City of Yelm
EST. 1924
WASHINGTON

DETERMINATION OF NON-SIGNIFICANCE

SEPA #: 2023.0001

Proponent:	Yelm High School
Description of Proposal:	Open grass field to synthetic turf for soccer field
Location of the Proposal:	1315 Yelm Ave. W, Yelm, WA 98597
Lead Agency:	City of Yelm

The City of Yelm as lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not 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.

This DNS is issued under WAC 197-11-340(2); the City of Yelm will not act on this proposal for 14 days from the date below.

March 15, 2023

Comments must be submitted by March 15, 2023 to planning@yelmwa.gov by 5:00 P.M.

Responsible Official:	Gary Cooper, Planning and Building Manager
Phone:	(360) 400-5003
Address:	901 Rhoton Rd. NW. Yelm, WA 98597
Date of Issue:	March 1, 2023

Gary Cooper

_____

Gary Cooper, Planning and Building Manager

SEPA ENVIRONMENTAL CHECKLIST

Purpose of checklist:

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

***Instructions for applicants*:**

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

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

Instructions for Lead Agencies:

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

Use of checklist for nonproject proposals: [help]

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.

CITY OF YELM

Environmental Checklist

CITY USE ONLY

FEE: $150.00

DATE REC'D_____
BY:_____
File No._____

A. Background

1. Name of proposed project, if applicable: **Yelm High School Soccer Field Conversion & Tennis Courts Reconstruction**

2. Name of applicant: **Yelm Community Schools**

3. Address and phone number of applicant and contact person: **Attn: Chris Hansen, Facilities Director., Ph. 360.458.6128, P.O. Box 476, Yelm, WA 98597**

4. Date checklist prepared: **12/29/22**

5. Agency requesting checklist: **City of Yelm**

6. Proposed timing or schedule (including phasing, if applicable**): Construction will commence in March, 2023 and will be complete in the second week of August, 2023 or sooner.**

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain. **No future activity is expected for the Yelm High School Soccer Field and Tennis Courts. This project is a Maintenance Upgrade.**

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal. **No environmental information is needed for this project as any impacts have already been incurred and the land use will remain as is. The Disposal site contains Prairie Soils and was reviewed for Prairie Species, including the Mazama Pocket Gopher. Key Environmental Solutions (KES) reviewed WDFW PHS Species on December 31, 2016, September 15, 2017 and October 30, 2017 and no PHS species were found on or immediately adjacent to the parcels. Across SR 510 to the NE Mazama Pocket Gophers have been found according to WDFW. At this time a Habitat Management Plan (HMP) is not needed.**

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. **No.**

10. List any government approvals or permits that will be needed for your proposal, if known.
City of Yelm ~~grade and fill permit.~~ Civil and building department approval

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 intended use of the project is to increase the versatility and competitive quality of the Yelm Soccer by converting the natural grass field to synthetic turf and to rebuild the Tennis Court as is, where is but with post tensioned concrete surfacing. The Yelm Soccer Field and Tennis Court's disturbed area totals 153,554+/- square feet. The Disposal site area to receive fill totals 48,000+/- square feet.**

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. ~~**Please see submitted plan set.**~~

1315 Yelm Ave. W.
Yelm, WA, 98597

Sec. 24, T 17 N, R,1E

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site:

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

b. What is the steepest slope on the site (approximate percent slope)? ~~**10.0%**~~ 2.46%

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. ~~**Refer to Geotechnical Memo.**~~ Sandy gravel and topsoil sand with silt

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe. **No**

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.
Removal of the existing field soil is to facilitate the installation of permeable aggregate required to accommodate positive drainage. Cut volumes to be hauled from the existing field and graded at the Disposal site totals 90,541+/- square feet and totals 2240+/- cubic yards. Permeable aggregate from an approved quarry site and to be backfilled into the Soccer Field totals 1680+/- cubic yards. Fill for the Tennis Courts total 1050 cy.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.
No.

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

Total = 42 Acres
Impervious = 28 Acres 66.67%

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:
Implement Best Management Practices will be followed during construction.

2. Air

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

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

c. Proposed measures to reduce or control emissions or other impacts to air, if any:
Implementation of Best Management Practices will be followed during construction.

3. Water

a. Surface Water:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into. **There is a drainage course approximately 1200 feet west of the project location.**

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans. **No.**

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material. **N/A**

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known. **No.**

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan. **No.**

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge. **No.**

b. Ground Water:

1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities

withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known. **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. **N/A**

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. **It is not anticipated that there would be any runoff coming from this site. The intent is to infiltrate 100 percent of the runoff from the proposed improvements on site.**

2) Could waste materials enter ground or surface waters? If so, generally describe. **No**

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe. **No**

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any: **No measures will be taken at the Yelm High School Tennis Court and Soccer Field site as the entire project is has an infilation rate ranging from 2.9 to 20 inches per hour and will therefore infiltrate all stormwater before it has an opportunity to drain off site.. Erosion control measures such as Silt Fence will be deployed at the Disposal site.**

4. Plants

a. Check the types of vegetation found on the site (both Yelm Stadium Field and the Disposal site):

__X_deciduous tree: alder, maple, aspen, other
__X evergreen tree: fir, cedar, pine, other
__X_shrubs
__X_grass
__X_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
__X__other types of vegetation Scotch Broom

b. What kind and amount of vegetation will be removed or altered?
All vegetation will be removed in the footprint of the proposed field and Disposal site. Dominant vegetation to be removed will be turfgrass, Scotch broom, orchard grass, tall oat-grass Common Velvetgrass colonial bentgrass Himalayan blackberry, black

hawthorn, thistle, common dandelion, Hairy's Cat ear, Hazelnut, snowberry, and moss.

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

1, Common Name: Mazama (Western) Pocket Gopher
Scientifica Name: *Thomomys Mazama*
Federal Status: Threatened
State Status: Threatened
Found near project site: 770', 0.15 miles to the NE across SR 510 and 1175', .37 miles to the NW across field and 93rd Ave

2. Common name: Streaked Horned Lark
Scientifica Name: *Eremophila alpestris strigata*
Federal Status: Threatened
State Status: Endangered
No know locations were found near the project vicinity (WDFW, PHS October 2017).

3. Common Name: Taylor's Checkerspot Butterfly
Scientifica Name: *Euphydryas editha taylori*
Federal Status: Endangered
State Status: Endangered
No know locations were found near the project vicinity (WDFW, PHS October 2017).

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any: **None are proposed at this time other than to hydroseed disturbed areas at the Disposal site with meadow grass.**

e. List all noxious weeds and invasive species known to be on or near the site.
Himalyan Blackberry, Scotch Broom

5. Animals

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

Examples include:

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

b. List any threatened and endangered species known to be on or near the site.
Didn't see any, but Golden Indian Paintbrush (*Castilleja levisecta)* has been found in the Yelm area.

c. Is the site part of a migration route? If so, explain.
No

d. Proposed measures to preserve or enhance wildlife, if any: **None proposed at this time.**

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

N/A

6. Energy and Natural Resources

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

Electric energy will be used to power the duplex outlets in the Tennis Courts.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe. **No**

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:

None.

7. Environmental Health

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

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 anticipated.**

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. Hazardous chemicals will not be allowed to be stored on-site during construction. **None anticipated for the life of the project.**

4) Describe special emergency services that might be required. **Fire and Life Safey and Law Enforcement could be notified during an emergency event.**

5) Proposed measures to reduce or control environmental health hazards, if any: Employ BMP's in accordance with the proposed improvements. **Contractor to have spill containment materials on-hand in the case of a minor fuel or oil spills.**

b. Noise

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

generated from machinery. Post construction there will be pedestrian and vehicular traffic.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site. **During the construction phase noise levels will be elevated due to the types of machinery employed ot construct the improvements. Vibratory Compaction Equipment and banging of dump truck beds will have periods of intermittent elevated sounds. After construction there will be normal passenger vehicle traffic noises. Normal hours of operation will be consistent with school schedules and activities.**

3) Proposed measures to reduce or control noise impacts, if any: **During construction limit the contractors hours of operation will be Mon. – Fri. 6:00 am to 5:00 pm. After construction vehicle noise will be mostly during school operating hours and special school events.**

8. Land and Shoreline Use

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe. **There are residential neighborhoods on the south and west sides of the project, and commercial properties to the east of the project. The current site use is the same as the proposed site use, tennis courts and a soccer field. No affect to adjacent properties.** Full site is Yelm High School

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? **No, this site is currently a high school sports court/field and will remain so after project completion.**

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: **The project is not anticipated to impact adjacent properties or the uses of those properties.**

c. Describe any structures on the site. **Yelm High School and all of its associated structures are present on site and will not be expanded or modified in any manner whatsoever.**

d. Will any structures be demolished? If so, what? **No**

e. What is the current zoning classification of the site? ~~**R-4 Residential and R-14**~~ Institutional District (ID)

f. What is the current comprehensive plan designation of the site? ~~**Split between High Density Residential and Low Density Residential**~~ Institutional District

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.
No, with the exception that the parcels have prairie soils. All of Yelm is a critical aquifer recharge area

i. Approximately how many people would reside or work in the completed project? **None**

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

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: **No measures are proposed because this project is simply a change of sport field surfacing from natural grass to synthetic turf and the Tennis Court surface will still be a hard court surface (concrete). No modification of Land-uses are proposed.**

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any: **None proposed.**

9. Housing

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

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed? **No structures are proposed.**

b. What views in the immediate vicinity would be altered or obstructed? **None**

d. Proposed measures to reduce or control aesthetic impacts, if any: **Removal and clearing to be contained in the areas designated on the contract documents.**

11. Light and Glare

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

Not applicable.

b. Could light or glare from the finished project be a safety hazard or interfere with views? **No**

c. What existing off-site sources of light or glare may affect your proposal? **Not applicable.**

d. Proposed measures to reduce or control light and glare impacts, if any**: Not applicable.**

12. Recreation

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

b. Would the proposed project displace any existing recreational uses? If so, describe. **No**

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any: **None**

13. Historic and cultural preservation

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers ? 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. **None known.**

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. **N/A**

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

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.

Yelm Highway and Tornado Alley

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? **Approximately 2000 feet east of the project at the intersection of Tahoma Blvd. and Yelm Ave.**

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate? **None.**

d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private**). No**

e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe. **No**

f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates? **Whereas this project is simply a change in sports field/court surfacing, the use of this facility will not be altered.**

g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe. **No.**

h. Proposed measures to reduce or control transportation impacts, if any: **None proposed.**

15. Public Services

a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe. **No**

b. Proposed measures to reduce or control direct impacts on public services, if any**. None anticipated.**

16. Utilities

a. Circle utilities currently available at the site:
electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other Reclaim Water; **all of these utilities are available to the site and no modifications will occur to these utilities as a result of this project.**

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. **None**

C. Signature

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

Signature: _____  _____

Name of signee _Bob Droll, ASLA_____

Position and Agency/Organization: Robert W. Droll, Landscape Architect, PS representing

Yelm Community Schools

Date Submitted: _____12/29/22_____

D. supplemental sheet for nonproject actions [help]

(**IT IS NOT NECESSARY** to use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

Proposed measures to avoid or reduce such increases are:

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

3. How would the proposal be likely to deplete energy or natural resources?

Proposed measures to protect or conserve energy and natural resources are:

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

Proposed measures to protect such resources or to avoid or reduce impacts are:

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

Proposed measures to avoid or reduce shoreline and land use impacts are:

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

Proposed measures to reduce or respond to such demand(s) are:

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

Yelm HS Field Conversion & Tennis Court Reconstruction

Permitting Submittal
January 3rd, 2022

Yelm Community Schools

Chris Hansen, Facilities Director
202 Stevens Ave NW Yelm, WA 98597

Consultant Team

Robert W. Droll, Landscape Architect, PS
Recreation Facility Design
4405 7th Avenue SE, Suite #203
Lacey, WA 98503
(360) 456-3813

Field Turf
175 N Industrial Blvd NE
Calhoun GA 30701
514-340-9311

Landau Associates
500 Columbia ST NW, Ste 1100
Olympia, WA 98501
360-791-3178

KPFF
612 Woodland Square Loop SE, Suite 100
Lacey, WA 98503
360-292-7230

Sheet Index

General Notes

1. TRAFFIC CONTROL SHALL BE SOLELY THE CONTRACTOR'S RESPONSIBILITY.
2. PROVIDE A THOROUGH DAILY CLEAN UP OF THE PROJECT SITE. REMOVE ALL TRASH AND DEBRIS, CLEAN PAVEMENT(S), AND CLEAN ALL INGRESS AND EGRESS POINTS, AND RIGHTS-OF-WAY.
3. PROTECT ALL EXISTING IMPROVEMENTS FROM DAMAGE AND DEFACEMENT.
4. VERIFY ALL DIMENSIONS BEFORE PROCEEDING. ANY DIMENSIONAL DEVIATION FROM THAT SHOWN WHICH MAY AFFECT INTENT OR DESIGN SHALL BE BROUGHT TO THE ATTENTION OF THE PROJECT ENGINEER. OBTAIN WRITTEN RESOLUTION PRIOR TO PROCEEDING WITH ANY WORK.
5. PROJECT ENGINEER SHALL BE IMMEDIATELY NOTIFIED DISCREPANCIES BETWEEN DRAWINGS AND SITE CONDITIONS.

Abbreviations

ABN	ABANDON	MAT'L	MATERIAL
AC	ASPHALTIC CONCRETE	MAX	MAXIMUM
ADD	ADDITIVE	ME	MATCH EXISTING
ALT	ALTERNATE	MIL	1/1000th INCH
ALUM	ALUMINUM	MIN	MINIMUM
APPROX	APPROXIMATELY	MPOC	MID-POINT OF CURVE
A.T.	ALL-THREAD	N	NORTH
@	AT	NIC	NOT IN CONTRACT
BC	BOTTOM OF CURB	NO.	NUMBER
BLKG	BLOCKING	NOM	NOMINLA
BM	BENCH MARK	NTS	NOT TO SCALE
BOC	BACK OF CURB	OC	ON CENTER
BW	BOTTOM OF WALL	OD	OUTSIDE DIAMETER
CB	CARRIAGE BOLT	OR	OWNER'S REPRESENTATIVE
CB	CATCH BASIN	PC	POINT OF CURVATURE
CF	CUBIC FOOT	PCC	PORTLAND CEMENT CONCRETE
CIE	COLLECTOR INVERT ELEVATION	P.E.	PROFESSIONAL ENGINEER
CJ	CONTROL JOINT	PERF	PERFORATED
CLR	CLEARING, CLEARANCE	PERIM	PERIMETER
CMP	CORRUGATED METAL PIPE	PI	POINT OF INTERSECTION
CO	CLEANOUT	PLT	PLATE
CONT	CONTINUOUS	PLYWD	PLYWOOD
CONC	CONCRETE	POLY	POLYETHYLENE
CORR	CORRUGATED	PRO	PROPOSED
CP	CENTER POINT	PSE	PUDGET SOUND ENERGEY
CS	COUNTERSINK	PSI	POUNDS PER SQUARE INCH
CSBC	CRUSHED SURFACING BASE COURSE	PT	POINT OF TANGENCY
CSTC	CRUSHED SURFACING TOP COURSE	PT	PRESSURE TREATED
CY	CUBIC YARD	PVC	POLYVINYL CHLORIDE
DEMO	DEMOLISH	PVC	POINT OF VERTICAL CURVATURE
DET	DETAIL	PVI	POINT OF VERTICAL INTERSECTION
DIA	DIAMETER	PVMT	PAVEMENT
DTL	DETAIL	PVT	POINT OF VERTICAL TANGENCY
DWG	DRAWING	R	RADIUS
E	EAST	REQ'D	REQUIRED
EA	EACH	RP	RADIUS POINT
EJ	EXPANSION JOINT	S	SLOPE (FT/FT)
EL, ELEV	ELEVATION	S	SOUTH
ELEC	ELECTRICAL	SCH	SCHEDULE
EOP	EDGE OF PAVEMENT	SEC	SECTION
EQ	EQUAL	SF	SQUARE FEET
EQ SP	EQUAL SPACING	SHLDR	SHOULDER
EX, EXIST	EXISTING	SIM	SIMILAR
FDN	FOUNDATION	SJ	SCORE JOINT
FFE	FINISH FLOOR ELEVATION	SM	SILTY SAND
FIN GR	FINISH GRADE	SP'D	SPACED
FT	FOOT, FEET	SQ	SQUARE
FTG	FOOTING	SS	SANITARY SEWER
GA	GAUGE	STD	STANDARD
GAL	GALLON	STA	STATION
GALV	GALANIZED	STL	STEEL
GPM	GALLONS PER MINUTE	SY	SQUARE YARD
GW	SANDY GRAVEL	TC	TOP OF CURB
HL	HELICAL	THK	THICK
HMA	HOT MIX ASPHALT	T.O.S	TOP OF SLAB
HP	HIGH POINT	TW	TOP OF WALL
HT	HEIGHT	TYP	TYPICAL
HZ	HORIZONTAL	UNO	UNLESS NOTED OTHERWISE
ID	INSIDE DIAMETER	VC	VERTICAL CURVE
IE	INVERT ELEVATION	VERT	VERTICAL
IN	INCH	W/	WITH
IRR	IRRIGATION	W/IN	WITHIN
JT	JOINT	W/O	WITHOUT
L	LEFT, LONG	WD	WIDTH
LB	LAG BOLT	WSDOT	WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
LF	LINEAR FOOT/FEET		
LP	LOW POINT	WWM	WELDED WIRE MESH
LS	LAG SCREW		
MB	MACHINE BOLT		

Project Site

1315 W Yelm Ave, Yelm, WA 98597

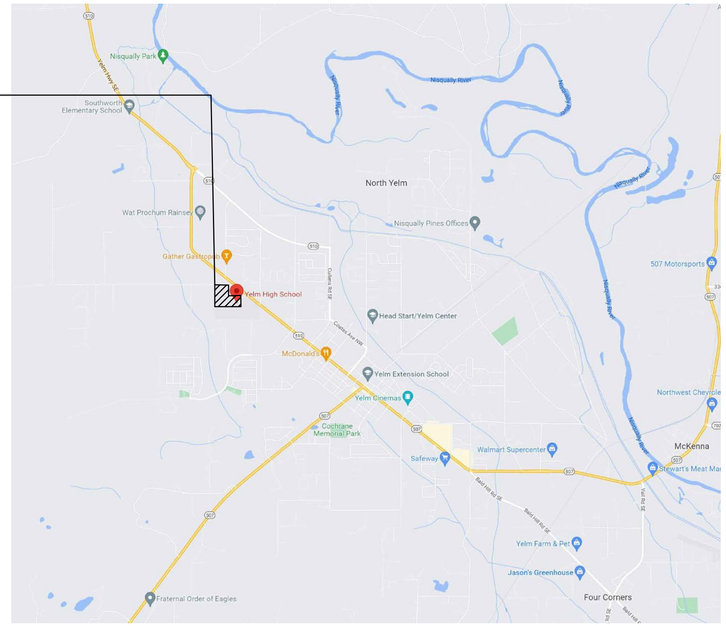
Legal Description

Section 24 Township 17 Range 1E

Zoning and Land Use

INSTITUTIONAL DISTRICT

PARCEL NUMBER:
21724210500



Vicinity Map

NTS

811 Call 811 two business days before you dig

CAUTION!!! OVERHEAD AND UNDERGROUND UTILITIES

THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL EXISTING UTILITIES. THE CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS PRIOR TO CONSTRUCTION BY CALLING THE UNDERGROUND LOCATE LINE AT 1-800-424-5555 A MINIMUM OF 48 HOURS PRIOR TO ANY EXCAVATION.

G1.0

JEREME F. CHAPMAN
STATE OF WASHINGTON
45779
REGISTERED
PROFESSIONAL LAND SURVEYOR

kpff

612 Woodland Square Loop SE,
Suite 100
Lacey, WA 98503

360.292.7230
www.kpff.com

BASIS OF MERIDIAN:

THURSTON COUNTY COORDINATE SYSTEM, NAD 83/91 PER THURSTON COUNTY MONUMENTS 252 AND 836.

VERTICAL DATUM:

NAVD 88–CONTRACTOR TO VERIFY VERTICAL DATUM WITH TIES TO TOPOGRAPHIC FEATURES PRIOR TO START OF CONSTRUCTION.

UTILITY NOTE:

UTILITIES SHOWN HEREON ARE PER KPFF ON SITE SURVEY OF SURFACE FEATURES IN CONJUNCTION WITH UNDERGROUND UTILITY LOCATES PERFORMED BY KPFF. AS WELL AS AS–BUILT DATA ON FILE AT THE OFFICE OF KPFF. ALL UTILITIES SHOWN HEREON SHOULD BE CONSIDERED APPROXIMATE ONLY AND SHOULD BE VERIFIED PRIOR TO EXCAVATION.

METHOD OF SURVEY:

CONTROL SURVEY PERFORMED USING GPS/RTK METHODS WITH THE USE OF TOPCON GR5 RECEIVERS, SUPPLEMENTAL CONTROL SURVEY AND TOPOGRAPHIC SURVEY PERFORMED USING A TOPCON GT 503 ROBOTIC TOTAL STATION.

THE SURVEY WORK PERFORMED DURING THE COURSE OF THIS SURVEY MEETS OR EXCEEDS THE STANDARDS AS SET FORTH IN WAC 332–130–090.

SURVEY WORK PERFORMED IN OCTOBER OF 2022.

Point	Northing	Easting	Elevation	Description
1	597563.704	1108737.868	341.70	HUB/MAGNAIL
2	597147.593	1108766.153	342.29	HUB/MAGNAIL
3	597228.941	1109109.147	344.12	MAGNAIL

N

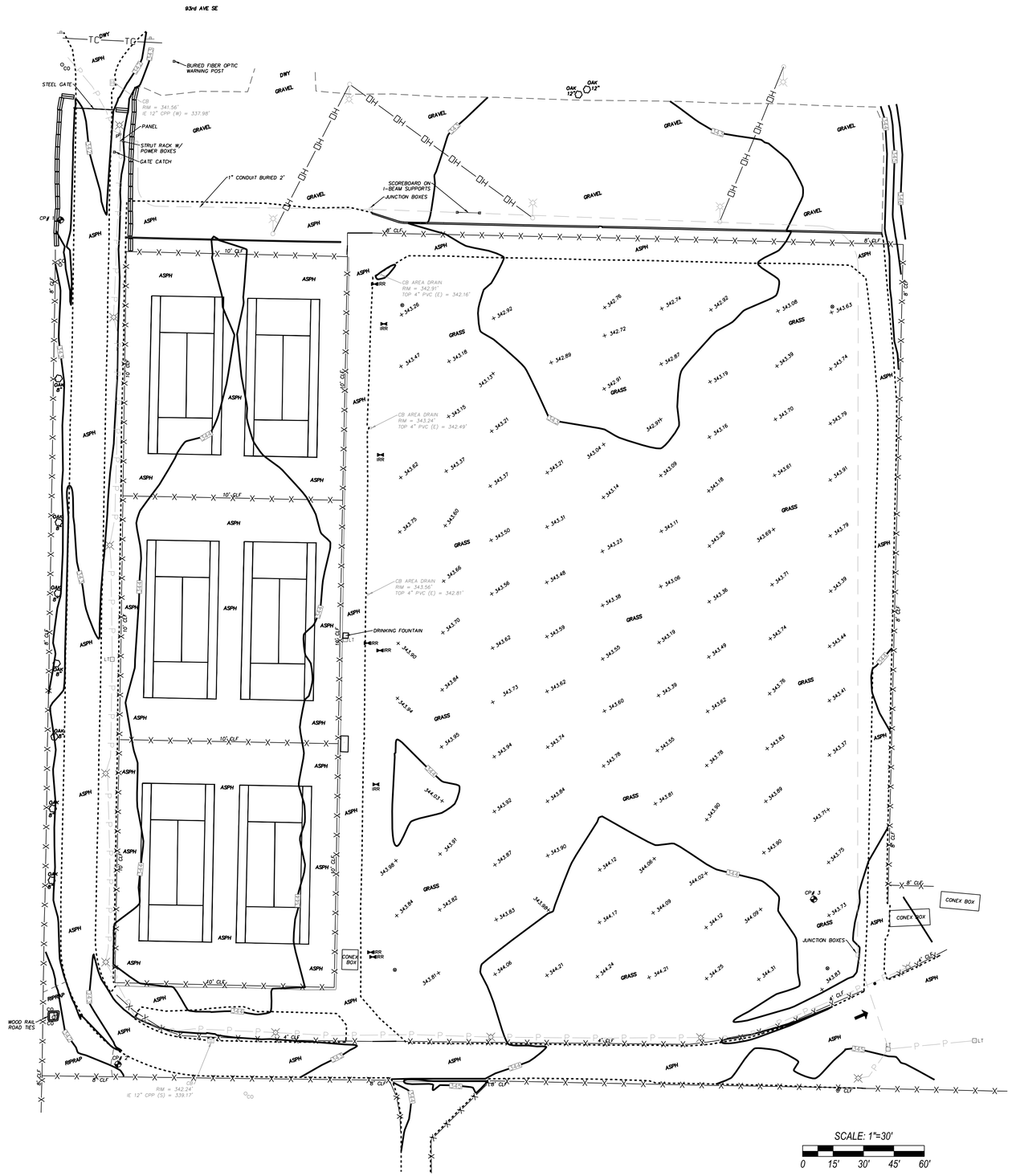
S

0 20 40 60

1" = 20'

LEGEND

- CONTROL POINTS
- POWER VAULT
- TRANSFORMER
- LIGHT JUNCTION BOX
- LIGHT POLE
- TEST HOLE
- STREET LIGHT
- IRRIGATION VALVE
- SEWER CLEANOUT
- CATCH BASIN
- ECOLOGY BLOCK
- FENCE AS NOTED
- STORM DRAIN
- UNDERGROUND TELECOMMUNICATIONS
- UNDERGROUND POWER
- CONCRETE HATCH



SCALE: 1"=30'

0 15' 30' 45' 60'

811 Call 811 two business days before you dig

PERMITTING SUBMITTAL

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

Yelm High School
Yelm WA

RWD
Landscape Architects
4405 7th Ave. SE, Suite 203
Lacey, WA 98503
360.456.3813
bob@rwdroll.com

STATE OF WASHINGTON
ROBERT W. DROLL
LANDSCAPE ARCHITECT
EXP. 12/09/2024

PROJECT NO. 22041
DRAWING
DESIGNED BY BD
DRAWN BY JH
CHECKED BY BD

REVISION

DATE	CHANGE

DATE: 1/03/2023

EXISTING CONDITIONS

G2.0

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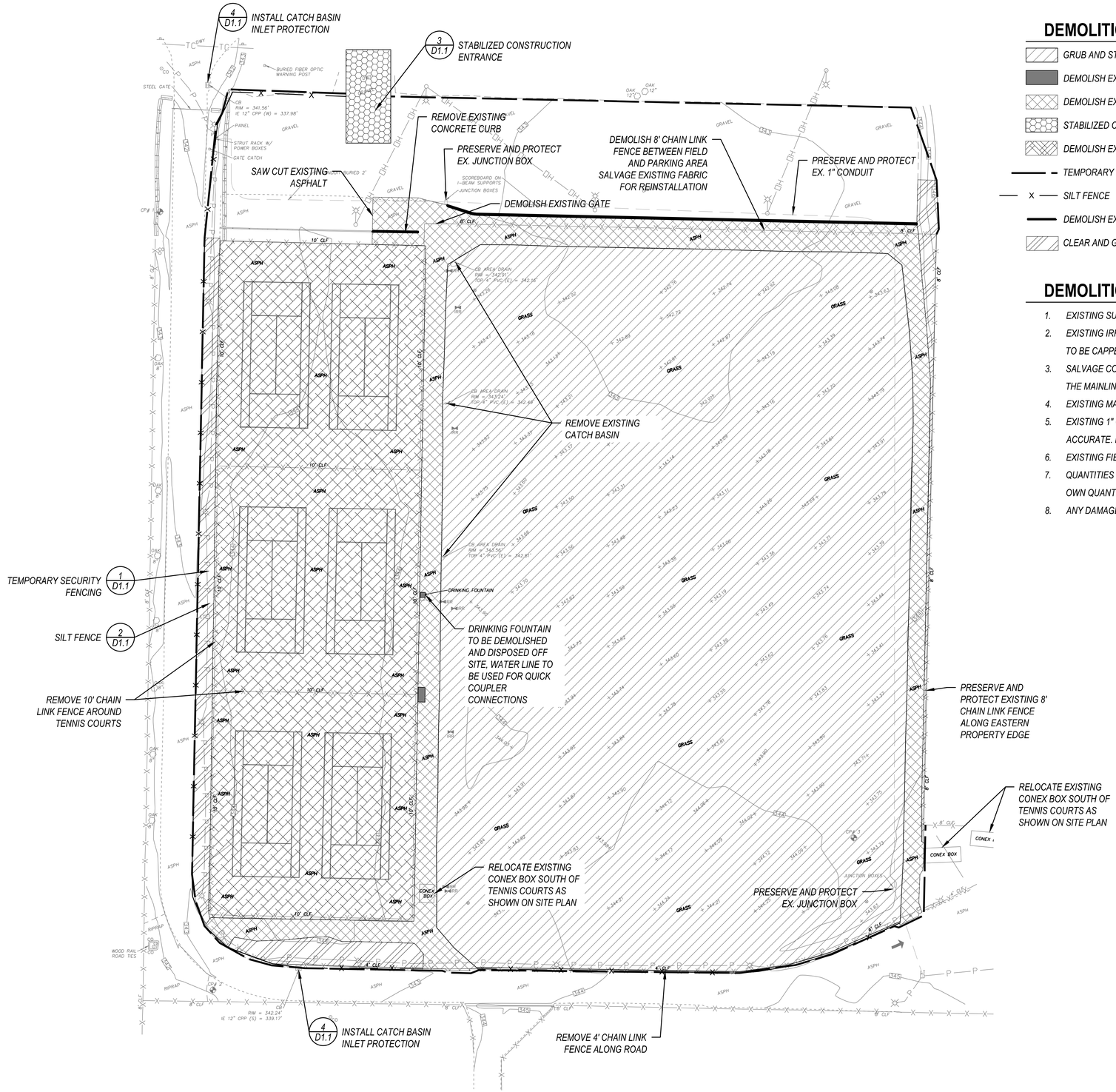

DEMOLITION LEGEND

- GRUB AND STRIP TOPSOIL, 6" MIN. (95,030 ± SF)
- DEMOLISH EXISTING CONCRETE (40 ± SF)
- DEMOLISH EXISTING ASPHALT (14,290 ± SF)
- STABILIZED CONSTRUCTION ENTRANCE (1200 ± SF)
- DEMOLISH EXISTING TENNIS COURT SURFACING (39,800 ± SF)
- TEMPORARY SECURITY FENCING
- SILT FENCE
- DEMOLISH EXISTING CONCRETE CURB (± 40 LF)
- CLEAR AND GRUB (5,430 ± SF)

DEMOLITION NOTES

1. EXISTING SUBSURFACE DRAINAGE TO BE ABANDONED IN PLACE
2. EXISTING IRRIGATION HEADS TO BE SALVAGED AND RETURNED TO OWNER, IRRIGATION LATERALS TO BE CAPPED AND ABANDONED IN PLACE.
3. SALVAGE CONTROL VALVES AND RETURN TO OWNER. CUT AND CAP NIPPLE CONNECTING VALVE TO THE MAINLINE
4. EXISTING MAINLINE TO REMAIN, PRESERVE IN PLACE.
5. EXISTING 1" CONDUIT AND JUNCTION BOXES SHOWN ARE SCHEMATIC AND ARE NOT SURVEY ACCURATE. PROTECT ALL CONDUIT & JUNCTION BOXES
6. EXISTING FIELD LIGHTS AND POWER JUNCTION BOXES TO REMAIN.
7. QUANTITIES PROVIDED FOR CONTRACTOR INFORMATION ONLY. CONTRACTOR TO DERIVE THEIR OWN QUANTITIES.
8. ANY DAMAGE SHALL BE REPAIRED IMMEDIATELY

SCALE: 1"=30'

0 15' 30' 45' 60'

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REVISION

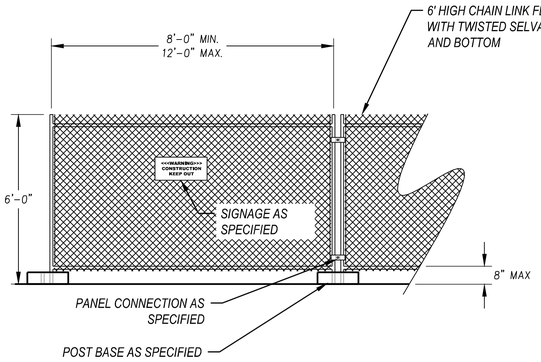
DATE	CHANGE

DATE: 1/03/2023

PERMITTING SUBMITTAL

DEMOLITION & TESC PLAN

D1.0



NOTES: INSTALLATION - NON-SLOPED AREAS:

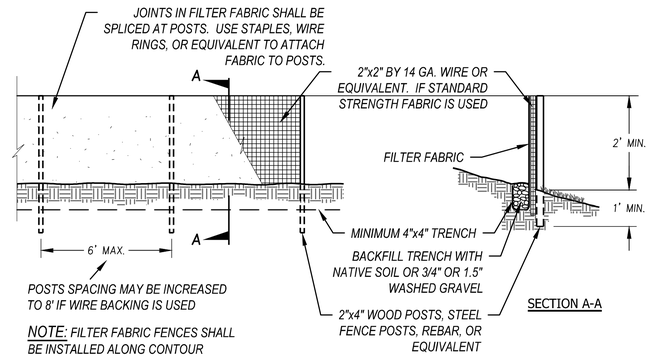
1. *CHAIN LINK FABRIC TO BE MIN. 11 GAUGE, GALVANIZED. NO RUSTED OR EXCESSIVELY MALFORMED FABRIC.*
2. *FENCE BASES SHALL BE CONCRETE AND OF SUFFICIENT WEIGHT AND/OR SPREAD TO ADEQUATELY SUPPORT EACH PANEL.*
3. *PANEL-TO-PANEL CONNECTIONS SHALL BE MADE AT A MINIMUM OF TWO LOCATIONS PER CONNECTION UNLESS OTHERWISE APPROVE*

PROVIDE OWNER WITH SHOP DRAWINGS DESCRIBING MATERIALS & METHODS FOR SECURE, PLUMB INSTALLATIONS ON SLOPED AREAS.

PROVIDE OWNER WITH SHOP DRAWINGS DESCRIBING MATERIALS & METHODS FOR GATES/ACCESS POINTS INSTALLATIONS.

1 / D1.1 Temporary Security Fencing

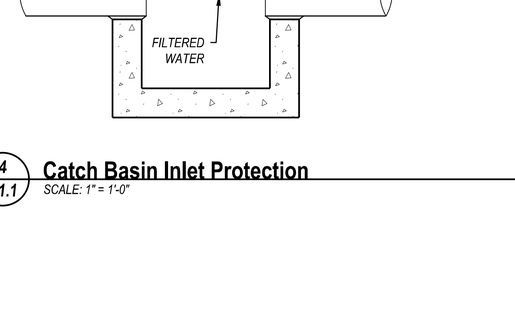
SCALE: 1" = 1'-0"



NOTE: FILTER FABRIC FENCES SHALL BE INSTALLED ALONG CONTOUR WHENEVER POSSIBLE.

2 / D1.1 Silt Fence

SCALE: NOT TO SCALE

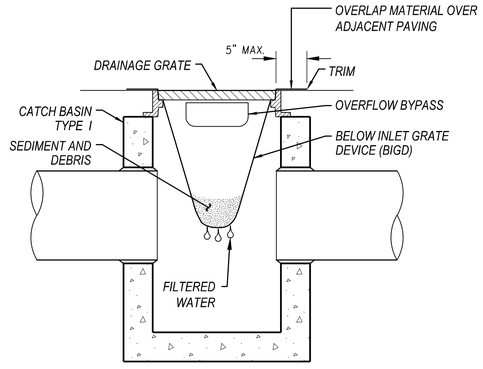


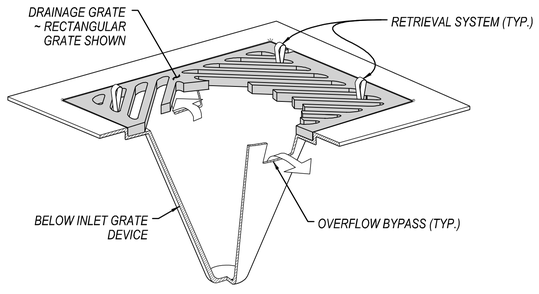
MAINTENANCE STANDARDS NOTES:

1. *CONTRACTOR IS RESPONSIBLE FOR MAINTAINING AND CLEANING THE APPROACH ON A REGULAR BASIS.*
2. *CONTRACTOR IS RESPONSIBLE FOR PROVIDING ADDITIONAL QUARRY SPALLS AS REQUIRED TO MAINTAIN PROPER FUNCTIONING OF THE ENTRANCE AS CONSTRUCTION PROGRESSES.*
3. *IF THE ENTRANCE 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 STREET SWEEPING, AN INCREASE IN THE DIMENSIONS OF THE ENTRANCE, OR THE INSTALLATION OF A WHEEL WASH. IF WASHING IS USED, IT SHALL BE DONE ON AN AREA COVERED WITH CRUSHED ROCK, AND WASH WATER SHALL DRAIN TO A SEDIMENT TRAP OR POND.*
4. *ANY SEDIMENT THAT IS TRACKED ONTO PAVEMENT SHALL BE REMOVED IMMEDIATELY BY SWEEPING. THE PAVEMENT SHALL NOT BE CLEANED BY WASHING DOWN THE STREET, EXCEPT WHEN 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 SHALL BE CONSIDERED. THE SEDIMENT WOULD THEN BE WASHED INTO THE SUMP.*
5. *ANY QUARRY SPALLS THAT ARE LOOSENED FROM THE PAD AND END UP ON THE ROADWAY SHALL BE REMOVED IMMEDIATELY.*
6. *IF VEHICLES ARE ENTERING OR EXITING THE SITE AT POINTS OTHER THAN THE CONSTRUCTION ENTRANCE, FENCING SHALL BE INSTALLED TO CONTROL TRAFFIC.*
7. *CONTRACTOR SHALL REMOVE STABILIZED CONSTRUCTION ENTRANCE.*

3 / D1.1 Stabilized Construction Entrance

SCALE: 1" = 1'-0"





INLET PROTECTION NOTE:

CONTRACTOR SHALL CLEAN-OUT ALL SEDIMENT AND DEBRIS UPON FINAL COMPLETION AND LEAVE THE INLET PROTECTION DEVICE IN PLACE.

INSTALLATION NOTES:

1. *SIZE THE BELOW INLET GRATE DEVICE (BIGD) FOR THE STORM WATER STRUCTURE IT WILL SERVICE.*
2. *THE BIGD SHALL HAVE A BUILT-IN HIGH-FLOW RELIEF SYSTEM (OVERFLOW BYPASS).*
3. *THE RETRIEVAL SYSTEM MUST ALLOW REMOVAL OF THE BIGD WITHOUT SPILLING THE COLLECTED MATERIAL.*
4. *PERFORM MAINTENANCE IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATION 8-01.3(15).*

4 / D1.1 Catch Basin Inlet Protection

SCALE: 1" = 1'-0"

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

Yelm High School
Yelm WA

RWD
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bob@rwdroll.com

STATE OF WASHINGTON · ROBERT W. DROLL · No. 4326 EXP. 12/09/2024 · LANDSCAPE ARCHITECT

PROJECT NO. 22041
DRAWING
DESIGNED BY BD
DRAWN BY JH
CHECKED BY BD

REVISION

DATE	CHANGE

DATE: 1/03/2023

PERMITTING SUBMITTAL

TESC DETAILS

D1.1

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NOT TO SCALE

811 Call 811 two business days before you dig

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

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Yelm WA

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DATE: 1/03/2023

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ON-SITE DISPOSAL AREA

D1.2

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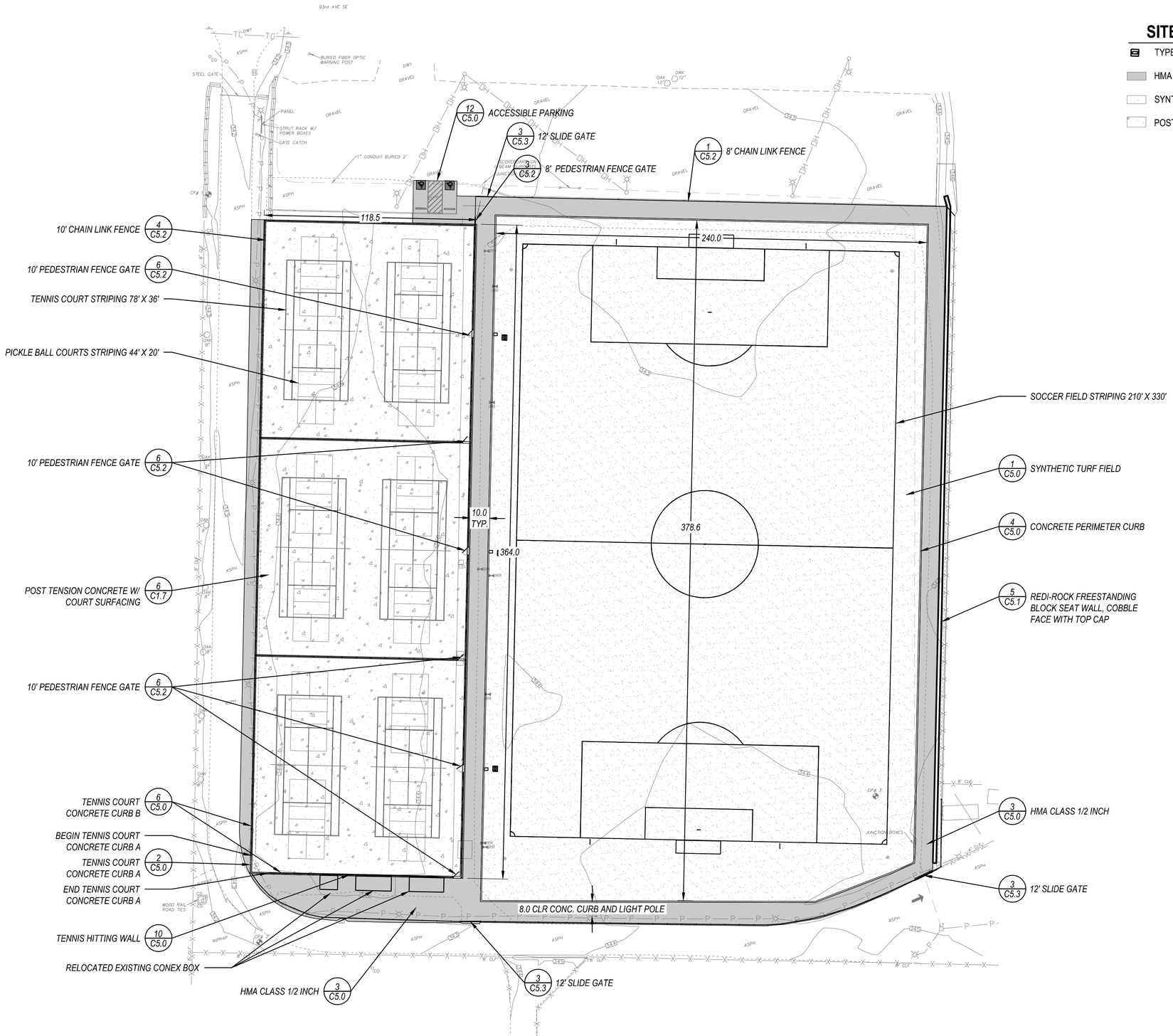

SITE PLAN LEGEND

- TYPE 1 CATCH BASIN
- HMA CLASS 1/2 INCH ± 18,820 SF
- SYNTHETIC TURF ± 90,300 SF
- POST TENSION CONCRETE W/ COURT SURFACING ± 42,000 SF

SCALE: 1"=30'

0 15' 30' 45' 60'

811 Call 811 two business days before you dig

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

Yelm High School
Yelm WA

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STATE OF WASHINGTON ROBERT W. DRAUL 20536 EXP. 12/09/2024 LANDSCAPE ARCHITECT

PROJECT NO. 22041
DRAWING
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REVISION

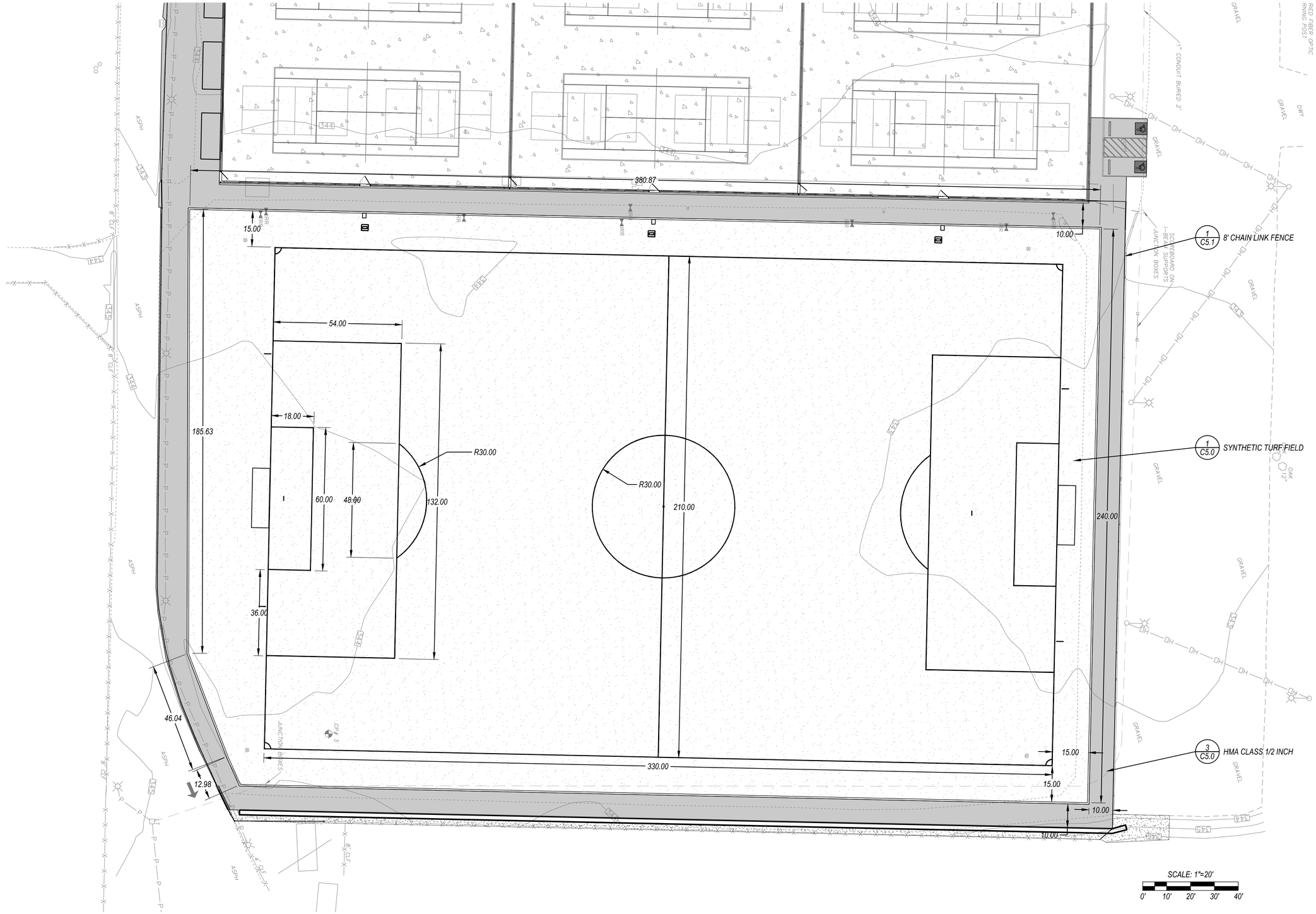
DATE	CHANGE

DATE: 1/03/2023

PERMITTING SUBMITTAL

SITE PLAN

C1.0



811 Call 811 two business days before you dig

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Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

Yelm High School
Yelm WA

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REVISION

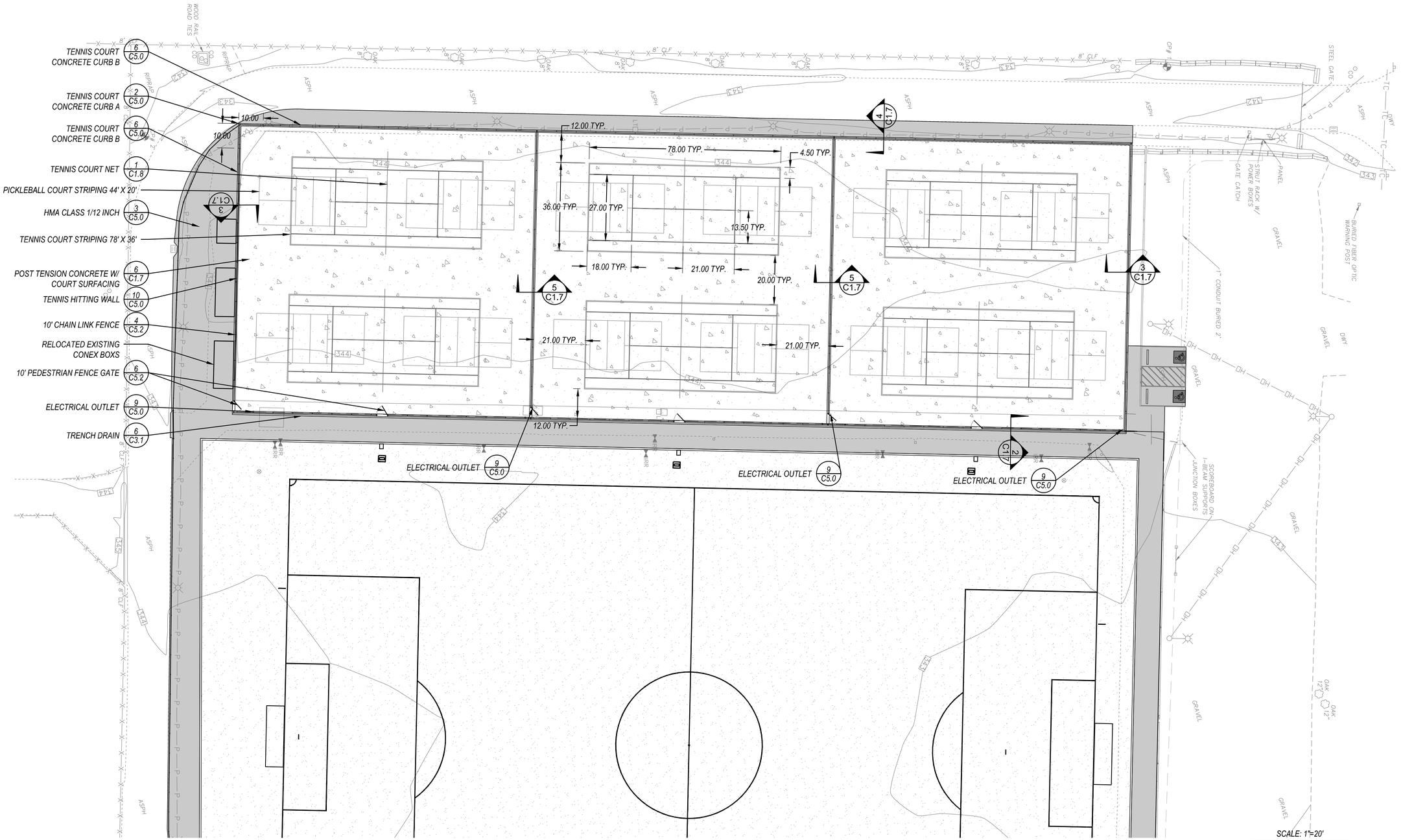
DATE	CHANGE

DATE: 1/03/2023

PERMITTING SUBMITTAL

SITE PLAN SOCCER FIELD ENLARGEMENT

C1.1



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Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

Yelm High School
Yelm WA

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360.456.3813
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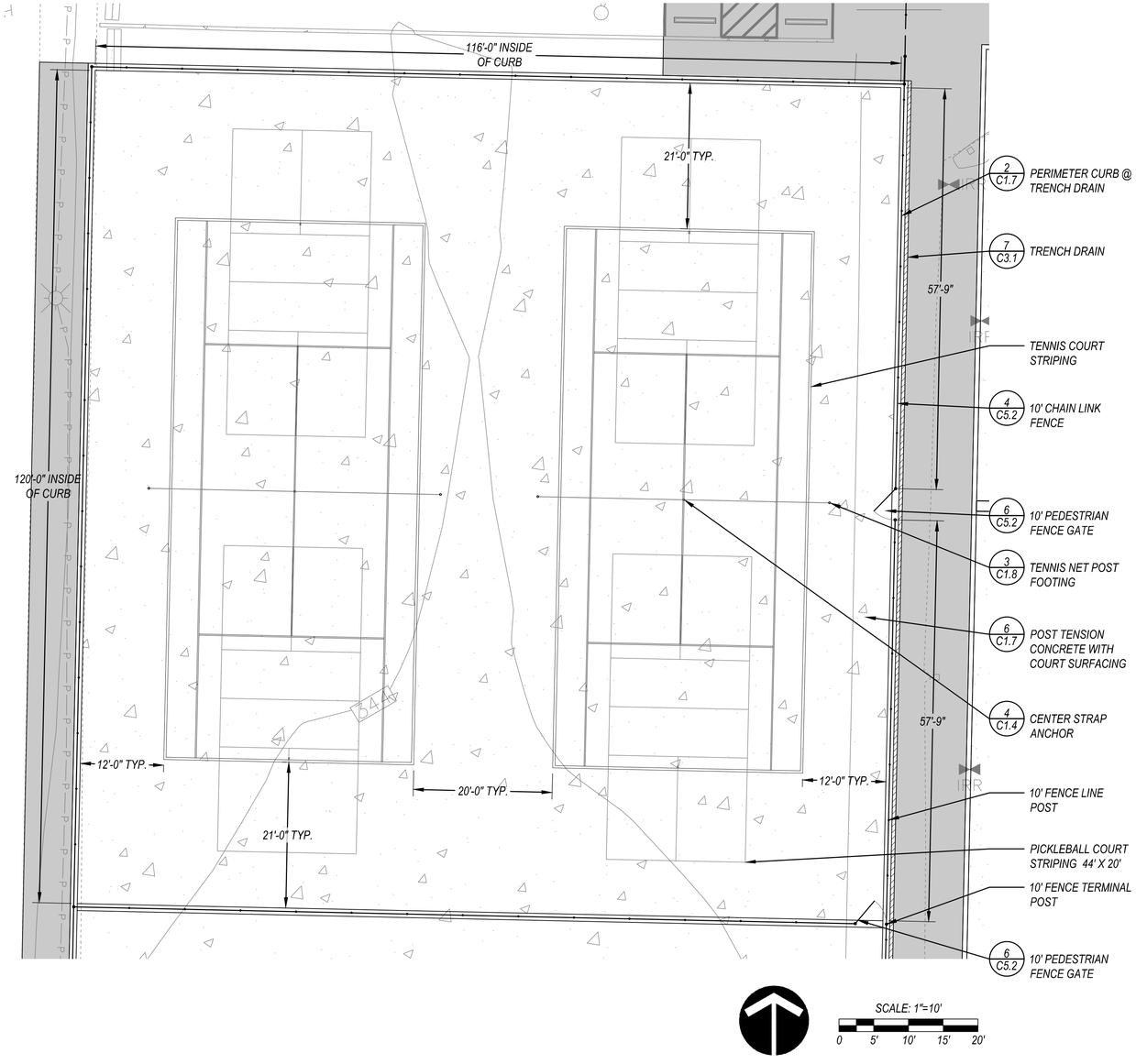
REVISION

DATE	CHANGE

DATE: 1/03/2023

SITE PLAN TENNIS COURT ENLARGEMENT

C1.2



SCALE: 1"=10'

0 5' 10' 15' 20'

NOTES

1. ALL DIMENSIONS ARE MEASURED FROM INSIDE OF CURB
2. *6" THICK POST TENSION CONCRETE SLAB SHALL BE PLACED OVER (2) LAYERS 6 MIL. POLYETHYLENE VAPOR BARRIER MEETING ASTM E1745 (TAPE ALL VAPORT BARRIER SEAMS AND LAY LAYERS PERPENDICULAR TO EACH OTHER) OVER 2" FINE SAND OVER 4" NO-FINES CRUSHED ROCK OVER NATIVE SOIL OR STRUCTURAL FILL SOIL.*

   CONTRACTOR SHALL REFERENCE ASBA RECOMMENDATIONS.

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

Yelm High School
Yelm WA

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4405 7th Ave. SE, Suite 203
Lacey, WA 98503
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DATE: 1/03/2023

PERMITTING SUBMITTAL

DUAL TENNIS COURT CELL

C1.4

811 Call 811 two business days before you dig

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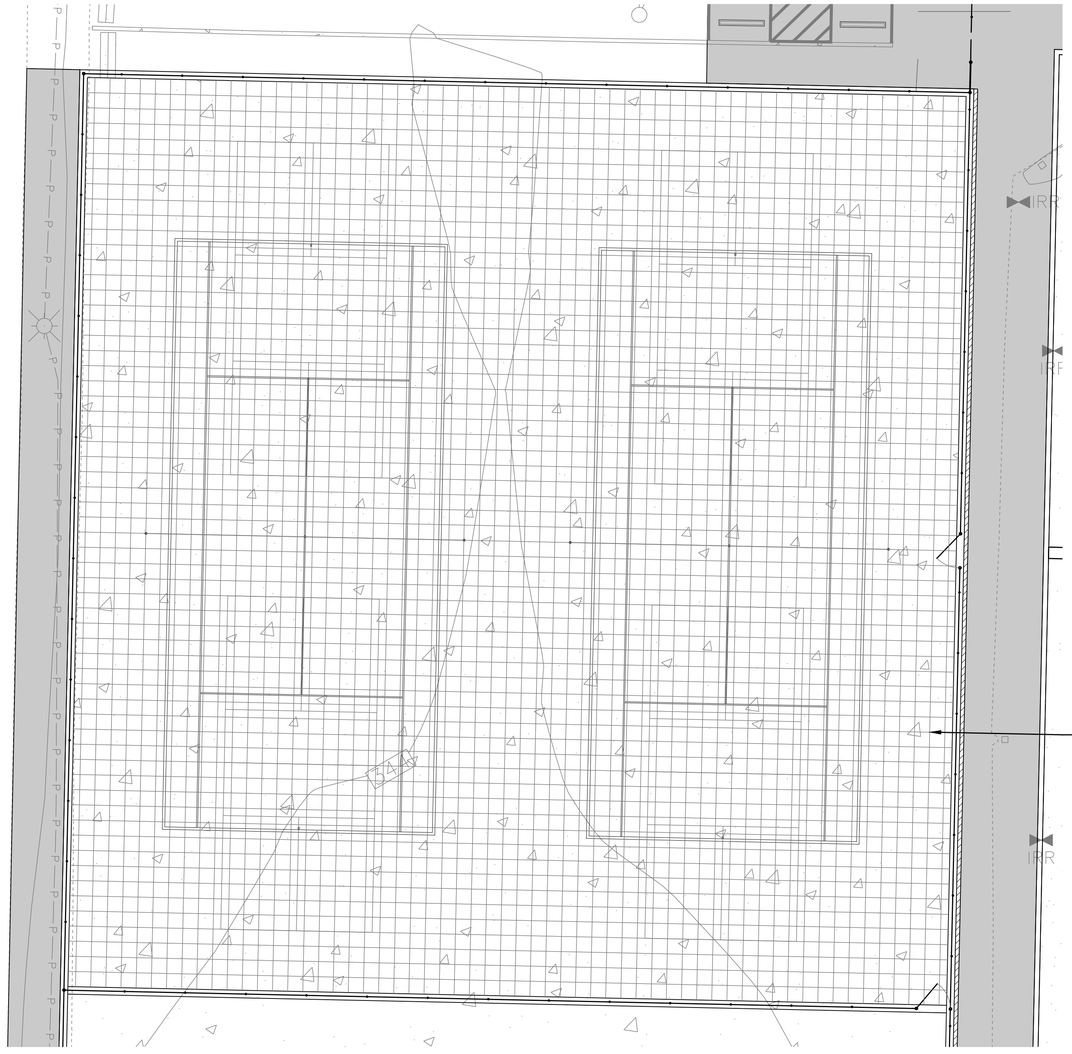

SCALE: 1"=10'

0 5' 10' 15' 20'

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

Yelm High School
Yelm WA

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STATE OF WASHINGTON
ROBERT W. DROLL
LAND 532 EXP. 12/09/2024
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DUAL TENNIS COURT REBAR PLAN

C1.5

811 Call 811 two business days before you dig

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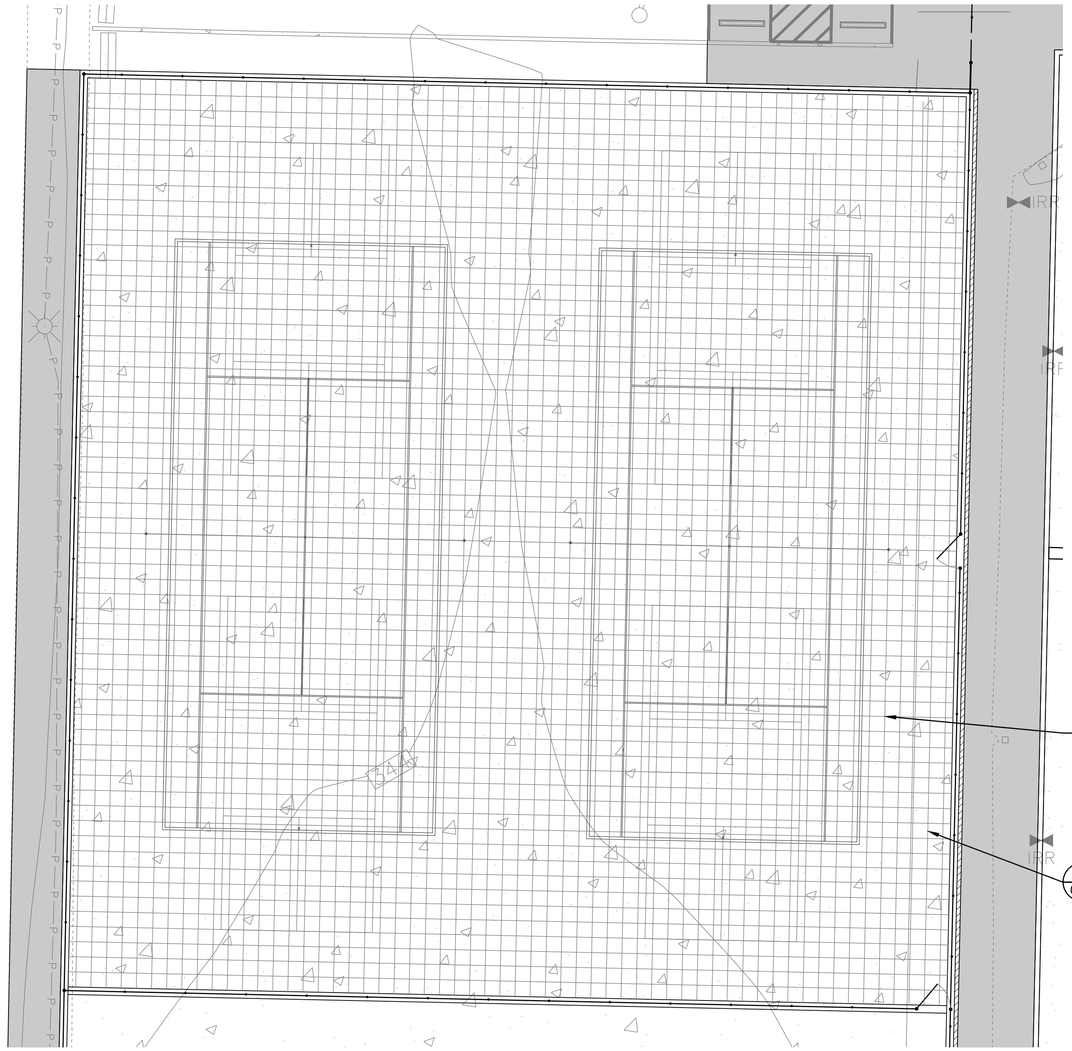
Jan-03-23 11:24am



SCALE: 1"=10'

0 5' 10' 15' 20'

SCALE: 1"=20'

0' 10' 20' 30' 40'

811 Call 811 two business days before you dig

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

Yelm High School
Yelm WA

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ROBERT W. DROLL
LANDSCAPE ARCHITECT
CERTIFIED EXP. 12/09/2024

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DUAL TENNIS COURT TENDON PLAN

C1.6

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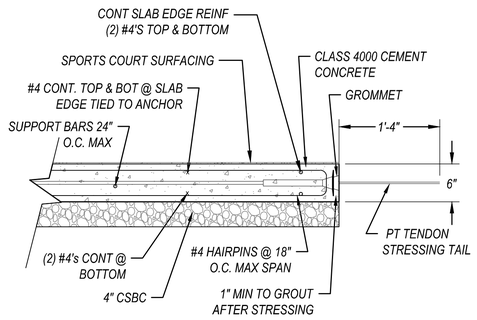
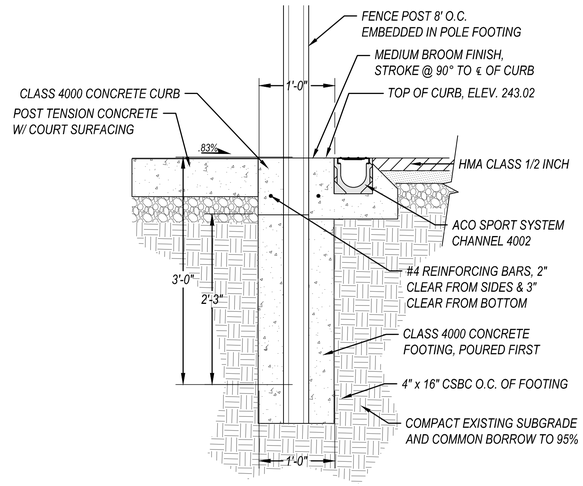


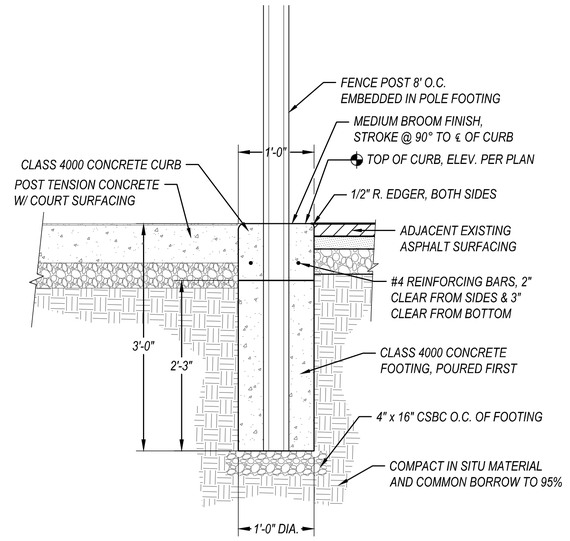
1 / C1.7 Single Tendon Anchor Detail

SCALE: 1" = 1'-0"



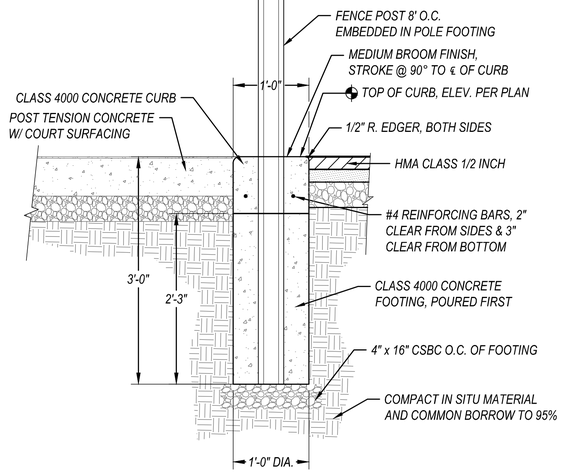
2 / C1.7 Perimeter Curb @ Trench Drain

SCALE: 1" = 1'-0"



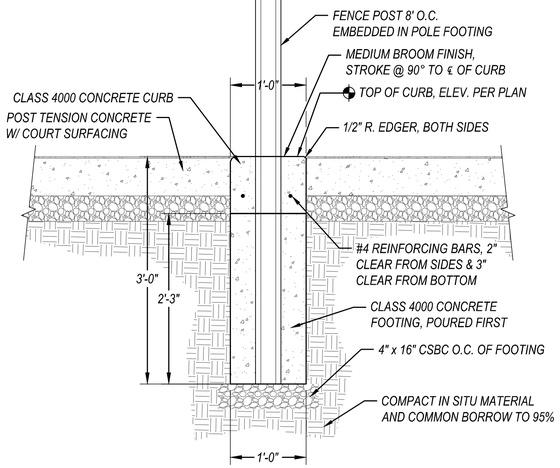
3 / C1.7 Perimeter Curb @ Ex. Asphalt

SCALE: 1 1/2" = 1'-0"



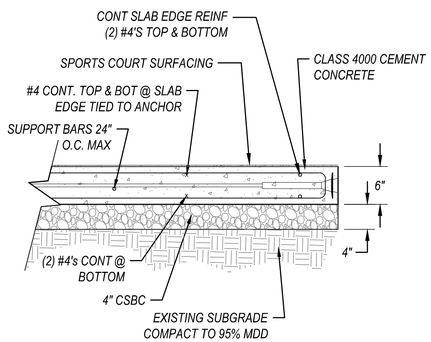
4 / C1.7 Perimeter Curb @ HMA Class 1/2 Inch

SCALE: 1" = 1'-0"



5 / C1.7 Dual Court Separation Curb

SCALE: 1" = 1'-0"



6 / C1.7 Post Tension Concrete with Court Surfacing

SCALE: 1" = 1'-0"

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Jan-03-23 11:42am

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

Yelm High School
Yelm WA

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ROBERT W. DROLL
LANDSCAPE ARCHITECT
No. 539 EXP. 12/09/2024

PROJECT NO. 22041
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DESIGNED BY BD
DRAWN BY JH
CHECKED BY BD

REVISION

DATE	CHANGE

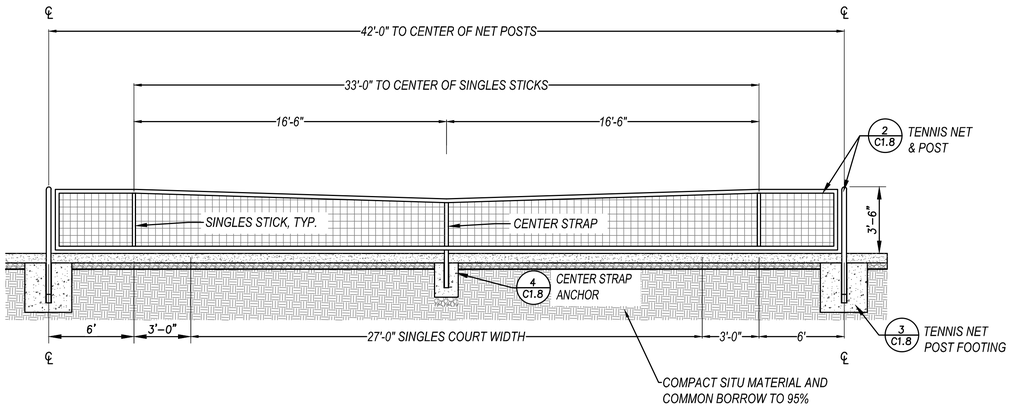
DATE: 1/03/2023

PERMITTING SUBMITTAL

POST TENSION CONCRETE COURT DETAILS

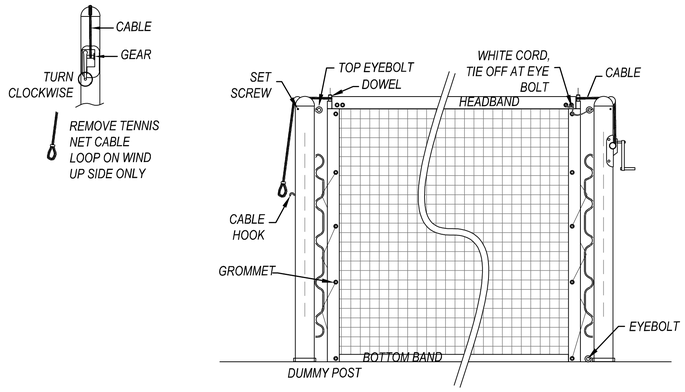
C1.7

811 Call 811 two business days before you dig



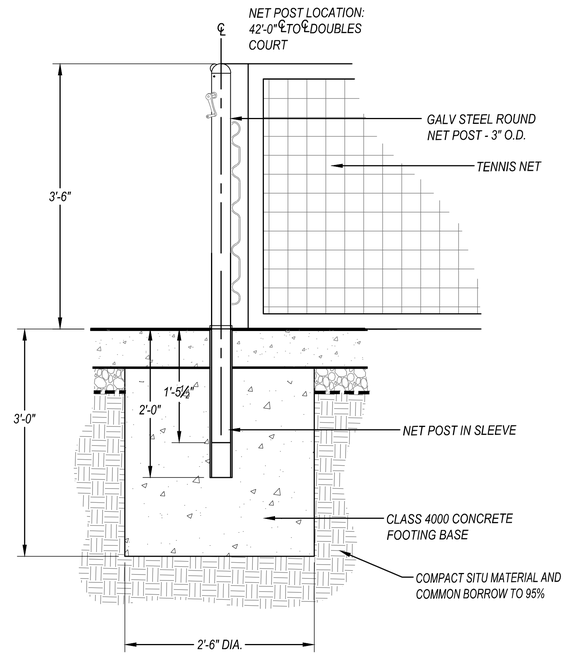
1 C1.8 Net Section

SCALE: 1/4" = 1'-0"



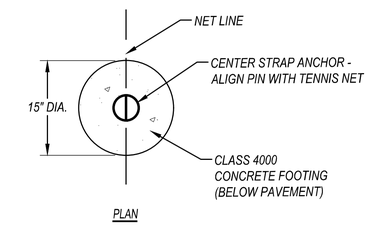
2 C1.8 Tennis Net & Post

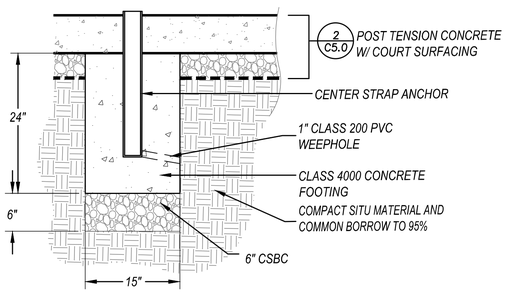
SCALE: 1" = 1'-0"



3 C1.8 Tennis Net Post Footing

SCALE: 1" = 1'-0"





4 C1.8 Center Strap Anchor

SCALE: 1" = 1'-0"

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

Yelm High School
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PROJECT NO. 22041
DRAWING
DESIGNED BY BD
DRAWN BY JH
CHECKED BY BD

REVISION

DATE	CHANGE

DATE: 1/03/2023

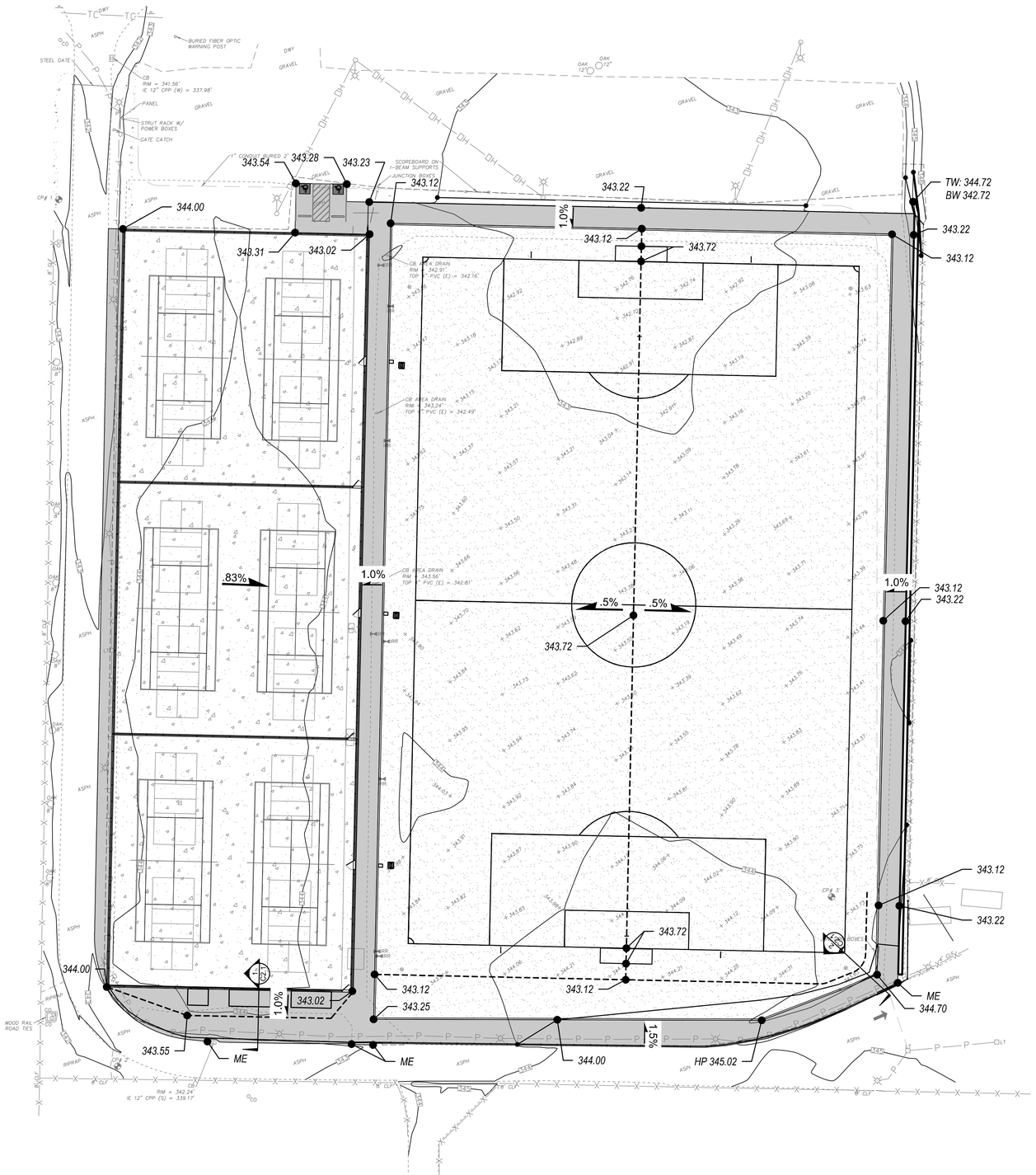
PERMITTING SUBMITTAL

TENNIS COURT DETAILS

C1.8

811 Call 811 two business days before you dig

O:\2022\22041 Yelm HS Soccer Tennis Courts\Drawings\Sheets\Duel Tennis Court.dwg
Jan-03-23 11:25am



GRADING LEGEND

XXX	PROPOSED INTERMEDIATE CONTOUR
XXX	PROPOSED INDEX CONTOUR
	GRADE BREAK
	DIRECTION OF SLOPE
XXX.XX	FINISH GRADE ELEVATION
EX	EXISTING GRADE
RE	RIM ELEVATION
ME	MEET EXISTING
TW	TOP OF WALL
BW	BOTTOM OF WALL
TR	TOP OF RAMP
BR	BOTTOM OF RAMP
	LIMIT OF WORK

SCALE: 1"=30'

0 15' 30' 45' 60'

811 Call 811 two business days before you dig

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REVISION

DATE	CHANGE

DATE: 1/03/2023

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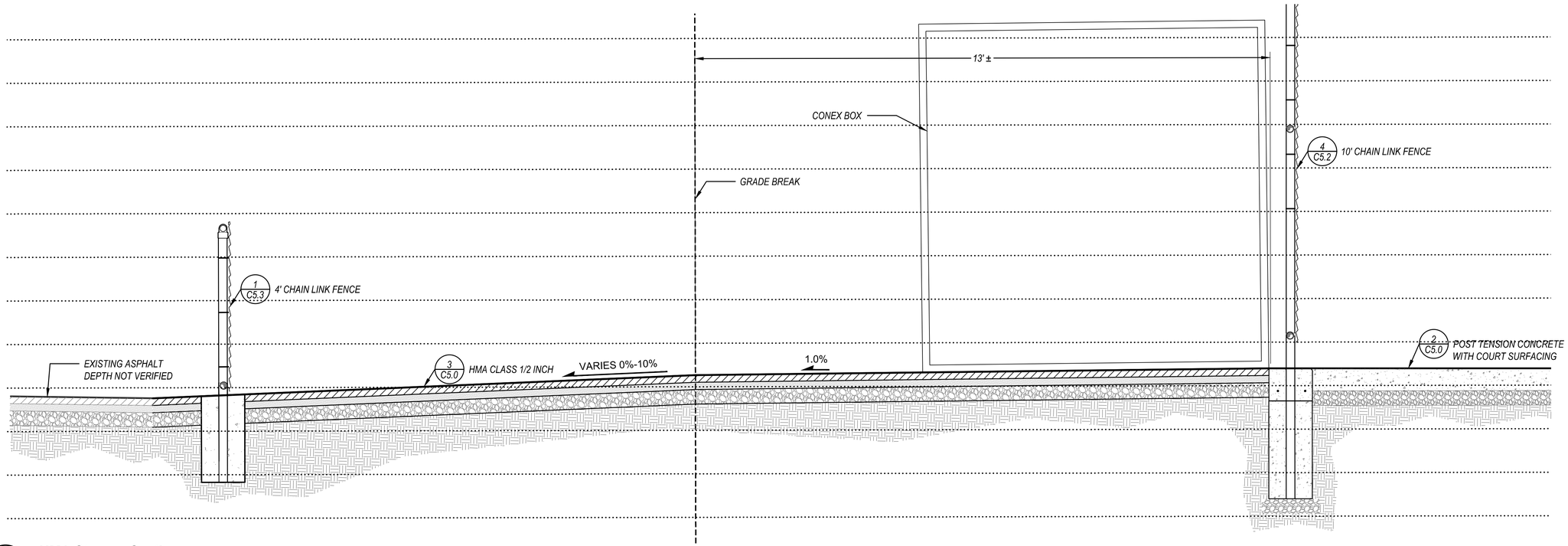
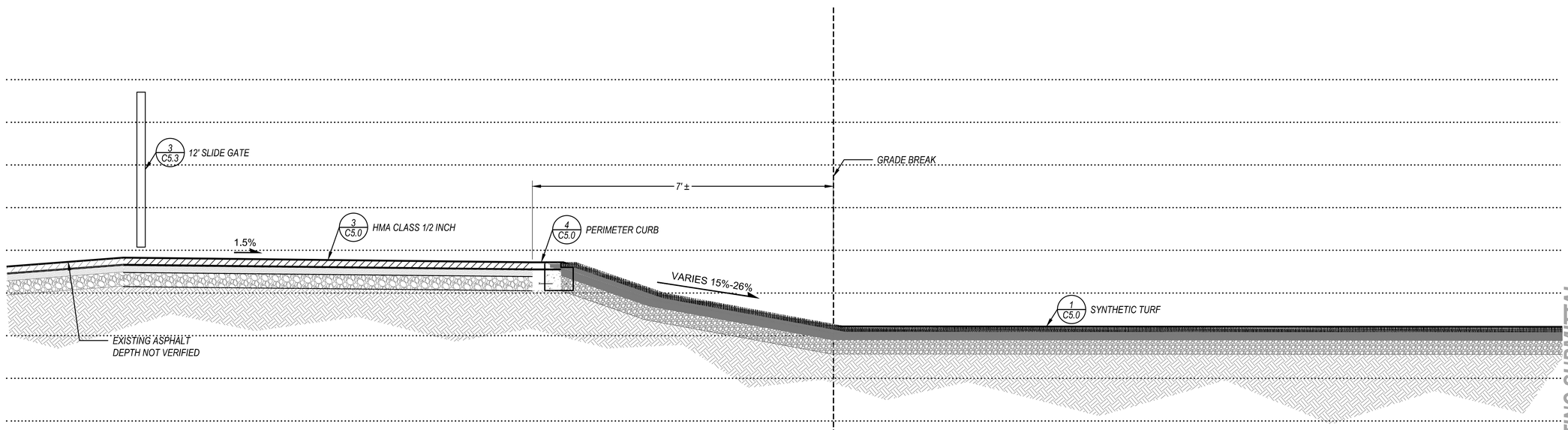
GRADING PLAN

C2.0



1 / C2.1 HMA Storage Section

SCALE: 3/4" = 1'-0"



2 / 2.1 Synthetic Turf Field End Section

SCALE: 3/4" = 1'-0"

811 Call 811 two business days before you dig

PERMITTING SUBMITTAL

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

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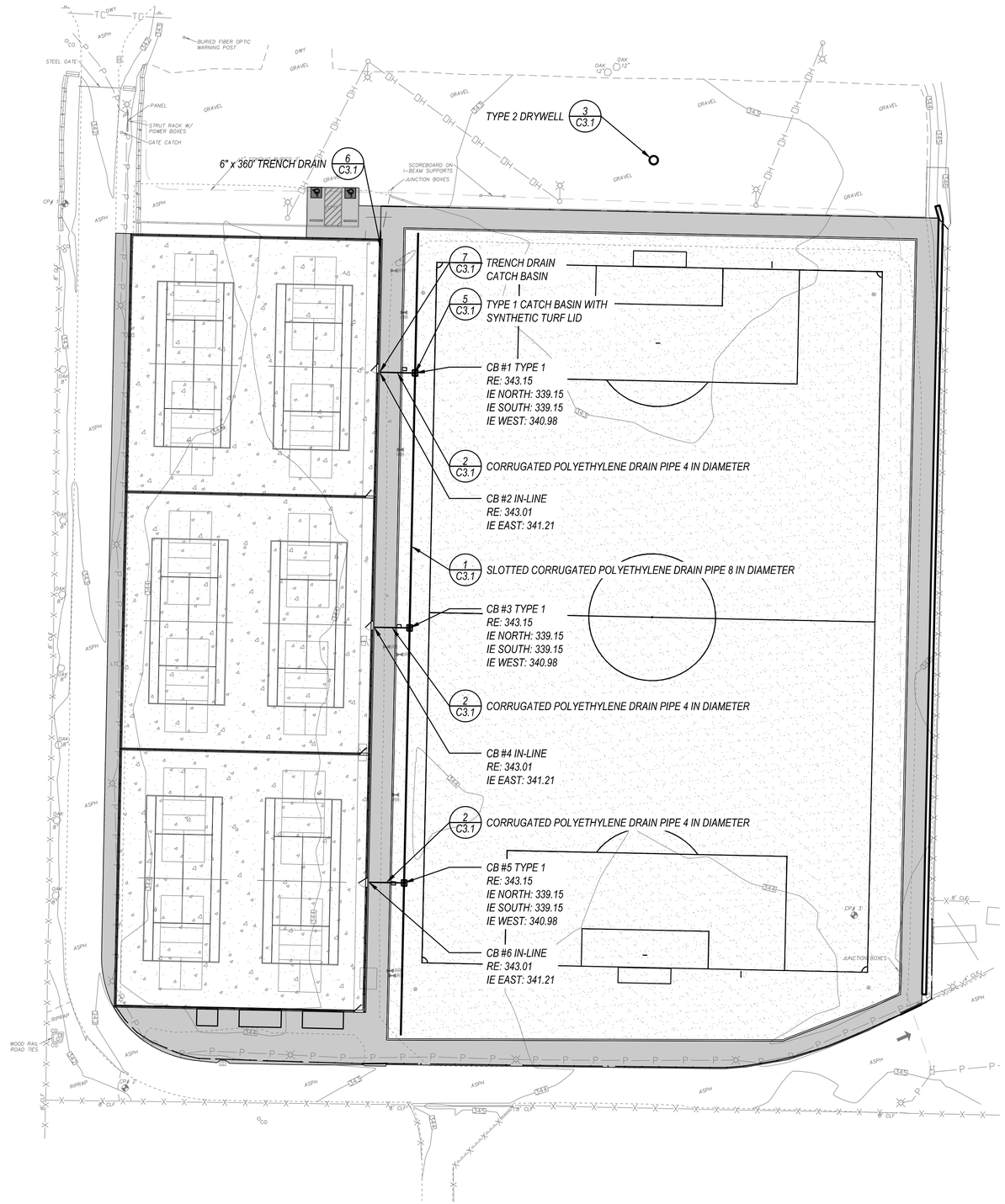
REVISION

DATE	CHANGE

DATE: 1/03/2023

GRADING SECTIONS

C2.1



DRAINAGE PLAN LEGEND

- SLOTTED CORRUGATED POLYETHYLENE DRAIN PIPE 8 IN. DIA.
- TRENCH DRAIN
- CORRUGATED POLYETHYLENE DRAIN PIPE 4 IN DIAMETER
- TYPE 1 CATCH BASIN WITH SYNTHETIC TURF LID
- TYPE 2 DRYWELL

SCALE: 1"=30'

0 15' 30' 45' 60'

811 Call 811 two business days before you dig

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

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ROBERT W. DAHL
No. 5397 EXP. 12/09/2024
LANDSCAPE ARCHITECT

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DATE	CHANGE

DATE: 1/03/2023

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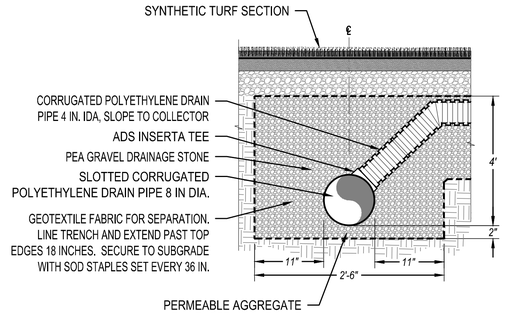
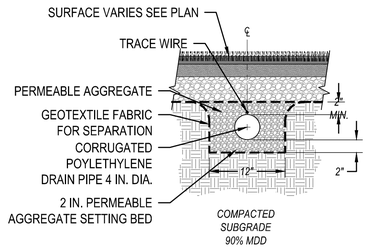
DRAINAGE PLAN

C3.0



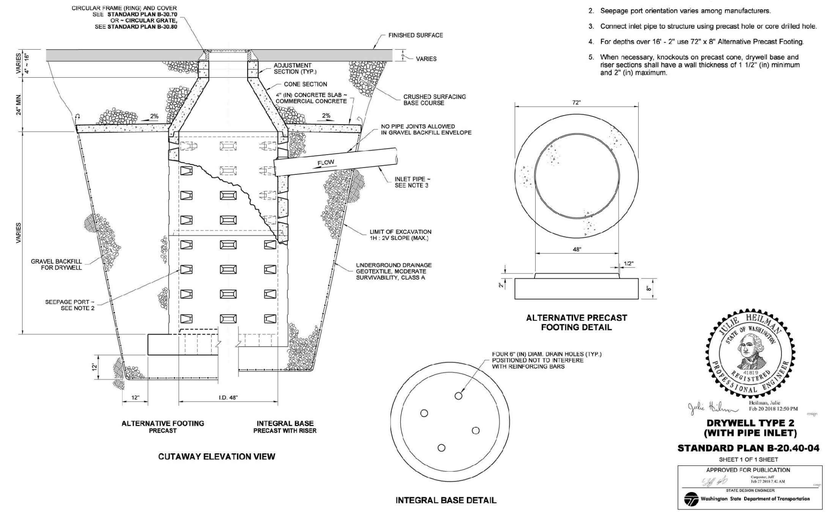
1 C3.1 Slotted Corrugated Polyethylene Drain Pipe 8 In. Dia.

SCALE: 1" = 1'-0"



2 C3.1 Corrugated Polyethylene Drain Pipe 4 In. Dia.

SCALE: 1" = 1'-0"



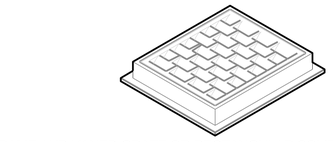
NOTES

1. Precast concrete cone sections may be eccentric or concentric.
2. Seepage port orientation varies among manufacturers.
3. Connect inlet pipe to structure using precast hole or core drilled hole.
4. For depths over 16' - 2" use 72" x 8" Alternative Precast Footing.
5. When necessary, knockouts on precast cone, drywell base and riser sections shall have a wall thickness of 1 1/2" (in) minimum and 2" (in) maximum.

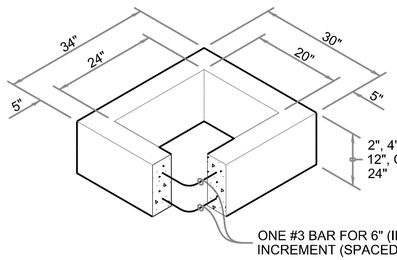
3 C3.1 Type 2 Drywell

SCALE: 1" = 1'-0"

DRYWELL TYPE 2 (WITH PIPE INLET)
STANDARD PLAN B-20.40-04
SHEET 1 OF 1 SHEET
APPROVED FOR PUBLICATION
Engineer, WSP
Feb 27,2015 7:41 AM
STATE DESIGN ENGINEER
Washington State Department of Transportation



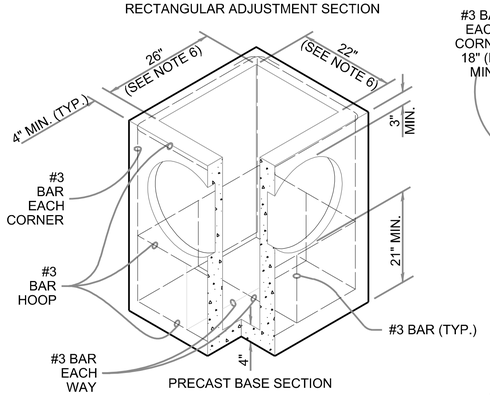
FRAME AND VANED GRATE OR RECTANGULAR SOLID CAST IRON COVER



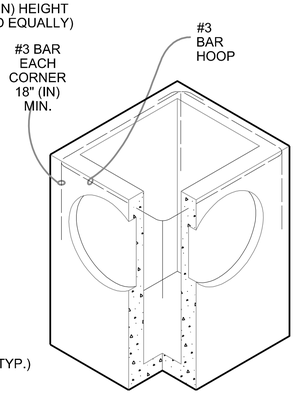
RECTANGULAR ADJUSTMENT SECTION

PIPE ALLOWANCES	
PIPE MATERIAL	MAXIMUM INSIDE DIAMETER (INCHES)
REINFORCED OR PLAIN CONCRETE	12"
ALL METAL PIPE	15"
CPSSP **(STD. SPEC. SECT. 9-05.20)**	12"
SOLID WALL PVC **(STD. SPEC. SECT. 9-05.12(1))**	15"
PROFILE WALL PVC **(STD. SPEC. SECT. 9-05.12(2))**	15"

* CORRUGATED POLYETHYLENE STORM SEWER PIPE



PRECAST BASE SECTION



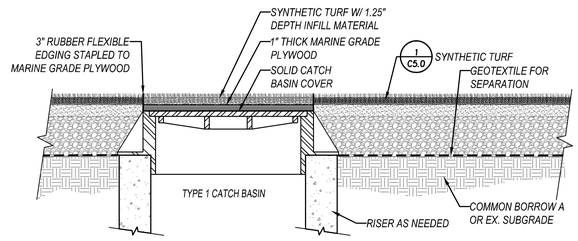
ALTERNATIVE PRECAST BASE SECTION

NOTES

1. AS ACCEPTABLE ALTERNATIVES TO THE REBAR SHOWN IN THE **PRECAST BASE SECTION**, FIBERS (PLACED ACCORDING TO THE STANDARD SPECIFICATIONS), OR WIRE MESH HAVING A MINIMUM AREA OF 0.12 SQUARE INCHES PER FOOT SHALL BE USED WITH THE MINIMUM REQUIRED REBAR SHOWN IN THE **ALTERNATIVE PRECAST BASE SECTION**. WIRE MESH SHALL NOT BE PLACED IN THE KNOCKOUTS.
2. THE KNOCKOUT DIAMETER SHALL NOT BE GREATER THAN 20" (IN). KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" (IN) MINIMUM TO 2.5" (IN) MAXIMUM. PROVIDE A 1.5" (IN) MINIMUM GAP BETWEEN THE KNOCKOUT WALL AND THE OUTSIDE OF THE PIPE. AFTER THE PIPE IS INSTALLED, FILL THE GAP WITH JOINT MORTAR IN ACCORDANCE WITH **STANDARD SPECIFICATION SECTION 9-04.3**.
3. THE MAXIMUM DEPTH FROM THE FINISHED GRADE TO THE LOWEST PIPE INVERT SHALL BE 5' (FT).
4. THE FRAME AND GRATE MAY BE INSTALLED WITH THE FLANGE DOWN, OR INTEGRALLY CAST INTO THE ADJUSTMENT SECTION WITH FLANGE UP.
5. THE PRECAST BASE SECTION MAY HAVE A ROUNDED FLOOR, AND THE WALLS MAY BE SLOPED AT A RATE OF 1 : 24 OR STEEPER.
6. THE OPENING SHALL BE MEASURED AT THE TOP OF THE **PRECAST BASE SECTION**.
7. ALL PICKUP HOLES SHALL BE GROUTED FULL AFTER THE BASIN HAS BEEN PLACED.

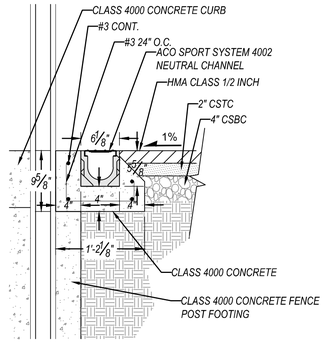
4 C3.1 Type 1 Catch Basin

SCALE: 1 1/2" = 1'-0"



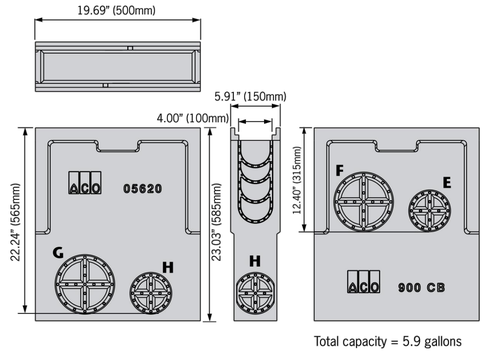
5 C3.1 Type 1 Catch Basin with Synthetic Turf Lid

SCALE: 1" = 1'-0"



6 C3.1 Trench Drain

SCALE: 1" = 1'-0"



Total capacity = 5.9 gallons

7 C3.1 Trench Drain Catch Basin

SCALE: NOT TO SCALE

PERMITTING SUBMITTAL

0:\2022\22041 Yelm HS Soccer Tennis Courts\Drawings\Sheets\Site Details.dwg
Jan-03-23 4:35pm

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

Yelm High School
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STATE OF WASHINGTON ROBERT W. DRAA LANDSCAPE ARCHITECT NO. 22041 EXP. 12/09/2024

PROJECT NO. 22041
DRAWING
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CHECKED BY BD

REVISION

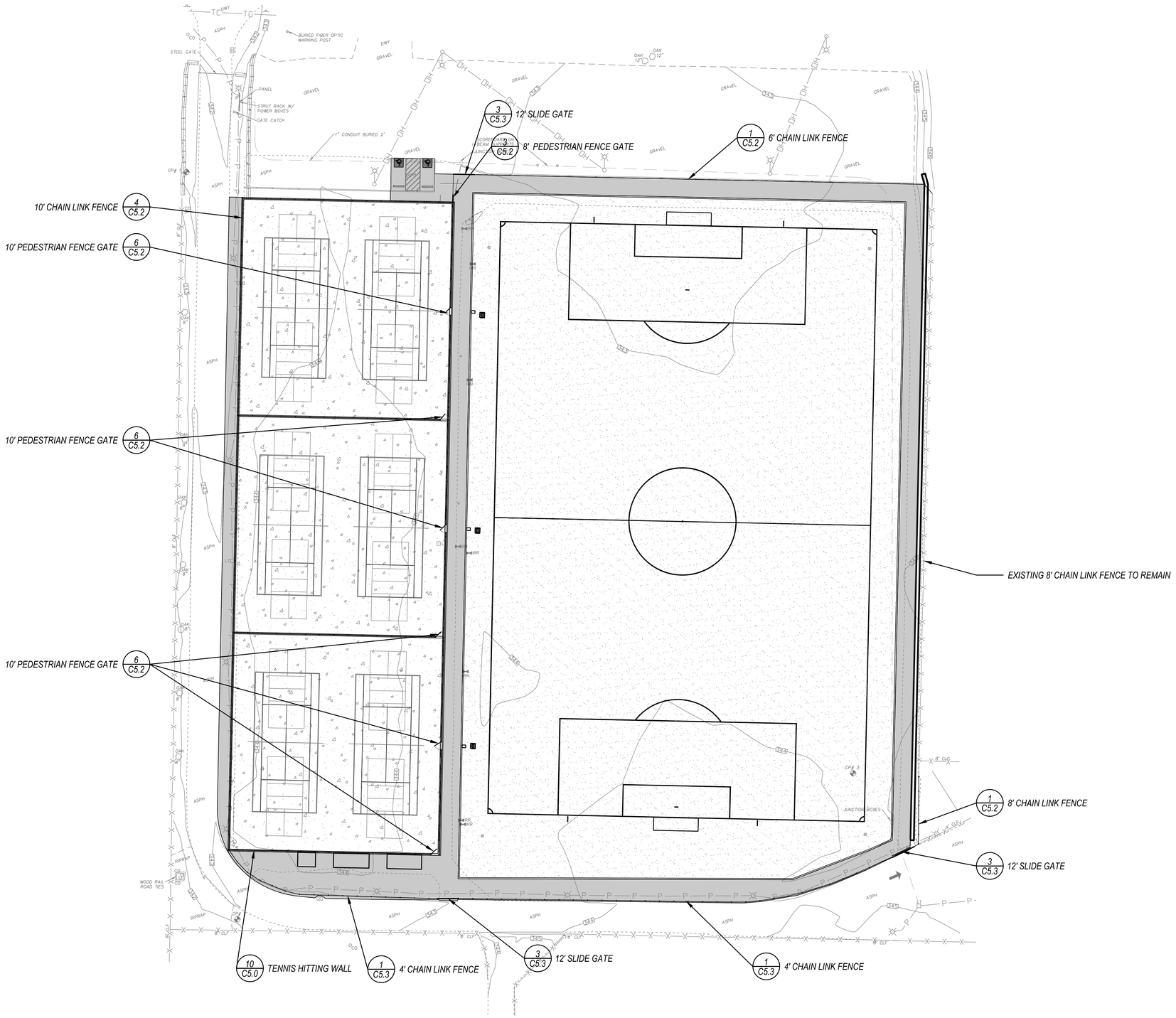
DATE	CHANGE

DATE: 1/03/2023

DRAINAGE DETAILS

C3.1

Sheet ____ of ____



SCALE: 1"=30'

0 15' 30' 45' 60'

811 Call 811 two business days before you dig

O:\2022\22041 Yelm HS Soccer Tennis Courts\Drawings\Sheets\Fencing Plan.dwg
Jan-03-23 11:26am

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STATE OF WASHINGTON
ROBERT W. DROLL
No. 5397 EXP. 12/09/2024
LANDSCAPE ARCHITECT

PROJECT NO. 22041
DRAWING
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CHECKED BY BD

REVISION

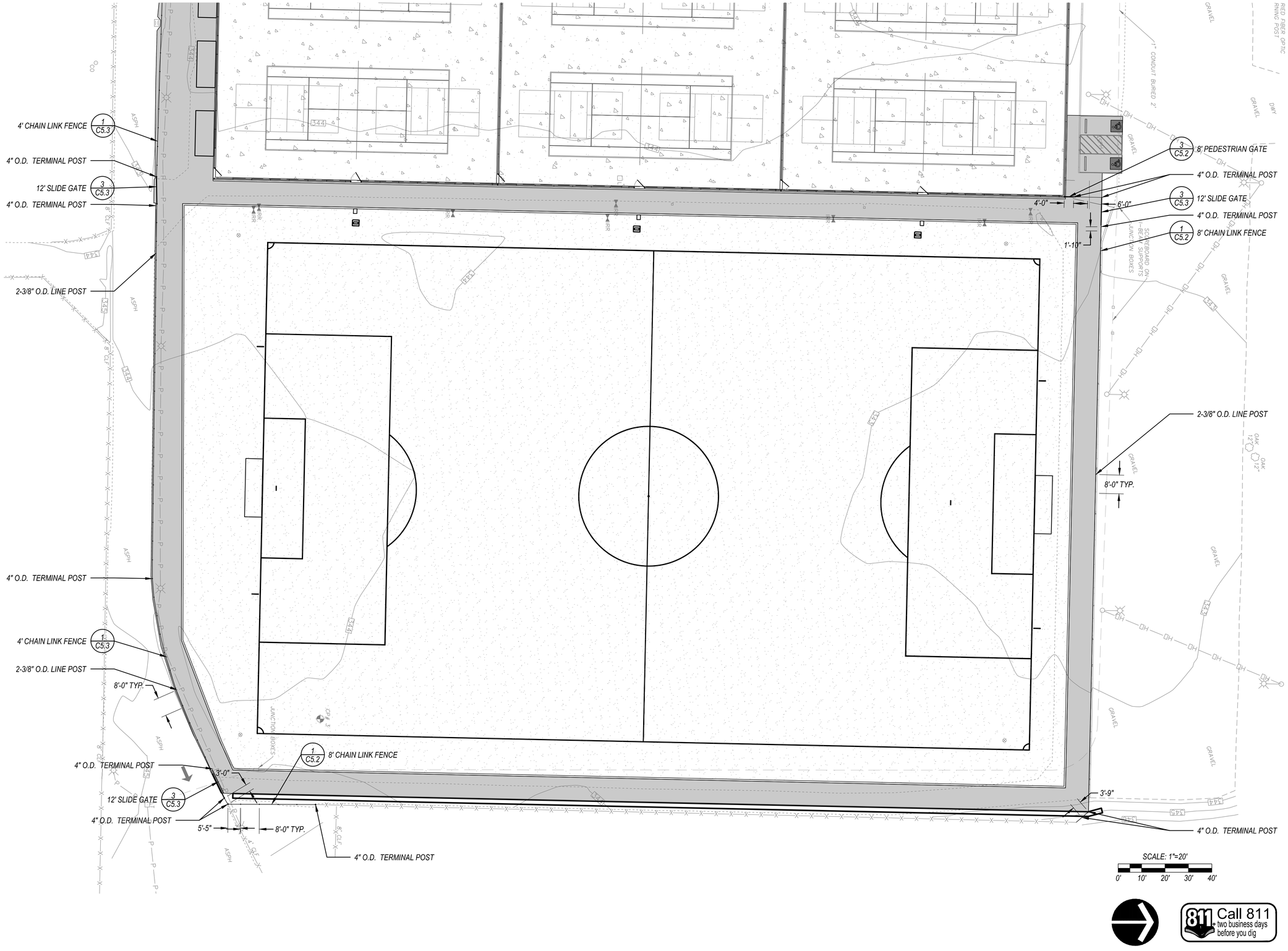
DATE	CHANGE

DATE: 1/03/2023

PERMITTING SUBMITTAL

FENCING PLAN

C4.0



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STATE OF WASHINGTON
ROBERT W. DRAVIS
No. 530 EXP. 12/09/2024
LANDSCAPE ARCHITECT

PROJECT NO. 22041
DRAWING
DESIGNED BY BD
DRAWN BY JH
CHECKED BY BD

REVISION

DATE	CHANGE

DATE: 1/03/2023

PERMITTING SUBMITTAL

SOCCER FIELD FENCING PLAN ENLARGEMENT

C4.1

Call 811 two business days before you dig

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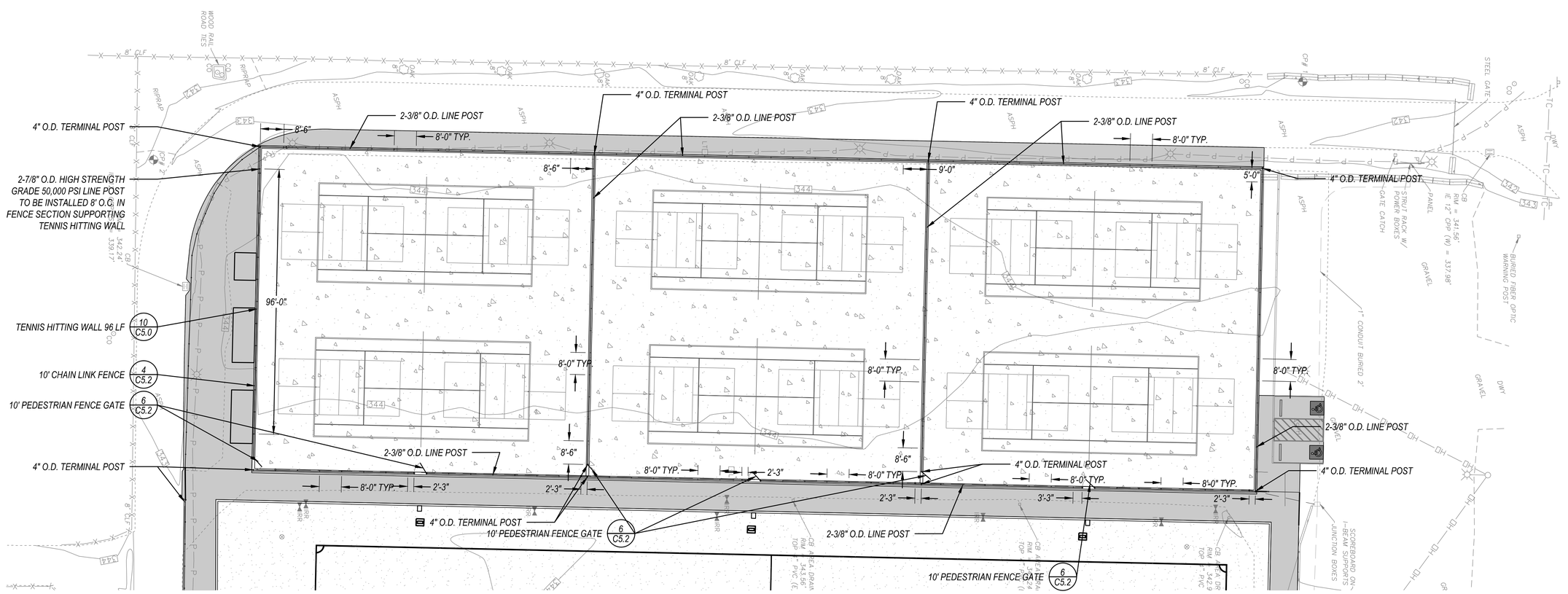

SCALE: 1"=20'

0' 10' 20' 30' 40'

811 Call 811 two business days before you dig

0:\2022\22041 Yelm HS Soccer Tennis Courts\Drawings\Sheets\Fencing Plan.dwg
Jan-03-23 4:06pm

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

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NO. 930 EXP. 12/09/2024
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REVISION

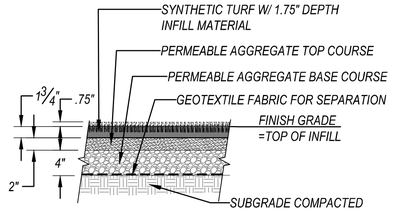
DATE	CHANGE

DATE: 1/03/2023

PERMITTING SUBMITTAL

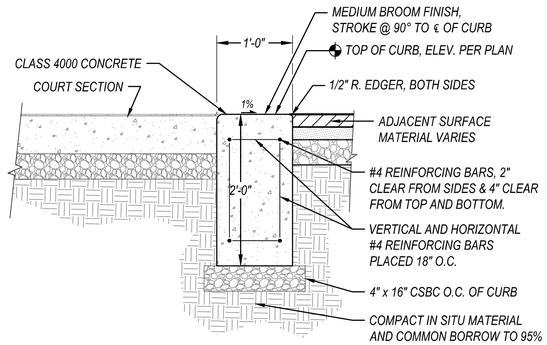
TENNIS COURT FENCING PLAN ENLARGEMENT

C4.2



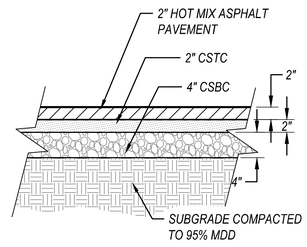
1 C5.0 Synthetic Turf

SCALE: 1" = 1'-0"



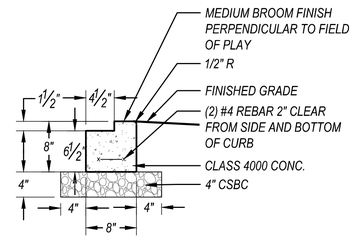
2 C5.0 Tennis Court Concrete Curb A

SCALE: 1" = 1'-0"



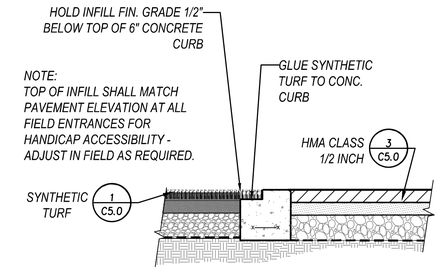
3 C5.0 HMA Class 1/2 Inch

SCALE: 1 1/2" = 1'-0"



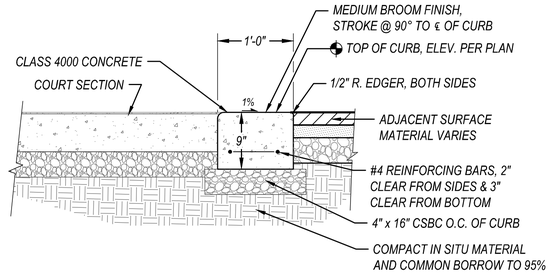
4 C5.0 Concrete Perimeter Curb

SCALE: 1" = 1'-0"



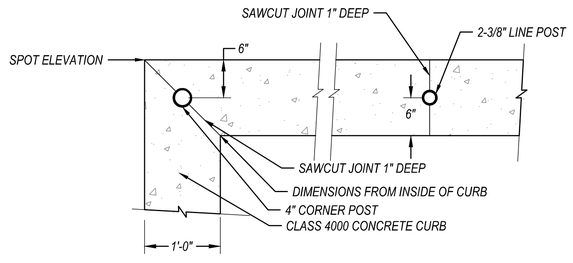
5 C5.0 Synthetic Turf @ Concrete Curb

SCALE: 1" = 1'-0"



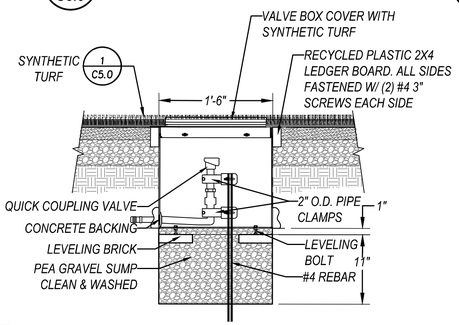
6 C5.0 Tennis Court Concrete Curb B

SCALE: 1" = 1'-0"



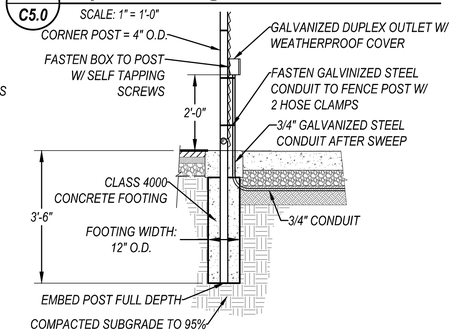
7 C5.0 Curb Scoring Plan

SCALE: 1" = 1'-0"



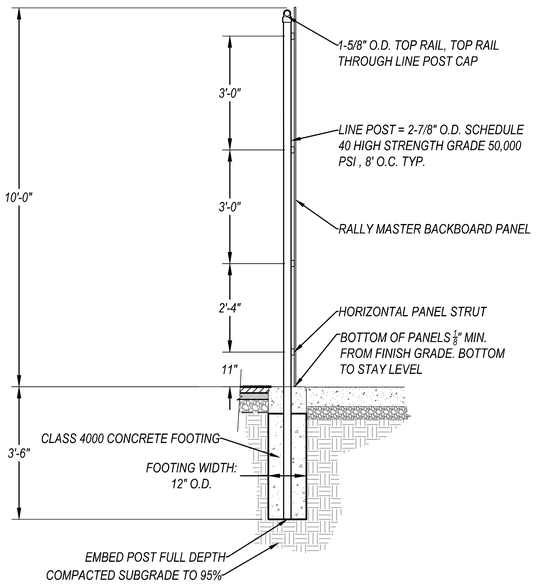
8 C5.0 Quick Coupling Valve with Synthetic Turf Lid

SCALE: 1" = 1'-0"



9 C5.0 Electrical Outlet

SCALE: 1" = 1'-0"



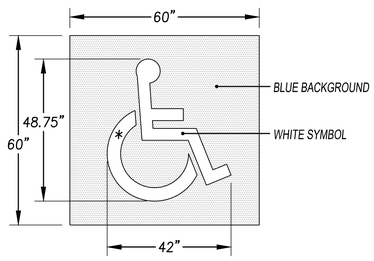
10 C5.0 Tennis Hitting Wall

SCALE: 1/2" = 1'-0"

NOTE:

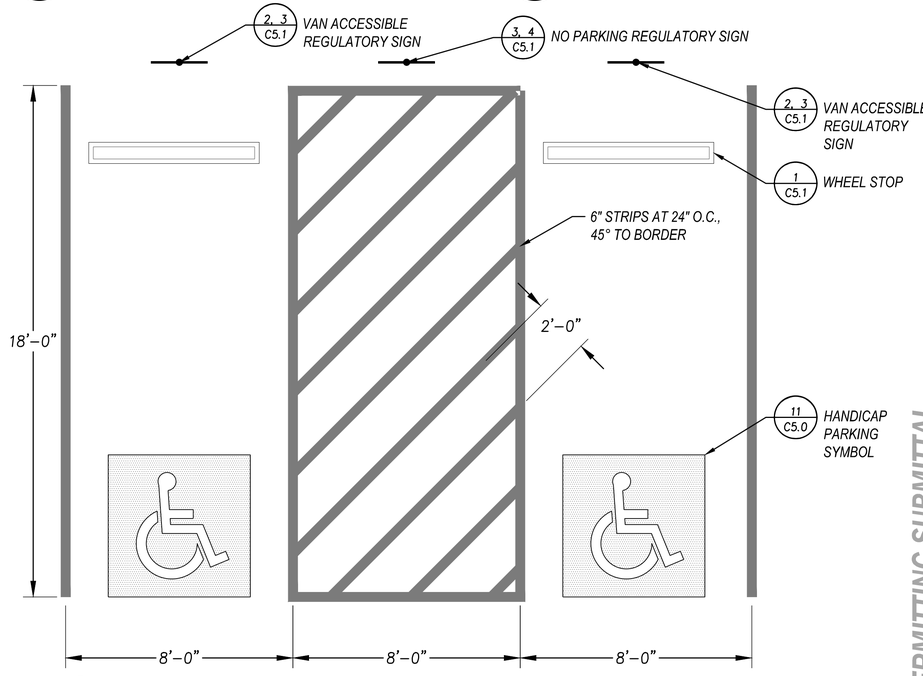
1. 60" x 60" BLUE BACKGROUND. BLUE SHALL BE IN ACCORDANCE WITH MUTCD/FEDERAL SPECIFICATIONS. (COLUMBIA PAINT 17-123-21 INSTANT DRY ACRYLIC TRAFFIC PAINT "HANDICAP BLUE" OR EQUIVALENT)
2. 42" x 48.75" SYMBOL OF ACCESSIBILITY SHALL BE WHITE.

* SEE STATE FABRICATION MANUAL APPENDIX D-12



11 C5.0 Handicap Parking Symbol

SCALE: 1/2" = 1'-0"



12 C5.0 Accessible Parking

SCALE: 3/8" = 1'-0"

PERMITTING SUBMITTAL

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

Yelm High School
Yelm WA

RWD
Landscape Architects
4405 7th Ave. SE, Suite 203
Lacey, WA 98503
360.456.3813
bob@rwdroll.com

STATE OF WASHINGTON · ROBERT W. DROLL · 20538 · EXP. 12/09/2024 · LANDSCAPE ARCHITECT

PROJECT NO. 22041
DRAWING
DESIGNED BY BD
DRAWN BY JH
CHECKED BY BD

REVISION

DATE	CHANGE

DATE: 1/03/2023

SITE DETAILS

C5.0

Sheet ____ of ____

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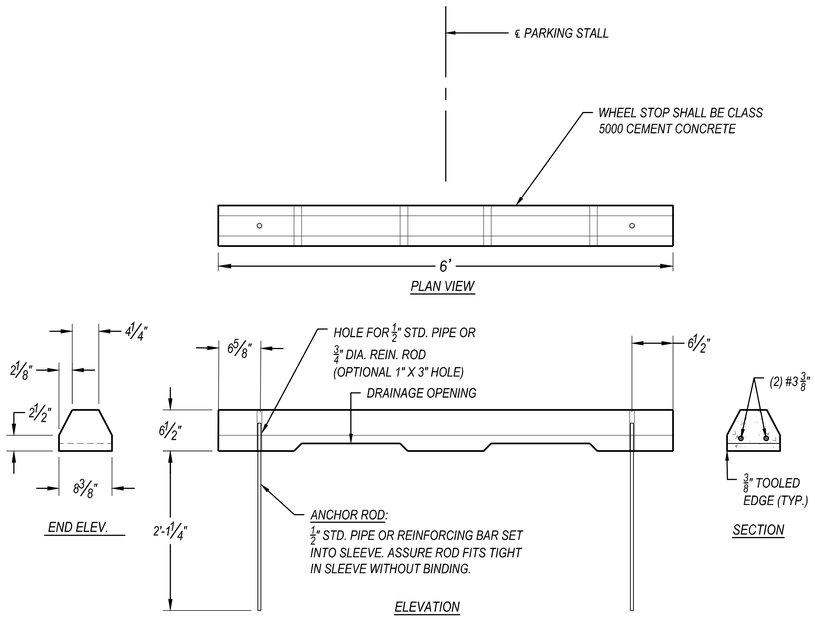
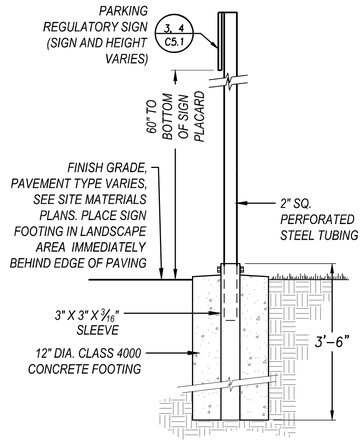
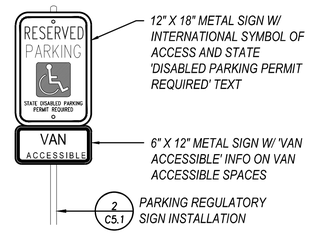


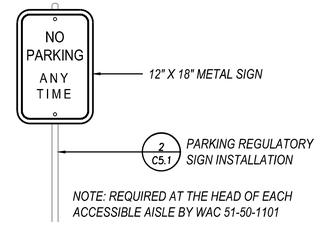
1 / C5.1 Precast Concrete Wheel Stop
SCALE: 1" = 1'-0"



2 / C5.1 Parking Regulatory Sign Installation
SCALE: 1" = 1'-0"



3 / C5.1 Van Accessible Regulatory Sign
SCALE: 1" = 1'-0"



4 / C5.1 No Parking Regulatory Sign
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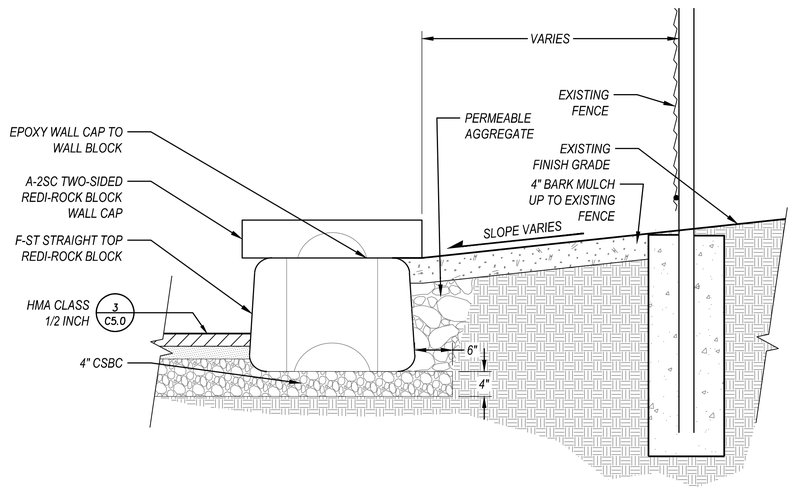

5 / C5.1 Redi-Rock Block Seat Wall
SCALE: 1" = 1'-0"

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Jan-03-23 11:34am

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

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DATE: 1/03/2023

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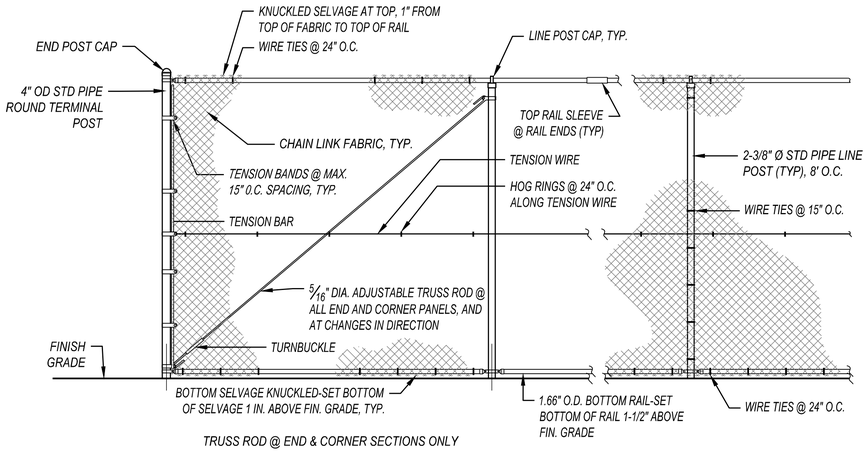
SITE DETAILS

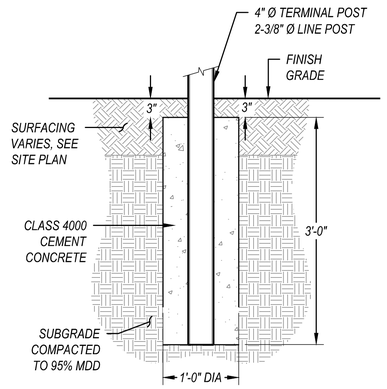
C5.1

Sheet ____ of ____

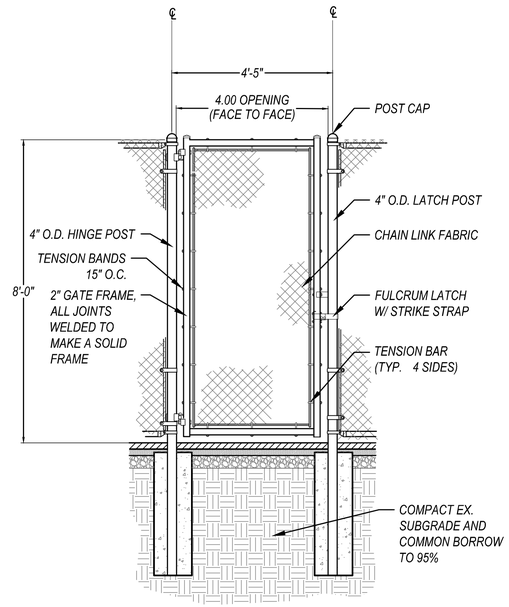


NOTE:
1. FOOTINGS NOT SHOWN ON THIS DETAIL FOR CONVENIENCE. PROVIDE FOOTINGS AT EACH POST.
2. FABRIC TO BE FROM SALVAGED EXISTING FENCE AS INSTRUCTED ON DEMOLITION PLAN
3. ALL 8FT. TALL CHAIN LINK FENCING FABRIC, FRAMES, POSTS, AND FITTINGS SHALL BE GALVANIZED.
4. INSTALL FABRIC ON 8 FT. TALL FENCING FACING INTO THE FIELD AREA.

1 / C5.2 — 8' Chain Link Fence
SCALE: 1/2" = 1'-0"

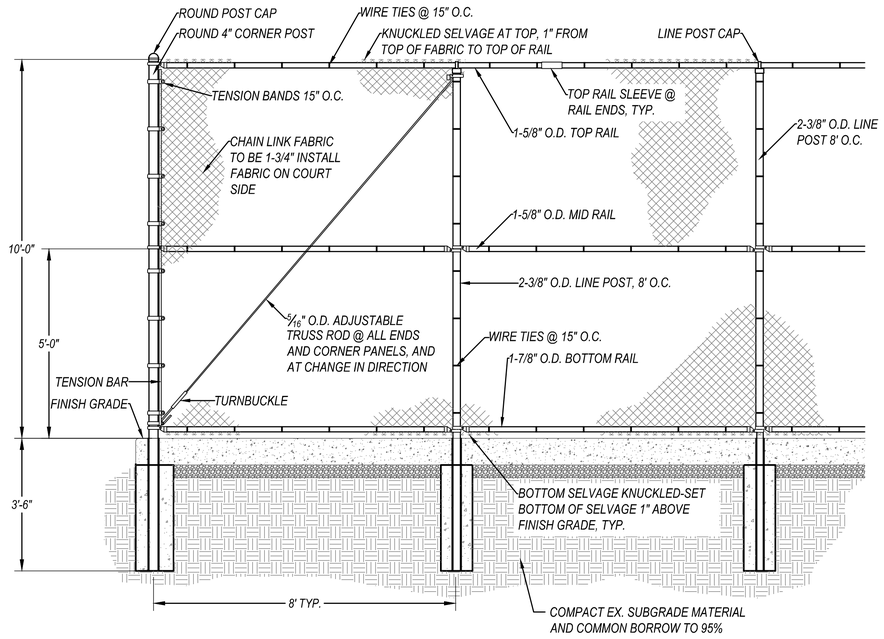


2 / C5.2 — 8' Chain Link Fence Section
SCALE: 1" = 1'-0"

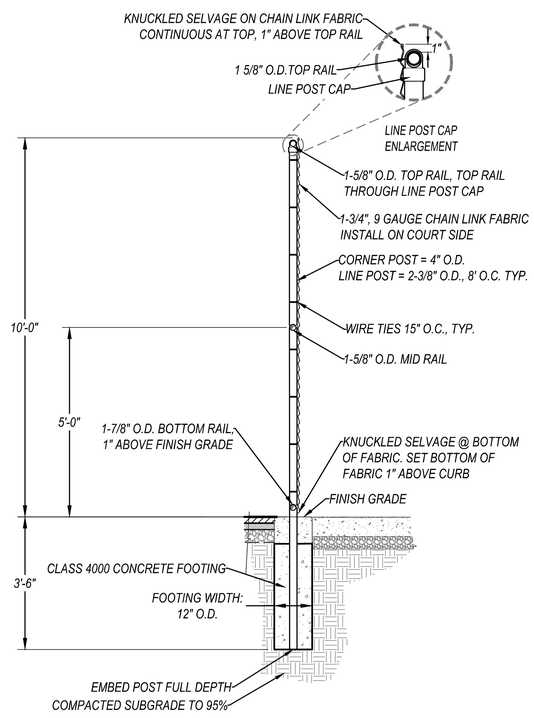


3 / C5.2 — 8' Pedestrian Fence Gate
SCALE: 1/2" = 1'-0"

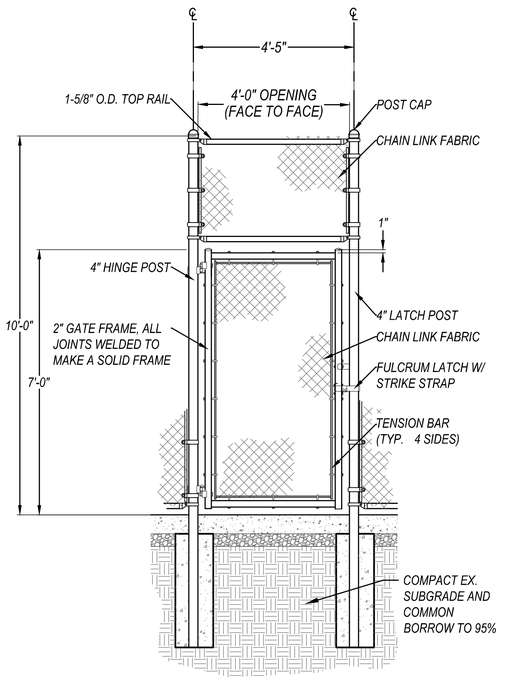
NOTE:
1. FRAMES, FABRIC, POSTS AND RAILS ARE TO BE SCHEDULE 40 PIPE GALVANIZED IN ACCORDANCE WITH A.S.T.M DESIGNATION A-120
2. INSTALL FABRIC ON TENNIS COURT SIDE OF FENCE



4 / C5.2 — 10' Chain Link Fence
SCALE: 1/2" = 1'-0"



5 / C5.2 — 10' Fence Post Section
SCALE: 1/2" = 1'-0"



6 / C5.2 — 10' Pedestrian Fence Gate
SCALE: 1/2" = 1'-0"

PERMITTING SUBMITTAL

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

Yelm High School
Yelm WA

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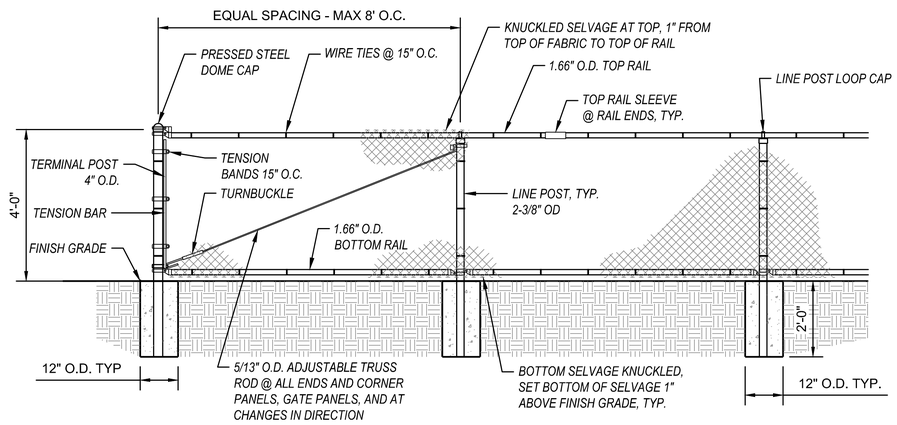
DATE: 1/03/2023

FENCING DETAILS

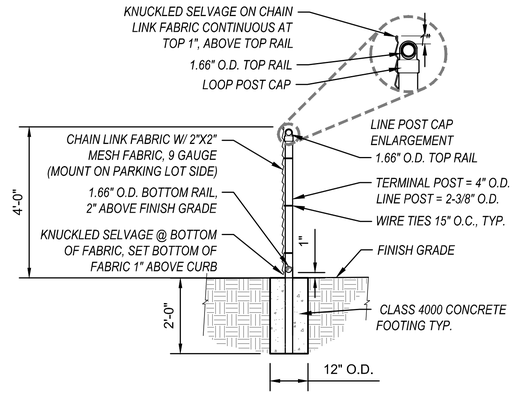
C5.2

Sheet ____ of ____



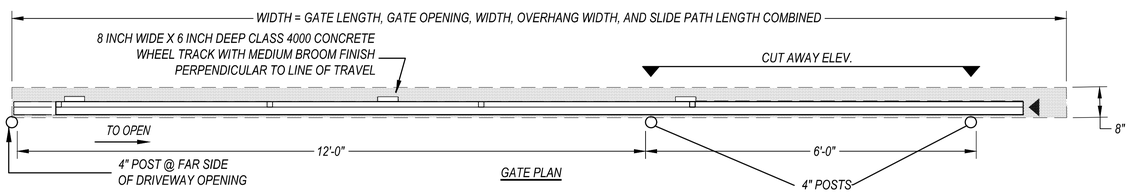
1 / C5.3 — 4' Chain Link Fence

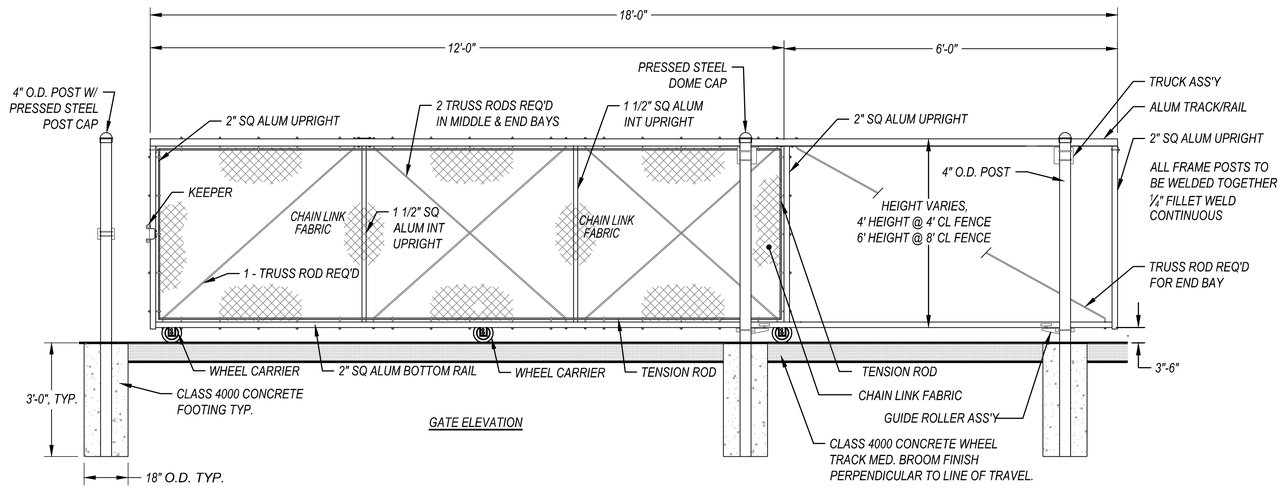
SCALE: 1/2" = 1'-0"



2 / C5.3 — 4' Fence Terminal and Line Post Footing

SCALE: 1/2" = 1'-0"





3 / C5.3 — 12' Slide Gate

SCALE: 1/2" = 1'-0"

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

Yelm High School
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DRAWN BY JH
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DATE	CHANGE

DATE: 1/03/2023

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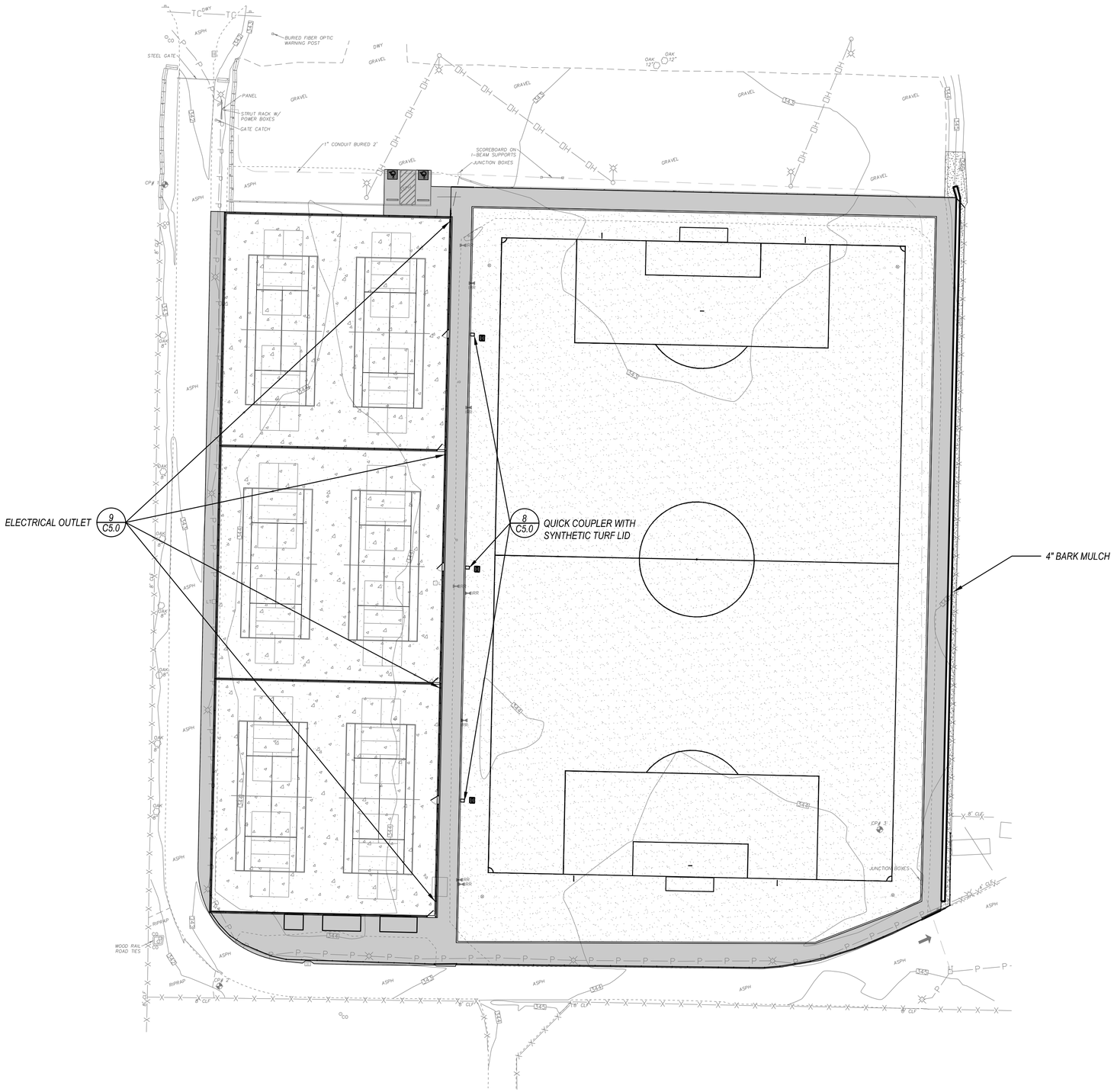
FENCING DETAILS

C5.3

Sheet ____ of ____



RESTORATION PLAN LEGEND

4" BARK MULCH

SCALE: 1"=30'

0 15' 30' 45' 60'

811 Call 811 two business days before you dig

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

Yelm High School
Yelm WA

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STATE OF WASHINGTON
ROBERT W. DAHL
No. 6397 EXP. 12/09/2024
LANDSCAPE ARCHITECT

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RESTORATION AND UTILITY MODIFICATION PLAN

C6.0

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Jan-03-23 11:32am

Yelm HS Soccer Field Conversion and Tennis Court Reconstruction

Yelm, WA

Project #: 10182200114

PRELIMINARY DRAINAGE REPORT

January 3, 2023

Prepared for:
Yelm High School
1315 Yelm Ave W
Yelm, WA 98597

Prepared by:
Ben Enfield, PE
Whitney Dunlap, PE

As a sub-consultant to
RWD Landscape Architects

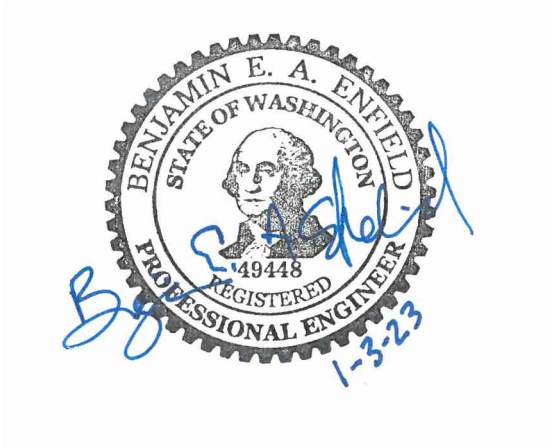
kpff

RWD
Landscape Architects

Consulting Engineers
612 Woodland Square Loop SE, Suite 100
Lacey, WA 98503
(360) 292-7230
(360) 292-7231 FAX

ENGINEER OF RECORD CERTIFICATION

This Drainage Report for **Yelm High School Soccer Field Conversion and Tennis Court Reconstruction** has been prepared by or under the supervision of the engineer below and meets the standard of care and expertise which is usual and customary in this community for professional engineers. It is understood that the **City of Yelm** does not and will not assume liability for the sufficiency, suitability, or performance of facilities included in this report.



CONTENTS

TABLES

APPENDICES

1 Project Overview

1.1 Project Location & Parcel Information

Site Address: 1315 Yelm Ave W
Parcel Number: 21724210500
Property Owner: Yelm School District #2
Total Parcel Area: 36.6 Acres
Abbreviated Legal: Section 24, Township 17, Range 1E

1.2 Project Summary

The proposed site improvements are located at the northwest portion of the Yelm High School campus. The project proposes to resurface six existing tennis courts, convert a grass field to a synthetic turf field, replace asphalt sidewalks and install associated drainage improvements. Elevations of the area range from approximately 346 to 342 generally sloping from east to west.

Of the entire 36.6-acre property, the proposed redevelopment will disturb approximately 151,120 square feet (3.47 acres). After completion of this project, 60 percent of the site will be pervious with the remaining 40 percent impervious. Table 1 summarizes existing on-site areas that will be disturbed with this redevelopment. Table 2 provides a summary of proposed on-site improvement areas.

Stormwater runoff from the proposed project will be collected through trench drains, catch basins and underdrains where it will be routed to infiltration galleries proposed under the resurfaced synthetic turf soccer field.

Under existing conditions, catch basins located on the west side of the field collect stormwater runoff where it is infiltrated onsite.

Table 1: Existing Areas

Cover	Surface Type	Area (sf)
Sidewalk	NPGIS*	14,330
Tennis Courts	NPGIS*	39,800
Total Impervious		**54,130**
Grass Field	NPGPS	95,030
Other Landscape	NPGPS	1,960
Total Disturbed Area		**151,120 (3.47 acres)**

Table 2: Proposed Areas

Cover	Surface Type	Area (sf)
Sidewalk	NPGIS	18,820
Tennis Courts	NPGIS	42,000
Total Impervious		**60,820**
Synthetic Turf Field	NPGPS	90,300
Total Disturbed Area		**151,120 (3.47 acres)**

1.3 Minimum Requirements

This project requires compliance will all minimum requirements.

Minimum Requirement #1: Stormwater Site Planning

This report meets the requirements of Stormwater Site Planning per the 2019 Stormwater Management Manual for Western Washington.

Minimum Requirement #2: Construction Stormwater Pollution Prevention Plan (CSWPPP)

A CSWPPP is provided within Appendix C of this report.

Minimum Requirement #3: Source Control of Pollution

Source Control BMPs applicable to all sites:

- S410 BMPs for Correcting Illicit Discharges to Storm Drains
- S453 BMPs for Formation of a Pollution Prevention Team
- S454 BMPs for Preventive Maintenance / Good Housekeeping
- S455 BMPs for Spill Prevention and Cleanup
- S456 BMPs for Employee Training
- S457 BMPS for Inspections
- S458 BMPs for Record Keeping

Other Source Control BMPs applicable to this specific site:

- S417 BMPs for Maintenance of Stormwater Drainage and Treatment Systems

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

The natural drainage pattern of the site will be maintained through continued use of on-site infiltration. Stormwater runoff from the project site will be collected and infiltrated through rock conveyance galleries located under the soccer field.

Minimum Requirement #5: On-Site Stormwater Management

This project meets the LID performance standard by providing full on-site infiltration of stormwater runoff therefore complying with this core requirement.

Minimum Requirement #6: Runoff Treatment

No runoff treatment is required or provided. All proposed improvements are non-pollution generating.

Minimum Requirement #7: Flow Control

Full infiltration of runoff from pervious and impervious surfaces is being provided onsite for this project meeting minimum requirements for flow control.

Minimum Requirement #8: Wetlands Protection

There are no wetlands on or adjacent to the project site and the project does not discharge into a wetland directly or indirectly through a conveyance system, therefore this minimum requirement does not apply.

Minimum Requirement #9: Operations & Maintenance

An Operations and Maintenance manual will be included within the final Stormwater Site Plan for permit submittal.

2 Existing Conditions Summary

2.1 Existing Conditions

The existing project site contains six tennis courts, walkways, and a grass field. Under existing conditions stormwater runoff from the tennis courts is directed into existing catch basins and infiltrates on site. The grass field also currently infiltrates all stormwater.

2.2 Critical Areas

Critical areas mapped and noted to be nearby the project are as follows:

Streams

Thompson Creek, a Class 4 stream is located approximately 1,000 feet from the project site.

Flood Zone

Flood zone A for Thompson creek is approximately 1,000 feet from the project site and approximately 15 vertical feet below.

Critical Aquifer Recharge Area

Category 1 CARA is mapped within the project site.

No wetlands, watershed protections areas, high groundwater areas, fuel tanks, wells, septic systems or landfills were found or are known that would affect this project.

2.3 Existing Soil Conditions

The site is mapped as Spanaway gravelly sandy loam, 0 to 3% slopes as well as Spanaway stony sandy loam, 0 to 3% slopes by the USDA Natural Resource Conservation Service. The geotechnical engineer encountered topsoil of approximately 6” underlain with recessional outwash consistent with the mapped soils.

3 Off-Site Analysis Report

All runoff generated on the project site is proposed to be infiltrated on-site. There are no significant areas of offsite land that contribute runoff to the project site. A downstream analysis is not required for this site.

4 Stormwater Control Plan

4.1 Existing Site Hydrology

Runoff in the tennis court and soccer field area currently sheet flows and infiltrates in the immediate vicinity.

4.2 Developed Site Hydrology

The site improvements maintain the existing use and function in place. Runoff will be collected and infiltrated in the field. An infiltration trench as well as rock section underlying the proposed turf field is proposed to infiltrate all runoff from the project site.

4.3 Performance Standards and Goals

This project will meet the LID performance standard for flow control through full infiltration.

4.4 Flow Control System

Runoff from the project site is directed to two separate infiltration facilities for full infiltration. The West infiltration facility is an infiltration trench that receives runoff from the west of the project including the tennis courts and walkway on the west side of the field. The East infiltration facility is 6 inches of rock under the entirety of the turf field. Areas tributary to the east infiltration facility include the soccer field and eastern walkways. The basin map located in Appendix A of the report shows the basins and are breakdowns to each facility.

The stormwater calculations for facility sizing can be found in Appendix B of this report. Based on the geotechnical report, infiltration rates differ across the site. There were four test pits excavated at each of the four corners of the existing grass field. The western facility is proposed where Test Pits 1 and 4 are located, which both were found to have an infiltration rate of 20 in/hr at a bottom facility depth of at least of 4.5’ deep.

The infiltrate rate in the upper layer of the test pits was found to have a reduced infiltration rate. The average of the infiltration rates in the four test pits for a depth of 0.5’ was found to be 4.85 in/hr and was utilized for design calculations of the rock section under the turf field.

The full geotechnical report can be found in Appendix D of this report that shows all infiltration rates at corresponding depths.

Table 3: Infiltration Facility Summary

	West Facility	East Facility
Pervious Contributing Area (ac)	0.00	2.07
Impervious Contributing Area (ac)	1.19	0.21
Total Basin Area (ac)	1.19	2.28
Infiltration rate (in/hr)	20	15.7
Facility Size (L' x W' x D')	378' x 2.5' x 4.17'	400' x 225' x 0.5'*

*Facility size is approximated for calculations based on field area of 90,000 SF. Actual field area is 90,300 SF.

4.5 Water Quality System

No water quality is proposed for this project as it does not meet thresholds for treatment.

5 Construction Stormwater Pollution Prevention Plan

A SWPPP has been completed and included as Appendix C of this report.

6 Special Reports and Studies

A geotechnical engineering report has been conducted for this site and is included in Appendix D of this report.

7 Other Permits

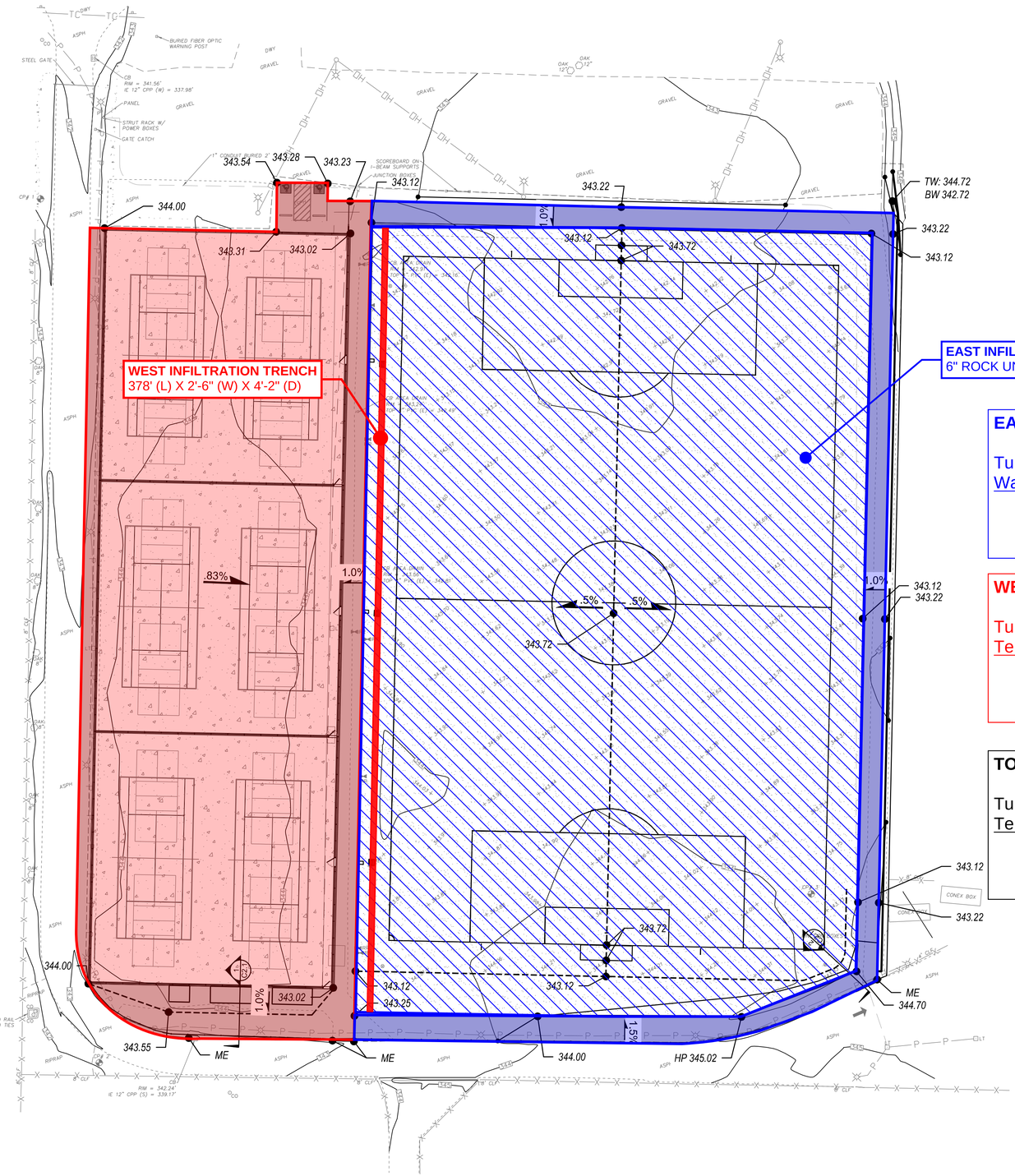
Associated building permits for the fence may be required. Owner to confirm with City.

8 Operations and Maintenance

An operations and maintenance manual will be provided for the site with the final drainage report.

APPENDIX A

Basin Map



GRADING LEGEND

XXX	PROPOSED INTERMEDIATE CONTOUR
XXX	PROPOSED INDEX CONTOUR
	GRADE BREAK
	DIRECTION OF SLOPE
XXX.XX	FINISH GRADE ELEVATION
EX	EXISTING GRADE
RE	RIM ELEVATION
ME	MEET EXISTING
TW	TOP OF WALL
BW	BOTTOM OF WALL
TR	TOP OF RAMP
BR	BOTTOM OF RAMP
	LIMIT OF WORK

EAST INFILTRATION BASIN

Turf field (pervious)	=	90,300 sf	= 2.07 ac
Walkways (impervious)	=	9,200 sf	= 0.21 ac
Basin Total	**=**	**99,500 sf**	**= 2.28 ac**

WEST INFILTRATION BASIN

Turf field (pervious)	=	0 sf	= 0.00 ac
Tennis court & walkways (impervious)	=	51,620 sf	= 1.19 ac
Basin Total	**=**	**51,620 sf**	**= 1.19 ac**

TOTAL BASIN

Turf field (pervious)	=	90,300 sf	= 2.07 ac
Tennis court & walkways (impervious)	=	60,820 sf	= 1.40 ac
Basin Total		**= 151,120 sf**	**= 3.47 ac**

SCALE: 1"=30'

0 15' 30' 45' 60'

811 Call 811 two business days before you dig

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DATE: 0000 00, 0000

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BASIN MAP

EX 1.0

APPENDIX B

Stormwater Calculations

WWHM2012

PROJECT REPORT

Yelm HS Soccer Field Conversion & Tennis Court Reconstruction

Flow Control Sizing

General Model Information

Project Name:	Yelm HS Infiltration
Site Name:	Yelm HS
Site Address:	1315 W Yelm Ave
City:	Yelm
Report Date:	1/3/2023
Gage:	Eaton Creek
Data Start:	1955/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	0.857
Version Date:	2021/08/18
Version:	4.2.18

POC Thresholds

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

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	3.47
Pervious Total	3.47
Impervious Land Use	acre
Impervious Total	0
Basin Total	3.47

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

WEST BASIN

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
SIDEWALKS FLAT	1.19
Impervious Total	1.19
Basin Total	1.19

Element Flows To:

Surface	Interflow	Groundwater
WEST TRENCH	WEST TRENCH	

EAST BASIN

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Lawn, Flat	2.07
Pervious Total	2.07

Impervious Land Use	acre
SIDEWALKS FLAT	0.21
Impervious Total	0.21
Basin Total	2.28

Element Flows To:

Surface	Interflow	Groundwater
EAST TRENCH	EAST TRENCH	

Routing Elements
Predeveloped Routing

Mitigated Routing

WEST TRENCH

Bottom Length:	378.00 ft.
Bottom Width:	2.50 ft.
Trench bottom slope 1:	0 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	4.17
Pour Space of material for first layer:	0.4
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	20
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	185.647
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	185.647
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	4.17 ft.
Riser Diameter:	0 in.
Element Flows To:	
Outlet 1	Outlet 2

Gravel Trench Bed Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.021	0.000	0.000	0.000
0.0574	0.021	0.000	0.000	0.437
0.1149	0.021	0.001	0.000	0.437
0.1723	0.021	0.001	0.000	0.437
0.2298	0.021	0.002	0.000	0.437
0.2872	0.021	0.002	0.000	0.437
0.3447	0.021	0.003	0.000	0.437
0.4021	0.021	0.003	0.000	0.437
0.4596	0.021	0.004	0.000	0.437
0.5170	0.021	0.004	0.000	0.437
0.5744	0.021	0.005	0.000	0.437
0.6319	0.021	0.005	0.000	0.437
0.6893	0.021	0.006	0.000	0.437
0.7468	0.021	0.006	0.000	0.437
0.8042	0.021	0.007	0.000	0.437
0.8617	0.021	0.007	0.000	0.437
0.9191	0.021	0.008	0.000	0.437
0.9766	0.021	0.008	0.000	0.437
1.0340	0.021	0.009	0.000	0.437
1.0914	0.021	0.009	0.000	0.437
1.1489	0.021	0.010	0.000	0.437
1.2063	0.021	0.010	0.000	0.437
1.2638	0.021	0.011	0.000	0.437
1.3212	0.021	0.011	0.000	0.437

1.3787	0.021	0.012	0.000	0.437
1.4361	0.021	0.012	0.000	0.437
1.4936	0.021	0.013	0.000	0.437
1.5510	0.021	0.013	0.000	0.437
1.6084	0.021	0.014	0.000	0.437
1.6659	0.021	0.014	0.000	0.437
1.7233	0.021	0.015	0.000	0.437
1.7808	0.021	0.015	0.000	0.437
1.8382	0.021	0.016	0.000	0.437
1.8957	0.021	0.016	0.000	0.437
1.9531	0.021	0.016	0.000	0.437
2.0106	0.021	0.017	0.000	0.437
2.0680	0.021	0.017	0.000	0.437
2.1254	0.021	0.018	0.000	0.437
2.1829	0.021	0.018	0.000	0.437
2.2403	0.021	0.019	0.000	0.437
2.2978	0.021	0.019	0.000	0.437
2.3552	0.021	0.020	0.000	0.437
2.4127	0.021	0.020	0.000	0.437
2.4701	0.021	0.021	0.000	0.437
2.5276	0.021	0.021	0.000	0.437
2.5850	0.021	0.022	0.000	0.437
2.6424	0.021	0.022	0.000	0.437
2.6999	0.021	0.023	0.000	0.437
2.7573	0.021	0.023	0.000	0.437
2.8148	0.021	0.024	0.000	0.437
2.8722	0.021	0.024	0.000	0.437
2.9297	0.021	0.025	0.000	0.437
2.9871	0.021	0.025	0.000	0.437
3.0446	0.021	0.026	0.000	0.437
3.1020	0.021	0.026	0.000	0.437
3.1594	0.021	0.027	0.000	0.437
3.2169	0.021	0.027	0.000	0.437
3.2743	0.021	0.028	0.000	0.437
3.3318	0.021	0.028	0.000	0.437
3.3892	0.021	0.029	0.000	0.437
3.4467	0.021	0.029	0.000	0.437
3.5041	0.021	0.030	0.000	0.437
3.5616	0.021	0.030	0.000	0.437
3.6190	0.021	0.031	0.000	0.437
3.6764	0.021	0.031	0.000	0.437
3.7339	0.021	0.032	0.000	0.437
3.7913	0.021	0.032	0.000	0.437
3.8488	0.021	0.033	0.000	0.437
3.9062	0.021	0.033	0.000	0.437
3.9637	0.021	0.034	0.000	0.437
4.0211	0.021	0.034	0.000	0.437
4.0786	0.021	0.035	0.000	0.437
4.1360	0.021	0.035	0.000	0.437
4.1934	0.021	0.037	0.000	0.437
4.2509	0.021	0.038	0.000	0.437
4.3083	0.021	0.039	0.000	0.437
4.3658	0.021	0.040	0.000	0.437
4.4232	0.021	0.042	0.000	0.437
4.4807	0.021	0.043	0.000	0.437
4.5381	0.021	0.044	0.000	0.437
4.5956	0.021	0.045	0.000	0.437
4.6530	0.021	0.047	0.000	0.437

4.7104	0.021	0.048	0.000	0.437
4.7679	0.021	0.049	0.000	0.437
4.8253	0.021	0.050	0.000	0.437
4.8828	0.021	0.052	0.000	0.437
4.9402	0.021	0.053	0.000	0.437
4.9977	0.021	0.054	0.000	0.437
5.0551	0.021	0.055	0.000	0.437
5.1126	0.021	0.057	0.000	0.437

EAST TRENCH

Bottom Length:	400.00 ft.
Bottom Width:	225.00 ft.
Trench bottom slope 1:	0 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	0.5
Pour Space of material for first layer:	0.4
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	4.85
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	33.564
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	33.564
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	0 in.
Element Flows To:	
Outlet 1	Outlet 2

Gravel Trench Bed Hydraulic Table

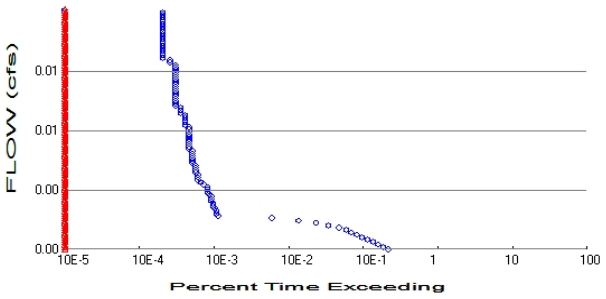
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	2.066	0.000	0.000	0.000
0.0167	2.066	0.013	0.000	10.10
0.0333	2.066	0.027	0.000	10.10
0.0500	2.066	0.041	0.000	10.10
0.0667	2.066	0.055	0.000	10.10
0.0833	2.066	0.068	0.000	10.10
0.1000	2.066	0.082	0.000	10.10
0.1167	2.066	0.096	0.000	10.10
0.1333	2.066	0.110	0.000	10.10
0.1500	2.066	0.124	0.000	10.10
0.1667	2.066	0.137	0.000	10.10
0.1833	2.066	0.151	0.000	10.10
0.2000	2.066	0.165	0.000	10.10
0.2167	2.066	0.179	0.000	10.10
0.2333	2.066	0.192	0.000	10.10
0.2500	2.066	0.206	0.000	10.10
0.2667	2.066	0.220	0.000	10.10
0.2833	2.066	0.234	0.000	10.10
0.3000	2.066	0.247	0.000	10.10
0.3167	2.066	0.261	0.000	10.10
0.3333	2.066	0.275	0.000	10.10
0.3500	2.066	0.289	0.000	10.10
0.3667	2.066	0.303	0.000	10.10
0.3833	2.066	0.316	0.000	10.10
0.4000	2.066	0.330	0.000	10.10
0.4167	2.066	0.344	0.000	10.10

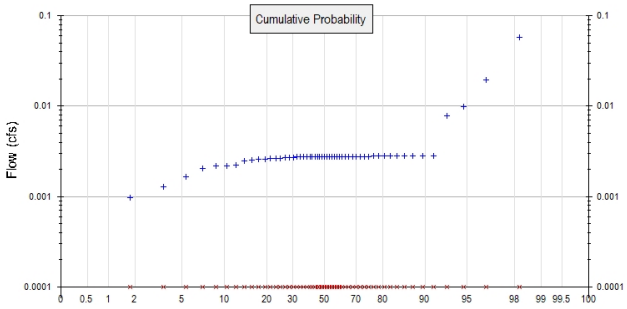
0.4333	2.066	0.358	0.000	10.10
0.4500	2.066	0.371	0.000	10.10
0.4667	2.066	0.385	0.000	10.10
0.4833	2.066	0.399	0.000	10.10
0.5000	2.066	0.413	0.000	10.10
0.5167	2.066	0.447	0.000	10.10
0.5333	2.066	0.482	0.000	10.10
0.5500	2.066	0.516	0.000	10.10
0.5667	2.066	0.551	0.000	10.10
0.5833	2.066	0.585	0.000	10.10
0.6000	2.066	0.619	0.000	10.10
0.6167	2.066	0.654	0.000	10.10
0.6333	2.066	0.688	0.000	10.10
0.6500	2.066	0.723	0.000	10.10
0.6667	2.066	0.757	0.000	10.10
0.6833	2.066	0.792	0.000	10.10
0.7000	2.066	0.826	0.000	10.10
0.7167	2.066	0.860	0.000	10.10
0.7333	2.066	0.895	0.000	10.10
0.7500	2.066	0.929	0.000	10.10
0.7667	2.066	0.964	0.000	10.10
0.7833	2.066	0.998	0.000	10.10
0.8000	2.066	1.033	0.000	10.10
0.8167	2.066	1.067	0.000	10.10
0.8333	2.066	1.101	0.000	10.10
0.8500	2.066	1.136	0.000	10.10
0.8667	2.066	1.170	0.000	10.10
0.8833	2.066	1.205	0.000	10.10
0.9000	2.066	1.239	0.000	10.10
0.9167	2.066	1.274	0.000	10.10
0.9333	2.066	1.308	0.000	10.10
0.9500	2.066	1.343	0.000	10.10
0.9667	2.066	1.377	0.000	10.10
0.9833	2.066	1.411	0.000	10.10
1.0000	2.066	1.446	0.000	10.10
1.0167	2.066	1.480	0.000	10.10
1.0333	2.066	1.515	0.000	10.10
1.0500	2.066	1.549	0.000	10.10
1.0667	2.066	1.584	0.000	10.10
1.0833	2.066	1.618	0.000	10.10
1.1000	2.066	1.652	0.000	10.10
1.1167	2.066	1.687	0.000	10.10
1.1333	2.066	1.721	0.000	10.10
1.1500	2.066	1.756	0.000	10.10
1.1667	2.066	1.790	0.000	10.10
1.1833	2.066	1.825	0.000	10.10
1.2000	2.066	1.859	0.000	10.10
1.2167	2.066	1.893	0.000	10.10
1.2333	2.066	1.928	0.000	10.10
1.2500	2.066	1.962	0.000	10.10
1.2667	2.066	1.997	0.000	10.10
1.2833	2.066	2.031	0.000	10.10
1.3000	2.066	2.066	0.000	10.10
1.3167	2.066	2.100	0.000	10.10
1.3333	2.066	2.135	0.000	10.10
1.3500	2.066	2.169	0.000	10.10
1.3667	2.066	2.203	0.000	10.10
1.3833	2.066	2.238	0.000	10.10

1.4000	2.066	2.272	0.000	10.10
1.4167	2.066	2.307	0.000	10.10
1.4333	2.066	2.341	0.000	10.10
1.4500	2.066	2.376	0.000	10.10
1.4667	2.066	2.410	0.000	10.10
1.4833	2.066	2.444	0.000	10.10
1.5000	2.066	2.479	0.000	10.10

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 3.47
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 2.07
Total Impervious Area: 1.4

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.002688
5 year	0.004602
10 year	0.006353
25 year	0.009255
50 year	0.012019
100 year	0.015394

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1956	0.019	0.000
1957	0.003	0.000
1958	0.003	0.000
1959	0.003	0.000
1960	0.003	0.000
1961	0.003	0.000
1962	0.003	0.000
1963	0.003	0.000
1964	0.003	0.000
1965	0.003	0.000

1966	0.003	0.000
1967	0.003	0.000
1968	0.003	0.000
1969	0.003	0.000
1970	0.003	0.000
1971	0.008	0.000
1972	0.058	0.000
1973	0.003	0.000
1974	0.003	0.000
1975	0.003	0.000
1976	0.003	0.000
1977	0.003	0.000
1978	0.003	0.000
1979	0.003	0.000
1980	0.003	0.000
1981	0.003	0.000
1982	0.003	0.000
1983	0.003	0.000
1984	0.003	0.000
1985	0.003	0.000
1986	0.003	0.000
1987	0.003	0.000
1988	0.002	0.000
1989	0.003	0.000
1990	0.003	0.000
1991	0.010	0.000
1992	0.003	0.000
1993	0.003	0.000
1994	0.002	0.000
1995	0.003	0.000
1996	0.003	0.000
1997	0.003	0.000
1998	0.003	0.000
1999	0.003	0.000
2000	0.002	0.000
2001	0.002	0.000
2002	0.001	0.000
2003	0.002	0.000
2004	0.003	0.000
2005	0.001	0.000
2006	0.002	0.000
2007	0.003	0.000
2008	0.001	0.000
2009	0.003	0.000
2010	0.003	0.000
2011	0.003	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0578	0.0000
2	0.0194	0.0000
3	0.0100	0.0000
4	0.0078	0.0000
5	0.0028	0.0000
6	0.0028	0.0000
7	0.0028	0.0000
8	0.0028	0.0000

9	0.0028	0.0000
10	0.0028	0.0000
11	0.0028	0.0000
12	0.0028	0.0000
13	0.0028	0.0000
14	0.0028	0.0000
15	0.0028	0.0000
16	0.0028	0.0000
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19	0.0028	0.0000
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26	0.0028	0.0000
27	0.0028	0.0000
28	0.0027	0.0000
29	0.0027	0.0000
30	0.0027	0.0000
31	0.0027	0.0000
32	0.0027	0.0000
33	0.0027	0.0000
34	0.0027	0.0000
35	0.0027	0.0000
36	0.0027	0.0000
37	0.0027	0.0000
38	0.0027	0.0000
39	0.0027	0.0000
40	0.0027	0.0000
41	0.0027	0.0000
42	0.0027	0.0000
43	0.0026	0.0000
44	0.0026	0.0000
45	0.0026	0.0000
46	0.0026	0.0000
47	0.0025	0.0000
48	0.0025	0.0000
49	0.0022	0.0000
50	0.0022	0.0000
51	0.0022	0.0000
52	0.0020	0.0000
53	0.0017	0.0000
54	0.0013	0.0000
55	0.0010	0.0000
56	0.0008	0.0000

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0013	4194	0	0	Pass
0.0015	3613	0	0	Pass
0.0016	3104	0	0	Pass
0.0017	2639	0	0	Pass
0.0018	2231	0	0	Pass
0.0019	1879	0	0	Pass
0.0020	1608	0	0	Pass
0.0021	1354	0	0	Pass
0.0022	1159	0	0	Pass
0.0023	921	0	0	Pass
0.0024	663	0	0	Pass
0.0025	456	0	0	Pass
0.0026	268	0	0	Pass
0.0027	115	0	0	Pass
0.0029	22	0	0	Pass
0.0030	21	0	0	Pass
0.0031	21	0	0	Pass
0.0032	20	0	0	Pass
0.0033	19	0	0	Pass
0.0034	19	0	0	Pass
0.0035	18	0	0	Pass
0.0036	18	0	0	Pass
0.0037	18	0	0	Pass
0.0038	17	0	0	Pass
0.0039	16	0	0	Pass
0.0040	16	0	0	Pass
0.0041	16	0	0	Pass
0.0043	14	0	0	Pass
0.0044	13	0	0	Pass
0.0045	12	0	0	Pass
0.0046	12	0	0	Pass
0.0047	12	0	0	Pass
0.0048	11	0	0	Pass
0.0049	11	0	0	Pass
0.0050	11	0	0	Pass
0.0051	11	0	0	Pass
0.0052	10	0	0	Pass
0.0053	10	0	0	Pass
0.0054	10	0	0	Pass
0.0055	10	0	0	Pass
0.0057	10	0	0	Pass
0.0058	10	0	0	Pass
0.0059	9	0	0	Pass
0.0060	9	0	0	Pass
0.0061	9	0	0	Pass
0.0062	9	0	0	Pass
0.0063	9	0	0	Pass
0.0064	9	0	0	Pass
0.0065	9	0	0	Pass
0.0066	9	0	0	Pass
0.0067	9	0	0	Pass
0.0068	9	0	0	Pass
0.0070	8	0	0	Pass

0.0071	8	0	0	Pass
0.0072	8	0	0	Pass
0.0073	8	0	0	Pass
0.0074	8	0	0	Pass
0.0075	7	0	0	Pass
0.0076	7	0	0	Pass
0.0077	7	0	0	Pass
0.0078	6	0	0	Pass
0.0079	6	0	0	Pass
0.0080	6	0	0	Pass
0.0081	6	0	0	Pass
0.0082	6	0	0	Pass
0.0084	6	0	0	Pass
0.0085	6	0	0	Pass
0.0086	6	0	0	Pass
0.0087	6	0	0	Pass
0.0088	6	0	0	Pass
0.0089	6	0	0	Pass
0.0090	6	0	0	Pass
0.0091	6	0	0	Pass
0.0092	6	0	0	Pass
0.0093	6	0	0	Pass
0.0094	6	0	0	Pass
0.0095	6	0	0	Pass
0.0096	6	0	0	Pass
0.0098	5	0	0	Pass
0.0099	5	0	0	Pass
0.0100	4	0	0	Pass
0.0101	4	0	0	Pass
0.0102	4	0	0	Pass
0.0103	4	0	0	Pass
0.0104	4	0	0	Pass
0.0105	4	0	0	Pass
0.0106	4	0	0	Pass
0.0107	4	0	0	Pass
0.0108	4	0	0	Pass
0.0109	4	0	0	Pass
0.0110	4	0	0	Pass
0.0112	4	0	0	Pass
0.0113	4	0	0	Pass
0.0114	4	0	0	Pass
0.0115	4	0	0	Pass
0.0116	4	0	0	Pass
0.0117	4	0	0	Pass
0.0118	4	0	0	Pass
0.0119	4	0	0	Pass
0.0120	4	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
WEST TRENCH POC	☐	168.94			☐	100.00			
EAST TRENCH POC	☐	30.54			☐	100.00			
Total Volume Infiltrated		199.48	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

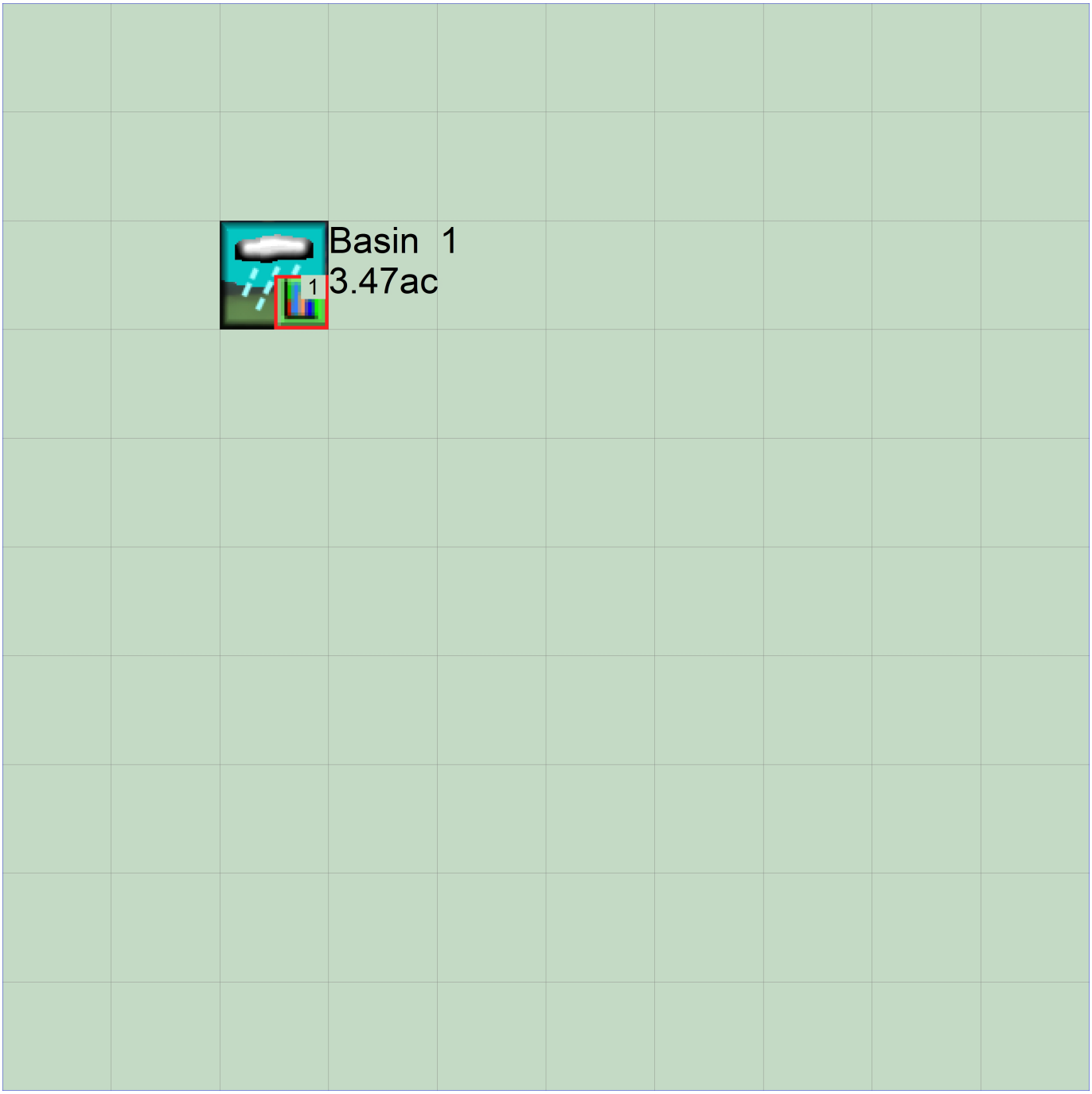
PERLND Changes

No PERLND changes have been made.

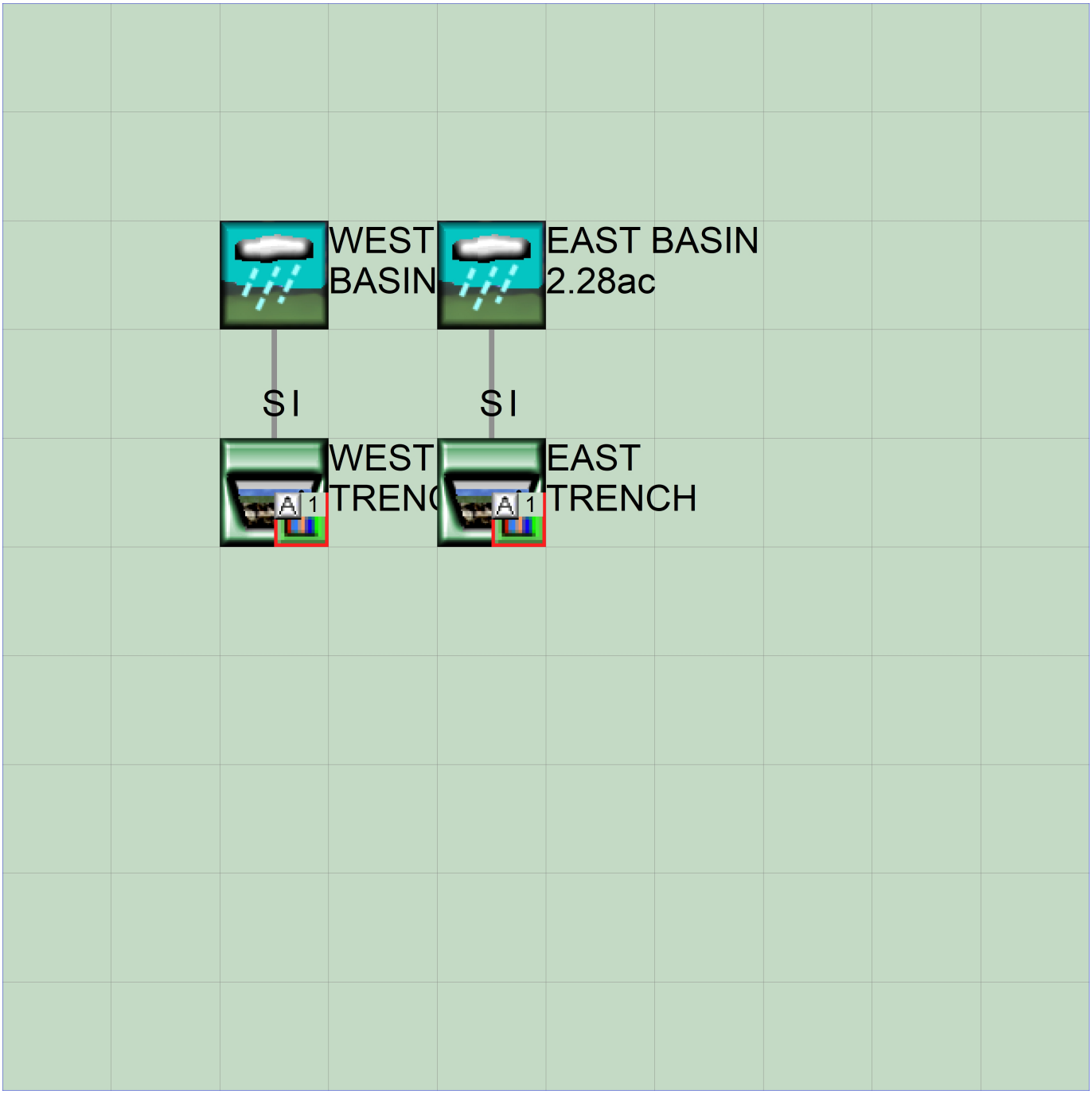
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2011 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
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MESSU      25   PreYelm HS Infiltration.MES
           27   PreYelm HS Infiltration.L61
           28   PreYelm HS Infiltration.L62
           30   POCYelm HS Infiltration1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                      in  out           ***
    1     A/B, Forest, Flat       1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    1         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    1         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    1         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    1               0         5         2       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    1              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    1          0.2       0.5      0.35         0       0.7       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    1              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND   1                        3.47     COPY   501     12
PERLND   1                        3.47     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *      *  *  *  *  *        ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><--------><--------> ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><---><---><---><---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.857          PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.857          IMPLND   1 999 EXTNL  PREC
```

```
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2011 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   Yelm HS Infiltration.wdm
MESSU       25   MitYelm HS Infiltration.MES
            27   MitYelm HS Infiltration.L61
            28   MitYelm HS Infiltration.L62
            30   POCYelm HS Infiltration1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      IMPLND       8
      PERLND       7
      RCHRES       1
      RCHRES       2
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        WEST TRENCH                MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
    7     A/B, Lawn, Flat         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    7         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
```

```
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    7         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    7         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    7              0         5       0.8       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    7              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    7          0.1       0.5      0.25         0       0.7      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    7              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    8      SIDEWALKS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    8         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    8         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    8         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    8            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
```

```
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    8             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    8             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
WEST BASIN***
IMPLND   8                       1.19     RCHRES   1      5
EAST BASIN***
PERLND   7                       2.07     RCHRES   2      2
PERLND   7                       2.07     RCHRES   2      3
IMPLND   8                       0.21     RCHRES   2      5

******Routing******
IMPLND   8                       1.19     COPY     1     15
PERLND   7                       2.07     COPY     1     12
IMPLND   8                       0.21     COPY     1     15
PERLND   7                       2.07     COPY     1     13
RCHRES   1                          1     COPY   501     17
RCHRES   2                          1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
    1     WEST TRENCH            2    1    1    1   28    0    1
    2     EAST TRENCH            2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
```

```
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
    1        0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
    2        0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><--------->      ***
    1              1      0.07       0.0       0.0       0.5       0.0
    2              2      0.08       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   91    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.021694  0.000000  0.000000  0.000000
  0.057444  0.021694  0.000498  0.000000  0.437500
  0.114889  0.021694  0.000997  0.000000  0.437500
  0.172333  0.021694  0.001495  0.000000  0.437500
  0.229778  0.021694  0.001994  0.000000  0.437500
  0.287222  0.021694  0.002492  0.000000  0.437500
  0.344667  0.021694  0.002991  0.000000  0.437500
  0.402111  0.021694  0.003489  0.000000  0.437500
  0.459556  0.021694  0.003988  0.000000  0.437500
  0.517000  0.021694  0.004486  0.000000  0.437500
  0.574444  0.021694  0.004985  0.000000  0.437500
  0.631889  0.021694  0.005483  0.000000  0.437500
  0.689333  0.021694  0.005982  0.000000  0.437500
  0.746778  0.021694  0.006480  0.000000  0.437500
  0.804222  0.021694  0.006979  0.000000  0.437500
  0.861667  0.021694  0.007477  0.000000  0.437500
  0.919111  0.021694  0.007976  0.000000  0.437500
  0.976556  0.021694  0.008474  0.000000  0.437500
  1.034000  0.021694  0.008973  0.000000  0.437500
  1.091444  0.021694  0.009471  0.000000  0.437500
  1.148889  0.021694  0.009970  0.000000  0.437500
  1.206333  0.021694  0.010468  0.000000  0.437500
  1.263778  0.021694  0.010967  0.000000  0.437500
  1.321222  0.021694  0.011465  0.000000  0.437500
  1.378667  0.021694  0.011964  0.000000  0.437500
  1.436111  0.021694  0.012462  0.000000  0.437500
  1.493556  0.021694  0.012961  0.000000  0.437500
  1.551000  0.021694  0.013459  0.000000  0.437500
  1.608444  0.021694  0.013958  0.000000  0.437500
  1.665889  0.021694  0.014456  0.000000  0.437500
  1.723333  0.021694  0.014955  0.000000  0.437500
  1.780778  0.021694  0.015453  0.000000  0.437500
  1.838222  0.021694  0.015952  0.000000  0.437500
  1.895667  0.021694  0.016450  0.000000  0.437500
  1.953111  0.021694  0.016948  0.000000  0.437500
  2.010556  0.021694  0.017447  0.000000  0.437500
  2.068000  0.021694  0.017945  0.000000  0.437500
  2.125444  0.021694  0.018444  0.000000  0.437500
  2.182889  0.021694  0.018942  0.000000  0.437500
  2.240333  0.021694  0.019441  0.000000  0.437500
  2.297778  0.021694  0.019939  0.000000  0.437500
```

```
2.355222  0.021694  0.020438  0.000000  0.437500
2.412667  0.021694  0.020936  0.000000  0.437500
2.470111  0.021694  0.021435  0.000000  0.437500
2.527556  0.021694  0.021933  0.000000  0.437500
2.585000  0.021694  0.022432  0.000000  0.437500
2.642444  0.021694  0.022930  0.000000  0.437500
2.699889  0.021694  0.023429  0.000000  0.437500
2.757333  0.021694  0.023927  0.000000  0.437500
2.814778  0.021694  0.024426  0.000000  0.437500
2.872222  0.021694  0.024924  0.000000  0.437500
2.929667  0.021694  0.025423  0.000000  0.437500
2.987111  0.021694  0.025921  0.000000  0.437500
3.044556  0.021694  0.026420  0.000000  0.437500
3.102000  0.021694  0.026918  0.000000  0.437500
3.159444  0.021694  0.027417  0.000000  0.437500
3.216889  0.021694  0.027915  0.000000  0.437500
3.274333  0.021694  0.028414  0.000000  0.437500
3.331778  0.021694  0.028912  0.000000  0.437500
3.389222  0.021694  0.029411  0.000000  0.437500
3.446667  0.021694  0.029909  0.000000  0.437500
3.504111  0.021694  0.030408  0.000000  0.437500
3.561556  0.021694  0.030906  0.000000  0.437500
3.619000  0.021694  0.031405  0.000000  0.437500
3.676444  0.021694  0.031903  0.000000  0.437500
3.733889  0.021694  0.032402  0.000000  0.437500
3.791333  0.021694  0.032900  0.000000  0.437500
3.848778  0.021694  0.033398  0.000000  0.437500
3.906222  0.021694  0.033897  0.000000  0.437500
3.963667  0.021694  0.034395  0.000000  0.437500
4.021111  0.021694  0.034894  0.000000  0.437500
4.078556  0.021694  0.035392  0.000000  0.437500
4.136000  0.021694  0.035891  0.000000  0.437500
4.193444  0.021694  0.037137  0.000000  0.437500
4.250889  0.021694  0.038383  0.000000  0.437500
4.308333  0.021694  0.039630  0.000000  0.437500
4.365778  0.021694  0.040876  0.000000  0.437500
4.423222  0.021694  0.042122  0.000000  0.437500
4.480667  0.021694  0.043368  0.000000  0.437500
4.538111  0.021694  0.044614  0.000000  0.437500
4.595556  0.021694  0.045861  0.000000  0.437500
4.653000  0.021694  0.047107  0.000000  0.437500
4.710444  0.021694  0.048353  0.000000  0.437500
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4.825333  0.021694  0.050845  0.000000  0.437500
4.882778  0.021694  0.052092  0.000000  0.437500
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4.997667  0.021694  0.054584  0.000000  0.437500
5.055111  0.021694  0.055830  0.000000  0.437500
5.112556  0.021694  0.057077  0.000000  0.437500
5.170000  0.021694  0.058323  0.000000  0.437500
END FTABLE  1
FTABLE      2
 92    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  2.066116  0.000000  0.000000  0.000000
0.016667  2.066116  0.013774  0.000000  10.10417
0.033333  2.066116  0.027548  0.000000  10.10417
0.050000  2.066116  0.041322  0.000000  10.10417
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0.216667  2.066116  0.179063  0.000000  10.10417
0.233333  2.066116  0.192837  0.000000  10.10417
```

0.250000	2.066116	0.206612	0.000000	10.10417
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0.516667	2.066116	0.447658	0.000000	10.10417
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0.550000	2.066116	0.516529	0.000000	10.10417
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END FTABLES

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<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.857          PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.857          IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
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<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1001 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      2 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
RCHRES   2 HYDR   RO     1 1        1      WDM   1004 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      1 1        1      WDM   1005 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      2 1        1      WDM   1006 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1007 STAG     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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APPENDIX C

CSWPPP

YELM HIGH SCHOOL
SOCCER FIELD CONVERSION AND TENNIS COURT RECONSTRUCTION

KPFF Project # 10182200114

PRELIMINARY

Stormwater Pollution Prevention Plan (SWPPP)

December 30, 2022

Prepared by:
Ben Enfield, PE

Consulting Engineers
612 Woodland Square Loop SE, Suite 100
Lacey, WA 98503
(360) 292-7230
(360) 292-7231 FAX

Construction Stormwater General Permit (CSWGP)

Stormwater Pollution Prevention Plan (SWPPP)

for

Yelm High School
Soccer Field Conversion and Tennis Court Reconstruction

Prepared for:
Department of Ecology
Northwest Regional Office

Permittee / Owner	Developer	Operator / Contractor
Yelm High School	Yelm High School	TBD

Certified Erosion and Sediment Control Lead (CESCL)

Name	Organization	Contact Phone Number
TBD	-	-

SWPPP Prepared By

Name	Organization	Contact Phone Number
Ben Enfield	KPFF Consulting Engineers	(360) 292-7230

SWPPP Preparation Date
9/1/2020

Project Construction Dates

Activity / Phase	Start Date	End Date
Site Improvements	TBD	TBD

TABLE OF CONTENTS

List of Tables

List of Appendices

List of Acronyms and Abbreviations

Acronym / Abbreviation	Explanation
303(d)	Section of the Clean Water Act pertaining to Impaired Waterbodies
BFO	Bellingham Field Office of the Department of Ecology
BMP(s)	Best Management Practice(s)
CESCL	Certified Erosion and Sediment Control Lead
CO_2	Carbon Dioxide
CRO	Central Regional Office of the Department of Ecology
CSWGP	Construction Stormwater General Permit
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ERO	Eastern Regional Office of the Department of Ecology
ERTS	Environmental Report Tracking System
ESC	Erosion and Sediment Control
GULD	General Use Level Designation
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
NWRO	Northwest Regional Office of the Department of Ecology
pH	Power of Hydrogen
RCW	Revised Code of Washington
SPCC	Spill Prevention, Control, and Countermeasure
su	Standard Units
SWMMEW	Stormwater Management Manual for Eastern Washington
SWMMWW	Stormwater Management Manual for Western Washington
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
SWRO	Southwest Regional Office of the Department of Ecology
TMDL	Total Maximum Daily Load
VFO	Vancouver Field Office of the Department of Ecology
WAC	Washington Administrative Code
WSDOT	Washington Department of Transportation
WWHM	Western Washington Hydrology Model

Project Information (1.0)

Project/Site Name: Yelm High School
Street/Location: 1315 W Yelm Ave
City: Yelm State: WA Zip code: 98597
Subdivision: n/a
Receiving waterbody: Groundwater

Existing Conditions (1.1)

Total acreage: 36.6 acres

Disturbed acreage: 3.5 acres

Existing structures: Yelm High School Campus

Land cover: The site is developed as a high school campus with multiple buildings, parking lots, athletic fields, and landscape areas.

Landscape topography: The project site is generally flat but slopes from northeast to southwest with typical slopes of less than 2%

Drainage patterns: There are onsite stormwater treatment and infiltration areas for existing parking lots. Generally, stormwater runoff from the site is handled as sheet flow and infiltrates onsite. Runoff currently infiltrates on-site and sheet flows off-site along the south and east property lines of the project site. Any runoff that does not infiltrate on-site sheet flows to the southwest toward Thompson Creek. Thompson Creek, at its closest point, is located approximately 450 feet southwest of the southwest property corner. The drainage pattern at the project site is also flat with slopes less than 2%. The existing tennis courts are constructed with a crown running north-south and the field is sloped at less than 1% slope to the north.

Existing Vegetation: The campus is fully developed. Pervious areas are grass or landscape.

Critical Areas (wetlands, streams, flood zone and high erosion risk): The project site is not within the floodway, high groundwater area, or wetland review areas associated with Thompson Creek. The site is located in a category 1 critical aquifer recharge area.

Table 1 includes a list of suspected and/or known contaminants associated with the construction activity.

Table 1 – Summary of Site Pollutant Constituents

Constituent (Pollutant)	Location	Depth	Concentration
None	-	-	-

Proposed Construction Activities (1.2)

Description of site development:

The proposed project will be replacement and improvement of existing tennis courts and sports field.

Description of construction activities:

TESC installation, site grading, trenching & installation for underground utilities (stormwater), and surface improvements.

Description of site drainage including flow from and onto adjacent properties. Must be consistent with Site Map in Appendix A:

All stormwater runoff will be collected within the project area and infiltrated.

Description of final stabilization:

Final stabilization will consist of landscaping and paving.

Contaminated Site Information:

Proposed activities regarding contaminated soils or groundwater (example: on-site treatment system, authorized sanitary sewer discharge):

None known or suspected.

Construction Stormwater Best Management Practices (BMPs) (2.0)

The SWPPP is a living document reflecting current conditions and changes throughout the life of the project. These changes may be informal (i.e. hand-written notes and deletions). Update the SWPPP when the CESCL has noted a deficiency in BMPs or deviation from original design.

The 13 Elements (2.1)

Element 1: Preserve Vegetation / Mark Clearing Limits (2.1.1)

To protect adjacent areas and to reduce the area of soil exposed to construction, the limits of construction will be clearly marked before land-disturbing activities begin.

List and describe BMPs:

BMP C101: Preserving Natural Vegetation

BMP C233: Silt Fence

Installation Schedules: Prior to land disturbing activities and as needed.

Inspection and Maintenance plan: Per BMP Maintenance Standards. It is the CESCL's responsibility to ensure that all necessary BMPs are adequately installed prior to land disturbing activities. Once installed, the CESCL must perform periodic inspections to ensure that all BMPs are functioning properly. The CESCL may also suggest the installation of additional BMPs not listed above.

Responsible Staff: Contractor provided CESCL.

Element 2: Establish Construction Access (2.1.2)

A stabilized construction entrances will be provided off 93rd Ave SE. A construction staging area is proposed in the gravel parking lot just north of the field and adjacent to the proposed construction access. Construction access or activities occurring on unpaved areas shall be minimized, yet where necessary, access points shall be stabilized to minimize the tracking of sediment onto public roads, street sweeping, and street cleaning shall be employed to prevent sediment from leaving the site. All wash wastewater shall be controlled on-site.

List and describe BMPs:

BMP C105: Stabilized Construction Access

BMP C107: Construction Road/Parking Area Stabilization

Construction road/parking area stabilization shall be implemented to keep the existing on-site roads clean.

Installation Schedules: Prior to land disturbing activities.

Inspection and Maintenance plan: Per BMP maintenance standards. It is the CESCL's responsibility to ensure that all necessary BMPs are adequately installed prior to land disturbing activities. Once installed, the CESCL must inspect the construction entrance for silt and soil build up and also look for any soil washout on to hard surfaces. If soil washout is present, the CESCL must take appropriate actions to alleviate the problem.

Responsible Staff: Contractor provided CESCL.

Element 3: Control Flow Rates (2.1.3)

No flow control BMP's are proposed as the site is currently developed and proposed activity will not increase the impervious area above what exists on site. Water Bars will be used a

Will you construct stormwater retention and/or detention facilities?
☐Yes ☒No

Will you use permanent infiltration ponds or other low impact development (example: rain gardens, bio-retention, porous pavement) to control flow during construction?
☐Yes ☒No

List and describe BMPs:

BMP C203: Water Bars

BMP C235: Wattles

Installation Schedules: Prior to land disturbing activities and as needed.

Inspection and Maintenance Plan: Per BMP maintenance standards sediment levels shall be monitored and sediment shall be removed to ensure proper performance of the check dams and sediment ponds. It is the CESCL's responsibility to ensure that all necessary BMPs are adequately installed prior to land disturbing activities. Once installed, the CESCL must inspect the construction entrance for silt and soil build up and also look for any soil washout on to hard surfaces. If the above listed BMPs are inadequate at controlling flowrates, the CESCL must take appropriate actions to alleviate the problem

Responsible Staff: Contractor provided CESCL

Element 4: Install Sediment Controls (2.1.4)

All stormwater runoff from disturbed areas shall pass through an appropriate sediment removal BMP prior to being discharged offsite or to an infiltration facility. In addition, sediment will be removed from paved areas, in and adjacent to construction work areas manually or using mechanical sweepers, as needed, to minimize tracking of sediments on vehicle tires away from the site and to minimize wash off of sediments from adjacent streets in runoff.

List and describe BMPs:

BMP C220: Storm Drain Inlet Protection

BMP C233: Silt Fence

Installation Schedules: Prior to land disturbing activities and as needed.

Inspection and Maintenance Plan: Per BMP maintenance standards. It is the CESCL's responsibility to ensure that all necessary BMPs are adequately installed. Once installed, the CESCL must perform periodic inspections to ensure that all BMPs are functioning properly. The CESCL may also suggest the installation of additional BMPs not listed above.

Responsible Staff: Contractor provided CESCL

Element 5: Stabilize Soils (2.1.5)

Exposed and unworked soils shall be stabilized with the application of effective BMPs to prevent erosion throughout the life of the project. All stockpiled soils shall be stabilized from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.

West of the Cascade Mountains Crest

Season	Dates	Number of Days Soils Can be Left Exposed
During the Dry Season	May 1 – September 30	7 days
During the Wet Season	October 1 – April 30	2 days

Soils must be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.

Anticipated project dates: Start date: Summer 2023 End date: Fall 2023

Will you construct during the wet season?
☐Yes ☒No

Exposed and unworked soils shall be stabilized with the application of effective BMPs to prevent erosion throughout the life of the project.

List and describe BMPs:

BMP C140: Dust Control

BMP C120: Temporary and Permanent Seeding

Installation Schedules: As needed.

Inspection and Maintenance Plan: Per BMP maintenance standards. It is the CESCL's responsibility to ensure that all necessary BMPs are adequately installed. Once installed, the CESCL must perform periodic inspections to ensure that all BMPs are functioning properly. The CESCL may also suggest the installation of additional BMPs not listed above.

Responsible Staff: Contractor provided CESCL

Element 6: Protect Slopes (2.1.6)

Not Applicable. No slopes are present or proposed.

Will steep slopes be present at the site during construction?
☐Yes ☒No

N/A

Installation Schedules: N/A

Inspection and Maintenance Plan: N/A

Responsible Staff: N/A

Element 7: Protect Drain Inlets (2.1.7)

All storm drain inlets existing and installed during construction shall be protected to prevent unfiltered or untreated water from entering the drainage conveyance system. Storm Drain Inlet Protection (BMP C220) will be implemented for all drainage inlets and that could potentially be impacted by sediment-laden runoff on and near the project site.

List and describe BMPs:

BMP C220: Storm Drain Inlet Protection

Installation Schedules: Prior to land disturbing activities.

Inspection and Maintenance Plan: Per BMP maintenance standards. It is the CESCL's responsibility to ensure that all necessary BMPs are adequately installed. Once installed, the CESCL must perform periodic inspections to ensure that all BMPs are functioning properly. Storm drain inlet protection should be regularly emptied and cleans to maximize effectiveness.

Responsible Staff: Contractor provided CESCL

Element 8: Stabilize Channels and Outlets (2.1.8)

N/A – No channels or direct discharge outlets are existing or proposed.

List and describe BMPs:

N/A

Installation Schedules: N/A

Inspection and Maintenance Plan: N/A

Responsible Staff: N/A

Element 9: Control Pollutants (2.1.9)

The following pollutants are anticipated to be present on-site:

Table 2 – Pollutants

Pollutant (and source, if applicable)
Petroleum products for construction equipment
Asphalt and concrete for site improvements
etc.

All pollutants, including waste materials and demolition debris, that occur on-site shall be handled and disposed of in a manner that does not cause contamination of stormwater. Good housekeeping and preventative measures will be taken to ensure that the site will be kept clean, well-organized, and free of debris.

List and describe BMPs:

BMP C151: Concrete Handling

BMP C153: Material Delivery, Storage and Containment

BMPC154: Concrete Washout Area

Volume IV – Source Control BMPs

S407 BMPs for Dust Control at Disturbed Land Areas and Unpaved Roadways and Parking Lots

S411 BMPs for Landscaping and Lawn/Vegetation Management

S412 BMPs for Loading and Unloading Areas for Liquid and Solid Material

S414 BMPs for Maintenance and Repair of Vehicles and Equipment

S417 BMPs for Maintenance of Stormwater Drainage and Treatment Systems

S419 BMPs for Mobile Fueling of Vehicles and Heavy Equipment

S421 BMPs for Parking and Storage of Vehicles and Equipment

S426 BMPs for Spills of Oil and Hazardous Materials

Installation Schedules: As needed.

Inspection and Maintenance Plan: Per BMP maintenance standards. It is the CESCL's responsibility to ensure that all necessary BMPs are adequately installed. Once installed, the CESCL must perform periodic inspections to ensure that all BMPs are functioning properly. The CESCL may also suggest the installation of additional BMPs not listed above.

Responsible Staff: Contractor provided CESCL.

Will maintenance, fueling, and/or repair of heavy equipment and vehicles occur on-site?
☒Yes ☐No

List and describe BMPs:

S412 BMPs for Loading and Unloading Areas for Liquid and Solid Material

S414 BMPs for Maintenance and Repair of Vehicles and Equipment

S419 BMPs for Mobile Fueling of Vehicles and Heavy Equipment

S426 BMPs for Spills of Oil and Hazardous Materials

Installation Schedules: As needed.

Inspection and Maintenance Plan: As needed

Responsible Staff: Per BMP maintenance standards. It is the CESCL's responsibility to ensure that all necessary BMPs are adequately installed. Once installed, the CESCL must perform periodic inspections to ensure that all BMPs are functioning properly. The CESCL may also suggest the installation of additional BMPs not listed above.

Will wheel wash or tire bath system BMPs be used during construction?
☐Yes ☒No

Will pH-modifying sources be present on-site?
☒Yes ☐No

Table 3 – pH-Modifying Sources

	None
X	Bulk cement
	Cement kiln dust
	Fly ash
	Other cementitious materials
	New concrete washing or curing waters
	Waste streams generated from concrete grinding and sawing
	Exposed aggregate processes
	Dewatering concrete vaults
X	Concrete pumping and mixer washout waters
	Recycled concrete
	Other (i.e. calcium lignosulfate) [please describe]

List and describe BMPs:

BMP C252: Treating and Disposing of High pH Water

Installation Schedules:

Inspection and Maintenance Plan: Per BMP maintenance standards. It is the CESCL's responsibility to ensure that all necessary BMPs are adequately installed. Once installed, the CESCL must perform periodic inspections to ensure that all BMPs are functioning properly. The CESCL may also suggest the installation of additional BMPs not listed above.

Responsible Staff: Contractor provided CESCL

Concrete trucks must not be washed out onto the ground, or into storm drains, open ditches, streets, or streams. Excess concrete must not be dumped on-site, except in designated concrete washout areas with appropriate BMPs installed.

Element 10: Control Dewatering (2.1.10)

Dewatering is not anticipated to be necessary based on proposed work and site conditions. Groundwater was not encountered during geotechnical site explorations.

Table 4 – Dewatering BMPs

	Infiltration
	Transport off-site in a vehicle (vacuum truck for legal disposal)
	Ecology-approved on-site chemical treatment or other suitable treatment technologies
	Sanitary or combined sewer discharge with local sewer district approval (last resort)
	Use of sedimentation bag with discharge to ditch or swale (small volumes of localized dewatering)

List and describe BMPs: N/A

Installation Schedules: N/A

Inspection and Maintenance Plan: N/A

Responsible Staff: Contractor provided CESCL

Element 11: Maintain BMPs (2.1.11)

All temporary and permanent Erosion and Sediment Control (ESC) BMPs shall be maintained and repaired as needed to ensure continued performance of their intended function.

Maintenance and repair shall be conducted in accordance with each particular BMP specification (see *Volume II of the SWMMWW or Chapter 7 of the SWMMEW*).

Visual monitoring of all BMPs installed at the site will be conducted at least once every calendar week and within 24 hours of any stormwater or non-stormwater discharge from the site. If the site becomes inactive and is temporarily stabilized, the inspection frequency may be reduced to once every calendar month.

All temporary ESC BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed.

Trapped sediment shall be stabilized on-site or removed. Disturbed soil resulting from removal of either BMPs or vegetation shall be permanently stabilized.

Additionally, protection must be provided for all BMPs installed for the permanent control of stormwater from sediment and compaction. BMPs that are to remain in place following completion of construction shall be examined and restored to full operating condition. If sediment enters these BMPs during construction, the sediment shall be removed and the facility shall be returned to conditions specified in the construction documents.

Element 12: Manage the Project (2.1.12)

The project will be managed based on the following principles:

- Projects will be phased to the maximum extent practicable and seasonal work limitations will be taken into account.
- Inspection and monitoring:
    - Inspection, maintenance and repair of all BMPs will occur as needed to ensure performance of their intended function.
    - Site inspections and monitoring will be conducted in accordance with Special Condition S4 of the CSWGP. Sampling locations are indicated on the Site Map. Sampling station(s) are located in accordance with applicable requirements of the CSWGP.
- Maintain an updated SWPPP.
    - The SWPPP will be updated, maintained, and implemented in accordance with Special Conditions S3, S4, and S9 of the CSWGP.

As site work progresses, the SWPPP will be modified routinely to reflect changing site conditions. The SWPPP will be reviewed monthly to ensure the content is current.

Table 5 – Management

X	Design the project to fit the existing topography, soils, and drainage patterns
X	Emphasize erosion control rather than sediment control
X	Minimize the extent and duration of the area exposed
X	Keep runoff velocities low
X	Retain sediment on-site
X	Thoroughly monitor site and maintain all ESC measures
X	Schedule major earthwork during the dry season
	Other (please describe)

Table 6 – BMP Implementation Schedule

Phase of Construction Project	Stormwater BMPs	Date	Wet/Dry Season
TBD	TBD	TBD	TBD

Phase of Construction Project	Stormwater BMPs	Date	Wet/Dry Season
TBD	TBD	TBD	TBD

Element 13: Protect Low Impact Development (LID) BMPs (2.1.13).

Infiltration trenches are proposed. Care should be taken to ensure heavy machinery does not compact areas for future infiltration in order to maintain the infiltration capacity of existing soils.

Pollution Prevention Team (3.0)

Table 7 – Team Information

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESCL)	TBD	
Resident Engineer	Ben Enfield	(360) 292-7230
Emergency Ecology Contact	Northwest Regional Office	(425) 649-7000
Emergency Permittee/ Owner Contact	TBD	
Non-Emergency Owner Contact	TBD	
Monitoring Personnel	TBD	
Ecology Regional Office	Northwest Regional Office	(425) 649-7000

Monitoring and Sampling Requirements (4.0)

Monitoring includes visual inspection, sampling for water quality parameters of concern, and documentation of the inspection and sampling findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections

Create your own Site Inspection Form or use the Construction Stormwater Site Inspection Form found on Ecology's website. https://www.ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Construction-stormwater-permit

Blank form under Appendix D.

The site log book must be maintained on-site within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

Numeric effluent limits may be required for certain discharges to 303(d) listed waterbodies. See CSWGP Special Condition S8 and Section 5 of this template.

Site Inspection (4.1)

Site inspections will be conducted at least once every calendar week and within 24 hours following any discharge from the site. For sites that are temporarily stabilized and inactive, the required frequency is reduced to once per calendar month.

Discharge will be to groundwater onsite.

Stormwater Quality Sampling (4.2)

N/A

Turbidity Sampling (4.2.1)

No offsite discharge is expected and therefore on site sampling is assumed to be required. If offsite discharge of stormwater does occur then monitoring shall be implemented.

Requirements include calibrated turbidity meter or transparency tube to sample site discharges for compliance with the CSWGP. Sampling will be conducted at all discharge points at least once per calendar week.

Method for sampling turbidity:

Table 8 – Turbidity Sampling Method

	Turbidity Meter/Turbidimeter (required for disturbances 5 acres or greater in size)
x	Transparency Tube (option for disturbances less than 1 acre and up to 5 acres in size)

The benchmark for turbidity value is 25 nephelometric turbidity units (NTU) and a transparency less than 33 centimeters.

If the discharge's turbidity is 26 to 249 NTU **or** the transparency is less than 33 cm but equal to or greater than 6 cm, the following steps will be conducted:

1. Review the SWPPP for compliance with Special Condition S9. Make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.
3. Document BMP implementation and maintenance in the site log book.

If the turbidity exceeds 250 NTU **or** the transparency is 6 cm or less at any time, the following steps will be conducted:

1. Telephone or submit an electronic report to the applicable Ecology Region's Environmental Report Tracking System (ERTS) within 24 hours. https://www.ecology.wa.gov/About-us/Get-involved/Report-an-environmental-issue
    - Northwest Region (King, Kitsap, Island, San Juan, Skagit, Snohomish, Whatcom): (425) 649-7000
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period
3. Document BMP implementation and maintenance in the site log book.
4. Continue to sample discharges daily until one of the following is true:
    - Turbidity is 25 NTU (or lower).
    - Transparency is 33 cm (or greater).
    - Compliance with the water quality limit for turbidity is achieved.
        - 1 - 5 NTU over background turbidity, if background is less than 50 NTU
        - 1% - 10% over background turbidity, if background is 50 NTU or greater
    - The discharge stops or is eliminated.

pH Sampling (4.2.2)

pH monitoring is required for “Significant concrete work” (i.e. greater than 1000 cubic yards poured concrete or recycled concrete over the life of the project).The use of engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD] or fly ash) also requires pH monitoring.

For significant concrete work, pH sampling will start the first day concrete is poured and continue until it is cured, typically three (3) weeks after the last pour.

For engineered soils and recycled concrete, pH sampling begins when engineered soils or recycled concrete are first exposed to precipitation and continues until the area is fully stabilized.

If the measured pH is 8.5 or greater, the following measures will be taken:

1. Prevent high pH water from entering storm sewer systems or surface water.
2. Adjust or neutralize the high pH water to the range of 6.5 to 8.5 su using appropriate technology such as carbon dioxide (CO_2) sparging (liquid or dry ice).
3. Written approval will be obtained from Ecology prior to the use of chemical treatment other than CO_2 sparging or dry ice.

Method for sampling pH:

Table 9 – pH Sampling Method

	pH meter
X	pH test kit
	Wide range pH indicator paper

Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies (5.0)

303(d) Listed Waterbodies (5.1)

Is the receiving water 303(d) (Category 5) listed for turbidity, fine sediment, phosphorus, or pH?
☐Yes ☒No

TMDL Waterbodies (5.2)

Waste Load Allocation for CWSGP discharges: N/A

Discharges to TMDL receiving waterbodies will meet in-stream water quality criteria at the point of discharge.

Reporting and Record Keeping (6.0)

Record Keeping (6.1)

Site Log Book (6.1.1)

A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Sample logs

Records Retention (6.1.2)

Records will be retained during the life of the project and for a minimum of three (3) years following the termination of permit coverage in accordance with Special Condition S5.C of the CSWGP.

Permit documentation to be retained on-site:

- CSWGP
- Permit Coverage Letter
- SWPPP
- Site Log Book

Permit documentation will be provided within 14 days of receipt of a written request from Ecology. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with Special Condition S5.G.2.b of the CSWGP.

Updating the SWPPP (6.1.3)

The SWPPP will be modified if:

- Found ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site.
- There is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

The SWPPP will be modified within seven (7) days if inspection(s) or investigation(s) determine additional or modified BMPs are necessary for compliance. An updated timeline for BMP implementation will be prepared.

Reporting (6.2)

Discharge Monitoring Reports (6.2.1)

Cumulative soil disturbance is one (1) acre or larger; therefore, Discharge Monitoring Reports (DMRs) will be submitted to Ecology monthly. If there was no discharge during a given monitoring period the DMR will be submitted as required, reporting "No Discharge". The DMR due date is fifteen (15) days following the end of each calendar month.
DMRs will be reported online through Ecology's WQWebDMR System.

To sign up for WQWebDMR go to:
https://www.ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance/WQWebPortal-guidance

Notification of Noncompliance (6.2.2)

If any of the terms and conditions of the permit is not met, and the resulting noncompliance may cause a threat to human health or the environment, the following actions will be taken:

1. Ecology will be notified within 24-hours of the failure to comply by calling the applicable Regional office ERTS phone number (Regional office numbers listed below).
2. Immediate action will be taken to prevent the discharge/pollution or otherwise stop or correct the noncompliance. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.
3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

Specific information to be included in the noncompliance report is found in Special Condition S5.F.3 of the CSWGP.

Anytime turbidity sampling indicates turbidity is 250 NTUs or greater, or water transparency is 6 cm or less, the Ecology Regional office will be notified by phone within 24 hours of analysis as required by Special Condition S5.A of the CSWGP.

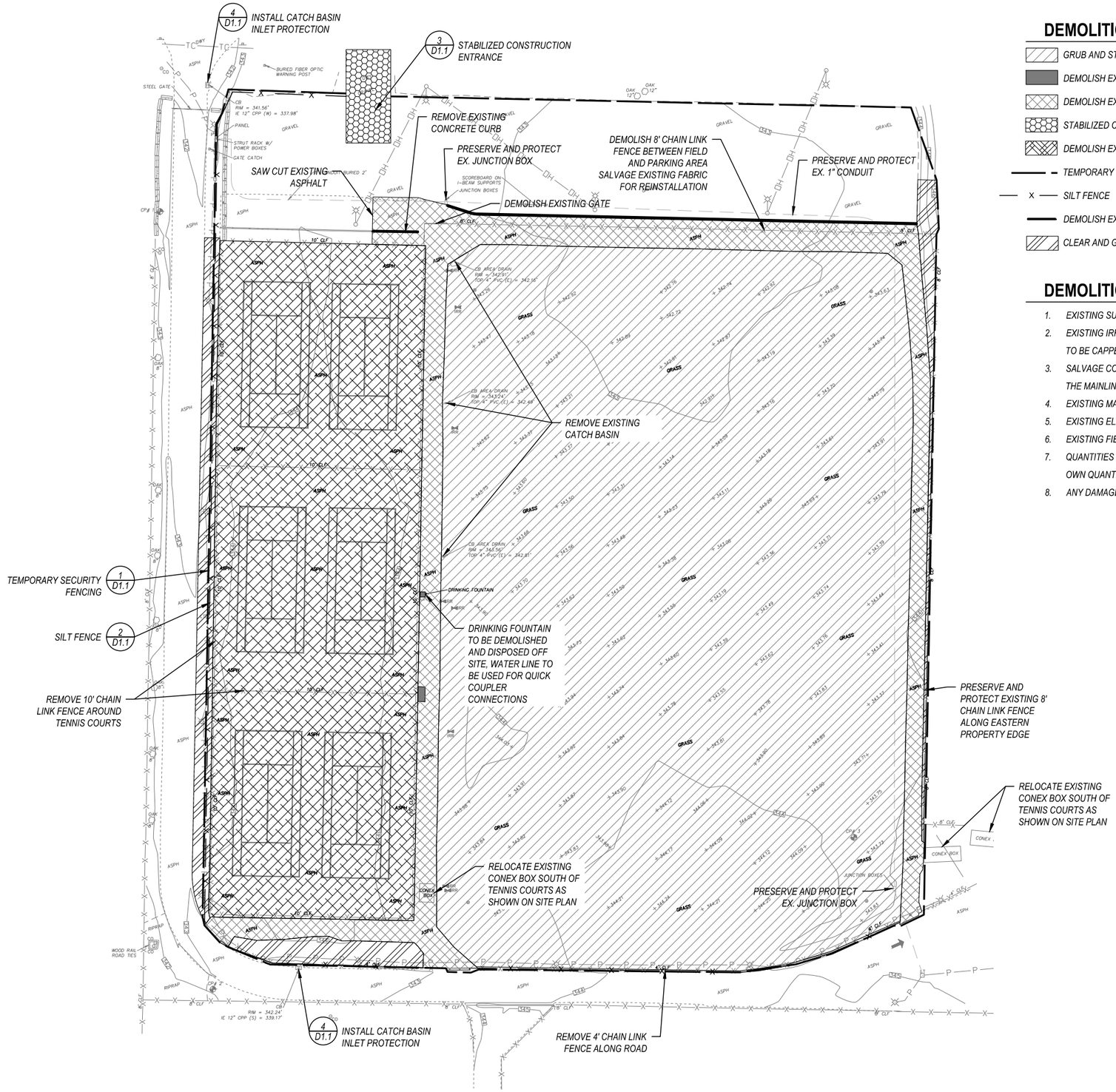
- Northwest Region at (425) 649-7000 for Island, King, Kitsap, San Juan, Skagit, Snohomish, or Whatcom County

Include the following information:

1. Your name and / Phone number
2. Permit number
3. City / County of project
4. Sample results
5. Date / Time of call
6. Date / Time of sample
7. Project name

In accordance with Special Condition S4.D.5.b of the CSWGP, the Ecology Regional office will be notified if chemical treatment other than CO_2 sparging is planned for adjustment of high pH water.

APPENDIX A
Site Map



DEMOLITION LEGEND

- GRUB AND STRIP TOPSOIL, 6" MIN. (95,030 ± SF)
- DEMOLISH EXISTING CONCRETE (40 ± SF)
- DEMOLISH EXISTING ASPHALT (14,290 ± SF)
- STABILIZED CONSTRUCTION ENTRANCE (1200 ± SF)
- DEMOLISH EXISTING TENNIS COURT SURFACING (39,800 ± SF)
- TEMPORARY SECURITY FENCING
- SILT FENCE
- DEMOLISH EXISTING CONCRETE CURB (± 40 LF)
- CLEAR AND GRUB (5,430 ± SF)

DEMOLITION NOTES

1. EXISTING SUBSURFACE DRAINAGE TO BE ABANDONED IN PLACE
2. EXISTING IRRIGATION HEADS TO BE SALVAGED AND RETURNED TO OWNER, IRRIGATION LATERALS TO BE CAPPED AND ABANDONED IN PLACE.
3. SALVAGE CONTROL VALVES AND RETURN TO OWNER. CUT AND CAP NIPPLE CONNECTING VALVE TO THE MAINLINE
4. EXISTING MAINLINE TO REMAIN, PRESERVE IN PLACE.
5. EXISTING ELECTRICAL LINES TO REMAIN.
6. EXISTING FIELD LIGHTS AND POWER JUNCTION BOXES TO REMAIN.
7. QUANTITIES PROVIDED FOR CONTRACTOR INFORMATION ONLY. CONTRACTOR TO DERIVE THEIR OWN QUANTITIES.
8. ANY DAMAGE SHALL BE REPAIRED IMMEDIATELY

SCALE: 1"=30'

0 15' 30' 45' 60'

811 Call 811 two business days before you dig

Yelm HS Soccer Field Conversion and Tennis Courts Reconstruction

Yelm High School
Yelm WA

RWD
Landscape Architects
4405 7th Ave. SE, Suite 203
Lacey, WA 98503
360.456.3813
bob@rwdrdl.com

PERMITTING SUBMITTAL

PROJECT NO. 22041
DRAWING

DESIGNED BY BD
DRAWN BY JH
CHECKED BY BD

REVISION

DATE	CHANGE

DATE: 0000 00, 0000

DEMOLITION & TESC PLAN

D1.0

APPENDIX B
BMP Detail

BMP C101: Preserving Natural Vegetation

Purpose

The purpose of preserving natural vegetation is to reduce erosion wherever practicable. Limiting site disturbance is the single most effective method for reducing erosion. For example, conifers can hold up to about 50 percent of all rain that falls during a storm. Up to 20-30 percent of this rain may never reach the ground but is taken up by the tree or evaporates. Another benefit is that the rain held in the tree can be released slowly to the ground after the storm.

Conditions of Use

Natural vegetation should be preserved on steep slopes, near perennial and intermittent water-courses or swales, and on building sites in wooded areas.

- As required by local governments.
- Phase construction to preserve natural vegetation on the project site for as long as possible during the construction period.

Design and Installation Specifications

Natural vegetation can be preserved in natural clumps or as individual trees, shrubs and vines.

The preservation of individual plants is more difficult because heavy equipment is generally used to remove unwanted vegetation. The points to remember when attempting to save individual plants are:

- Is the plant worth saving? Consider the location, species, size, age, vigor, and the work involved. Local governments may also have ordinances to save natural vegetation and trees.
- Fence or clearly mark areas around trees that are to be saved. It is preferable to keep ground disturbance away from the trees at least as far out as the dripline.

Plants need protection from three kinds of injuries:

- *Construction Equipment* - This injury can be above or below the ground level. Damage results from scarring, cutting of roots, and compaction of the soil. Placing a fenced buffer zone around plants to be saved prior to construction can prevent construction equipment injuries.
- *Grade Changes* - Changing the natural ground level will alter grades, which affects the plant's ability to obtain the necessary air, water, and minerals. Minor fills usually do not cause problems although sensitivity between species does vary and should be checked. Trees can typically tolerate fill of 6 inches or less. For shrubs and other plants, the fill should be less.

  When there are major changes in grade, it may become necessary to supply air to the roots of plants. This can be done by placing a layer of gravel and a tile system over the roots before the fill is made. The tile system should be laid out on the original grade leading from a dry well

around the tree trunk. The system should then be covered with small stones to allow air to circulate over the root area.

Lowering the natural ground level can seriously damage trees and shrubs. The highest percentage of the plant roots are in the upper 12 inches of the soil and cuts of only 2-3 inches can cause serious injury. To protect the roots it may be necessary to terrace the immediate area around the plants to be saved. If roots are exposed, construction of retaining walls may be needed to keep the soil in place. Plants can also be preserved by leaving them on an undisturbed, gently sloping mound. To increase the chances for survival, it is best to limit grade changes and other soil disturbances to areas outside the dripline of the plant.

- *Excavations* - Protect trees and other plants when excavating for drainfields, power, water, and sewer lines. Where possible, the trenches should be routed around trees and large shrubs. When this is not possible, it is best to tunnel under them. This can be done with hand tools or with power augers. If it is not possible to route the trench around plants to be saved, then the following should be observed:
    - Cut as few roots as possible. When you have to cut, cut clean. Paint cut root ends with a wood dressing like asphalt base paint if roots will be exposed for more than 24-hours.
    - Backfill the trench as soon as possible.
    - Tunnel beneath root systems as close to the center of the main trunk to preserve most of the important feeder roots.

Some problems that can be encountered with a few specific trees are:

- Maple, Dogwood, Red alder, Western hemlock, Western red cedar, and Douglas fir do not readily adjust to changes in environment and special care should be taken to protect these trees.
- The windthrow hazard of Pacific silver fir and madrona is high, while that of Western hemlock is moderate. The danger of windthrow increases where dense stands have been thinned. Other species (unless they are on shallow, wet soils less than 20 inches deep) have a low windthrow hazard.
- Cottonwoods, maples, and willows have water-seeking roots. These can cause trouble in sewer lines and infiltration fields. On the other hand, they thrive in high moisture conditions that other trees would not.
- Thinning operations in pure or mixed stands of Grand fir, Pacific silver fir, Noble fir, Sitka spruce, Western red cedar, Western hemlock, Pacific dogwood, and Red alder can cause serious disease problems. Disease can become established through damaged limbs, trunks, roots, and freshly cut stumps. Diseased and weakened trees are also susceptible to insect attack.

Maintenance Standards

Inspect flagged and/or fenced areas regularly to make sure flagging or fencing has not been removed or damaged. If the flagging or fencing has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.

If tree roots have been exposed or injured, “prune” cleanly with an appropriate pruning saw or loppers directly above the damaged roots and recover with native soils. Treatment of sap flowing trees (fir, hemlock, pine, soft maples) is not advised as sap forms a natural healing barrier.

BMP C102: Buffer Zones

Purpose

Creation of an undisturbed area or strip of natural vegetation or an established suitable planting that will provide a living filter to reduce soil erosion and stormwater runoff velocities.

Conditions of Use

Buffer zones are used along streams, wetlands and other bodies of water that need protection from erosion and sedimentation. Contractors can use vegetative buffer zone BMPs to protect natural swales and they can incorporate them into the natural landscaping of an area.

Do not use critical-areas buffer zones as sediment treatment areas. These areas shall remain completely undisturbed. The local permitting authority may expand the buffer widths temporarily to allow the use of the expanded area for removal of sediment.

The types of buffer zones can change the level of protection required as shown below:

Designated Critical Area Buffers - buffers that protect Critical Areas, as defined by the Washington State Growth Management Act, and are established and managed by the local permitting authority. These should not be disturbed and must protected with sediment control BMPs to prevent impacts. The local permitting authority may expand the buffer widths temporarily to allow the use of the expanded area for removal of sediment.

Vegetative Buffer Zones - areas that may be identified in undisturbed vegetation areas or managed vegetation areas that are outside any Designated Critical Area Buffer. They may be utilized to provide an additional sediment control area and/or reduce runoff velocities. If being used for preservation of natural vegetation, they should be arranged in clumps or strips. They can be used to protect natural swales and incorporated into the natural landscaping area.

Design and Installation Specifications

- Preserving natural vegetation or plantings in clumps, blocks, or strips is generally the easiest and most successful method.
- Leave all unstable steep slopes in natural vegetation.
- Mark clearing limits and keep all equipment and construction debris out of the natural areas and buffer zones. Steel construction fencing is the most effective method to protect sensitive areas and buffers. Alternatively, wire-backed silt fence on steel posts is marginally effective. Flagging alone is typically not effective.
- Keep all excavations outside the dripline of trees and shrubs.
- Do not push debris or extra soil into the buffer zone area because it will cause damage by

burying and smothering vegetation.

- Vegetative buffer zones for streams, lakes or other waterways shall be established by the local permitting authority or other state or federal permits or approvals.

Maintenance Standards

Inspect the area frequently to make sure flagging remains in place and the area remains undisturbed. Replace all damaged flagging immediately. Remove all materials located in the buffer area that may impede the ability of the vegetation to act as a filter.

BMP C105: Stabilized Construction Access

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.

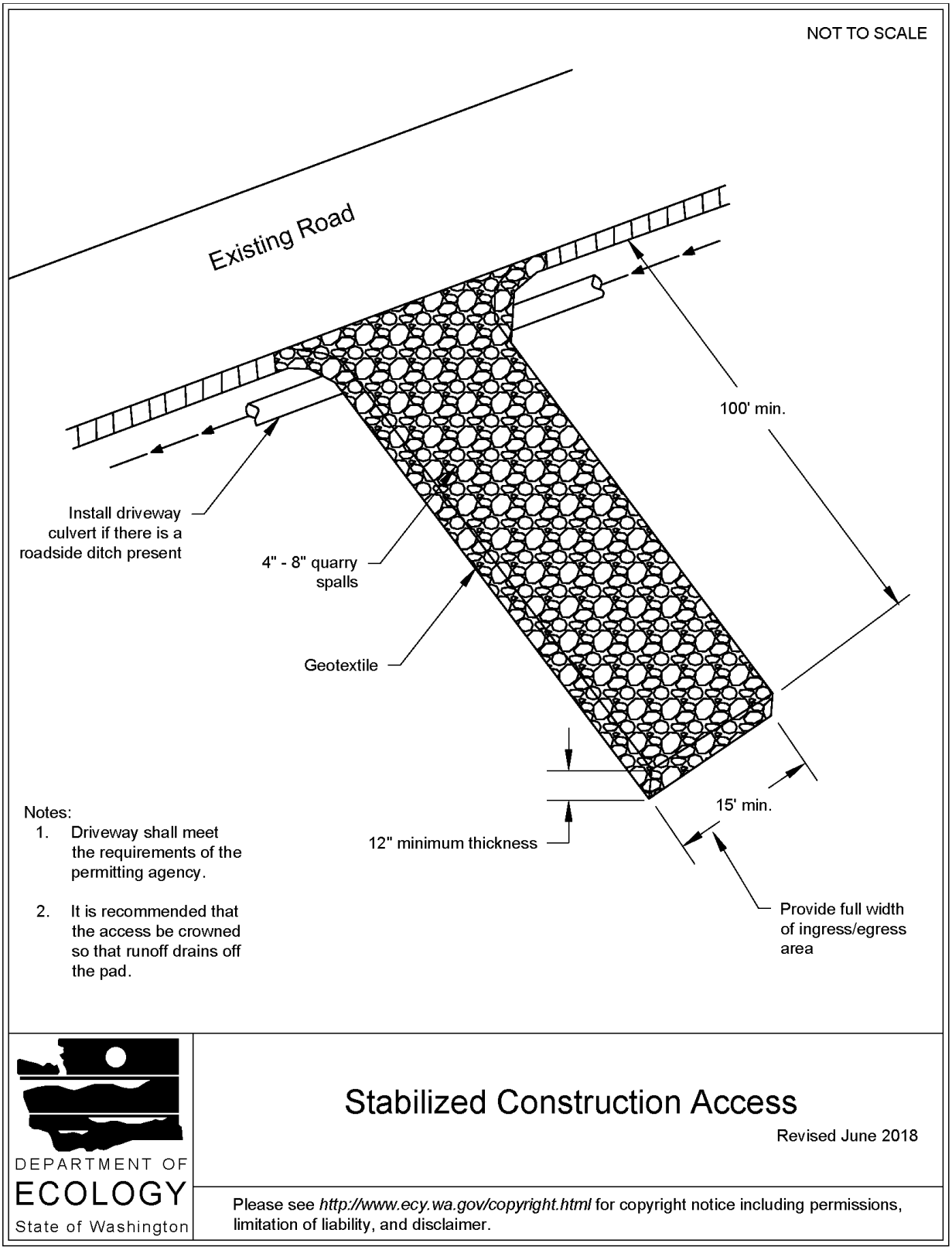
Maintenance Standards

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.

Figure II-3.1: Stabilized Construction Access



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 C106: Wheel Wash

Purpose

Wheel washes reduce the amount of sediment transported onto paved roads by washing dirt from the wheels of motor vehicles prior to the motor vehicles leaving the construction site.

Conditions of Use

- Use a wheel wash when BMP C105: Stabilized Construction Access is not preventing sediment from being tracked off site.
- Wheel washing is generally an effective BMP when installed with careful attention to topography. For example, a wheel wash can be detrimental if installed at the top of a slope abutting a right-of-way where the water from the dripping truck can run unimpeded into the street.
- Pressure washing combined with an adequately sized and surfaced pad with direct drainage to a large 10-foot x 10-foot sump can be very effective.
- Wheel wash wastewater is not stormwater. It is commonly called process water, and must be discharged to a separate on-site treatment system that prevents discharge to waters of the State, or to the sanitary sewer with local sewer district approval.
- Wheel washes may use closed-loop recirculation systems to conserve water use.
- Wheel wash wastewater shall not include wastewater from concrete washout areas.
- When practical, the wheel wash should be placed in sequence with BMP C105: Stabilized Construction Access. Locate the wheel wash such that vehicles exiting the wheel wash will enter directly onto BMP C105: Stabilized Construction Access. In order to achieve this, BMP C105: Stabilized Construction Access may need to be extended beyond the standard installation to meet the exit of the wheel wash.

Design and Installation Specifications

Suggested details are shown in Figure II-3.2: Wheel Wash. The Local Permitting Authority may allow other designs. A minimum of 6 inches of asphalt treated base (ATB) over crushed base material or 8 inches over a good subgrade is recommended to pave the wheel wash.

Use a low clearance truck to test the wheel wash before paving. Either a belly dump or lowboy will work well to test clearance.

Keep the water level from 12 to 14 inches deep to avoid damage to truck hubs and filling the truck tongues with water.

Midpoint spray nozzles are only needed in extremely muddy conditions.

Wheel wash systems should be designed with a small grade change, 6- to 12-inches for a 10-foot-wide pond, to allow sediment to flow to the low side of pond to help prevent re-suspension of sediment. A drainpipe with a 2- to 3-foot riser should be installed on the low side of the pond to allow for easy cleaning and refilling. Polymers may be used to promote coagulation and flocculation in a closed-loop system. Polyacrylamide (PAM) added to the wheel wash water at a rate of 0.25 - 0.5 pounds per 1,000 gallons of water increases effectiveness and reduces cleanup time. If PAM is already being used for dust or erosion control and is being applied by a water truck, the same truck can be used to change the wash water.

Maintenance Standards

The wheel wash should start out each day with fresh water.

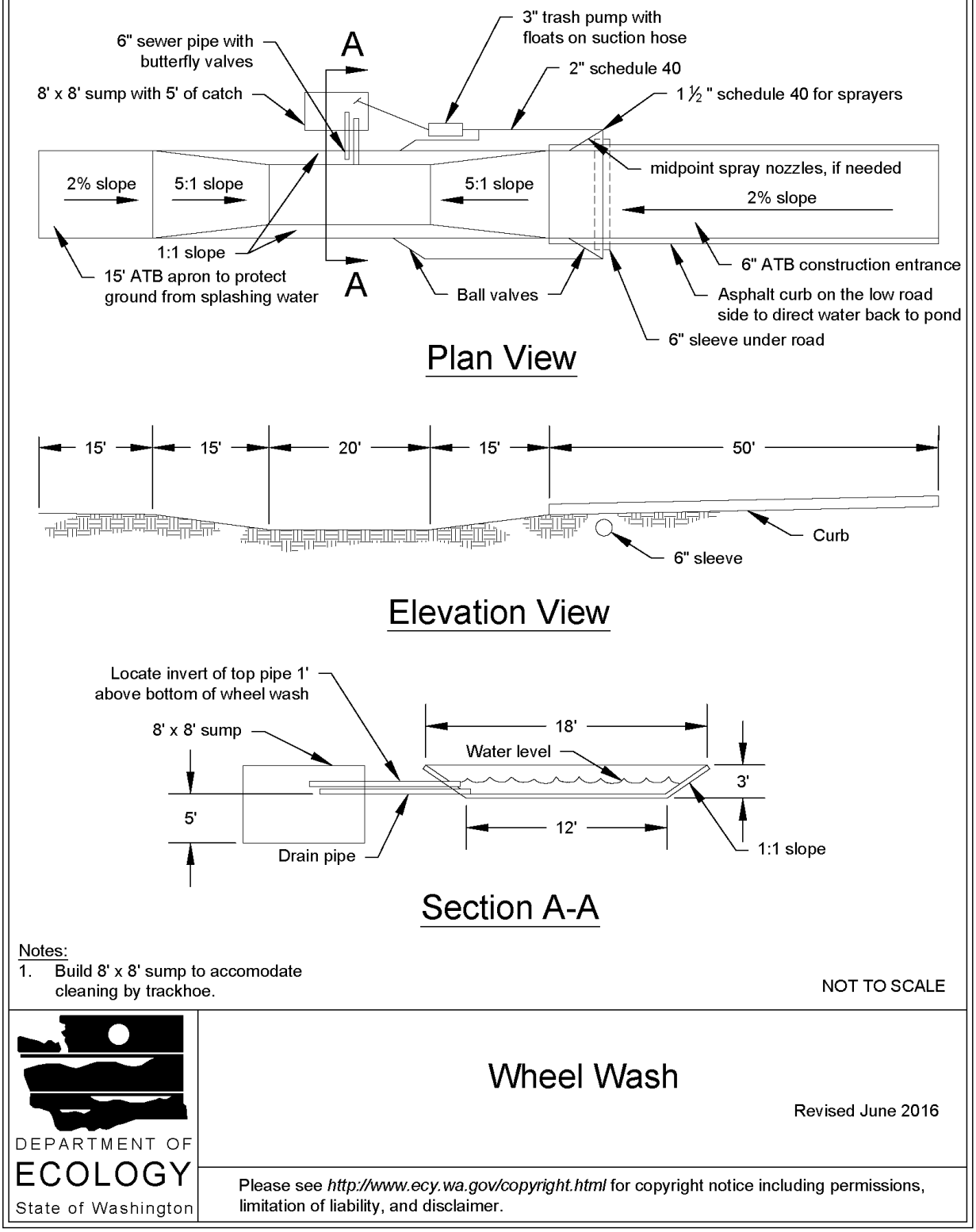
The wheel wash water should be changed a minimum of once per day. On large earthwork jobs where more than 10-20 trucks per hour are expected, the wheel wash water will need to be changed more often.

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

Figure II-3.2: Wheel Wash



Notes:

1. Build 8' x 8' sump to accomodate cleaning by trackhoe.

NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Wheel Wash

Revised June 2016

BMP C107: Construction Road / Parking Area Stabilization

Purpose

Stabilizing roads, parking areas, and other on-site vehicle transportation routes immediately after grading reduces erosion caused by construction traffic or stormwater runoff.

Conditions of Use

Roads and parking areas shall be stabilized wherever they are constructed, whether permanent or temporary, for use by construction traffic.

BMP C103: High-Visibility Fence shall be installed, if necessary, to limit the access of vehicles to only those roads and parking areas that are stabilized.

Design and Installation Specifications

- On areas that will receive asphalt as part of the project, install the first lift as soon as possible.
- A 6-inch depth of 2- to 4-inch crushed rock, gravel base, or crushed surfacing base course shall be applied immediately after grading or utility installation. A 4-inch course of asphalt treated base (ATB) may also be used, or the road/parking area may be paved. It may also be possible to use cement or calcium chloride for soil stabilization. If cement or cement kiln dust is used for roadbase stabilization, pH monitoring and BMP C252: Treating and Disposing of High pH Water is necessary to evaluate and minimize the effects on stormwater. If the area will not be used for permanent roads, parking areas, or structures, a 6-inch depth of hog fuel may also be used, but this is likely to require more maintenance. Whenever possible, construction roads and parking areas shall be placed on a firm, compacted subgrade.
- Temporary road gradients shall not exceed 15 percent. Roadways shall be carefully graded to drain. Drainage ditches shall be provided on each side of the roadway in the case of a crowned section, or on one side in the case of a super-elevated section. Drainage ditches shall be directed to a sediment control BMP.
- Rather than relying on ditches, it may also be possible to grade the road so that runoff sheetflows into a heavily vegetated area with a well-developed topsoil. Landscaped areas are not adequate. If this area has at least 50 feet of vegetation that water can flow through, then it is generally preferable to use the vegetation to treat runoff, rather than a sediment pond or trap. The 50 feet shall not include wetlands or their buffers. If runoff is allowed to sheetflow through adjacent vegetated areas, it is vital to design the roadways and parking areas so that no concentrated runoff is created.
- Storm drain inlets shall be protected to prevent sediment-laden water entering the drainage system (see BMP C220: Inlet Protection).

Maintenance Standards

Inspect stabilized areas regularly, especially after large storm events.

Crushed rock, gravel base, etc., shall be added as required to maintain a stable driving surface and to stabilize any areas that have eroded.

Following construction, these areas shall be restored to pre-construction condition or better to prevent future erosion.

Perform street cleaning at the end of each day or more often if necessary.

BMP C120: Temporary and Permanent Seeding

Purpose

Seeding reduces erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion.

Conditions of Use

Use seeding throughout the project on disturbed areas that have reached final grade or that will remain unworked for more than 30 days.

The optimum seeding windows for western Washington are April 1 through June 30 and September 1 through October 1.

Between July 1 and August 30 seeding requires irrigation until 75 percent grass cover is established.

Between October 1 and March 30 seeding requires a cover of mulch or an erosion control blanket until 75 percent grass cover is established.

Review all disturbed areas in late August to early September and complete all seeding by the end of September. Otherwise, vegetation will not establish itself enough to provide more than average protection.

Mulch is required at all times for seeding because it protects seeds from heat, moisture loss, and transport due to runoff. Mulch can be applied on top of the seed or simultaneously by hydroseeding. See BMP C121: Mulching for specifications.

Seed and mulch all disturbed areas not otherwise vegetated at final site stabilization. Final stabilization means the completion of all soil disturbing activities at the site and the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (such as pavement, riprap, gabions, or geotextiles) which will prevent erosion. See BMP T5.13: Post-Construction Soil Quality and Depth.

Design and Installation Specifications

General

- Install channels intended for vegetation before starting major earthwork and hydroseed with a Bonded Fiber Matrix. For vegetated channels that will have high flows, install erosion control blankets over the top of hydroseed. Before allowing water to flow in vegetated channels, establish 75 percent vegetation cover. If vegetated channels cannot be established by seed

before water flow; install sod in the channel bottom — over top of hydromulch and erosion control blankets.

- Confirm the installation of all required surface water control measures to prevent seed from washing away.
- Hydroseed applications shall include a minimum of 1,500 pounds per acre of mulch with 3 percent tackifier. See BMP C121: Mulching for specifications.
- Areas that will have seeding only and not landscaping may need compost or meal-based mulch included in the hydroseed in order to establish vegetation. Re-install native topsoil on the disturbed soil surface before application. See BMP T5.13: Post-Construction Soil Quality and Depth.
- When installing seed via hydroseeding operations, only about 1/3 of the seed actually ends up in contact with the soil surface. This reduces the ability to establish a good stand of grass quickly. To overcome this, consider increasing seed quantities by up to 50 percent.
- Enhance vegetation establishment by dividing the hydromulch operation into two phases:
    - Phase 1- Install all seed and fertilizer with 25-30 percent mulch and tackifier onto soil in the first lift.
    - Phase 2- Install the rest of the mulch and tackifier over the first lift.

  Or, enhance vegetation by:
    - Installing the mulch, seed, fertilizer, and tackifier in one lift.
    - Spread or blow straw over the top of the hydromulch at a rate of 800-1000 pounds per acre.
    - Hold straw in place with a standard tackifier.

  Both of these approaches will increase cost moderately but will greatly improve and enhance vegetative establishment. The increased cost may be offset by the reduced need for:
    - Irrigation.
    - Reapplication of mulch.
    - Repair of failed slope surfaces.

  This technique works with standard hydromulch (1,500 pounds per acre minimum) and Bonded Fiber Matrix/ Mechanically Bonded Fiber Matrix (BFM/MBFMs) (3,000 pounds per acre minimum).
- Seed may be installed by hand if:
    - Temporary and covered by straw, mulch, or topsoil.
    - Permanent in small areas (usually less than 1 acre) and covered with mulch, topsoil, or erosion blankets.
- The seed mixes listed in Table II-3.4: Temporary and Permanent Seed Mixes include

recommended mixes for both temporary and permanent seeding.

- Apply these mixes, with the exception of the wet area seed mix, at a rate of 120 pounds per acre. This rate can be reduced if soil amendments or slow-release fertilizers are used. Apply the wet area seed mix at a rate of 60 pounds per acre.
- Consult the local suppliers or the local conservation district for their recommendations. The appropriate mix depends on a variety of factors, including location, exposure, soil type, slope, and expected foot traffic. Alternative seed mixes approved by the local authority may be used, depending on the soil type and hydrology of the area.

Table II-3.4: Temporary and Permanent Seed Mixes

Common Name	Latin Name	% Weight	% Purity	% Germination
Temporary Erosion Control Seed Mix A standard mix for areas requiring a temporary vegetative cover.				
Chewings or annual blue grass	*Festuca rubra var. commutata* or *Poa anna*	40	98	90
Perennial rye	*Lolium perenne*	50	98	90
Redtop or colonial bentgrass	*Agrostis alba* or *Agrostis tenuis*	5	92	85
White dutch clover	*Trifolium repens*	5	98	90
Landscaping Seed Mix A recommended mix for landscaping seed.				
Perennial rye blend	*Lolium perenne*	70	98	90
Chewings and red fescue blend	*Festuca rubra var. commutata* or *Festuca rubra*	30	98	90
Low-Growing Turf Seed Mix A turf seed mix for dry situations where there is no need for watering. This mix requires very little maintenance.				
Dwarf tall fescue (several varieties)	*Festuca arundinacea var.*	45	98	90
Dwarf perennial rye (Barclay)	*Lolium perenne var. barclay*	30	98	90
Red fescue	*Festuca rubra*	20	98	90
Colonial bentgrass	*Agrostis tenuis*	5	98	90
Bioswale Seed Mix A seed mix for bioswales and other intermittently wet areas.				
Tall or meadow fes-	*Festuca arundin-*	75-80	98	90

Table II-3.4: Temporary and Permanent Seed Mixes (continued)

Common Name	Latin Name	% Weight	% Purity	% Germination
cue	*acea* or *Festuca elatior*			
Seaside/Creeping bentgrass	*Agrostis palustris*	10-15	92	85
Redtop bentgrass	*Agrostis alba* or *Agrostis gigantea*	5-10	90	80
Wet Area Seed Mix A low-growing, relatively non-invasive seed mix appropriate for very wet areas that are not regulated wetlands. Consult Hydraulic Permit Authority (HPA) for seed mixes if applicable.				
Tall or meadow fescue	*Festuca arundinacea* or *Festuca elatior*	60-70	98	90
Seaside/Creeping bentgrass	*Agrostis palustris*	10-15	98	85
Meadow foxtail	*Alepocurus pratensis*	10-15	90	80
Alsike clover	*Trifolium hybridum*	1-6	98	90
Redtop bentgrass	*Agrostis alba*	1-6	92	85
Meadow Seed Mix A recommended meadow seed mix for infrequently maintained areas or non-maintained areas where colonization by native plants is desirable. Likely applications include rural road and utility right-of-way. Seeding should take place in September or very early October in order to obtain adequate establishment prior to the winter months. Consider the appropriateness of clover, a fairly invasive species, in the mix. Amending the soil can reduce the need for clover.				
Redtop or Oregon bentgrass	*Agrostis alba* or *Agrostis oregonensis*	20	92	85
Red fescue	*Festuca rubra*	70	98	90
White dutch clover	*Trifolium repens*	10	98	90

Roughening and Rototilling

- The seedbed should be firm and rough. Roughen all soil no matter what the slope. Track walk slopes before seeding if engineering purposes require compaction. Backblading or smoothing of slopes greater than 4H:1V is not allowed if they are to be seeded.
- Restoration-based landscape practices require deeper incorporation than that provided by a simple single-pass rototilling treatment. Wherever practical, initially rip the subgrade to improve long-term permeability, infiltration, and water inflow qualities. At a minimum,

permanent areas shall use soil amendments to achieve organic matter and permeability performance defined in engineered soil/landscape systems. For systems that are deeper than 8 inches complete the rototilling process in multiple lifts, or prepare the engineered soil system per specifications and place to achieve the specified depth.

Fertilizers

- Conducting soil tests to determine the exact type and quantity of fertilizer is recommended. This will prevent the over-application of fertilizer.
- Organic matter is the most appropriate form of fertilizer because it provides nutrients (including nitrogen, phosphorus, and potassium) in the least water-soluble form.
- In general, use 10-4-6 N-P-K (nitrogen-phosphorus-potassium) fertilizer at a rate of 90 pounds per acre. Always use slow-release fertilizers because they are more efficient and have fewer environmental impacts. Do not add fertilizer to the hydromulch machine, or agitate, more than 20 minutes before use. Too much agitation destroys the slow-release coating.
- There are numerous products available that take the place of chemical fertilizers. These include several with seaweed extracts that are beneficial to soil microbes and organisms. If 100 percent cottonseed meal is used as the mulch in hydroseed, chemical fertilizer may not be necessary. Cottonseed meal provides a good source of long-term, slow-release, available nitrogen.

Bonded Fiber Matrix and Mechanically Bonded Fiber Matrix

- On steep slopes use Bonded Fiber Matrix (BFM) or Mechanically Bonded Fiber Matrix (MBFM) products. Apply BFM/MBFM products at a minimum rate of 3,000 pounds per acre with approximately 10 percent tackifier. Achieve a minimum of 95 percent soil coverage during application. Numerous products are available commercially. Most products require 24-36 hours to cure before rainfall and cannot be installed on wet or saturated soils. Generally, products come in 40-50 pound bags and include all necessary ingredients except for seed and fertilizer.
- Install products per manufacturer's instructions.
- BFMs and MBFMs provide good alternatives to blankets in most areas requiring vegetation establishment. Advantages over blankets include:
    - BFM and MBFMs do not require surface preparation.
    - Helicopters can assist in installing BFM and MBFMs in remote areas.
    - On slopes steeper than 2.5H:1V, blanket installers may require ropes and harnesses for safety.
    - Installing BFM and MBFMs can save at least $1,000 per acre compared to blankets.

Maintenance Standards

Reseed any seeded areas that fail to establish at least 75 percent cover (100 percent cover for areas that receive sheet or concentrated flows). If reseeding is ineffective, use an alternate method such as sodding, mulching, nets, or blankets.

- Reseed and protect by mulch any areas that experience erosion after achieving adequate cover. Reseed and protect by mulch any eroded area.
- Supply seeded areas with adequate moisture, but do not water to the extent that it causes run-off.

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 C140: Dust Control

Purpose

Dust control prevents wind transport of dust from disturbed soil surfaces onto roadways, drainage ways, and surface waters.

Conditions of Use

Use dust control in areas (including roadways) subject to surface and air movement of dust where on-site or off-site impacts to roadways, drainage ways, or surface waters are likely.

Design and Installation Specifications

- Vegetate or mulch areas that will not receive vehicle traffic. In areas where planting, mulching, or paving is impractical, apply gravel or landscaping rock.
- Limit dust generation by clearing only those areas where immediate activity will take place, leaving the remaining area(s) in the original condition. Maintain the original ground cover as long as practical.
- Construct natural or artificial windbreaks or windscreens. These may be designed as enclosures for small dust sources.
- Sprinkle the site with water until the surface is wet. Repeat as needed. To prevent carryout of mud onto the street, refer to BMP C105: Stabilized Construction Access and BMP C106: Wheel Wash.
- Irrigation water can be used for dust control. Irrigation systems should be installed as a first step on sites where dust control is a concern.
- Spray exposed soil areas with a dust palliative, following the manufacturer's instructions and cautions regarding handling and application. Used oil is prohibited from use as a dust suppressant. Local governments may approve other dust palliatives such as calcium chloride or PAM.
- PAM (BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection) added to water at a rate of 0.5 pounds per 1,000 gallons of water per acre and applied from a water truck is more effective than water alone. This is due to increased infiltration of water into the soil and reduced evaporation. In addition, small soil particles are bonded together and are not as easily transported by wind. Adding PAM may reduce the quantity of water needed for dust control. Note that the application rate specified here applies to this BMP, and is not the same application rate that is specified in BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection, but the downstream protections still apply.

  Refer to BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection for conditions of use. PAM shall not be directly applied to water or allowed to enter a water body.
- Contact your local Air Pollution Control Authority for guidance and training on other dust control measures. Compliance with the local Air Pollution Control Authority constitutes

compliance with this BMP.

- Use vacuum street sweepers.
- Remove mud and other dirt promptly so it does not dry and then turn into dust.
- Techniques that can be used for unpaved roads and lots include:
    - Lower speed limits. High vehicle speed increases the amount of dust stirred up from unpaved roads and lots.
    - Upgrade the road surface strength by improving particle size, shape, and mineral types that make up the surface and base materials.
    - Add surface gravel to reduce the source of dust emission. Limit the amount of fine particles (those smaller than .075 mm) to 10 to 20 percent.
    - Use geotextile fabrics to increase the strength of new roads or roads undergoing reconstruction.
    - Encourage the use of alternate, paved routes, if available.
    - Apply chemical dust suppressants using the admix method, blending the product with the top few inches of surface material. Suppressants may also be applied as surface treatments.
    - Limit dust-causing work on windy days.
    - Pave unpaved permanent roads and other trafficked areas.

Maintenance Standards

Respray area as necessary to keep dust to a minimum.

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 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

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.

Figure II-3.7: Concrete Washout Area with Wood Planks

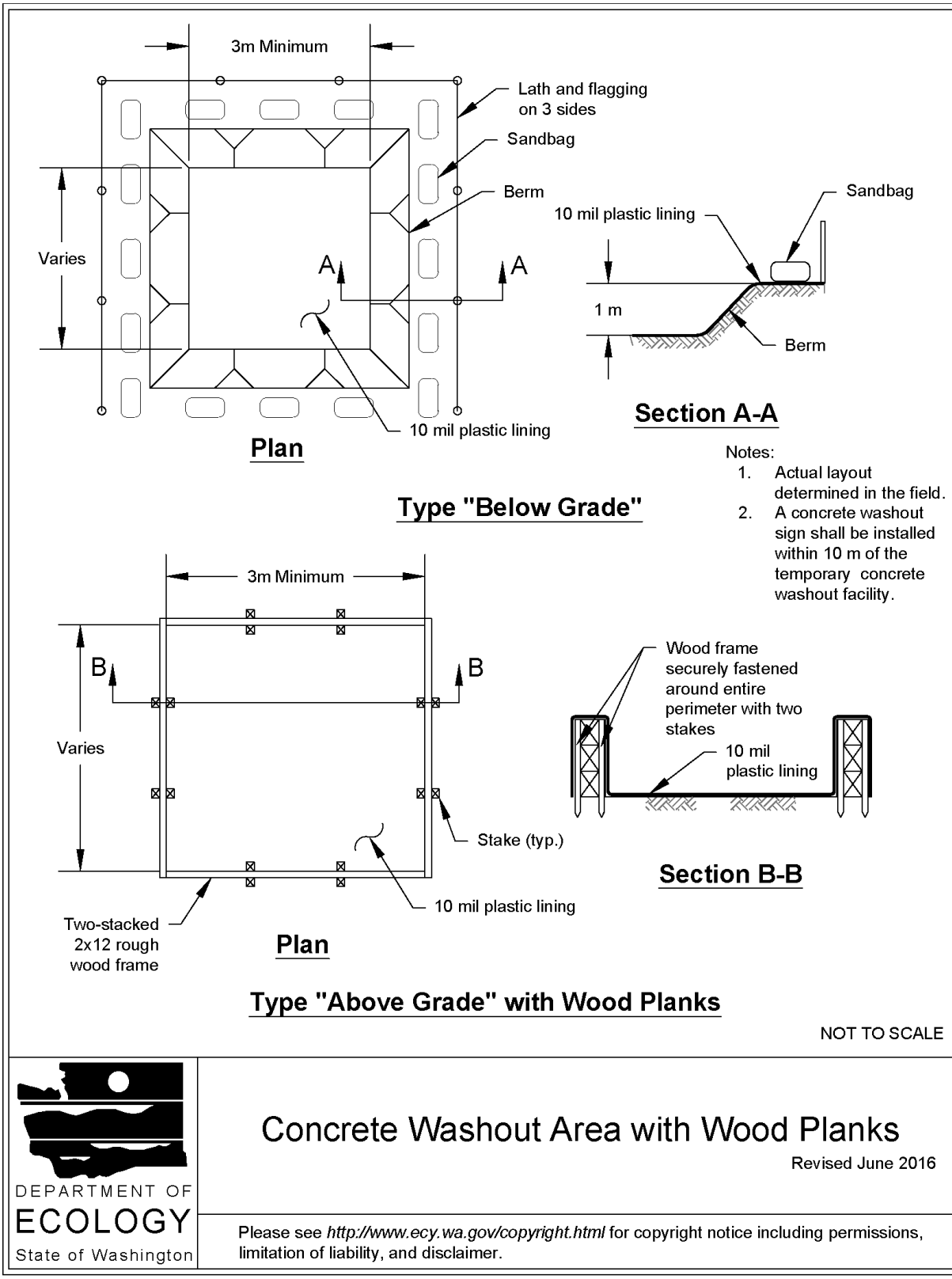


Figure II-3.8: Concrete Washout Area with Straw Bales

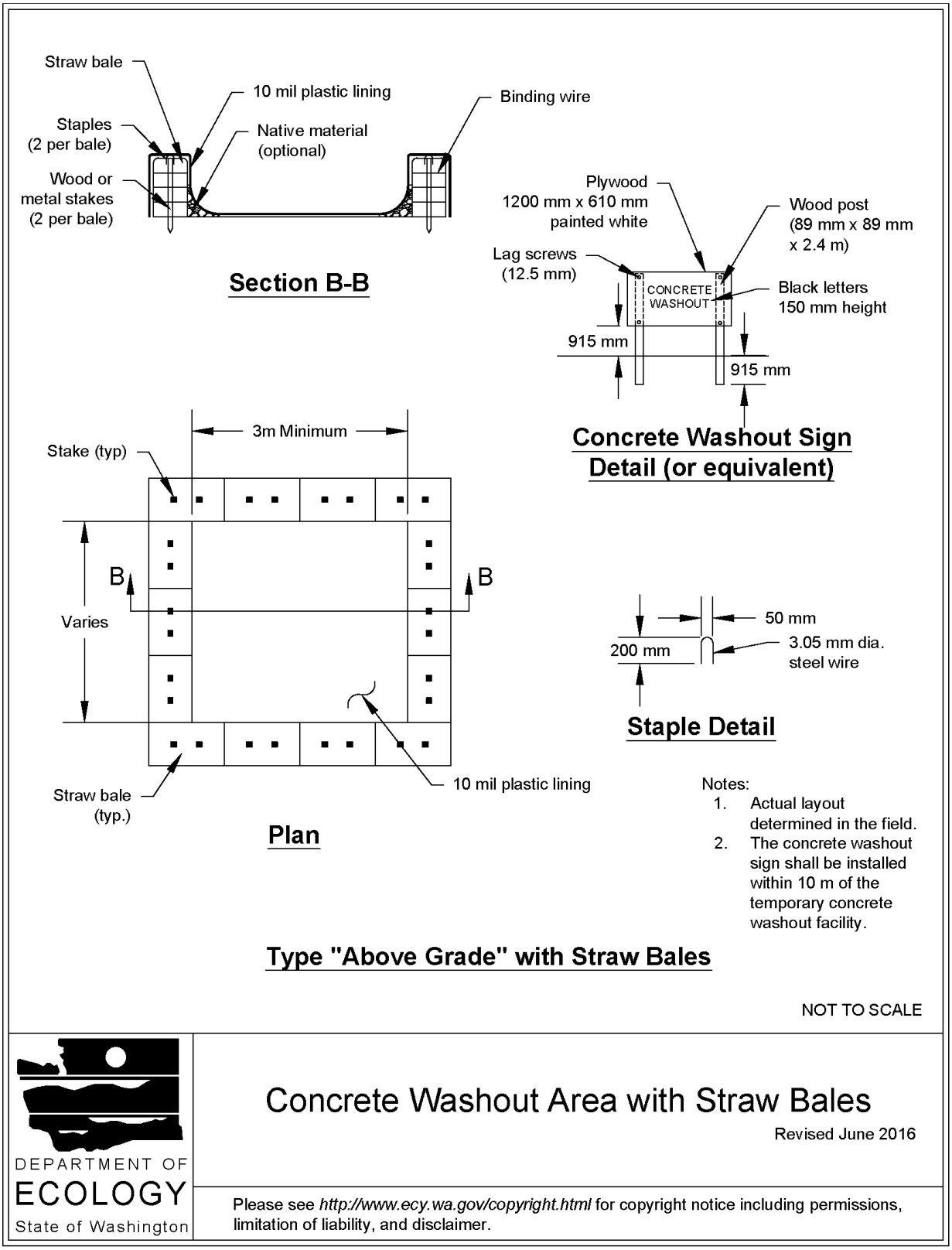
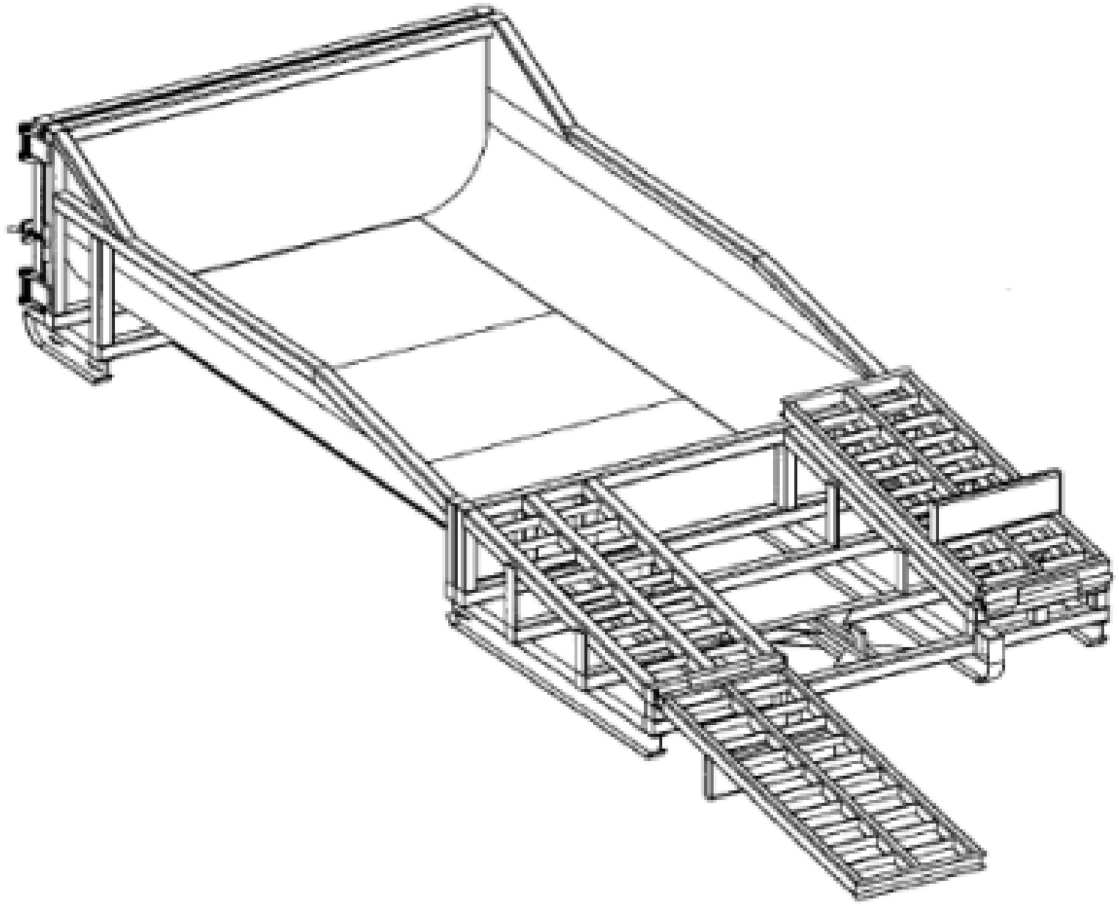


Figure II-3.9: Prefabricated Concrete Washout Container w/Ramp



NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Prefabricated Concrete Washout Container w/Ramp

Revised June 2016

Maintenance Standards

Replace riprap as needed.

BMP C203: Water Bars

Purpose

A water bar is a small ditch or ridge of material that is constructed diagonally across a road or right-of-way to divert stormwater runoff from the road surface, wheel tracks, or a shallow road ditch. See Figure II-3.12: Water Bar.

Conditions of Use

Clearing right-of-way and construction of access for power lines, pipelines, and other similar installations often require long narrow right-of-ways over sloping terrain. Disturbance and compaction promotes gully formation in these cleared strips by increasing the volume and velocity of runoff. Gully formation may be especially severe in tire tracks and ruts. To prevent gullying, runoff can often be diverted across the width of the right-of-way to undisturbed areas by using small predesigned diversions.

Give special consideration to each individual outlet area, as well as to the cumulative effect of added diversions. Use gravel to stabilize the diversion where significant vehicular traffic is anticipated.

Design and Installation Specifications

- Height: 8-inch minimum, measured from the channel bottom to the ridge top.
- Side slope of channel: 2H:1V maximum; 3H:1V or flatter when vehicles will cross.
- Top width of ridge: 6-inch minimum.
- Locate water bars to use natural drainage systems and to discharge into well vegetated stable areas.
- See Table II-3.9: Water Bar Spacing Guidelines:

Table II-3.9: Water Bar Spacing Guidelines

Slope Along Road (%)	Spacing (ft)
< 5	125
5 - 10	100
10 - 20	75
20 - 35	50
> 35	Use rock lined ditch

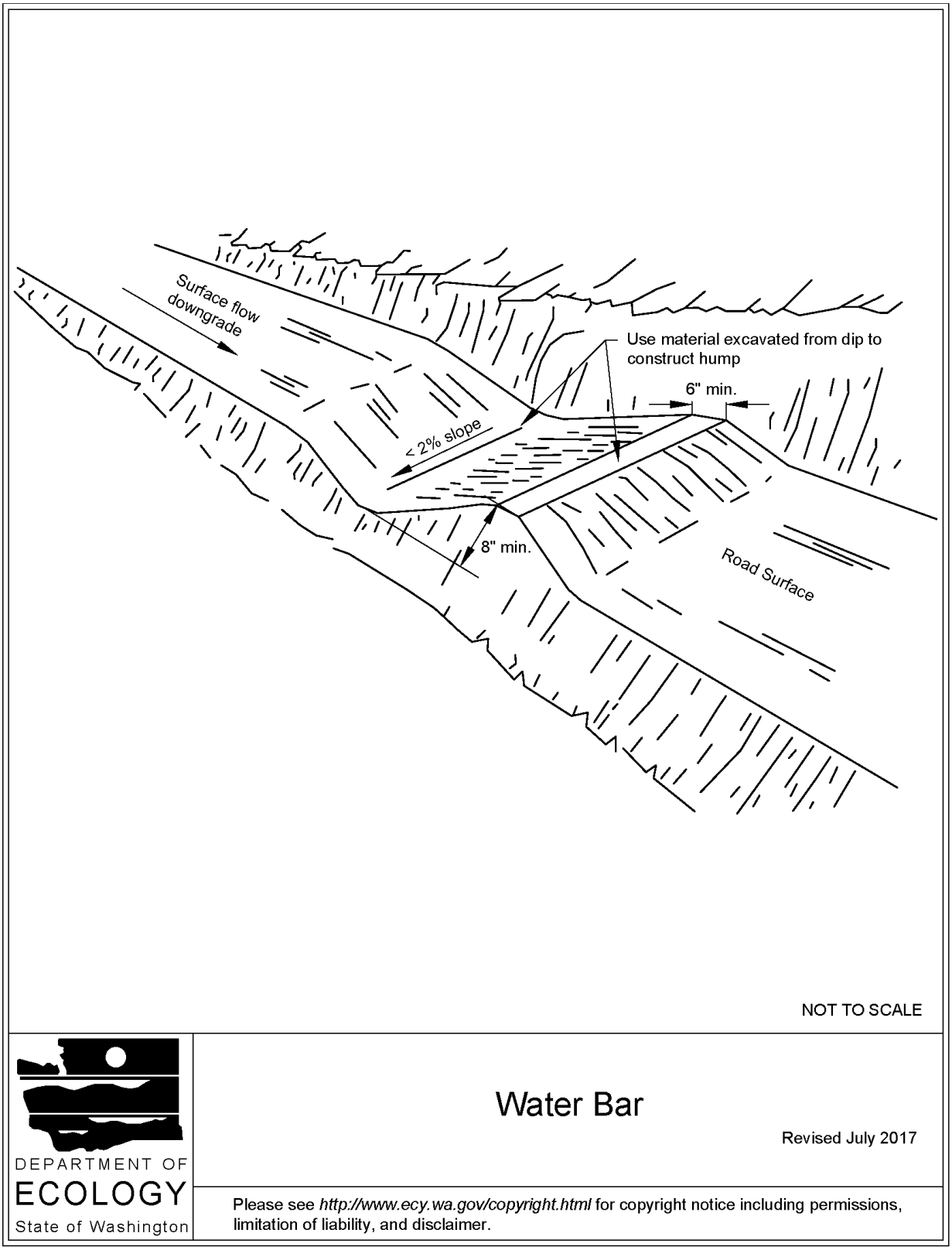
- Grade of water bar and angle: Select an angle that results in a ditch slope less than 2 percent.
- Install the water bar as soon as the clearing and grading is complete. When utilities are being installed, reconstruct the water bar as construction is complete in each section.
- Compact the water bar ridge.
- Stabilize, seed, and mulch the portions that are not subject to traffic. Gravel the areas crossed by vehicles.
- Note that BMP C208: Triangular Silt Dike (TSD) can be used to create the ridge for the water bar.

Maintenance Standards

Periodically inspect water bars after every heavy rainfall for wear and erosion damage.

- Immediately remove sediment from the flow area and repair the dike.
- Check outlet areas and make timely repairs as needed.
- When permanent road drainage is established and the area above the temporary water bar is permanently stabilized, remove the dikes and fill the channel to blend with the natural ground, and appropriately stabilize the disturbed area.

Figure II-3.12: Water Bar



BMP C220: Inlet Protection

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

Excavated Drop Inlet Protection

Excavated drop inlet protection consists of an excavated impoundment around the storm drain inlet. Sediment settles out of the stormwater prior to entering the storm drain. Design and installation specifications for excavated drop inlet protection include:

- Provide a depth of 1-2 ft as measured from the crest of the inlet structure.
- Slope sides of excavation should be no steeper than 2H:1V.
- Minimum volume of excavation is 35 cubic yards.
- Shape the excavation to fit the site, with the longest dimension oriented toward the longest inflow area.
- Install provisions for draining to prevent standing water.
- Clear the area of all debris.

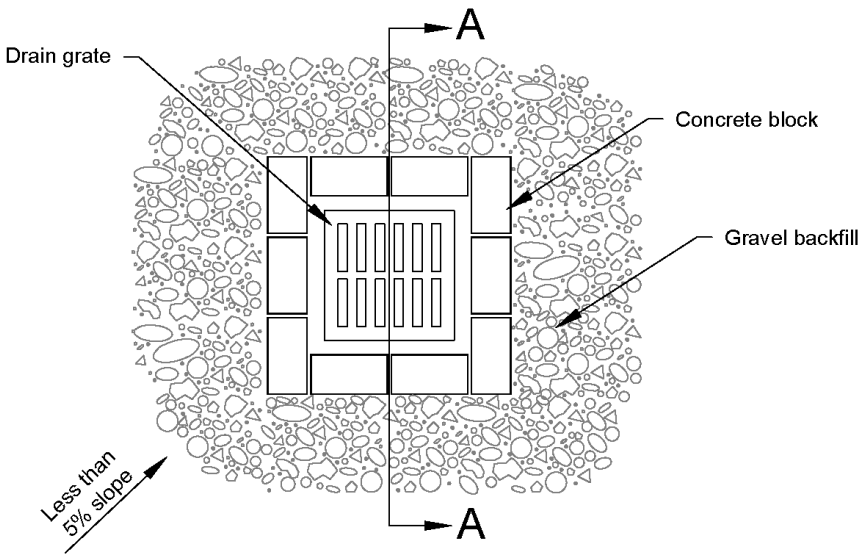
- Grade the approach to the inlet uniformly.
- Drill weep holes into the side of the inlet.
- Protect weep holes with screen wire and washed aggregate.
- Seal weep holes when removing structure and stabilizing area.
- Build a temporary dike, if necessary, to the down slope side of the structure to prevent bypass flow.

Block and Gravel Filter

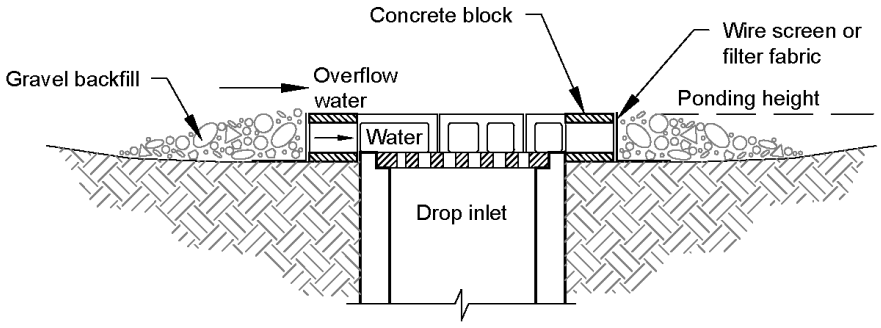
A block and gravel filter is a barrier formed around the inlet with standard concrete blocks and gravel. See Figure II-3.17: Block and Gravel Filter. Design and installation specifications for block gravel filters include:

- Provide a height of 1 to 2 feet above the inlet.
- Recess the first row of blocks 2-inches into the ground for stability.
- Support subsequent courses by placing a pressure treated wood 2x4 through the block opening.
- Do not use mortar.
- Lay some blocks in the bottom row on their side to allow for dewatering the pool.
- Place hardware cloth or comparable wire mesh with ½-inch openings over all block openings.
- Place gravel to just below the top of blocks on slopes of 2H:1V or flatter.
- An alternative design is a gravel berm surrounding the inlet, as follows:
    - Provide a slope of 3H:1V on the upstream side of the berm.
    - Provide a slope of 2H:1V on the downstream side of the berm.
    - Provide a 1-foot wide level stone area between the gravel berm and the inlet.
    - Use stones 3 inches in diameter or larger on the upstream slope of the berm.
    - Use gravel ½- to ¾-inch at a minimum thickness of 1-foot on the downstream slope of the berm.

Figure II-3.17: Block and Gravel Filter



Plan View



Section A-A

Notes:

1. Drop inlet sediment barriers are to be used for small, nearly level drainage areas. (less than 5%)
2. Excavate a basin of sufficient size adjacent to the drop inlet.
3. The top of the structure (ponding height) must be well below the ground elevation downslope to prevent runoff from bypassing the inlet. A temporary dike may be necessary on the downslope side of the structure.

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Block and Gravel Filter

Revised June 2016

Gravel and Wire Mesh Filter

Gravel and wire mesh filters are gravel barriers placed over the top of the inlet. This method does not provide an overflow. Design and installation specifications for gravel and wire mesh filters include:

- Use a hardware cloth or comparable wire mesh with ½-inch openings.
    - Place wire mesh over the drop inlet so that the wire extends a minimum of 1-foot beyond each side of the inlet structure.
    - Overlap the strips if more than one strip of mesh is necessary.
- Place coarse aggregate over the wire mesh.
    - Provide at least a 12-inch depth of aggregate over the entire inlet opening and extend at least 18-inches on all sides.

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.

Curb Inlet Protection with Wooden Weir

Curb inlet protection with wooden weir is an option that consists of a barrier formed around a curb inlet with a wooden frame and gravel. Design and installation specifications for curb inlet protection with wooden weirs include:

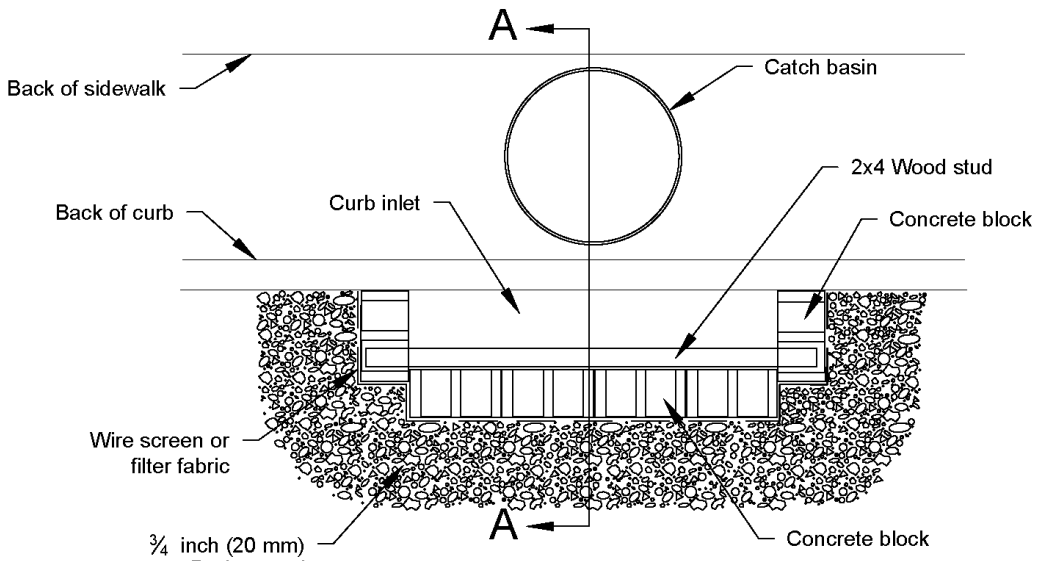
- Use wire mesh with ½-inch openings.
- Use extra strength filter cloth.
- Construct a frame.
- Attach the wire and filter fabric to the frame.
- Pile coarse washed aggregate against the wire and fabric.
- Place weight on the frame anchors.

Block and Gravel Curb Inlet Protection

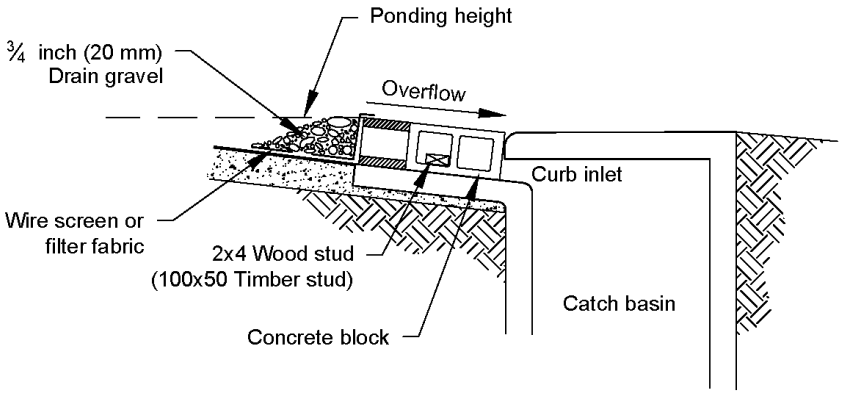
Block and gravel curb inlet protection is a barrier formed around a curb inlet with concrete blocks and gravel. See Figure II-3.18: Block and Gravel Curb Inlet Protection. Design and installation specifications for block and gravel curb inlet protection include:

- Use wire mesh with ½-inch openings.
- Place two concrete blocks on their sides abutting the curb at either side of the inlet opening. These are spacer blocks.
- Place a 2x4 stud through the outer holes of each spacer block to align the front blocks.
- Place blocks on their sides across the front of the inlet and abutting the spacer blocks.
- Place wire mesh over the outside vertical face.
- Pile coarse aggregate against the wire to the top of the barrier.

Figure II-3.18: Block and Gravel Curb Inlet Protection



Plan View



Section A-A

Notes:

1. Use block and gravel type sediment barrier when curb inlet is located in gently sloping street segment, where water can pond and allow sediment to separate from runoff.
2. Barrier shall allow for overflow from severe storm event.
3. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

NOT TO SCALE

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State of Washington

Block and Gravel Curb Inlet Protection

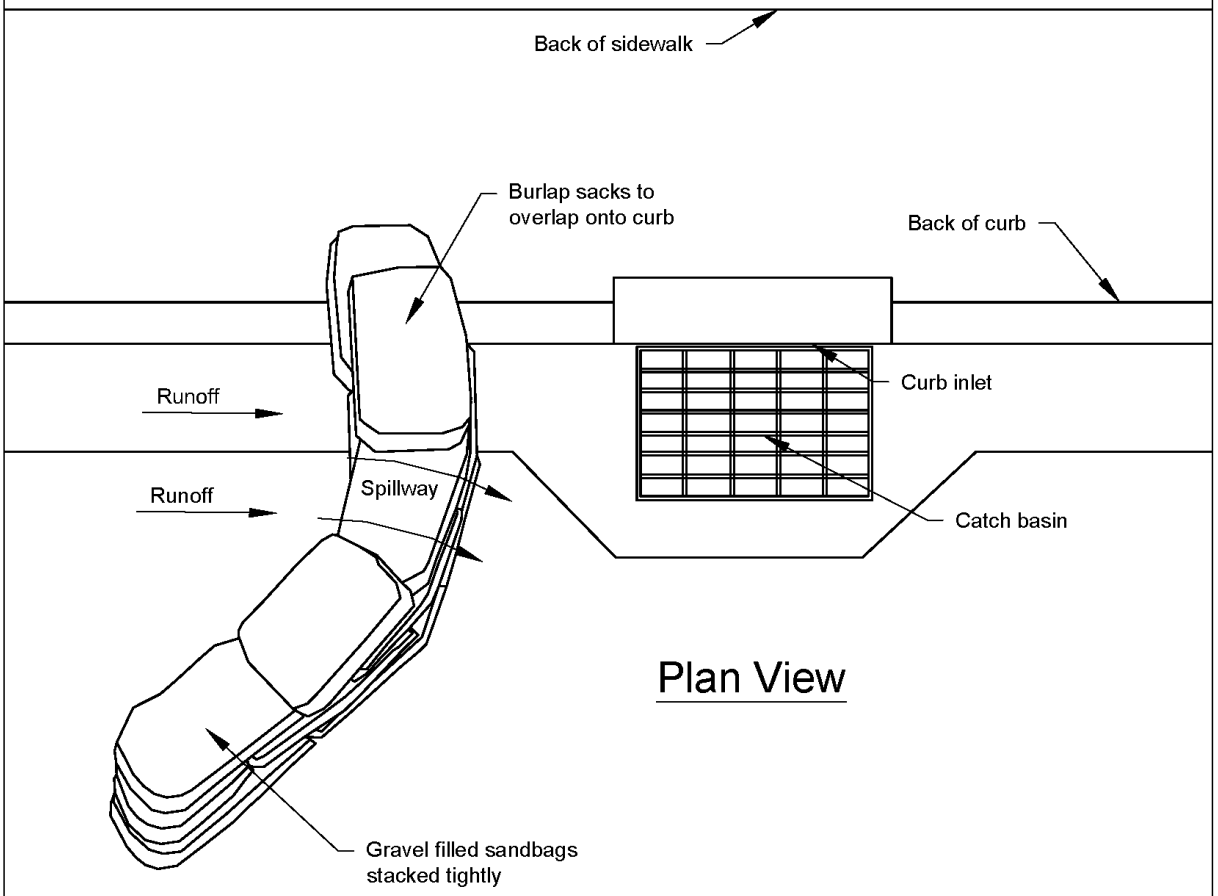
Revised June 2016

Curb and Gutter Sediment Barrier

Curb and gutter sediment barrier is a sandbag or rock berm (riprap and aggregate) 3 feet high and 3 feet wide in a horseshoe shape. See Figure II-3.19: Curb and Gutter Barrier. Design and installation specifications for curb and gutter sediment barrier include:

- Construct a horseshoe shaped berm, faced with coarse aggregate if using riprap, 3 feet high and 3 feet wide, at least 2 feet from the inlet.
- Construct a horseshoe shaped sedimentation trap on the upstream side of the berm. Size the trap to sediment trap standards for protecting a culvert inlet.

Figure II-3.19: Curb and Gutter Barrier



Notes:

1. Place curb type sediment barriers on gently sloping street segments, where water can pond and allow sediment to separate from runoff.
2. Sandbags of either burlap or woven 'geotextile' fabric, are filled with gravel, layered and packed tightly.
3. Leave a one sandbag gap in the top row to provide a spillway for overflow.
4. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

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State of Washington

Curb and Gutter Barrier

Revised June 2016

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 C233: Silt Fence

Purpose

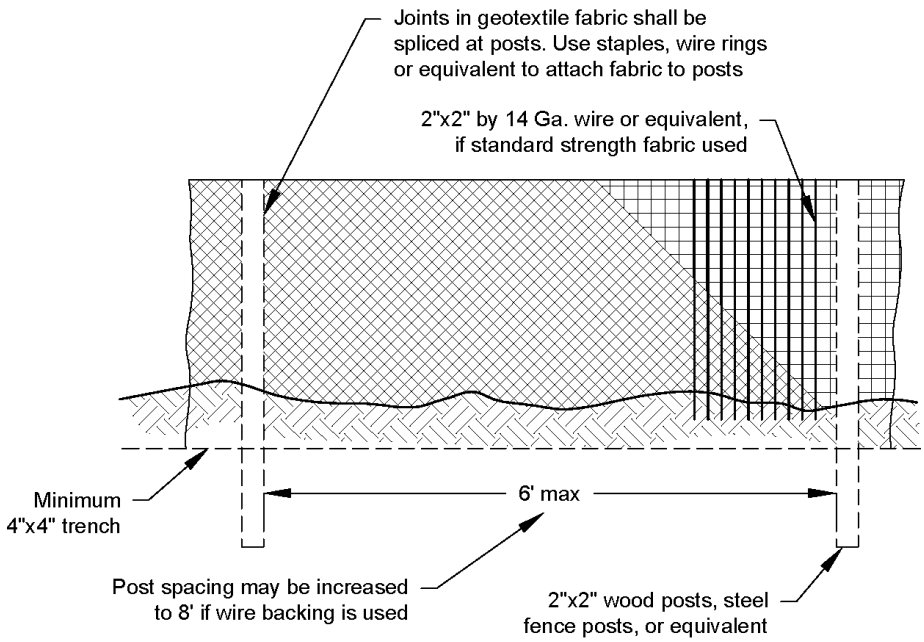
Silt fence reduces the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

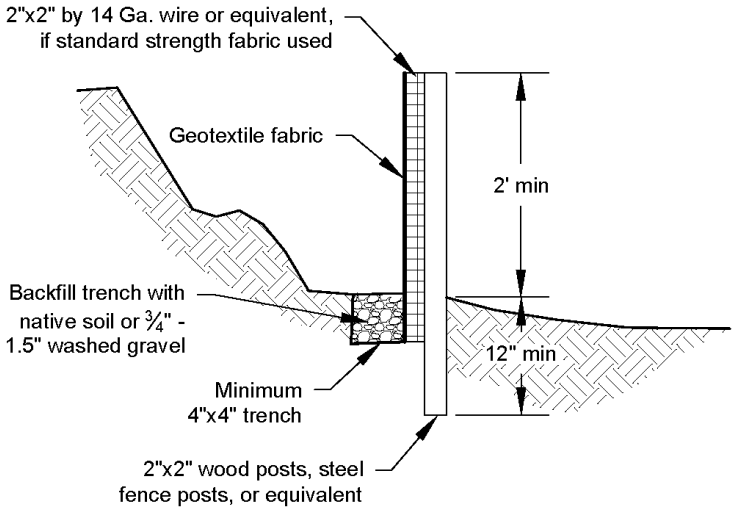
Conditions of Use

Silt fence may be used downslope of all disturbed areas.

- Silt fence shall prevent sediment carried by runoff from going beneath, through, or over the top of the silt fence, but shall allow the water to pass through the fence.
- Silt fence is not intended to treat concentrated flows, nor is it intended to treat substantial amounts of overland flow. Convey any concentrated flows through the drainage system to a sediment trapping BMP.
- Do not construct silt fences in streams or use in V-shaped ditches. Silt fences do not provide an adequate method of silt control for anything deeper than sheet or overland flow.

Figure II-3.22: Silt Fence





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State of Washington

Silt Fence

Revised July 2017

Design and Installation Specifications

- Use in combination with other construction stormwater BMPs.
- Maximum slope steepness (perpendicular to the silt fence line) 1H:1V.
- Maximum sheet or overland flow path length to the silt fence of 100 feet.
- Do not allow flows greater than 0.5 cfs.
- Use geotextile fabric that meets the following standards. All geotextile properties listed below are minimum average roll values (i.e., the test result for any sampled roll in a lot shall meet or exceed the values shown in Table II-3.11: Geotextile Fabric Standards for Silt Fence):

Table II-3.11: Geotextile Fabric Standards for Silt Fence

Geotextile Property	Minimum Average Roll Value
Polymeric Mesh AOS (ASTM D4751)	0.60 mm maximum for slit film woven (#30 sieve). 0.30 mm maximum for all other geotextile types (#50 sieve). 0.15 mm minimum for all fabric types (#100 sieve).
Water Permittivity (ASTM D4491)	0.02 sec^{-1} minimum
Grab Tensile Strength (ASTM D4632)	180 lbs. Minimum for extra strength fabric. 100 lbs minimum for standard strength fabric.
Grab Tensile Strength (ASTM D4632)	30% maximum
Ultraviolet Resistance (ASTM D4355)	70% minimum

- Support standard strength geotextiles with wire mesh, chicken wire, 2-inch x 2-inch wire, safety fence, or jute mesh to increase the strength of the geotextile. Silt fence materials are available that have synthetic mesh backing attached.
- Silt fence material shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0°F to 120°F.
- One-hundred percent biodegradable silt fence is available that is strong, long lasting, and can be left in place after the project is completed, if permitted by the local jurisdiction.
- Refer to Figure II-3.22: Silt Fence for standard silt fence details. Include the following Standard Notes for silt fence on construction plans and specifications:

    1. The Contractor shall install and maintain temporary silt fences at the locations shown in the Plans.
    2. Construct silt fences in areas of clearing, grading, or drainage prior to starting those activities.

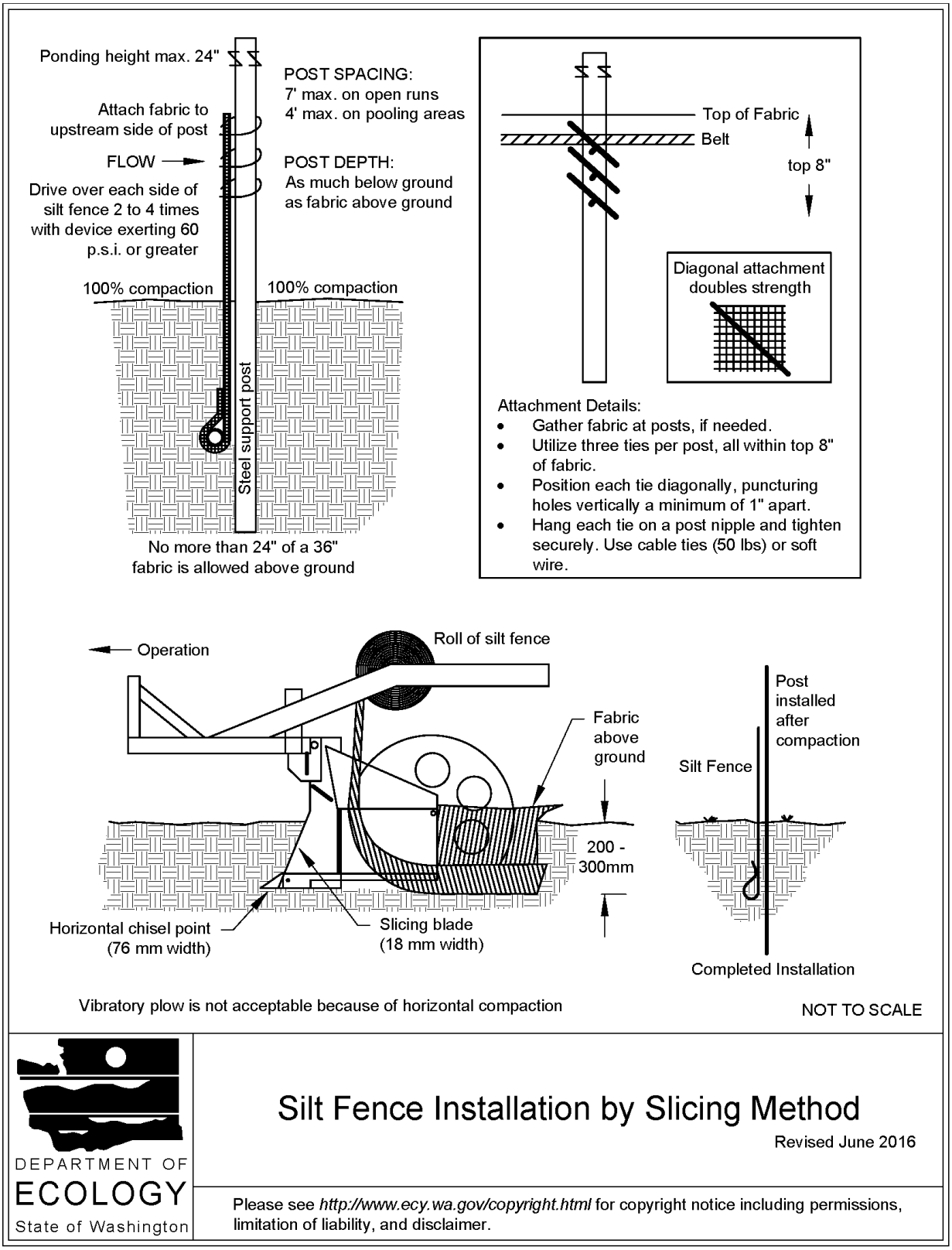
3. The silt fence shall have a 2-feet min. and a 2½-feet max. height above the original ground surface.
4. The geotextile fabric shall be sewn together at the point of manufacture to form fabric lengths as required. Locate all sewn seams at support posts. Alternatively, two sections of silt fence can be overlapped, provided that the overlap is long enough and that the adjacent silt fence sections are close enough together to prevent silt laden water from escaping through the fence at the overlap.
5. Attach the geotextile fabric on the up-slope side of the posts and secure with staples, wire, or in accordance with the manufacturer's recommendations. Attach the geotextile fabric to the posts in a manner that reduces the potential for tearing.
6. Support the geotextile fabric with wire or plastic mesh, dependent on the properties of the geotextile selected for use. If wire or plastic mesh is used, fasten the mesh securely to the up-slope side of the posts with the geotextile fabric up-slope of the mesh.
7. Mesh support, if used, shall consist of steel wire with a maximum mesh spacing of 2-inches, or a prefabricated polymeric mesh. The strength of the wire or polymeric mesh shall be equivalent to or greater than 180 lbs. grab tensile strength. The polymeric mesh must be as resistant to the same level of ultraviolet radiation as the geotextile fabric it supports.
8. Bury the bottom of the geotextile fabric 4-inches min. below the ground surface. Backfill and tamp soil in place over the buried portion of the geotextile fabric, so that no flow can pass beneath the silt fence and scouring cannot occur. When wire or polymeric back-up support mesh is used, the wire or polymeric mesh shall extend into the ground 3-inches min.
9. Drive or place the silt fence posts into the ground 18-inches min. A 12–inch min. depth is allowed if topsoil or other soft subgrade soil is not present and 18-inches cannot be reached. Increase fence post min. depths by 6 inches if the fence is located on slopes of 3H:1V or steeper and the slope is perpendicular to the fence. If required post depths cannot be obtained, the posts shall be adequately secured by bracing or guying to prevent overturning of the fence due to sediment loading.
10. Use wood, steel or equivalent posts. The spacing of the support posts shall be a maximum of 6-feet. Posts shall consist of either:
    - Wood with minimum dimensions of 2 inches by 2 inches by 3 feet. Wood shall be free of defects such as knots, splits, or gouges.
    - No. 6 steel rebar or larger.
    - ASTM A 120 steel pipe with a minimum diameter of 1-inch.
    - U, T, L, or C shape steel posts with a minimum weight of 1.35 lbs./ft.
    - Other steel posts having equivalent strength and bending resistance to the post sizes listed above.
11. Locate silt fences on contour as much as possible, except at the ends of the fence,

where the fence shall be turned uphill such that the silt fence captures the runoff water and prevents water from flowing around the end of the fence.

12. If the fence must cross contours, with the exception of the ends of the fence, place check dams perpendicular to the back of the fence to minimize concentrated flow and erosion. The slope of the fence line where contours must be crossed shall not be steeper than 3H:1V.
    - Check dams shall be approximately 1-foot deep at the back of the fence. Check dams shall be continued perpendicular to the fence at the same elevation until the top of the check dam intercepts the ground surface behind the fence.
    - Check dams shall consist of crushed surfacing base course, gravel backfill for walls, or shoulder ballast. Check dams shall be located every 10 feet along the fence where the fence must cross contours.

- Refer to Figure II-3.23: Silt Fence Installation by Slicing Method for slicing method details. The following are specifications for silt fence installation using the slicing method:
    1. The base of both end posts must be at least 2- to 4-inches above the top of the geotextile fabric on the middle posts for ditch checks to drain properly. Use a hand level or string level, if necessary, to mark base points before installation.
    2. Install posts 3- to 4-feet apart in critical retention areas and 6- to 7-feet apart in standard applications.
    3. Install posts 24-inches deep on the downstream side of the silt fence, and as close as possible to the geotextile fabric, enabling posts to support the geotextile fabric from upstream water pressure.
    4. Install posts with the nipples facing away from the geotextile fabric.
    5. Attach the geotextile fabric to each post with three ties, all spaced within the top 8-inches of the fabric. Attach each tie diagonally 45 degrees through the fabric, with each puncture at least 1-inch vertically apart. Each tie should be positioned to hang on a post nipple when tightening to prevent sagging.
    6. Wrap approximately 6-inches of the geotextile fabric around the end posts and secure with 3 ties.
    7. No more than 24-inches of a 36-inch geotextile fabric is allowed above ground level.
    8. Compact the soil immediately next to the geotextile fabric with the front wheel of the tractor, skid steer, or roller exerting at least 60 pounds per square inch. Compact the upstream side first and then each side twice for a total of four trips. Check and correct the silt fence installation for any deviation before compaction. Use a flat-bladed shovel to tuck the fabric deeper into the ground if necessary.

Figure II-3.23: Silt Fence Installation by Slicing Method



Maintenance Standards

- Repair any damage immediately.
- Intercept and convey all evident concentrated flows uphill of the silt fence to a sediment trapping BMP.
- Check the uphill side of the silt fence for signs of the fence clogging and acting as a barrier to flow and then causing channelization of flows parallel to the fence. If this occurs, replace the fence and remove the trapped sediment.
- Remove sediment deposits when the deposit reaches approximately one-third the height of the silt fence, or install a second silt fence.
- Replace geotextile fabric that has deteriorated due to ultraviolet breakdown.

BMP C234: Vegetated Strip

Purpose

Vegetated strips reduce the transport of coarse sediment from a construction site by providing a physical barrier to sediment and reducing the runoff velocities of overland flow.

Conditions of Use

- Vegetated strips may be used downslope of all disturbed areas.
- Vegetated strips are not intended to treat concentrated flows, nor are they intended to treat substantial amounts of overland flow. Any concentrated flows must be conveyed through the drainage system to BMP C241: Sediment Pond (Temporary) or other sediment trapping BMP. The only circumstance in which overland flow can be treated solely by a vegetated strip, rather than by a sediment trapping BMP, is when the following criteria are met (see Table II-3.12: Contributing Drainage Area for Vegetated Strips):

Table II-3.12: Contributing Drainage Area for Vegetated Strips

Average Contributing Area Slope	Average Contributing Area Percent Slope	Max Contributing area Flowpath Length
1.5H : 1V or flatter	67% or flatter	100 feet
2H : 1V or flatter	50% or flatter	115 feet
4H : 1V or flatter	25% or flatter	150 feet
6H : 1V or flatter	16.7% or flatter	200 feet
10H : 1V or flatter	10% or flatter	250 feet

Design and Installation Specifications

- The vegetated strip shall consist of a continuous strip of dense vegetation with topsoil for a minimum of a 25-foot length along the flowpath. Grass-covered, landscaped areas are generally not adequate because the volume of sediment overwhelms the grass. Ideally, vegetated strips shall consist of undisturbed native growth with a well-developed soil that allows for infiltration of runoff.
- The slope within the vegetated strip shall not exceed 4H:1V.
- The uphill boundary of the vegetated strip shall be delineated with clearing limits.

Maintenance Standards

- Any areas damaged by erosion or construction activity shall be seeded immediately and protected by mulch.
- If more than 5 feet of the original vegetated strip width has had vegetation removed or is being eroded, sod must be installed.
- If there are indications that concentrated flows are traveling across the vegetated strip, stormwater runoff controls must be installed to reduce the flows entering the vegetated strip, or additional perimeter protection must be installed.

BMP C235: Wattles

Purpose

Wattles are temporary erosion and sediment control barriers consisting of straw, compost, or other material that is wrapped in netting made of natural plant fiber or similar encasing material. They reduce the velocity and can spread the flow of rill and sheet runoff, and can capture and retain sediment.

Conditions of Use

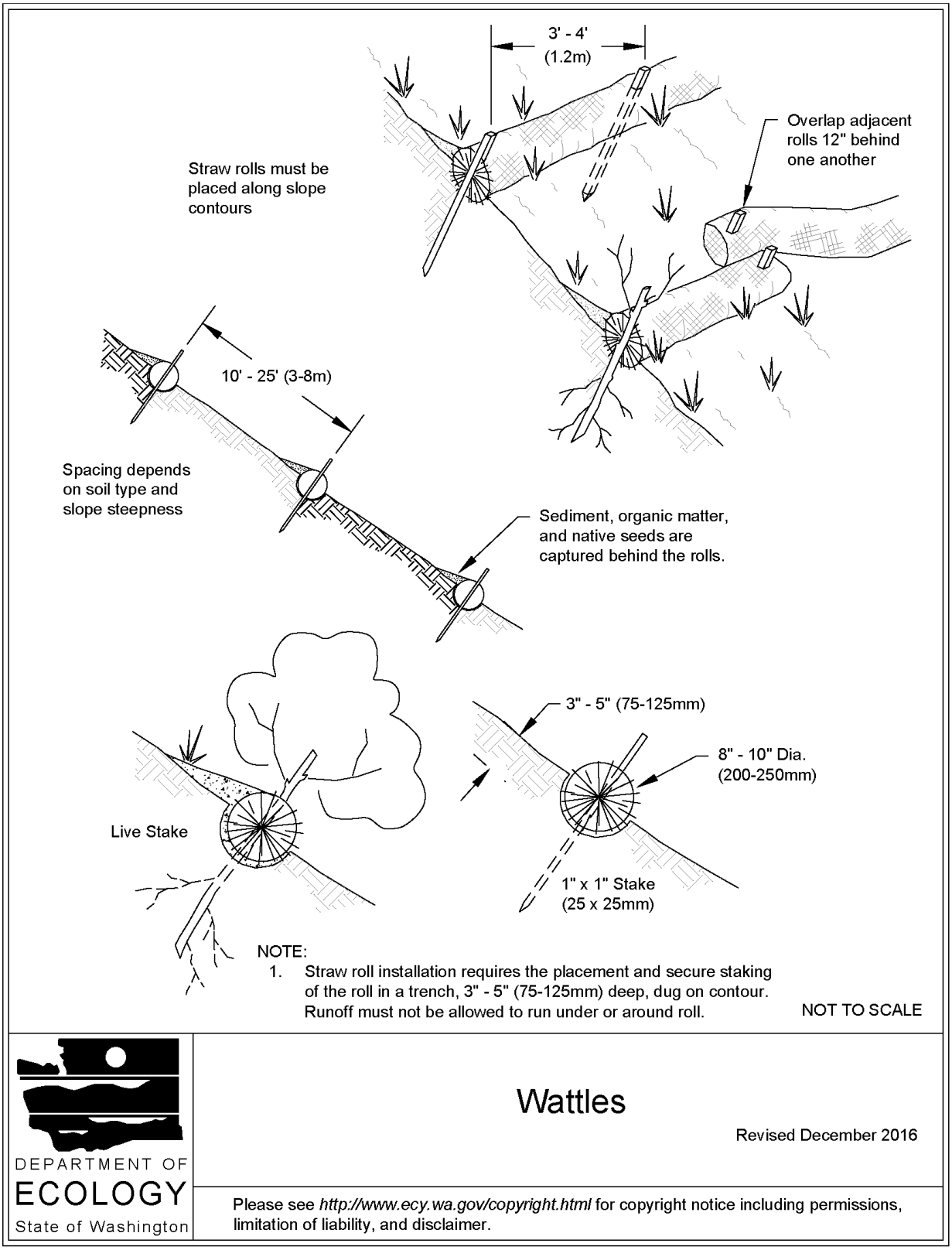
- Wattles shall consist of cylinders of plant material such as weed-free straw, coir, wood chips, excelsior, or wood fiber or shavings encased within netting made of natural plant fibers unaltered by synthetic materials.
- Use wattles:
    - In disturbed areas that require immediate erosion protection.
    - On exposed soils during the period of short construction delays, or over winter months.
    - On slopes requiring stabilization until permanent vegetation can be established.
- The material used dictates the effectiveness period of the wattle. Generally, wattles are effective for one to two seasons.

- Prevent rilling beneath wattles by entrenching and overlapping wattles to prevent water from passing between them.

Design Criteria

- See Figure II-3.24: Wattles for typical construction details.
- Wattles are typically 8 to 10 inches in diameter and 25 to 30 feet in length.
- Install wattles perpendicular to the flow direction and parallel to the slope contour.
- Place wattles in shallow trenches, staked along the contour of disturbed or newly constructed slopes. Dig narrow trenches across the slope (on contour) to a depth of 3- to 5-inches on clay soils and soils with gradual slopes. On loose soils, steep slopes, and areas with high rainfall, the trenches should be dug to a depth of 5- to 7- inches, or 1/2 to 2/3 of the thickness of the wattle.
- Start building trenches and installing wattles from the base of the slope and work up. Spread excavated material evenly along the uphill slope and compact it using hand tamping or other methods.
- Construct trenches at intervals of 10- to 25-feet depending on the steepness of the slope, soil type, and rainfall. The steeper the slope the closer together the trenches.
- Install the wattles snugly into the trenches and overlap the ends of adjacent wattles 12 inches behind one another.
- Install stakes at each end of the wattle, and at 4-foot centers along entire length of wattle.
- If required, install pilot holes for the stakes using a straight bar to drive holes through the wattle and into the soil.
- Wooden stakes should be approximately 0.75 x 0.75 x 24 inches min. Willow cuttings or 3/8-inch rebar can also be used for stakes.
- Stakes should be driven through the middle of the wattle, leaving 2 to 3 inches of the stake protruding above the wattle.

Figure II-3.24: Wattles



Maintenance Standards

- Wattles may require maintenance to ensure they are in contact with soil and thoroughly entrenched, especially after significant rainfall on steep sandy soils.
- Inspect the slope after significant storms and repair any areas where wattles are not tightly abutted or water has scoured beneath the wattles.

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 C236: Vegetative Filtration

Purpose

Vegetative filtration as a BMP is used in conjunction with detention storage in the form of portable tanks or BMP C241: Sediment Pond (Temporary), BMP C206: Level Spreader, and a pumping system with surface intake. Vegetative filtration improves turbidity levels of stormwater discharges by filtering runoff through existing vegetation where undisturbed forest floor duff layer or established lawn with thatch layer are present. Vegetative filtration can also be used to infiltrate dewatering waste from foundations, vaults, and trenches as long as runoff does not occur.

Conditions of Use

- For every five acres of disturbed soil use one acre of grass field, farm pasture, or wooded area. Reduce or increase this area depending on project size, ground water table height, and other site conditions.
- Wetlands shall not be used for vegetative filtration.
- Do not use this BMP in areas with a high ground water table, or in areas that will have a high seasonal ground water table during the use of this BMP.
- This BMP may be less effective on soils that prevent the infiltration of the water, such as hard till.
- Using other effective source control measures throughout a construction site will prevent the generation of additional highly turbid water and may reduce the time period or area need for this BMP.
- Stop distributing water into the vegetated filtration area if standing water or erosion results.

BMP C252: Treating and Disposing of High pH Water

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.

APPENDIX C
Correspondence

(Correspondence to be added to the appendix as received)

APPENDIX D
Site Inspection Form

Construction Stormwater Site Inspection Form

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
5 Stabilize Soils Cont.	Are stockpiles stabilized from erosion, protected with sediment trapping measures and located away from drain inlet, waterways, and drainage channels?						
	Have soils been stabilized at the end of the shift, before a holiday or weekend if needed based on the weather forecast?						
6 Protect Slopes	Has stormwater and ground water been diverted away from slopes and disturbed areas with interceptor dikes, pipes and or swales?						
	Is off-site storm water managed separately from stormwater generated on the site?						
	Is excavated material placed on uphill side of trenches consistent with safety and space considerations?						
	Have check dams been placed at regular intervals within constructed channels that are cut down a slope?						
7 Drain Inlets	Storm drain inlets made operable during construction are protected.						
	Are existing storm drains within the influence of the project protected?						
8 Stabilize Channel and Outlets	Have all on-site conveyance channels been designed, constructed and stabilized to prevent erosion from expected peak flows?						
	Is stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes and downstream conveyance systems?						
9 Control Pollutants	Are waste materials and demolition debris handled and disposed of to prevent contamination of stormwater?						
	Has cover been provided for all chemicals, liquid products, petroleum products, and other material?						
	Has secondary containment been provided capable of containing 110% of the volume?						
	Were contaminated surfaces cleaned immediately after a spill incident?						
	Were BMPs used to prevent contamination of stormwater by a pH modifying sources?						

Construction Stormwater Site Inspection Form

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
9 Cont.	Wheel wash wastewater is handled and disposed of properly.						
10 Control Dewatering	Concrete washout in designated areas. No washout or excess concrete on the ground.						
	Dewatering has been done to an approved source and in compliance with the SWPPP.						
	Were there any clean non turbid dewatering discharges?						
11 Maintain BMP	Are all temporary and permanent erosion and sediment control BMPs maintained to perform as intended?						
12 Manage the Project	Has the project been phased to the maximum degree practicable?						
	Has regular inspection, monitoring and maintenance been performed as required by the permit?						
	Has the SWPPP been updated, implemented and records maintained?						
13 Protect LID	Is all Bioretention and Rain Garden Facilities protected from sedimentation with appropriate BMPs?						
	Is the Bioretention and Rain Garden protected against over compaction of construction equipment and foot traffic to retain its infiltration capabilities?						
	Permeable pavements are clean and free of sediment and sediment laden-water runoff. Muddy construction equipment has not been on the base material or pavement.						
	Have soiled permeable pavements been cleaned of sediments and pass infiltration test as required by stormwater manual methodology?						
	Heavy equipment has been kept off existing soils under LID facilities to retain infiltration rate.						

E. Check all areas that have been inspected. ✔

All in place BMPs ☐ All disturbed soils ☐ All concrete wash out area ☐ All material storage areas ☐
All discharge locations ☐ All equipment storage areas ☐ All construction entrances/exits ☐

APPENDIX E
Construction Stormwater General Permit (CSWGP)

Download the CSWGP:
http://www.ecy.wa.gov/programs/wq/stormwater/construction/index.htm

APPENDIX D

Geotechnical Report

Draft Technical Memorandum

TO: Robert Droll, President, RWD Landscape Architects

FROM: Chad McMullen, PE, and Lance Levine, PE

DATE: October 24, 2022

RE: **Summary of Geotechnical Engineering Services**
Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction
Yelm, Washington
RWD Project No. 22041
Landau Project No. 1444018.010.011

Introduction

This memorandum summarizes the results of geotechnical engineering services provided by Landau Associates, Inc. (Landau) in support of the Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction project, located at 1315 West Yelm Avenue in Yelm, Washington (site; Figure 1). Services were provided in accordance with the scope outlined in Landau's proposal, dated September 27, 2022.

This memorandum has been prepared with information provided by RWD Landscape Architects (RWD, project landscape architect) and Yelm Community Schools (YCS, project owner) and with data collected during Landau's geotechnical field exploration and laboratory testing programs.

Project Understanding

YCS proposes to resurface a grass-covered soccer field and rebuild six tennis courts in the northwest corner of the site. The soccer field will be resurfaced with synthetic turf. RWD retained Landau to complete a limited field investigation and develop infiltration recommendations for onsite stormwater infiltration.

Site Conditions

The total area of the existing soccer field and tennis courts measures approximately 370 feet (ft) by 400 ft. An asphalt-paved walkway wraps around the perimeter of the soccer field. The field and courts are generally flat and level. Topography to the west of the site slopes gently downward; a privately developed parcel east of the site is elevated 1 to 2 ft above the existing soccer field. Terrain to the north and south is flat and level. Relevant site features are shown on Figure 2.

Geologic Setting

Geologic information for the site and the surrounding area was obtained from the Washington Geologic Information Portal (DNR, accessed October 13, 2022). Surficial deposits at the site are mapped as Fraser-age continental glacial outwash gravels (Qgog), a unit that consists of predominantly sandy gravels and gravelly sand with cobbles and boulders. This material was deposited during the last glacial recession and has not been glacially overridden.

A layer of topsoil was observed in Landau's October 2022 explorations. The topsoil consisted of silty sand and compost overlying glacial soils; YCS staff stated that the topsoil was placed to help establish grass turf. Other soil conditions encountered in Landau's explorations were consistent with the mapped geology for the site.

Subsurface Explorations

On October 5, 2022, YCS excavated four test pits (TP-1 through TP-4) 8.0 to 9.0 ft below ground surface (bgs). The approximate locations of the explorations are shown on Figure 2.

Landau personnel coordinated and monitored the field explorations, collected representative soil samples, and maintained detailed logs of the subsurface soil and groundwater conditions observed. Subsurface conditions were described using the soil classification system shown on Figure 3, in general accordance with ASTM International (ASTM) standard D2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedures).* Summary logs of the explorations are presented on Figures 4 through 7.

Soil samples were transported to Landau's geotechnical laboratory for further examination and testing. Natural moisture content determinations were performed on select soil samples in accordance with ASTM standard test method D2216, *Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.* The natural moisture content is shown as "W = xx" (i.e., percentage of dry weight) in the "Test Data" column on Figures 4 through 7.

Grain size analyses were performed on select soil samples in accordance with ASTM standard test method D6913, *Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.* Samples selected for grain size analysis are designated with a "GS" in the "Test Data" column on Figures 4 through 7. Results of the grain size analyses are presented on Figure 8.

Soil Conditions

The soils observed in Landau's October 2022 explorations were categorized into two units:

- **Topsoil:** Topsoil was observed in all four test pits and consisted of grass turf over fine to medium sand with silt. The silty sand was mixed with compost to promote turf growth. The topsoil was in a loose, damp condition and extended 0.5 ft bgs.
- **Recessional Outwash:** Recessional outwash was observed beneath the topsoil in all four test pits and consisted of sandy gravel with cobbles, of gravelly sand with cobbles, of gravelly sand with silt, and of fine to medium sand. Occasional boulders were observed in test pit TP-1. These variable soil gradations are typical of a sediment-choked, high-energy, braided river channel downstream of a receding glacier. The recessional outwash extended to the maximum depth explored.

Groundwater Conditions

Groundwater was not observed in Landau's October 2022 explorations, though soils were generally damp during test pit excavation. No seeps or pockets of moist or wet soil were observed. Mottling or other indicators of a seasonal high groundwater table were not observed.

The groundwater conditions reported herein are for the specific date and locations indicated and may not be representative of other locations and/or times. Groundwater conditions will vary depending on local subsurface conditions, weather conditions, and other factors. Groundwater levels are expected to fluctuate seasonally, with maximum groundwater levels occurring during late winter and early spring.

Conclusions and Recommendations

Based on the subsurface conditions observed in Landau's explorations, site soils are suitable for stormwater infiltration.

Infiltration Rate Assessment

The site is underlain by soils that will allow for moderate to rapid infiltration. Groundwater was not observed within the depths explored, and it is unlikely that infiltrated stormwater would mound above the groundwater table.

Design infiltration rates were estimated using the results of Landau's geotechnical laboratory tests (Figure 8) and the soil grain size method in the Washington State Department of Ecology's 2019 *Stormwater Management Manual for Western Washington* (hereafter, *2019 SWMMWW*). Correction factors were applied to account for site variability and the number of locations tested (CFv = 0.5), the test method (CFt = 0.4), and biofouling and siltation effects (CFm = 0.9). Landau used the simplified method to calculate design infiltration rates of 2.9 to 20 inches per hour, as shown in Table 1. (The *2019 SWMMWW* limits infiltration rates to 20 inches per hour.)

Table 1. Design Factored Infiltration Rates

Exploration Designation	Depth Range (ft bgs)	Design Infiltration Rate (in/hr)
TP-1	0.5–4.5	6.8
	4.5–8	20[(a)]
TP-2	0.5–1.5	6.8
	1.5–8	20[(a)]
TP-3	0.5–8	2.9
TP-4	0.5–1.5	2.9
	1.5–5	15
	5–8	20[(a)]

(a) Maximum rate of 20 inches per hour.
bgs = below ground surface
ft = foot/feet
in/hr = inches per hour

Use of This Technical Memorandum

Landau Associates has prepared this technical memorandum for the exclusive use of RWD Landscape Architects and Yelm Community Schools for specific application to the Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction project in Yelm, Washington. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of Landau Associates. Reuse of the information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by Landau Associates, shall be at the user's sole risk. Landau Associates warrants that, within the limitations of scope, schedule, and budget, its services have been provided in a manner consistent with that level of skill and care ordinarily exercised by members of the profession currently practicing in the same locality, under similar conditions as this project. Landau Associates makes no other warranty, either express or implied.

Closing

We trust that this memorandum provides you with the information needed to proceed with the project. If you have questions or comments, please contact Lance Levine at 360.628.5109 or at llevine@landauinc.com.

LANDAU ASSOCIATES, INC.

Chad McMullen, PE
Senior Engineer

Lance Levine, PE
Senior Engineer

CTM/LGL/SRW/mcs
[\\OLYMPIA1\PROJECTS\1444\018.010\R\YHS SOCCER FIELD CONVERSION AND TENNIS COURTS RECONSTRUCTION DRAFT TECHNICAL MEMORANDUM 10.24.2022.DOCX]

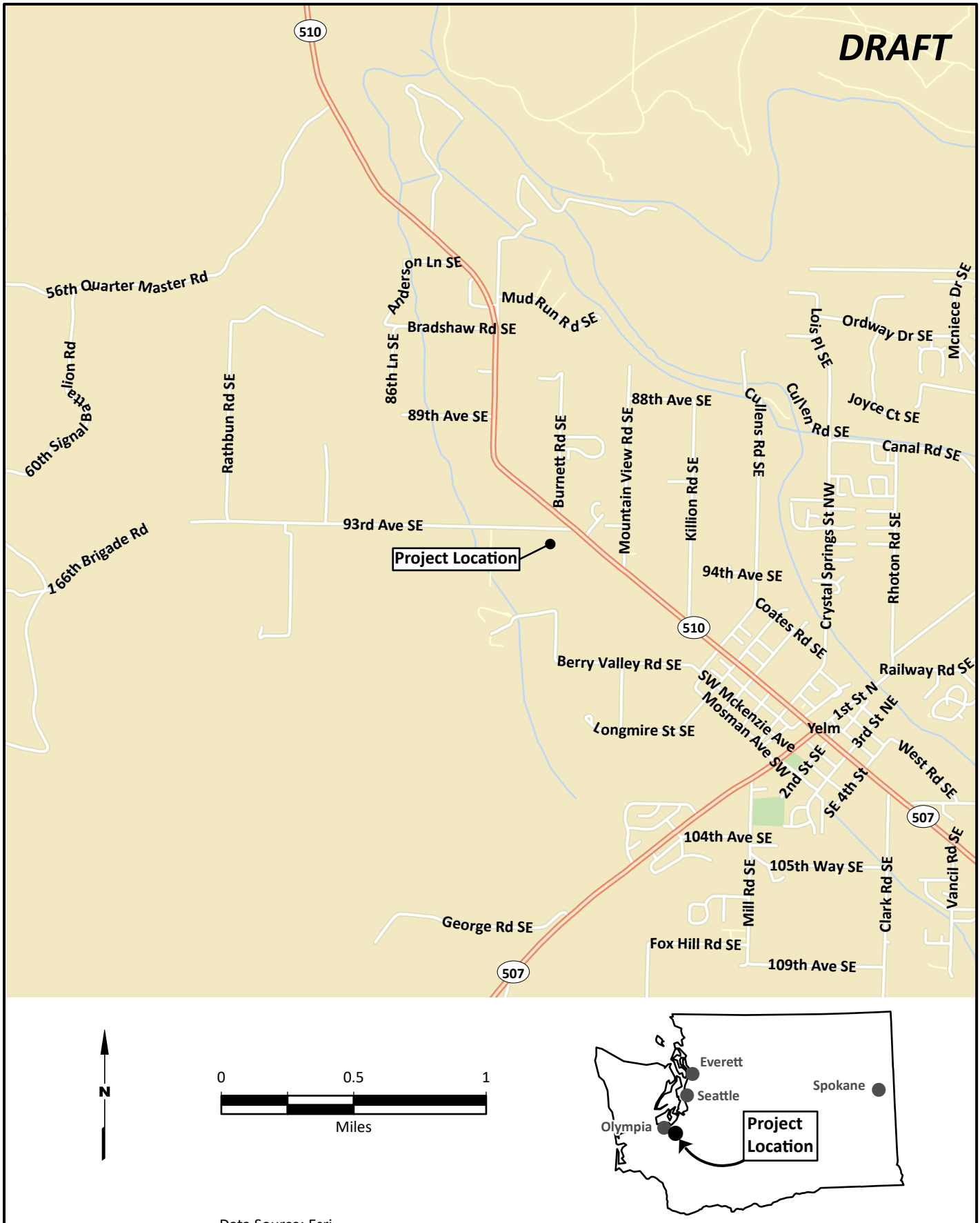
Attachments: Figure 1. Vicinity Map
Figure 2. Site Exploration and Location Plan
Figure 3. Soil Classification System and Key
Figures 4–7. Logs of Test Pits TP-1 through TP-4
Figure 8. Grain Size Distribution

References

ASTM. 2017. Annual Book of ASTM Standards. In: *Soil and Rock (I).* West Conshohocken, PA: ASTM International.

DNR. Washington Geologic Information Portal. Washington State Department of Natural Resources. Accessed October 13, 2022. Available online at: https://geologyportal.dnr.wa.gov/.

Ecology. 2019. *Stormwater Management Manual for Western Washington.* Publication No. 19-10-021. Washington State Department of Ecology. July.



Data Source: Esri.

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Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction Yelm, Washington	**Vicinity Map**	Figure 1

Legend

TP-1 Approximate Test Pit Location and Designation

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Source: Google Maps 2022

0 120 240

Scale in Feet

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Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction
Yelm, Washington

Site Exploration and Location Plan

Figure 2

Soil Classification System

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS LETTER SYMBOL[1]	TYPICAL DESCRIPTIONS [2][3]
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		GW	Well-graded gravel; gravel/sand mixture(s); little or no fines
				GP	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		GM	Silty gravel; gravel/sand/silt mixture(s)
				GC	Clayey gravel; gravel/sand/clay mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		SW	Well-graded sand; gravelly sand; little or no fines
				SP	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)		SM	Silty sand; sand/silt mixture(s)
				SC	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)			ML	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
				CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
				OL	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)			MH	Inorganic silt; micaceous or diatomaceous fine sand
				CH	Inorganic clay of high plasticity; fat clay
				OH	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL			PT	Peat; humus; swamp soil with high organic content

OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		AC or PC	Asphalt concrete pavement or Portland cement pavement
ROCK		RK	Rock (See Rock Classification)
WOOD		WD	Wood, lumber, wood chips
DEBRIS		DB	Construction debris, garbage

Notes:
1. USCS letter symbols correspond to symbols used by the Unified Soil Classification System and ASTM classification methods. Dual letter symbols (e.g., SP-SM for sand or gravel) indicate soil with an estimated 5-15% fines. Multiple letter symbols (e.g., ML/CL) indicate borderline or multiple soil classifications.
2. Soil descriptions are based on the general approach presented in the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the Standard Test Method for Classification of Soils for Engineering Purposes, as outlined in ASTM D 2487.
3. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

Primary Constituent:	> 50%	"GRAVEL," "SAND," "SILT," "CLAY," etc.
Secondary Constituents:	> 30% and ≤ 50%	"very gravelly," "very sandy," "very silty," etc.
	> 15% and ≤ 30%	"gravelly," "sandy," "silty," etc.
Additional Constituents:	> 5% and ≤ 15%	"with gravel," "with sand," "with silt," etc.
	≤ 5%	"with trace gravel," "with trace sand," "with trace silt," etc., or not noted.

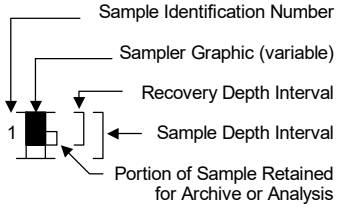
4. Soil density or consistency descriptions are based on judgement using a combination of sampler penetration blow counts, drilling or excavating conditions, field tests, and laboratory tests, as appropriate.

Drilling and Sampling Key

SAMPLER TYPE & METHOD

Graphic	Code	Description
☒	a	3.25-in OD, 2.42-in ID Split Spoon
⧓	b	2.00-in OD, 1.50-in ID Split Spoon
◧	c	Shelby Tube
◪	d	Grab Sample
◧	e	Single-Tube Core Barrel
◧	f	Double-Tube Core Barrel
☒	g	2.50-in OD, 2.00-in ID WSDOT
☒	h	3.00-in OD, 2.37-in ID Mod. Calif.
☒	i	Other - See text if applicable
	1	300-lb Hammer, 30-inch Drop
	2	140-lb Hammer, 30-inch Drop
	3	Pushed Sample
	4	Vibrocore (Rotosonic/Geoprobe)
	5	Other - See text if applicable
	6	Piston Extraction

SAMPLE NUMBER & INTERVAL



Field and Lab Test Data

Code	Description
PP = 1.0	Pocket Penetrometer, tsf
TV = 0.5	Torvane, tsf
PID = 100	Photoionization Detector VOC screening, ppm
W = 10	Moisture Content, %
D = 120	Dry Density, pcf
-200 = 60	Material smaller than No. 200 sieve, %
GS	Grain Size - See separate figure for data
AL	Atterberg Limits - See separate figure for data
GT	Other Geotechnical Testing
CA	Chemical Analysis

Groundwater

▽ Approximate water level at time of drilling (ATD)

▼ Approximate water level at time after drilling/excavation/well

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Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction
Yelm, Washington

Soil Classification System and Key

Figure 3

TP-1

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Rubber-tired Backhoe Ground Elevation (ft): Not Measured Excavated By: Yelm Community Schools Logged By: CTM	
0						SP-SM	2 inches of grass turf above 4 inches of fine to medium SAND with silt (loose, damp)	Groundwater Not Encountered
							(TOPSOIL)	
						SP	Dark brown, cobbly, very gravelly, fine to coarse SAND with trace organics (medium dense, damp)	
							(RECESSIONAL OUTWASH)	
2		S-1	d	W = 14 GS			-- occasional small, rounded boulders measuring up to 16 inches	
4						GP	Light brown, sandy, fine to coarse GRAVEL with cobbles and boulders (medium dense to dense, damp)	
		S-2	d					
6							-- soil caving; excavation terminated at 8.0 feet	
8								
10								
12								

Test Pit Completed 10/05/22
Total Depth of Test Pit = 8.0 ft.

Point located at

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction
Yelm, Washington

Log of Test Pit TP-1

Figure 4

TP-2

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol		
0						SP-SM	2 inches of grass turf above 4 inches of fine to medium SAND with silt (loose, damp)	Groundwater Not Encountered
							(TOPSOIL)	
		S-1	d			SP	Dark brown, cobbly, very gravelly, fine to coarse SAND with trace organics (medium dense, damp)	
							(RECESSIONAL OUTWASH)	
2						GP	Light brown, sandy, fine to coarse GRAVEL with cobbles (medium dense to dense, damp)	
		S-2	d	W = 6 GS				
4								
6							-- soil raveling and caving; excavation terminated at 8.0 feet	
8								
10								
12								

Excavation Method: Rubber-tired Backhoe
Ground Elevation (ft): Not Measured
Excavated By: Yelm Community Schools
Logged By: CTM

Test Pit Completed 10/05/22
Total Depth of Test Pit = 8.0 ft.

Point located at

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction
Yelm, Washington

Log of Test Pit TP-2

Figure 5

TP-3

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Rubber-tired Backhoe Ground Elevation (ft): Not Measured Excavated By: Yelm Community Schools Logged By: CTM	
0						SP-SM	2 inches of grass turf above 4 inches of fine to medium SAND with silt (loose, damp)	Groundwater Not Encountered
							(TOPSOIL)	
						GP-GM	Dark brown, sandy, fine to coarse GRAVEL with silt, cobbles, and trace organics (medium dense, damp)	
							(RECESSIONAL OUTWASH)	
2						SW-SM	Light brown, gravelly, fine to coarse SAND with silt (loose to medium dense, damp)	
		S-1	d	W = 16 GS				
4								
6		S-2	d				-- grades to with cobbles	
8						GP	Light brown, cobbly, sandy, fine to coarse GRAVEL (medium dense to dense, damp)	
10								
12								

Test Pit Completed 10/05/22 Point located at
Total Depth of Test Pit = 9.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction
Yelm, Washington

Log of Test Pit TP-3

Figure 6

TP-4

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Rubber-tired Backhoe Ground Elevation (ft): Not Measured Excavated By: Yelm Community Schools Logged By: CTM	
0						SP-SM	2 inches of grass turf above 4 inches of fine to medium SAND with silt (loose, damp)	Groundwater Not Encountered
							(TOPSOIL)	
						GP-GM	Dark brown, sandy, fine to coarse GRAVEL with silt and trace organics (medium dense, damp)	
							(RECESSIONAL OUTWASH)	
2		S-1	d	W = 8 GS		SP	Light brown, fine to medium SAND (loose to medium dense, damp)	
4							-- grades to very gravelly, with cobbles, and dense	
6		S-2	d			GP	Light brown, sandy, fine to coarse GRAVEL (dense, damp)	
8								
10								
12								

Test Pit Completed 10/05/22
Total Depth of Test Pit = 8.0 ft.

Point located at

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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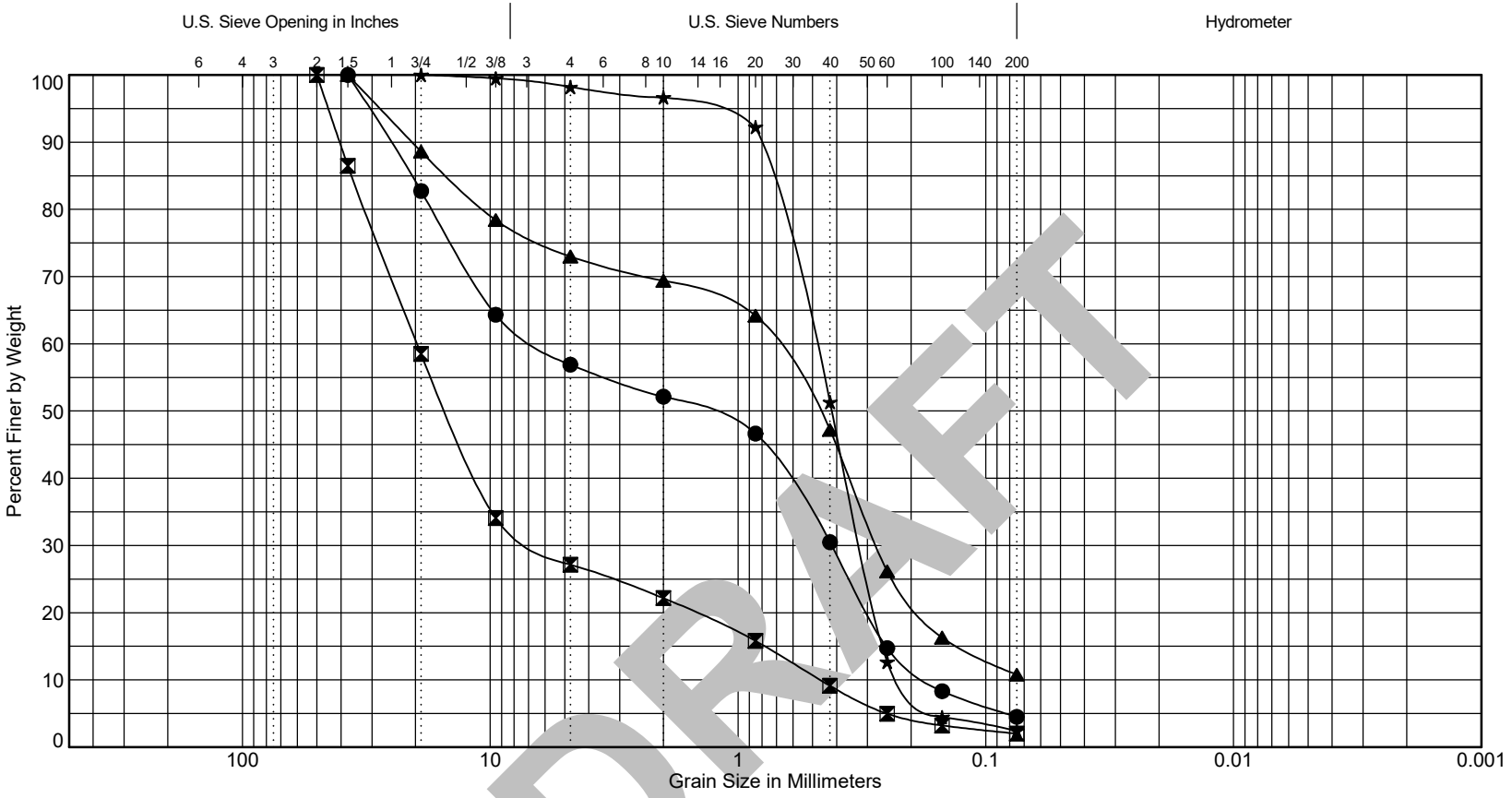
Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction
Yelm, Washington

Log of Test Pit TP-4

Figure 7



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

Symbol	Exploration Number	Sample Number	Depth (ft)	Natural Moisture (%)	Soil Description	Unified Soil Classification
●	TP-1	S-1	1.5	14	Very gravelly, fine to coarse SAND	SP
⊠	TP-2	S-2	3.0	6	Sandy, fine to coarse GRAVEL	GP
▲	TP-3	S-1	3.0	16	Gravelly, well-graded SAND with silt	SW-SM
★	TP-4	S-1	2.0	8	Fine to medium SAND	SP

LANDAU ASSOCIATES

Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction
Yelm, Washington

Grain Size Distribution

Figure 8

Draft Technical Memorandum

TO: Robert Droll, President, RWD Landscape Architects

FROM: Chad McMullen, PE, and Lance Levine, PE

DATE: October 24, 2022

RE: **Summary of Geotechnical Engineering Services**
Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction
Yelm, Washington
RWD Project No. 22041
Landau Project No. 1444018.010.011

Introduction

This memorandum summarizes the results of geotechnical engineering services provided by Landau Associates, Inc. (Landau) in support of the Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction project, located at 1315 West Yelm Avenue in Yelm, Washington (site; Figure 1). Services were provided in accordance with the scope outlined in Landau's proposal, dated September 27, 2022.

This memorandum has been prepared with information provided by RWD Landscape Architects (RWD, project landscape architect) and Yelm Community Schools (YCS, project owner) and with data collected during Landau's geotechnical field exploration and laboratory testing programs.

Project Understanding

YCS proposes to resurface a grass-covered soccer field and rebuild six tennis courts in the northwest corner of the site. The soccer field will be resurfaced with synthetic turf. RWD retained Landau to complete a limited field investigation and develop infiltration recommendations for onsite stormwater infiltration.

Site Conditions

The total area of the existing soccer field and tennis courts measures approximately 370 feet (ft) by 400 ft. An asphalt-paved walkway wraps around the perimeter of the soccer field. The field and courts are generally flat and level. Topography to the west of the site slopes gently downward; a privately developed parcel east of the site is elevated 1 to 2 ft above the existing soccer field. Terrain to the north and south is flat and level. Relevant site features are shown on Figure 2.

Geologic Setting

Geologic information for the site and the surrounding area was obtained from the Washington Geologic Information Portal (DNR, accessed October 13, 2022). Surficial deposits at the site are mapped as Fraser-age continental glacial outwash gravels (Qgog), a unit that consists of predominantly sandy gravels and gravelly sand with cobbles and boulders. This material was deposited during the last glacial recession and has not been glacially overridden.

A layer of topsoil was observed in Landau's October 2022 explorations. The topsoil consisted of silty sand and compost overlying glacial soils; YCS staff stated that the topsoil was placed to help establish grass turf. Other soil conditions encountered in Landau's explorations were consistent with the mapped geology for the site.

Subsurface Explorations

On October 5, 2022, YCS excavated four test pits (TP-1 through TP-4) 8.0 to 9.0 ft below ground surface (bgs). The approximate locations of the explorations are shown on Figure 2.

Landau personnel coordinated and monitored the field explorations, collected representative soil samples, and maintained detailed logs of the subsurface soil and groundwater conditions observed. Subsurface conditions were described using the soil classification system shown on Figure 3, in general accordance with ASTM International (ASTM) standard D2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedures).* Summary logs of the explorations are presented on Figures 4 through 7.

Soil samples were transported to Landau's geotechnical laboratory for further examination and testing. Natural moisture content determinations were performed on select soil samples in accordance with ASTM standard test method D2216, *Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.* The natural moisture content is shown as "W = xx" (i.e., percentage of dry weight) in the "Test Data" column on Figures 4 through 7.

Grain size analyses were performed on select soil samples in accordance with ASTM standard test method D6913, *Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.* Samples selected for grain size analysis are designated with a "GS" in the "Test Data" column on Figures 4 through 7. Results of the grain size analyses are presented on Figure 8.

Soil Conditions

The soils observed in Landau's October 2022 explorations were categorized into two units:

- **Topsoil:** Topsoil was observed in all four test pits and consisted of grass turf over fine to medium sand with silt. The silty sand was mixed with compost to promote turf growth. The topsoil was in a loose, damp condition and extended 0.5 ft bgs.
- **Recessional Outwash:** Recessional outwash was observed beneath the topsoil in all four test pits and consisted of sandy gravel with cobbles, of gravelly sand with cobbles, of gravelly sand with silt, and of fine to medium sand. Occasional boulders were observed in test pit TP-1. These variable soil gradations are typical of a sediment-choked, high-energy, braided river channel downstream of a receding glacier. The recessional outwash extended to the maximum depth explored.

Groundwater Conditions

Groundwater was not observed in Landau's October 2022 explorations, though soils were generally damp during test pit excavation. No seeps or pockets of moist or wet soil were observed. Mottling or other indicators of a seasonal high groundwater table were not observed.

The groundwater conditions reported herein are for the specific date and locations indicated and may not be representative of other locations and/or times. Groundwater conditions will vary depending on local subsurface conditions, weather conditions, and other factors. Groundwater levels are expected to fluctuate seasonally, with maximum groundwater levels occurring during late winter and early spring.

Conclusions and Recommendations

Based on the subsurface conditions observed in Landau's explorations, site soils are suitable for stormwater infiltration.

Infiltration Rate Assessment

The site is underlain by soils that will allow for moderate to rapid infiltration. Groundwater was not observed within the depths explored, and it is unlikely that infiltrated stormwater would mound above the groundwater table.

Design infiltration rates were estimated using the results of Landau's geotechnical laboratory tests (Figure 8) and the soil grain size method in the Washington State Department of Ecology's 2019 *Stormwater Management Manual for Western Washington* (hereafter, *2019 SWMMWW*). Correction factors were applied to account for site variability and the number of locations tested (CFv = 0.5), the test method (CFt = 0.4), and biofouling and siltation effects (CFm = 0.9). Landau used the simplified method to calculate design infiltration rates of 2.9 to 20 inches per hour, as shown in Table 1. (The *2019 SWMMWW* limits infiltration rates to 20 inches per hour.)

Table 1. Design Factored Infiltration Rates

Exploration Designation	Depth Range (ft bgs)	Design Infiltration Rate (in/hr)
TP-1	0.5–4.5	6.8
	4.5–8	20[(a)]
TP-2	0.5–1.5	6.8
	1.5–8	20[(a)]
TP-3	0.5–8	2.9
TP-4	0.5–1.5	2.9
	1.5–5	15
	5–8	20[(a)]

(a) Maximum rate of 20 inches per hour.
bgs = below ground surface
ft = foot/feet
in/hr = inches per hour

Use of This Technical Memorandum

Landau Associates has prepared this technical memorandum for the exclusive use of RWD Landscape Architects and Yelm Community Schools for specific application to the Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction project in Yelm, Washington. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of Landau Associates. Reuse of the information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by Landau Associates, shall be at the user's sole risk. Landau Associates warrants that, within the limitations of scope, schedule, and budget, its services have been provided in a manner consistent with that level of skill and care ordinarily exercised by members of the profession currently practicing in the same locality, under similar conditions as this project. Landau Associates makes no other warranty, either express or implied.

Closing

We trust that this memorandum provides you with the information needed to proceed with the project. If you have questions or comments, please contact Lance Levine at 360.628.5109 or at llevine@landauinc.com.

LANDAU ASSOCIATES, INC.

Chad McMullen, PE
Senior Engineer

Lance Levine, PE
Senior Engineer

CTM/LGL/SRW/mcs
[\\OLYMPIA1\PROJECTS\1444\018.010\R\YHS SOCCER FIELD CONVERSION AND TENNIS COURTS RECONSTRUCTION DRAFT TECHNICAL MEMORANDUM 10.24.2022.DOCX]

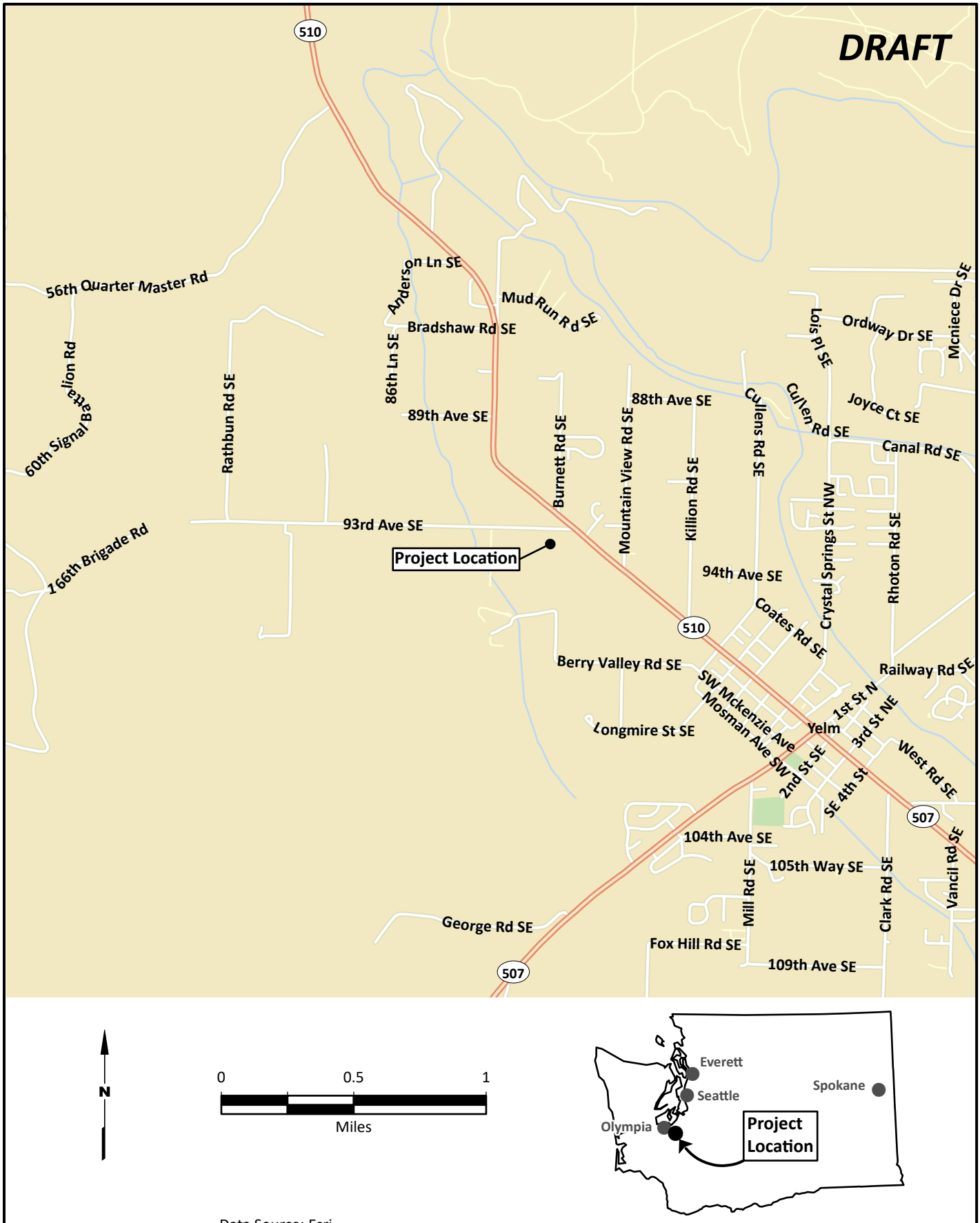
Attachments: Figure 1. Vicinity Map
Figure 2. Site Exploration and Location Plan
Figure 3. Soil Classification System and Key
Figures 4–7. Logs of Test Pits TP-1 through TP-4
Figure 8. Grain Size Distribution

References

ASTM. 2017. Annual Book of ASTM Standards. In: *Soil and Rock (I).* West Conshohocken, PA: ASTM International.

DNR. Washington Geologic Information Portal. Washington State Department of Natural Resources. Accessed October 13, 2022. Available online at: https://geologyportal.dnr.wa.gov/.

Ecology. 2019. *Stormwater Management Manual for Western Washington.* Publication No. 19-10-021. Washington State Department of Ecology. July.



Data Source: Esri.

G:\Projects\1444\018\010\011\YelmHSSoccerField\YelmHSSoccerField.aprx 10/15/2022

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Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction Yelm, Washington	**Vicinity Map**	Figure 1

Legend

TP-1 Approximate Test Pit Location and Designation

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Source: Google Maps 2022

0 120 240

Scale in Feet

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Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction
Yelm, Washington

Site Exploration and Location Plan

Figure 2

Soil Classification System

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS LETTER SYMBOL[1]	TYPICAL DESCRIPTIONS [2][3]
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		GW	Well-graded gravel; gravel/sand mixture(s); little or no fines
				GP	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		GM	Silty gravel; gravel/sand/silt mixture(s)
				GC	Clayey gravel; gravel/sand/clay mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		SW	Well-graded sand; gravelly sand; little or no fines
				SP	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)		SM	Silty sand; sand/silt mixture(s)
				SC	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)			ML	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
				CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
				OL	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)			MH	Inorganic silt; micaceous or diatomaceous fine sand
				CH	Inorganic clay of high plasticity; fat clay
				OH	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL			PT	Peat; humus; swamp soil with high organic content

OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		AC or PC	Asphalt concrete pavement or Portland cement pavement
ROCK		RK	Rock (See Rock Classification)
WOOD		WD	Wood, lumber, wood chips
DEBRIS		DB	Construction debris, garbage

Notes:
1. USCS letter symbols correspond to symbols used by the Unified Soil Classification System and ASTM classification methods. Dual letter symbols (e.g., SP-SM for sand or gravel) indicate soil with an estimated 5-15% fines. Multiple letter symbols (e.g., ML/CL) indicate borderline or multiple soil classifications.
2. Soil descriptions are based on the general approach presented in the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the Standard Test Method for Classification of Soils for Engineering Purposes, as outlined in ASTM D 2487.
3. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

Primary Constituent:	> 50%	"GRAVEL," "SAND," "SILT," "CLAY," etc.
Secondary Constituents:	> 30% and ≤ 50%	"very gravelly," "very sandy," "very silty," etc.
	> 15% and ≤ 30%	"gravelly," "sandy," "silty," etc.
Additional Constituents:	> 5% and ≤ 15%	"with gravel," "with sand," "with silt," etc.
	≤ 5%	"with trace gravel," "with trace sand," "with trace silt," etc., or not noted.

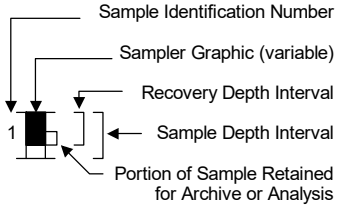
4. Soil density or consistency descriptions are based on judgement using a combination of sampler penetration blow counts, drilling or excavating conditions, field tests, and laboratory tests, as appropriate.

Drilling and Sampling Key

SAMPLER TYPE & METHOD

Graphic	Code	Description
☒	a	3.25-in OD, 2.42-in ID Split Spoon
⧓	b	2.00-in OD, 1.50-in ID Split Spoon
◧	c	Shelby Tube
◪	d	Grab Sample
◧	e	Single-Tube Core Barrel
◧	f	Double-Tube Core Barrel
☒	g	2.50-in OD, 2.00-in ID WSDOT
☒	h	3.00-in OD, 2.37-in ID Mod. Calif.
☒	i	Other - See text if applicable
	1	300-lb Hammer, 30-inch Drop
	2	140-lb Hammer, 30-inch Drop
	3	Pushed Sample
	4	Vibrocore (Rotosonic/Geoprobe)
	5	Other - See text if applicable
	6	Piston Extraction

SAMPLE NUMBER & INTERVAL



Field and Lab Test Data

Code	Description
PP = 1.0	Pocket Penetrometer, tsf
TV = 0.5	Torvane, tsf
PID = 100	Photoionization Detector VOC screening, ppm
W = 10	Moisture Content, %
D = 120	Dry Density, pcf
-200 = 60	Material smaller than No. 200 sieve, %
GS	Grain Size - See separate figure for data
AL	Atterberg Limits - See separate figure for data
GT	Other Geotechnical Testing
CA	Chemical Analysis

Groundwater

▽ Approximate water level at time of drilling (ATD)

▼ Approximate water level at time after drilling/excavation/well

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Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction
Yelm, Washington

Soil Classification System and Key

Figure 3

TP-1

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Rubber-tired Backhoe Ground Elevation (ft): Not Measured Excavated By: Yelm Community Schools Logged By: CTM	
0						SP-SM	2 inches of grass turf above 4 inches of fine to medium SAND with silt (loose, damp)	Groundwater Not Encountered
							(TOPSOIL)	
						SP	Dark brown, cobbly, very gravelly, fine to coarse SAND with trace organics (medium dense, damp)	
							(RECESSIONAL OUTWASH)	
2		S-1	d	W = 14 GS			-- occasional small, rounded boulders measuring up to 16 inches	
4						GP	Light brown, sandy, fine to coarse GRAVEL with cobbles and boulders (medium dense to dense, damp)	
		S-2	d					
6							-- soil caving; excavation terminated at 8.0 feet	
8								
10								
12								

Test Pit Completed 10/05/22
Total Depth of Test Pit = 8.0 ft.

Point located at

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction
Yelm, Washington

Log of Test Pit TP-1

Figure 4

TP-2

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol		
0						SP-SM	2 inches of grass turf above 4 inches of fine to medium SAND with silt (loose, damp)	Groundwater Not Encountered
							(TOPSOIL)	
		S-1	d			SP	Dark brown, cobbly, very gravelly, fine to coarse SAND with trace organics (medium dense, damp)	
							(RECESSIONAL OUTWASH)	
2						GP	Light brown, sandy, fine to coarse GRAVEL with cobbles (medium dense to dense, damp)	
		S-2	d	W = 6 GS				
4								
6							-- soil raveling and caving; excavation terminated at 8.0 feet	
8								
10								
12								

Excavation Method: Rubber-tired Backhoe
Ground Elevation (ft): Not Measured
Excavated By: Yelm Community Schools
Logged By: CTM

Test Pit Completed 10/05/22
Total Depth of Test Pit = 8.0 ft.

Point located at

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction
Yelm, Washington

Log of Test Pit TP-2

Figure 5

TP-3

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Rubber-tired Backhoe Ground Elevation (ft): Not Measured Excavated By: Yelm Community Schools Logged By: CTM	
0						SP-SM	2 inches of grass turf above 4 inches of fine to medium SAND with silt (loose, damp)	Groundwater Not Encountered
							(TOPSOIL)	
						GP-GM	Dark brown, sandy, fine to coarse GRAVEL with silt, cobbles, and trace organics (medium dense, damp)	
							(RECESSIONAL OUTWASH)	
2						SW-SM	Light brown, gravelly, fine to coarse SAND with silt (loose to medium dense, damp)	
		S-1	d	W = 16 GS				
4								
6		S-2	d				-- grades to with cobbles	
8						GP	Light brown, cobbly, sandy, fine to coarse GRAVEL (medium dense to dense, damp)	
10								
12								

Test Pit Completed 10/05/22 Point located at
Total Depth of Test Pit = 9.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction
Yelm, Washington

Log of Test Pit TP-3

Figure 6

TP-4

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Rubber-tired Backhoe Ground Elevation (ft): Not Measured Excavated By: Yelm Community Schools Logged By: CTM	
0						SP-SM	2 inches of grass turf above 4 inches of fine to medium SAND with silt (loose, damp)	Groundwater Not Encountered
							(TOPSOIL)	
						GP-GM	Dark brown, sandy, fine to coarse GRAVEL with silt and trace organics (medium dense, damp)	
							(RECESSIONAL OUTWASH)	
2		S-1	d	W = 8 GS		SP	Light brown, fine to medium SAND (loose to medium dense, damp)	
4							-- grades to very gravelly, with cobbles, and dense	
6		S-2	d			GP	Light brown, sandy, fine to coarse GRAVEL (dense, damp)	
8								
10								
12								

Test Pit Completed 10/05/22
Total Depth of Test Pit = 8.0 ft.

Point located at

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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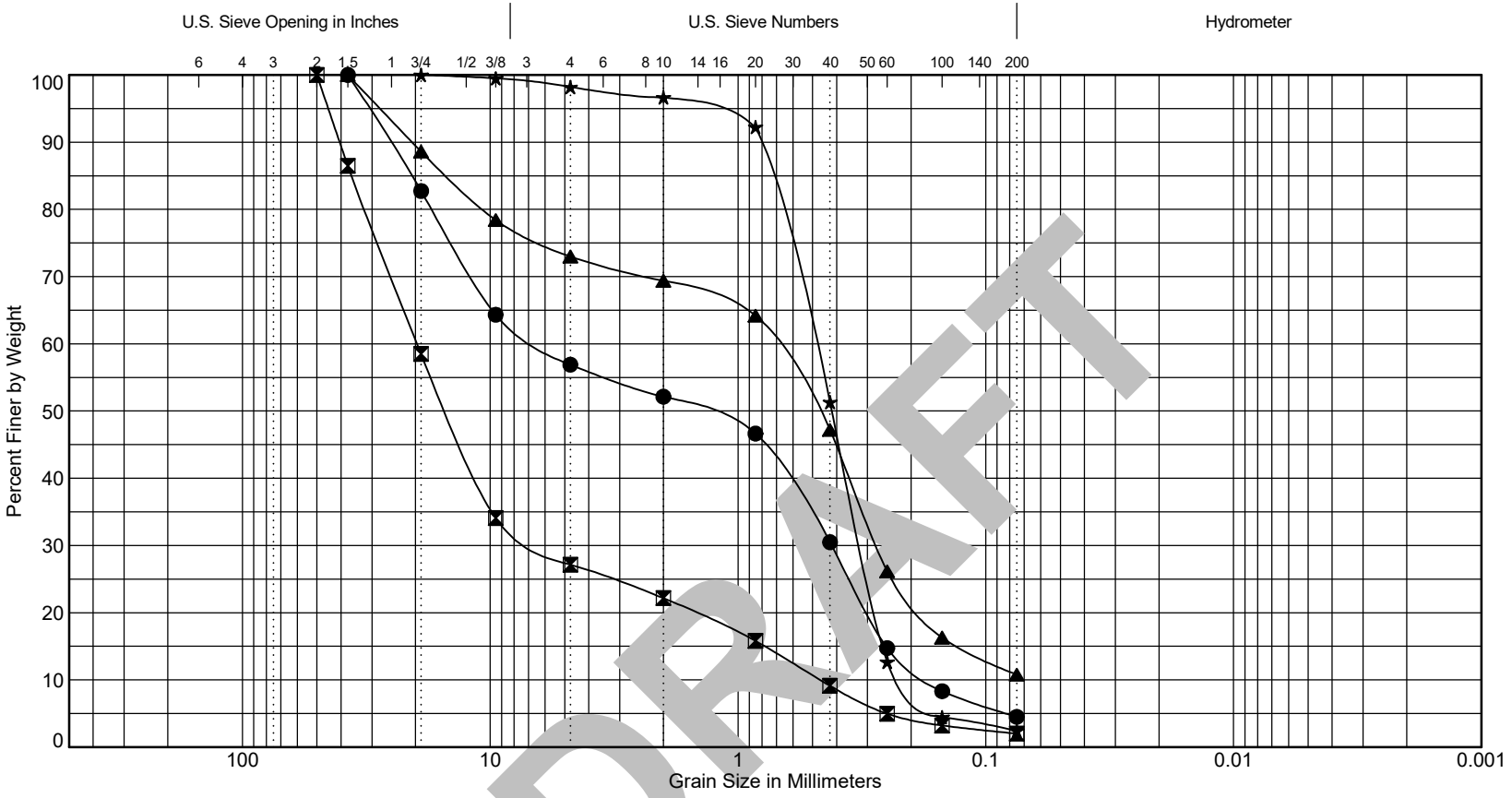
Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction
Yelm, Washington

Log of Test Pit TP-4

Figure 7



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

Symbol	Exploration Number	Sample Number	Depth (ft)	Natural Moisture (%)	Soil Description	Unified Soil Classification
●	TP-1	S-1	1.5	14	Very gravelly, fine to coarse SAND	SP
⊠	TP-2	S-2	3.0	6	Sandy, fine to coarse GRAVEL	GP
▲	TP-3	S-1	3.0	16	Gravelly, well-graded SAND with silt	SW-SM
★	TP-4	S-1	2.0	8	Fine to medium SAND	SP

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Yelm High School Soccer Field Conversion and Tennis Courts Reconstruction
Yelm, Washington

Grain Size Distribution

Figure 8