City of Yelm
EST. 1924
WASHINGTON

SEPA #: 2021.0035

DETERMINATION OF NON-SIGNIFICANCE

Proponent:	City of Yelm
Description of Proposal:	Water Reclamation Facility Upgrades
Location of the Proposal:	931 Northern Pacific Road SW
Section/Township/Range:	Section 19 Township 17 Range 2E
Threshold Determination:	The City of Yelm as lead agency for this action has determined that this proposal does not have a probable significant adverse impact on the environment. Therefore, an environmental impact statement (EIS) will not be required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.
Mitigating Measures:	None
Lead agency:	City of Yelm
Responsible Official:	Grant Beck, Community Development Director
Date of Issue:	July 13, 2021
Comment Deadline:	July 28, 2021
Appeal Deadline:	There is no local administrative appeal of a DNS

Grant Beck, Community Development Director

This Determination of Non-Significance (DNS) is issued pursuant to Washington Administrative Code 197-11-340 (2). Comments must be submitted to Casey Mauck, caseym@yelmwa.gov, at City of Yelm, 106 2nd St SE, Yelm, WA 98597, by July 28, 2021 at 5:00 P.M. The City of Yelm will not act on this proposal prior July 28, 2021 at 5:00 P.M.

DO NOT PUBLISH BELOW THIS LINE

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Posted in public areas: July 13, 2021

Copies to: All agencies/citizens on SEPA mailing list
Dept. of Ecology w/checklist

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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.

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 [HELP]

1. Name of proposed project, if applicable:
Water Reclamation Facility Phase 2 Upgrades

2. Name of applicant:
City of Yelm

3. Address and phone number of applicant and contact person:
Patrick Hughes, (360) 878-2042, 106 2nd St SE Yelm, WA 98597

4. Date checklist prepared:
5/25/2021

5. Agency requesting checklist:
City of Yelm

6. Proposed timing or schedule (including phasing, if applicable):
Begin construction: December 2021; Completion: December 2022 (370 day schedule)

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.

City of Yelm Sewer Facilities Plan (SFP) was prepared, submitted to, and subsequently approved by the Washington Department of Ecology on October 21, 2016. Appendix I of the SFP included a State Environmental Review Process (SERP) checklist. This SERP was approved by Ecology on November 10, 2016. A City of Yelm Community Development Department Environmental Checklist is also included in Appendix I of the SFP.

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.

This project consists of two major components. Construction plans and specifications for the liquid stream component ("Schedule A") were submitted to Ecology for review, and were subsequently approved on December 8, 2020. Plans and specifications for the Biosolids component ("Schedule B") are currently under development and will be submitted to Ecology for review and approval prior to construction.

10. List any government approvals or permits that will be needed for your proposal, if known.

City of Yelm Site Plan Review Approval, civil construction and building permit approvals. An update to the Sewer Facilities Plan is being prepared and will be submitted to Ecology for review and approval. A renewal of the City's NPDES (dischage) permit will also be required.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

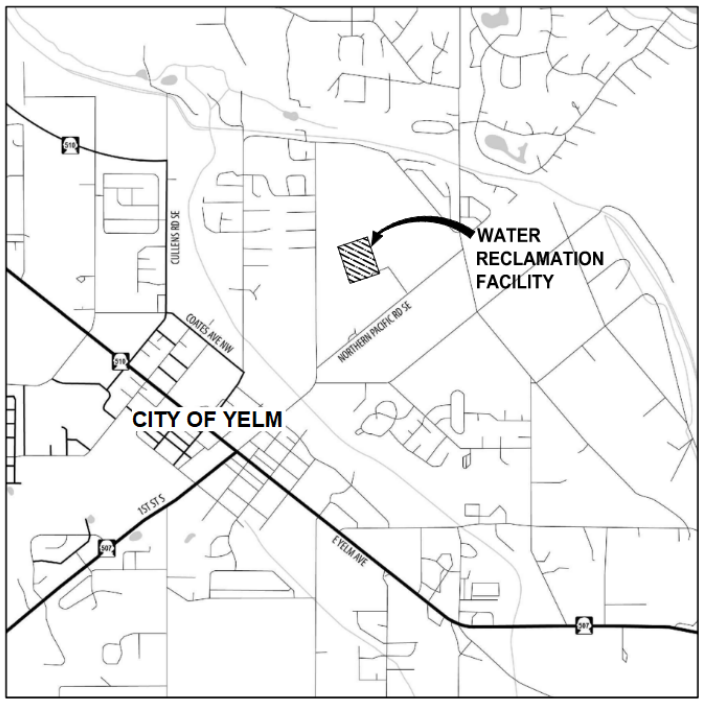
The City of Yelm's existing Water Reclamation Facility produces Class A reclaimed water that is distributed for irrigation and other beneficial uses. Designed in 1995, it is now nearing its design capacity of 1.06 million gallons per day. The projected flow by 2030 is 1.25 million gallons per day and

1.80 million gallons per day in 2040. In order to meet this projection, the current sequencing batch reactor (SBR) liquid steam process will be modified to a membrane bioreactor system (MBR). Proposed upgrades include an addition to the current solids handling building and converting 2 of the 3 SBR basins to anoxic and aeration tanks.

Major components in the liquid stream modifications will include construction of a new plant headworks facility, a new crane system at the membrane tankage to facilitate module and equipment removal, new MBR tanks, and construction of a new Mechanical/Electrical Building.

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. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

The City of Yelm Water Reclamation facility is located at 931 Northern Pacific Road SW, Parcel 64300900400, with construction access from 902 Rhoton Road, Parcel No. 64300800304. Project is located in the NE ¼ of Section 19, T17N, R2E in Thurston County, Washington.



LOCATION MAP
NO SCALE

B. Environmental Elements [HELP]

1. *Earth* [help]

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)?
The steepest slope on the site is approximately 27%.

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.

The soils of Thurston County have been mapped and classified into 133 soil units by the United States Department of Agriculture, Soils Conservation Service (SCS). The majority of soils in the City of Yelm area are classified as either (1) Spanaway gravelly sandy or stony loam or (2) Everett very gravelly sandy loam. The characteristics of the soils have been grouped by the SCS as undulating and rolling, coarse and moderately coarse textured soils underlain by loose glacial outwash materials.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.
There are no known unstable soils in the vicinity of the proposed project.

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.

The total area of surface disturbance for the WRF upgrades (both liquid and solid stream components) is approximately 1.21 acres. Except for small quantities (utility pipe bedding, trench backfill, road base gravel, etc.) there will be very little fill required (less than 1,000 cubic yards) for this portion of the project.

The total area of surface disturbance for the proposed access road is estimated to be approximately 1.55 acres. Actual quantities of fill will be determined during the design stage, but the objective is to "balance" the quantities of fill and excavation. Where native materials are unsuitable for fill (for example, crushed road gravel), suitable materials will be imported from nearby sources.

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

Possible minor erosion may result from construction activities. Best management practices will be followed to prevent erosion. A Temporary Erosion and Sediment Control (TESC) Plan has been prepared and is included as Sheet C002 of the WRF Ph 2 construction plans. A similar plan will be prepared for construction of the proposed access road.

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

The existing 11.9-acre site is presently covered with 87,800 square feet of impervious surfaces (53,500 pavement and 34,300 buildings), or 16.9% impervious. Approximately

8,800 square feet of new impervious surfaces (3,100 sft of pavement and 5,700 sft of building area) will be added to the existing site. After construction, approximately 18.6% of the site will be covered with impervious surfaces.

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

Standard erosion control measures and BMP's will be utilized to the maximum extent to reduce and control erosion and earth impacts associated with the project.

2. *Air* [help]

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.

Temporary gas and diesel powered vehicles and construction equipment emissions (exhaust) will occur during the projects construction. Emergency generator may be operated for routine maintenance purposes, and will be used during power outages. During normal operations (i.e., after construction), some odor emission is expected as part of the solid treatment (biosolids) process. A new odor control unit will be installed immediately adjacent to the proposed bio dryer to control odor emission. No other long term air emissions are expected to result from the project.

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

There are no known off-site sources of emission or odor that will affect this proposal.

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

Standard energy efficient machinery and equipment. All equipment and facilities are required to meet local, state and federal regulation in regards to air emissions.

3. *Water* [help]

a. Surface Water: [help]

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.

N/A

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.

N/A

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.

N/A

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

N/A

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

A portion of parcel 64300800304 which includes the proposed construction access is encumbered by designated flood zone, however recent documentation of best available science from FEMA indicate that the flood zone in this area should be removed from the FIRM. The City anticipates that approval of construction in the area shown on the FIRM would be allowed based on FEMA current findings.

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.

Under the City of Yelm's NPDES permit #WA0040762, the Water Reclamation facility currently discharges, and proposes to continue to discharge, Class A reclaimed water to three primary outfalls. For Outfall #001 (reclaimed water distribution) the City is authorized to distribute Class A reclaimed water to public and private entities for commercial and industrial uses and/or to apply reclaimed water to land for irrigation purposes and ground water recharge by surface percolation. Currently, 50,000 gallons per day is discharged at Cochrane Memorial Park through a series of rapid infiltration basins. Outfall #002 is to the Centrailia Power Canal. However, whenever flows in the Power Canal drops below 200 cubic feet per second, the City of Yelm must cease discharging effluent to the Centralia Power Canal. Outfall #003 is to the Nisqually River. The City is authorized to discharge municipal wastewater at this location only as an emergency backup.

b. Ground Water: [help]

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.

N/A

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.

Refer to the response for Question 3.a.6), above.

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.

Approved stormwater facilities for impervious surface meeting the most current Stormwater Management Manual for Western Washington are provided. A Site Grading and Drainage Plan is included in the construction plan set (Sheet C007). Storm runoff collected by existing and proposed catch basins discharge to a ditch located along the west property line, and into an existing storm detention basin located in the northeast portion of the site.

2) Could waste materials enter ground or surface waters? If so, generally describe.

Yes, but only in the form of Class A reclaimed water, discharged as described under Question 3.a.6), above.

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

N/A

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

Stormwater facilities will meet or exceed the minimum requirements of the most current Stormwater Management Manual for Western Washington.

4. *Plants* [help]

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

X deciduous tree: alder, maple, aspen, other
X evergreen tree: fir, cedar, pine, other
X shrubs
X 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?

Grading for construction access, and expanded facilities will remove grasses. Some evergreen trees considered perimeter landscape will be removed for access.

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:

Additional landscape requirements of the City will be met.

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

N/A

5. *Animals* [help]

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 _____

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

Yelm Mazama Pocket Gopher is known to be located on the Yelm prairie. The project site is hard surface with no evidence of gopher activity. Parcel 64300800304 which is construction access has low soil suitability, with known barriers surrounding the site. Adjoining parcels have expert review of no evidence, as well as visual reconnaissance that shows no activity.

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

N/A

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

N/A

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

N/A

6. *Energy and Natural Resources* [help]

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.

The completed project will use electric power and generator.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

N/A

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:

N/A

7. *Environmental Health* [help]

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.

The main chemicals used in the liquid treatment process include sodium hydroxide (used for pH control), liquid chlorine (for disinfection) and sodium bisulfite (for dechlorination). For the solid treatment process (biosolids), a polymer will be used as a coagulant. The City has a written chemical safety response plan in place for the existing facility. This plan includes Material Safety Data Sheets for each chemical used. This plan

is on file at Water Reclamation Facility and will be modified as needed to address new processes and chemicals that are part of the planned facility modifications.

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.

See response for Question B.7.a., above.

4) Describe special emergency services that might be required.

Police services are provided by the City of Yelm. Fire and EMS services are provided by the SE Thurston Fire Authority/Medic One.

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

These measures are described in detail in the written chemical safety response plan on file at Water Reclamation Facility. Included are Material Safety Data Sheets for each chemical used.

b. Noise

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

Nearby industrial uses include machinery and processing noise.

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)? Indi- cate what hours noise would come from the site.

Short term construction noise between 7am-6pm. Generator is used as needed. Very little noise will be generated by the plant under normal operating conditions.

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

Construction noise limited to normal business hours.

8. *Land and Shoreline Use* [help]

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 and adjacent properties are currently developed as industrial uses, and vacant land zoned industrial. Use is consistent with zoning.

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?

N/A

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:

N/A

c. Describe any structures on the site.

Solids handling building, control building, reclaimed water storage tank, maintenance building, 2 sludge storage tanks, 3 SBR tanks, 2 ponds

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

No

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?

N/A

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

Extremely sensitive critical aquifer recharge area

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

6 WRF personnel

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

N/A

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

N/A

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

City development regulations apply to provide visual barriers between uses, and landscaping to screen the facility

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any:

N/A

9. *Housing* [help]

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

N/A

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

N/A

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

N/A

10. *Aesthetics* [help]

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

The tallest structure at this site, after construction, will be the top of the crane gallery, located above the proposed MBR tanks. The top elevation will be 376.73. Comparing this to a nearby proposed ground surface elevation of 341.90, this height will be 34.83 feet. The principal exterior building material proposed for the new mechanical/electrical building will be CMU (concrete masonry unit) construction. Refer to Sheet A402 of the construction plans.

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

N/A

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

Retain existing perimeter landscaping screening

11. *Light and Glare* [help]

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

On site building lighting, no off site lighting.

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

N/A

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

N/A

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

N/A

12. *Recreation* [help]

a. What designated and informal recreational opportunities are in the immediate vicinity?

N/A

b. Would the proposed project displace any existing recreational uses? If so, describe.

N/A

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

N/A

13. *Historic and cultural preservation* [help]

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 ? If so, specifically describe.

N/A

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.

Search of WISAARD maps show no properties or structures eligible.

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.

Department of Archaeology and Historic Preservation data inventory map WISAARD.

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.

N/A

14. *Transportation* [help]

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.

Main access on Northern Pacific Rd NW and construction access on Rhoton Rd NW

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?

No

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?

No additional or eliminated parking is proposed

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).

N/A

e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

N/A

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?

Construction will generate temporary vehicle trips, however no change is expected after construction.

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.

N/A

h. Proposed measures to reduce or control transportation impacts, if any:

N/A

15. *Public Services* [help]

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.

None anticipated.

b. Proposed measures to reduce or control direct impacts on public services, if any.

N/A

16. *Utilities* [help]

a. Circle utilities currently available at the site:

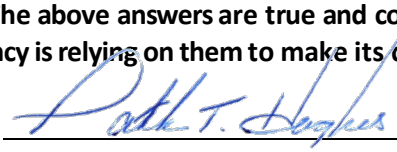
electricity, natural gas, water, reclaimed water, refuse service, telephone, sanitary sewer, other _____

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 utility services, Puget Sound Energy, Telephone and cable services

C. Signature **[HELP]**

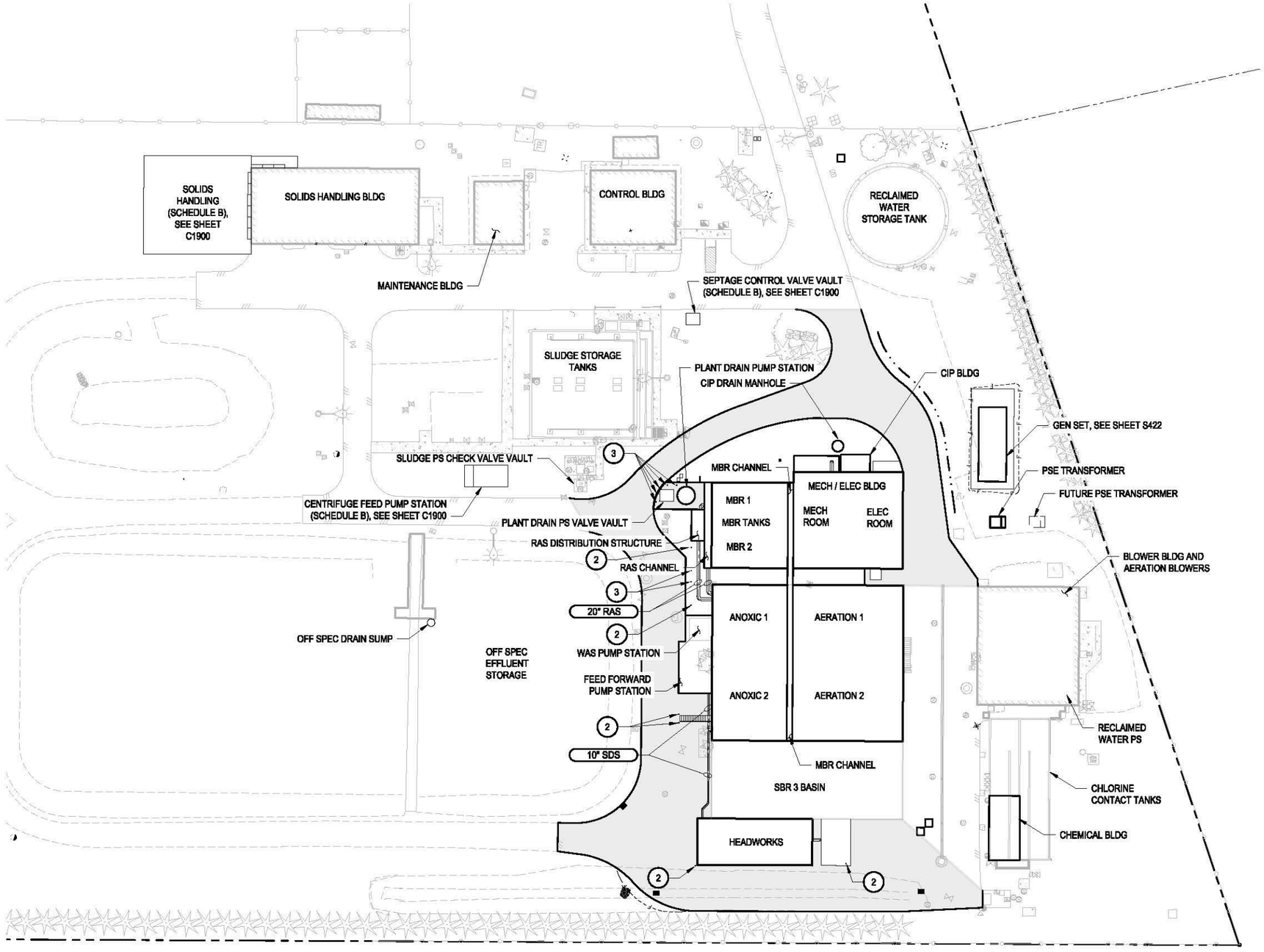
The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: 

Name of signee Patrick T. Hughes, P.E.

Position and Agency/Organization City Engineer, City of Yelm, WA

Date Submitted: June 2, 2021



PLAN

SCALE IN FEET

0 30 60

NOTES

1. THE BASE MAP FOR THIS PROJECT WAS CREATED FROM FIELD SURVEY AS DESCRIBED ON SHEET C002 AND FACILITY RECORD DRAWINGS. THE LOCATIONS OF ALL EXISTING UTILITIES SHOWN HEREON HAVE BEEN OBTAINED FROM AVAILABLE RECORDS AND SHOULD THEREFORE BE CONSIDERED APPROXIMATE ONLY. IT IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO INDEPENDENTLY VERIFY THE ACCURACY OF ALL UTILITY LOCATIONS SHOWN, AND TO FURTHER DISCOVER AND AVOID ANY OTHER UTILITIES NOT SHOWN HEREON WHICH MAY BE AFFECTED BY THE IMPLEMENTATION OF THESE PLANS.

(2) BOLLARD, SEE DETAIL 3, SHEET C012.

(3) REMOVABLE BOLLARD, SEE DETAIL 2, SHEET C012.

90% REVIEW SUBMITTAL
NOT FOR CONSTRUCTION

	REVISIONS	DATE	BY

DESIGNED R. RAYMOND
DRAWN K. TAYLOR
CHECKED D. KOPCHYNSKI
APPROVED

ONE INCH AT FULL SCALE. IF NOT, SCALE ACCORDINGLY

FILE NAME PS1781042-C003
JOB No. 216-1781-042
DATE MAY 2021

PRELIMINARY
RANDOLPH SCOT TAYLOR
STATE OF WASHINGTON
REGISTERED PROFESSIONAL ENGINEER

Parametrix
ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES
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PROJECT NAME
CITY OF YELM
YELM WATER RECLAMATION FACILITY PHASE 2 UPGRADES
YELM, WASHINGTON

OVERALL SITE PLAN

DRAWING NO.
75 OF 252
C003

Water Reclamation Facility – Phase 2 Upgrades Construction Stormwater Pollution Prevention Plan (SWPPP)

Prepared for

City of Yelm
EST. 1924
WASHINGTON
"Proudly Serving Our Community"

June 2021

Prepared by
Parametrix

Water Reclamation Facility – Phase 2 Upgrades Construction Stormwater Pollution Prevention Plan (SWPPP)

Prepared for

City of Yelm
106 Second St. SE
Yelm, WA 98597

Prepared by

Parametrix
1019 39th Avenue SE, Suite 100
Puyallup, WA 98374
T. 253.604.6600 F. 1.855.542.6353
www.parametrix.com

June 2021 | 216-1781-042

CITATION

Parametrix. 2021. Water Reclamation Facility – Phase 2 Upgrades Construction Stormwater Pollution Prevention Plan (SWPPP). Prepared by Parametrix, Puyallup, Washington. June 2021.

CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

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B Hydrologic Calculations
C Excerpts from Ecology Manual

ACRONYMS AND ABBREVIATIONS

BMPs	best management practices
CSWGP	Construction Stormwater General Permit
Ecology Manual	Stormwater Management Manual for Western Washington
Ecology	Washington State Department of Ecology
LID	low impact development
mgd	million gallons per day
Project	WRF Phase 2 Upgrades
SSP	Stormwater Site Plan
SWPPP	Stormwater Pollution Prevention Plan
TDAs	Threshold Discharge Areas
TESC	Temporary Erosion and Sediment Control
WRF	Water Reclamation Facility

1. OVERVIEW

The City of Yelm's existing Water Reclamation Facility (WRF) was designed in 1995 to treat maximum monthly flows of up to 1.06 million gallons per day (mgd) to Class A reclaimed water standards using several treatment steps. If the quality of the treated water meets permit limits for reclaimed water and there is a demand for reuse later, the reclaimed water is pumped to the beneficial use sites. The WRF Phase 2 Upgrades Project (the Project) includes design of treatment processes to improve treatment levels to better meet the Class A reclaimed water standard. This portion of the Project is referred to as Schedule A, Liquid Stream Improvements.

In addition to treatment improvements, the Project proposes solids handling improvements which includes the construction of a new receiving station and installation of equipment to produce a Class A biosolid. This portion of the Project is referred to as Schedule B, Solids Improvements.

This Construction Stormwater Pollution Prevention Plan (SWPPP) has been prepared to reflect the two different schedules due to variations in the design schedule. The final SWPPP will reflect both Schedule A and Schedule B.

The site is relatively flat, has no critical areas, and highly infiltrative soils. There are no permanent stormwater management best management practices (BMPs) for flow control or water quality treatment. However, there are permanent BMPs that are triggered for Minimum Requirement 5, On-Site Stormwater Management.

Schedule A site modifications applicable to this SWPPP are summarized as follows:

- Clearing and grading;
- Building demolition;
- Pavement removal;
- A slab for a new generator;
- A new electrical and mechanical building;
- A new membrane bioreactor tank;
- A new pump station building; and
- New pavement for site circulation where proposed improvements are construction within the footprint of existing pavement.

Schedule B site modifications applicable to this SWPPP are summarized as follows:

- Clearing and grading; and
- Construction of a new slab for loading biosolids. The slab will have a roof to prevent rainfall from falling on the biosolids during the loading process.

The contractor will be required to submit the Notice of Intent for coverage under the Construction Stormwater General Permit (CSWGP) and for compliance with all CSWGP testing, monitoring and reporting requirements. The Temporary Erosion and Sediment Control (TESC) BMPs identified in this Construction SWPPP are anticipated to be the minimum required. The contractor shall identify all applicable TESC BMPs based on the contractor's Schedule And construction sequencing in a contractor-prepared SWPPP.

1.1 Element 1: Preserve Vegetation/Mark Clearing Limits

1.1.1 Schedule A, Liquid Stream Improvements

Vegetation preservation BMPs are not applicable to Schedule A. The location of clearing limits using BMP C103, High Visibility Fence, are shown in the plans in Appendix A.

1.1.2 Schedule B, Solids Improvements

Vegetation preservation BMPs are not applicable to Schedule B. The location of clearing limits using BMP C103, High Visibility Fence, are shown in the plans in Appendix A.

1.2 Element 2: Establish Construction Access

1.2.1 Schedule A, Liquid Stream Improvements

The location of stabilized construction entrances and exit using BMP C105, Stabilized Construction Access, are shown in the plans in Appendix A.

1.2.2 Schedule B, Solids Improvements

The location of stabilized construction entrances and exit using BMP C105, Stabilized Construction Access, are shown in the plans in Appendix A.

1.3 Element 3: Control Flow Rates

1.3.1 Schedule A, Liquid Stream Improvements

Based on the Stormwater Site Plan, flow control is not applicable to any of the Project's Threshold Discharge Areas (TDAs). Also, there are no adjacent critical areas, stormwater management BMPs, or development which would require controlling flow rates during construction in Schedule A. Temporary flow rate control BMPs are not applicable.

1.3.2 Schedule B, Solids Improvements

Based on the Stormwater Site Plan, flow control is not applicable to any of the Project's TDAs. Also, there are no adjacent critical areas, stormwater management BMPs, or development which would require controlling flow rates during construction in Schedule A. Temporary flow rate control BMPs are not applicable.

1.4 Element 4: Install Sediment Controls

1.4.1 Schedule A, Liquid Stream Improvements

The plans in Appendix A are based on using BMP C251, Construction Stormwater Filtration, to temporarily control sediments during construction in Schedule A. BMP C240, Sediment Trap, or BMP C241, Sediment Pond (Temporary) may be an alternative; however, those may encumber more site area

during construction and may require more piping and pumping to discharge to existing conveyance systems. Infiltration at temporary sediment traps or temporary sediment ponds may be feasible if adequate treatment is provided to protect groundwater. Preliminary flow rate calculations are included in Appendix B.

The contractor-prepared SWPPP will need to identify the contractor-selected sediment controls and document final sizing calculations and discharge points.

The contractor-prepared SWPPP shall also include BMP C250, Construction Stormwater Chemical Treatment, if proposed. The contractor will be required to obtain Washington State Department of Ecology (Ecology) approval if BMP C250 is proposed.

1.4.2 Schedule B, Solids Improvements

The plans in Appendix A are based on using BMP C251, Construction Stormwater Filtration, to temporarily control sediments during construction in Schedule A. BMP C240, Sediment Trap, or BMP C241, Sediment Pond (Temporary) may be an alternative; however, those may encumber more site area during construction and may require more piping and pumping to discharge to existing conveyance systems. Infiltration at temporary sediment traps or temporary sediment ponds may be feasible if adequate treatment is provided to protect groundwater.

The contractor-prepared SWPPP will need to identify the contractor-selected sediment controls and document final sizing calculations and discharge points. Preliminary flow rate calculations are included in Appendix B.

The contractor-prepared SWPPP shall also include BMP C250, Construction Stormwater Chemical Treatment, if proposed. The contractor will be required to obtain Ecology approval if BMP C250 is proposed.

1.5 Element 5: Stabilize Soils

1.5.1 Schedule A, Liquid Stream Improvements

Disturbed areas in Schedule A that are to be vegetated are to be restored in accordance with the landscaping plans as indicated in the TESC plans in Appendix A.

1.5.2 Schedule B, Solids Improvements

Disturbed areas in Schedule A that are to be vegetated are to be restored in accordance with the landscaping plans as indicated in the TESC plans in Appendix A.

1.6 Element 6: Protect Slopes

1.6.1 Schedule A, Liquid Stream Improvements

Slope project is not applicable in Schedule A.

1.6.2 Schedule B, Solids Improvements

Slope project is not applicable in Schedule B.

1.7 Element 7: Protect Drain Inlets

1.7.1 Schedule A, Liquid Stream Improvements

The locations of inlet protection for Schedule A using BMP C220, Inlet Protection, are shown in the plans in Appendix A.

1.7.2 Schedule B, Solids Improvements

There are no existing or proposed inlets in Schedule B for which BMP C220, Inlet Protection, is applicable.

1.8 Element 8: Stabilize Channels and Outlets

1.8.1 Schedule A, Liquid Stream Improvements

A permanent rock pad for energy dissipation is needed for Schedule A for the storm drain discharge into the existing swale along the westerly side of the site. The location of the rock pad is shown on the plans in Appendix A. See the Stormwater Site Plan (SSP) for details.

1.8.2 Schedule B, Solids Improvements

There are no channels or outlets in Schedule B requiring temporary stabilization BMPs.

1.9 Element 9: Control Pollutants

1.9.1 Schedule A, Liquid Stream Improvements

Potential pollutant sources in Schedule A include sawcutting and pavement demolition and placement of concrete. BMPs identified in the plans in Appendix A include:

- BMP C151, Concrete Handling;
- BMP C154, Concrete Washout Area;
- BMP C152, Sawcutting and Surface Pollution Prevention; and
- BMP C252, Treating and Disposing of High pH Water.

1.9.2 Schedule B, Solids Improvements

Potential pollutant sources in Schedule B include placement of concrete. BMPs identified in the plans in Appendix A include:

- BMP C151, Concrete Handling;
- BMP C154, Concrete Washout Area; and
- BMP C252, Treating and Disposing of High pH Water.

1.10 Element 10: Control Dewatering

1.10.1 Schedule A, Liquid Stream Improvements

Dewatering in Schedule A is not anticipated due to the depth to groundwater.

1.10.2 Schedule B, Solids Improvements

Dewatering in Schedule A is not anticipated due to the depth to groundwater.

1.11 Element 11: Maintain BMPs

1.11.1 Schedule A, Liquid Stream Improvements

See the excerpts in Appendix C from the Stormwater Management Manual for Western Washington (Ecology Manual) for maintenance requirements of TESC BMPs in Schedule A.

1.11.2 Schedule B, Solids Improvements

See the excerpts in Appendix C from the Ecology Manual for maintenance requirements of TESC BMPs in Schedule B.

1.12 Element 12: Manage the Project

1.12.1 Schedule A, Liquid Stream Improvements

The contractor will need to manage the Project so that stormwater discharges during construction meet the requirements of the CSWGP. To support this, Appendix C includes the following BMPs for Schedule A:

- BMP C153, Material Delivery, Storage and Containment;
- BMP C160, Certified Erosion and Sediment Control Lead; and
- BMP C162, Scheduling.

1.12.2 Schedule B, Solids Improvements

The contractor will need to manage the Project so that stormwater discharges during construction meet the requirements of the CSWGP. To support this, Appendix C includes the following BMPs for Schedule A:

- BMP C153, Material Delivery, Storage and Containment;
- BMP C160, Certified Erosion and Sediment Control Lead; and
- BMP C162, Scheduling.

1.13 Element 13: Protect Low Impact Development BMPs

1.13.1 Schedule A, Liquid Stream Improvements

There are no existing or proposed low impact development (LID) BMPs in Schedule A to be protected. However, the roof downspout dispersion systems as shown in the plans with the SSP include vegetated areas downstream of splashblocks or rock splash pads. Those areas will need to be protected if they are constructed prior to the roof downspouts being installed.

1.13.2 Schedule B, Solids Improvements

There are no existing or proposed LID BMPs in Schedule A to be protected. However, the roof downspout dispersion systems as shown in the plans with the SSP include vegetated areas downstream of splashblocks or rock splash pads. Those areas will need to be protected if they are constructed prior to the roof downspouts being installed.

Appendix A

Temporary Erosion and Sediment Control (TESC) Plans

Appendix B

Hydrologic Calculations

CITY OF YELM									
WRF Phase 2 Upgrades									
TESC Calculations for filtration systems, BMP C251, Construction Stormwater Filtration									
Updated 6/11/21 for updated biodryer footprint							Drawdown time, hours:	8	
							Factor:		
Area Description	SS2G name	Grass	Roof, NPGIS	PGIS	Total Impervious	10-yr 24-hr runoff volume, cu ft	1.5	Treatment rate, gpm	
Solids Handling Roof	TDA 1	0	2,998	0	2,998				
Acres		0.000			0.069	1,192.75	1,789	28	
Generator Pad, Mech/Elec Bldg, & MBR Tank Vicinity	TDA 2 3	757	5,894	8,807	14,701				
Acres		0.017			0.337	5,942.65	8,914	139	
Pump Sta and Headworks Vicinity	TDA 4	9,687	5,466	18,398	23,864				
Acres		0.222			0.548	10,975.93	16,464	257	
Parameters for StormShed3G:									
Time of concentration, minutes:			5						
Hydrologic Soil Group, per geotechnical report			A						
CN, impervious:			98						
CN, pervious, grass:			68	39 per TR 55 per Ecology Manual. Lawn cover, good condition, HSG A but 68 in SS3G					
Precipitation depth:			5						

CITY OF YELM
WRF Phase 2
TESC calculations for BMP C251, Construction Stormwater Filtration

TDA1 Event Summary

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method
2 yr 24 hr	0.0387	8.00	0.0131	0.069	SBUH
10 year	0.0792	8.00	0.0274	0.069	SBUH

All results based on storm duration of **24.0** hours. This is ok if all precipitations are appropriate for the storm duration. If some design event precipitations are for different duration storms, those results are incorrect

Record Id: TDA1

Design Method	SBUH	**Rainfall type**	TYPE1a.rac
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	24.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.00 ac	**DCIA**	0.069 ac
Pervious CN	0.00	**DC CN**	98.00
Pervious TC	0.00 min	**DC TC**	5.00 min

DCI - CN Calc

Description	SubArea	Sub cn
Impervious surfaces (pavements, roofs, etc)	0.069 ac	98.00
DC Composited CN (AMC 2)		98.00

DCI - TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Sheet		0.00 ft	0.0%	5.0	0.00 in	5.00 min

Pervious TC	5.00 min

TDA2_3 Event Summary

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method
2 yr 24 hr	0.1891	8.00	0.0643	0.354	SBUH
10 year	0.3933	8.00	0.1364	0.354	SBUH

All results based on storm duration of **24.0** hours. This is ok if all precipitations are appropriate for the storm duration. If some design event precipitations are for different duration storms, those results are incorrect

Record Id: TDA2_3

Design Method	SBUH	**Rainfall type**	TYPE1a.rac
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	24.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.017 ac	**DCIA**	0.337 ac
Pervious CN	68.00	**DC CN**	98.00
Pervious TC	5.00 min	**DC TC**	5.00 min

Pervious CN Calc

Description	SubArea	Sub cn
Open spaces, lawns,parks (>75% grass)	0.017 ac	68.00
Pervious Composited CN (AMC 2)		68.00

Pervious TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Sheet		0.00 ft	0.0%	5.0	0.00 in	5.00 min
Pervious TC						5.00 min

DCI - CN Calc		
Description	**SubArea**	**Sub cn**
Impervious surfaces (pavements, roofs, etc)	0.337 ac	98.00
DC Composited CN (AMC 2)		98.00

DCI - TC Calc						
Type	**Description**	**Length**	**Slope**	**Coeff**	**Misc**	**TT**
Sheet		0.00 ft	0.0%	5.0	0.00 in	5.00 min
Pervious TC						5.00 min

TDA4 Event Summary

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method
2 yr 24 hr	0.3093	8.00	0.1108	0.768	SBUH
10 year	0.7103	8.00	0.252	0.768	SBUH

All results based on storm duration of **24.0** hours. This is ok if all precipitations are appropriate for the storm duration. If some design event precipitations are for different duration storms, those results are incorrect

Record Id: TDA4

Design Method	SBUH	**Rainfall type**	TYPE1a.rac

Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	24.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.22 ac	**DCIA**	0.548 ac
Pervious CN	68.00	**DC CN**	98.00
Pervious TC	5.00 min	**DC TC**	5.00 min

Pervious CN Calc

Description	SubArea	Sub cn
Open spaces, lawns,parks (>75% grass)	0.22 ac	68.00
Pervious Composited CN (AMC 2)		68.00

Pervious TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Sheet		0.00 ft	0.0%	5.0	0.00 in	5.00 min
Pervious TC						5.00 min

DCI - CN Calc

Description	SubArea	Sub cn
Impervious surfaces (pavements, roofs, etc)	0.548 ac	98.00
DC Composited CN (AMC 2)		98.00

DCI - TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Sheet		0.00 ft	0.0%	5.0	0.00 in	5.00 min
Pervious TC						5.00 min

Appendix C

Excerpts from Ecology Manual

Excerpts for Yelm WRF Phase 2 Construction SWPPP Appendix C

Volume II

Construction Stormwater Pollution Prevention

Stormwater Management Manual for Western Washington

Prepared by:

Washington State Department of Ecology
Water Quality Program

July 2019

Publication Number 19-10-021

II-3 Construction Stormwater BMPs

II-3.1 A Summary of Construction Stormwater BMPs

This chapter contains standards and specifications for temporary BMPs, used as appropriate during the construction phase of a project. Often using BMPs in combination is the best method to meet Construction Stormwater Pollution Prevention Plan (Construction SWPPP) requirements.

The standards and specifications in this chapter are not intended to limit innovative efforts to effectively control erosion and sedimentation. Construction SWPPPs can contain experimental BMPs or make minor modifications to standard BMPs. However, the permitting authority (state, local, or both) must approve such practices before use. Experimental and modified BMPs must achieve the same or better performance than the BMPs listed below.

None of the BMPs listed below will work successfully throughout the construction project without inspection and maintenance. Regular inspections to identify problems with the operation of each BMP, and the timely repair of any problems are essential to the continued operation of the BMPs. As site conditions change, BMPs must change to remain in compliance.

Construction stormwater BMPs are divided into two categories: Construction Source Control BMPs and Construction Runoff BMPs.

Table II-3.1: Construction Stormwater BMPs by SWPPP Element shows the relationship of the Construction Stormwater BMPs to the Construction SWPPP Elements described in I-3.4.2 MR2: Construction Stormwater Pollution Prevention Plan (SWPPP).

Table II-3.1: Construction Stormwater BMPs by SWPPP Element

Construction Stormwater BMP	Construction SWPPP Element #												
	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13
Construction Source Control BMPs													
BMP C101: Preserving Natural Vegetation	✓												
BMP C102: Buffer Zones	✓												✓
BMP C103: High-Visibility Fence	✓												✓
BMP C105: Stabilized Construction Access		✓											
BMP C106: Wheel Wash		✓											

Table II-3.1: Construction Stormwater BMPs by SWPPP Element (continued)

Construction Storm-water BMP	Construction SWPPP Element #												
	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13
BMP C107: Construction Road / Parking Area Stabilization		✓											
BMP C120: Temporary and Permanent Seeding					✓	✓							
BMP C121: Mulching					✓	✓							
BMP C122: Nets and Blankets					✓	✓		✓					
BMP C123: Plastic Covering					✓	✓							
BMP C124: Sodding					✓	✓							
BMP C125: Topsoiling / Composting					✓								
BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection					✓								
BMP C130: Surface Roughening					✓	✓							
BMP C131: Gradient Terraces					✓	✓							
BMP C140: Dust Control					✓								
BMP C150: Materials on Hand											✓	✓	
BMP C151: Concrete Handling									✓				
BMP C152: Sawcutting and Surfacing Pollution Prevention									✓				
BMP C153: Material Delivery, Storage, and Containment									✓				

Table II-3.1: Construction Stormwater BMPs by SWPPP Element (continued)

Construction Storm-water BMP	Construction SWPPP Element #												
	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13
BMP C154: Concrete Washout Area									✓				
BMP C160: Certified Erosion and Sediment Control Lead											✓	✓	
BMP C162: Scheduling												✓	
Construction Runoff BMPs													
BMP C200: Interceptor Dike and Swale						✓							✓
BMP C201: Grass-Lined Channels						✓							✓
BMP C202: Riprap Channel Lining								✓					
BMP C203: Water Bars			✓			✓				✓			
BMP C204: Pipe Slope Drains						✓							
BMP C205: Subsurface Drains						✓							
BMP C206: Level Spreader						✓				✓			
BMP C207: Check Dams			✓			✓		✓					✓
BMP C208: Triangular Silt Dike (TSD)						✓							✓
BMP C209: Outlet Pro-tection			✓					✓					
BMP C220: Inlet Pro-tection							✓						
BMP C231: Brush Bar-rier				✓									✓
BMP C232: Gravel Fil-ter Berm				✓									

Table II-3.1: Construction Stormwater BMPs by SWPPP Element (continued)

Construction Storm-water BMP	Construction SWPPP Element #												
	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13
BMP C233: Silt Fence				✓									✓
BMP C234: Vegetated Strip				✓									✓
BMP C235: Wattles			✓	✓									
BMP C236: Vegetative Filtration										✓			
BMP C240: Sediment Trap			✓	✓									
BMP C241: Sediment Pond (Temporary)			✓	✓									
BMP C250: Con-struction Stormwater Chemical Treatment				✓					✓				
BMP C251: Con-struction Stormwater Filtration				✓					✓				
BMP C252: Treating and Disposing of High pH Water									✓				

Construction SWPPP Elements:

Element 1: Preserve Vegetation / Mark Clearing Limits
Element 2: Establish Construction Access
Element 3: Control Flow Rates
Element 4: Install Sediment Controls
Element 5: Stabilize Soils
Element 6: Protect Slopes
Element 7: Protect Drain Inlets
Element 8: Stabilize Channels and Outlets
Element 9: Control Pollutants
Element 10: Control Dewatering
Element 11: Maintain BMPs
Element 12: Manage the Project
Element 13: Protect Low Impact Development BMPs

II-3.2 Construction Source Control BMPs

See detail on plans

BMP C103: High-Visibility Fence

Purpose

High-visibility fencing is intended to:

- Restrict clearing to approved limits.
- Prevent disturbance of sensitive areas, their buffers, and other areas required to be left undisturbed.
- Limit construction traffic to designated construction entrances, exits, or internal roads.
- Protect areas where marking with survey tape may not provide adequate protection.

Conditions of Use

To establish clearing limits plastic, fabric, or metal fence may be used:

- At the boundary of sensitive areas, their buffers, and other areas required to be left uncleared.
- As necessary to control vehicle access to and on the site.

Design and Installation Specifications

High-visibility plastic fence shall be composed of a high-density polyethylene material and shall be at least four feet in height. Posts for the fencing shall be steel or wood and placed every 6 feet on center (maximum) or as needed to ensure rigidity. The fencing shall be fastened to the post every six inches with a polyethylene tie. On long continuous lengths of fencing, a tension wire or rope shall be used as a top stringer to prevent sagging between posts. The fence color shall be high-visibility orange. The fence tensile strength shall be 360 lbs/ft using the ASTM D4595 testing method.

If appropriate install fabric silt fence in accordance with BMP C233: Silt Fence to act as high-visibility fence. Silt fence shall be at least 3 feet high and must be highly visible to meet the requirements of this BMP.

Metal fences shall be designed and installed according to the manufacturer's specifications.

Metal fences shall be at least 3 feet high and must be highly visible.

Fences shall not be wired or stapled to trees.

Maintenance Standards

If the fence has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.

BMP C105: Stabilized Construction Access

See detail on plans

Purpose

Stabilized construction accesses are established to reduce the amount of sediment transported onto paved roads outside the project site by vehicles or equipment. This is done by constructing a stabilized pad of quarry spalls at entrances and exits for project sites.

Conditions of Use

Construction accesses shall be stabilized wherever traffic will be entering or leaving a construction site if paved roads or other paved areas are within 1,000 feet of the site.

For residential subdivision construction sites, provide a stabilized construction access for each residence, rather than only at the main subdivision entrance. Stabilized surfaces shall be of sufficient length/width to provide vehicle access/parking, based on lot size and configuration.

On large commercial, highway, and road projects, the designer should include enough extra materials in the contract to allow for additional stabilized accesses not shown in the initial Construction SWPPP. It is difficult to determine exactly where access to these projects will take place; additional materials will enable the contractor to install them where needed.

Design and Installation Specifications

See Figure II-3.1: Stabilized Construction Access for details. Note: the 100' minimum length of the access shall be reduced to the maximum practicable size when the size or configuration of the site does not allow the full length (100').

Construct stabilized construction accesses with a 12-inch thick pad of 4-inch to 8-inch quarry spalls, a 4-inch course of asphalt treated base (ATB), or use existing pavement. Do not use crushed concrete, cement, or calcium chloride for construction access stabilization because these products raise pH levels in stormwater and concrete discharge to waters of the State is prohibited.

A separation geotextile shall be placed under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet the standards listed in Table II-3.2: Stabilized Construction Access Geotextile Standards.

Table II-3.2: Stabilized Construction Access Geotextile Standards

Geotextile Property	Required Value
Grab Tensile Strength (ASTM D4751)	200 psi min.

Table II-3.2: Stabilized Construction Access Geotextile Standards (continued)

Geotextile Property	Required Value
Grab Tensile Elongation (ASTM D4632)	30% max.
Mullen Burst Strength (ASTM D3786-80a)	400 psi min.
AOS (ASTM D4751)	20-45 (U.S. standard sieve size)

- Consider early installation of the first lift of asphalt in areas that will be paved; this can be used as a stabilized access. Also consider the installation of excess concrete as a stabilized access. During large concrete pours, excess concrete is often available for this purpose.
- Fencing (see BMP C103: High-Visibility Fence) shall be installed as necessary to restrict traffic to the construction access.
- Whenever possible, the access shall be constructed on a firm, compacted subgrade. This can substantially increase the effectiveness of the pad and reduce the need for maintenance.
- Construction accesses should avoid crossing existing sidewalks and back of walk drains if at all possible. If a construction access must cross a sidewalk or back of walk drain, the full length of the sidewalk and back of walk drain must be covered and protected from sediment leaving the site.

Alternative Material Specification

WSDOT has raised safety concerns about the Quarry Spall rock specified above. WSDOT observes that the 4-inch to 8-inch rock sizes can become trapped between Dually truck tires, and then released off-site at highway speeds. WSDOT has chosen to use a modified specification for the rock while continuously verifying that the Stabilized Construction Access remains effective. To remain effective, the BMP must prevent sediment from migrating off site. To date, there has been no performance testing to verify operation of this new specification. Jurisdictions may use the alternative specification, but must perform increased off-site inspection if they use, or allow others to use, it.

Stabilized Construction Accesses may use material that meets the requirements of WSDOT's *Standard Specifications for Road, Bridge, and Municipal Construction* Section 9-03.9(1) (WSDOT, 2016) for ballast except for the following special requirements.

The grading and quality requirements are listed in Table II-3.3: Stabilized Construction Access Alternative Material Requirements.

Table II-3.3: Stabilized Construction Access Alternative Material Requirements

Sieve Size	Percent Passing
2½"	99-100

Table II-3.3: Stabilized Construction Access Alternative Material Requirements (continued)

Sieve Size	Percent Passing
2″	65-100
¾″	40-80
No. 4	5 max.
No. 100	0-2
% Fracture	75 min.

- All percentages are by weight.
- The sand equivalent value and dust ratio requirements do not apply.
- The fracture requirement shall be at least one fractured face and will apply the combined aggregate retained on the No. 4 sieve in accordance with FOP for AASHTO T 335.

Maintenance Standards

Quarry spalls shall be added if the pad is no longer in accordance with the specifications.

- If the access is not preventing sediment from being tracked onto pavement, then alternative measures to keep the streets free of sediment shall be used. This may include replacement/cleaning of the existing quarry spalls, street sweeping, an increase in the dimensions of the access, or the installation of BMP C106: Wheel Wash.
- Any sediment that is tracked onto pavement shall be removed by shoveling or street sweeping. The sediment collected by sweeping shall be removed or stabilized on site. The pavement shall not be cleaned by washing down the street, except when high efficiency sweeping is ineffective and there is a threat to public safety. If it is necessary to wash the streets, the construction of a small sump to contain the wash water shall be considered. The sediment would then be washed into the sump where it can be controlled.
- Perform street sweeping by hand or with a high efficiency sweeper. Do not use a non-high efficiency mechanical sweeper because this creates dust and throws soils into storm systems or conveyance ditches.
- Any quarry spalls that are loosened from the pad, which end up on the roadway shall be removed immediately.
- If vehicles are entering or exiting the site at points other than the construction access(es), BMP C103: High-Visibility Fence shall be installed to control traffic.

- Upon project completion and site stabilization, all construction accesses intended as permanent access for maintenance shall be permanently stabilized.

BMP C151: Concrete Handling

Purpose

Concrete work can generate process water and slurry that contain fine particles and high pH, both of which can violate water quality standards in the receiving water. Concrete spillage or concrete discharge to waters of the State is prohibited. Use this BMP to minimize and eliminate concrete, concrete process water, and concrete slurry from entering waters of the State.

Conditions of Use

Any time concrete is used, utilize these management practices. Concrete construction project components include, but are not limited to:

- Curbs
- Sidewalks
- Roads
- Bridges
- Foundations
- Floors
- Runways

Disposal options for concrete, in order of preference are:

1. Off-site disposal
2. Concrete wash-out areas (see BMP C154: Concrete Washout Area)
3. De minimus washout to formed areas awaiting concrete

Design and Installation Specifications

- Wash concrete truck drums at an approved off-site location or in designated concrete washout areas only. Do not wash out concrete trucks onto the ground (including formed areas awaiting concrete), or into storm drains, open ditches, streets, or streams. Refer to BMP C154: Concrete Washout Area for information on concrete washout areas.
    - Return unused concrete remaining in the truck and pump to the originating batch plant for recycling. Do not dump excess concrete on site, except in designated concrete washout areas as allowed in BMP C154: Concrete Washout Area.
- Wash small concrete handling equipment (e.g. hand tools, screeds, shovels, rakes, floats, trowels, and wheelbarrows) into designated concrete washout areas or into formed areas awaiting concrete pour.
- At no time shall concrete be washed off into the footprint of an area where an infiltration feature will be installed.
- Wash equipment difficult to move, such as concrete paving machines, in areas that do not directly drain to natural or constructed stormwater conveyance or potential infiltration areas.
- Do not allow washwater from areas, such as concrete aggregate driveways, to drain directly (without detention or treatment) to natural or constructed stormwater conveyances.
- Contain washwater and leftover product in a lined container when no designated concrete washout areas (or formed areas, allowed as described above) are available. Dispose of contained concrete and concrete washwater (process water) properly.

- Always use forms or solid barriers for concrete pours, such as pilings, within 15-feet of surface waters.
- Refer to BMP C252: Treating and Disposing of High pH Water for pH adjustment requirements.
- Refer to the Construction Stormwater General Permit (CSWGP) for pH monitoring requirements if the project involves one of the following activities:
    - Significant concrete work (as defined in the CSWGP).
    - The use of soils amended with (but not limited to) Portland cement-treated base, cement kiln dust or fly ash.
    - Discharging stormwater to segments of water bodies on the 303(d) list (Category 5) for high pH.

Maintenance Standards

Check containers for holes in the liner daily during concrete pours and repair the same day.

BMP C152: Sawcutting and Surfacing Pollution Prevention

Purpose

Sawcutting and surfacing operations generate slurry and process water that contains fine particles and high pH (concrete cutting), both of which can violate the water quality standards in the receiving water. Concrete spillage or concrete discharge to waters of the State is prohibited. Use this BMP to minimize and eliminate process water and slurry created through sawcutting or surfacing from entering waters of the State.

Conditions of Use

Utilize these management practices anytime sawcutting or surfacing operations take place. Sawcutting and surfacing operations include, but are not limited to:

- Sawing
- Coring
- Grinding
- Roughening
- Hydro-demolition
- Bridge and road surfacing

Design and Installation Specifications

- Vacuum slurry and cuttings during cutting and surfacing operations.
- Slurry and cuttings shall not remain on permanent concrete or asphalt pavement overnight.
- Slurry and cuttings shall not drain to any natural or constructed drainage conveyance including stormwater systems. This may require temporarily blocking catch basins.
- Dispose of collected slurry and cuttings in a manner that does not violate ground water or surface water quality standards.
- Do not allow process water generated during hydro-demolition, surface roughening or similar operations to drain to any natural or constructed drainage conveyance including stormwater systems. Dispose of process water in a manner that does not violate ground water or surface water quality standards.
- Handle and dispose of cleaning waste material and demolition debris in a manner that does not cause contamination of water. Dispose of sweeping material from a pick-up sweeper at an appropriate disposal site.

Maintenance Standards

Continually monitor operations to determine whether slurry, cuttings, or process water could enter waters of the state. If inspections show that a violation of water quality standards could occur, stop operations and immediately implement preventive measures such as berms, barriers, secondary containment, and/or vacuum trucks.

BMP C153: Material Delivery, Storage, and Containment

Purpose

Prevent, reduce, or eliminate the discharge of pollutants to the stormwater system or watercourses from material delivery and storage. Minimize the storage of hazardous materials on-site, store materials in a designated area, and install secondary containment.

Conditions of Use

Use at construction sites with delivery and storage of the following materials:

- Petroleum products such as fuel, oil and grease
- Soil stabilizers and binders (e.g., Polyacrylamide)
- Fertilizers, pesticides and herbicides
- Detergents
- Asphalt and concrete compounds

- Hazardous chemicals such as acids, lime, adhesives, paints, solvents, and curing compounds
- Any other material that may be detrimental if released to the environment

Design and Installation Specifications

- The temporary storage area should be located away from vehicular traffic, near the construction entrance(s), and away from waterways or storm drains.
- Safety Data Sheets (SDS) should be supplied for all materials stored. Chemicals should be kept in their original labeled containers.
- Hazardous material storage on-site should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- During the wet weather season (Oct 1 – April 30), consider storing materials in a covered area.
- Materials should be stored in secondary containments, such as an earthen dike, horse trough, or even a children's wading pool for non-reactive materials such as detergents, oil, grease, and paints. Small amounts of material may be secondarily contained in "bus boy" trays or concrete mixing trays.
- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, within secondary containment.
- If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids to reduce corrosion. Domed plastic covers are inexpensive and snap to the top of drums, preventing water from collecting.
- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 shall be stored in approved containers and drums and shall not be overfilled. Containers and drums shall be stored in temporary secondary containment facilities.
- Temporary secondary containment facilities shall provide for a spill containment volume able to contain 10% of the total enclosed container volume of all containers, or 110% of the capacity of the largest container within its boundary, whichever is greater.
- Secondary containment facilities shall be impervious to the materials stored therein for a minimum contact time of 72 hours.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- During the wet weather season (Oct 1 – April 30), each secondary containment facility shall be covered during non-working days, prior to and during rain events.
- Keep material storage areas clean, organized and equipped with an ample supply of appropriate spill clean-up material (spill kit).
- The spill kit should include, at a minimum:

- 1-Water Resistant Nylon Bag
- 3-Oil Absorbent Socks 3”x 4’
- 2-Oil Absorbent Socks 3”x 10’
- 12-Oil Absorbent Pads 17”x19”
- 1-Pair Splash Resistant Goggles
- 3-Pair Nitrile Gloves
- 10-Disposable Bags with Ties
- Instructions

Maintenance Standards

- Secondary containment facilities shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills shall be collected and placed into drums. These liquids shall be handled as hazardous waste unless testing determines them to be non-hazardous.
- Re-stock spill kit materials as needed.

BMP C154: Concrete Washout Area

See details on plans.

Purpose

Prevent or reduce the discharge of pollutants from concrete waste to stormwater by conducting washout off-site, or performing on-site washout in a designated area.

Conditions of Use

Concrete washout areas are implemented on construction projects where:

- Concrete is used as a construction material
- It is not possible to dispose of all concrete wastewater and washout off-site (ready mix plant, etc.).
- Concrete truck drums are washed on-site.

  Note that auxiliary concrete truck components (e.g. chutes and hoses) and small concrete handling equipment (e.g. hand tools, screeds, shovels, rakes, floats, trowels, and wheel-barrows) may be washed into formed areas awaiting concrete pour.

At no time shall concrete be washed off into the footprint of an area where an infiltration feature will be installed.

Design and Installation Specifications

Implementation

- Perform washout of concrete truck drums at an approved off-site location or in designated concrete washout areas only.
- Do not wash out concrete onto non-formed areas, or into storm drains, open ditches, streets, or streams.
- Wash equipment difficult to move, such as concrete paving machines, in areas that do not directly drain to natural or constructed stormwater conveyance or potential infiltration areas.
- Do not allow excess concrete to be dumped on-site, except in designated concrete washout areas as allowed above.
- Concrete washout areas may be prefabricated concrete washout containers, or self-installed structures (above-grade or below-grade).
- Prefabricated containers are most resistant to damage and protect against spills and leaks. Companies may offer delivery service and provide regular maintenance and disposal of solid and liquid waste.
- If self-installed concrete washout areas are used, below-grade structures are preferred over above-grade structures because they are less prone to spills and leaks.
- Self-installed above-grade structures should only be used if excavation is not practical.
- Concrete washout areas shall be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

Education

- Discuss the concrete management techniques described in this BMP with the ready-mix concrete supplier before any deliveries are made.
- Educate employees and subcontractors on the concrete waste management techniques described in this BMP.
- Arrange for the contractor's superintendent or Certified Erosion and Sediment Control Lead (CESCL) to oversee and enforce concrete waste management procedures.
- A sign should be installed adjacent to each concrete washout area to inform concrete equipment operators to utilize the proper facilities.

Contracts

Incorporate requirements for concrete waste management into concrete supplier and subcontractor agreements.

Location and Placement

- Locate concrete washout areas at least 50 feet from sensitive areas such as storm drains, open ditches, water bodies, or wetlands.
- Allow convenient access to the concrete washout area for concrete trucks, preferably near the area where the concrete is being poured.
- If trucks need to leave a paved area to access the concrete washout area, prevent track-out with a pad of rock or quarry spalls (see BMP C105: Stabilized Construction Access). These areas should be far enough away from other construction traffic to reduce the likelihood of accidental damage and spills.
- The number of concrete washout areas you install should depend on the expected demand for storage capacity.
- On large sites with extensive concrete work, concrete washout areas should be placed in multiple locations for ease of use by concrete truck drivers.

Concrete Truck Washout Procedures

- Washout of concrete truck drums shall be performed in designated concrete washout areas only.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated concrete washout areas or properly disposed of off-site.

Concrete Washout Area Installation

- Concrete washout areas should be constructed as shown in the figures below, with a recommended minimum length and minimum width of 10 ft, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
- Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
- Lath and flagging should be commercial type.
- Liner seams shall be installed in accordance with manufacturers' recommendations.
- Soil base shall be prepared free of rocks or other debris that may cause tears or holes in the plastic lining material.

Maintenance Standards

Inspection and Maintenance

- Inspect and verify that concrete washout areas are in place prior to the commencement of concrete work.
- Once concrete wastes are washed into the designated washout area and allowed to harden,

the concrete should be broken up, removed, and disposed of per applicable solid waste regulations. Dispose of hardened concrete on a regular basis.

- During periods of concrete work, inspect the concrete washout areas daily to verify continued performance.
    - Check overall condition and performance.
    - Check remaining capacity (% full).
    - If using self-installed concrete washout areas, verify plastic liners are intact and sidewalls are not damaged.
    - If using prefabricated containers, check for leaks.
- Maintain the concrete washout areas to provide adequate holding capacity with a minimum freeboard of 12 inches.
- Concrete washout areas must be cleaned, or new concrete washout areas must be constructed and ready for use once the concrete washout area is 75% full.
- If the concrete washout area is nearing capacity, vacuum and dispose of the waste material in an approved manner.
    - Do not discharge liquid or slurry to waterways, storm drains or directly onto ground.
    - Do not discharge to the sanitary sewer without local approval.
    - Place a secure, non-collapsing, non-water collecting cover over the concrete washout area prior to predicted wet weather to prevent accumulation and overflow of precipitation.
    - Remove and dispose of hardened concrete and return the structure to a functional condition. Concrete may be reused on-site or hauled away for disposal or recycling.
- When you remove materials from a self-installed concrete washout area, build a new structure; or, if the previous structure is still intact, inspect for signs of weakening or damage, and make any necessary repairs. Re-line the structure with new plastic after each cleaning.

Removal of Concrete Washout Areas

- When concrete washout areas are no longer required for the work, the hardened concrete, slurries and liquids shall be removed and properly disposed of.
- Materials used to construct concrete washout areas shall be removed from the site of the work and disposed of or recycled.
- Holes, depressions or other ground disturbance caused by the removal of the concrete washout areas shall be backfilled, repaired, and stabilized to prevent erosion.

BMP C160: Certified Erosion and Sediment Control Lead

Purpose

The project proponent designates at least one person as the responsible representative in charge of erosion and sediment control (ESC), and water quality protection. The designated person shall be responsible for ensuring compliance with all local, state, and federal erosion and sediment control and water quality requirements. Construction sites one acre or larger that discharge to waters of the State must designate a Certified Erosion and Sediment Control Lead (CESCL) as the responsible representative.

Conditions of Use

A CESCL shall be made available on projects one acre or larger that discharge stormwater to surface waters of the state. Sites less than one acre may have a person without CESCL certification conduct inspections.

The CESCL shall:

- Have a current certificate proving attendance in an erosion and sediment control training course that meets the minimum ESC training and certification requirements established by Ecology.

  Ecology has provided the minimum requirements for CESCL course training, as well as a list of ESC training and certification providers at:

  https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Certified-erosion-sediment-control

  OR

- Be a Certified Professional in Erosion and Sediment Control (CPESC). For additional information go to:

  http://www.envirocertintl.org/cpesc/

Specifications

- CESCL certification shall remain valid for three years.
- The CESCL shall have authority to act on behalf of the contractor or project proponent and shall be available, or on-call, 24 hours per day throughout the period of construction.
- The Construction SWPPP shall include the name, telephone number, fax number, and address of the designated CESCL. See II-2 Construction Stormwater Pollution Prevention Plans (Construction SWPPPs).
- A CESCL may provide inspection and compliance services for multiple construction projects in the same geographic region, but must be on site whenever earthwork activities are

occurring that could generate release of turbid water.

- Duties and responsibilities of the CESCL shall include, but are not limited to the following:
    - Maintaining a permit file on site at all times which includes the Construction SWPPP and any associated permits and plans.
    - Directing BMP installation, inspection, maintenance, modification, and removal.
    - Updating all project drawings and the Construction SWPPP with changes made.
    - Completing any sampling requirements including reporting results using electronic Discharge Monitoring Reports (WebDMR).
    - Facilitate, participate in, and take corrective actions resulting from inspections performed by outside agencies or the owner.
    - Keeping daily logs, and inspection reports. Inspection reports should include:
        - Inspection date/time.
        - Weather information; general conditions during inspection and approximate amount of precipitation since the last inspection.
        - Visual monitoring results, including a description of discharged stormwater. The presence of suspended sediment, turbid water, discoloration, and oil sheen shall be noted, as applicable.
        - Any water quality monitoring performed during inspection.
        - General comments and notes, including a brief description of any BMP repairs, maintenance or installations made as a result of the inspection.
        - A summary or list of all BMPs implemented, including observations of all erosion/sediment control structures or practices. The following shall be noted:
            1. Locations of BMPs inspected.
            2. Locations of BMPs that need maintenance.
            3. Locations of BMPs that failed to operate as designed or intended.
            4. Locations of where additional or different BMPs are required.

BMP C162: Scheduling

Purpose

Sequencing a construction project reduces the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking.

BMP C220: Inlet Protection

See detail on plans.

Purpose

Inlet protection prevents coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.

Conditions of Use

Use inlet protection at inlets that are operational before permanent stabilization of the disturbed areas that contribute runoff to the inlet. Provide protection for all storm drain inlets downslope and within 500 feet of a disturbed or construction area, unless those inlets are preceded by a sediment trapping BMP.

Also consider inlet protection for lawn and yard drains on new home construction. These small and numerous drains coupled with lack of gutters can add significant amounts of sediment into the roof drain system. If possible, delay installing lawn and yard drains until just before landscaping, or cap these drains to prevent sediment from entering the system until completion of landscaping. Provide 18-inches of sod around each finished lawn and yard drain.

Table II-3.10: Storm Drain Inlet Protection lists several options for inlet protection. All of the methods for inlet protection tend to plug and require a high frequency of maintenance. Limit contributing drainage areas for an individual inlet to one acre or less. If possible, provide emergency overflows with additional end-of-pipe treatment where stormwater ponding would cause a hazard.

Table II-3.10: Storm Drain Inlet Protection

Type of Inlet Protection	Emergency Overflow	Applicable for Paved/ Earthen Surfaces	Conditions of Use
Drop Inlet Protection			
Excavated drop inlet protection	Yes, temporary flooding may occur	Earthen	Applicable for heavy flows. Easy to maintain. Large area requirement: 30'x30'/acre
Block and gravel drop inlet protection	Yes	Paved or Earthen	Applicable for heavy concentrated flows. Will not pond.
Gravel and wire drop inlet protection	No	Paved or Earthen	Applicable for heavy concentrated flows. Will pond. Can withstand traffic.
Catch basin filters	Yes	Paved or Earthen	Frequent maintenance required.
Curb Inlet Protection			
Curb inlet protection with wooden weir	Small capacity overflow	Paved	Used for sturdy, more compact installation.
Block and gravel curb inlet protection	Yes	Paved	Sturdy, but limited filtration.
Culvert Inlet Protection			
Culvert inlet sediment trap	N/A	N/A	18 month expected life.

Design and Installation Specifications

Catch Basin Filters

Catch basin filters are designed by manufacturers for construction sites. The limited sediment storage capacity increases the amount of inspection and maintenance required, which may be daily for heavy sediment loads. To reduce maintenance requirements, combine a catch basin filter with another type of inlet protection. This type of inlet protection provides flow bypass without overflow and therefore may be a better method for inlets located along active rights-of-way. Design and installation specifications for catch basin filters include:

- Provides 5 cubic feet of storage.
- Requires dewatering provisions.
- Provides a high-flow bypass that will not clog under normal use at a construction site.
- Insert the catch basin filter in the catch basin just below the grating.

Maintenance Standards

- Inspect all forms of inlet protection frequently, especially after storm events. Clean and replace clogged catch basin filters. For rock and gravel filters, pull away the rocks from the inlet and clean or replace. An alternative approach would be to use the clogged rock as fill and put fresh rock around the inlet.
- Do not wash sediment into storm drains while cleaning. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize as appropriate.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C251: Construction Stormwater Filtration

See calculation results on plans.

Purpose

Filtration removes sediment from runoff originating from disturbed areas of the site.

Conditions of Use

Traditional Construction Stormwater BMPs used to control soil erosion and sediment loss from construction sites may not be adequate to ensure compliance with the water quality standard for turbidity in the receiving water. Filtration may be used in conjunction with gravity settling to remove sediment as small as fine silt (0.5 µm). The reduction in turbidity will be dependent on the particle size distribution of the sediment in the stormwater. In some circumstances, sedimentation and filtration may achieve compliance with the water quality standard for turbidity.

The use of construction stormwater filtration does not require approval from Ecology as long as treatment chemicals are not used. Filtration in conjunction with BMP C250: Construction Stormwater Chemical Treatment requires testing under the Chemical Technology Assessment Protocol – Ecology (CTAPE) before it can be initiated. Approval from Ecology must be obtained at each site where chemical use is proposed prior to use. See https://-fortress.wa.gov/ecy/publications/SummaryPages/ecy070258.html for a copy of the Request for Chemical Treatment form.

Design and Installation Specifications

Two types of filtration systems may be applied to construction stormwater treatment: rapid and slow.

Rapid filtration systems are the typical system used for water and wastewater treatment. They can achieve relatively high hydraulic flow rates, on the order of 2 to 20 gpm/sf, because they have automatic backwash systems to remove accumulated solids.

Slow filtration systems have very low hydraulic rates, on the order of 0.02 gpm/sf, because they do not have backwash systems. Slow filtration systems have generally been used as post construction BMPs to treat stormwater (see V-6 Filtration BMPs). Slow filtration is mechanically simple in comparison to rapid filtration, but requires a much larger filter area.

Filter Types and Efficiencies

Sand media filters are available with automatic backwashing features that can filter to 50 µm particle size. Screen or bag filters can filter down to 5 µm. Fiber wound filters can remove particles down to 0.5 µm. Filters should be sequenced from the largest to the smallest pore opening. Sediment removal efficiency will be related to particle size distribution in the stormwater.

Treatment Process and Description

Stormwater is collected at interception point(s) on the site and diverted to an untreated stormwater sediment pond or tank for removal of large sediment, and storage of the stormwater before it is treated by the filtration system. In a rapid filtration system, the untreated stormwater is pumped from the pond or tank through the filtration media. Slow filtration systems are designed using gravity to convey water from the pond or tank to and through the filtration media.

Sizing

Filtration treatment systems must be designed to control the velocity and peak volumetric flow rate that is discharged from the system and consequently the project site. See Element 3: Control Flow Rates for further details on this requirement.

The untreated stormwater storage pond or tank should be sized to hold 1.5 times the volume of runoff generated from the site during the 10-year, 24-hour storm event, minus the filtration treatment system flowrate for an 8-hour period. For a chitosan-enhanced sand filtration system, the filtration treatment system flowrate should be sized using a hydraulic loading rate between 6-8 gpm/ft^2. Other hydraulic loading rates may be more appropriate for other systems. Bypass should be provided around the filtration treatment system to accommodate extreme storm events. Runoff volume shall be calculated using the methods presented in III-2.3 Single Event Hydrograph Method. Worst-case land cover conditions (i.e., producing the most runoff) should be used for analyses (in most cases, this would be the land cover conditions just prior to final landscaping).

If the filtration treatment system design does not allow you to discharge at the rates as required by Element 3: Control Flow Rates, and if the site has a permanent Flow Control BMP that will serve the planned development, the discharge from the filtration treatment system may be directed to the permanent Flow Control BMP to comply with Element 3: Control Flow Rates. In this case, all discharge (including water passing through the treatment system and stormwater bypassing the treatment

system) will be directed into the permanent Flow Control BMP. If site constraints make locating the untreated stormwater storage pond difficult, the permanent Flow Control BMP may be divided to serve as the untreated stormwater storage pond and the post-treatment temporary flow control pond. A berm or barrier must be used in this case so the untreated water does not mix with the treated water. Both untreated stormwater storage requirements, and adequate post-treatment flow control must be achieved. The designer must document in the Construction SWPPP how the permanent Flow Control BMP is able to attenuate the discharge from the site to meet the requirements of Element 3: Control Flow Rates. If the design of the permanent Flow Control BMP was modified for temporary construction flow control purposes, the construction of the permanent Flow Control BMP must be finalized, as designed for its permanent function, at project completion.

Maintenance Standards

- Rapid sand filters typically have automatic backwash systems that are triggered by a pre-set pressure drop across the filter. If the backwash water volume is not large or substantially more turbid than the untreated stormwater stored in the holding pond or tank, backwash return to the untreated stormwater pond or tank may be appropriate. However, other means of treatment and disposal may be necessary.
- Screen, bag, and fiber filters must be cleaned and/or replaced when they become clogged.
- Sediment shall be removed from the storage and/or treatment ponds as necessary. Typically, sediment removal is required once or twice during a wet season and at the decommissioning of the ponds.
- Disposal of filtration equipment must comply with applicable local, state, and federal regulations.

BMP C252: Treating and Disposing of High pH Water

See note on plans.

Purpose

When pH levels in stormwater rise above 8.5, it is necessary to lower the pH levels to the acceptable range of 6.5 to 8.5 prior to discharge to surface or ground water. A pH level range of 6.5 to 8.5 is typical for most natural watercourses, and this neutral pH range is required for the survival of aquatic organisms. Should the pH rise or drop out of this range, fish and other aquatic organisms may become stressed and may die.

Conditions of Use

- The water quality standard for pH in Washington State is in the range of 6.5 to 8.5. Stormwater with pH levels exceeding water quality standards may be either neutralized on site or disposed of to a sanitary sewer or concrete batch plant with pH neutralization capabilities.
- Neutralized stormwater may be discharged to surface waters under the Construction Stormwater General permit.
- Neutralized process water such as concrete truck wash-out, hydro-demolition, or saw-cutting slurry must be managed to prevent discharge to surface waters. Any stormwater

contaminated during concrete work is considered process wastewater and must not be discharged to waters of the State or stormwater collection systems.

- The process used for neutralizing and/or disposing of high pH stormwater from the site must be documented in the Construction Stormwater Pollution Prevention Plan.

Causes of High pH

High pH at construction sites is most commonly caused by the contact of stormwater with poured or recycled concrete, cement, mortars, and other Portland cement or lime containing construction materials. (See BMP C151: Concrete Handling for more information on concrete handling procedures). The principal caustic agent in cement is calcium hydroxide (free lime).

Calcium hardness can contribute to high pH values and cause toxicity that is associated with high pH conditions. A high level of calcium hardness in waters of the state is not allowed. Ground water standard for calcium and other dissolved solids in Washington State is less than 500 mg/l.

Treating High pH Stormwater by Carbon Dioxide Sparging

Advantages of Carbon Dioxide Sparging

- Rapidly neutralizes high pH water.
- Cost effective and safer to handle than acid compounds.
- CO_2 is self-buffering. It is difficult to overdose and create harmfully low pH levels.
- Material is readily available.

The Chemical Process of Carbon Dioxide Sparging

When carbon dioxide (CO_2) is added to water (H_2O), carbonic acid (H_2CO_3) is formed which can further dissociate into a proton (H+) and a bicarbonate anion (HCO_3-) as shown below:

$$CO_2 + H_2O \leftrightarrow H_2CO_3 \leftrightarrow H+ + HCO_3-$$

The free proton is a weak acid that can lower the pH. Water temperature has an effect on the reaction as well. The colder the water temperature is, the slower the reaction occurs. The warmer the water temperature is, the quicker the reaction occurs. Most construction applications in Washington State have water temperatures in the 50°F or higher range so the reaction is almost simultaneous.

The Treatment Process of Carbon Dioxide Sparging

High pH water may be treated using continuous treatment, continuous discharge systems. These manufactured systems continuously monitor influent and effluent pH to ensure that pH values are within an acceptable range before being discharged. All systems must have fail safe automatic shut off switches in the event that pH is not within the acceptable discharge range. Only trained operators may operate manufactured systems. System manufacturers often provide trained operators or training on their devices.

The following procedure may be used when not using a continuous discharge system:

1. Prior to treatment, the appropriate jurisdiction should be notified in accordance with the regulations set by the jurisdiction.
2. Every effort should be made to isolate the potential high pH water in order to treat it separately from other stormwater on-site.
3. Water should be stored in an acceptable storage facility, detention pond, or containment cell prior to pH treatment.
4. Transfer water to be treated for pH to the pH treatment structure. Ensure that the pH treatment structure size is sufficient to hold the amount of water that is to be treated. Do not fill the pH treatment structure completely, allow at least 2 feet of freeboard.
5. The operator samples the water within the pH treatment structure for pH and notes the clarity of the water. As a rule of thumb, less CO_2 is necessary for clearer water. The results of the samples and water clarity observations should be recorded.
6. In the pH treatment structure, add CO_2 until the pH falls into the range of 6.9-7.1. Adjusting pH to within 0.2 pH units of receiving water (background pH) is recommended. It is unlikely that pH can be adjusted to within 0.2 pH units using dry ice. Compressed carbon dioxide gas should be introduced to the water using a carbon dioxide diffuser located near the bottom of the pH treatment structure, this will allow carbon dioxide to bubble up through the water and diffuse more evenly.
7. Slowly discharge the water, making sure water does not get stirred up in the process. Release about 80% of the water from the pH treatment structure leaving any sludge behind. If turbidity remains above the maximum allowable, consider adding filtration to the treatment train. See BMP C251: Construction Stormwater Filtration.
8. Discharge treated water through a pond or drainage system.
9. Excess sludge needs to be disposed of properly as concrete waste. If several batches of water are undergoing pH treatment, sludge can be left in the treatment structure for the next batch treatment. Dispose of sludge when it fills 50% of the treatment structure volume.
10. Disposal must comply with applicable local, state, and federal regulations.

Treating High pH Stormwater by Food Grade Vinegar

Food grade vinegar that meets FDA standards may be used to neutralize high pH water. Food grade vinegar is only 4% to 18% acetic acid with the remainder being water. Food grade vinegar may be used if dosed just enough to lower pH sufficiently. Use a treatment process as described above for CO_2 sparging, but add food grade vinegar instead of CO_2.

This treatment option for high pH stormwater does not apply to anything but food grade vinegar. Acetic acid does not equal vinegar. Any other product or waste containing acetic acid must go through the evaluation process in Appendix G of *Whole Effluent Toxicity Testing Guidance and Test Review Criteria* (Marshall, 2016).

Disposal of High pH Stormwater

Sanitary Sewer Disposal

Local sewer authority approval is required prior to disposal via the sanitary sewer.

Concrete Batch Plant Disposal

- Only permitted facilities may accept high pH water.
- Contact the facility to ensure they can accept the high pH water.

Maintenance Standards

Safety and materials handling:

- All equipment should be handled in accordance with OSHA rules and regulations.
- Follow manufacturer guidelines for materials handling.

Each operator should provide:

- A diagram of the monitoring and treatment equipment.
- A description of the pumping rates and capacity the treatment equipment is capable of treating.

Each operator should keep a written record of the following:

- Client name and phone number.
- Date of treatment.
- Weather conditions.
- Project name and location.
- Volume of water treated.
- pH of untreated water.
- Amount of CO_2 or food grade vinegar needed to adjust water to a pH range of 6.9-7.1.
- pH of treated water.
- Discharge point location and description.

A copy of this record should be given to the client/contractor who should retain the record for three years.

Water Reclamation Facility – Phase 2 Upgrades
Stormwater Site Plan

Prepared for

City of Yelm
EST. 1924
WASHINGTON
"Proudly Serving Our Community"

June 2021

Prepared by
Parametrix

Water Reclamation Facility – Phase 2 Upgrades Stormwater Site Plan

Prepared for

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Yelm, WA 98597

Prepared by

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June 2021 | 216-1781-042

CITATION

Parametrix. 2021. Water Reclamation Facility – Phase 2 Upgrades Stormwater Site Plan. Prepared by Parametrix, Puyallup, Washington. June 2021.

CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

Prepared by Jeffrey L. Coop, PE

Checked by Randy Raymond, PE

Approved by Brian Bunker, PE

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APPENDICES

A Stormwater Plans
B Area Calculations
C Construction SWPPP

ACRONYMS AND ABBREVIATIONS

Ecology Manual	Stormwater Management Manual for Western Washington
Ecology	Washington State Department of Ecology
mgd	million gallons per day
Project	WRF Phase 2 Upgrades
sf	square feet
SWPPP	Stormwater Pollution Prevention Plan
TDA	Threshold Discharge Area
WRF	Water Reclamation Facility

1. OVERVIEW

The City of Yelm's existing Water Reclamation Facility (WRF) was designed in 1995 to treat maximum monthly flows of up to 1.06 million gallons per day (mgd) to Class A reclaimed water standards using several treatment steps. If the quality of the treated water meets permit limits for reclaimed water and there is a demand for reuse later, the reclaimed water is pumped to the beneficial use sites. The WRF Phase 2 Upgrades Project (the Project) includes design of treatment processes to improve treatment levels to better meet the Class A reclaimed water standard. This portion of the Project is referred to as Schedule A, Liquid Stream Improvements.

In addition to treatment improvements, the Project proposes solids handling improvements which includes the construction of a new receiving station and installation of equipment to produce a Class A biosolid. This portion of the Project is referred to as Schedule B, Solids Improvements.

This Construction Stormwater Pollution Prevention Plan (SWPPP) has been prepared to reflect the two different schedules due to variations in the design schedule. The final SWPPP will reflect both Schedule A and Schedule B.

Schedule A site modifications are located in Threshold Discharge Areas (TDA) 2, 3 and 4. Schedule A site modifications applicable to this SWPPP are summarized as follows:

- A slab for a new generator;
- A new electrical and mechanical building;
- A new membrane bioreactor tank;
- A new pump station building; and
- New pavement for site circulation where proposed improvements are constructed within the footprint of the existing pavement.

Schedule B site modifications are located in TDA 1. Those modifications applicable to this SWPPP are summarized as follows:

- Construction of a new slab for loading biosolids. The slab will have a roof to prevent rainfall from falling on the biosolids during the loading process.

1.1 Step 1 – Analyze Existing Site Conditions to Determine LID Feasibility

1.1.1 Schedule A, Liquid Stream Improvements

The site is not considered a redevelopment project based on the limited amount of stormwater-runoff generating impervious area. Consequently, the Project is considered a new Project. Based on the area calculations, all nine Minimum Requirements are triggered at the Project level. Minimum Requirement #5, On-Site Stormwater Management, is triggered because the Project is not exempt from flow control at the Project level even though stormwater on the site infiltrates due to the permeability of the soils.

Schedule A includes surfaces in TDA 2, 3, and 4. Surfaces include lawn/landscaping, roofs, and pavement. BMPs for Minimum Requirement #5 were selected from List 2 of Table I-3.2, The List Approach for MR5 Compliance, in Volume I, Chapter 3 of the Washington State Department of Ecology's (Ecology's) *Stormwater Management Manual for Western Washington* (Ecology Manual). Applicable BMPs are identified in Table 1-1 below.

Other BMPs from List 2 of Table I-3.2 of Volume I, Chapter 3 of the Ecology Manual were not selected based on the following:

- Roofs:
  - BMP T5.30: Full Dispersion – this could impact potential future expansion due to land encumbrance of the dispersion area.
  - BMP T5.10A: Downspout Full Infiltration – TDAs 2, 3, and 4 are exempt from flow control. Full infiltration is not required.
  - BMP T7.30: Bioretention – TDA 2 does not create additional pollution-generating impervious surface. TDAs 3 and 4 are below the thresholds triggering water quality treatment. Bioretention is not applicable.
  - BMP T5.10C: Perforated Stub-out Connections – There is limited existing conveyance systems to connect to. Although there are some proposed conveyance systems, they are not necessarily located near where downspouts would be located. This BMP is not applicable.
- Other Hard Surfaces:
  - BMP T5.30: Full Dispersion – This could impact potential future expansion due to land encumbrance of the dispersion area.
  - BMP T5.15: Permeable Pavements – This BMP was not selected due to spill potential.
  - BMP T7.30: Bioretention – TDA 1 does not create additional pollution-generating impervious surface. TDAs 3 and 4 do not trigger water quality treatment. Bioretention is not applicable.
  - BMP T5.11: Concentrated Flow Dispersion – The site design for other hard surfaces does not result in concentrated flow discharges. This BMP is not applicable.

1.1.2 Schedule B, Solids Improvements

Schedule B includes surfaces in TDA 1. Surfaces include roofs for the solids improvement area. Applicable BMPs are identified in Table 1-1 below. Other BMPs from List 2 of Table I-3.2 of Volume I, Chapter 3 of the Ecology Manual were not selected based on the following:

- Roofs:
  - BMP T5.30: Full Dispersion – This could impact potential future expansion due to land encumbrance of the dispersion area.
  - BMP T5.10A: Downspout Full Infiltration – TDA 1 is exempt from flow control. Full infiltration is not required.

- BMP T7.30: Bioretention – TDA 1 does not create additional pollution-generating impervious surface. Water quality treatment is not triggered. Bioretention is not applicable.
- BMP T5.10C: Perforated Stub-out Connections – There are no existing conveyance systems to connect to; this BMP is not applicable.

1.2 Step 2 – Prepare the Preliminary Development Layout

1.2.1 Schedule A, Liquid Stream Improvements

See the plans in Appendix A for the site layout.

1.2.2 Schedule B, Solids Improvements

See the plans in Appendix A for the site layout.

1.3 Step 3 – Perform an Off-Site Analysis

1.3.1 Schedule A, Liquid Stream Improvements

An off-site analysis is not applicable. Site soils are permeable. Stormwater will be dispersed and infiltrate or route directly to an existing infiltration swale.

1.3.2 Schedule B, Solids Improvements

An off-site analysis is not applicable. Site soils are permeable. Stormwater will be dispersed and infiltrate or route directly to an existing infiltration swale.

1.4 Step 4 – Determine and Read the Applicable Minimum Requirements

Minimum Requirements for both Schedule A, Liquid Stream Improvements, and Schedule B, Solids Improvements, are summarized in Table 1-1 below. Table 1-1 was prepared based on the results of the area calculations, which are summarized in Table 1-2, Table 1-3, and Table 1-4.

Table 1-1. Summary of Minimum Requirements

	Minimum Requirement	Site, Liquid Stream Improvements + Solids Improvements	Threshold Discharge Area (TDA) 1	Threshold Discharge Area (TDA) 2	Threshold Discharge Area (TDA) 3	Threshold Discharge Area (TDA) 4
1	Preparation of Stormwater Site Plans	Applicable; Project results in 5,000 square feet (sf) or more of new plus replaced hard surface area	Applicable at Site level			
2	Construction Stormwater Pollution Prevention Plan (SWPPP)	Applicable; Project results in 5,000 sf or more of new plus replaced hard surface area	Applicable at Site level			
3	Source Control of Pollution	Applicable; Project results in 5,000 sf or more of new plus replaced hard surface area	Applicable at Site level			
4	Preservation of Natural Drainage Systems and Outfalls	Applicable; Project results in 5,000 sf or more of new plus replaced hard surface area	Applicable at Site level			
5	On-Site Stormwater Management	Applicable; Project results in 5,000 sf or more of new plus replaced hard surface area	• Roof: BMP T5.10B: Downspout Dispersion Systems	• Hard Surfaces: BMP T5.12: Sheet Flow Dispersion	• Roof: BMP T5.10B: Downspout Dispersion Systems • Hard Surfaces: BMP T5.12: Sheet Flow Dispersion • Lawn/Landscaping: BMP T5.13: Post-Construction Soil Quality and Depth	• Roof: BMP T5.10B: Downspout Dispersion Systems • Hard Surfaces: BMP T5.12: Sheet Flow Dispersion • Lawn/Landscaping: BMP T5.13: Post-Construction Soil Quality and Depth

(table continues)

	Minimum Requirement	Site, Liquid Stream Improvements + Solids Improvements	Threshold Discharge Area (TDA) 1	Threshold Discharge Area (TDA) 2	Threshold Discharge Area (TDA) 3	Threshold Discharge Area (TDA) 4
6	Runoff Treatment	Applicable at Project level; review applicability at TDA level	Not applicable; <5,000 sf of pollution-generating hard surface	Not applicable; <5,000 sf of pollution-generating hard surface	Not applicable; <5,000 sf of pollution-generating hard surface	Not applicable; <5,000 sf of pollution-generating hard surface
7	Flow Control	Applicable at Project level; review applicability at TDA level	Not applicable; <10,000 sf effective impervious area	Not applicable; <10,000 sf effective impervious area	Not applicable; <10,000 sf effective impervious area	Not applicable; <10,000 sf effective impervious area
8	Wetlands Protection	Applicable; Project results in 5,000 sf or more of new plus replaced hard surface area	Applicable at Site level			
9	Operation and Maintenance	Applicable; Project results in 5,000 sf or more of new plus replaced hard surface area	Applicable at Site level			

Table 1-2. Summary of Existing Land Cover Area Calculations

Threshold Discharge Area (TDA)		Grass	Roof, NPGIS[a]	PGIS[b]	Impervious Subtotal	Total Area
1	square feet	2,998	0	0	0	2,998
	acre	0.069	0.000	0.000	0.000	0.069
2	square feet	1,393	0	0	0	1,393
	acre	0.032	0.000	0.000	0.000	0.032
3	square feet	11,367	693	6,404	7,097	18,464
	acre	0.261	0.016	0.147	0.163	0.424
4	square feet	13,715	4,966	14,866	19,832	33,546
	acre	0.315	0.114	0.341	0.455	0.770
PROJECT	square feet	29,473	5,659	21,270	26,929	56,402
	acres	0.677	0.130	0.488	0.618	1.295

a NPGIS = nonpollution-generating impervious surface

b PGIS = pollution-generating impervious surface

Table 1-3. Summary of Post-Project Land Cover Area Calculations

Threshold Discharge Area (TDA)		New and Remaining Landscaping	New and Remaining Roof and other NPGIS[a]	New and Remaining PGIS[b]	Total
1	square feet	0	2,998	0	2,998
	acre	0.000	0.069	0.000	0.069
2	square feet	0	1,393	0	1,393
	acre	0.000	0.032	0.000	0.032
3	square feet	757	4,501	8,807	14,064
	acre	0.017	0.103	0.202	0.323
4	square feet	9,687	5,466	18,398	33,551
	acre	0.222	0.125	0.422	0.770
PROJECT	square feet	10,444	14,358	27,204	52,006
	acre	0.240	0.330	0.625	1.194

a NPGIS = nonpollution-generating impervious surface

b PGIS = pollution-generating impervious surface

Table 1-4. Summary of Area Changes

Threshold Discharge Area (TDA)		Net Change in Impervious	Net Change in PGIS[a]	Added NPGIS[b]	Added PGIS	Total Added NPGIS + PGIS
1	square feet	2,998	0	2,998	0	2,998
	Acre					
2	square feet	1,393	0	1,393	0	1,393
	Acre					
3	square feet	6,210	2,403	2,552	4,866	7,417
	acre					
4	square feet	4,032	3,532	0	3,975	3,975
	acre					
PROJECT	square feet	41,562	5,934	6,943	8,841	15,784
	acre					

a PGIS = pollution-generating impervious surface

b NPGIS = nonpollution-generating impervious surface

1.5 Step 5 – Prepare a Permanent Stormwater Control Plan

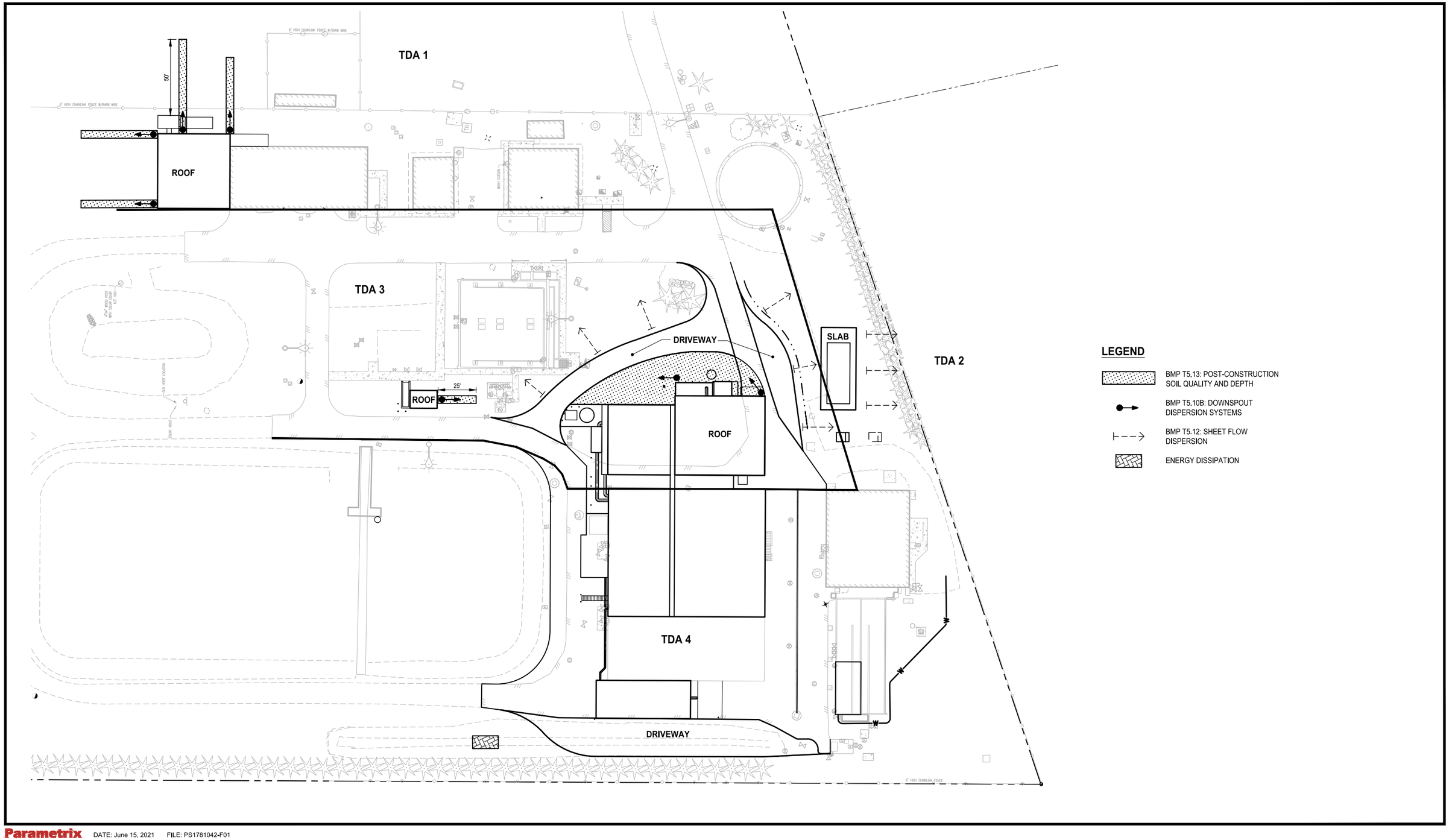
1.5.1 Schedule A, Liquid Stream Improvements

See Figure 1-1 for the Permanent Stormwater Control Plan for the BMPs identified in Table 1-1 for Schedule A.

Schedule A includes a pipe discharge to the existing swale for energy dissipation. The outlet will be stabilized with a rock pad. See Appendix B for the rock pad sizing calculations.

1.5.2 Schedule B, Solids Improvements

See Figure 1 for the Permanent Stormwater Control Plan for the BMPs identified in Table 1-1 for Schedule B.



Parametrix DATE: June 15, 2021 FILE: PS1781042-F01

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0 60

SCALE IN FEET

Figure 1
Permanent Stormwater Control Plan
Yelm Water Reclamation Facility Phase 2 Upgrades
Yelm, Washington

1.6 Step 6 – Prepare a Construction Stormwater Pollution Prevention Plan

1.6.1 Schedule A, Liquid Stream Improvements

The Construction SWPPP is included in Appendix C. TESC BMPs identified for Schedule A include the following:

- BMP C103, High-Visibility Fence
- BMP C105, Stabilized Construction Access
- BMP C151, Concrete Handling
- BMP C152, Sawcutting and Surface Pollution Prevention
- BMP C153, Material Delivery, Storage and Containment
- BMP C154, Concrete Washout Area
- BMP C160, Certified Erosion and Sediment Control Lead
- BMP C162, Scheduling
- BMP C220, Inlet Protection
- BMP C251, Construction Stormwater Filtration
- BMP C252, Treating and Disposing of High pH Water

1.6.2 Schedule B, Solids Improvements

The Construction SWPPP is included in Appendix C. TESC BMPs identified for Schedule B include the following:

- BMP C103, High-Visibility Fence
- BMP C105, Stabilized Construction Access
- BMP C151, Concrete Handling
- BMP C153, Material Delivery, Storage and Containment
- BMP C154, Concrete Washout Area
- BMP C160, Certified Erosion and Sediment Control Lead
- BMP C162, Scheduling
- BMP C251, Construction Stormwater Filtration
- BMP C252, Treating and Disposing of High pH Water

1.7 Step 7 – Complete the Stormwater Site Plan

1.7.1 Schedule A, Liquid Stream Improvements

Stormwater conveyance and stormwater management BMPs applicable to Schedule A are shown in the plans in Appendix A.

1.7.2 Schedule B, Solids Improvements

Stormwater conveyance and stormwater management BMPs applicable to Schedule B are shown in the plans in Appendix A.

1.8 Step 8 – Check Compliance with All Applicable Minimum Requirements

Applicable Minimum Requirements are summarized in above in Table 1-1 in Step 5.

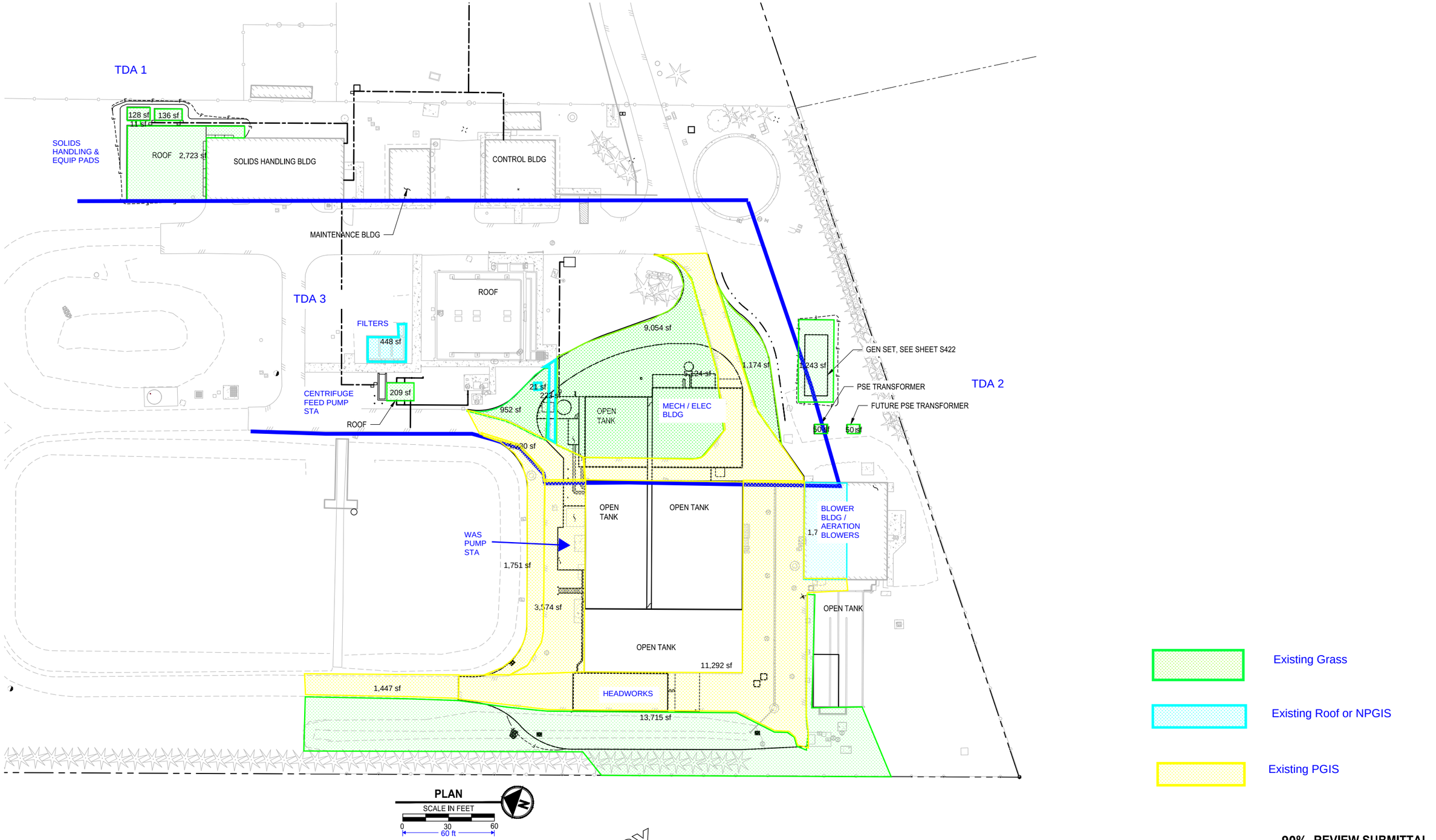
There are no additional requirements.

Appendix A

Stormwater Plans

Appendix B

Area Calculations



PLAN

SCALE IN FEET

0 30 60

60 ft

90% REVIEW SUBMITTAL

NOT FOR CONSTRUCTION

	REVISIONS	DATE	BY

DESIGNED R. RAYMOND
DRAWN K. TAYLOR
CHECKED D. KOPCHYNSKI
APPROVED

ONE INCH AT FULL SCALE. IF NOT, SCALE ACCORDINGLY

FILE NAME PS1781042-C003
JOB No. 216-1781-042
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PROJECT NAME
CITY OF YELM
YELM WATER RECLAMATION FACILITY PHASE 2 UPGRADES
YELM, WASHINGTON

OVERALL SITE PLAN

DRAWING NO. 75 OF 252

C003

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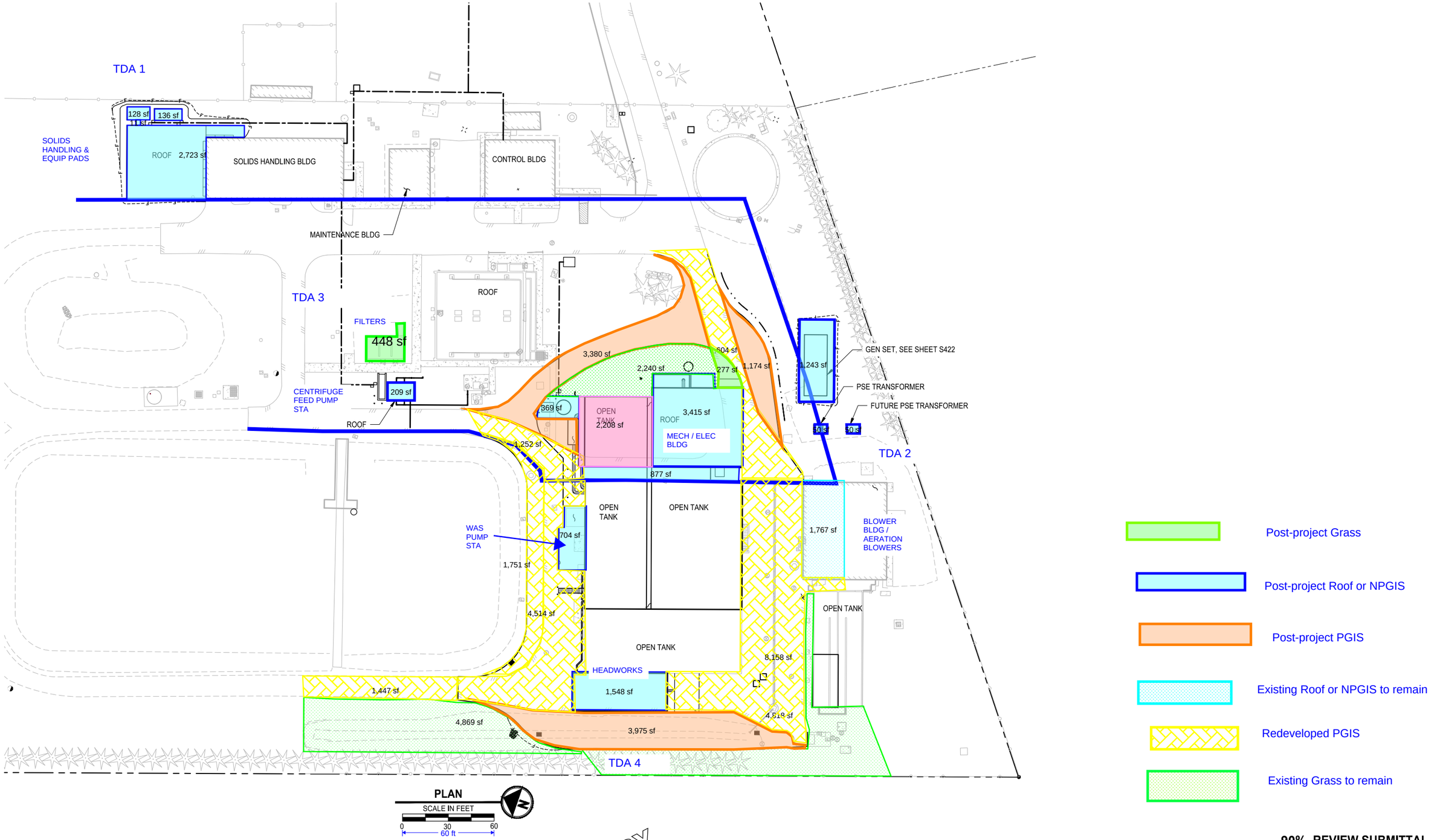
LAYOUT: C003



PLAN
SCALE IN FEET
0 30 60
60 ft

90% REVIEW SUBMITTAL
NOT FOR CONSTRUCTION

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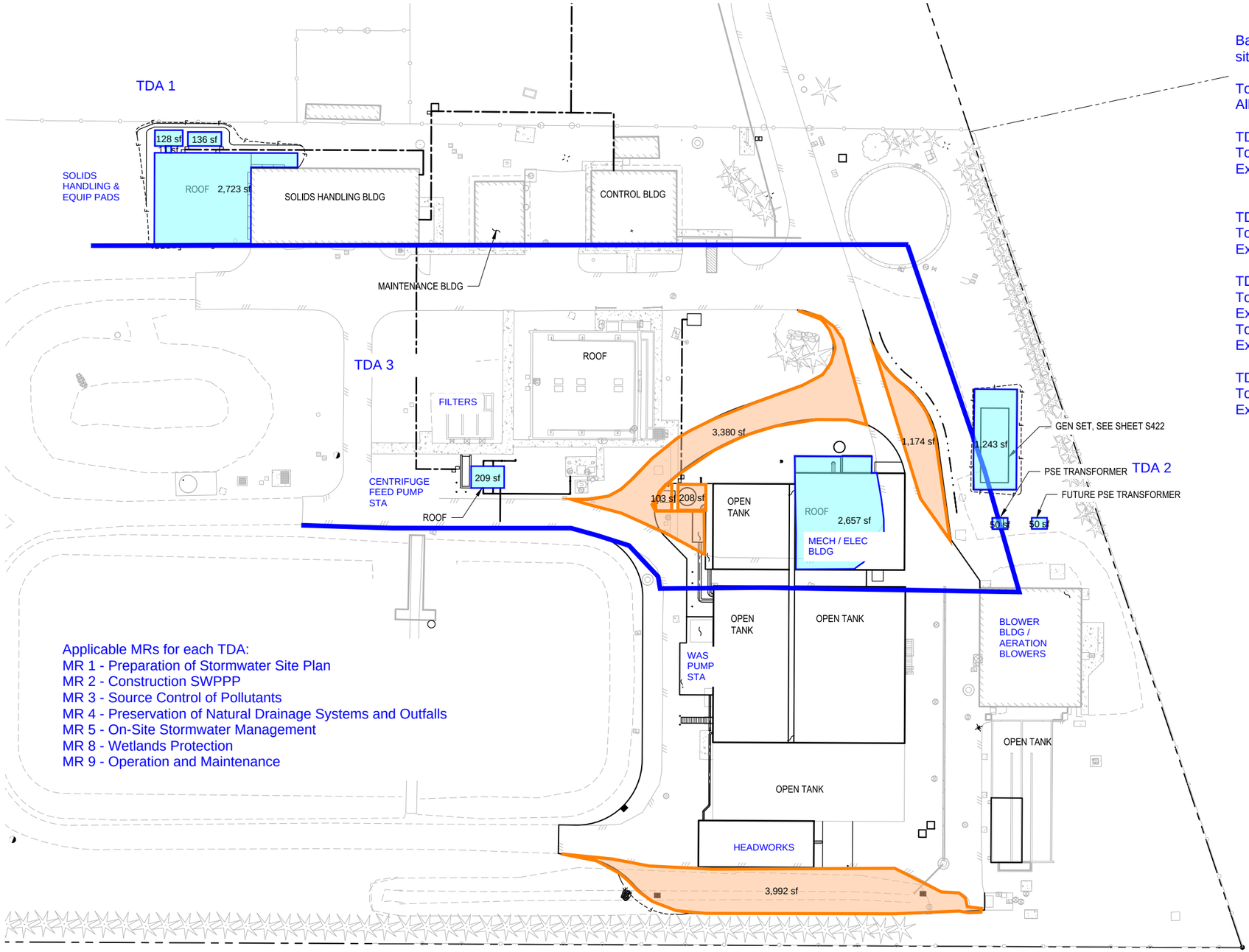
DRAWING NO.
75 OF 252
C003



Based on aerial photography and presence of multiple open basins, site has less than 35% impervious cover. This is not a redevelopment project.

Total new (added) impervious = 15,784 sq ft
All Minimum Requirements (MR) triggered at project level

TDA 1:
Total new (added) impervious = 2,998 sq ft
Exempt from MR 7 (flow control); < 10,000 sq ft)

TDA 2:
Total new (added) impervious = 1,393 sq ft
Exempt from MR 7 (flow control); < 10,000 sq ft)

TDA 3:
Total new (added) PGHS = 4,866 sq ft
Exempt from MR 6 (runoff treatment) < 5,000 sq ft
Total new (added) impervious = 7,417 sq ft
Exempt from MR 7 (flow control); < 10,000 sq ft)

TDA 4:
Total new (added) impervious = 3,975 sq ft
Exempt from MR 7 (flow control); < 10,000 sq ft)

PLAN
SCALE IN FEET
0 30 60
60 ft

NEW Post-project Roof or NPGIS

NEW Post-project PGIS

90% REVIEW SUBMITTAL
NOT FOR CONSTRUCTION

REVISIONS	DATE	BY

DESIGNED R. RAYMOND
DRAWN K. TAYLOR
CHECKED D. KOPCHYNSKI
APPROVED

ONE INCH AT FULL SCALE. IF NOT, SCALE ACCORDINGLY

FILE NAME PS1781042-C003
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OVERALL SITE PLAN

DRAWING NO. 75 OF 252

C003

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CITY OF YELM
WRF Phase 2 Upgrades

Summary of Area Calculations
Updated 6/11/21

		Existing Cover					Post-Project Cover								
TDA		Grass	Roof, NPGIS	PGIS	Impervious Subtotal	Total area	New and Remaining Landscaping	New and Remaining Roof and other NPGIS	New and Remaining PGIS	Total	Net Change in Impervious	Net Change in PGIS	Added NPGIS	Added PGIS	Total Added NPGIS + PGIS
1	sq ft	2,998	0	0	0	2,998	0	2,998	0	2,998	2,998	0	2,998	0	2,998
	ac	0.069	0.000	0.000	0.000	0.069	0.000	0.069	0.000	0.069					
2	sq ft	1,393	0	0	0	1,393	0	1,393	0	1,393	1,393	0	1,393	0	1,393
	ac	0.032	0.000	0.000	0.000	0.032	0.000	0.032	0.000	0.032					
3	sq ft	11,367	693	6,404	7,097	18,464	757	4,501	8,807	14,064	6,210	2,403	2,552	4,866	7,417
	ac	0.261	0.016	0.147	0.163	0.424	0.017	0.103	0.202	0.323					
4	sq ft	13,715	4,966	14,866	19,832	33,546	9,687	5,466	18,398	33,551	4,032	3,532	0	3,975	3,975
	ac	0.315	0.114	0.341	0.455	0.770	0.222	0.125	0.422	0.770					
PROJECT	sq ft	29,473	5,659	21,270	26,929	56,402	10,444	14,358	27,204	52,006	41,562	5,934	6,943	8,841	15,784
	ac	0.677	0.130	0.488	0.618	1.295	0.240	0.330	0.625	1.194					

CITY OF YELM						
WRF Phase 2 Upgrades						
Area Calculations						
Updated 6/11/21						
		Existing Cover				
TDA	Area Description	Grass	Roof, NPGIS	PGIS	Impervious Subtotal	Total area
1	Solids Handling Roof	2,998	0	0	0	2,998
	Sub-total, sq ft	2,998	0	0	0	2,998
	Sub-total, ac	0.069	0.000	0.000	0.000	0.069
2	Generator Pad, PSE Transformer Pads	1,393	0	0	0	1,393
	Sub-total, sq ft	1,393	0	0	0	1,393
	Sub-total, ac	0.032	0.000	0.000	0.000	0.032
3	Effluent Filters		448		448	448
	Open tank				0	0
	Centrifuge feed pump sta	209			0	209
	Mech/Elec Building Roof				0	0
	Existing pavement east of SBR Tanks			6,404	6,404	6,404
	Sidewalk at Sludge Storage Tanks		223		223	223
	Reject Water PS Vault		22		22	22
	Paving around Drain PS				0	0
	Pavement				0	0
	Grass	11,158			0	11,158
	Sub-total, sq ft	11,367	693	6,404	7,097	18,464
	Sub-total, ac	0.261	0.016	0.147	0.163	0.424
4	Pavement			14,866	14,866	14,866
	Pond embankment		3,198		3,198	3,198
	Headworks Roof				0	0
	WAS/Feed Forward PS				0	0
	Blower Bldg / Aeration Blowers Roof		1,767		1,767	1,767
	Grass	13,715			0	13,715
	Sub-total, sq ft	13,715	4,966	14,866	19,832	33,546
	Sub-total, ac	0.315	0.114	0.341	0.455	0.770
	TOTAL, SQ FT	29,473	5,659	21,270	26,929	56,402
	TOTAL, AC	0.677	0.130	0.488	0.618	1.295
	TDA 2 + 3	12,760	693	6,404	7,097	19,857
		0.293	0.016	0.147	0.163	0.456

CITY OF YELM
WRF Phase 2 Upgrades

Area Calculations
Updated 6/11/21

		Post-project Cover									
TDA	Area Description	Grass	Existing Grass to remain	Subtotal	Roof, NPGIS	Existing Roof, NPGIS to remain	Subtotal	PGIS	Existing PGIS to remain	Subtotal	Total
1	Solids Handling Roof			0	2,998		2,998			0	2,998
	Sub-total, sq ft			0			2,998	0		0	2,998
	Sub-total, ac			0.000			0.069	0.000		0.000	0.069
2	Generator Pad, PSE Transformer Pads			0	1,393		1,393	0	0	0	1,393
	Sub-total, sq ft			0			1,393	0		0	1,393
	Sub-total, ac			0.000			0.032	0.000		0.000	0.032
3	Effluent Filters	448		448	877		877			0	1,325
	Open tank		-2,208	-2,208			0			0	-2,208
	Centrifuge feed pump sta			0	209		209			0	209
	Mech/Elec Building Roof			0	3,415		3,415			0	3,415
	Existing pavement east of SBR Tanks			0			0		2,604	2,604	2,604
	Sidewalk at Sludge Storage Tanks			0			0			0	0
	Reject Water PS Vault			0			0			0	0
	Paving around Drain PS			0			0	369		369	369
	Pavement			0			0	3,380	1,280	4,660	4,660
	Grass	277	2,240	2,517			0	1,174		1,174	3,691
	Sub-total, sq ft			757			4,501	4,923		8,807	14,064
	Sub-total, ac			0.017			0.103	0.113		0.202	0.323
4	Pavement			0			0	3,975	12,671	16,647	16,647
	Pond embankment			0		1,447	1,447	1,751		1,751	3,198
	Headworks Roof			0	1,548		1,548			0	1,548
	WAS/Feed Forward PS			0	704		704			0	704
	Blower Bldg / Aeration Blowers Roof			0		1,767	1,767			0	1,767
	Grass		9,687	9,687			0			0	9,687
	Sub-total, sq ft			9,687			5,466	5,726		18,398	33,551
	Sub-total, ac			0.222			0.125	0.131		0.422	0.770
	TOTAL, SQ FT			10,444			14,358	10,649		27,204	52,006
	TOTAL, AC			0.240			0.330	0.244		0.625	1.194
	TDA 2 + 3			757			5,894			8,807	15,457
				0.017			0.135			0.202	0.355

CITY OF YELM						
WRF Phase 2 Upgrades						
Area Calculations						
Updated 6/11/21						
TDA	Area Description	Net Change in Impervious	Net Change in PGIS	Added NPGIS	Added PGIS	Total Added NPGIS + PGIS
1	Solids Handling Roof			2,998		
	Sub-total, sq ft	2,998	0	2,998	0	2,998
	Sub-total, ac					
2	Generator Pad, PSE Transformer Pads			1,393		
	Sub-total, sq ft	1,393	0	1,393	0	1,393
	Sub-total, ac					
3	Effluent Filters					
	Open tank					
	Centrifuge feed pump sta			209		
	Mech/Elec Building Roof			2342.7		
	Existing pavement east of SBR Tanks					
	Sidewalk at Sludge Storage Tanks					
	Reject Water PS Vault					
	Paving around Drain PS				311.9	
	Pavement				3,380	
	Grass				1,174	
	Sub-total, sq ft	6,210	2,403	2,552	4,866	7,417
	Sub-total, ac					
4	Pavement				3,975	
	Pond embankment					
	Headworks Roof					
	WAS/Feed Forward PS					
	Blower Bldg / Aeration Blowers Roof					
	Grass					
	Sub-total, sq ft	4,032	3,532	0	3,975	3,975
	Sub-total, ac					
	TOTAL, SQ FT	41,562	5,934	6,943	8,841	15,784
	TOTAL, AC					

Appendix C

Construction SWPPP

Water Reclamation Facility – Phase 2 Upgrades Construction Stormwater Pollution Prevention Plan (SWPPP)

Prepared for

City of Yelm
EST. 1924
WASHINGTON
"Proudly Serving Our Community"

June 2021

Prepared by
Parametrix

Water Reclamation Facility – Phase 2 Upgrades Construction Stormwater Pollution Prevention Plan (SWPPP)

Prepared for

City of Yelm
106 Second St. SE
Yelm, WA 98597

Prepared by

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June 2021 | 216-1781-042

CITATION

Parametrix. 2021. Water Reclamation Facility – Phase 2 Upgrades Construction Stormwater Pollution Prevention Plan (SWPPP). Prepared by Parametrix, Puyallup, Washington. June 2021.

CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

Prepared by Jeffrey L. Coop, PE

Checked by Randy Raymond, PE

Approved by Brian Bunker, PE

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APPENDICES

A Temporary Erosion and Sediment Control (TESC) Plans
B Hydrologic Calculations
C Excerpts from Ecology Manual

ACRONYMS AND ABBREVIATIONS

BMPs	best management practices
CSWGP	Construction Stormwater General Permit
Ecology Manual	Stormwater Management Manual for Western Washington
Ecology	Washington State Department of Ecology
LID	low impact development
mgd	million gallons per day
Project	WRF Phase 2 Upgrades
SSP	Stormwater Site Plan
SWPPP	Stormwater Pollution Prevention Plan
TDAs	Threshold Discharge Areas
TESC	Temporary Erosion and Sediment Control
WRF	Water Reclamation Facility

1. OVERVIEW

The City of Yelm's existing Water Reclamation Facility (WRF) was designed in 1995 to treat maximum monthly flows of up to 1.06 million gallons per day (mgd) to Class A reclaimed water standards using several treatment steps. If the quality of the treated water meets permit limits for reclaimed water and there is a demand for reuse later, the reclaimed water is pumped to the beneficial use sites. The WRF Phase 2 Upgrades Project (the Project) includes design of treatment processes to improve treatment levels to better meet the Class A reclaimed water standard. This portion of the Project is referred to as Schedule A, Liquid Stream Improvements.

In addition to treatment improvements, the Project proposes solids handling improvements which includes the construction of a new receiving station and installation of equipment to produce a Class A biosolid. This portion of the Project is referred to as Schedule B, Solids Improvements.

This Construction Stormwater Pollution Prevention Plan (SWPPP) has been prepared to reflect the two different schedules due to variations in the design schedule. The final SWPPP will reflect both Schedule A and Schedule B.

The site is relatively flat, has no critical areas, and highly infiltrative soils. There are no permanent stormwater management best management practices (BMPs) for flow control or water quality treatment. However, there are permanent BMPs that are triggered for Minimum Requirement 5, On-Site Stormwater Management.

Schedule A site modifications applicable to this SWPPP are summarized as follows:

- Clearing and grading;
- Building demolition;
- Pavement removal;
- A slab for a new generator;
- A new electrical and mechanical building;
- A new membrane bioreactor tank;
- A new pump station building; and
- New pavement for site circulation where proposed improvements are construction within the footprint of existing pavement.

Schedule B site modifications applicable to this SWPPP are summarized as follows:

- Clearing and grading; and
- Construction of a new slab for loading biosolids. The slab will have a roof to prevent rainfall from falling on the biosolids during the loading process.

The contractor will be required to submit the Notice of Intent for coverage under the Construction Stormwater General Permit (CSWGP) and for compliance with all CSWGP testing, monitoring and reporting requirements. The Temporary Erosion and Sediment Control (TESC) BMPs identified in this Construction SWPPP are anticipated to be the minimum required. The contractor shall identify all applicable TESC BMPs based on the contractor's Schedule And construction sequencing in a contractor-prepared SWPPP.

1.1 Element 1: Preserve Vegetation/Mark Clearing Limits

1.1.1 Schedule A, Liquid Stream Improvements

Vegetation preservation BMPs are not applicable to Schedule A. The location of clearing limits using BMP C103, High Visibility Fence, are shown in the plans in Appendix A.

1.1.2 Schedule B, Solids Improvements

Vegetation preservation BMPs are not applicable to Schedule B. The location of clearing limits using BMP C103, High Visibility Fence, are shown in the plans in Appendix A.

1.2 Element 2: Establish Construction Access

1.2.1 Schedule A, Liquid Stream Improvements

The location of stabilized construction entrances and exit using BMP C105, Stabilized Construction Access, are shown in the plans in Appendix A.

1.2.2 Schedule B, Solids Improvements

The location of stabilized construction entrances and exit using BMP C105, Stabilized Construction Access, are shown in the plans in Appendix A.

1.3 Element 3: Control Flow Rates

1.3.1 Schedule A, Liquid Stream Improvements

Based on the Stormwater Site Plan, flow control is not applicable to any of the Project's Threshold Discharge Areas (TDAs). Also, there are no adjacent critical areas, stormwater management BMPs, or development which would require controlling flow rates during construction in Schedule A. Temporary flow rate control BMPs are not applicable.

1.3.2 Schedule B, Solids Improvements

Based on the Stormwater Site Plan, flow control is not applicable to any of the Project's TDAs. Also, there are no adjacent critical areas, stormwater management BMPs, or development which would require controlling flow rates during construction in Schedule A. Temporary flow rate control BMPs are not applicable.

1.4 Element 4: Install Sediment Controls

1.4.1 Schedule A, Liquid Stream Improvements

The plans in Appendix A are based on using BMP C251, Construction Stormwater Filtration, to temporarily control sediments during construction in Schedule A. BMP C240, Sediment Trap, or BMP C241, Sediment Pond (Temporary) may be an alternative; however, those may encumber more site area

during construction and may require more piping and pumping to discharge to existing conveyance systems. Infiltration at temporary sediment traps or temporary sediment ponds may be feasible if adequate treatment is provided to protect groundwater. Preliminary flow rate calculations are included in Appendix B.

The contractor-prepared SWPPP will need to identify the contractor-selected sediment controls and document final sizing calculations and discharge points.

The contractor-prepared SWPPP shall also include BMP C250, Construction Stormwater Chemical Treatment, if proposed. The contractor will be required to obtain Washington State Department of Ecology (Ecology) approval if BMP C250 is proposed.

1.4.2 Schedule B, Solids Improvements

The plans in Appendix A are based on using BMP C251, Construction Stormwater Filtration, to temporarily control sediments during construction in Schedule A. BMP C240, Sediment Trap, or BMP C241, Sediment Pond (Temporary) may be an alternative; however, those may encumber more site area during construction and may require more piping and pumping to discharge to existing conveyance systems. Infiltration at temporary sediment traps or temporary sediment ponds may be feasible if adequate treatment is provided to protect groundwater.

The contractor-prepared SWPPP will need to identify the contractor-selected sediment controls and document final sizing calculations and discharge points. Preliminary flow rate calculations are included in Appendix B.

The contractor-prepared SWPPP shall also include BMP C250, Construction Stormwater Chemical Treatment, if proposed. The contractor will be required to obtain Ecology approval if BMP C250 is proposed.

1.5 Element 5: Stabilize Soils

1.5.1 Schedule A, Liquid Stream Improvements

Disturbed areas in Schedule A that are to be vegetated are to be restored in accordance with the landscaping plans as indicated in the TESC plans in Appendix A.

1.5.2 Schedule B, Solids Improvements

Disturbed areas in Schedule A that are to be vegetated are to be restored in accordance with the landscaping plans as indicated in the TESC plans in Appendix A.

1.6 Element 6: Protect Slopes

1.6.1 Schedule A, Liquid Stream Improvements

Slope project is not applicable in Schedule A.

1.6.2 Schedule B, Solids Improvements

Slope project is not applicable in Schedule B.

1.7 Element 7: Protect Drain Inlets

1.7.1 Schedule A, Liquid Stream Improvements

The locations of inlet protection for Schedule A using BMP C220, Inlet Protection, are shown in the plans in Appendix A.

1.7.2 Schedule B, Solids Improvements

There are no existing or proposed inlets in Schedule B for which BMP C220, Inlet Protection, is applicable.

1.8 Element 8: Stabilize Channels and Outlets

1.8.1 Schedule A, Liquid Stream Improvements

A permanent rock pad for energy dissipation is needed for Schedule A for the storm drain discharge into the existing swale along the westerly side of the site. The location of the rock pad is shown on the plans in Appendix A. See the Stormwater Site Plan (SSP) for details.

1.8.2 Schedule B, Solids Improvements

There are no channels or outlets in Schedule B requiring temporary stabilization BMPs.

1.9 Element 9: Control Pollutants

1.9.1 Schedule A, Liquid Stream Improvements

Potential pollutant sources in Schedule A include sawcutting and pavement demolition and placement of concrete. BMPs identified in the plans in Appendix A include:

- BMP C151, Concrete Handling;
- BMP C154, Concrete Washout Area;
- BMP C152, Sawcutting and Surface Pollution Prevention; and
- BMP C252, Treating and Disposing of High pH Water.

1.9.2 Schedule B, Solids Improvements

Potential pollutant sources in Schedule B include placement of concrete. BMPs identified in the plans in Appendix A include:

- BMP C151, Concrete Handling;
- BMP C154, Concrete Washout Area; and
- BMP C252, Treating and Disposing of High pH Water.

1.10 Element 10: Control Dewatering

1.10.1 Schedule A, Liquid Stream Improvements

Dewatering in Schedule A is not anticipated due to the depth to groundwater.

1.10.2 Schedule B, Solids Improvements

Dewatering in Schedule A is not anticipated due to the depth to groundwater.

1.11 Element 11: Maintain BMPs

1.11.1 Schedule A, Liquid Stream Improvements

See the excerpts in Appendix C from the Stormwater Management Manual for Western Washington (Ecology Manual) for maintenance requirements of TESC BMPs in Schedule A.

1.11.2 Schedule B, Solids Improvements

See the excerpts in Appendix C from the Ecology Manual for maintenance requirements of TESC BMPs in Schedule B.

1.12 Element 12: Manage the Project

1.12.1 Schedule A, Liquid Stream Improvements

The contractor will need to manage the Project so that stormwater discharges during construction meet the requirements of the CSWGP. To support this, Appendix C includes the following BMPs for Schedule A:

- BMP C153, Material Delivery, Storage and Containment;
- BMP C160, Certified Erosion and Sediment Control Lead; and
- BMP C162, Scheduling.

1.12.2 Schedule B, Solids Improvements

The contractor will need to manage the Project so that stormwater discharges during construction meet the requirements of the CSWGP. To support this, Appendix C includes the following BMPs for Schedule A:

- BMP C153, Material Delivery, Storage and Containment;
- BMP C160, Certified Erosion and Sediment Control Lead; and
- BMP C162, Scheduling.

1.13 Element 13: Protect Low Impact Development BMPs

1.13.1 Schedule A, Liquid Stream Improvements

There are no existing or proposed low impact development (LID) BMPs in Schedule A to be protected. However, the roof downspout dispersion systems as shown in the plans with the SSP include vegetated areas downstream of splashblocks or rock splash pads. Those areas will need to be protected if they are constructed prior to the roof downspouts being installed.

1.13.2 Schedule B, Solids Improvements

There are no existing or proposed LID BMPs in Schedule A to be protected. However, the roof downspout dispersion systems as shown in the plans with the SSP include vegetated areas downstream of splashblocks or rock splash pads. Those areas will need to be protected if they are constructed prior to the roof downspouts being installed.

Appendix A

Temporary Erosion and Sediment Control (TESC) Plans

Appendix B

Hydrologic Calculations

CITY OF YELM									
WRF Phase 2 Upgrades									
TESC Calculations for filtration systems, BMP C251, Construction Stormwater Filtration									
Updated 6/11/21 for updated biodryer footprint							Drawdown time, hours:	8	
							Factor:		
Area Description	SS2G name	Grass	Roof, NPGIS	PGIS	Total Impervious	10-yr 24-hr runoff volume, cu ft	1.5	Treatment rate, gpm	
Solids Handling Roof	TDA 1	0	2,998	0	2,998				
Acres		0.000			0.069	1,192.75	1,789	28	
Generator Pad, Mech/Elec Bldg, & MBR Tank Vicinity	TDA 2 3	757	5,894	8,807	14,701				
Acres		0.017			0.337	5,942.65	8,914	139	
Pump Sta and Headworks Vicinity	TDA 4	9,687	5,466	18,398	23,864				
Acres		0.222			0.548	10,975.93	16,464	257	
Parameters for StormShed3G:									
Time of concentration, minutes:			5						
Hydrologic Soil Group, per geotechnical report			A						
CN, impervious:			98						
CN, pervious, grass:			68	39 per TR 55 per Ecology Manual. Lawn cover, good condition, HSG A but 68 in SS3G					
Precipitation depth:			5						

CITY OF YELM
WRF Phase 2
TESC calculations for BMP C251, Construction Stormwater Filtration

TDA1 Event Summary

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method
2 yr 24 hr	0.0387	8.00	0.0131	0.069	SBUH
10 year	0.0792	8.00	0.0274	0.069	SBUH

All results based on storm duration of **24.0** hours. This is ok if all precipitations are appropriate for the storm duration. If some design event precipitations are for different duration storms, those results are incorrect

Record Id: TDA1

Design Method	SBUH	**Rainfall type**	TYPE1a.rac
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	24.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.00 ac	**DCIA**	0.069 ac
Pervious CN	0.00	**DC CN**	98.00
Pervious TC	0.00 min	**DC TC**	5.00 min

DCI - CN Calc

Description	SubArea	Sub cn
Impervious surfaces (pavements, roofs, etc)	0.069 ac	98.00
DC Composited CN (AMC 2)		98.00

DCI - TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Sheet		0.00 ft	0.0%	5.0	0.00 in	5.00 min

Pervious TC	5.00 min

TDA2_3 Event Summary

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method
2 yr 24 hr	0.1891	8.00	0.0643	0.354	SBUH
10 year	0.3933	8.00	0.1364	0.354	SBUH

All results based on storm duration of **24.0** hours. This is ok if all precipitations are appropriate for the storm duration. If some design event precipitations are for different duration storms, those results are incorrect

Record Id: TDA2_3

Design Method	SBUH	**Rainfall type**	TYPE1a.rac
Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	24.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.017 ac	**DCIA**	0.337 ac
Pervious CN	68.00	**DC CN**	98.00
Pervious TC	5.00 min	**DC TC**	5.00 min

Pervious CN Calc

Description	SubArea	Sub cn
Open spaces, lawns,parks (>75% grass)	0.017 ac	68.00
Pervious Composited CN (AMC 2)		68.00

Pervious TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Sheet		0.00 ft	0.0%	5.0	0.00 in	5.00 min
Pervious TC						5.00 min

DCI - CN Calc		
Description	**SubArea**	**Sub cn**
Impervious surfaces (pavements, roofs, etc)	0.337 ac	98.00
DC Composited CN (AMC 2)		98.00

DCI - TC Calc						
Type	**Description**	**Length**	**Slope**	**Coeff**	**Misc**	**TT**
Sheet		0.00 ft	0.0%	5.0	0.00 in	5.00 min
Pervious TC						5.00 min

TDA4 Event Summary

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method
2 yr 24 hr	0.3093	8.00	0.1108	0.768	SBUH
10 year	0.7103	8.00	0.252	0.768	SBUH

All results based on storm duration of **24.0** hours. This is ok if all precipitations are appropriate for the storm duration. If some design event precipitations are for different duration storms, those results are incorrect

Record Id: TDA4

Design Method	SBUH	**Rainfall type**	TYPE1a.rac

Hyd Intv	10.00 min	**Peaking Factor**	484.00
Storm Duration	24.00 hrs	**Abstraction Coeff**	0.20
Pervious Area	0.22 ac	**DCIA**	0.548 ac
Pervious CN	68.00	**DC CN**	98.00
Pervious TC	5.00 min	**DC TC**	5.00 min

Pervious CN Calc

Description	SubArea	Sub cn
Open spaces, lawns,parks (>75% grass)	0.22 ac	68.00
Pervious Composited CN (AMC 2)		68.00

Pervious TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Sheet		0.00 ft	0.0%	5.0	0.00 in	5.00 min
Pervious TC						5.00 min

DCI - CN Calc

Description	SubArea	Sub cn
Impervious surfaces (pavements, roofs, etc)	0.548 ac	98.00
DC Composited CN (AMC 2)		98.00

DCI - TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Sheet		0.00 ft	0.0%	5.0	0.00 in	5.00 min
Pervious TC						5.00 min

Appendix C

Excerpts from Ecology Manual

Excerpts for Yelm WRF Phase 2 Construction SWPPP Appendix C

Volume II

Construction Stormwater Pollution Prevention

Stormwater Management Manual for Western Washington

Prepared by:

Washington State Department of Ecology
Water Quality Program

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II-3 Construction Stormwater BMPs

II-3.1 A Summary of Construction Stormwater BMPs

This chapter contains standards and specifications for temporary BMPs, used as appropriate during the construction phase of a project. Often using BMPs in combination is the best method to meet Construction Stormwater Pollution Prevention Plan (Construction SWPPP) requirements.

The standards and specifications in this chapter are not intended to limit innovative efforts to effectively control erosion and sedimentation. Construction SWPPPs can contain experimental BMPs or make minor modifications to standard BMPs. However, the permitting authority (state, local, or both) must approve such practices before use. Experimental and modified BMPs must achieve the same or better performance than the BMPs listed below.

None of the BMPs listed below will work successfully throughout the construction project without inspection and maintenance. Regular inspections to identify problems with the operation of each BMP, and the timely repair of any problems are essential to the continued operation of the BMPs. As site conditions change, BMPs must change to remain in compliance.

Construction stormwater BMPs are divided into two categories: Construction Source Control BMPs and Construction Runoff BMPs.

Table II-3.1: Construction Stormwater BMPs by SWPPP Element shows the relationship of the Construction Stormwater BMPs to the Construction SWPPP Elements described in I-3.4.2 MR2: Construction Stormwater Pollution Prevention Plan (SWPPP).

Table II-3.1: Construction Stormwater BMPs by SWPPP Element

Construction Stormwater BMP	Construction SWPPP Element #												
	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13
Construction Source Control BMPs													
BMP C101: Preserving Natural Vegetation	✓												
BMP C102: Buffer Zones	✓												✓
BMP C103: High-Visibility Fence	✓												✓
BMP C105: Stabilized Construction Access		✓											
BMP C106: Wheel Wash		✓											

Table II-3.1: Construction Stormwater BMPs by SWPPP Element (continued)

Construction Storm-water BMP	Construction SWPPP Element #												
	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13
BMP C107: Construction Road / Parking Area Stabilization		✓											
BMP C120: Temporary and Permanent Seeding					✓	✓							
BMP C121: Mulching					✓	✓							
BMP C122: Nets and Blankets					✓	✓		✓					
BMP C123: Plastic Covering					✓	✓							
BMP C124: Sodding					✓	✓							
BMP C125: Topsoiling / Composting					✓								
BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection					✓								
BMP C130: Surface Roughening					✓	✓							
BMP C131: Gradient Terraces					✓	✓							
BMP C140: Dust Control					✓								
BMP C150: Materials on Hand											✓	✓	
BMP C151: Concrete Handling									✓				
BMP C152: Sawcutting and Surfacing Pollution Prevention									✓				
BMP C153: Material Delivery, Storage, and Containment									✓				

Table II-3.1: Construction Stormwater BMPs by SWPPP Element (continued)

Construction Storm-water BMP	Construction SWPPP Element #												
	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13
BMP C154: Concrete Washout Area									✓				
BMP C160: Certified Erosion and Sediment Control Lead											✓	✓	
BMP C162: Scheduling												✓	
Construction Runoff BMPs													
BMP C200: Interceptor Dike and Swale						✓							✓
BMP C201: Grass-Lined Channels						✓							✓
BMP C202: Riprap Channel Lining								✓					
BMP C203: Water Bars			✓			✓				✓			
BMP C204: Pipe Slope Drains						✓							
BMP C205: Subsurface Drains						✓							
BMP C206: Level Spreader						✓				✓			
BMP C207: Check Dams			✓			✓		✓					✓
BMP C208: Triangular Silt Dike (TSD)						✓							✓
BMP C209: Outlet Pro-tection			✓					✓					
BMP C220: Inlet Pro-tection							✓						
BMP C231: Brush Bar-rier				✓									✓
BMP C232: Gravel Fil-ter Berm				✓									

Table II-3.1: Construction Stormwater BMPs by SWPPP Element (continued)

Construction Storm-water BMP	Construction SWPPP Element #												
	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13
BMP C233: Silt Fence				✓									✓
BMP C234: Vegetated Strip				✓									✓
BMP C235: Wattles			✓	✓									
BMP C236: Vegetative Filtration										✓			
BMP C240: Sediment Trap			✓	✓									
BMP C241: Sediment Pond (Temporary)			✓	✓									
BMP C250: Con-struction Stormwater Chemical Treatment				✓					✓				
BMP C251: Con-struction Stormwater Filtration				✓					✓				
BMP C252: Treating and Disposing of High pH Water									✓				

Construction SWPPP Elements:

Element 1: Preserve Vegetation / Mark Clearing Limits
Element 2: Establish Construction Access
Element 3: Control Flow Rates
Element 4: Install Sediment Controls
Element 5: Stabilize Soils
Element 6: Protect Slopes
Element 7: Protect Drain Inlets
Element 8: Stabilize Channels and Outlets
Element 9: Control Pollutants
Element 10: Control Dewatering
Element 11: Maintain BMPs
Element 12: Manage the Project
Element 13: Protect Low Impact Development BMPs

II-3.2 Construction Source Control BMPs

See detail on plans

BMP C103: High-Visibility Fence

Purpose

High-visibility fencing is intended to:

- Restrict clearing to approved limits.
- Prevent disturbance of sensitive areas, their buffers, and other areas required to be left undisturbed.
- Limit construction traffic to designated construction entrances, exits, or internal roads.
- Protect areas where marking with survey tape may not provide adequate protection.

Conditions of Use

To establish clearing limits plastic, fabric, or metal fence may be used:

- At the boundary of sensitive areas, their buffers, and other areas required to be left uncleared.
- As necessary to control vehicle access to and on the site.

Design and Installation Specifications

High-visibility plastic fence shall be composed of a high-density polyethylene material and shall be at least four feet in height. Posts for the fencing shall be steel or wood and placed every 6 feet on center (maximum) or as needed to ensure rigidity. The fencing shall be fastened to the post every six inches with a polyethylene tie. On long continuous lengths of fencing, a tension wire or rope shall be used as a top stringer to prevent sagging between posts. The fence color shall be high-visibility orange. The fence tensile strength shall be 360 lbs/ft using the ASTM D4595 testing method.

If appropriate install fabric silt fence in accordance with BMP C233: Silt Fence to act as high-visibility fence. Silt fence shall be at least 3 feet high and must be highly visible to meet the requirements of this BMP.

Metal fences shall be designed and installed according to the manufacturer's specifications.

Metal fences shall be at least 3 feet high and must be highly visible.

Fences shall not be wired or stapled to trees.

Maintenance Standards

If the fence has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.

BMP C105: Stabilized Construction Access

See detail on plans

Purpose

Stabilized construction accesses are established to reduce the amount of sediment transported onto paved roads outside the project site by vehicles or equipment. This is done by constructing a stabilized pad of quarry spalls at entrances and exits for project sites.

Conditions of Use

Construction accesses shall be stabilized wherever traffic will be entering or leaving a construction site if paved roads or other paved areas are within 1,000 feet of the site.

For residential subdivision construction sites, provide a stabilized construction access for each residence, rather than only at the main subdivision entrance. Stabilized surfaces shall be of sufficient length/width to provide vehicle access/parking, based on lot size and configuration.

On large commercial, highway, and road projects, the designer should include enough extra materials in the contract to allow for additional stabilized accesses not shown in the initial Construction SWPPP. It is difficult to determine exactly where access to these projects will take place; additional materials will enable the contractor to install them where needed.

Design and Installation Specifications

See Figure II-3.1: Stabilized Construction Access for details. Note: the 100' minimum length of the access shall be reduced to the maximum practicable size when the size or configuration of the site does not allow the full length (100').

Construct stabilized construction accesses with a 12-inch thick pad of 4-inch to 8-inch quarry spalls, a 4-inch course of asphalt treated base (ATB), or use existing pavement. Do not use crushed concrete, cement, or calcium chloride for construction access stabilization because these products raise pH levels in stormwater and concrete discharge to waters of the State is prohibited.

A separation geotextile shall be placed under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet the standards listed in Table II-3.2: Stabilized Construction Access Geotextile Standards.

Table II-3.2: Stabilized Construction Access Geotextile Standards

Geotextile Property	Required Value
Grab Tensile Strength (ASTM D4751)	200 psi min.

Table II-3.2: Stabilized Construction Access Geotextile Standards (continued)

Geotextile Property	Required Value
Grab Tensile Elongation (ASTM D4632)	30% max.
Mullen Burst Strength (ASTM D3786-80a)	400 psi min.
AOS (ASTM D4751)	20-45 (U.S. standard sieve size)

- Consider early installation of the first lift of asphalt in areas that will be paved; this can be used as a stabilized access. Also consider the installation of excess concrete as a stabilized access. During large concrete pours, excess concrete is often available for this purpose.
- Fencing (see BMP C103: High-Visibility Fence) shall be installed as necessary to restrict traffic to the construction access.
- Whenever possible, the access shall be constructed on a firm, compacted subgrade. This can substantially increase the effectiveness of the pad and reduce the need for maintenance.
- Construction accesses should avoid crossing existing sidewalks and back of walk drains if at all possible. If a construction access must cross a sidewalk or back of walk drain, the full length of the sidewalk and back of walk drain must be covered and protected from sediment leaving the site.

Alternative Material Specification

WSDOT has raised safety concerns about the Quarry Spall rock specified above. WSDOT observes that the 4-inch to 8-inch rock sizes can become trapped between Dually truck tires, and then released off-site at highway speeds. WSDOT has chosen to use a modified specification for the rock while continuously verifying that the Stabilized Construction Access remains effective. To remain effective, the BMP must prevent sediment from migrating off site. To date, there has been no performance testing to verify operation of this new specification. Jurisdictions may use the alternative specification, but must perform increased off-site inspection if they use, or allow others to use, it.

Stabilized Construction Accesses may use material that meets the requirements of WSDOT's *Standard Specifications for Road, Bridge, and Municipal Construction* Section 9-03.9(1) (WSDOT, 2016) for ballast except for the following special requirements.

The grading and quality requirements are listed in Table II-3.3: Stabilized Construction Access Alternative Material Requirements.

Table II-3.3: Stabilized Construction Access Alternative Material Requirements

Sieve Size	Percent Passing
2½"	99-100

Table II-3.3: Stabilized Construction Access Alternative Material Requirements (continued)

Sieve Size	Percent Passing
2″	65-100
¾″	40-80
No. 4	5 max.
No. 100	0-2
% Fracture	75 min.

- All percentages are by weight.
- The sand equivalent value and dust ratio requirements do not apply.
- The fracture requirement shall be at least one fractured face and will apply the combined aggregate retained on the No. 4 sieve in accordance with FOP for AASHTO T 335.

Maintenance Standards

Quarry spalls shall be added if the pad is no longer in accordance with the specifications.

- If the access is not preventing sediment from being tracked onto pavement, then alternative measures to keep the streets free of sediment shall be used. This may include replacement/cleaning of the existing quarry spalls, street sweeping, an increase in the dimensions of the access, or the installation of BMP C106: Wheel Wash.
- Any sediment that is tracked onto pavement shall be removed by shoveling or street sweeping. The sediment collected by sweeping shall be removed or stabilized on site. The pavement shall not be cleaned by washing down the street, except when high efficiency sweeping is ineffective and there is a threat to public safety. If it is necessary to wash the streets, the construction of a small sump to contain the wash water shall be considered. The sediment would then be washed into the sump where it can be controlled.
- Perform street sweeping by hand or with a high efficiency sweeper. Do not use a non-high efficiency mechanical sweeper because this creates dust and throws soils into storm systems or conveyance ditches.
- Any quarry spalls that are loosened from the pad, which end up on the roadway shall be removed immediately.
- If vehicles are entering or exiting the site at points other than the construction access(es), BMP C103: High-Visibility Fence shall be installed to control traffic.

- Upon project completion and site stabilization, all construction accesses intended as permanent access for maintenance shall be permanently stabilized.

BMP C151: Concrete Handling

Purpose

Concrete work can generate process water and slurry that contain fine particles and high pH, both of which can violate water quality standards in the receiving water. Concrete spillage or concrete discharge to waters of the State is prohibited. Use this BMP to minimize and eliminate concrete, concrete process water, and concrete slurry from entering waters of the State.

Conditions of Use

Any time concrete is used, utilize these management practices. Concrete construction project components include, but are not limited to:

- Curbs
- Sidewalks
- Roads
- Bridges
- Foundations
- Floors
- Runways

Disposal options for concrete, in order of preference are:

1. Off-site disposal
2. Concrete wash-out areas (see BMP C154: Concrete Washout Area)
3. De minimus washout to formed areas awaiting concrete

Design and Installation Specifications

- Wash concrete truck drums at an approved off-site location or in designated concrete washout areas only. Do not wash out concrete trucks onto the ground (including formed areas awaiting concrete), or into storm drains, open ditches, streets, or streams. Refer to BMP C154: Concrete Washout Area for information on concrete washout areas.
    - Return unused concrete remaining in the truck and pump to the originating batch plant for recycling. Do not dump excess concrete on site, except in designated concrete washout areas as allowed in BMP C154: Concrete Washout Area.
- Wash small concrete handling equipment (e.g. hand tools, screeds, shovels, rakes, floats, trowels, and wheelbarrows) into designated concrete washout areas or into formed areas awaiting concrete pour.
- At no time shall concrete be washed off into the footprint of an area where an infiltration feature will be installed.
- Wash equipment difficult to move, such as concrete paving machines, in areas that do not directly drain to natural or constructed stormwater conveyance or potential infiltration areas.
- Do not allow washwater from areas, such as concrete aggregate driveways, to drain directly (without detention or treatment) to natural or constructed stormwater conveyances.
- Contain washwater and leftover product in a lined container when no designated concrete washout areas (or formed areas, allowed as described above) are available. Dispose of contained concrete and concrete washwater (process water) properly.

- Always use forms or solid barriers for concrete pours, such as pilings, within 15-feet of surface waters.
- Refer to BMP C252: Treating and Disposing of High pH Water for pH adjustment requirements.
- Refer to the Construction Stormwater General Permit (CSWGP) for pH monitoring requirements if the project involves one of the following activities:
    - Significant concrete work (as defined in the CSWGP).
    - The use of soils amended with (but not limited to) Portland cement-treated base, cement kiln dust or fly ash.
    - Discharging stormwater to segments of water bodies on the 303(d) list (Category 5) for high pH.

Maintenance Standards

Check containers for holes in the liner daily during concrete pours and repair the same day.

BMP C152: Sawcutting and Surfacing Pollution Prevention

Purpose

Sawcutting and surfacing operations generate slurry and process water that contains fine particles and high pH (concrete cutting), both of which can violate the water quality standards in the receiving water. Concrete spillage or concrete discharge to waters of the State is prohibited. Use this BMP to minimize and eliminate process water and slurry created through sawcutting or surfacing from entering waters of the State.

Conditions of Use

Utilize these management practices anytime sawcutting or surfacing operations take place. Sawcutting and surfacing operations include, but are not limited to:

- Sawing
- Coring
- Grinding
- Roughening
- Hydro-demolition
- Bridge and road surfacing

Design and Installation Specifications

- Vacuum slurry and cuttings during cutting and surfacing operations.
- Slurry and cuttings shall not remain on permanent concrete or asphalt pavement overnight.
- Slurry and cuttings shall not drain to any natural or constructed drainage conveyance including stormwater systems. This may require temporarily blocking catch basins.
- Dispose of collected slurry and cuttings in a manner that does not violate ground water or surface water quality standards.
- Do not allow process water generated during hydro-demolition, surface roughening or similar operations to drain to any natural or constructed drainage conveyance including stormwater systems. Dispose of process water in a manner that does not violate ground water or surface water quality standards.
- Handle and dispose of cleaning waste material and demolition debris in a manner that does not cause contamination of water. Dispose of sweeping material from a pick-up sweeper at an appropriate disposal site.

Maintenance Standards

Continually monitor operations to determine whether slurry, cuttings, or process water could enter waters of the state. If inspections show that a violation of water quality standards could occur, stop operations and immediately implement preventive measures such as berms, barriers, secondary containment, and/or vacuum trucks.

BMP C153: Material Delivery, Storage, and Containment

Purpose

Prevent, reduce, or eliminate the discharge of pollutants to the stormwater system or watercourses from material delivery and storage. Minimize the storage of hazardous materials on-site, store materials in a designated area, and install secondary containment.

Conditions of Use

Use at construction sites with delivery and storage of the following materials:

- Petroleum products such as fuel, oil and grease
- Soil stabilizers and binders (e.g., Polyacrylamide)
- Fertilizers, pesticides and herbicides
- Detergents
- Asphalt and concrete compounds

- Hazardous chemicals such as acids, lime, adhesives, paints, solvents, and curing compounds
- Any other material that may be detrimental if released to the environment

Design and Installation Specifications

- The temporary storage area should be located away from vehicular traffic, near the construction entrance(s), and away from waterways or storm drains.
- Safety Data Sheets (SDS) should be supplied for all materials stored. Chemicals should be kept in their original labeled containers.
- Hazardous material storage on-site should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- During the wet weather season (Oct 1 – April 30), consider storing materials in a covered area.
- Materials should be stored in secondary containments, such as an earthen dike, horse trough, or even a children's wading pool for non-reactive materials such as detergents, oil, grease, and paints. Small amounts of material may be secondarily contained in "bus boy" trays or concrete mixing trays.
- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, within secondary containment.
- If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids to reduce corrosion. Domed plastic covers are inexpensive and snap to the top of drums, preventing water from collecting.
- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 shall be stored in approved containers and drums and shall not be overfilled. Containers and drums shall be stored in temporary secondary containment facilities.
- Temporary secondary containment facilities shall provide for a spill containment volume able to contain 10% of the total enclosed container volume of all containers, or 110% of the capacity of the largest container within its boundary, whichever is greater.
- Secondary containment facilities shall be impervious to the materials stored therein for a minimum contact time of 72 hours.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- During the wet weather season (Oct 1 – April 30), each secondary containment facility shall be covered during non-working days, prior to and during rain events.
- Keep material storage areas clean, organized and equipped with an ample supply of appropriate spill clean-up material (spill kit).
- The spill kit should include, at a minimum:

- 1-Water Resistant Nylon Bag
- 3-Oil Absorbent Socks 3”x 4’
- 2-Oil Absorbent Socks 3”x 10’
- 12-Oil Absorbent Pads 17”x19”
- 1-Pair Splash Resistant Goggles
- 3-Pair Nitrile Gloves
- 10-Disposable Bags with Ties
- Instructions

Maintenance Standards

- Secondary containment facilities shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills shall be collected and placed into drums. These liquids shall be handled as hazardous waste unless testing determines them to be non-hazardous.
- Re-stock spill kit materials as needed.

BMP C154: Concrete Washout Area

See details on plans.

Purpose

Prevent or reduce the discharge of pollutants from concrete waste to stormwater by conducting washout off-site, or performing on-site washout in a designated area.

Conditions of Use

Concrete washout areas are implemented on construction projects where:

- Concrete is used as a construction material
- It is not possible to dispose of all concrete wastewater and washout off-site (ready mix plant, etc.).
- Concrete truck drums are washed on-site.

  Note that auxiliary concrete truck components (e.g. chutes and hoses) and small concrete handling equipment (e.g. hand tools, screeds, shovels, rakes, floats, trowels, and wheel-barrows) may be washed into formed areas awaiting concrete pour.

At no time shall concrete be washed off into the footprint of an area where an infiltration feature will be installed.

Design and Installation Specifications

Implementation

- Perform washout of concrete truck drums at an approved off-site location or in designated concrete washout areas only.
- Do not wash out concrete onto non-formed areas, or into storm drains, open ditches, streets, or streams.
- Wash equipment difficult to move, such as concrete paving machines, in areas that do not directly drain to natural or constructed stormwater conveyance or potential infiltration areas.
- Do not allow excess concrete to be dumped on-site, except in designated concrete washout areas as allowed above.
- Concrete washout areas may be prefabricated concrete washout containers, or self-installed structures (above-grade or below-grade).
- Prefabricated containers are most resistant to damage and protect against spills and leaks. Companies may offer delivery service and provide regular maintenance and disposal of solid and liquid waste.
- If self-installed concrete washout areas are used, below-grade structures are preferred over above-grade structures because they are less prone to spills and leaks.
- Self-installed above-grade structures should only be used if excavation is not practical.
- Concrete washout areas shall be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

Education

- Discuss the concrete management techniques described in this BMP with the ready-mix concrete supplier before any deliveries are made.
- Educate employees and subcontractors on the concrete waste management techniques described in this BMP.
- Arrange for the contractor's superintendent or Certified Erosion and Sediment Control Lead (CESCL) to oversee and enforce concrete waste management procedures.
- A sign should be installed adjacent to each concrete washout area to inform concrete equipment operators to utilize the proper facilities.

Contracts

Incorporate requirements for concrete waste management into concrete supplier and subcontractor agreements.

Location and Placement

- Locate concrete washout areas at least 50 feet from sensitive areas such as storm drains, open ditches, water bodies, or wetlands.
- Allow convenient access to the concrete washout area for concrete trucks, preferably near the area where the concrete is being poured.
- If trucks need to leave a paved area to access the concrete washout area, prevent track-out with a pad of rock or quarry spalls (see BMP C105: Stabilized Construction Access). These areas should be far enough away from other construction traffic to reduce the likelihood of accidental damage and spills.
- The number of concrete washout areas you install should depend on the expected demand for storage capacity.
- On large sites with extensive concrete work, concrete washout areas should be placed in multiple locations for ease of use by concrete truck drivers.

Concrete Truck Washout Procedures

- Washout of concrete truck drums shall be performed in designated concrete washout areas only.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated concrete washout areas or properly disposed of off-site.

Concrete Washout Area Installation

- Concrete washout areas should be constructed as shown in the figures below, with a recommended minimum length and minimum width of 10 ft, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
- Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
- Lath and flagging should be commercial type.
- Liner seams shall be installed in accordance with manufacturers' recommendations.
- Soil base shall be prepared free of rocks or other debris that may cause tears or holes in the plastic lining material.

Maintenance Standards

Inspection and Maintenance

- Inspect and verify that concrete washout areas are in place prior to the commencement of concrete work.
- Once concrete wastes are washed into the designated washout area and allowed to harden,

the concrete should be broken up, removed, and disposed of per applicable solid waste regulations. Dispose of hardened concrete on a regular basis.

- During periods of concrete work, inspect the concrete washout areas daily to verify continued performance.
    - Check overall condition and performance.
    - Check remaining capacity (% full).
    - If using self-installed concrete washout areas, verify plastic liners are intact and sidewalls are not damaged.
    - If using prefabricated containers, check for leaks.
- Maintain the concrete washout areas to provide adequate holding capacity with a minimum freeboard of 12 inches.
- Concrete washout areas must be cleaned, or new concrete washout areas must be constructed and ready for use once the concrete washout area is 75% full.
- If the concrete washout area is nearing capacity, vacuum and dispose of the waste material in an approved manner.
    - Do not discharge liquid or slurry to waterways, storm drains or directly onto ground.
    - Do not discharge to the sanitary sewer without local approval.
    - Place a secure, non-collapsing, non-water collecting cover over the concrete washout area prior to predicted wet weather to prevent accumulation and overflow of precipitation.
    - Remove and dispose of hardened concrete and return the structure to a functional condition. Concrete may be reused on-site or hauled away for disposal or recycling.
- When you remove materials from a self-installed concrete washout area, build a new structure; or, if the previous structure is still intact, inspect for signs of weakening or damage, and make any necessary repairs. Re-line the structure with new plastic after each cleaning.

Removal of Concrete Washout Areas

- When concrete washout areas are no longer required for the work, the hardened concrete, slurries and liquids shall be removed and properly disposed of.
- Materials used to construct concrete washout areas shall be removed from the site of the work and disposed of or recycled.
- Holes, depressions or other ground disturbance caused by the removal of the concrete washout areas shall be backfilled, repaired, and stabilized to prevent erosion.

BMP C160: Certified Erosion and Sediment Control Lead

Purpose

The project proponent designates at least one person as the responsible representative in charge of erosion and sediment control (ESC), and water quality protection. The designated person shall be responsible for ensuring compliance with all local, state, and federal erosion and sediment control and water quality requirements. Construction sites one acre or larger that discharge to waters of the State must designate a Certified Erosion and Sediment Control Lead (CESCL) as the responsible representative.

Conditions of Use

A CESCL shall be made available on projects one acre or larger that discharge stormwater to surface waters of the state. Sites less than one acre may have a person without CESCL certification conduct inspections.

The CESCL shall:

- Have a current certificate proving attendance in an erosion and sediment control training course that meets the minimum ESC training and certification requirements established by Ecology.

  Ecology has provided the minimum requirements for CESCL course training, as well as a list of ESC training and certification providers at:

  https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Certified-erosion-sediment-control

  OR

- Be a Certified Professional in Erosion and Sediment Control (CPESC). For additional information go to:

  http://www.envirocertintl.org/cpesc/

Specifications

- CESCL certification shall remain valid for three years.
- The CESCL shall have authority to act on behalf of the contractor or project proponent and shall be available, or on-call, 24 hours per day throughout the period of construction.
- The Construction SWPPP shall include the name, telephone number, fax number, and address of the designated CESCL. See II-2 Construction Stormwater Pollution Prevention Plans (Construction SWPPPs).
- A CESCL may provide inspection and compliance services for multiple construction projects in the same geographic region, but must be on site whenever earthwork activities are

occurring that could generate release of turbid water.

- Duties and responsibilities of the CESCL shall include, but are not limited to the following:
    - Maintaining a permit file on site at all times which includes the Construction SWPPP and any associated permits and plans.
    - Directing BMP installation, inspection, maintenance, modification, and removal.
    - Updating all project drawings and the Construction SWPPP with changes made.
    - Completing any sampling requirements including reporting results using electronic Discharge Monitoring Reports (WebDMR).
    - Facilitate, participate in, and take corrective actions resulting from inspections performed by outside agencies or the owner.
    - Keeping daily logs, and inspection reports. Inspection reports should include:
        - Inspection date/time.
        - Weather information; general conditions during inspection and approximate amount of precipitation since the last inspection.
        - Visual monitoring results, including a description of discharged stormwater. The presence of suspended sediment, turbid water, discoloration, and oil sheen shall be noted, as applicable.
        - Any water quality monitoring performed during inspection.
        - General comments and notes, including a brief description of any BMP repairs, maintenance or installations made as a result of the inspection.
        - A summary or list of all BMPs implemented, including observations of all erosion/sediment control structures or practices. The following shall be noted:
            1. Locations of BMPs inspected.
            2. Locations of BMPs that need maintenance.
            3. Locations of BMPs that failed to operate as designed or intended.
            4. Locations of where additional or different BMPs are required.

BMP C162: Scheduling

Purpose

Sequencing a construction project reduces the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking.

BMP C220: Inlet Protection

See detail on plans.

Purpose

Inlet protection prevents coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.

Conditions of Use

Use inlet protection at inlets that are operational before permanent stabilization of the disturbed areas that contribute runoff to the inlet. Provide protection for all storm drain inlets downslope and within 500 feet of a disturbed or construction area, unless those inlets are preceded by a sediment trapping BMP.

Also consider inlet protection for lawn and yard drains on new home construction. These small and numerous drains coupled with lack of gutters can add significant amounts of sediment into the roof drain system. If possible, delay installing lawn and yard drains until just before landscaping, or cap these drains to prevent sediment from entering the system until completion of landscaping. Provide 18-inches of sod around each finished lawn and yard drain.

Table II-3.10: Storm Drain Inlet Protection lists several options for inlet protection. All of the methods for inlet protection tend to plug and require a high frequency of maintenance. Limit contributing drainage areas for an individual inlet to one acre or less. If possible, provide emergency overflows with additional end-of-pipe treatment where stormwater ponding would cause a hazard.

Table II-3.10: Storm Drain Inlet Protection

Type of Inlet Protection	Emergency Overflow	Applicable for Paved/ Earthen Surfaces	Conditions of Use
Drop Inlet Protection			
Excavated drop inlet protection	Yes, temporary flooding may occur	Earthen	Applicable for heavy flows. Easy to maintain. Large area requirement: 30'x30'/acre
Block and gravel drop inlet protection	Yes	Paved or Earthen	Applicable for heavy concentrated flows. Will not pond.
Gravel and wire drop inlet protection	No	Paved or Earthen	Applicable for heavy concentrated flows. Will pond. Can withstand traffic.
Catch basin filters	Yes	Paved or Earthen	Frequent maintenance required.
Curb Inlet Protection			
Curb inlet protection with wooden weir	Small capacity overflow	Paved	Used for sturdy, more compact installation.
Block and gravel curb inlet protection	Yes	Paved	Sturdy, but limited filtration.
Culvert Inlet Protection			
Culvert inlet sediment trap	N/A	N/A	18 month expected life.

Design and Installation Specifications

Catch Basin Filters

Catch basin filters are designed by manufacturers for construction sites. The limited sediment storage capacity increases the amount of inspection and maintenance required, which may be daily for heavy sediment loads. To reduce maintenance requirements, combine a catch basin filter with another type of inlet protection. This type of inlet protection provides flow bypass without overflow and therefore may be a better method for inlets located along active rights-of-way. Design and installation specifications for catch basin filters include:

- Provides 5 cubic feet of storage.
- Requires dewatering provisions.
- Provides a high-flow bypass that will not clog under normal use at a construction site.
- Insert the catch basin filter in the catch basin just below the grating.

Maintenance Standards

- Inspect all forms of inlet protection frequently, especially after storm events. Clean and replace clogged catch basin filters. For rock and gravel filters, pull away the rocks from the inlet and clean or replace. An alternative approach would be to use the clogged rock as fill and put fresh rock around the inlet.
- Do not wash sediment into storm drains while cleaning. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize as appropriate.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C251: Construction Stormwater Filtration

See calculation results on plans.

Purpose

Filtration removes sediment from runoff originating from disturbed areas of the site.

Conditions of Use

Traditional Construction Stormwater BMPs used to control soil erosion and sediment loss from construction sites may not be adequate to ensure compliance with the water quality standard for turbidity in the receiving water. Filtration may be used in conjunction with gravity settling to remove sediment as small as fine silt (0.5 µm). The reduction in turbidity will be dependent on the particle size distribution of the sediment in the stormwater. In some circumstances, sedimentation and filtration may achieve compliance with the water quality standard for turbidity.

The use of construction stormwater filtration does not require approval from Ecology as long as treatment chemicals are not used. Filtration in conjunction with BMP C250: Construction Stormwater Chemical Treatment requires testing under the Chemical Technology Assessment Protocol – Ecology (CTAPE) before it can be initiated. Approval from Ecology must be obtained at each site where chemical use is proposed prior to use. See https://-fortress.wa.gov/ecy/publications/SummaryPages/ecy070258.html for a copy of the Request for Chemical Treatment form.

Design and Installation Specifications

Two types of filtration systems may be applied to construction stormwater treatment: rapid and slow.

Rapid filtration systems are the typical system used for water and wastewater treatment. They can achieve relatively high hydraulic flow rates, on the order of 2 to 20 gpm/sf, because they have automatic backwash systems to remove accumulated solids.

Slow filtration systems have very low hydraulic rates, on the order of 0.02 gpm/sf, because they do not have backwash systems. Slow filtration systems have generally been used as post construction BMPs to treat stormwater (see V-6 Filtration BMPs). Slow filtration is mechanically simple in comparison to rapid filtration, but requires a much larger filter area.

Filter Types and Efficiencies

Sand media filters are available with automatic backwashing features that can filter to 50 µm particle size. Screen or bag filters can filter down to 5 µm. Fiber wound filters can remove particles down to 0.5 µm. Filters should be sequenced from the largest to the smallest pore opening. Sediment removal efficiency will be related to particle size distribution in the stormwater.

Treatment Process and Description

Stormwater is collected at interception point(s) on the site and diverted to an untreated stormwater sediment pond or tank for removal of large sediment, and storage of the stormwater before it is treated by the filtration system. In a rapid filtration system, the untreated stormwater is pumped from the pond or tank through the filtration media. Slow filtration systems are designed using gravity to convey water from the pond or tank to and through the filtration media.

Sizing

Filtration treatment systems must be designed to control the velocity and peak volumetric flow rate that is discharged from the system and consequently the project site. See Element 3: Control Flow Rates for further details on this requirement.

The untreated stormwater storage pond or tank should be sized to hold 1.5 times the volume of runoff generated from the site during the 10-year, 24-hour storm event, minus the filtration treatment system flowrate for an 8-hour period. For a chitosan-enhanced sand filtration system, the filtration treatment system flowrate should be sized using a hydraulic loading rate between 6-8 gpm/ft^2. Other hydraulic loading rates may be more appropriate for other systems. Bypass should be provided around the filtration treatment system to accommodate extreme storm events. Runoff volume shall be calculated using the methods presented in III-2.3 Single Event Hydrograph Method. Worst-case land cover conditions (i.e., producing the most runoff) should be used for analyses (in most cases, this would be the land cover conditions just prior to final landscaping).

If the filtration treatment system design does not allow you to discharge at the rates as required by Element 3: Control Flow Rates, and if the site has a permanent Flow Control BMP that will serve the planned development, the discharge from the filtration treatment system may be directed to the permanent Flow Control BMP to comply with Element 3: Control Flow Rates. In this case, all discharge (including water passing through the treatment system and stormwater bypassing the treatment

system) will be directed into the permanent Flow Control BMP. If site constraints make locating the untreated stormwater storage pond difficult, the permanent Flow Control BMP may be divided to serve as the untreated stormwater storage pond and the post-treatment temporary flow control pond. A berm or barrier must be used in this case so the untreated water does not mix with the treated water. Both untreated stormwater storage requirements, and adequate post-treatment flow control must be achieved. The designer must document in the Construction SWPPP how the permanent Flow Control BMP is able to attenuate the discharge from the site to meet the requirements of Element 3: Control Flow Rates. If the design of the permanent Flow Control BMP was modified for temporary construction flow control purposes, the construction of the permanent Flow Control BMP must be finalized, as designed for its permanent function, at project completion.

Maintenance Standards

- Rapid sand filters typically have automatic backwash systems that are triggered by a pre-set pressure drop across the filter. If the backwash water volume is not large or substantially more turbid than the untreated stormwater stored in the holding pond or tank, backwash return to the untreated stormwater pond or tank may be appropriate. However, other means of treatment and disposal may be necessary.
- Screen, bag, and fiber filters must be cleaned and/or replaced when they become clogged.
- Sediment shall be removed from the storage and/or treatment ponds as necessary. Typically, sediment removal is required once or twice during a wet season and at the decommissioning of the ponds.
- Disposal of filtration equipment must comply with applicable local, state, and federal regulations.

BMP C252: Treating and Disposing of High pH Water

See note on plans.

Purpose

When pH levels in stormwater rise above 8.5, it is necessary to lower the pH levels to the acceptable range of 6.5 to 8.5 prior to discharge to surface or ground water. A pH level range of 6.5 to 8.5 is typical for most natural watercourses, and this neutral pH range is required for the survival of aquatic organisms. Should the pH rise or drop out of this range, fish and other aquatic organisms may become stressed and may die.

Conditions of Use

- The water quality standard for pH in Washington State is in the range of 6.5 to 8.5. Stormwater with pH levels exceeding water quality standards may be either neutralized on site or disposed of to a sanitary sewer or concrete batch plant with pH neutralization capabilities.
- Neutralized stormwater may be discharged to surface waters under the Construction Stormwater General permit.
- Neutralized process water such as concrete truck wash-out, hydro-demolition, or saw-cutting slurry must be managed to prevent discharge to surface waters. Any stormwater

contaminated during concrete work is considered process wastewater and must not be discharged to waters of the State or stormwater collection systems.

- The process used for neutralizing and/or disposing of high pH stormwater from the site must be documented in the Construction Stormwater Pollution Prevention Plan.

Causes of High pH

High pH at construction sites is most commonly caused by the contact of stormwater with poured or recycled concrete, cement, mortars, and other Portland cement or lime containing construction materials. (See BMP C151: Concrete Handling for more information on concrete handling procedures). The principal caustic agent in cement is calcium hydroxide (free lime).

Calcium hardness can contribute to high pH values and cause toxicity that is associated with high pH conditions. A high level of calcium hardness in waters of the state is not allowed. Ground water standard for calcium and other dissolved solids in Washington State is less than 500 mg/l.

Treating High pH Stormwater by Carbon Dioxide Sparging

Advantages of Carbon Dioxide Sparging

- Rapidly neutralizes high pH water.
- Cost effective and safer to handle than acid compounds.
- CO_2 is self-buffering. It is difficult to overdose and create harmfully low pH levels.
- Material is readily available.

The Chemical Process of Carbon Dioxide Sparging

When carbon dioxide (CO_2) is added to water (H_2O), carbonic acid (H_2CO_3) is formed which can further dissociate into a proton (H+) and a bicarbonate anion (HCO_3-) as shown below:

$$CO_2 + H_2O \leftrightarrow H_2CO_3 \leftrightarrow H+ + HCO_3-$$

The free proton is a weak acid that can lower the pH. Water temperature has an effect on the reaction as well. The colder the water temperature is, the slower the reaction occurs. The warmer the water temperature is, the quicker the reaction occurs. Most construction applications in Washington State have water temperatures in the 50°F or higher range so the reaction is almost simultaneous.

The Treatment Process of Carbon Dioxide Sparging

High pH water may be treated using continuous treatment, continuous discharge systems. These manufactured systems continuously monitor influent and effluent pH to ensure that pH values are within an acceptable range before being discharged. All systems must have fail safe automatic shut off switches in the event that pH is not within the acceptable discharge range. Only trained operators may operate manufactured systems. System manufacturers often provide trained operators or training on their devices.

The following procedure may be used when not using a continuous discharge system:

1. Prior to treatment, the appropriate jurisdiction should be notified in accordance with the regulations set by the jurisdiction.
2. Every effort should be made to isolate the potential high pH water in order to treat it separately from other stormwater on-site.
3. Water should be stored in an acceptable storage facility, detention pond, or containment cell prior to pH treatment.
4. Transfer water to be treated for pH to the pH treatment structure. Ensure that the pH treatment structure size is sufficient to hold the amount of water that is to be treated. Do not fill the pH treatment structure completely, allow at least 2 feet of freeboard.
5. The operator samples the water within the pH treatment structure for pH and notes the clarity of the water. As a rule of thumb, less CO_2 is necessary for clearer water. The results of the samples and water clarity observations should be recorded.
6. In the pH treatment structure, add CO_2 until the pH falls into the range of 6.9-7.1. Adjusting pH to within 0.2 pH units of receiving water (background pH) is recommended. It is unlikely that pH can be adjusted to within 0.2 pH units using dry ice. Compressed carbon dioxide gas should be introduced to the water using a carbon dioxide diffuser located near the bottom of the pH treatment structure, this will allow carbon dioxide to bubble up through the water and diffuse more evenly.
7. Slowly discharge the water, making sure water does not get stirred up in the process. Release about 80% of the water from the pH treatment structure leaving any sludge behind. If turbidity remains above the maximum allowable, consider adding filtration to the treatment train. See BMP C251: Construction Stormwater Filtration.
8. Discharge treated water through a pond or drainage system.
9. Excess sludge needs to be disposed of properly as concrete waste. If several batches of water are undergoing pH treatment, sludge can be left in the treatment structure for the next batch treatment. Dispose of sludge when it fills 50% of the treatment structure volume.
10. Disposal must comply with applicable local, state, and federal regulations.

Treating High pH Stormwater by Food Grade Vinegar

Food grade vinegar that meets FDA standards may be used to neutralize high pH water. Food grade vinegar is only 4% to 18% acetic acid with the remainder being water. Food grade vinegar may be used if dosed just enough to lower pH sufficiently. Use a treatment process as described above for CO_2 sparging, but add food grade vinegar instead of CO_2.

This treatment option for high pH stormwater does not apply to anything but food grade vinegar. Acetic acid does not equal vinegar. Any other product or waste containing acetic acid must go through the evaluation process in Appendix G of *Whole Effluent Toxicity Testing Guidance and Test Review Criteria* (Marshall, 2016).

Disposal of High pH Stormwater

Sanitary Sewer Disposal

Local sewer authority approval is required prior to disposal via the sanitary sewer.

Concrete Batch Plant Disposal

- Only permitted facilities may accept high pH water.
- Contact the facility to ensure they can accept the high pH water.

Maintenance Standards

Safety and materials handling:

- All equipment should be handled in accordance with OSHA rules and regulations.
- Follow manufacturer guidelines for materials handling.

Each operator should provide:

- A diagram of the monitoring and treatment equipment.
- A description of the pumping rates and capacity the treatment equipment is capable of treating.

Each operator should keep a written record of the following:

- Client name and phone number.
- Date of treatment.
- Weather conditions.
- Project name and location.
- Volume of water treated.
- pH of untreated water.
- Amount of CO_2 or food grade vinegar needed to adjust water to a pH range of 6.9-7.1.
- pH of treated water.
- Discharge point location and description.

A copy of this record should be given to the client/contractor who should retain the record for three years.