09/13
Version: 4.2.17

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass: No

GroundWater: No

Pervious Land Use acre
A B, Forest, Flat 3.659

Pervious Total 3.659

Impervious Land Use acre

Impervious Total 0

Basin Total 3.659

Areas to be disturbed
modeled as "forest" for LID
Analysis

Element Flows To:
Surface

Interflow

Groundwater

Mitigated Land Use

Basin 1

Bypass: No

GroundWater: No

Pervious Land Use acre
A B, Pasture, Steep 0.403

Pervious Total 0.403

Impervious Land Use acre
PARKING FLAT 2.902

Impervious Total 2.902

Basin Total 3.305

Element Flows To:

Surface	Interflow	Groundwater
Surface retention 1	Surface retention 1	

Basin 2

Bypass: Yes

GroundWater: No

Pervious Land Use acre
A B, Pasture, Mod 0.1
A B, Pasture, Flat 0.115

Pervious Total 0.215

Impervious Land Use acre

Impervious Total 0

Basin Total 0.215

Element Flows To:
Surface Interflow Groundwater

Routing Elements

Predeveloped Routing

Mitigated Routing

Bioretention 1

Bottom Length: 207.00 ft.
 Bottom Width: 16.00 ft.
 Material thickness of first layer: 1.5
 Material type for first layer: SMMWW 12 in/hr
 Material thickness of second layer: 0
 Material type for second layer: Sand
 Material thickness of third layer: 0
 Material type for third layer: GRAVEL
 Infiltration On
 Infiltration rate: 8
 Infiltration safety factor: 1
 Wetted surface area On
 Total Volume Infiltrated (ac-ft.): 518.268
 Total Volume Through Riser (ac-ft.): 0
 Total Volume Through Facility (ac-ft.): 518.268
 Percent Infiltrated: 100
 Total Precip Applied to Facility: 14.713
 Total Evap From Facility: 5.993
 Underdrain not used
 Discharge Structure
 Riser Height: 1 ft.
 Riser Diameter: 0.5 in.
 Element Flows To:
 Outlet 1 Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
325.00	0.1240	0.0000	0.0000	0.0000
325.04	0.1227	0.0013	0.0000	0.0000
325.08	0.1214	0.0027	0.0000	0.0000
325.12	0.1201	0.0041	0.0000	0.0000
325.15	0.1189	0.0055	0.0000	0.0007
325.19	0.1176	0.0069	0.0000	0.0062
325.23	0.1164	0.0084	0.0000	0.0098
325.27	0.1151	0.0099	0.0000	0.0144
325.31	0.1138	0.0114	0.0000	0.0203
325.35	0.1126	0.0129	0.0000	0.0275
325.38	0.1113	0.0144	0.0000	0.0362
325.42	0.1101	0.0160	0.0000	0.0464
325.46	0.1088	0.0176	0.0000	0.0583
325.50	0.1076	0.0192	0.0000	0.0720
325.54	0.1063	0.0208	0.0000	0.0876
325.58	0.1051	0.0224	0.0000	0.1053
325.62	0.1039	0.0241	0.0000	0.1251
325.65	0.1026	0.0258	0.0000	0.1472
325.69	0.1014	0.0275	0.0000	0.1717
325.73	0.1001	0.0292	0.0000	0.1988
325.77	0.0989	0.0310	0.0000	0.2286
325.81	0.0977	0.0327	0.0000	0.2611
325.85	0.0965	0.0345	0.0000	0.2966
325.88	0.0952	0.0363	0.0000	0.3352
325.92	0.0940	0.0382	0.0000	0.3770

325.96	0.0928	0.0400	0.0000	0.4221
326.00	0.0916	0.0419	0.0000	0.4707
326.04	0.0904	0.0438	0.0000	0.5229
326.08	0.0892	0.0457	0.0000	0.5789
326.12	0.0880	0.0477	0.0000	0.6388
326.15	0.0868	0.0497	0.0000	0.7027
326.19	0.0856	0.0517	0.0000	0.7708
326.23	0.0844	0.0537	0.0000	0.8433
326.27	0.0832	0.0557	0.0000	0.9201
326.31	0.0820	0.0578	0.0000	0.9488
326.35	0.0808	0.0598	0.0000	0.9590
326.38	0.0796	0.0619	0.0000	0.9692
326.42	0.0784	0.0641	0.0000	0.9794
326.46	0.0772	0.0662	0.0000	0.9897
326.50	0.0760	0.0684	0.0000	1.0000

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infiltr(cfs)
1.5000	0.1240	0.0684	0.0000	0.9200	0.0103
1.5385	0.1252	0.0732	0.0000	0.9200	0.0206
1.5769	0.1265	0.0780	0.0000	0.9672	0.0310
1.6154	0.1278	0.0829	0.0000	0.9908	0.0414
1.6538	0.1291	0.0878	0.0000	1.0144	0.0517
1.6923	0.1304	0.0928	0.0000	1.0379	0.0621
1.7308	0.1317	0.0979	0.0000	1.0615	0.0726
1.7692	0.1330	0.1030	0.0000	1.0851	0.0830
1.8077	0.1343	0.1081	0.0000	1.1087	0.0935
1.8462	0.1356	0.1133	0.0000	1.1323	0.1040
1.8846	0.1369	0.1185	0.0000	1.1559	0.1145
1.9231	0.1382	0.1238	0.0000	1.1795	0.1250
1.9615	0.1395	0.1292	0.0000	1.2031	0.1356
2.0000	0.1408	0.1346	0.0000	1.2267	0.1461
2.0385	0.1421	0.1400	0.0000	1.2503	0.1567
2.0769	0.1434	0.1455	0.0000	1.2738	0.1673
2.1154	0.1447	0.1510	0.0000	1.2974	0.1779
2.1538	0.1460	0.1566	0.0000	1.3210	0.1886
2.1923	0.1473	0.1623	0.0000	1.3446	0.1992
2.2308	0.1487	0.1679	0.0000	1.3682	0.2099
2.2692	0.1500	0.1737	0.0000	1.3918	0.2206
2.3077	0.1513	0.1795	0.0000	1.4154	0.2314
2.3462	0.1526	0.1853	0.0000	1.4390	0.2421
2.3846	0.1540	0.1912	0.0000	1.4626	0.2529
2.4231	0.1553	0.1972	0.0000	1.4862	0.2636
2.4615	0.1566	0.2032	0.0000	1.5097	0.2744
2.5000	0.1580	0.2092	0.0000	1.5333	0.2853
2.5385	0.1593	0.2153	0.0011	1.5333	0.2961
2.5769	0.1607	0.2215	0.0015	1.5333	0.3070
2.6154	0.1620	0.2277	0.0019	1.5333	0.3179
2.6538	0.1634	0.2339	0.0021	1.5333	0.3288
2.6923	0.1647	0.2403	0.0024	1.5333	0.3397
2.7308	0.1661	0.2466	0.0026	1.5333	0.3506
2.7692	0.1674	0.2530	0.0028	1.5333	0.3616
2.8077	0.1688	0.2595	0.0030	1.5333	0.3726
2.8462	0.1702	0.2660	0.0032	1.5333	0.3836
2.8846	0.1715	0.2726	0.0034	1.5333	0.3946
2.9231	0.1729	0.2792	0.0036	1.5333	0.4056
2.9615	0.1742	0.2859	0.0037	1.5333	0.4167
3.0000	0.1756	0.2926	0.0039	1.5333	0.4277

3.0385	0.1770	0.2994	0.0040	1.5333	0.4388
3.0769	0.1784	0.3062	0.0042	1.5333	0.4500
3.1154	0.1797	0.3131	0.0043	1.5333	0.4611
3.1538	0.1811	0.3200	0.0044	1.5333	0.4723
3.1923	0.1825	0.3270	0.0045	1.5333	0.4834
3.2308	0.1839	0.3341	0.0047	1.5333	0.4946
3.2692	0.1853	0.3412	0.0048	1.5333	0.5058
3.3077	0.1867	0.3483	0.0049	1.5333	0.5171
3.3462	0.1881	0.3555	0.0050	1.5333	0.5283
3.3846	0.1895	0.3628	0.0051	1.5333	0.5396
3.4231	0.1909	0.3701	0.0053	1.5333	0.5509
3.4615	0.1923	0.3775	0.0054	1.5333	0.5622
3.5000	0.1937	0.3849	0.0055	1.5333	0.5622
3.5000	0.1937	0.3849	0.0056	1.5333	0.0000

Surface retention 1

Element Flows To:

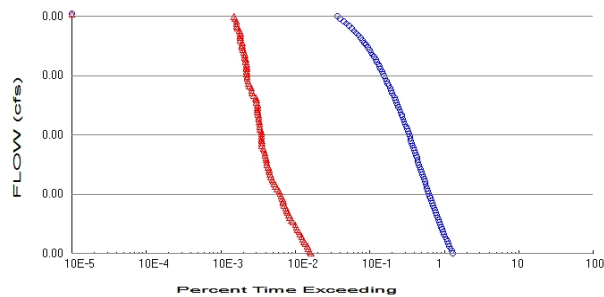
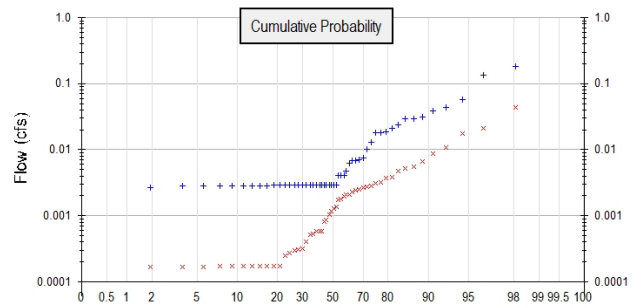
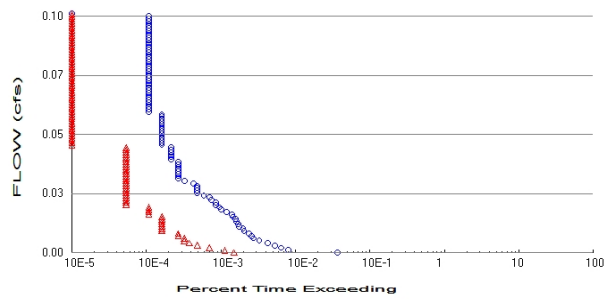
Outlet 1

Outlet 2

Bioretention 1

Analysis Results

POC 1



+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1

Total Pervious Area: 3.659
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1

Total Pervious Area: 0.618
Total Impervious Area: 2.902

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.00555
5 year	0.015401
10 year	0.028395
25 year	0.057986
50 year	0.095211
100 year	0.152298

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.001002
5 year	0.003686
10 year	0.007601
25 year	0.017002
50 year	0.029133
100 year	0.047884

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1956	0.018	0.003
1957	0.004	0.003
1958	0.003	0.001
1959	0.003	0.001
1960	0.003	0.001
1961	0.013	0.002
1962	0.003	0.000
1963	0.003	0.004
1964	0.003	0.001
1965	0.003	0.002
1966	0.003	0.000
1967	0.005	0.001
1968	0.003	0.000
1969	0.003	0.000
1970	0.003	0.000
1971	0.024	0.003
1972	0.039	0.006
1973	0.003	0.000
1974	0.010	0.001
1975	0.003	0.000
1976	0.004	0.001
1977	0.003	0.000
1978	0.004	0.002
1979	0.003	0.000
1980	0.003	0.001
1981	0.007	0.003
1982	0.008	0.002
1983	0.003	0.001
1984	0.003	0.001
1985	0.003	0.000
1986	0.007	0.003
1987	0.006	0.002
1988	0.003	0.000
1989	0.003	0.000
1990	0.021	0.011
1991	0.032	0.004
1992	0.003	0.000
1993	0.003	0.000
1994	0.003	0.000
1995	0.018	0.003
1996	0.044	0.005
1997	0.029	0.005
1998	0.007	0.007
1999	0.003	0.000
2000	0.003	0.001
2001	0.003	0.000
2002	0.019	0.002
2003	0.003	0.000
2004	0.185	0.044
2005	0.030	0.021
2006	0.133	0.017
2007	0.057	0.009
2008	0.003	0.002

[Ranked Annual Peaks](#)

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.1852	0.0443
2	0.1332	0.0208
3	0.0574	0.0175
4	0.0442	0.0107
5	0.0388	0.0088
6	0.0316	0.0067
7	0.0299	0.0056
8	0.0292	0.0051
9	0.0239	0.0047
10	0.0209	0.0039
11	0.0188	0.0037
12	0.0182	0.0032
13	0.0182	0.0031
14	0.0131	0.0028
15	0.0101	0.0028
16	0.0075	0.0026
17	0.0070	0.0025
18	0.0068	0.0024
19	0.0068	0.0023
20	0.0063	0.0021
21	0.0048	0.0021
22	0.0041	0.0020
23	0.0041	0.0018
24	0.0040	0.0018
25	0.0030	0.0014
26	0.0029	0.0013
27	0.0029	0.0012
28	0.0029	0.0010
29	0.0029	0.0009
30	0.0029	0.0008
31	0.0029	0.0006
32	0.0029	0.0006
33	0.0029	0.0006
34	0.0029	0.0005
35	0.0029	0.0005
36	0.0029	0.0004
37	0.0029	0.0003
38	0.0029	0.0003
39	0.0029	0.0003
40	0.0029	0.0003
41	0.0029	0.0002
42	0.0029	0.0002
43	0.0029	0.0002
44	0.0029	0.0002
45	0.0029	0.0002
46	0.0029	0.0002
47	0.0029	0.0002
48	0.0028	0.0002
49	0.0028	0.0002
50	0.0028	0.0002
51	0.0028	0.0002
52	0.0026	0.0002
53	0.0026	0.0002

LID Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0004	24234	302	1	Pass
0.0005	23361	289	1	Pass
0.0005	22506	278	1	Pass
0.0005	21744	270	1	Pass
0.0005	20963	256	1	Pass
0.0006	20294	243	1	Pass
0.0006	19681	233	1	Pass
0.0006	19105	226	1	Pass
0.0006	18520	214	1	Pass
0.0007	18012	208	1	Pass
0.0007	17486	199	1	Pass
0.0007	16996	191	1	Pass
0.0007	16509	186	1	Pass
0.0008	16026	174	1	Pass
0.0008	15593	166	1	Pass
0.0008	15217	157	1	Pass
0.0008	14793	152	1	Pass
0.0008	14385	145	1	Pass
0.0009	13963	141	1	Pass
0.0009	13531	139	1	Pass
0.0009	13199	132	1	Pass
0.0009	12844	128	0	Pass
0.0010	12467	128	1	Pass
0.0010	12169	124	1	Pass
0.0010	11809	120	1	Pass
0.0010	11513	117	1	Pass
0.0011	11210	113	1	Pass
0.0011	10943	106	0	Pass
0.0011	10660	101	0	Pass
0.0011	10411	97	0	Pass
0.0012	10147	94	0	Pass
0.0012	9913	91	0	Pass
0.0012	9657	88	0	Pass
0.0012	9393	85	0	Pass
0.0012	9190	84	0	Pass
0.0013	8991	83	0	Pass
0.0013	8757	81	0	Pass
0.0013	8532	77	0	Pass
0.0013	8309	77	0	Pass
0.0014	8105	76	0	Pass
0.0014	7919	75	0	Pass
0.0014	7724	73	0	Pass
0.0014	7540	73	0	Pass
0.0015	7328	71	0	Pass
0.0015	7150	69	0	Pass
0.0015	6984	66	0	Pass
0.0015	6819	66	0	Pass
0.0016	6655	66	0	Pass
0.0016	6508	65	0	Pass
0.0016	6356	65	1	Pass
0.0016	6191	65	1	Pass
0.0016	5995	65	1	Pass
0.0017	5847	63	1	Pass

0.0017	5681	62	1	Pass
0.0017	5508	62	1	Pass
0.0017	5351	61	1	Pass
0.0018	5207	60	1	Pass
0.0018	5077	60	1	Pass
0.0018	4942	59	1	Pass
0.0018	4787	58	1	Pass
0.0019	4654	58	1	Pass
0.0019	4505	58	1	Pass
0.0019	4388	58	1	Pass
0.0019	4243	56	1	Pass
0.0020	4111	56	1	Pass
0.0020	3962	55	1	Pass
0.0020	3841	51	1	Pass
0.0020	3713	49	1	Pass
0.0020	3579	48	1	Pass
0.0021	3457	48	1	Pass
0.0021	3340	45	1	Pass
0.0021	3219	44	1	Pass
0.0021	3104	43	1	Pass
0.0022	3001	42	1	Pass
0.0022	2894	42	1	Pass
0.0022	2795	41	1	Pass
0.0022	2700	41	1	Pass
0.0023	2594	41	1	Pass
0.0023	2505	41	1	Pass
0.0023	2423	41	1	Pass
0.0023	2325	40	1	Pass
0.0024	2226	40	1	Pass
0.0024	2126	39	1	Pass
0.0024	2018	39	1	Pass
0.0024	1925	38	1	Pass
0.0024	1846	37	2	Pass
0.0025	1760	36	2	Pass
0.0025	1670	36	2	Pass
0.0025	1578	36	2	Pass
0.0025	1493	34	2	Pass
0.0026	1397	34	2	Pass
0.0026	1311	34	2	Pass
0.0026	1227	34	2	Pass
0.0026	1140	33	2	Pass
0.0027	1052	31	2	Pass
0.0027	971	30	3	Pass
0.0027	892	30	3	Pass
0.0027	824	30	3	Pass
0.0028	745	29	3	Pass
0.0028	687	28	4	Pass

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0028	687	28	4	Pass
0.0037	148	21	14	Pass
0.0046	120	13	10	Pass
0.0056	98	9	9	Pass
0.0065	80	7	8	Pass
0.0074	61	6	9	Pass
0.0084	51	6	11	Pass
0.0093	48	5	10	Pass
0.0102	44	5	11	Pass
0.0112	38	3	7	Pass
0.0121	37	3	8	Pass
0.0130	33	3	9	Pass
0.0140	32	3	9	Pass
0.0149	30	3	10	Pass
0.0158	29	3	10	Pass
0.0168	27	3	11	Pass
0.0177	26	2	7	Pass
0.0186	22	2	9	Pass
0.0196	19	2	10	Pass
0.0205	18	2	11	Pass
0.0214	16	1	6	Pass
0.0224	16	1	6	Pass
0.0233	14	1	7	Pass
0.0243	13	1	7	Pass
0.0252	11	1	9	Pass
0.0261	9	1	11	Pass
0.0271	9	1	11	Pass
0.0280	9	1	11	Pass
0.0289	9	1	11	Pass
0.0299	8	1	12	Pass
0.0308	6	1	16	Pass
0.0317	5	1	20	Pass
0.0327	5	1	20	Pass
0.0336	5	1	20	Pass
0.0345	5	1	20	Pass
0.0355	5	1	20	Pass
0.0364	5	1	20	Pass
0.0373	5	1	20	Pass
0.0383	5	1	20	Pass
0.0392	4	1	25	Pass
0.0401	4	1	25	Pass
0.0411	4	1	25	Pass
0.0420	4	1	25	Pass
0.0429	4	1	25	Pass
0.0439	4	1	25	Pass
0.0448	3	0	0	Pass
0.0457	3	0	0	Pass
0.0467	3	0	0	Pass
0.0476	3	0	0	Pass
0.0485	3	0	0	Pass
0.0495	3	0	0	Pass
0.0504	3	0	0	Pass
0.0513	3	0	0	Pass

0.0523	3	0	0	Pass
0.0532	3	0	0	Pass
0.0541	3	0	0	Pass
0.0551	3	0	0	Pass
0.0560	3	0	0	Pass
0.0569	3	0	0	Pass
0.0579	2	0	0	Pass
0.0588	2	0	0	Pass
0.0597	2	0	0	Pass
0.0607	2	0	0	Pass
0.0616	2	0	0	Pass
0.0625	2	0	0	Pass
0.0635	2	0	0	Pass
0.0644	2	0	0	Pass
0.0653	2	0	0	Pass
0.0663	2	0	0	Pass
0.0672	2	0	0	Pass
0.0681	2	0	0	Pass
0.0691	2	0	0	Pass
0.0700	2	0	0	Pass
0.0709	2	0	0	Pass
0.0719	2	0	0	Pass
0.0728	2	0	0	Pass
0.0737	2	0	0	Pass
0.0747	2	0	0	Pass
0.0756	2	0	0	Pass
0.0765	2	0	0	Pass
0.0775	2	0	0	Pass
0.0784	2	0	0	Pass
0.0793	2	0	0	Pass
0.0803	2	0	0	Pass
0.0812	2	0	0	Pass
0.0821	2	0	0	Pass
0.0831	2	0	0	Pass
0.0840	2	0	0	Pass
0.0849	2	0	0	Pass
0.0859	2	0	0	Pass
0.0868	2	0	0	Pass
0.0877	2	0	0	Pass
0.0887	2	0	0	Pass
0.0896	2	0	0	Pass
0.0905	2	0	0	Pass
0.0915	2	0	0	Pass
0.0924	2	0	0	Pass
0.0933	2	0	0	Pass
0.0943	2	0	0	Pass
0.0952	2	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume: 0 acre-feet

On-line facility target flow: 0 cfs.

Adjusted for 15 min: 0 cfs.

Off-line facility target flow: 0 cfs.

Adjusted for 15 min: 0 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
retention 1 POC	<input checked="" type="checkbox"/>	471.62	518.27	518.27	<input checked="" type="checkbox"/>	100.00	518.27	100.00	Treat. Credit
Total Volume Infiltrated		471.62	518.27	518.27		100.00	518.27	518 / 518 = 100%	Treat. Credit = 100%
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix

Predeveloped Schematic



Basin 1
13.66ac

Mitigated Schematic



WWHM2012

PROJECT REPORT

906 Rhoton Rd.

Pre- to Post-Developed
Runoff Rate Analysis

General Model Information

Project Name: 22015_110322
Site Name: MM Rhoton
Site Address: 906 Rhoton Rd. SE
City: Yelm
Report Date: 11/4/2022
Gage: Lake Lawrence
Data Start: 1955/10/01
Data End: 2008/09/30
Timestep: 15 Minute
Precip Scale: 0.857
Version Date: 2019/09/13
Version: 4.2.17

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass: No

GroundWater: No

Pervious Land Use acre
A B, Pasture, Flat 3.659

Pervious Total 3.659

Impervious Land Use acre

Impervious Total 0

Basin Total 3.659

Element Flows To:
Surface Interflow Groundwater

Mitigated Land Use

Basin 1

Bypass: No

GroundWater: No

Pervious Land Use acre
A B, Pasture, Steep 0.403

Pervious Total 0.403

Impervious Land Use acre
PARKING FLAT 2.902

Impervious Total 2.902

Basin Total 3.305

Contributing lawn/
landscape areas



Element Flows To:

Surface	Interflow	Groundwater
Surface retention 1	Surface retention 1	

Basin 2

Bypass: Yes

GroundWater: No

Pervious Land Use acre
A B, Pasture, Mod 0.1
A B, Pasture, Flat 0.115

Pervious Total 0.215

Undetained runoff

Impervious Land Use acre

Impervious Total 0

Basin Total 0.215

Element Flows To:
Surface

Interflow


Groundwater

Routing Elements

Predeveloped Routing

Mitigated Routing

Bioretention 1

Bottom Length: 207.00 ft.
 Bottom Width: 16.00 ft.
 Material thickness of first layer: 1.5
 Material type for first layer: SMMWW 12 in/hr
 Material thickness of second layer: 0
 Material type for second layer: Sand
 Material thickness of third layer: 0
 Material type for third layer: GRAVEL
 Infiltration On
 Infiltration rate: 8
 Infiltration safety factor: 1
 Wetted surface area On
 Total Volume Infiltrated (ac-ft.): 518.268
 Total Volume Through Riser (ac-ft.): 0
 Total Volume Through Facility (ac-ft.): 518.268
 Percent Infiltrated: 100 
 Total Precip Applied to Facility: 14.713
 Total Evap From Facility: 5.993
 Underdrain not used
 Discharge Structure
 Riser Height: 1 ft.
 Riser Diameter: 0.5 in.
 Element Flows To:
 Outlet 1 Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
325.00	0.1240	0.0000	0.0000	0.0000
325.04	0.1227	0.0013	0.0000	0.0000
325.08	0.1214	0.0027	0.0000	0.0000
325.12	0.1201	0.0041	0.0000	0.0000
325.15	0.1189	0.0055	0.0000	0.0007
325.19	0.1176	0.0069	0.0000	0.0062
325.23	0.1164	0.0084	0.0000	0.0098
325.27	0.1151	0.0099	0.0000	0.0144
325.31	0.1138	0.0114	0.0000	0.0203
325.35	0.1126	0.0129	0.0000	0.0275
325.38	0.1113	0.0144	0.0000	0.0362
325.42	0.1101	0.0160	0.0000	0.0464
325.46	0.1088	0.0176	0.0000	0.0583
325.50	0.1076	0.0192	0.0000	0.0720
325.54	0.1063	0.0208	0.0000	0.0876
325.58	0.1051	0.0224	0.0000	0.1053
325.62	0.1039	0.0241	0.0000	0.1251
325.65	0.1026	0.0258	0.0000	0.1472
325.69	0.1014	0.0275	0.0000	0.1717
325.73	0.1001	0.0292	0.0000	0.1988
325.77	0.0989	0.0310	0.0000	0.2286
325.81	0.0977	0.0327	0.0000	0.2611
325.85	0.0965	0.0345	0.0000	0.2966
325.88	0.0952	0.0363	0.0000	0.3352
325.92	0.0940	0.0382	0.0000	0.3770

325.96	0.0928	0.0400	0.0000	0.4221
326.00	0.0916	0.0419	0.0000	0.4707
326.04	0.0904	0.0438	0.0000	0.5229
326.08	0.0892	0.0457	0.0000	0.5789
326.12	0.0880	0.0477	0.0000	0.6388
326.15	0.0868	0.0497	0.0000	0.7027
326.19	0.0856	0.0517	0.0000	0.7708
326.23	0.0844	0.0537	0.0000	0.8433
326.27	0.0832	0.0557	0.0000	0.9201
326.31	0.0820	0.0578	0.0000	0.9488
326.35	0.0808	0.0598	0.0000	0.9590
326.38	0.0796	0.0619	0.0000	0.9692
326.42	0.0784	0.0641	0.0000	0.9794
326.46	0.0772	0.0662	0.0000	0.9897
326.50	0.0760	0.0684	0.0000	1.0000

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infiltr(cfs)
1.5000	0.1240	0.0684	0.0000	0.9200	0.0103
1.5385	0.1252	0.0732	0.0000	0.9200	0.0206
1.5769	0.1265	0.0780	0.0000	0.9672	0.0310
1.6154	0.1278	0.0829	0.0000	0.9908	0.0414
1.6538	0.1291	0.0878	0.0000	1.0144	0.0517
1.6923	0.1304	0.0928	0.0000	1.0379	0.0621
1.7308	0.1317	0.0979	0.0000	1.0615	0.0726
1.7692	0.1330	0.1030	0.0000	1.0851	0.0830
1.8077	0.1343	0.1081	0.0000	1.1087	0.0935
1.8462	0.1356	0.1133	0.0000	1.1323	0.1040
1.8846	0.1369	0.1185	0.0000	1.1559	0.1145
1.9231	0.1382	0.1238	0.0000	1.1795	0.1250
1.9615	0.1395	0.1292	0.0000	1.2031	0.1356
2.0000	0.1408	0.1346	0.0000	1.2267	0.1461
2.0385	0.1421	0.1400	0.0000	1.2503	0.1567
2.0769	0.1434	0.1455	0.0000	1.2738	0.1673
2.1154	0.1447	0.1510	0.0000	1.2974	0.1779
2.1538	0.1460	0.1566	0.0000	1.3210	0.1886
2.1923	0.1473	0.1623	0.0000	1.3446	0.1992
2.2308	0.1487	0.1679	0.0000	1.3682	0.2099
2.2692	0.1500	0.1737	0.0000	1.3918	0.2206
2.3077	0.1513	0.1795	0.0000	1.4154	0.2314
2.3462	0.1526	0.1853	0.0000	1.4390	0.2421
2.3846	0.1540	0.1912	0.0000	1.4626	0.2529
2.4231	0.1553	0.1972	0.0000	1.4862	0.2636
2.4615	0.1566	0.2032	0.0000	1.5097	0.2744
2.5000	0.1580	0.2092	0.0000	1.5333	0.2853
2.5385	0.1593	0.2153	0.0011	1.5333	0.2961
2.5769	0.1607	0.2215	0.0015	1.5333	0.3070
2.6154	0.1620	0.2277	0.0019	1.5333	0.3179
2.6538	0.1634	0.2339	0.0021	1.5333	0.3288
2.6923	0.1647	0.2403	0.0024	1.5333	0.3397
2.7308	0.1661	0.2466	0.0026	1.5333	0.3506
2.7692	0.1674	0.2530	0.0028	1.5333	0.3616
2.8077	0.1688	0.2595	0.0030	1.5333	0.3726
2.8462	0.1702	0.2660	0.0032	1.5333	0.3836
2.8846	0.1715	0.2726	0.0034	1.5333	0.3946
2.9231	0.1729	0.2792	0.0036	1.5333	0.4056
2.9615	0.1742	0.2859	0.0037	1.5333	0.4167
3.0000	0.1756	0.2926	0.0039	1.5333	0.4277

3.0385	0.1770	0.2994	0.0040	1.5333	0.4388
3.0769	0.1784	0.3062	0.0042	1.5333	0.4500
3.1154	0.1797	0.3131	0.0043	1.5333	0.4611
3.1538	0.1811	0.3200	0.0044	1.5333	0.4723
3.1923	0.1825	0.3270	0.0045	1.5333	0.4834
3.2308	0.1839	0.3341	0.0047	1.5333	0.4946
3.2692	0.1853	0.3412	0.0048	1.5333	0.5058
3.3077	0.1867	0.3483	0.0049	1.5333	0.5171
3.3462	0.1881	0.3555	0.0050	1.5333	0.5283
3.3846	0.1895	0.3628	0.0051	1.5333	0.5396
3.4231	0.1909	0.3701	0.0053	1.5333	0.5509
3.4615	0.1923	0.3775	0.0054	1.5333	0.5622
3.5000	0.1937	0.3849	0.0055	1.5333	0.5622
3.5000	0.1937	0.3849	0.0056	1.5333	0.0000

Surface retention 1

Element Flows To:

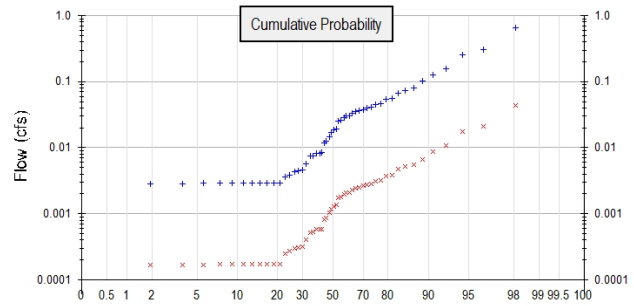
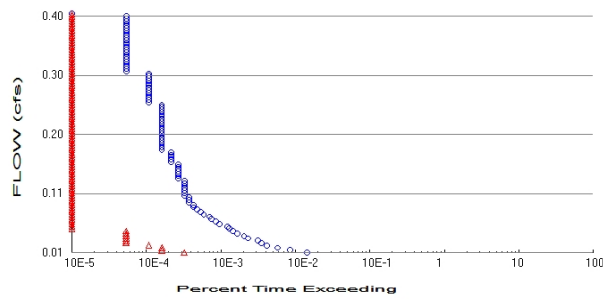
Outlet 1

Outlet 2

Bioretention 1

Analysis Results

POC 1



+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1

Total Pervious Area: 3.659
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1

Total Pervious Area: 0.618
Total Impervious Area: 2.902

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.015063
5 year	0.053395
10 year	0.10788
25 year	0.23588
50 year	0.398078
100 year	0.645182

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.001002
5 year	0.003686
10 year	0.007601
25 year	0.017002
50 year	0.029133
100 year	0.047884

Less than 0.15-cfs
increase

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1956	0.037	0.003
1957	0.046	0.003
1958	0.017	0.001
1959	0.015	0.001
1960	0.008	0.001
1961	0.025	0.002
1962	0.003	0.000
1963	0.054	0.004
1964	0.012	0.001
1965	0.026	0.002

1966	0.003	0.000
1967	0.019	0.001
1968	0.004	0.000
1969	0.003	0.000
1970	0.004	0.000
1971	0.045	0.003
1972	0.081	0.006
1973	0.006	0.000
1974	0.019	0.001
1975	0.004	0.000
1976	0.012	0.001
1977	0.003	0.000
1978	0.033	0.002
1979	0.003	0.000
1980	0.008	0.001
1981	0.041	0.003
1982	0.030	0.002
1983	0.008	0.001
1984	0.007	0.001
1985	0.003	0.000
1986	0.038	0.003
1987	0.035	0.002
1988	0.003	0.000
1989	0.003	0.000
1990	0.154	0.011
1991	0.056	0.004
1992	0.003	0.000
1993	0.003	0.000
1994	0.004	0.000
1995	0.040	0.003
1996	0.074	0.005
1997	0.068	0.005
1998	0.101	0.007
1999	0.003	0.000
2000	0.008	0.001
2001	0.003	0.000
2002	0.029	0.002
2003	0.005	0.000
2004	0.651	0.044
2005	0.304	0.021
2006	0.254	0.017
2007	0.128	0.009
2008	0.031	0.002

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.6515	0.0443
2	0.3044	0.0208
3	0.2542	0.0175
4	0.1544	0.0107
5	0.1276	0.0088
6	0.1011	0.0067
7	0.0812	0.0056
8	0.0744	0.0051
9	0.0679	0.0047
10	0.0558	0.0039
11	0.0540	0.0037

12	0.0460	0.0032
13	0.0450	0.0031
14	0.0406	0.0028
15	0.0398	0.0028
16	0.0380	0.0026
17	0.0366	0.0025
18	0.0350	0.0024
19	0.0333	0.0023
20	0.0307	0.0021
21	0.0301	0.0021
22	0.0287	0.0020
23	0.0261	0.0018
24	0.0253	0.0018
25	0.0195	0.0014
26	0.0185	0.0013
27	0.0169	0.0012
28	0.0148	0.0010
29	0.0124	0.0009
30	0.0119	0.0008
31	0.0085	0.0006
32	0.0083	0.0006
33	0.0083	0.0006
34	0.0076	0.0005
35	0.0075	0.0005
36	0.0057	0.0004
37	0.0046	0.0003
38	0.0044	0.0003
39	0.0043	0.0003
40	0.0039	0.0003
41	0.0036	0.0002
42	0.0029	0.0002
43	0.0029	0.0002
44	0.0029	0.0002
45	0.0029	0.0002
46	0.0029	0.0002
47	0.0029	0.0002
48	0.0029	0.0002
49	0.0029	0.0002
50	0.0029	0.0002
51	0.0029	0.0002
52	0.0028	0.0002
53	0.0027	0.0002

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0075	265	6	2	Pass
0.0115	158	3	1	Pass
0.0154	108	3	2	Pass
0.0194	77	2	2	Pass
0.0233	65	1	1	Pass
0.0273	58	1	1	Pass
0.0312	43	1	2	Pass
0.0351	38	1	2	Pass
0.0391	31	1	3	Pass
0.0430	27	1	3	Pass
0.0470	24	0	0	Pass
0.0509	23	0	0	Pass
0.0549	18	0	0	Pass
0.0588	16	0	0	Pass
0.0628	14	0	0	Pass
0.0667	13	0	0	Pass
0.0707	11	0	0	Pass
0.0746	10	0	0	Pass
0.0785	9	0	0	Pass
0.0825	8	0	0	Pass
0.0864	8	0	0	Pass
0.0904	7	0	0	Pass
0.0943	7	0	0	Pass
0.0983	7	0	0	Pass
0.1022	6	0	0	Pass
0.1062	6	0	0	Pass
0.1101	6	0	0	Pass
0.1140	6	0	0	Pass
0.1180	6	0	0	Pass
0.1219	6	0	0	Pass
0.1259	6	0	0	Pass
0.1298	5	0	0	Pass
0.1338	5	0	0	Pass
0.1377	5	0	0	Pass
0.1417	5	0	0	Pass
0.1456	5	0	0	Pass
0.1495	5	0	0	Pass
0.1535	5	0	0	Pass
0.1574	4	0	0	Pass
0.1614	4	0	0	Pass
0.1653	4	0	0	Pass
0.1693	4	0	0	Pass
0.1732	4	0	0	Pass
0.1772	3	0	0	Pass
0.1811	3	0	0	Pass
0.1851	3	0	0	Pass
0.1890	3	0	0	Pass
0.1929	3	0	0	Pass
0.1969	3	0	0	Pass
0.2008	3	0	0	Pass
0.2048	3	0	0	Pass
0.2087	3	0	0	Pass
0.2127	3	0	0	Pass

0.2166	3	0	0	Pass
0.2206	3	0	0	Pass
0.2245	3	0	0	Pass
0.2284	3	0	0	Pass
0.2324	3	0	0	Pass
0.2363	3	0	0	Pass
0.2403	3	0	0	Pass
0.2442	3	0	0	Pass
0.2482	3	0	0	Pass
0.2521	3	0	0	Pass
0.2561	2	0	0	Pass
0.2600	2	0	0	Pass
0.2640	2	0	0	Pass
0.2679	2	0	0	Pass
0.2718	2	0	0	Pass
0.2758	2	0	0	Pass
0.2797	2	0	0	Pass
0.2837	2	0	0	Pass
0.2876	2	0	0	Pass
0.2916	2	0	0	Pass
0.2955	2	0	0	Pass
0.2995	2	0	0	Pass
0.3034	2	0	0	Pass
0.3073	1	0	0	Pass
0.3113	1	0	0	Pass
0.3152	1	0	0	Pass
0.3192	1	0	0	Pass
0.3231	1	0	0	Pass
0.3271	1	0	0	Pass
0.3310	1	0	0	Pass
0.3350	1	0	0	Pass
0.3389	1	0	0	Pass
0.3428	1	0	0	Pass
0.3468	1	0	0	Pass
0.3507	1	0	0	Pass
0.3547	1	0	0	Pass
0.3586	1	0	0	Pass
0.3626	1	0	0	Pass
0.3665	1	0	0	Pass
0.3705	1	0	0	Pass
0.3744	1	0	0	Pass
0.3784	1	0	0	Pass
0.3823	1	0	0	Pass
0.3862	1	0	0	Pass
0.3902	1	0	0	Pass
0.3941	1	0	0	Pass
0.3981	1	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume: 0 acre-feet

On-line facility target flow: 0 cfs.

Adjusted for 15 min: 0 cfs.

Off-line facility target flow: 0 cfs.

Adjusted for 15 min: 0 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
retention 1 POC	<input checked="" type="checkbox"/>	471.62	518.27	518.27	<input checked="" type="checkbox"/>	100.00	518.27	100.00	Treat. Credit
Total Volume Infiltrated		471.62	518.27	518.27		100.00	518.27	518 / 518 = 100%	Treat. Credit = 100%
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

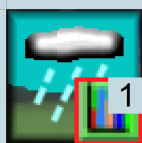
No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix

Predeveloped Schematic



Basin 1
13.66ac

Mitigated Schematic



SOILS REPORT

906 RHOTON RD
TPN 64300800303, 906 RHOTON RD SE
YELM, WA

McClung Construction

Attn: Steve McClung
712 Main St.
Buckley, WA

Prepared by:



Ray Gean
Staff Geologist/Project Manager

Approved by:



04/27/2022

Luke Preston McCann, L.E.G.
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04/27/2022

QG Project # QG22-060

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1.0 INTRODUCTION

This report presents the findings and recommendations of Quality Geo NW's (QG) soil investigation conducted in support of new site surface improvements.

1.1 PROJECT DESCRIPTION

QG understands the project entails the construction of new mixed-use structures within a presently clear large parcel. QG has been contracted to perform a soils investigation of the proposed site to provide stormwater and earthwork recommendations.

1.2 FIELD WORK

Site exploration activities were performed on 3/24/2022. Exploration locations were marked in the field by a QG Staff Geologist with respect to the provided map and cleared for public conductible utilities. Our exploration locations were selected by an QG Staff Geologist prior to field work to provide safest access to relevant soil conditions. The geologist directed the advancement of 2 excavated test pits (TP). The test pits were advanced within the vicinity of the anticipated development footprint areas, to maximum depths of 10.0 feet below present grade (BPG) in general accordance with the specified contract depth.

During explorations QG logged each soil horizon we encountered, and field classified them in accordance with the Unified Soil Classification System (USCS). Representative soil samples were collected from each unit, identified according to boring location and depth, placed in plastic bags to protect against moisture loss, and were transported to the soil laboratory for supplemental classification and other tests.

2.0 EXISTING SITE CONDITIONS

2.1 AREA GEOLOGY

QG reviewed available map publications to assess known geologic conditions and hazards present at the site location. The Washington Geologic Information Portal (WGIP), maintained by the Department of Natural Resources Division of Geology and Earth Resources, provides 1:100,000-scale geologic mapping of the region. Geology of the site location and vicinity consists of continental glacial outwash and gravel (Qgog). The deposits on site are described as “Recessional and proglacial, stratified pebble, cobble, and boulder gravel deposited in meltwater streams and their deltas; locally contains ice-contact deposits.”

The WGIP Map also offers layers of mapped geohazard conditions within the state. According to the regional-scale interactive map, no known geohazards are mapped for the site.

The United States Department of Agriculture portal (USDA) provides a soil mapping of the region. The soils in the vicinity are mapped as Spanaway gravelly sandy loam (110), these are formed by outwash plains and terrace deposits. The parent material for these soils is volcanic ash over gravelly outwash. The soils are described as gravelly sandy loam from 0 to 15 inches, very gravelly loam from 15 to 20 inches, and extremely gravelly sand from 20 to 60+ inches. Depth to restrictive feature is more than 80 inches. Capacity of most limiting layer to transmit water (ksat), is listed as high (1.98 to 5.95 in/hr). Depth to water table is more than 80 inches.

2.2 SITE & SURFACE CONDITIONS

The project area is relatively flat, near the same elevation as the adjacent road. The site is currently undeveloped within the parcel and mostly grasses.

2.3 SOIL LOG

Site soil conditions were generally identical across the property in the 2 test pits. Representative lab samples were taken from TP-1. Soil conditions on site were as follows:

- **0' to 1.6' – Topsoil:**

An overriding 19-inch layer of topsoil was present over the site.

- **1.6' to 10.0' – Poorly Graded Sand with Silt (SP-SM)**

Beneath topsoil, native sediments resemble a tan to gray fine sandy outwash, with minimal gravel present and fine sediments, in a typically medium dense to dense condition. Groundwater was encountered at 7-feet within this unit. No groundwater was encountered the other test pit down to maximum depth of 10 feet below present grade.

2.4 SURFACE WATER AND GROUNDWATER CONDITIONS

No active surface water features are present on site. In the near vicinity, Yelm Creek is ~2100 feet west of the parcel. Based on well logs made publicly available by the WA Department of Ecology, the groundwater table is reported to exist at approximately 22 feet beneath the entire site. During our test pit explorations, a possible perched groundwater table was encountered in TP-1 at approximately 7.0 feet below grade.

QG's scope of work did not include determination or monitoring of seasonal groundwater elevation variations, formal documentation of wet season site conditions, or conclusive measurement of groundwater elevations at depths past the extent feasible for explorations at the time of the field explorations.

3.0 GEOTECHNICAL RECOMMENDATIONS

3.1 SHALLOW FOUNDATION RECOMMENDATIONS

QG recommends excavating loose or organic cover soils down to firm bearing conditions expected within 1.5 feet from the surface. As the variability in subgrade support between consolidated glacial deposits and weathered medium dense cover soils may result in differential settlement, QG recommends that foundations be placed on compacted native soils wherever, or on firm structural fill installed over these compacted soils to achieve footing grade.

Assuming site preparation is completed as described above, we recommend the following:

- **Subgrade Preparation**

QG recommends excavating and clearing any loose or organic cover soils, including the thin overriding layer of topsoil where necessary, from areas of proposed pavement construction, down to firm bearing conditions and benching the final bottom of subgrade elevation flat. Excavations should be performed with a smooth blade bucket to limit disturbance of subgrade soils. Vibratory compaction methods are suitable for densification of the non-organic native soils.

After excavations have been completed to the planned subgrade elevations, but before placing fill or structural elements, the exposed subgrade should be evaluated under the periodic guidance of a QG representative. Any areas that are identified as being soft or yielding during subgrade evaluation should be brought to the attention of the geotechnical engineer. Where over excavation is performed below a structure, the over excavation area should extend beyond the outside of the footing a distance equal to the depth of the over excavation below the footing. The over excavated areas should be backfilled with properly compacted structural fill.

The proposed buildings may utilize either stepped or continuous footings with slab-on-grade elements. For continuous footing elements, upon reaching bearing strata, we recommend benching foundation lines flat. Continuous perimeter and strip foundations may be stepped as needed to accommodate variations in final subgrade level. We also recommend maximum steps of 18 inches with spacing of at least 5 feet be constructed unless specified otherwise by the design engineer. Structural fill may then be placed as needed to reestablish final foundation grade.

- **Allowable Bearing Capacity:**

Up to 1,500 pounds per square foot (psf) for foundations placed on compacted native soil or on approved structural fill soils placed in accordance with the recommendations of *Section 4.2*. Bearing capacities, at or below 1,500 psf may eliminate the need for additional inspection

requirements if approved by the county. The allowable bearing capacity may be increased by 1/3 for transient loading due to wind and seismic events.

- **Minimum Footing Depth:**

For a shallow perimeter and spread footing system, all exterior footings shall be embedded a minimum of 18 inches and all interior footings shall be embedded a minimum of 12 inches below the lowest adjacent finished grade, but not less than the depth required by design. However, all footings must also penetrate to the prescribed bearing stratum cited above. Minimum depths are referenced per IBC requirements for frost protection; other design concerns may dictate greater values be applied.

- **Minimum Footing Width:**

Footings should be proportioned to meet the stated bearing capacity and/or the IBC 2012 (or current) minimum requirements. For a shallow perimeter and spread footing system, continuous strip footings should be a minimum of 16 inches wide and interior or isolated column footings should be a minimum of 24 inches wide.

- **Estimated Settlements:**

All concrete settles after placement. We estimate that the maximum settlements will be on the order of 0.5 inch, or less, with a differential settlement of ½ inch, or less, over 50 linear feet. Settlement is anticipated to occur soon after the load is applied during construction.

3.1.1 BUILDING SLAB ON GRADE FLOOR

QG anticipates that slab-on-grade floors are planned for the interior of the proposed building. Based on typical construction practices, we assume finished slab grade will be similar to or marginally above present grade for the below recommendations. If floor grades are planned to be substantially raised or lowered from existing grade, QG should be contacted to provide revised or alternative recommendations.

- **Capillary Break:**

A capillary break will be helpful to maintain a dry slab floor and reduce the potential for floor damage resulting from shallow perched water inundation. To provide a capillary moisture break, a 6-inch thick, properly compacted granular mat consisting of open-graded, free-draining angular aggregate is recommended below floor slabs. To provide additional slab structural support, or to substitute for a structural fill base pad where specified, QG recommends the capillary break should consist of crushed rock all passing the 1-inch sieve and no more than 3 percent (by weight) passing the U.S. No. #4 sieve, compacted in accordance with *Section 5.2.2* of this report.

- **Vapor Barrier:**

A vapor retarding membrane such as 10 mil polyethylene film should be placed beneath all floor slabs to prevent transmission of moisture where floor coverings may be affected. Care should be taken during construction not to puncture or damage the membrane. To protect the membrane, a layer of sand no more than 2 inches thick may be placed over the membrane if desired. If excessive relict organic fill material is discovered at any location, additional sealant or more industrial gas barriers may be required to prevent off-gassing of decaying material from infiltrating the new structure. These measures shall be determined by the structural engineer to meet local code requirements as necessary.

- **Structural Design Considerations:**

QG assumes design and specifications of slabs will be assessed by the project design engineer. We suggest a minimum unreinforced concrete structural section of 4.0 inches be considered to help protect against cracking and localized settlement, especially where larger equipment or localized loads are anticipated. It is generally recommended that any floor slabs and annular exterior concrete paving subject to vehicular loading be designed to incorporate reinforcing. Additionally, some level of reinforcing, such as a wire mesh may be desirable to prolong slab life due to the overwhelming presence of such poor underlying soils. It should be noted that QG does not express any guarantee or warranty for proposed slab sections.

3.2 INFILTRATION RATE DETERMINATION

QG understands design of on-site stormwater controls are pending the results of this study to confirm design parameters and interpreted depths to perched seasonal groundwater and restrictive soil features.

3.2.1 GRADATION ANALYSIS METHODS & RESULTS

During test pit excavations for general site investigation, QG additionally collected representative samples of native soil deposits among potential infiltration strata and depths. Representative soil samples were selected from the north portion of the site (TP-1) to characterize the local infiltration conditions.

We understand the project will be subject to infiltration design based on the Washington Department of Ecology Stormwater Management Manual for Western Washington (DoE SMMWW). For initial site infiltration characterization within the scope of this study, laboratory gradation analyses were completed including sieve and hydrometer tests for stormwater design characterization and rate determination to supplement field observations. Results of laboratory testing in terms of rate calculation are summarized below.

Laboratory results were interpreted to recommended design inputs in accordance with methods of the 2019 DoE SMMWW. Gradation results were applied to the Massmann (2003) equation (1) to calculate Ksat representing the initial saturated hydraulic conductivity.

$$(1) \quad \log_{10}(K_{sat}) = -1.57 + 1.90 \cdot D_{10} + 0.015 \cdot D_{60} - 0.013 \cdot D_{90} - 2.08 \cdot ff$$

Corrected Ksat values presented below are a product of the initial Ksat and correction factor CFT. For a generalized site-wide design situation, we have applied a site variability factor of CFv = 0.7 along with typical values of CFt = 0.4 (for the Grain Size Method) and CFm = 0.9 (assuming standard influent control).

$$(2) \quad CFT = CF_v \times CF_t \times CF_m = 0.7 \times 0.4 \times 0.9 = 0.25$$

Results were cross-referenced with test pit logs to determine the validity and suitability of unique materials as an infiltration receptor. Additional reduction factors were applied for practical rate determination based on our professional judgement.

Table 1. Results Of Massmann Analysis

TP #	Sample Depth (BPG)	Unit Extent (ft)	Soil Type	D10	D60	D90	Fines (%)	Ksat (in/hr)	Correct ed Ksat (in/hr)	LT Design Infiltration Rate(in/hr)	Cation Exchange Capacity (meq/100g)	Organic Content %
1	3.5	1.6 to 7.5	SP-SM	0.075	0.2	0.6	9.79	32.77	8.19	8.00	3.0	1.4

Beneath topsoils, the lower tan to gray outwash soils were observed to generally exhibit minimal fines content and minimal oxidation patterns. The presence of a groundwater at 7 feet below present grade across the site, and the likelihood that this is may be the seasonal high, limit the potential for conventional in-ground infiltration facilities. In-ground infiltration structures are required to maintain a minimum separation from restrictive soil & groundwater features. **We recommend the designer pursue shallow infiltration structures instead, such as bio swales, rain gardens, pervious pavements, etc. These features shall penetrate beneath the overriding topsoil but have their bottom infiltrating base no deeper than 4.00 feet below present grade.**

For shallow infiltration features utilizing treatment media, we recommend a maximum design rate of up to 8.00 inch/hour be considered, which is typically suitable for most shallow infiltration features. This does not consider the potential reductions from compaction during construction. Construction traffic should be prevented from crossing within proposed infiltration areas, in order to limit reduction of the infiltration potential. If traffic can not be minimized, then a significant reduction to the infiltration rate can be anticipated, and additional in-field testing will be required prior to placement of the drainage course.

QG recommends the facility designer review these results and stated assumptions per reference literature to ensure applicability with the proposed development, level of anticipated controls, and

long- term maintenance plan. The designer may make reasonable adjustments to correction factors and the resulting design values based on these criteria to ensure design and operational intent is met. We recommend that we be contacted if substantial changes to rate determination are considered.

3.2.2 TREATMENT POTENTIAL

Depending on stormwater and runoff sources, some stormwater features, such as rain gardens or pervious pavements may require treatment. Stormwater facilities utilizing native soils as treatment media typically require Cation Exchange Capacities (CEC) of greater than 5 milliequivalents per 100grams (meq/100g) and organic contents greater than 1% (this may vary depending on local code). The soils directly beneath the topsoil did not meet the minimum treatment standards.

3.2.3 DRAINAGE RECOMMENDATIONS

QG recommends proper drainage controls for stormwater runoff during and after site development to protect the site. The ground surface adjacent to structures should be sloped to drain away at a 5% minimum to prevent ponding of water adjacent to them.

QG recommends all stormwater catchments (new or existing) be tightlined (piped) away from structures to an existing catch basin, stormwater system, established channel, or approved outfall to be released using appropriate energy-dissipating features at the outfall to minimize point erosion. Roof and footing drains should be tightlined separately or should be gathered in an appropriately sized catch basin structure and redistributed collectively. If storm drains are incorporated for impervious flatworks (driveways, sidewalks, etc.) collected waters should also be discharged according to the above recommendations. Based on our observations of a shallow groundwater table, appropriate measures should be taken by the site designer to consider and allow for an adequate emergency outfall location in the event of future record stormwater fall that cannot be anticipated.

3.3 IMPERVIOUS PAVEMENT CONSIDERATIONS

QG anticipates most pavements will be constructed of flexible Hot Mix Asphalt surfacing, with thickened sections for anticipated heavy load areas. The main entrance/exit drive will likely experience different traffic volumes than the far end of the pavement areas. As a result, consideration could be given to increasing the pavement section in the main entrance/exit drive. Pavement sections presented in the above table should not be used for areas which experience repeated truck traffic/parking, equipment or truck parking areas, entrances and exit aprons, or contain trash dumpster loading zones. In these areas, a Portland Cement Concrete (PCC) pavement should be used, as opposed to HMA.

One of the important considerations in designing a high quality and durable pavement is providing adequate drainage. Design of drainage for the proposed pavement section is outside of QG 's scope of work at this time. It is important that bird baths (leeching basins) and surface waves are not created during construction of the HMA layer. A proper slope should also be allowed, and drainage should be provided along the edges of pavements and around catch basins to prevent accumulation of free water within the base course, which otherwise may result in subgrade softening and pavement deterioration under exposure and repeated traffic conditions.

All pavements require regular maintenance and repair in order to maintain the serviceability of the pavement. These repairs and maintenance are due to normal wear and tear of the pavement surface and are required in order to extend the serviceability life of the pavement. However, after 10 years of service, a normal pavement structure is likely to deteriorate to a point where pavement rehabilitation may be required to maintain the serviceability. The deterioration is more likely if the pavement is constructed over poor subgrade soils or in area of higher traffic volumes.

Rigid pavement components are commonly utilized for portions of accesses and ancillary exterior improvements. The project civil designer may re-evaluate the below general recommendations for pavement thicknesses and base sections, if necessary, to ensure proper application to a given structure and use. QG recommends that we be contacted for further consultation if the below sections are proposed to be reduced.

Concrete driveway aprons and curb alignments, if utilized, should consist of a minimum 6-inch thickness of unreinforced concrete pavement over structural base fill. Base thickness should correspond to related location and anticipated traffic loading. For light traffic areas, a 6-inch minimum base thickness (total 12-inch section) can be applied. For heavy traffic zones, we recommend allotting a 12- inch minimum base section beneath the pavement, or the incorporation of reinforcing steel in the concrete.

Concrete sidewalks, walkways and patios if present may consist of a minimum 4-inch section of plain concrete (unreinforced) installed over a 6-inch minimum compacted base of crushed rock. At locations where grade has been raised with structural fill, a 4-inch minimum crushed rock section may be used. Flatworks should employ frequent joint controls to limit cracking potential.

4.0 CONSTRUCTION RECOMMENDATIONS

4.1 EARTHWORK

4.1.1 GRADING & EXCAVATION

A grading plan was not available to QG at the time of this report. However, based on provided conceptual plans, this study assumes finished site grade will approximate current grade. Therefore, depths referred to in this report are considered roughly equivalent to final depths. Excavations can generally be performed with conventional earthmoving equipment such as bulldozers, scrapers, and excavators.

4.1.2 SUBGRADE EVALUATION & PREPARATION

After excavations have been completed to the planned subgrade elevations, but before placing fill or structural elements, the exposed subgrade should be evaluated under the part-time observation and guidance of an QG representative.

The special inspection firm should continuously evaluate all backfilling. Any areas that are identified as being soft or yielding during subgrade evaluation should be over excavated to a firm and unyielding condition or to the depth determined by the geotechnical engineer. Where over excavation is performed below a structure, the over excavation area should extend beyond the outside of the footing a distance equal to the depth of the over excavation below the footing. The over excavated areas should be backfilled with properly compacted structural fill.

4.1.3 SITE PREPARATION, EROSION CONTROLL, WET WEATHER

Any silty or organic rich native soils may be moisture-sensitive and become soft and difficult to traverse with construction equipment when wet. During wet weather, the contractor should take measures to protect any exposed soil subgrades, limit construction traffic during earthwork activities, and limit machine use only to areas undergoing active preparation.

Once the geotechnical engineer has approved subgrade, further measures should be implemented to prevent degradation or disturbance of the subgrade. These measures could include, but are not limited to, placing a layer of crushed rock or lean concrete on the exposed subgrade, or covering the exposed subgrade with a plastic tarp and keeping construction traffic off the subgrade. Once subgrade has been approved, any disturbance because the subgrade was not protected should be repaired by the contractor at no cost to the owner.

During wet weather, earthen berms or other methods should be used to prevent runoff from draining into excavations. All runoffs should be collected and disposed of properly. Measures may

also be required to reduce the moisture content of on-site soils in the event of wet weather. These measures can include, but are not limited to, air drying and soil amendment, etc.

QG recommends earthwork activities take place during the summer dry season.

4.2 STRUCTURAL FILL MATERIALS AND COMPACTION

4.2.1 MATERIALS

All material placed below structures or pavement areas should be considered structural fill. Excavated native soils may be considered suitable for reuse as structural fill on a case-by-case basis. Imported material can also be used as structural fill. Care should be taken by the earthwork contractor during grading to avoid contaminating stockpiled soils that are planned for reuse as structural fill with native organic materials. Frozen soil is not suitable for use as structural fill. Fill material may not be placed on frozen soil.

Structural fill material shall be free of deleterious materials, have a maximum particle size of 4 inches, and be compactable to the required compaction level. Imported structural fill material should conform to the WSDOT manual Section 9-03.14(1) Gravel Borrow, or an approved alternative import material. Controlled-density fill (CDF) or lean mix concrete can be used as an alternative to structural fill materials, except in areas where free-draining materials are required or specified.

Imported materials utilized for trench back fill shall conform to Section 9-03.19, Trench Backfill, of the most recent edition (at the time of construction) of the State of Washington Department of Transportation *Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT Standard Specifications)*. Imported materials utilized as grade fill beneath roads shall conform to WSDOT Section 9-03.10, Gravel Base.

Pipe bedding material should conform to the manufacturer's recommendations and be worked around the pipe to provide uniform support. Cobbles exposed in the bottom of utility excavations should be covered with pipe bedding or removed to avoid inducing concentrated stresses on the pipe.

Soils with fines content near or greater than 10% fines content may likely be moisture sensitive and become difficult to use during wet weather. Care should be taken by the earthwork contractor during grading to avoid contaminating stockpiled soils that are planned for reuse as structural fill with native organic materials.

The contractor should submit samples of each of the required earthwork materials to the materials testing lab for evaluation and approval prior to delivery to the site. The samples should be

submitted at least 5 days prior to their delivery and sufficiently in advance of the work to allow the contractor to identify alternative sources if the material proves unsatisfactory.

4.2.2 FILL PLACEMENT AND COMPACTION

For lateral and bearing support, structural fill placement below footings shall extend at minimum a distance past each edge of the base of the footing equal to the depth of structural fill placed below the footing [i.e. extending at least a 1H:1V past both the interior and the exterior of the concrete footing].

Prior to placement and compaction, structural fill should be moisture conditioned to within 3 percent of its optimum moisture content. Loose lifts of structural fill shall not exceed 12 inches in thickness. All structural fill shall be compacted to a firm and unyielding condition and to a minimum percent compaction based on its modified Proctor maximum dry density as determined per ASTM D1557. Structural fill placed beneath each of the following shall be compacted to the indicated percent compaction:

- Foundation and Floor Slab Subgrades: 95 Percent
- Pavement Subgrades & wall backfill (upper 2 feet): 95 Percent
- Pavement Subgrades & wall backfill (below 2 feet): 90 Percent
- Utility Trenches (upper 4 feet): 95 Percent
- Utility Trenches (below 4 feet): 90 Percent

A sufficient number of tests should be performed to verify compaction of each lift. The number of tests required will vary depending on the fill material, its moisture condition and the equipment being used. Initially, more frequent tests will be required while the contractor establishes the means and methods required to achieve proper compaction.

Jetting or flooding is not a substitute for mechanical compaction and should not be allowed.

4.3 TEMPORARY EXCAVATIONS AND TRENCHES

All excavations and trenches must comply with applicable local, state, and federal safety regulations. Construction site safety is the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing soil type information solely as a service to our client for planning purposes. Under no circumstances should the information be interpreted to mean that QG is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred. The contractor shall be responsible for the safety of personnel working in utility trenches. Given that steep excavations in native soils may be prone to caving, we recommend all utility trenches, but particularly those greater than 4 feet in depth, be supported in

accordance with state and federal safety regulations. Heavy construction equipment, building materials, excavated soil, and vehicular traffic should not be allowed near the top of any excavation.

Temporary excavations and trenches should be protected from the elements by covering with plastic sheeting or some other similar impermeable material. Sheeting sections should overlap by at least 12 inches and be tightly secured with sandbags, tires, staking, or other means to prevent wind from exposing the soils under the sheeting.

5.0 SPECIAL INSPECTION

The recommendations made in this report assume that an adequate program of tests and observations will be made throughout construction to verify compliance with these recommendations. Testing and observations performed during construction should include, but not necessarily be limited to, the following:

- Geotechnical plan review and engineering consultation as needed prior to construction phase,
- Observations and testing during site preparation, earthwork, structural fill, and pavement section placement,
- Consultation on temporary excavation cutslopes and shoring if needed,
- Consultation as necessary during construction.

QG recommends that a local and reputable materials testing & inspection firm be retained for construction phase testing and observation in accordance with the local code requirements. We also strongly recommend that QG be retained as the project Geotechnical Engineering Firm of Record (GER) during the construction of this project to perform periodic supplementary geotechnical observations and review the special inspectors reports during construction.

Our knowledge of the project site and the design recommendations contained herein will be of great benefit in the event that difficulties arise and either modifications or additional geotechnical engineering recommendations are required or desired. We can also, in a timely fashion observe the actual soil conditions encountered during construction, evaluate the applicability of the recommendations presented in this report to the soil conditions encountered, and recommend appropriate changes in design or construction procedures if conditions differ from those described herein.

We would be pleased to meet with you at your convenience to discuss the *Time & Materials* scope and cost for these services.

6.0 LIMITATIONS

Upon acceptance and use of this report, and its interpretations and recommendations, the user shall agree to indemnify and hold harmless QG, including its owners, employees and subcontractors, from any adverse effects resulting from development and occupation of the subject site. Ultimately, it is the owner's choice to develop and live in such an area of possible geohazards (which exist in perpetuity across the earth in one form or another), and therefore the future consequences, both anticipated and unknown, are solely the responsibility of the owner. By using this report for development of the subject property, the owner must accept and understand that it is not possible to fully anticipate all inherent risks of development. The recommendations provided above are intended to reduce (but may not eliminate) such risks.

This report does not represent a construction specification or engineered plan and shall not be used or referenced as such. The information included in this report should be considered supplemental to the requirements contained in the project plans & specifications and should be read in conjunction with the above referenced information. The selected recommendations presented in this report are intended to inform only the specific corresponding subjects. All other requirements of the above-mentioned items remain valid, unless otherwise specified.

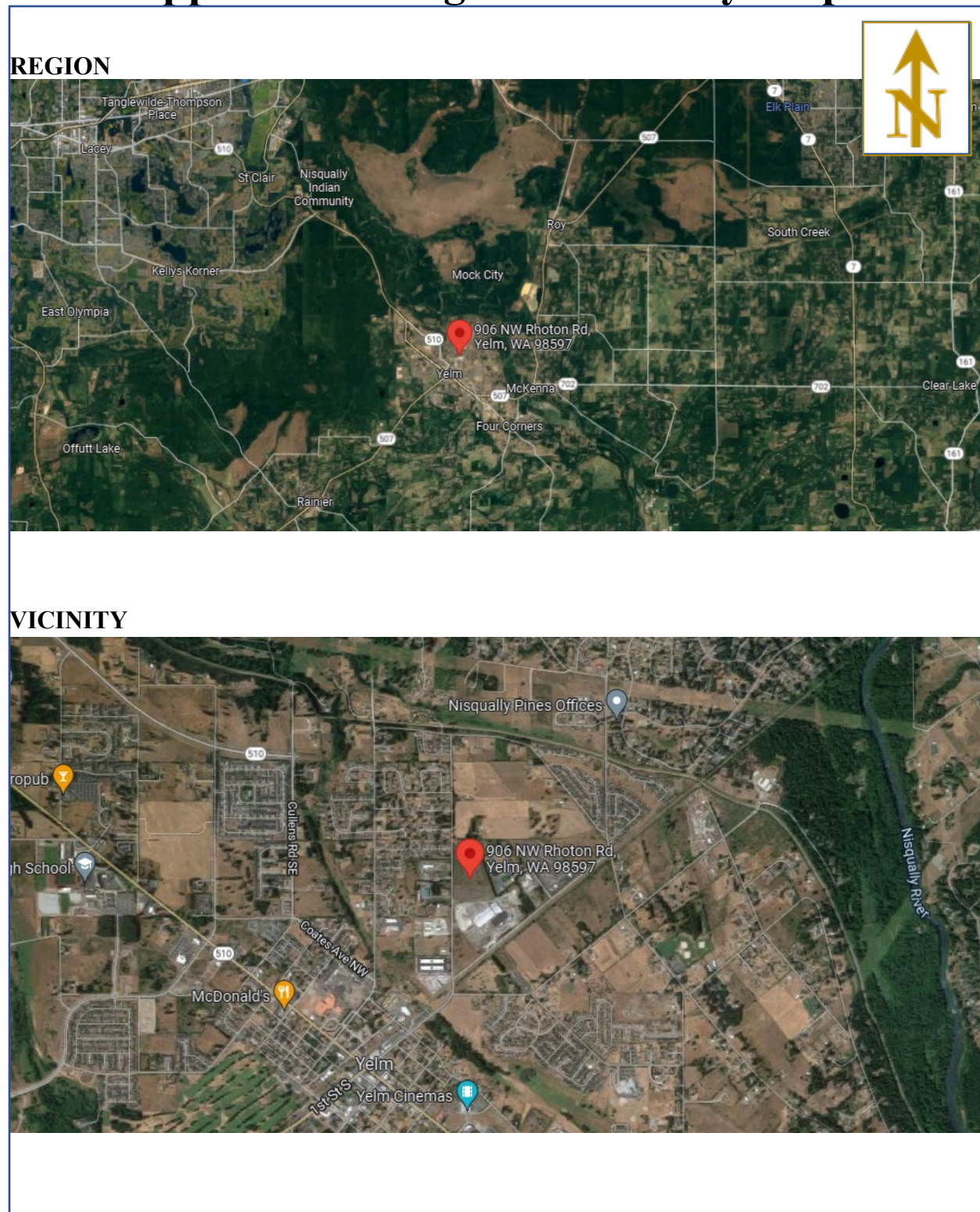
Recommendations contained in this report are based on our understanding of the proposed development and construction activities, field observations and explorations, and laboratory test results. It is possible that soil and groundwater conditions could vary and differ between or beyond the points explored. If soil or groundwater conditions are encountered during construction that differ from those described herein, or if the scope of the proposed construction changes from that described in this report, QG should be notified immediately in order to review and provide supplemental recommendations.

The findings of this study are limited by the level of scope applied. We have prepared this report in substantial accordance with the generally accepted geotechnical engineering practice as it exists in the subject region. No warranty, expressed or implied, is made. The recommendations provided in this report assume that an adequate program of tests and observations will be conducted by a WABO approved special inspection firm during the construction phase in order to evaluate compliance with our recommendations.

This report may be used only by the Client and their design consultants and only for the purposes stated within a reasonable time from its issuance, but in no event later than 18 months from the date of the report. It is the Client's responsibility to ensure that the Designer, Contractor, Subcontractors, etc. are made aware of this report in its entirety. Note that if another firm assumes Geotechnical Engineer of Record responsibilities, they need to review this report and either concur with the findings, conclusions, and recommendations or provide alternate findings, conclusions and recommendation.

Land or facility use, on- and off-site conditions, regulations, or other factors may change over time, and additional work may be required. Based on the intended use of the report, QG may recommend that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the Client or anyone else will release QG from any liability resulting from the use of this report. The Client, the design consultants, and any unauthorized party, agree to defend, indemnify, and hold harmless QG from any claim or liability associated with such unauthorized use or non-compliance. We recommend that QG be given the opportunity to review the final project plans and specifications to evaluate if our recommendations have been properly interpreted. We assume no responsibility for misinterpretation of our recommendations.

Appendix A. Region & Vicinity Maps



Quality Geo
NW, PLLC

Site Region
906 Rhoton Rd

Source: Google Imagery, 2022
Scale & Locations are approx.
Not for Construction

Figure 1

Appendix B. Exploration Map



Quality Geo
NW, PLLC

Site Map
906 Rhoton Rd

Source: Thurston Co. GIS, 2022
Scale & Locations are approx.
Not for Construction

Figure 2

Appendix C. Exploration Logs



TEST PIT LOG TP-1

PROJECT NUMBER QG22-060		FIELD WORK DATE 3/24/2022		BORING LOCATION West part of the parcel	
PROJECT NAME 906 Rhoton Rd Geo		DRILLING METHOD Excavated Test Pit		SURFACE ELEVATION Existing	
PROJECT LOCATION Yelm, WA				LOGGED BY RG	
COMMENTS					
Depth (ft)	Samples	Is Analysed?	Graphic Log	USCS	Material Description
0.5				TS	TOPSOIL
1					
1.5				SP-SM	POORLY GRADED SAND w/ SILT. Tan color, moist, minor organics, cobble more than 12 inches, medium dense to dense. Gravel %=1 Sand%=89 Fines%=10
2					
2.5					
3					
3.5					
4					
4.5					
5					
5.5					
6					
6.5					
7					
7.5					Termination Depth at 7.5 Feet. Terminated at Contracted Depth Groundwater Encountered at 7-feet
8					
8.5					



TEST PIT LOG TP-2

PROJECT NUMBER QG22-060		FIELD WORK DATE 3/24/2022		BORING LOCATION West part of the parcel	
PROJECT NAME 906 Rhoton Rd Geo		DRILLING METHOD Excavated Test Pit		SURFACE ELEVATION Existing	
PROJECT LOCATION Yelm, WA				LOGGED BY RG	
COMMENTS					
Depth (ft)	Samples	Is Analysed?	Graphic Log	USCS	Material Description
0.5				TS	TOPSOIL
1					
1.5				SP-SM	POORLY GRADED SAND w/ SILT. Tan color becoming gray with depth past 6-feet, moist, minor organics, cobble more than 12 inches, medium dense to dense. Gravel %=1 Sand%=89 Fines%=10
2					
2.5					
3					
3.5					
4					
4.5					
5					
5.5					
6					
6.5					
7					
7.5					
8					
8.5					
9					
9.5					
10					Termination Depth at 10.0 Feet. Terminated at Contracted Depth No Groundwater Encountered
10.5					

Appendix D. Laboratory Results

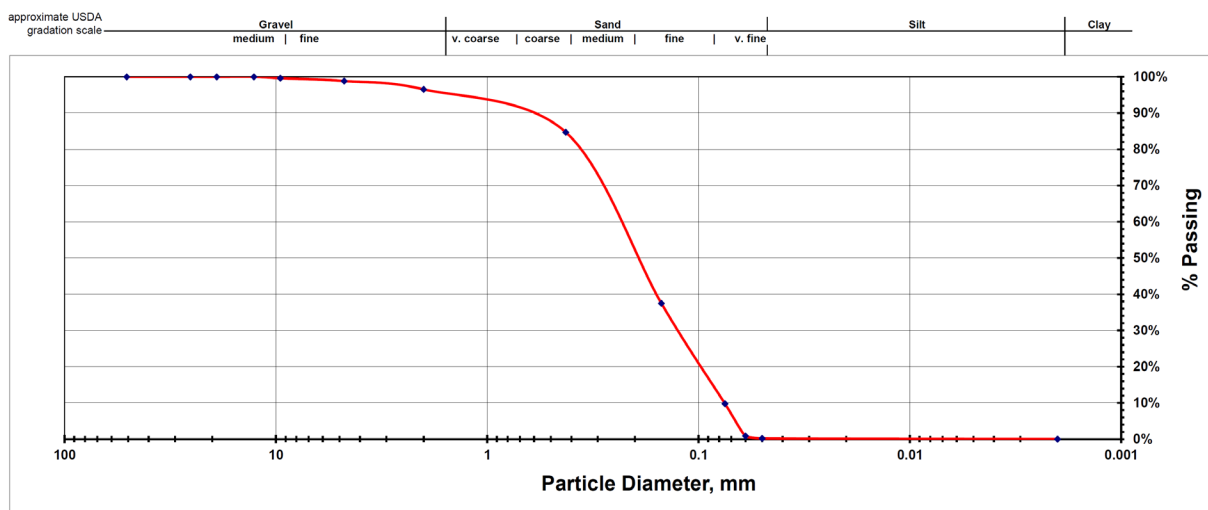


PARTICLE SIZE DISTRIBUTION REPORT

CLIENT: Quality Geo NW
PROJECT: 906 Rhoton RD - QG22-060
Lab #: S22-04747

SAMPLE ID: TP-1 @ 3.5FT

Date Received: 3/30/2022
Date Reported: 4/4/2022
Test Method: ASTM D2487/ D 422



description sieve # diameter, mm	CoCr 2" 50.8	CoGr 1" 25.4	MedGr 3/4" 19.05	MedGr 1/2" 12.70	MedGr 3/8" 9.53	FiGr 4 4.75	vCoS 10 2.00	MedS 40 0.425	FIS 100 0.150	vFIS 200 0.075	(% of Whole Sample Passing last Sieve) Hydrometer Method			Sand Total	Gravel Total
Retained	0.0%	0.0%	0.0%	0.0%	0.4%	0.8%	2.3%	11.8%	47.2%	27.71%	8.91%	0.69%	0.20%	98.0%	1.1%
Passing	100%	100%	100%	100.0%	99.6%	98.9%	96.6%	84.7%	37.5%	9.79%					

Graph Values	D ₅₀	0.6	Coefficient of Uniformity: 3.2 Coefficient of Gradation: 1.09	% of Sample < 2mm			USDA TEXTURAL CLASSIFICATION OF FRACTION PASSING 2mm SEIVE	Sand
	D ₆₀	0.2		Sand	Silt	Clay		
	D ₃₀	0.14		91%	7%	2%		
	D ₁₀	0.075						

OM (LOI 360) 1.4 %
CEC 3.0 meq/100g

Reviewed by: BCT Date: 4/4/2022

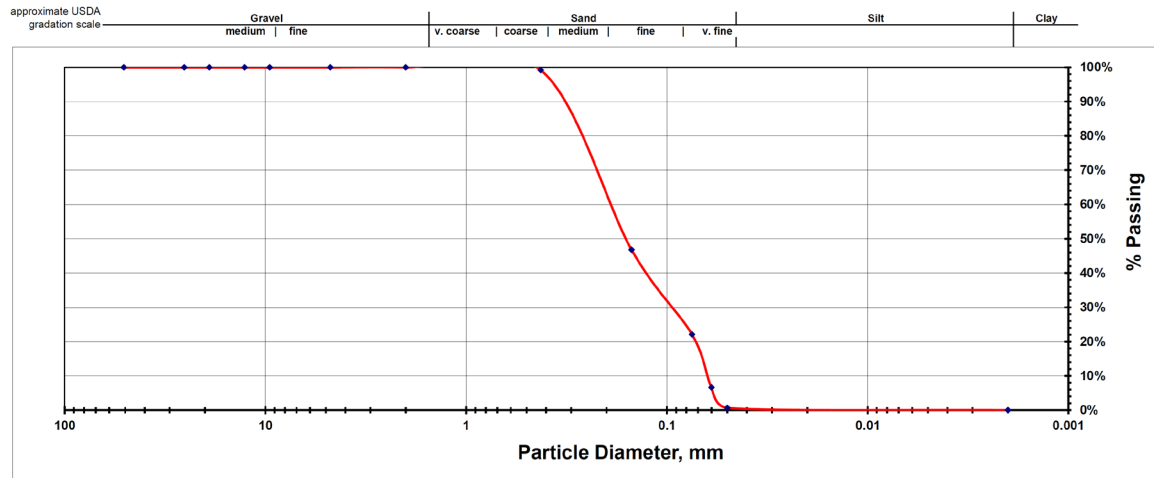


PARTICLE SIZE DISTRIBUTION REPORT

CLIENT: Quality Geo NW
PROJECT: BRIGGS GEO - QG22-010
Lab # S22-367

SAMPLE ID: TP-1 7ft

Date Received 1/28/2022
Date Reported 2/11/2022
Test Method: ASTM D2487/C117, C136/ D 422



description siege # diameter, mm	CoCr 2" 50.8	CoGr 1" 25.4	MedGr 3/4" 19.05	MedGr 1/2" 12.70	MedGr 3/8" 9.53	FiGr 4 4.75	vCoS 10 2.00	MedS 40 0.425	FIS 100 0.150	vFIS 200 0.075	(% of Whole Sample Passing last Sieve) Hydrometer Method			Sand Total	Gravel Total
Retained	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	52.4%	24.7%	15.5%	6.0%	0.7%	93.4%	0.0%
Passing	100%	100%	100%	100.0%	100.0%	100.0%	100.0%	99.2%	46.8%	22.1%					

Graph Values		Coefficient of Uniformity: 3.0		Coefficient of Gradation: 0.74		% of Sample < 2mm			USDA TEXTURAL CLASSIFICATION of FRACTION PASSING 2mm SEIVE	
						Sand	Silt	Clay		
D ₁₀	0.32					70%	27%	3%	Sandy Loam	
D ₅₀	0.19									
D ₉₀	0.094									
D ₁₀	0.063									

OM (LOI 360) 0.75 %
CEC 7.1 meq/100g

Reviewed by: KB

2/11/2022