Pacific Tech Construction

A Site Plan Application

Submitted to
City of Kelso

July 2020

Prepared for:
Pacific Tech Development, LLC
Contact: Joe Lane
1302 Walnut Street
Kelso, WA 98626

THREE RIVERS LAND SERVICES

Prepared by:
Tim Wines, P.E.
Three Rivers Land Services, PLLC
604 N 16th Ave
Kelso, WA 98626
(360) 431-9988

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SECTION 1

Master Application

MASTER LAND USE APPLICATION

Kelso WASHINGTON

Questions and Applications can be directed to:	**Community Development**	360-423-9922 (Office)
	203 S. Pacific #208	360-423-6591 (Fax)
	PO Box 819	building@kelso.gov
	Kelso WA 98626	

For Office Use Only

Office Use Only	❑ Zoning	❑ Site Plan Review	❑ SEPA	❑ Type 1 Review	❑ Type II Review	❑ Type III Review

CHECK ALL THAT APPLY AND ATTACH THE APPROPRIATE SUPPLEMENTAL FORM(S)

Zoning / Comp Plan Amendment		Subdivision	Other
❑ Annexation	❑ Planned Unit Development	❑ Alteration/Vacation	❑ Appeal
❑ Code Interpretation	❑ Rezone / Comp. Plan Amend	❑ Binding Site Plan	☒ Environmental Checklist
❑ Conditional Use	☒ Site Plan	❑ Boundary Line Adjustment	❑ JARPA:
❑ Design Review	❑ Text Amendment Request	❑ Short Subdivision	❑ Critical Area
	❑ Variance	❑ Sign Permit	❑ Shoreline Exemption
		❑ Subdivision (Long)	❑ Substantial Development
		❑ Subdivision Variance	

Pro ject Name: Pacific Tech Site Plan

Property Address: 1303 S 13th Avenue, Kelso, WA 98626

Parcel Number(s): 24355 Will project be in the Flood Plain (yes/no)

Any part of this property within 200 feet of a shoreline of statewide significance (yes/no)

Will there be any filling, grading or excavation associated with the project (yes/no) If yes, quantity of earthwork 5,000 cy

Project Description Construct a 30,000 metal building and a 4,800 sf metal building on 3.06 acres.

Applicant Information

The property owner(s), by signing this form, hearby state as true that they are the owner(s) of the property that is the subject of this application, have reviewed the proposal as presented in the application, and wish to pursue the change(s) in land use.

Applicant PROPERTY OWNER			
Business Name: Pacific Tech Development, LLC	Contact Name Joe Lane		
Mailing/Billing Address: 1302 Walnut Street	City: Kelso	State: WA	Zip: 98626
Phone: 360-414-8084	Email: jlane@pacifictechgroup.com		
Signature:	Date: 7/14/20		
Representative of Applicant			
Business Name: Three Rivers Land Services, PLLC	Contact Name Tim Wines		
Mailing/Billing Address: 604 N 16th Avenue	City: Kelso	State: WA	Zip: 98626
Phone: 360-431-9988	Email: tim@threeriv.com		
Additional PROPERTY OWNER			
Business Name: Same as applicant	Contact Name		
Mailing/Billing Address:	City:	State:	Zip:
Phone:	Email:		
Signature:	Date:		

If there are additional property owners, provide attachment in the same format and with same declaration.

Are existing structures located on lots? No Yes (Show location and label type of structure on map. Identify uses of all existing and proposed structures.)

SECTION 2

Project Narrative

PROJECT NARRATIVE
FOR
PACIFIC TECH CONSTRUCTION

A SITE PLAN APPLICATION

SUBMITTED TO
CITY OF KELSO

FOR PACIFIC TECH DEVELOPMENT, LLC

July 2020

General Information

Applicant/Owner:	Pacific Tech Development, LLC 1302 Walnut Street Kelso, WA 98626 Attn: Joe Lane (360) 414-8084
Project Contacts:	Three Rivers Land Services, PLLC Tim Wines, Project Engineer 604 N. 16th Avenue Kelso, WA 98626 360-431-9988 tim@threeriv.com
Project Location:	1303 S 13th Avenue Kelso, WA 98626 Parcel 24355
Project Area:	3.06 acres
Existing Zoning:	LI (Light Industrial)
Comprehensive Plan:	Industrial

Project Location and Development Proposal

Pacific Tech Development, LLC is proposing to construct a 30,000 sf metal building and a 4,800 sf metal building on approximately 3.06 acres in Kelso. The project will be completed in two phases. The 30,000 sf structure will be completed with the first phase and is anticipated to be broken into multiple bays that will be leased out to various business for their operations or for other miscellaneous uses such as warehouse storage. It is also anticipated that approximately 9,000 sf of the western portion of the building will be utilized as an indoor sports complex for activities such as indoor soccer, basketball, or batting cages. The 4,800 sf structure will be completed with the future second phase and will also be leased by potential tenant for their operations or warehouse storage. The site is currently zoned LI (Light Industrial). It is bounded by S. 13th Street to the west, a Consolidated Diking Improvement District #3 (CDID #3) drainage ditch to the north and east, and the Cowlitz County Public Works building to the south.

The site is located at 1302 S. 13th Avenue, Kelso, WA in the Southwest ¼ of Section 35, T8N, R2W of the Willamette Meridian, Cowlitz County, Washington. The site is comprised of three Kelso Out Lots (KEOL 561, 561B-1, and 561d-1) identified as Parcel 24355.

Improvements proposed for the site include the construction of the 30,000 sf and 4,800 sf metal buildings, interior travel lanes and associated parking, gravel storage areas, various stormwater facilities, and all utilities necessary to serve the tenants.

Site Characteristics and Existing Conditions

The site is flat, with all major utilities stubbed or adjacent to the property. There are no existing structures located on the site. There is a sanitary sewer line with a 20' easement to the City of Kelso that runs in a southeasterly direction on the western end of the site. Also, there is an existing overhead power line that follows the southern boundary line and turns north across the site roughly paralleling the lot line between Parcel A (KEOL 561) and Parcel B (KEOL 561B-1 and KEOL 561D-1).

As previously stated, the parcel is bounded on the north and east by the CDID #3 drainage ditch, on the south by the Cowlitz County Public Works building (Parcel 2434403), and on the west by S. 13th Avenue. S. 13th Avenue is an improved 36' wide asphalt roadway with curb, gutter, and sidewalk located on both sides. There are two existing driveway drops on S. 13th Avenue accessing the site. One is on the northern end of the site and the other is a shared access with Cowlitz County Public Works.

A Subsurface Exploration and Geotechnical Report has been prepared by Columbia West Engineering, Inc. that describes the site geologic setting and addresses the results of surface and subsurface site conditions encountered during their field investigation. The report also identifies construction recommendations. This report has been included with this application.

A SEPA checklist has been completed for the project and is provided in the application submittal.

Applicable Criteria

In order to obtain site plan approval, it is necessary to demonstrate how the proposal meets or exceeds each of the applicable approval criteria and various standards set forth in the City of Kelso Municipal Code (KMC). The following addresses these items, including a general description of how services will be provided to the site and how the proposal is consistent with all applicable provisions.

13.04 Water System

Water service will be provided by the City of Kelso. There is an existing water main on the eastern side of S. 13th Avenue. The applicant will extend water service from the existing infrastructure to each proposed structure. The 30,000 sf building will be sprinkled to provide fire protection to the proposed structure. Construction drawing approval from the City of Kelso will be obtained prior to construction of the site.

13.08 Sewer System

Sewer service will be provided by the City of Kelso. There is an existing 36" sewer main within a 20' wide easement running through the site that will provide water and sewer availability. The applicant will install two separate sewer laterals from the existing infrastructure to each proposed structure. Construction drawing approval from the City of Kelso will be obtained prior to construction of the site.

13.09 Stormwater Management

See section 17.22.130 below.

17.14.060 SEPA Checklist

A SEPA checklist has been prepared and submitted with this application.

17.18 Zoning

Per the City of Kelso official zoning map this property is zoned Light Industrial (LI).

17.18.040 Table of permitted uses

Per Table 17.18.040, Athletic club/exercise facilities, manufacturing and processing, professional/technical services, restaurants, retail sales/services, tavern/pub, and warehousing are some of the permitted uses in the LI zone.

17.22.020 Density, dimension, height, and setback requirements

As previously stated, this property has been zoned LI. The proposed layout meets all the following required development standards of Table 17.22.020:

Maximum Residential Density allowed = N/A
Minimum Lot Width = 25'
Maximum Building Height = 35' (May be increased by a variance.)
Setback (Front) = 20'
Setback (Side) = 20' (Setbacks in the rear and side will be determined based upon use and as specified by the currently adopted building code.)
Setback (Rear) = 20' (Setbacks in the rear and side will be determined based upon use and as specified by the currently adopted building code.)
Maximum Lot Coverage = 85%

17.22.090 Clearing and grading

This project will be required to obtain a fill and grading permit from the City of Kelso prior to the start of excavation activities. Due to the existing site conditions, a substantial amount of clearing and grading will take place for the development of this site. As previously stated, a geotechnical investigation has been completed by Columbia West Engineering. During the geotechnical investigation it was discovered that a portion of the site is covered with an undocumented fill. The fill section ranges from 1' to 5' in depth. In addition, the underlying soils may have potential for differential settlement. As part of the design process, the geotechnical engineer and the structural engineer are collaborating to determine the most economical solution for the construction of the new buildings. As a result, it may be necessary to remove a sizable portion of the undocumented fill material and replace it structurally. The alternative may be the use of piles or geopiers.

The majority of the site will be stripped of organics and graded for drainage. To reduce the potential for erosion and prevent sediment from exiting the site during construction activities, approved erosion control Best Management Practices (BMP's) will be implemented. A site specific, engineered erosion control plan will be prepared for this development with the final construction drawings. The plan will be reviewed and approved by the City of Kelso engineering staff prior to any construction on the site. The plan will detail the use of approved BMPs such as filter fabric fence, inlet protection, construction entranceway, hydroseeding, and all other BMP's necessary to control sediment and erosion on-site. Standard erosion control practices will be followed during all phases of construction on this project.

17.22.100 Landscaping

A landscape plan will be prepared and approved by a landscape architect licensed in the state of Washington. The landscape plan will be designed to meet the KMC including the provisions for the parking area required in the Kelso Engineering Design Manual (KEDM). It should be noted that it is intended to utilize portions of the landscape areas

for water quality mitigation and therefore, modifications to the landscaping requirements may be necessary.

17.22.110 Parking

KMC 17.22.110(B)(3) states that the required parking amount shall be determined by the city for all nonresidential uses. For determination by the city, the applicant shall supply the required number of parking spaces for the proposed use as determined by other comparable jurisdictions. Table 40.340.101-4 of the Clark County Municipal Code was utilized to determine the required number of spaces. Table 1 below provides the gross floor area for the anticipated uses of the two buildings. As can be seen from Table 1, this site is anticipating the need for a minimum of 58 parking spaces. The applicant proposes to construct 65 spaces, 2 of which will be ADA compliant spaces, as shown on the preliminary site plan.

Table 1 - Parking Space Requirements

Use	Total Area (sf)	Minimum Number of Parking Spaces	Total Spaces Required
Court Floor Area	9,000	1 space / 500 sf	18
Warehouse	9,000	1 space / 1,500 sf	6
Light Industrial Use	16,800	1 space / 500 sf	34
Total	34,400		58

17.22.120 Stormwater management

Because this development is larger than 5,000 sf it will be required to meet Minimum Requirements 1-9 of the City of Kelso's stormwater Ordinance. Water quality treatment will be provided by utilizing a system of bioretention filters that will be installed in the landscape areas throughout the site. The stormwater will then be conveyed to the existing CDID #3 ditch located along the north and east property line of the project. It should be noted that this project will be exempt from flow control because it will convey the stormwater to a Washington State Department of Ecology (DOE) exempted waterbody through an entirely manmade conveyance system. Prior to construction, a stormwater, grading, and erosion control plan will be approved by the City of Kelso.

17.22.210 Signs

It has not been decided yet, but it is possible that a monument sign will be install at the entrance to the site. If a sign is installed it will be designed to meet the provisions of this section of the KMC.

17.22.300 Performance standards

All exterior mechanical equipment will be visually screened from surrounding properties and streets. While actual tenants are not known at this time, all applicable performance standards of this section will be adhered to with this development.

17.26 Environmentally Sensitive Areas

There are no environmentally sensitive areas on this site.

17.50 Building and Construction

All relevant building codes will be adhered to for the design and construction of this project. Acceptable fire flow will be provided to the site and all buildings will contain fire suppression systems. In addition, the proposed site plan provides a fire access route that will be approved by the Deputy Fire Marshal for Cowlitz 2 Fire & Rescue.

Summary

The applicant has submitted all necessary information required to receive a technically complete determination. This submittal demonstrates compliance with all applicable approval criteria provided for under the KMC. No substantial burden will be placed upon service providers as a result of this project. There is adequate water availability, sewer availability, and fire and police protection to serve the site. The applicant will be mitigating the impacts to the surrounding areas and infrastructure through a variety of measures including complying with the KMC, paying system development charges for connection to municipal services if necessary, and paying increased property taxes. Finally, the approval of this development will benefit the community in many ways, some of which include providing recreational opportunities, providing operating space for multiple small businesses, and create multiple family wage jobs throughout the construction process.

SECTION 3

SEPA

WAC 197-11-960 Environmental Checklist

ENVIRONMENTAL CHECKLIST

Purpose of Checklist:

The State Environmental Policy Act (SEPA), chapter 43.21C RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Instructions for Applicants:

This environmental checklist asks you to describe some basic information about your proposal. Governmental agencies use this checklist to determine whether the environmental impacts of your proposal are significant, requiring preparation of an EIS. Answer the questions briefly, with the most precise information known, or give the best description you can.

You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer, or if a question does not apply to your proposal, write "do not know" or "does not apply". Complete answers to the questions now may avoid unnecessary delays later.

Some questions ask about governmental regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the governmental agencies can assist you.

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

Use of checklist for nonproject proposals:

Complete this checklist for nonproject proposals, even though questions may be answered "does not apply". IN ADDITION, complete the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (Part D).

For nonproject actions, the references in the checklist to the words "project", "applicant", and "property or site" should be read as "proposal", "proposer", and "affected geographic area", respectively.

ENVIRONMENTAL CHECKLIST

A. BACKGROUND

1. Name of proposed project, if applicable:
   Pacific Tech Construction Site Plan

2. Name of applicant:
   Three Rivers Land Services

3. Address and phone number of applicant and contact person.
   604 N 16th Avenue **Contact: Tim Wines**
   Kelso, WA 98626 **360-431-9988**

4. Date checklist prepared:
   February 23, 2020

5. Agency requesting checklist:
   City of Kelso

6. Proposed timing or schedule (including phasing, if applicable):
   Summer 2020 for the main building. Construction of the second building is not known at this time.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.
   Possibly adding a second building in the future.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.
   A geotechnical investigation was completed by Columbia West Engineering, Inc.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.
   None known.

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

Preliminary Site Plan approval, final Site Plan approval, building permit, and construction drawing approval by the City of Kelso. NPDES permit and SWPPP with the Department of Ecology.

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.
Construction of a 30,000 sf building on 3.73 acres along with parking and maneuvering area and installation of required utilities. A second 4,800 sf building will be constructed in the future.

12. Location of the proposal.
The project is located on the east side of S. 13th Avenue north of its intersection with Walnut Street in Kelso, WA. The parcel number is 24355. It is located in the Southwest ¼ of Section 35, Township 8 North, Range 2 West, WM.

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site: **Flat**, rolling, hilly, steep slopes, mountainous, other _____.

b. What is the steepest slope on the site (approximate percent slope)?
2%

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 prime farmland.
Caples silty loam (0-3%) covering 100% of parcel.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.
None known.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

There will be grading for the new structure, parking lot and utilities. There will be approximately 13,000 cu-yds of grading or fill material.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.
Not likely, due to the fact the site is so flat. However, precautions will be taken with appropriate erosion control BMP's to reduce the potential of erosion.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?
Approximately 67%.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:
Silt fences, construction entrance, straw ground cover, bio-bags, re-seeding, inlet protection, and biofiltration swales.

2. Air

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.
Some emissions during construction and whatever would be normal for automobiles for employees or delivery following construction.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.
None.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:
None proposed.

3. Water

a. Surface:

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.
Yes, there is an existing Cowlitz Diking District #3 drainage ditch that forms the northern and eastern boundary of the site. The Cowlitz Diking District pumps the water from this ditch into the Coweeman River.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described water? If yes, please describe and attach available plans.
Yes, the entire project will be within 200 feet of the drainage ditch. This includes construction of the structures, parking lots, and necessary utilities.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.
None.

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

5) Does the proposal lie within a 100-year flood plain? If so, note location on the site plan.
No, the project is in a FEMA Zone X area with reduced flood risk due to Levee. However, the CDID #3 ditch located along the north and east boundary of the site is designated as a 100-year floodplain.

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:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.
No.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals . . .; agricultural; etc). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.
None.

c. Water Runoff (including storm water):

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.
Runoff from the seasonal precipitation will be conveyed and disposed of into the existing Cowlitz Diking District #3 drainage ditch. The site will collect and treat the stormwater prior to discharge into the ditch. It should be noted that the ditch is listed as an exempted waterbody by the Washington State Department of Ecology (DOE).

2) Could waste materials enter ground or surface waters? If so, generally describe.
Possible, but not likely.

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

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

This project will provide water quality treatment through bioswales or some other approved BMP prior to discharge to the existing ditch.

4. Plants

a. Check or circle types of vegetation found on the site.

- Deciduous tree: alder, maple, aspen, other
- Evergreen tree: fir, cedar, pine, other
- Shrubs
- **Grass**
- Pasture
- Crop or grain
- Wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other.
- Other types of vegetation

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

It is anticipated that approximately 3,000 cu-yd of organic material will be removed to allow for the construction of the site.

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

None known.

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

A landscaping plan will be created to meet the City of Kelso requirements. The landscaping plan will incorporate vegetation for the installation of stormwater facilities.

5. Animals

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

Examples include:

- Birds: hawk, heron, eagle, **songbirds**, other:
- Mammals: deer, bear, elk, beaver, other:
- Fish: bass, salmon, trout, herring, shellfish, other.

b. List any threatened or endangered species known to be on or near the site.
None known.

c. Is the site part of a migration route? If so, explain.
The site is located within the Pacific Flyway for migratory waterfowl.

d. Proposed measures to preserve or enhance wildlife, if any:
None.

e. List any invasive animal species known to be on or near the site:
None known.

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 or propane will be used for heating and everyday needs.

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, however, the buildings will be designed to meet the Washington State energy efficiency codes.

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.
It is possible that a spill could occur from a future tenant, however, appropriate BMP's will be implemented to mitigate for and reduce the possibility of this happening.

1) Describe any known or possible contamination at the site from present or past uses.
None known.

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.
None known.

3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.
It is anticipated that the portion of the building anticipate being constructed as bays will be leased to potential tenants to be used to operate their business or as equipment and material storage.

4) Describe special emergency services that might be required.
Whatever would be normal for a light industrial site with office space, storage space, or recreational use. This could include additional fire or police protection.

5) Proposed measures to reduce or control environmental health hazards, if any:
None proposed.

b. Noise

1) What types of noise exist in the area which may affect your project (e.g.: traffic, equipment, operation, other)?
None.

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.
Noise will be generated due to the construction of the site. The construction will most likely occur

between the hours of 7:00am and 6:00pm. Long-term noise may be generated from the various businesses. Additional noise may result from product shipping and truck traffic. Long-term noise is expected to occur during normal business hours.

3) Proposed measures to reduce or control noise impacts, if any:
None proposed.

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.
A portion of the site is currently being used as a gravel overflow parking or vehicle and equipment storage area for Pacific Tech Construction. The remainder of the site is a grass field. Property to the north and east is drainage ditch owned by the Cowlitz Diking District #3. The property to the south is the Cowlitz County Public Works building. S. 13th Avenue makes up the property's west boundary. This proposal will not affect current land uses on nearby or adjacent properties.

b. Has the project site been used as working forest lands? If so, describe. How much agriculture 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 non-forest use?
No, the project site has not been used as working forest lands. None of the project site is being used for agriculture or forest land. None of the project site has farmland or forest land tax status.

1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:
No.

c. Describe any structures on the site.
There are no existing structures on the site.

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

e. What is the current zoning classification of the site?
Light Industrial (LI).

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

g. If applicable, what is the current shoreline master program designation of the site?
Not applicable.

h. Has any part of the site been classified as critical area by the city or county? If so, specify.
No.

i. Approximately how many people would reside or work in the completed project?
It is unknown at this time what tenants will occupy the facility nor how many employees they may have. It is anticipated that there could be approximately 70 people that would work in the completed project.

j. Approximately how many people would the completed project displace?
None.

k. Proposed measures to avoid or reduce displacement impacts, if any:
None.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:
The project will meet all applicable City codes.

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.
None.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.
None.

c. Proposed measures to reduce or control housing impacts, if any:
None.

10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?
The proposed buildings height will conform to City of Kelso code which is 35' in height. The preliminary design for the proposed building is for an eve height of 20'. It has not been decided what the final pitch of the roof will be, but it is not likely that it will be greater than a 5:12 pitch. That would keep the maximum height of the building under the 35' requirement. It is anticipated that the principal exterior building material will be mostly metal with some potential rock wainscoting.

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

c. Proposed measures to reduce or control aesthetic impacts, if any:
Landscaping will be required for this proposal. This will provide some mitigation for the aesthetic impacts.

11. Light and Glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?
Streetlights may be installed in the parking area which will be shielded to meet City of Kelso code. In addition,

lighting may be placed on the structures. The lighting will mainly occur during the evening hours.

b. Could light or glare from the finished project be a safety hazard or interfere with views?
Not anticipated.

c. What existing off-site sources of light or glare may affect your proposal?
None.

d. Proposed measures to reduce or control light and glare impacts, if any:
Lights in the parking area and on the proposed building will be shielded to meet City of Kelso requirements.

12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?
None known.

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:
It is anticipated that approximately 9,000 sf of the proposed building will be used for recreational purposes such as a soccer field, baseball facility, or other sporting endeavors.

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.
No.

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. There are no know material evidence, artifacts, or area of cultural importance on or near the site.

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.
None, however, a geotechnical evaluation was completed for the site and it was identified that a substantial amount of fill material has been placed across the site. Furthermore, nearly the entirety of the site has been disturbed multiple times and no artifacts are known to have been observed.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.
None proposed, however, the final construction drawings will contain a note indicating that if any historic artifacts are discovered during construction, site work will stop immediately, and appropriate local and state agencies will be notified.

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.
The property is accessed via S. 13th Avenue. Two separate driveways will be constructed to access the site. The southernmost driveway is an existing driveway that will be shared between this site and the existing site to the south. Site circulation will be provided to allow emergency access vehicles to navigate through the site.

b. Is the site or affected geographic area currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

Yes, the site is served by River Cities Transit Route 57. The nearest stop is located at Walnut and 11th Avenue.

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?
There will be no parking spaces eliminated and there will be 65 parking spaces provided when the project is done.

d. Will the proposals 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 non-passenger vehicles). What data or transportation models were used to make these estimates?
It is anticipated that this project will generate approximately 323 vehicle trips per day. These volumes were generated assuming 25,800 sf of General Light Industrial (ITE Code 110) and two soccer fields (ITE Code 488). Peak volumes would likely occur during the normal morning and evening commuting hours associated with other places of employment (6:00 to 9:00 AM, 3:00 to 6:00 PM).

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.

g. 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.

There would most likely be an increased need for fire protection and police protection.

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

With the improvements to the site, the property owner will be required to pay additional property taxes to mitigate for the need for additional public services. In addition, each business will be paying taxes to mitigate for additional services required.

16. Utilities

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.

Water, sanitary sewer, refuse service, and electricity.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site:

Power-Cowlitz PUD, Phone-AT&T or another local provider, Sewer-City of Kelso, Water-City of Kelso.

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: _____

Date Submitted: 2/24/20

SECTION 4

Preliminary Site Plan, Architectural Elevations, & Floor Plans

Pacific Tech Construction Site Plan

Located in the SW 1/4 of Section 35 T8N, R2W, W.M.
Cowlitz County, Washington

GENERAL NOTES

OWNER:
Pacific Tech Development, LLC
1302 Walnut Street
Kelso, WA 98626
Phone : (360) 414-8084
Fax: (360) 414-8196

DEVELOPER: *Same as Owner*

SITE ADDRESS:
Parcel Number: 24355
KEOL 561, 561B-1, and 561D-1
in V Wallace DLC
1303 S 13th Avenue
Kelso, WA 98626

PROJECT ENGINEER:
Tim S. Wines
Three Rivers Land Services
604 N. 16th Avenue
Kelso, WA 98626
PH: (360) 431-9988

PRESENT USE:
The site is currently vacant. There are currently no existing structures on the site.

EXISTING STREETS:
NE 13th Avenue fronts the site along the west.

EXISTING ZONING:
ILM

SANITARY SEWER SERVICE:
City of Kelso

WATER SERVICE:
City of Kelso

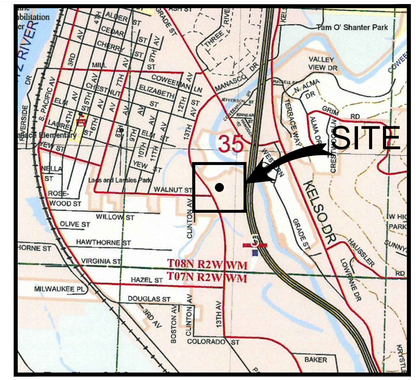
ELECTRICAL SERVICE:
Cowlitz PUD

SETBACKS:
Front = 20 ft
Rear = 0 ft
Side = 0 ft

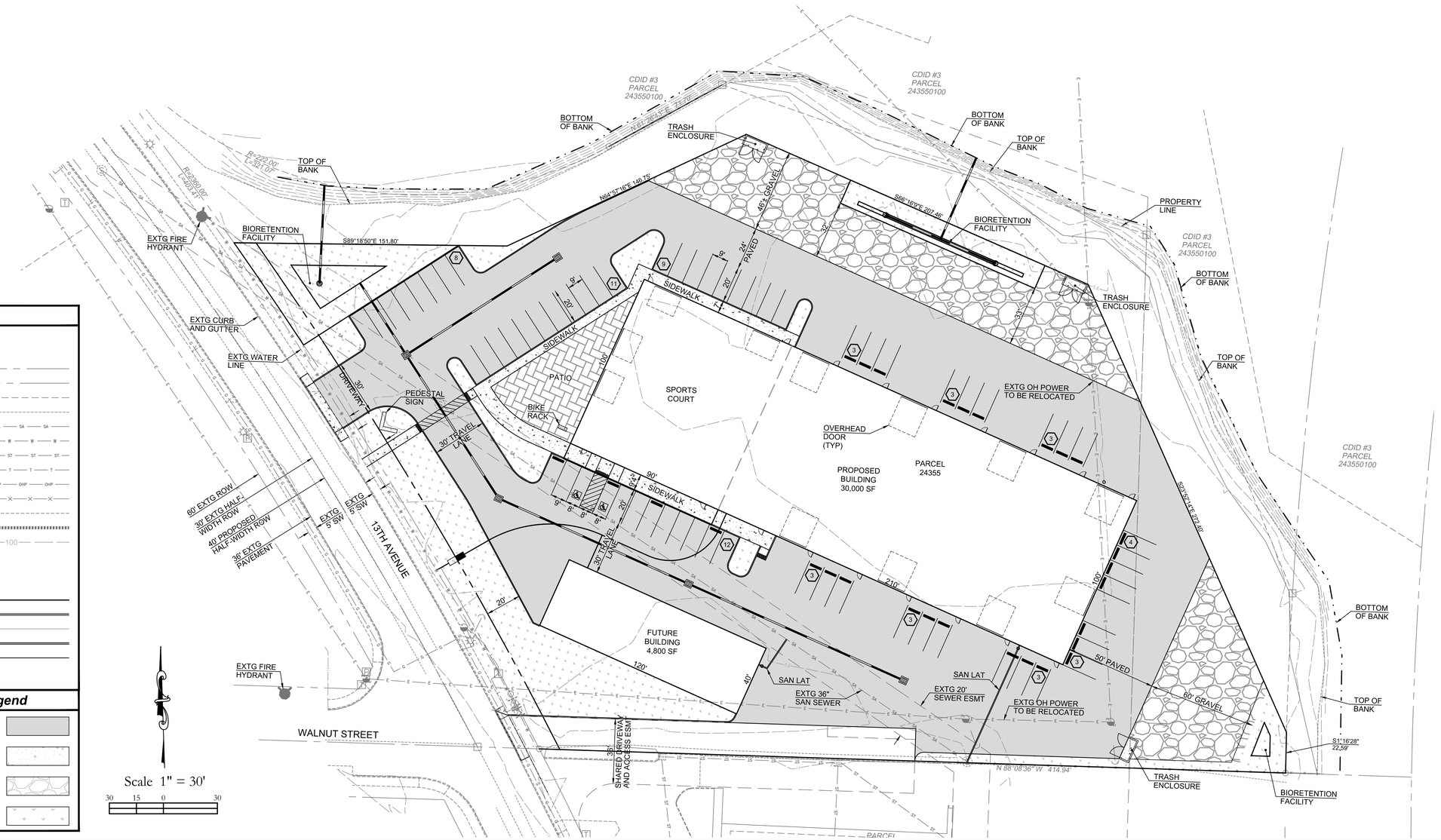
PARKING:
Standard Space = 63
ADA Spaces = 2
Total Spaces = 65

WELLS OR SEPTICS:
None

EXISTING CONDITIONS (ON-SITE):
Per Lawson Land Services survey dated 10/2/07.



VICINITY MAP
NOT TO SCALE



Linetype Legend

Existing	
Existing Road Right-of-Way	
Existing Road Centerline	
Existing Property Line	
Existing Pavement Edge	
Existing Sanitary Sewer	SA SA SA SA
Existing Waterline	W W W W W
Existing Storm Sewer	ST ST ST ST ST
Existing Telephone	T T T T T
Existing Overhead Power	OHP OHP OHP OHP
Existing Fence	X X X X X
Existing Sidewalk	
Existing Paint Striping	
Existing Ground Contour	100
Proposed	
Proposed Property Line	
Proposed Sanitary Lateral	
Proposed Water Service	
Proposed Curb	
Proposed Edge of Pavement	

Proposed Hatching Legend

Proposed Asphalt Section	
Proposed Concrete	
Proposed Gravel	
Proposed Landscaping	

THREE RIVERS LAND SERVICES

Conceptual Site Plan for:
Pacific Tech Construction
Located in Kelso, Washington

Three Rivers Land Services | Consulting Engineers & Planners | 604 N 16th Avenue, Kelso, WA 98626 | PH (360) 431-9988

Revisions			
A	7/14/20	For Review	TSW
B			
1			
2			
3			
4			

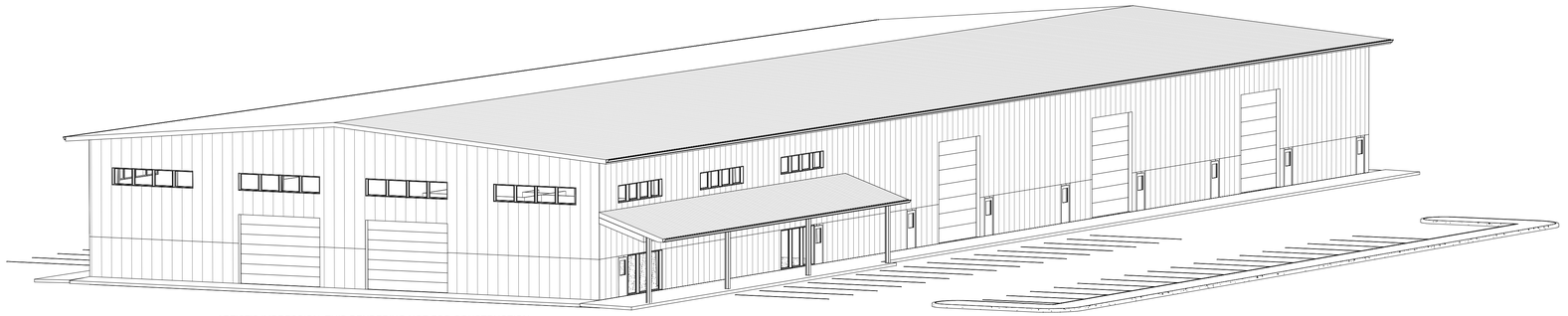
Project No.	1053
SCALE:	H: 1" = 30' V: N/A
DESIGNED BY:	TSW
DRAFTED BY:	TSW
REVIEWED BY:	TSW

1
1

New Industrial Building for:

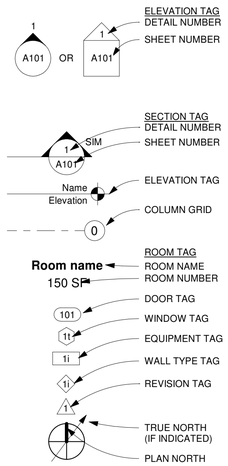
Pacific Tech Construction
13th Avenue
Kelso, WA 98626

DRAWING INDEX



ARTIST'S IMPRESSION, THIS RENDERING NOT FOR CONSTRUCTION

SYMBOLS



LINETYPES

- CENTERLINE
- PROPERTY LINE
- HIDDEN LINE
- BREAK LINE
- NEW WALL
- EXISTING WALL
- WALL TO BE DEMOLISHED
- FIRE RATED WALL

MATERIALS

- CONCRETE
- BRICK
- GRAVEL
- CMU
- SAND/ GYPSUM
- PLYWOOD
- EARTH
- WOOD
- RIGID INSULATION
- BATT INSULATION

DIMENSIONS

WALLS ARE DIMENSIONED TO FACE OF STUD/ MASONRY OR CENTERLINE OF COLUMN GRIDS UNLESS NOTED OTHERWISE. OPENINGS ARE TO CENTERLINE OR ROUGH OPENING.

ABBREVIATIONS

&	AND
<, L	ANGLE
@	AT
#	NUMBER
AB	ANCHOR BOLT
AC	AIR CONDITIONING
ACT	ACOUSTICAL CEILING TILE
AD	AREA DRAIN
ADJ	ADJACENT, ADJUSTABLE
AFF	ABOVE FINISHED FLOOR
AHJ	AUTHORITY HAVING JURISDICTION
ALT	ALTERNATE
AL	ALUMINUM
APPROX	APPROXIMATELY
ARCH	ARCHITECT(URAL)
BD	BOARD
BRG	BEARING
BLDG	BUILDING
BOT	BOTTOM
BS	BOTH SIDES
BSMT	BASEMENT
BTB	BACK TO BACK
C	CONDUIT
CB	CIRCUIT BREAKER, CATCH BASIN
CJ	CONTROL JOINT
CLG	CEILING
CLR	CLEAR
CMU	CONCRETE MASONRY UNIT
CO	CLEAN OUT
COL	COLUMN
CONC	CONCRETE
CONN	CONNECTION
CONSTR	CONSTRUCTION
CONT	CONTINUE, CONTINUOUS
CPT	CARPET
CT	CERAMIC TILE
CU	COPPER
CW	COLD WATER
D	DEEP/ DEPTH, DIAMETER
DEMO	DEMOLITION
DEPT	DEPARTMENT
DF	DRINKLING FOUNTAIN
DIA	DIAMETER
DIM	DIMENSION
DISC	DISCONNECT
DL	DEAD LOAD
DN	DOWN
DR	DOOR
DS	DOWNSPOUT
DWG	DRAWING(S)
E	EAST
(E)	EXISTING
EC	ELECTRICAL CONTRACTOR
EL, ELEV	ELEVATION
ELEC	ELECTRIC(AL)
EP	ELECTRICAL PANEL
EPS	EXPANDED POLYSTYRENE
EQ	EQUAL
EQUP	EQUIPMENT
EW	EACH WAY
EWC	ELECTRIC WATER COOLER
EXIST	EXISTING
EXP	EXPANSION
EXT	EXTERIOR
FA	FIRE ALARM
FD	FLOOR DRAIN
FDN	FOUNDATION
FEC	FIRE EXTINGUISHER CABINET
FFL	FINISHED FLOOR LEVEL
FIN	FINISH(ED)
FOC	FACE OF CONCRETE
FOF	FACE OF FINISH
FOM	FAC OF MASONRY
FOS	FACE OF STUD
FRP	FIBERGLASS REINFORCED PLASTIC
FT	FOOT, FEET
FTG	FOOTING
FURR	FURRED/ ING
GA	GAUGE
GALV	GALVANIZED
GLULAM	GLUE LAMINATED BEAM
GB	GYPSUM BOARD
GC	GENERAL CONTRACTOR
GPM	GALLONS PER MINUTE
GWB	GYPSUM WALLBOARD
H	HIGH
HB	HOSE BIBB
HC	HANDICAP(PED)
HD	HOLD DOWN
HORIZ	HORIZONTAL
HPL	HIGH PRESSURE LAMINATE
HT	HEIGHT
HVAC	HEATING, VENTILATION, & AIR CONDITIONING
HW	HOT WATER
ICF	INSULATED CONCRETE FORM
ID	INSIDE DIAMETER
IN	INCH(ES)
INSUL	INSULATION
INTR	INTERIOR
JAN	JANITOR
JT	JOINT
K	KIP (KILOPOUND)
KB	KNEE BRACE
LAM	LAMINATED
LAV	LAVATORY
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LPL	LOW PRESSURE LAMINATE
LT	LIGHT
LVL	LAMINATED VENEER LUMBER
MAX	MAXIMUM
MBH	1000 BTU/ HOUR
MC	MECHANICAL CONTRACTOR
MECH	MECHANICAL
MEP	MECHANICAL/ ELECTRICAL/ PLUMBING
MFG	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
MO	MASONRY OPENING
MTL	METAL
MULL	MULLION
N	NORTH
(N)	NEW
NIC	NOT IN CONTRACT
NO	NUMBER
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
ORD	OVERFLOW ROOF DRAIN
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED, OWNER INSTALLED
OTO	OUT-TO-OUT
PC	PLUMBING CONTRACTOR
∅	PHASE, DIAMETER
PL	PLATE
PLAM	PLASTIC LAMINATE
PLYWD	PLYWOOD
PNL	PANEL
PR	PAIR
PSI	POUNDS PER SQUARE INCH
PSF	POUNDS PER SQUARE FOOT
PT	PRESSURE TREATED
PVC	POLYVINYL CHLORIDE
QT	QUARRY TILE
R	RADIUS, RISER
RB	RESILIENT BASE
RD	ROOF DRAIN
REFR	REFRIGERATOR
REINF	REINFORCED/ ING
REV	REVISION/ED
RM	ROOM
RO	ROUGH OPENING
ROW	RIGHT OF WAY
S	SOUTH
S4S	SURFACED 4 SIDES
SC	SOLID CORE
SECT	SECTION
SF	SQUARE FEET
SHT	SHEET
SIM	SIMILAR
SPECS	SPECIFICATIONS
SS	STAILESS STEEL
STOR	STORAGE
STRUCT	STRUCTURAL
SQ	SQUARE
SYM	SYMMETRICAL
T	TREAD
T.O.	TOP OF
T&B	TOP & BOTTOM
T&G	TONGUE & GROOVE
TEL	TELEPHONE
TOA	TOP OF ASPHALT
TOC	TOP OF CONCRETE/ CURB
TEMP	TEMPORARY
TK	TIGHT KNOT
TV	TELEVISION
TYP	TYPICAL (THIS CONDITION OCCURS MANY TIMES)
UNO	UNLESS NOTED OTHERWISE
VCT	VINYL COMPOSITION TILE
VERT	VERTICAL
VEST	VESTIBULE
VCT	VINYL COMPOSITION TILE
VTR	VENT THROUGH ROOF
W	WIDE/ WIDTH, WEST
W/	WITH
W/O	WITHOUT
WC	WATER CLOSET
WD	WOOD
WH	WATER HEATER
WP	WATERPROOF
WRB	WEATHER RESISTANT BARRIER
WSCT	WAINSCOT
WT	WEIGHT
WWF	WELDED WIRE FABRIC
XPS	EXTRUDED POLYSTYRENE

ADDITIONAL ABBREVIATIONS MAY BE DEFINED ON OTHER SHEETS

PROJECT NOTES

00 GENERAL PROJECT REQUIREMENTS

1. All ideas, designs, arrangements and plans indicated by these drawings are property of the Architect and were created for use on and in connection with the specified project and no other. None of the ideas, designs, arrangements or plans must be used by or disclosed to any person, firm, or corporation for any purpose without the written permission of the Architect.
2. Contractors shall verify and be responsible for all dimensions and conditions on the job. If a discrepancy should exist between a small scale drawing and an enlarged drawing, enlarged drawing governs. Details govern over plans. Written dimensions on these drawings shall have precedence over scale dimensions. Architectural drawings govern over engineering drawings. If discrepancies exist, request written clarification from the Architect.
3. The Contractor is responsible for checking all contract documents, field conditions and dimensions for accuracy and coordination. If there are any questions regarding these or other coordination questions, the Contractor is responsible for obtaining a clarification from the Architect before proceeding with work.
4. As a warrantee, the contractor must remedy any defects in the work and pay for any damage to other work resulting therefrom, which must appear within a period of one year from the date of final payment.
5. Any damage to areas inside or outside of the project area caused by the Contractor must be repaired to the status prior to construction at no cost to owner.
6. All primary and subcontractors shall visit the site and familiarize themselves with the existing building and site conditions, the proposed work and the location of surrounding utilities, topography, plants and structures which may impact the execution of this project.
7. All trades are responsible for installing their work to allow ceiling heights, mechanical work, and light fixtures to be located as shown and for informing the architect in advance if heights or locations can not be achieved. Proceeding with non-coordinated work is with the understanding that any costs for corrective modifications will be the responsibility of the Contractor. Trade priority must be as follows unless directed otherwise by the Architect:
   a. Structure
   b. Electrical lighting fixtures
   c. Mechanical grilles and diffusers
   d. Mechanical ductwork
   e. Piping systems (including fire suppression)
   f. Electrical conduit
8. All suppliers, primary, and subcontractors are responsible for field verifying as-built conditions prior to fabrication or assembly of building components. The general contractor must be responsible for coordination between components produced by various suppliers, primary, and subcontractors.
9. Submit shop drawings and schedules to Architect for approval for all cabinets, counters, millwork, hardware, glass, frames, and doors. Allow ten (10) business days for architectural review.
10. The Architect is not responsible for safety on the job site. Job safety is the responsibility of the general contractor. Shoring and demolition are ultra hazardous activities. Design of shoring systems must be by the Contractor.
11. The Contractor must comply with all building code requirements of the state or local authority having jurisdiction and shall obtain and pay for all required permits, fees, and inspections. Any permits required for plumbing, heating, or electrical must be paid by the respective subcontractor, but included in total cost of construction.
12. It is the Contractor's responsibility to keep the construction site neat and clear of excess debris as well as maintaining the adjacent public roads access the site clear of mud and construction materials.
13. Neither the final payment nor any provision in the contract documents nor partial or entire occupancy of the premises by the owner constitute an acceptance of work not done in accordance with the contract documents.
14. General conditions of the contract for construction are A.I.A. Document A201, current version, and shall be considered in its entirety to be a part of these specifications.
15. Whenever the contract, specifications, laws, ordinances, or public authority require any work to be specially inspected or approved, the Contractor must give the governing authority timely notice of its readiness for inspection and of the date for inspection.
16. The Architect's responsibility is limited to the items shown on the drawings. Obtain the Architect's specific approval prior to deviating from the drawings. Follow the best trade and engineering practices for the items not specifically detailed and indicated.
17. All changes or deviations from the contract, including those for extra or additional work, must be submitted in writing for approval of the Architect. No verbal orders will be recognized.
18. These notes and the drawings may refer to participants in this building project which may not correspond precisely with the terminology set forth in the contracts between the various participants in this project; therefore owner, leasor, developer or "other" refers to the same party unless otherwise specified; Contractor, builder refers to the same party unless otherwise specified; Architect, designer, interior designer, or engineer refers to the same party unless otherwise specified.
19. At substantial completion, provide the Owner with Operations and Maintenance manuals for all equipment and systems in the project. This will be collected and organized into a binder and includes, but is not limited to: warranties, instructions, maintenance programs, and operational data for mechanical/ electrical/ plumbing equipment, installed equipment, elevators, roofing systems, envelope compliance forms, window NFRC certficates, etc.

APPLICABLE CODES

2015 International Building Code with WA State amendments

SUBMITTALS

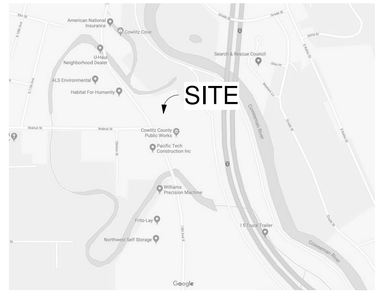
REQUIRED SUBMITTALS
Provide the following shop drawings and/or product submittals to the Architect for review, as well as any others as indicated. Allow ten (10) business days for processing.

- METAL BUILDING SYSTEMS, INCLUDING:
  a. STRUCTURAL CALCULATIONS W/ FOUNDATION REACTIONS (SEE SHEET S1 FOR ADDITIONAL REQUIREMENTS)
  b. FRAMING DRAWINGS
  c. PRODUCT LITERATURE DESCRIBING PANEL PROFILES & FASTENERS, TRIM, ACCESSORIES
  d. FINISH SAMPLE W/ PHYSICAL COLOR CHART
- LIGHT FIXTURES
- LIGHTING CONTROLS
- ANY PRODUCTS THAT ARE A SUBSTITUTION FOR THOSE SHOWN ON THE DRAWINGS

DEFERRED SUBMITTALS
Deferred submittals are designes prepared by others, and must meet or exceed minimum code requirements and conform to the general design intent expressed in these construction documents. Provide the following deferred submittals for Architect's review prior to submittal to the Authority Having Jurisdiction.

- METAL BUILDING SYSTEMS

VICINITY MAP



OWNER

Pacific Tech Construction
1302 Walnut Street
Kelso, WA 98626
(360) 414-8084
Contact: Slate Miller
Email: smiller@pactechgroup.com

ARCHITECT

Brittell Architecture, Inc.
1338 Commerce Ave, Suite E
Longview, WA 98632
(360) 636-5074
Contact: David Brittell
Email: david@brittellarch.com

CIVIL ENGINEER

Three Rivers Land Services, PLLC
604 N 16th Ave
Kelso, WA 98626
(360) 431-9988
Contact: Tim Wines
Email: tim@threeriv.com

STRUCTURAL ENGINEER

MD Structural Engineering
113 W 7th Street, Suite 205
Vancouver, WA 98660
(360) 433-9093
Contact: Mike Daubenberger
Email: mike@mdstructural.com

BRITTELL ARCHITECTURE, INC.
Longview WA - Newberg OR - Nehalem OR
www.BrittellArch.com

New Industrial Building for:
Pacific Tech Construction
13th Avenue
Kelso, WA 98626

No.	Description	Date
A	SCHEMATIC DESIGN REVIEW	10/29/19
B	REVISED SCHEMATIC DESIGN	11/18/19
C	REVISED SCHEMATIC DESIGN	11/26/19
D	REVISED SCHEMATIC DESIGN	01/23/20
E	REVISED SCHEMATIC DESIGN	04/30/20
F	REVISED SCHEMATIC DESIGN	06/01/20

PRELIMINARY
NOT FOR CONSTRUCTION

Project number 1932

G1

GENERAL INFORMATION

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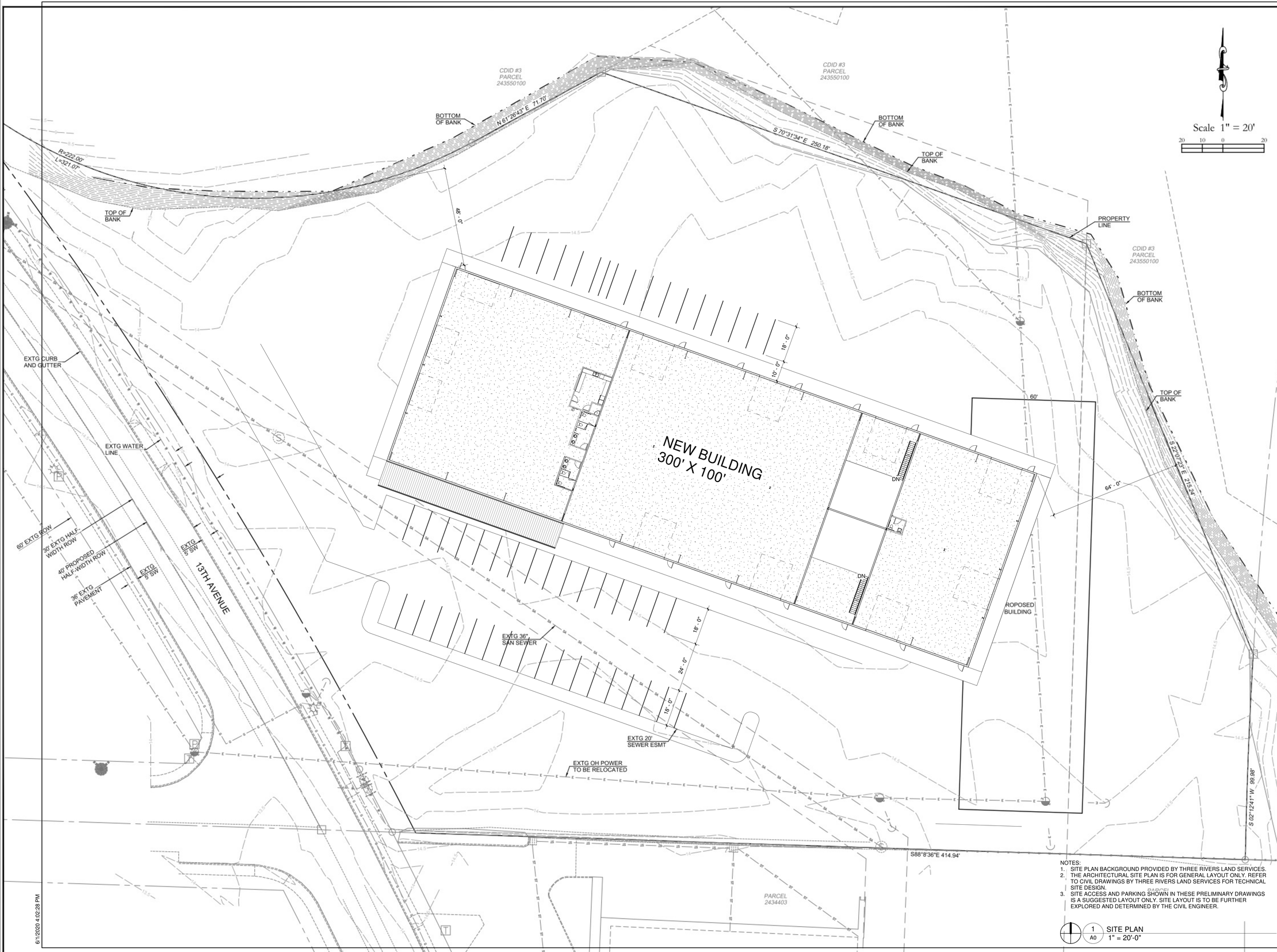


NOTES:
1. SITE PLAN BACKGROUND PROVIDED BY THREE RIVERS LAND SERVICES.
2. THE ARCHITECTURAL SITE PLAN IS FOR GENERAL LAYOUT ONLY. REFER TO CIVIL DRAWINGS BY THREE RIVERS LAND SERVICES FOR TECHNICAL SITE DESIGN.
3. SITE ACCESS AND PARKING SHOWN IN THESE PRELIMINARY DRAWINGS IS A SUGGESTED LAYOUT ONLY. SITE LAYOUT IS TO BE FURTHER EXPLORED AND DETERMINED BY THE CIVIL ENGINEER.

1 / A0 SITE PLAN
1" = 20'-0"

6/1/2020 4:02:28 PM

THREE RIVERS LAND SERVICES

Consulting Engineers & Planners | 604 N 16th Avenue, Kelso, WA 98626 | PH (360) 431-0988

Proposed Building Location for:

Pacific Tech Construction Site Plan

Located in Kelso, Washington

Revisions

No.	Description	Date	
A	SCHEMATIC DESIGN REVIEW	10/29/19	TSW
B	REVISED SCHEMATIC DESIGN	11/18/19	TSW
C	REVISED SCHEMATIC DESIGN	11/26/19	
D	REVISED SCHEMATIC DESIGN	01/23/20	
E	REVISED SCHEMATIC DESIGN	04/30/20	
A	For Review	4/16/19	TSW
B			
1			
2			
3			
4			

Project No. 2063

SCALE: H: 1" = 20'
V: N/A

DESIGNED BY:	TSW
DRAFTED BY:	TSW
REVIEWED BY:	TSW

1 / 1

BRITTELL ARCHITECTURE, INC.
Longview WA - Newberg OR - Nehalem OR
www.BrittellArch.com

New Industrial Building for:

Pacific Tech Construction

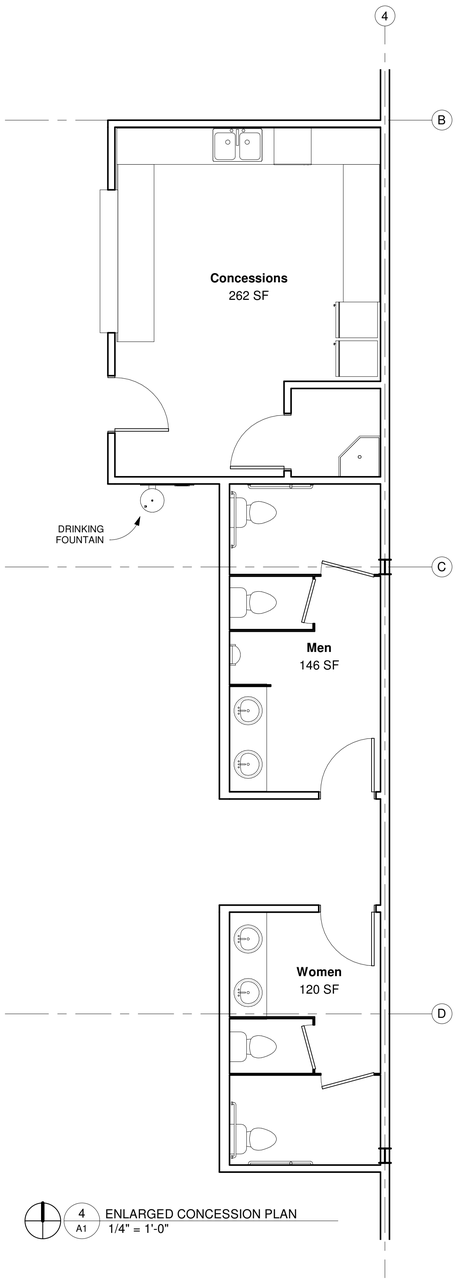
13th Avenue
Kelso, WA 98626

PRELIMINARY
NOT FOR CONSTRUCTION

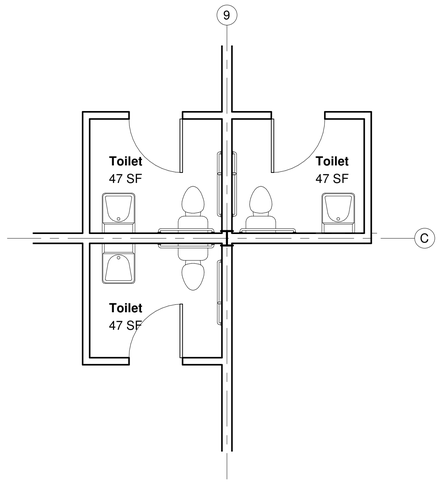
Project number 1932

A0

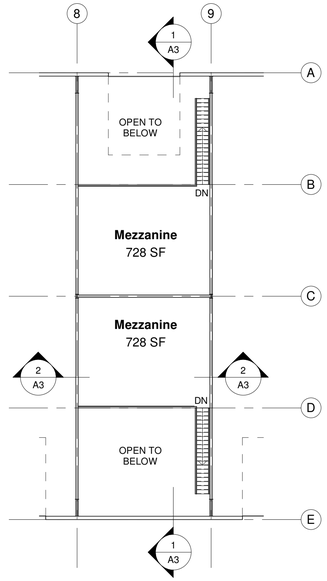
ARCHITECTURAL SITE PLAN



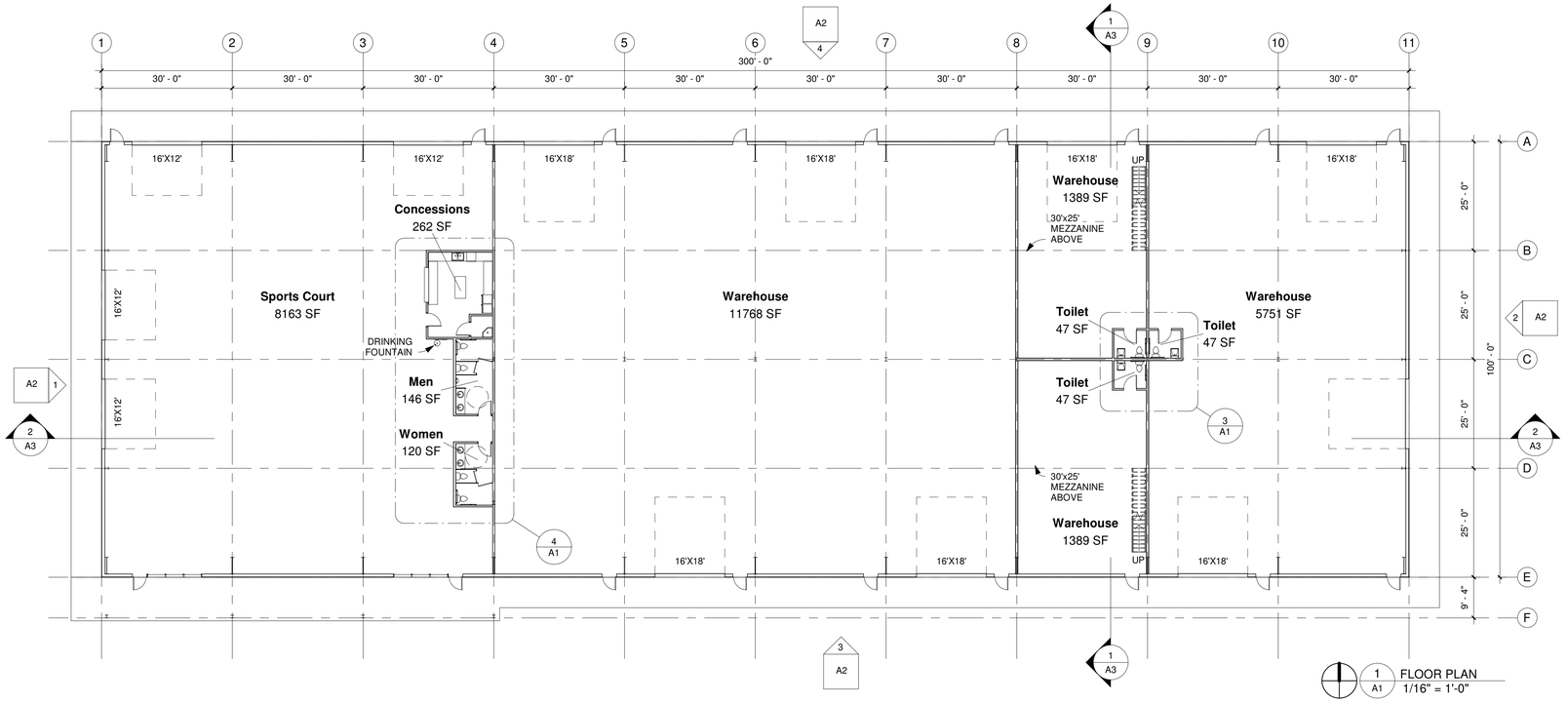
4 A1 ENLARGED CONCESSION PLAN
1/4" = 1'-0"



3 A1 ENLARGED TOILET PLAN
1/4" = 1'-0"



2 A1 MEZZANINE PLAN
1/16" = 1'-0"



1 A1 FLOOR PLAN
1/16" = 1'-0"

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BRITTELL
ARCHITECTURE, INC.
Longview WA - Newberg OR - Nehalem OR
www.BrittellArch.com

New Industrial Building for:
Pacific Tech Construction
13th Avenue
Kelso, WA 98626

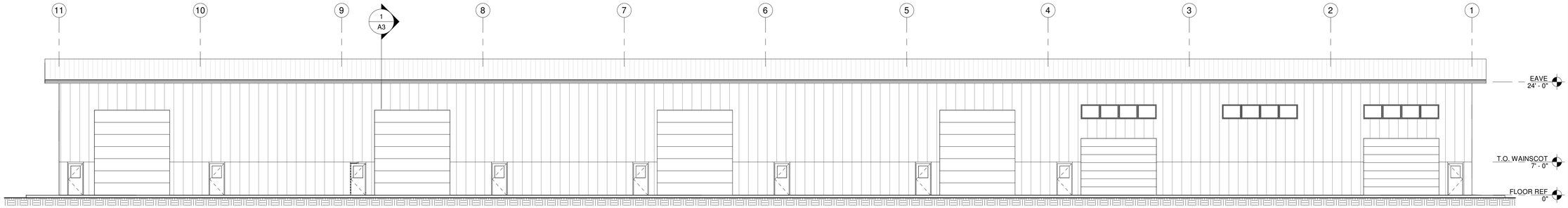
No.	Description	Date
A	SCHEMATIC DESIGN REVIEW	10/29/19
B	REVISED SCHEMATIC DESIGN	11/18/19
C	REVISED SCHEMATIC DESIGN	11/26/19
D	REVISED SCHEMATIC DESIGN	01/23/20
E	REVISED SCHEMATIC DESIGN	04/30/20
F	REVISED SCHEMATIC DESIGN	06/01/20

PRELIMINARY
NOT FOR CONSTRUCTION

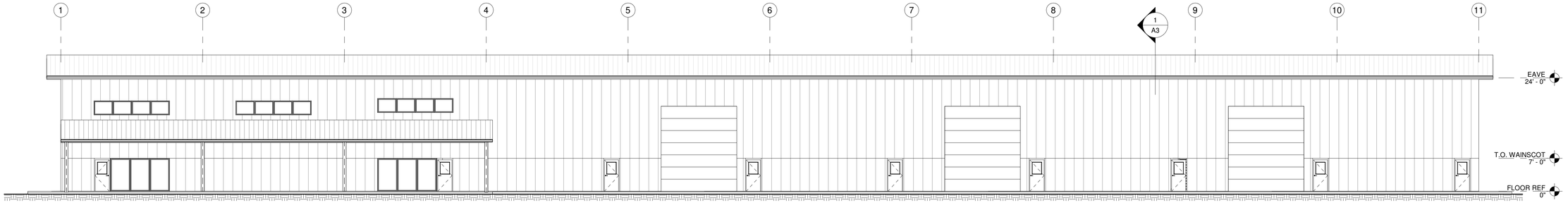
Project number 1932

A1

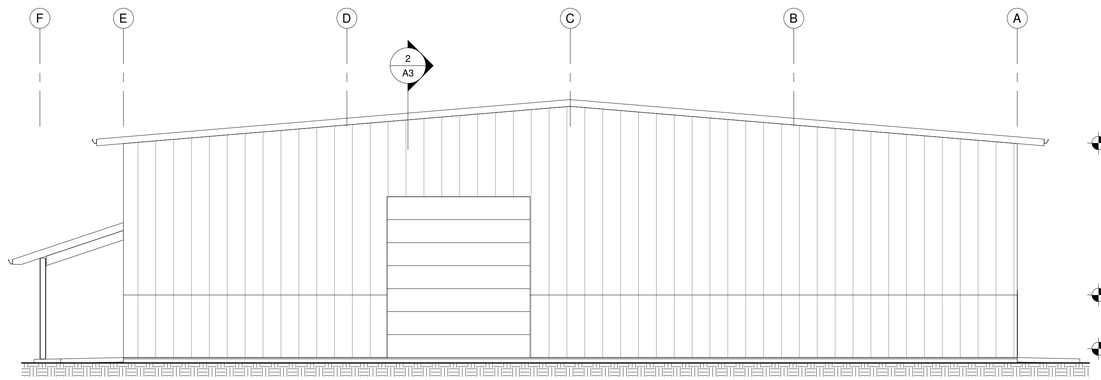
FLOOR PLAN



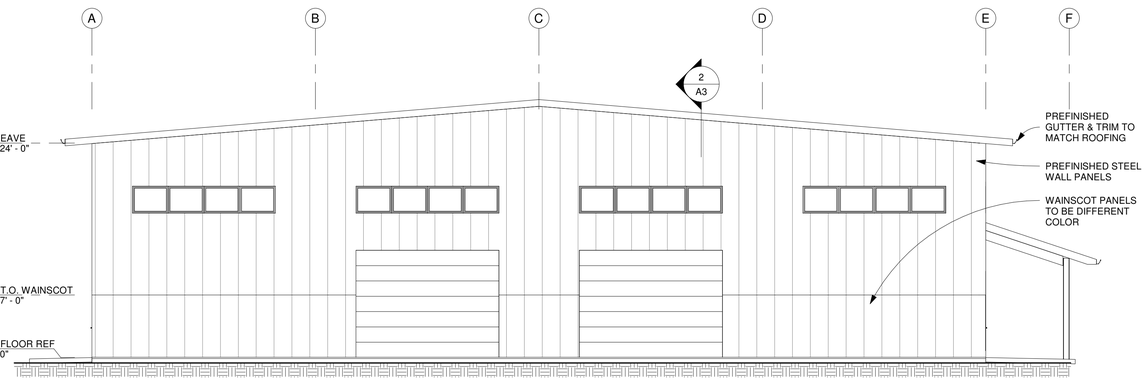
4 / A2 NORTH ELEVATION
3/32" = 1'-0"



3 / A2 SOUTH ELEVATION
3/32" = 1'-0"



2 / A2 EAST ELEVATION
1/8" = 1'-0"



1 / A2 WEST ELEVATION
1/8" = 1'-0"

6/1/2020 4:02:31 PM

BRITTELL
ARCHITECTURE, INC.
Longview WA - Newberg OR - Nehalem OR
www.BrittellArch.com

New Industrial Building for:
Pacific Tech Construction
13th Avenue
Kelso, WA 98626

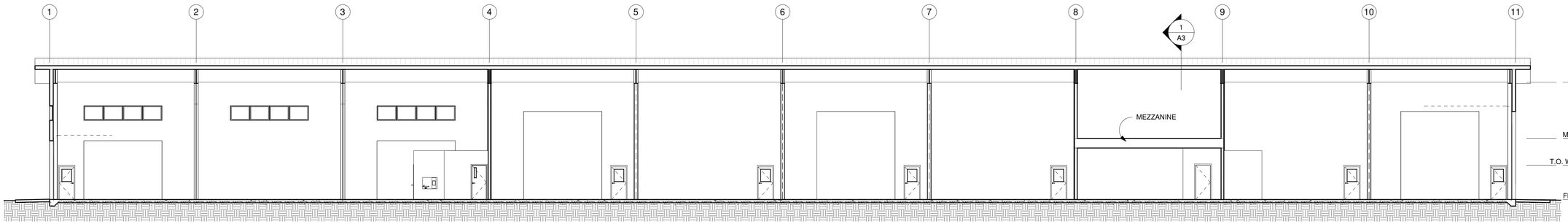
No.	Description	Date
A	SCHEMATIC DESIGN REVIEW	10/29/19
B	REVISED SCHEMATIC DESIGN	11/18/19
C	REVISED SCHEMATIC DESIGN	11/26/19
D	REVISED SCHEMATIC DESIGN	01/23/20
E	REVISED SCHEMATIC DESIGN	04/30/20
F	REVISED SCHEMATIC DESIGN	06/01/20

PRELIMINARY
NOT FOR CONSTRUCTION

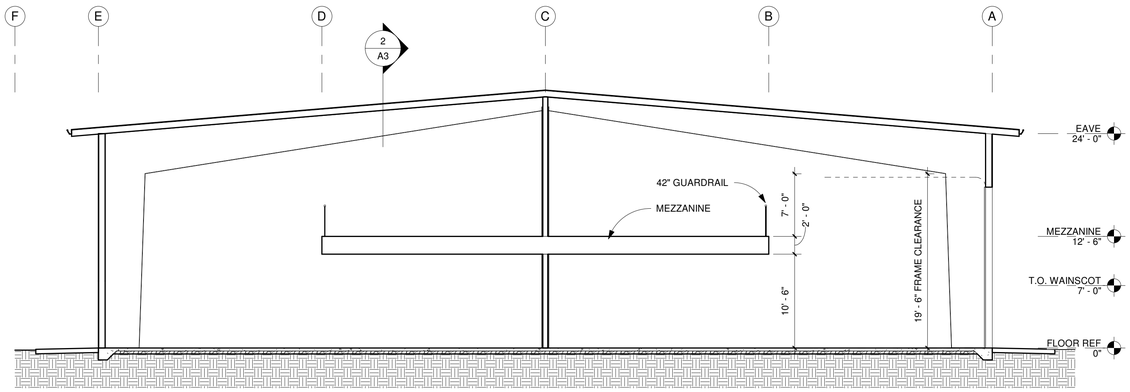
Project number 1932

A2

ELEVATIONS



2 A3 BUILDING SECTION N/S
3/32" = 1'-0"



1 A3 BUILDING SECTION E/W
1/8" = 1'-0"

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F	REVISED SCHEMATIC DESIGN	06/01/20

PRELIMINARY
NOT FOR CONSTRUCTION

Project number 1932

A3

SECTIONS

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SECTION 5

Preliminary Stormwater Report

Pacific Tech Site Plan
Kelso, Washington

Preliminary Stormwater Management Report
July 10, 2020

Prepared for:
Pac Tech Development, LLC
1302 Walnut Street
Kelso, WA 98626

Prepared by:
Tim Wines, P.E.
Three Rivers Land Services, PLLC
604 N 16th Ave
Kelso, WA 98626
(360) 431-9988

THREE RIVERS LAND SERVICES

TABLE OF CONTENTS

APPENDICES

CERTIFICATE OF ENGINEER

Pacific Tech Site Plan
Preliminary Drainage Report

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

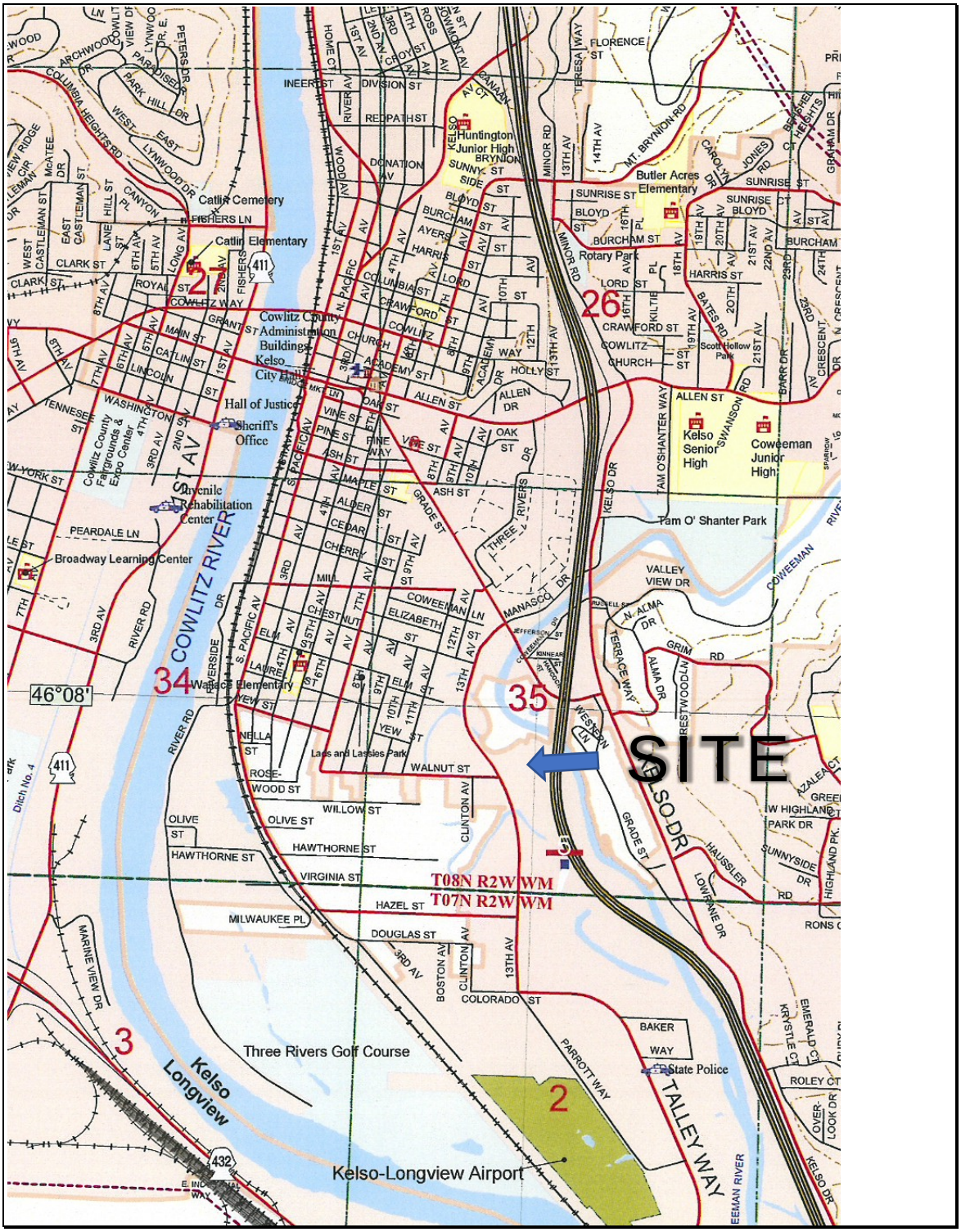
This document was:

Approved by: 7/10/20

Timothy S. Wines, P.E.

1. VICINITY MAP

Kelso, Washington
Sec. 35, T. 8 N., R. 2 W., W.M.



2. SOILS MAP

USDA SCS Map
Site Soils include: Caples silty clay loam, 0 to 3 percent slopes (17).

3. PROJECT DESCRIPTION

Pacific Tech Development, LLC is proposing to construct a 30,000 sf metal building and a 4,800 sf metal building on approximately 3.06 acres in Kelso. The project will be completed in two phases. The 30,000 sf structure will be completed with the first phase and is anticipated to be broken into multiple bays that will be leased out to various business for their operations or for other miscellaneous uses such as warehouse storage. It is also anticipated that approximately 9,000 sf of the western portion of the building will be utilized as an indoor sports complex for activities such as indoor soccer, basketball, or batting cages. The 4,800 sf structure will be completed with the future second phase and will also be leased by potential tenant for their operations or warehouse storage. The site is currently zoned LI (Light Industrial). It is bounded by S. 13th Street to the west, a Consolidated Diking Improvement District #3 (CDID #3) drainage slough to the north and east, and the Cowlitz County Public Works building to the south.

The site is located at 1302 S. 13th Avenue, Kelso, WA in the Southwest ¼ of Section 35, T8N, R2W of the Willamette Meridian, Cowlitz County, Washington. The site is comprised of three Kelso Out Lots (KEOL 561, 561B-1, and 561d-1) identified as Parcel 24355.

Improvements proposed for the site include the construction of the 30,000 sf and 4,800 sf metal buildings, interior travel lanes and associated parking, gravel storage areas, various stormwater facilities, and all utilities necessary to serve the tenants.

4. PRE-DEVELOPMENT CONDITIONS

The proposed project is located directly east of the intersection of S. 13th Avenue and Walnut Street. Topography on the site is flat, with all major utilities stubbed or adjacent to the property. There are no existing structures located on the site. There is a sanitary sewer line with a 20' easement to the City of Kelso that runs in a southeasterly direction on the western end of the site. Also, there is an existing overhead power line that follows the southern boundary line and turns north across the site roughly paralleling the lot line between Parcel A (KEOL 561) and Parcel B (KEOL 561B-1 and KEOL 561D-1).

As previously stated, the parcel is bounded on the north and east by the CDID #3 drainage slough, on the south by the Cowlitz County Public Works building (Parcel 2434403), and on the west by S. 13th Avenue. S. 13th Avenue is an improved 36' wide asphalt roadway with curb, gutter, and sidewalk located on both sides. There are two existing driveway drops on S. 13th Avenue accessing the site. One is on the northern end of the site and the other is a shared access with Cowlitz County Public Works.

A Subsurface Exploration and Geotechnical Report has been prepared by Columbia West Engineering, Inc. that describes the site geologic setting and addresses the results of surface and subsurface site conditions encountered during their field investigation. The report also identifies construction recommendations. This report has been included in Appendix D.

Currently, stormwater runoff from this site flows north and east to the CDID #3 drainage slough bordering the site.

On-Site Hydrologic Soil Groups

The NRCS Soil Survey of Cowlitz County maps the soils on the site as Caples silty clay loam, 0 to 3 percent slopes (Map Unit Symbol 17). The NRCS designation for Caples soils is hydrological soil group (HSG) C/D. The NRCS soils map is included in Appendix A of this report.

5. POST-DEVELOPMENT CONDITIONS

Following construction, most of the site will be covered by the buildings, asphalt for the parking and maneuvering areas, and landscaping. Building 1 will be centrally located on the site with the parking and maneuvering areas distributed around the building while Building 2 will be located in the southwest corner of the site abutting the 13th Avenue ROW and the site entrance to the south.

As part of the construction, erosion control measures will be installed and then the site will be stripped of the organic topsoil. A portion of the topsoil will be retained onsite for use in the landscape areas. The remainder will be hauled offsite to an approved dump site. Grading will occur to prepare the site for the new buildings, the parking/maneuvering areas, along with the installation of the necessary utilities. Asphalt will then be installed to accommodate circulation throughout the site and provide the required parking area. Finally, site landscaping will be installed to meet the Kelso Municipal Code (KMC) requirements.

Because this project is creating more than 2,000 sf of new impervious surface, it is required to provide stormwater management per KMC 17.22.120. The provisions of this chapter require the project meet Minimum Requirements 1-9 of the Stormwater Management Manual for Western Washington (SWMMWW). The parking and maneuvering area has been designed to either be collected in a series of catch basins or sheet flow the stormwater to three individual bioretention facilities (BRF's) located in the landscaping areas. Bioretention Facility 1 (BRF 1) will be located on the northwest corner of the site and has been designed to collect and treat the stormwater runoff generated from the portion of the site located west and south of Building 1. Bioretention Facility 2 (BRF 2) will be located on the northern boundary of the site and has been designed to collect and treat the stormwater runoff generated from the portion of the site located north of Building 1. Finally, Bioretention Facility 3 (BRF 3) will be located in the southeast corner of the site and has been designed to collect and treat the stormwater runoff generated from the portion of the site located east of Building 1. All three BRF's will be sized to provide water quality treatment. However, due to the lack of infiltration capacity in the underlying soils, the BRF's will be constructed with an underdrain beneath the 18" of bioretention soil mix (BSM). The underdrain has been designed to collect and convey the stormwater runoff into the CDID #3 slough which bounds the north and east property lines. In addition, an overflow standpipe will be installed in each facility to allow for the stormwater runoff from larger storm events to bypass the water quality facility and discharge directly into the CDID #3 slough. It should also be noted

that the stormwater runoff generated from the buildings will be discharged directly into the CDID #3 slough which is listed in the Stormwater Management Manual for Western Washington (SWMMWW) Appendix I-A: Flow Control Exempt Receiving Waters as an exempted waterbody. Therefore, Minimum Requirement #7 (Flow Control) will not be required.

6. MINIMUM REQUIREMENTS

Determination of Applicable Minimum Requirements

The site is new development and it will create greater than 5,000 square feet of new hard surfaces. Based on these criteria, the project triggers all minimum requirements (Minimum Requirements 1-9) according to the Kelso Engineering Design Manual (KEDM) Section 2.02.

Minimum Requirement 1: Preparation of Stormwater Site Plans

The information provided in this report, together with the associated drawings, satisfies the City's requirements regarding preparation of Stormwater Site Plans.

Minimum Requirement 2: Construction Stormwater Pollution Prevention

A Stormwater Pollution Prevention Plan for this project will be prepared with the final construction drawings.

Minimum Requirement 3: Source Control of Pollution

The Stormwater Pollution Prevention Plan and the Erosion Control Plan that will be developed for this project will provide for the short-term protection of the site and downstream areas from potential pollutants associated with the construction project. It is not anticipated that there will be any long-term pollution risks associated with this project.

All landscaping areas will be constructed utilizing BMP T5.13 Post Construction Soil Quality & Depth procedures. A detail will be included in the construction plans to specify materials and minimum depths. It is not anticipated that the site will generate an average daily vehicle traffic (ADT) count greater than 100 vehicles per 1,000 square feet of gross building area nor will it have vehicle storage of more than 25 diesel vehicles that are over 10 tons gross weight. Therefore, the site does not meet the threshold vehicle traffic intensity level of a high-use site. As such, no oil removal system has been proposed with this design.

Minimum Requirement 4: Preservation of Natural Drainage Systems and Outfalls

The Stormwater Management Manual for Western Washington (SWMMWW) requires that natural drainage patterns shall be maintained and discharges from the project site shall occur at the natural location, to the maximum extent practicable. It also requires that the manner by which runoff is discharged from the project site must not cause a significant adverse impact to downstream receiving waters and down-gradient properties. The completed stormwater system will discharge stormwater directly into the CDID #3 slough which is the natural drainage outfall for this property. As a result, downstream properties will not be adversely impacted by the proposed project.

Minimum Requirement 5: Onsite Stormwater Management BMP's

The KEDM and the SWMMWW requires that flow control exempt projects located within the city limits that trigger MR's 1-9 use either "the LID BMPs from List #3" or "Use any Flow Control BMP's desired to achieve the LID Performance Standard and apply BMP T5.13". This site qualifies as a flow control exempt project. However, soils on this site are classified by the NRCS as Hydrologic Soil Group (HSG) C/D which are not conducive for infiltration. Furthermore, due to the site layout, dispersion BMP's are not feasible. As a result, this project will be exempt from implementing the LID Performance Standards.

Minimum Requirement 6: Runoff Treatment Analysis and Design

As mentioned previously, water quality treatment will be accomplished via three stormwater bioretention facilities located in the landscaping areas. All three facilities will be of various shapes. BRF 1 will be triangular shaped and have a bottom surface area of 484 sf. The two sides of the triangle will be approximately 38.5' and 25.4' with a hypotenuse of 46.1'. BRF 2 will be rectangular in shape with a bottom with of 2' and a bottom length of 100' for a bottom area of 200 sf. While BRF 3 will be of irregular shape with a bottom area of 115.6 sf. All three facilities will provide 1' of surface storage prior to reaching the elevation of the overflow inlets and will each contain a minimum 18" of bioretention soils mix base.

Stormwater modeling for the water quality treatment design has been completed using the Western Washington Hydrology Model (WWHM) and the resulting calculations are provided in Appendix B. A total of 48,137 square feet of pavement, sidewalk, and landscaping area will drain to BRF 1, a total of 28,325 square feet of pavement, sidewalk, and landscaping area will drain to BRF 2, a total of 13,850 square feet of pavement, sidewalk, and landscaping area will drain to BRF 3 (see Basin Map in Appendix A). Basin area calculations for sizing of the bioretention facilities can be found in Table 1 below.

Table 1
Drainage Basin Calculations

	Basin	Impervious (sq-ft)	Pervious (sq-ft)	Total (sq-ft)
Developed Area				
	Basin 1	37,067	11,070	**48,137**
	Basin 2	27,652	673	**28,325**
	Basin 3	12,479	1,371	**13,850**
	Totals	**77,198**	**13,114**	**90,312**

Because bioretention facilities 1 and 3 are an irregular shape, they have been modeled as a square pond with dimensions that are equal to the square footage of the bottom of the actual facility. Since the bottom area of BRF 1 was 484 sf a design width and length of 22'was used to model the facility. Likewise, since the bottom area of BRF 3 was 115.6 sf a design width and length of 10.75 sf was used to model the facility. Since BRF 2 is rectangular in shape the

actual width of 2’ and length of 100’ was used to model this facility. All the facilities will have side slopes equal to or flatter than 3:1 and, as previously stated, a depth of storage of 1’. The infiltration rate of the bioretention soil mix is assumed to be the standard SMMWW rate of 12 in/hr that is built into the WWHM. The standard SMMWW soil type was selected for the soil material in both bioretention facilities and a safety factor of 4 has been applied to the SMMWW since more than 5,000 square feet of pollution generating impervious surfaces will drain to each of the three facilities. As shown on respectively on pages 8, 12, and 16 of the WWHM report included in Appendix B, BRF 1 will successfully infiltrate 91.88% of all tributary runoff through the bioretention soil mix, BRF 2 will successfully infiltrate 91.22% of all tributary runoff through the bioretention soil mix, and BRF 3 will successfully infiltrate 91.54% of all tributary runoff through the bioretention soil mix. This exceeds the SMMWW requirement that at least 91% of all runoff be infiltrated through the treatment soils.

It should be noted that bioretention is a LID type stormwater BMP that is encouraged by the Department of Ecology as a desirable means of providing basic runoff treatment.

Minimum Requirement 7: Flow Control Analysis and Design
As previously stated, the stormwater runoff generated from this site will be discharged into the CDID #3 slough. The KEDM Chapter 2.04 (A)(1) states that “Projects within the Consolidated Diking Improvement District #1 (CDID #1) and Consolidated Diking Improvement District #3 (CDID #3) boundaries and sites discharging to these boundaries via manmade conveyances are exempt from MR 7 if the discharge meets each restriction listed in SWMMMWW Vol. I, Section 2.5.7”. Therefore, since this project will be discharging into a CDID #3 drainage slough, it will be exempt from flow control requirements.

Minimum Requirement 8: Wetlands Protection
This project will not have an impact on any downstream wetlands.

Minimum Requirement 9: Operations and Maintenance
A maintenance and operations manual will be prepared as part of the final design.

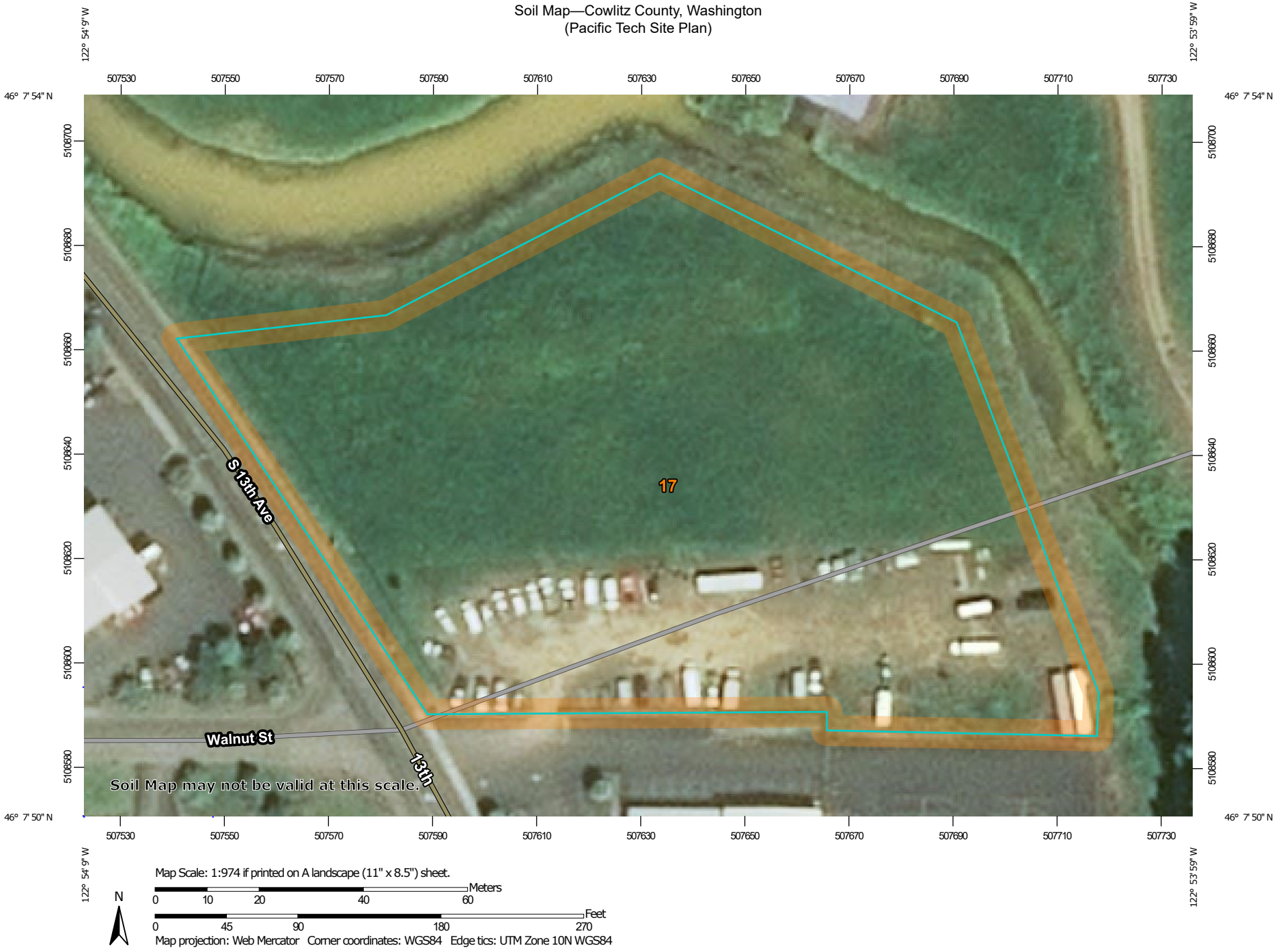
7. CONVEYANCE SYSTEM

The site conveyance system will be designed to convey runoff from the 25-year storm event under gravity flow conditions.

APPENDIX A

Soils Information
SCS Curve Numbers

Soil Map—Cowlitz County, Washington
(Pacific Tech Site Plan)



Map Scale: 1:974 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 45 90 180 270

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Cowlitz County, Washington
Survey Area Data: Version 21, Jun 4, 2020

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

Date(s) aerial images were photographed: Apr 26, 2019—Jun 11, 2019

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
17	Caples silty clay loam, 0 to 3 percent slopes	3.1	100.0%
Totals for Area of Interest		**3.1**	**100.0%**

Hydrologic Soil Group—Cowlitz County, Washington
(Pacific Tech Site Plan)

Map Scale: 1:974 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 45 90 180 270

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

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

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Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
17	Caples silty clay loam, 0 to 3 percent slopes	C/D	3.1	100.0%
Totals for Area of Interest			**3.1**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

APPENDIX B

WWHM Bioretention Facility Sizing Calculations

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	1053 Pac Tech
Site Name:	Pac Tech
Site Address:	1303 S 13th Avenue
City:	Kelso, WA 98626
Report Date:	7/10/2020
Gage:	Longview
Data Start:	1955/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.14
Version Date:	2016/02/25
Version:	4.2.12

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

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.2541
Pervious Total	0.2541

Impervious Land Use	acre
PARKING FLAT	0.8509
Impervious Total	0.8509
Basin Total	1.105

Element Flows To:

Surface	Interflow	Groundwater
Surface retention 1	Surface retention 1	

Basin 2

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.0154
Pervious Total	0.0154

Impervious Land Use	acre
SIDEWALKS FLAT	0.0141
PARKING FLAT	0.6207
Impervious Total	0.6348
Basin Total	0.6502

Element Flows To:

Surface	Interflow	Groundwater
Surface retention 2	Surface retention 2	

Basin 3

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.0315
Pervious Total	0.0315

Impervious Land Use	acre
PARKING FLAT	0.2865
Impervious Total	0.2865
Basin Total	0.318

Element Flows To:

Surface	Interflow	Groundwater
Surface retention 3	Surface retention 3	

Routing Elements
Predeveloped Routing

Mitigated Routing

Bioretention 1

Bottom Length:	22.00 ft.
Bottom Width:	22.00 ft.
Material thickness of first layer:	1.5
Material type for first layer:	SMMWW 12 in/hr
Material thickness of second layer:	1
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.67
Orifice Diameter (in.):	8
Offset (in.):	0
Flow Through Underdrain (ac-ft.):	172.95
Total Outflow (ac-ft.):	188.229
Percent Through Underdrain:	91.88
Discharge Structure	
Riser Height:	1 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0314	0.0000	0.0000	0.0000
0.0604	0.0312	0.0003	0.0000	0.0000
0.1209	0.0306	0.0006	0.0000	0.0000
0.1813	0.0300	0.0010	0.0001	0.0000
0.2418	0.0294	0.0013	0.0002	0.0000
0.3022	0.0288	0.0017	0.0004	0.0000
0.3626	0.0282	0.0020	0.0006	0.0000
0.4231	0.0276	0.0024	0.0010	0.0000
0.4835	0.0271	0.0028	0.0015	0.0000
0.5440	0.0265	0.0032	0.0020	0.0000
0.6044	0.0259	0.0036	0.0024	0.0000
0.6648	0.0254	0.0040	0.0027	0.0000
0.7253	0.0248	0.0045	0.0035	0.0000
0.7857	0.0243	0.0049	0.0044	0.0000
0.8462	0.0237	0.0054	0.0055	0.0000
0.9066	0.0232	0.0058	0.0067	0.0000
0.9670	0.0227	0.0063	0.0081	0.0000
1.0275	0.0222	0.0068	0.0096	0.0000
1.0879	0.0216	0.0073	0.0101	0.0000
1.1484	0.0211	0.0079	0.0113	0.0000
1.2088	0.0206	0.0084	0.0131	0.0000
1.2692	0.0201	0.0089	0.0151	0.0000
1.3297	0.0196	0.0095	0.0173	0.0000
1.3901	0.0192	0.0101	0.0197	0.0000
1.4505	0.0187	0.0107	0.0222	0.0000
1.5110	0.0182	0.0112	0.0247	0.0000
1.5714	0.0177	0.0118	0.0249	0.0000
1.6319	0.0173	0.0124	0.0278	0.0000
1.6923	0.0168	0.0129	0.0309	0.0000

1.7527	0.0164	0.0135	0.0336	0.0000
1.8132	0.0159	0.0142	0.0336	0.0000
1.8736	0.0155	0.0148	0.0336	0.0000
1.9341	0.0151	0.0154	0.0336	0.0000
1.9945	0.0147	0.0161	0.0336	0.0000
2.0549	0.0142	0.0168	0.0336	0.0000
2.1154	0.0138	0.0175	0.0336	0.0000
2.1758	0.0134	0.0182	0.0336	0.0000
2.2363	0.0130	0.0189	0.0336	0.0000
2.2967	0.0126	0.0196	0.0336	0.0000
2.3571	0.0122	0.0203	0.0336	0.0000
2.4176	0.0119	0.0211	0.0336	0.0000
2.4780	0.0115	0.0219	0.0336	0.0000
2.5000	0.0111	0.0222	0.0336	0.0000

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
2.5000	0.0314	0.0222	0.0000	0.1399	0.0000
2.5604	0.0320	0.0241	0.0000	0.1399	0.0000
2.6209	0.0327	0.0260	0.0000	0.1453	0.0000
2.6813	0.0333	0.0280	0.0000	0.1507	0.0000
2.7418	0.0339	0.0301	0.0000	0.1561	0.0000
2.8022	0.0346	0.0321	0.0000	0.1615	0.0000
2.8626	0.0352	0.0342	0.0000	0.1669	0.0000
2.9231	0.0359	0.0364	0.0000	0.1724	0.0000
2.9835	0.0365	0.0386	0.0000	0.1778	0.0000
3.0440	0.0372	0.0408	0.0000	0.1832	0.0000
3.1044	0.0379	0.0431	0.0000	0.1886	0.0000
3.1648	0.0386	0.0454	0.0000	0.1940	0.0000
3.2253	0.0393	0.0477	0.0000	0.1995	0.0000
3.2857	0.0399	0.0501	0.0000	0.2049	0.0000
3.3462	0.0406	0.0526	0.0000	0.2103	0.0000
3.4066	0.0413	0.0550	0.0000	0.2157	0.0000
3.4670	0.0421	0.0576	0.0000	0.2211	0.0000
3.5275	0.0428	0.0601	0.0483	0.2265	0.0000
3.5879	0.0435	0.0627	0.2754	0.2320	0.0000
3.6484	0.0442	0.0654	0.5952	0.2374	0.0000
3.7088	0.0450	0.0681	0.9624	0.2428	0.0000
3.7692	0.0457	0.0708	1.3333	0.2482	0.0000
3.8297	0.0464	0.0736	1.6654	0.2536	0.0000
3.8901	0.0472	0.0764	1.9255	0.2590	0.0000
3.9505	0.0480	0.0793	2.1028	0.2645	0.0000
4.0110	0.0487	0.0822	2.2515	0.2699	0.0000
4.0714	0.0495	0.0852	2.3809	0.2753	0.0000
4.1319	0.0503	0.0882	2.5036	0.2807	0.0000
4.1923	0.0510	0.0913	2.6207	0.2861	0.0000
4.2527	0.0518	0.0944	2.7327	0.2915	0.0000
4.3132	0.0526	0.0975	2.8402	0.2970	0.0000
4.3736	0.0534	0.1007	2.9439	0.3024	0.0000
4.4341	0.0542	0.1040	3.0440	0.3078	0.0000
4.4945	0.0550	0.1073	3.1410	0.3132	0.0000
4.5549	0.0559	0.1107	3.2350	0.3186	0.0000
4.6154	0.0567	0.1141	3.3264	0.3240	0.0000
4.6758	0.0575	0.1175	3.4153	0.3295	0.0000
4.7363	0.0584	0.1210	3.5020	0.3349	0.0000
4.7967	0.0592	0.1246	3.5866	0.3403	0.0000
4.8571	0.0600	0.1282	3.6692	0.3457	0.0000
4.9176	0.0609	0.1318	3.7500	0.3511	0.0000

4.9780	0.0618	0.1355	3.8291	0.3565	0.0000
5.0385	0.0626	0.1393	3.9066	0.3620	0.0000
5.0989	0.0635	0.1431	3.9826	0.3674	0.0000
5.1593	0.0644	0.1470	4.0572	0.3728	0.0000
5.2198	0.0653	0.1509	4.1304	0.3782	0.0000
5.2802	0.0662	0.1549	4.2024	0.3836	0.0000
5.3407	0.0671	0.1589	4.2731	0.3891	0.0000
5.4011	0.0680	0.1630	4.3427	0.3945	0.0000
5.4615	0.0689	0.1671	4.4112	0.3999	0.0000
5.5000	0.0694	0.1698	4.4787	0.4033	0.0000

Surface retention 1

Element Flows To:

Outlet 1	Outlet 2
	Bioretention 1

Bioretention 2

Bottom Length:	100.00 ft.
Bottom Width:	2.00 ft.
Material thickness of first layer:	1.5
Material type for first layer:	SMMWW 12 in/hr
Material thickness of second layer:	1
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.67
Orifice Diameter (in.):	8
Offset (in.):	0
Flow Through Underdrain (ac-ft.):	113.009
Total Outflow (ac-ft.):	123.885
Percent Through Underdrain:	91.22
Discharge Structure	
Riser Height:	1 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0449	0.0000	0.0000	0.0000
0.0495	0.0444	0.0001	0.0000	0.0000
0.0989	0.0435	0.0002	0.0000	0.0000
0.1484	0.0426	0.0004	0.0000	0.0000
0.1978	0.0417	0.0005	0.0000	0.0000
0.2473	0.0408	0.0007	0.0000	0.0000
0.2967	0.0399	0.0009	0.0001	0.0000
0.3462	0.0391	0.0011	0.0002	0.0000
0.3956	0.0382	0.0013	0.0003	0.0000
0.4451	0.0373	0.0016	0.0004	0.0000
0.4945	0.0365	0.0018	0.0005	0.0000
0.5440	0.0356	0.0021	0.0007	0.0000
0.5934	0.0348	0.0024	0.0009	0.0000
0.6429	0.0339	0.0027	0.0011	0.0000
0.6923	0.0331	0.0030	0.0014	0.0000
0.7418	0.0322	0.0034	0.0017	0.0000
0.7912	0.0314	0.0037	0.0020	0.0000
0.8407	0.0305	0.0041	0.0024	0.0000
0.8901	0.0297	0.0045	0.0027	0.0000
0.9396	0.0289	0.0049	0.0028	0.0000
0.9890	0.0281	0.0053	0.0033	0.0000
1.0385	0.0273	0.0058	0.0038	0.0000
1.0879	0.0264	0.0062	0.0043	0.0000
1.1374	0.0256	0.0067	0.0049	0.0000
1.1868	0.0248	0.0072	0.0056	0.0000
1.2363	0.0240	0.0077	0.0062	0.0000
1.2857	0.0232	0.0083	0.0065	0.0000
1.3352	0.0224	0.0088	0.0070	0.0000
1.3846	0.0216	0.0094	0.0078	0.0000
1.4341	0.0209	0.0100	0.0086	0.0000
1.4835	0.0201	0.0106	0.0095	0.0000

1.5330	0.0193	0.0112	0.0104	0.0000
1.5824	0.0185	0.0117	0.0114	0.0000
1.6319	0.0178	0.0123	0.0124	0.0000
1.6813	0.0170	0.0130	0.0124	0.0000
1.7308	0.0162	0.0136	0.0135	0.0000
1.7802	0.0155	0.0143	0.0139	0.0000
1.8297	0.0147	0.0149	0.0139	0.0000
1.8791	0.0140	0.0156	0.0139	0.0000
1.9286	0.0132	0.0163	0.0139	0.0000
1.9780	0.0125	0.0170	0.0139	0.0000
2.0275	0.0117	0.0178	0.0139	0.0000
2.0769	0.0110	0.0185	0.0139	0.0000
2.1264	0.0103	0.0193	0.0139	0.0000
2.1758	0.0096	0.0201	0.0139	0.0000
2.2253	0.0088	0.0209	0.0139	0.0000
2.2747	0.0081	0.0217	0.0139	0.0000
2.3242	0.0074	0.0226	0.0139	0.0000
2.3736	0.0067	0.0235	0.0139	0.0000
2.4231	0.0060	0.0243	0.0139	0.0000
2.4725	0.0053	0.0252	0.0139	0.0000
2.5000	0.0046	0.0258	0.0139	0.0000

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
2.5000	0.0449	0.0258	0.0000	0.0574	0.0000
2.5495	0.0458	0.0280	0.0000	0.0574	0.0000
2.5989	0.0467	0.0303	0.0000	0.0592	0.0000
2.6484	0.0476	0.0326	0.0000	0.0611	0.0000
2.6978	0.0485	0.0350	0.0000	0.0629	0.0000
2.7473	0.0494	0.0374	0.0000	0.0647	0.0000
2.7967	0.0503	0.0399	0.0000	0.0665	0.0000
2.8462	0.0513	0.0424	0.0000	0.0684	0.0000
2.8956	0.0522	0.0449	0.0000	0.0702	0.0000
2.9451	0.0531	0.0476	0.0000	0.0720	0.0000
2.9945	0.0541	0.0502	0.0000	0.0739	0.0000
3.0440	0.0550	0.0529	0.0000	0.0757	0.0000
3.0934	0.0560	0.0556	0.0000	0.0775	0.0000
3.1429	0.0569	0.0584	0.0000	0.0794	0.0000
3.1923	0.0579	0.0613	0.0000	0.0812	0.0000
3.2418	0.0588	0.0642	0.0000	0.0830	0.0000
3.2912	0.0598	0.0671	0.0000	0.0849	0.0000
3.3407	0.0607	0.0701	0.0000	0.0867	0.0000
3.3901	0.0617	0.0731	0.0000	0.0885	0.0000
3.4396	0.0627	0.0762	0.0000	0.0904	0.0000
3.4890	0.0637	0.0793	0.0000	0.0922	0.0000
3.5385	0.0647	0.0825	0.0800	0.0940	0.0000
3.5879	0.0656	0.0857	0.2754	0.0958	0.0000
3.6374	0.0666	0.0890	0.5323	0.0977	0.0000
3.6868	0.0676	0.0923	0.8261	0.0995	0.0000
3.7363	0.0686	0.0957	1.1332	0.1013	0.0000
3.7857	0.0696	0.0991	1.4294	0.1032	0.0000
3.8352	0.0706	0.1025	1.6924	0.1050	0.0000
3.8846	0.0716	0.1061	1.9054	0.1068	0.0000
3.9341	0.0727	0.1096	2.0620	0.1087	0.0000
3.9835	0.0737	0.1132	2.1721	0.1105	0.0000
4.0330	0.0747	0.1169	2.2994	0.1123	0.0000
4.0824	0.0757	0.1206	2.4037	0.1142	0.0000
4.1319	0.0768	0.1244	2.5036	0.1160	0.0000

4.1813	0.0778	0.1282	2.5998	0.1178	0.0000
4.2308	0.0788	0.1321	2.6925	0.1197	0.0000
4.2802	0.0799	0.1360	2.7821	0.1215	0.0000
4.3297	0.0809	0.1400	2.8689	0.1233	0.0000
4.3791	0.0820	0.1440	2.9531	0.1252	0.0000
4.4286	0.0830	0.1481	3.0351	0.1270	0.0000
4.4780	0.0841	0.1522	3.1148	0.1288	0.0000
4.5000	0.0846	0.1541	3.1926	0.1296	0.0000

Surface retention 2

Element Flows To:

Outlet 1	Outlet 2
	Bioretention 2

Bioretention 3

Bottom Length:	10.75 ft.
Bottom Width:	10.75 ft.
Material thickness of first layer:	1.5
Material type for first layer:	SMMWW 12 in/hr
Material thickness of second layer:	1
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.67
Orifice Diameter (in.):	8
Offset (in.):	0
Flow Through Underdrain (ac-ft.):	53.106
Total Outflow (ac-ft.):	58.015
Percent Through Underdrain:	91.54
Discharge Structure	
Riser Height:	1 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0152	0.0000	0.0000	0.0000
0.0495	0.0150	0.0001	0.0000	0.0000
0.0989	0.0147	0.0001	0.0000	0.0000
0.1484	0.0143	0.0002	0.0000	0.0000
0.1978	0.0140	0.0003	0.0000	0.0000
0.2473	0.0137	0.0003	0.0000	0.0000
0.2967	0.0133	0.0004	0.0001	0.0000
0.3462	0.0130	0.0005	0.0001	0.0000
0.3956	0.0127	0.0006	0.0001	0.0000
0.4451	0.0124	0.0007	0.0002	0.0000
0.4945	0.0121	0.0008	0.0003	0.0000
0.5440	0.0117	0.0009	0.0004	0.0000
0.5934	0.0114	0.0010	0.0005	0.0000
0.6429	0.0111	0.0011	0.0006	0.0000
0.6923	0.0108	0.0012	0.0008	0.0000
0.7418	0.0105	0.0013	0.0010	0.0000
0.7912	0.0103	0.0014	0.0012	0.0000
0.8407	0.0100	0.0016	0.0014	0.0000
0.8901	0.0097	0.0017	0.0016	0.0000
0.9396	0.0094	0.0018	0.0016	0.0000
0.9890	0.0091	0.0020	0.0019	0.0000
1.0385	0.0089	0.0021	0.0022	0.0000
1.0879	0.0086	0.0023	0.0025	0.0000
1.1374	0.0083	0.0024	0.0028	0.0000
1.1868	0.0081	0.0026	0.0032	0.0000
1.2363	0.0078	0.0028	0.0036	0.0000
1.2857	0.0076	0.0029	0.0038	0.0000
1.3352	0.0073	0.0031	0.0040	0.0000
1.3846	0.0071	0.0033	0.0045	0.0000
1.4341	0.0069	0.0035	0.0050	0.0000
1.4835	0.0066	0.0037	0.0055	0.0000

1.5330	0.0064	0.0039	0.0060	0.0000
1.5824	0.0062	0.0041	0.0066	0.0000
1.6319	0.0059	0.0043	0.0072	0.0000
1.6813	0.0057	0.0045	0.0072	0.0000
1.7308	0.0055	0.0047	0.0078	0.0000
1.7802	0.0053	0.0049	0.0080	0.0000
1.8297	0.0051	0.0051	0.0080	0.0000
1.8791	0.0049	0.0053	0.0080	0.0000
1.9286	0.0047	0.0056	0.0080	0.0000
1.9780	0.0045	0.0058	0.0080	0.0000
2.0275	0.0043	0.0061	0.0080	0.0000
2.0769	0.0041	0.0063	0.0080	0.0000
2.1264	0.0040	0.0066	0.0080	0.0000
2.1758	0.0038	0.0068	0.0080	0.0000
2.2253	0.0036	0.0071	0.0080	0.0000
2.2747	0.0034	0.0074	0.0080	0.0000
2.3242	0.0033	0.0077	0.0080	0.0000
2.3736	0.0031	0.0079	0.0080	0.0000
2.4231	0.0030	0.0082	0.0080	0.0000
2.4725	0.0028	0.0085	0.0080	0.0000
2.5000	0.0027	0.0087	0.0080	0.0000

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
2.5000	0.0152	0.0087	0.0000	0.0332	0.0000
2.5495	0.0156	0.0095	0.0000	0.0332	0.0000
2.5989	0.0159	0.0103	0.0000	0.0342	0.0000
2.6484	0.0163	0.0111	0.0000	0.0353	0.0000
2.6978	0.0167	0.0119	0.0000	0.0363	0.0000
2.7473	0.0170	0.0127	0.0000	0.0374	0.0000
2.7967	0.0174	0.0136	0.0000	0.0385	0.0000
2.8462	0.0178	0.0144	0.0000	0.0395	0.0000
2.8956	0.0182	0.0153	0.0000	0.0406	0.0000
2.9451	0.0185	0.0162	0.0000	0.0416	0.0000
2.9945	0.0189	0.0172	0.0000	0.0427	0.0000
3.0440	0.0193	0.0181	0.0000	0.0437	0.0000
3.0934	0.0197	0.0191	0.0000	0.0448	0.0000
3.1429	0.0201	0.0200	0.0000	0.0459	0.0000
3.1923	0.0205	0.0211	0.0000	0.0469	0.0000
3.2418	0.0209	0.0221	0.0000	0.0480	0.0000
3.2912	0.0214	0.0231	0.0000	0.0490	0.0000
3.3407	0.0218	0.0242	0.0000	0.0501	0.0000
3.3901	0.0222	0.0253	0.0000	0.0511	0.0000
3.4396	0.0226	0.0264	0.0000	0.0522	0.0000
3.4890	0.0230	0.0275	0.0000	0.0533	0.0000
3.5385	0.0235	0.0287	0.0800	0.0543	0.0000
3.5879	0.0239	0.0298	0.2754	0.0554	0.0000
3.6374	0.0244	0.0310	0.5323	0.0564	0.0000
3.6868	0.0248	0.0322	0.8261	0.0575	0.0000
3.7363	0.0253	0.0335	1.1332	0.0586	0.0000
3.7857	0.0257	0.0347	1.4294	0.0596	0.0000
3.8352	0.0262	0.0360	1.6924	0.0607	0.0000
3.8846	0.0266	0.0373	1.9054	0.0617	0.0000
3.9341	0.0271	0.0387	2.0620	0.0628	0.0000
3.9835	0.0276	0.0400	2.1721	0.0638	0.0000
4.0330	0.0280	0.0414	2.2994	0.0649	0.0000
4.0824	0.0285	0.0428	2.4037	0.0660	0.0000
4.1319	0.0290	0.0442	2.5036	0.0670	0.0000

4.1813	0.0295	0.0457	2.5998	0.0681	0.0000
4.2308	0.0300	0.0471	2.6925	0.0691	0.0000
4.2802	0.0305	0.0486	2.7821	0.0702	0.0000
4.3297	0.0310	0.0501	2.8689	0.0713	0.0000
4.3791	0.0315	0.0517	2.9531	0.0723	0.0000
4.4286	0.0320	0.0532	3.0351	0.0734	0.0000
4.4780	0.0325	0.0548	3.1148	0.0744	0.0000
4.5000	0.0327	0.0556	3.1926	0.0749	0.0000

Surface retention 3

Element Flows To:

Outlet 1	Outlet 2
	Bioretention 3

Analysis Results

POC 1

POC #1 was not reported because POC must exist in both scenarios and both scenarios must have been run.

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

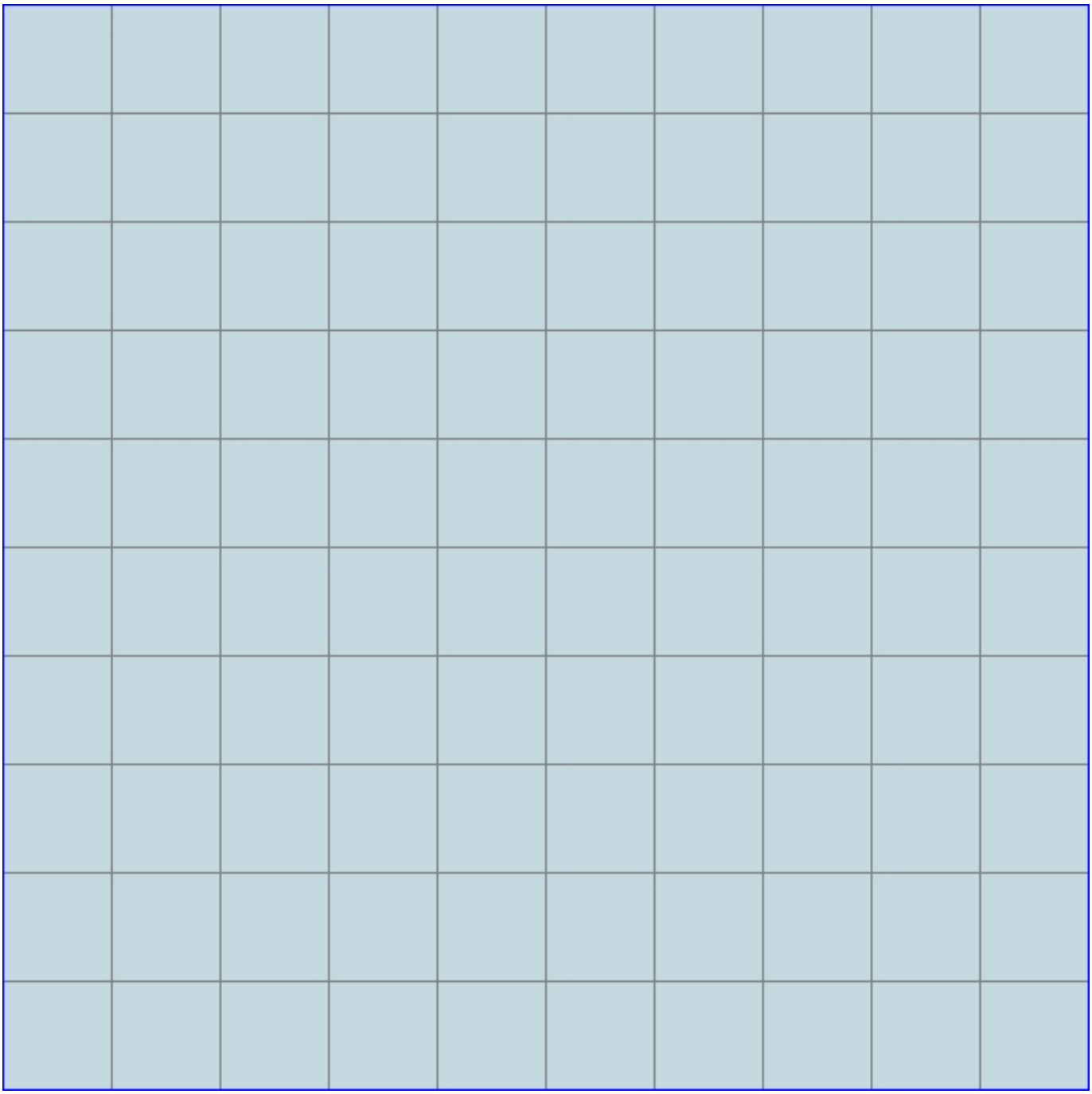
No PERLND changes have been made.

IMPLND Changes

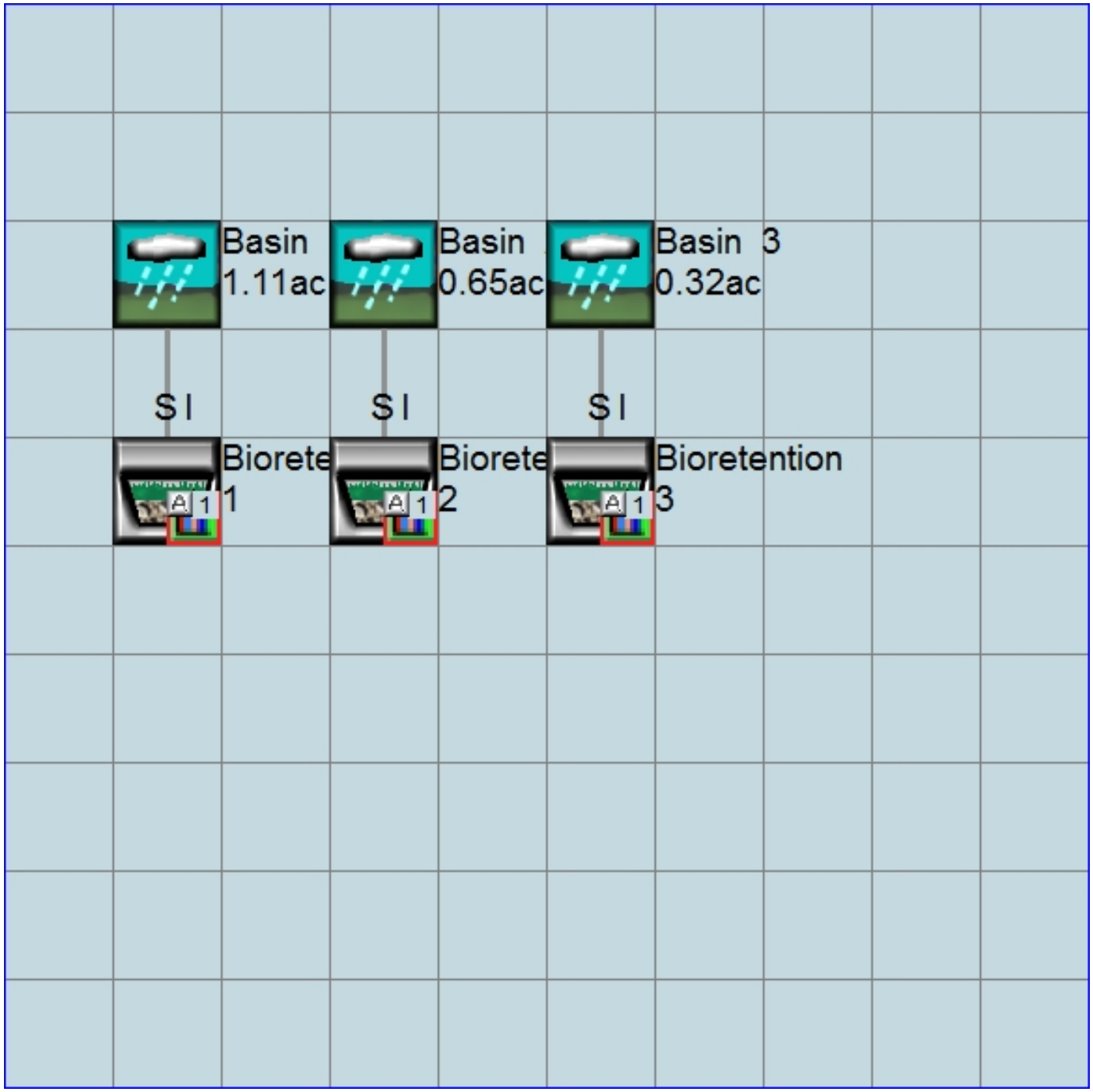
No IMPLND changes have been made.

Appendix

Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2009 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   1053 Pac Tech.wdm
MESSU       25   Mit1053 Pac Tech.MES
            27   Mit1053 Pac Tech.L61
            28   Mit1053 Pac Tech.L62
            30   POC1053 Pac Tech1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      16
      IMPLND      11
      IMPLND       8
      GENER        2
      RCHRES       1
      RCHRES       2
      GENER        4
      RCHRES       3
      RCHRES       4
      GENER        6
      RCHRES       5
      RCHRES       6
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Surface retention  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 ***
    2        24
    4        24
    6        24
  END OPCODE
  PARM
    #    #         K ***
    2             0.
    4             0.
    6             0.
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
```

```
    # -  #                          User  t-series Engl Metr ***
                                        in  out           ***
   16     C, 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 ***
   16         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  *********
   16         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 ***
   16         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
   16              0       4.5      0.03       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   16             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   16           0.1      0.25      0.25         6       0.5      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
   16             0         0         0         0       2.5          1         0
  END PWAT-STATE1

END PERLND

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

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
   11         0    0    1    0    0    0
    8         0    0    1    0    0    0
  END ACTIVITY

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

```
   11         0    0    4    0    0    0    1    9
    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     ***
   11         0    0    0    0    0
    8         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
   11          400      0.01       0.1       0.1
    8          400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
   11             0         0
    8             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
   11             0         0
    8             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  16                     0.2541     RCHRES   1      2
PERLND  16                     0.2541     RCHRES   1      3
IMPLND  11                     0.8509     RCHRES   1      5
Basin  2***
PERLND  16                     0.0154     RCHRES   3      2
PERLND  16                     0.0154     RCHRES   3      3
IMPLND   8                     0.0141     RCHRES   3      5
IMPLND  11                     0.6207     RCHRES   3      5
Basin  3***
PERLND  16                     0.0315     RCHRES   5      2
PERLND  16                     0.0315     RCHRES   5      3
IMPLND  11                     0.2865     RCHRES   5      5

******Routing******
PERLND  16                     0.2541     COPY     1     12
IMPLND  11                     0.8509     COPY     1     15
PERLND  16                     0.2541     COPY     1     13
RCHRES   1                          1     RCHRES   2      8
RCHRES   3                          1     RCHRES   4      8
RCHRES   3                                COPY     1     18
PERLND  16                     0.0315     COPY     1     12
IMPLND  11                     0.2865     COPY     1     15
PERLND  16                     0.0315     COPY     1     13
RCHRES   5                          1     RCHRES   6      8
RCHRES   2                          1     COPY   501     16
RCHRES   1                          1     COPY   501     17
RCHRES   4                          1     COPY   501     16
RCHRES   6                          1     COPY   501     16
RCHRES   5                          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
GENER    2 OUTPUT TIMSER      .0011111     RCHRES   1     EXTNL  OUTDGT 1
GENER    4 OUTPUT TIMSER      .0011111     RCHRES   3     EXTNL  OUTDGT 1
GENER    6 OUTPUT TIMSER      .0011111     RCHRES   5     EXTNL  OUTDGT 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     Surface retentio-005    3    1    1    1   28    0    1
    2     Bioretention  1         1    1    1    1   28    0    1
    3     Surface retentio-008    3    1    1    1   28    0    1
    4     Bioretention  2         1    1    1    1   28    0    1
    5     Surface retentio-011    3    1    1    1   28    0    1
    6     Bioretention  3         1    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
    3         1    0    0    0    0    0    0    0    0    0
    4         1    0    0    0    0    0    0    0    0    0
    5         1    0    0    0    0    0    0    0    0    0
    6         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
    3         4    0    0    0    0    0    0    0    0    0    1    9
    4         4    0    0    0    0    0    0    0    0    0    1    9
    5         4    0    0    0    0    0    0    0    0    0    1    9
    6         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  6  0  0       0  1  0  0  0       2  1  2  2  2
    2       0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
    3       0  1  0  0    4  5  6  0  0       0  1  0  0  0       2  1  2  2  2
    4       0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
    5       0  1  0  0    4  5  6  0  0       0  1  0  0  0       2  1  2  2  2
    6       0  1  0  0    4  0  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      0.01       0.0       0.0       0.5       0.0
    2              2      0.01       0.0       0.0       0.5       0.0
    3              3      0.01       0.0       0.0       0.5       0.0
    4              4      0.02       0.0       0.0       0.5       0.0
    5              5      0.01       0.0       0.0       0.5       0.0
```

```
    6              6      0.01       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  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    3            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    4            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    5            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    6            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
*** User-Defined Variable Quantity Lines
***                           addr
***                          <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol2   RCHRES   2 VOL              4
  UVQUAN v2m2   GLOBAL     WORKSP  1        3
  UVQUAN vpo2   GLOBAL     WORKSP  2        3
  UVQUAN v2d2   GENER    2 K       1        3
*** User-Defined Variable Quantity Lines
***                           addr
***                          <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol4   RCHRES   4 VOL              4
  UVQUAN v2m4   GLOBAL     WORKSP  3        3
  UVQUAN vpo4   GLOBAL     WORKSP  4        3
  UVQUAN v2d4   GENER    4 K       1        3
*** User-Defined Variable Quantity Lines
***                           addr
***                          <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol6   RCHRES   6 VOL              4
  UVQUAN v2m6   GLOBAL     WORKSP  5        3
  UVQUAN vpo6   GLOBAL     WORKSP  6        3
  UVQUAN v2d6   GENER    6 K       1        3
*** User-Defined Target Variable Names
***                   addr or                        addr or
***                  <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m2    1 WORKSP  1         1.0 QUAN
  UVNAME  vpo2    1 WORKSP  2         1.0 QUAN
  UVNAME  v2d2    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                   addr or                        addr or
***                  <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m4    1 WORKSP  3         1.0 QUAN
  UVNAME  vpo4    1 WORKSP  4         1.0 QUAN
  UVNAME  v2d4    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                   addr or                        addr or
***                  <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m6    1 WORKSP  5         1.0 QUAN
  UVNAME  vpo6    1 WORKSP  6         1.0 QUAN
  UVNAME  v2d6    1 K       1         1.0 QUAN
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
```

```
  GENER   2                                 v2m2           =  904.
*** Compute remaining available pore space
  GENER   2                                 vpo2           =  v2m2
  GENER   2                                 vpo2          -=  vol2
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo2 < 0.0) THEN
  GENER   2                                 vpo2           =  0.0
END IF
*** Infiltration volume
  GENER   2                                 v2d2           =  vpo2
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   4                                 v2m4           =  1044.
*** Compute remaining available pore space
  GENER   4                                 vpo4           =  v2m4
  GENER   4                                 vpo4          -=  vol4
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo4 < 0.0) THEN
  GENER   4                                 vpo4           =  0.0
END IF
*** Infiltration volume
  GENER   4                                 v2d4           =  vpo4
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   6                                 v2m6           =  353.
*** Compute remaining available pore space
  GENER   6                                 vpo6           =  v2m6
  GENER   6                                 vpo6          -=  vol6
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo6 < 0.0) THEN
  GENER   6                                 vpo6           =  0.0
END IF
*** Infiltration volume
  GENER   6                                 v2d6           =  vpo6
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   43    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.031428  0.000000  0.000000
  0.060440  0.031204  0.000312  0.000000
  0.120879  0.030593  0.000635  0.000017
  0.181319  0.029989  0.000968  0.000073
  0.241758  0.029390  0.001311  0.000187
  0.302198  0.028797  0.001666  0.000371
  0.362637  0.028210  0.002031  0.000638
  0.423077  0.027630  0.002407  0.000996
  0.483516  0.027055  0.002795  0.001454
  0.543956  0.026487  0.003194  0.002021
  0.604396  0.025924  0.003605  0.002399
  0.664835  0.025368  0.004028  0.002703
  0.725275  0.024817  0.004462  0.003509
  0.785714  0.024273  0.004909  0.004444
  0.846154  0.023734  0.005368  0.005515
  0.906593  0.023202  0.005840  0.006728
  0.967033  0.022676  0.006324  0.008089
  1.027473  0.022155  0.006821  0.009603
  1.087912  0.021641  0.007330  0.010057
  1.148352  0.021133  0.007853  0.011276
  1.208791  0.020631  0.008390  0.013113
  1.269231  0.020135  0.008939  0.015118
  1.329670  0.019645  0.009503  0.017297
  1.390110  0.019161  0.010080  0.019655
  1.450549  0.018683  0.010671  0.022195
  1.510989  0.018211  0.011220  0.024684
  1.571429  0.017745  0.011782  0.024921
  1.631868  0.017285  0.012358  0.027838
  1.692308  0.016831  0.012947  0.030947
  1.752747  0.016383  0.013549  0.033611
```

```
  1.813187  0.015941  0.014164  0.033611
  1.873626  0.015506  0.014794  0.033611
  1.934066  0.015076  0.015437  0.033611
  1.994505  0.014652  0.016094  0.033611
  2.054945  0.014235  0.016766  0.033611
  2.115385  0.013823  0.017451  0.033611
  2.175824  0.013418  0.018152  0.033611
  2.236264  0.013018  0.018867  0.033611
  2.296703  0.012625  0.019596  0.033611
  2.357143  0.012237  0.020341  0.033611
  2.417582  0.011856  0.021101  0.033611
  2.478022  0.011480  0.021876  0.033611
  2.500000  0.011111  0.046539  0.033611
  END FTABLE  2
  FTABLE      1
   51    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.011111  0.000000  0.000000  0.000000  0.000000
  0.060440  0.032047  0.001918  0.000000  0.139862  0.000000
  0.120879  0.032672  0.003874  0.000000  0.145279  0.000000
  0.181319  0.033303  0.005868  0.000000  0.150696  0.000000
  0.241758  0.033940  0.007900  0.000000  0.156113  0.000000
  0.302198  0.034584  0.009971  0.000000  0.161530  0.000000
  0.362637  0.035233  0.012080  0.000000  0.166948  0.000000
  0.423077  0.035888  0.014230  0.000000  0.172365  0.000000
  0.483516  0.036550  0.016419  0.000000  0.177782  0.000000
  0.543956  0.037217  0.018648  0.000000  0.183199  0.000000
  0.604396  0.037890  0.020918  0.000000  0.188616  0.000000
  0.664835  0.038570  0.023228  0.000000  0.194034  0.000000
  0.725275  0.039255  0.025580  0.000000  0.199451  0.000000
  0.785714  0.039947  0.027974  0.000000  0.204868  0.000000
  0.846154  0.040644  0.030409  0.000000  0.210285  0.000000
  0.906593  0.041348  0.032887  0.000000  0.215702  0.000000
  0.967033  0.042058  0.035407  0.000000  0.221119  0.000000
  1.027473  0.042773  0.037971  0.048301  0.226537  0.000000
  1.087912  0.043495  0.040578  0.275387  0.231954  0.000000
  1.148352  0.044223  0.043229  0.595207  0.237371  0.000000
  1.208791  0.044957  0.045924  0.962367  0.242788  0.000000
  1.269231  0.045696  0.048663  1.333311  0.248205  0.000000
  1.329670  0.046442  0.051448  1.665407  0.253623  0.000000
  1.390110  0.047194  0.054277  1.925525  0.259040  0.000000
  1.450549  0.047952  0.057153  2.102770  0.264457  0.000000
  1.510989  0.048716  0.060074  2.251466  0.269874  0.000000
  1.571429  0.049486  0.063042  2.380897  0.275291  0.000000
  1.631868  0.050262  0.066056  2.503645  0.280708  0.000000
  1.692308  0.051044  0.069117  2.620651  0.286126  0.000000
  1.752747  0.051832  0.072226  2.732651  0.291543  0.000000
  1.813187  0.052626  0.075383  2.840238  0.296960  0.000000
  1.873626  0.053427  0.078588  2.943896  0.302377  0.000000
  1.934066  0.054233  0.081841  3.044026  0.307794  0.000000
  1.994505  0.055045  0.085144  3.140965  0.313211  0.000000
  2.054945  0.055864  0.088495  3.235001  0.318629  0.000000
  2.115385  0.056688  0.091897  3.326380  0.324046  0.000000
  2.175824  0.057518  0.095348  3.415315  0.329463  0.000000
  2.236264  0.058355  0.098850  3.501992  0.334880  0.000000
  2.296703  0.059197  0.102402  3.586574  0.340297  0.000000
  2.357143  0.060046  0.106005  3.669208  0.345715  0.000000
  2.417582  0.060900  0.109660  3.750021  0.351132  0.000000
  2.478022  0.061761  0.113367  3.829129  0.356549  0.000000
  2.538462  0.062627  0.117126  3.906635  0.361966  0.000000
  2.598901  0.063500  0.120938  3.982634  0.367383  0.000000
  2.659341  0.064379  0.124802  4.057208  0.372800  0.000000
  2.719780  0.065264  0.128720  4.130437  0.378218  0.000000
  2.780220  0.066154  0.132691  4.202390  0.383635  0.000000
  2.840659  0.067051  0.136717  4.273131  0.389052  0.000000
  2.901099  0.067954  0.140797  4.342721  0.394469  0.000000
  2.961538  0.068863  0.144931  4.411212  0.399886  0.000000
```

```
  3.000000  0.069444  0.147591  4.478657  0.403334  0.000000
  END FTABLE  1
  FTABLE      4
   52    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.044881  0.000000  0.000000
  0.049451  0.044382  0.000112  0.000000
  0.098901  0.043487  0.000239  0.000000
  0.148352  0.042596  0.000383  0.000005
  0.197802  0.041709  0.000542  0.000019
  0.247253  0.040827  0.000717  0.000048
  0.296703  0.039948  0.000909  0.000095
  0.346154  0.039073  0.001117  0.000162
  0.395604  0.038203  0.001341  0.000252
  0.445055  0.037336  0.001582  0.000367
  0.494505  0.036474  0.001839  0.000509
  0.543956  0.035615  0.002113  0.000681
  0.593407  0.034761  0.002404  0.000883
  0.642857  0.033911  0.002711  0.001117
  0.692308  0.033064  0.003035  0.001386
  0.741758  0.032222  0.003376  0.001690
  0.791209  0.031384  0.003735  0.002030
  0.840659  0.030549  0.004110  0.002410
  0.890110  0.029719  0.004503  0.002706
  0.939560  0.028893  0.004913  0.002829
  0.989011  0.028071  0.005341  0.003289
  1.038462  0.027253  0.005786  0.003791
  1.087912  0.026439  0.006249  0.004337
  1.137363  0.025629  0.006729  0.004928
  1.186813  0.024823  0.007227  0.005564
  1.236264  0.024021  0.007744  0.006247
  1.285714  0.023223  0.008278  0.006509
  1.335165  0.022430  0.008830  0.006979
  1.384615  0.021640  0.009401  0.007759
  1.434066  0.020854  0.009989  0.008589
  1.483516  0.020073  0.010596  0.009471
  1.532967  0.019295  0.011164  0.010404
  1.582418  0.018521  0.011749  0.011390
  1.631868  0.017752  0.012350  0.012426
  1.681319  0.016986  0.012968  0.012430
  1.730769  0.016225  0.013604  0.013521
  1.780220  0.015467  0.014257  0.013889
  1.829670  0.014714  0.014926  0.013889
  1.879121  0.013965  0.015614  0.013889
  1.928571  0.013220  0.016318  0.013889
  1.978022  0.012478  0.017040  0.013889
  2.027473  0.011741  0.017780  0.013889
  2.076923  0.011008  0.018538  0.013889
  2.126374  0.010279  0.019313  0.013889
  2.175824  0.009554  0.020106  0.013889
  2.225275  0.008833  0.020916  0.013889
  2.274725  0.008116  0.021745  0.013889
  2.324176  0.007403  0.022592  0.013889
  2.373626  0.006694  0.023457  0.013889
  2.423077  0.005989  0.024340  0.013889
  2.472527  0.005288  0.025242  0.013889
  2.500000  0.004591  0.054077  0.013889
  END FTABLE  4
  FTABLE      3
   42    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.004591  0.000000  0.000000  0.000000  0.000000
  0.049451  0.045782  0.002242  0.000000  0.057387  0.000000
  0.098901  0.046687  0.004528  0.000000  0.059219  0.000000
  0.148352  0.047596  0.006859  0.000000  0.061050  0.000000
  0.197802  0.048509  0.009235  0.000000  0.062882  0.000000
```

```
0.247253  0.049427  0.011657  0.000000  0.064713  0.000000
0.296703  0.050348  0.014124  0.000000  0.066545  0.000000
0.346154  0.051273  0.016636  0.000000  0.068376  0.000000
0.395604  0.052203  0.019195  0.000000  0.070208  0.000000
0.445055  0.053136  0.021799  0.000000  0.072039  0.000000
0.494505  0.054074  0.024450  0.000000  0.073871  0.000000
0.543956  0.055015  0.027148  0.000000  0.075702  0.000000
0.593407  0.055961  0.029891  0.000000  0.077534  0.000000
0.642857  0.056910  0.032682  0.000000  0.079365  0.000000
0.692308  0.057864  0.035520  0.000000  0.081197  0.000000
0.741758  0.058822  0.038405  0.000000  0.083028  0.000000
0.791209  0.059784  0.041338  0.000000  0.084860  0.000000
0.840659  0.060749  0.044318  0.000000  0.086691  0.000000
0.890110  0.061719  0.047346  0.000000  0.088523  0.000000
0.939560  0.062693  0.050422  0.000000  0.090354  0.000000
0.989011  0.063671  0.053546  0.000000  0.092186  0.000000
1.038462  0.064653  0.056719  0.079976  0.094017  0.000000
1.087912  0.065639  0.059941  0.275387  0.095849  0.000000
1.137363  0.066629  0.063211  0.532289  0.097680  0.000000
1.186813  0.067623  0.066531  0.826090  0.099512  0.000000
1.236264  0.068621  0.069899  1.133165  0.101343  0.000000
1.285714  0.069623  0.073317  1.429395  0.103175  0.000000
1.335165  0.070630  0.076785  1.692395  0.105006  0.000000
1.384615  0.071640  0.080303  1.905359  0.106838  0.000000
1.434066  0.072654  0.083871  2.061968  0.108669  0.000000
1.483516  0.073673  0.087489  2.172110  0.110501  0.000000
1.532967  0.074695  0.091157  2.299375  0.112332  0.000000
1.582418  0.075721  0.094876  2.403681  0.114164  0.000000
1.631868  0.076752  0.098646  2.503645  0.115995  0.000000
1.681319  0.077786  0.102467  2.599769  0.117827  0.000000
1.730769  0.078825  0.106339  2.692463  0.119658  0.000000
1.780220  0.079867  0.110263  2.782070  0.121490  0.000000
1.829670  0.080914  0.114238  2.868880  0.123321  0.000000
1.879121  0.081965  0.118266  2.953139  0.125153  0.000000
1.928571  0.083019  0.122345  3.035059  0.126984  0.000000
1.978022  0.084078  0.126476  3.114826  0.128816  0.000000
2.000000  0.084550  0.128329  3.192601  0.129630  0.000000
END FTABLE  3
FTABLE      6
 52    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.015222  0.000000  0.000000
0.049451  0.015028  0.000062  0.000000
0.098901  0.014681  0.000127  0.000000
0.148352  0.014339  0.000195  0.000003
0.197802  0.014000  0.000267  0.000011
0.247253  0.013666  0.000343  0.000028
0.296703  0.013335  0.000423  0.000055
0.346154  0.013009  0.000506  0.000094
0.395604  0.012687  0.000594  0.000146
0.445055  0.012369  0.000685  0.000212
0.494505  0.012054  0.000781  0.000294
0.543956  0.011744  0.000881  0.000393
0.593407  0.011438  0.000985  0.000510
0.642857  0.011136  0.001093  0.000645
0.692308  0.010838  0.001206  0.000801
0.741758  0.010544  0.001324  0.000976
0.791209  0.010254  0.001446  0.001173
0.840659  0.009968  0.001573  0.001392
0.890110  0.009686  0.001705  0.001563
0.939560  0.009409  0.001842  0.001635
0.989011  0.009135  0.001984  0.001900
1.038462  0.008865  0.002131  0.002191
1.087912  0.008599  0.002284  0.002506
1.137363  0.008338  0.002441  0.002847
1.186813  0.008080  0.002604  0.003215
1.236264  0.007827  0.002773  0.003610
1.285714  0.007577  0.002947  0.003761
1.335165  0.007332  0.003127  0.004032
```

```
  1.384615  0.007090  0.003313  0.004483
  1.434066  0.006853  0.003504  0.004963
  1.483516  0.006620  0.003702  0.005472
  1.532967  0.006390  0.003886  0.006012
  1.582418  0.006165  0.004077  0.006582
  1.631868  0.005944  0.004272  0.007180
  1.681319  0.005727  0.004474  0.007182
  1.730769  0.005513  0.004682  0.007813
  1.780220  0.005304  0.004895  0.008025
  1.829670  0.005099  0.005114  0.008025
  1.879121  0.004898  0.005340  0.008025
  1.928571  0.004701  0.005572  0.008025
  1.978022  0.004508  0.005809  0.008025
  2.027473  0.004319  0.006054  0.008025
  2.076923  0.004135  0.006304  0.008025
  2.126374  0.003954  0.006561  0.008025
  2.175824  0.003777  0.006825  0.008025
  2.225275  0.003604  0.007095  0.008025
  2.274725  0.003436  0.007372  0.008025
  2.324176  0.003271  0.007656  0.008025
  2.373626  0.003110  0.007947  0.008025
  2.423077  0.002954  0.008245  0.008025
  2.472527  0.002801  0.008550  0.008025
  2.500000  0.002653  0.018316  0.008025
  END FTABLE  6
  FTABLE      5
   42    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.002653  0.000000  0.000000  0.000000  0.000000
  0.049451  0.015575  0.000761  0.000000  0.033159  0.000000
  0.098901  0.015931  0.001540  0.000000  0.034217  0.000000
  0.148352  0.016292  0.002337  0.000000  0.035276  0.000000
  0.197802  0.016657  0.003152  0.000000  0.036334  0.000000
  0.247253  0.017026  0.003985  0.000000  0.037392  0.000000
  0.296703  0.017399  0.004836  0.000000  0.038450  0.000000
  0.346154  0.017776  0.005706  0.000000  0.039509  0.000000
  0.395604  0.018157  0.006594  0.000000  0.040567  0.000000
  0.445055  0.018543  0.007502  0.000000  0.041625  0.000000
  0.494505  0.018932  0.008428  0.000000  0.042683  0.000000
  0.543956  0.019325  0.009374  0.000000  0.043742  0.000000
  0.593407  0.019722  0.010339  0.000000  0.044800  0.000000
  0.642857  0.020124  0.011325  0.000000  0.045858  0.000000
  0.692308  0.020529  0.012330  0.000000  0.046916  0.000000
  0.741758  0.020938  0.013355  0.000000  0.047975  0.000000
  0.791209  0.021352  0.014401  0.000000  0.049033  0.000000
  0.840659  0.021769  0.015467  0.000000  0.050091  0.000000
  0.890110  0.022191  0.016554  0.000000  0.051149  0.000000
  0.939560  0.022616  0.017662  0.000000  0.052208  0.000000
  0.989011  0.023046  0.018791  0.000000  0.053266  0.000000
  1.038462  0.023480  0.019941  0.079976  0.054324  0.000000
  1.087912  0.023917  0.021113  0.275387  0.055383  0.000000
  1.137363  0.024359  0.022307  0.532289  0.056441  0.000000
  1.186813  0.024805  0.023522  0.826090  0.057499  0.000000
  1.236264  0.025255  0.024760  1.133165  0.058557  0.000000
  1.285714  0.025708  0.026020  1.429395  0.059616  0.000000
  1.335165  0.026166  0.027303  1.692395  0.060674  0.000000
  1.384615  0.026628  0.028608  1.905359  0.061732  0.000000
  1.434066  0.027094  0.029936  2.061968  0.062790  0.000000
  1.483516  0.027564  0.031288  2.172110  0.063849  0.000000
  1.532967  0.028038  0.032662  2.299375  0.064907  0.000000
  1.582418  0.028516  0.034061  2.403681  0.065965  0.000000
  1.631868  0.028999  0.035483  2.503645  0.067023  0.000000
  1.681319  0.029485  0.036929  2.599769  0.068082  0.000000
  1.730769  0.029975  0.038399  2.692463  0.069140  0.000000
  1.780220  0.030469  0.039894  2.782070  0.070198  0.000000
  1.829670  0.030968  0.041413  2.868880  0.071257  0.000000
  1.879121  0.031470  0.042956  2.953139  0.072315  0.000000
```

```
  1.928571  0.031976  0.044525  3.035059  0.073373  0.000000
  1.978022  0.032487  0.046119  3.114826  0.074431  0.000000
  2.000000  0.032715  0.046835  3.192601  0.074902  0.000000
  END FTABLE  5
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    1.143          PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.143          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
WDM      2 PREC     ENGL    1.143          RCHRES   1     EXTNL  PREC
WDM      2 PREC     ENGL    1.143          RCHRES   3     EXTNL  PREC
WDM      2 PREC     ENGL    1.143          RCHRES   5     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.76           RCHRES   2     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   3     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.76           RCHRES   4     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   5     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.76           RCHRES   6     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   2 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1002 STAG     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1003 FLOW     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   4 HYDR   RO     1 1        1      WDM   1004 FLOW     ENGL      REPL
RCHRES   4 HYDR   STAGE  1 1        1      WDM   1005 STAG     ENGL      REPL
RCHRES   3 HYDR   STAGE  1 1        1      WDM   1006 STAG     ENGL      REPL
RCHRES   3 HYDR   O      1 1        1      WDM   1007 FLOW     ENGL      REPL
RCHRES   6 HYDR   RO     1 1        1      WDM   1008 FLOW     ENGL      REPL
RCHRES   6 HYDR   STAGE  1 1        1      WDM   1009 STAG     ENGL      REPL
RCHRES   5 HYDR   STAGE  1 1        1      WDM   1010 STAG     ENGL      REPL
RCHRES   5 HYDR   O      1 1        1      WDM   1011 FLOW     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        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

  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
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  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
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RCHRES     OFLOW  OVOL   2                 COPY           INPUT  MEAN
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END MASS-LINK

END RUN
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Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

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Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

APPENDIX C

Preliminary Site Plan

Pacific Tech Construction Site Plan

Located in the SW 1/4 of Section 35 T8N, R2W, W.M.
Cowlitz County, Washington

GENERAL NOTES

OWNER:
Pacific Tech Development, LLC
1302 Walnut Street
Kelso, WA 98626
Phone : (360) 414-8084
Fax: (360) 414-8196

DEVELOPER: *Same as Owner*

SITE ADDRESS:
Parcel Number: 24355
KEOL 561, 561B-1, and 561D-1
in V Wallace DLC
1303 S 13th Avenue
Kelso, WA 98626

PROJECT ENGINEER:
Tim S. Wines
Three Rivers Land Services
604 N. 16th Avenue
Kelso, WA 98626
PH: (360) 431-9988

PRESENT USE:
The site is currently vacant. There are currently no existing structures on the site.

EXISTING STREETS:
NE 13th Avenue fronts the site along the west.

EXISTING ZONING:
ILM

SANITARY SEWER SERVICE:
City of Kelso

WATER SERVICE:
City of Kelso

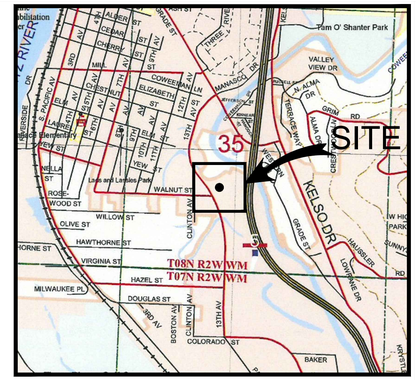
ELECTRICAL SERVICE:
Cowlitz PUD

SETBACKS:
Front = 20 ft
Rear = 0 ft
Side = 0 ft

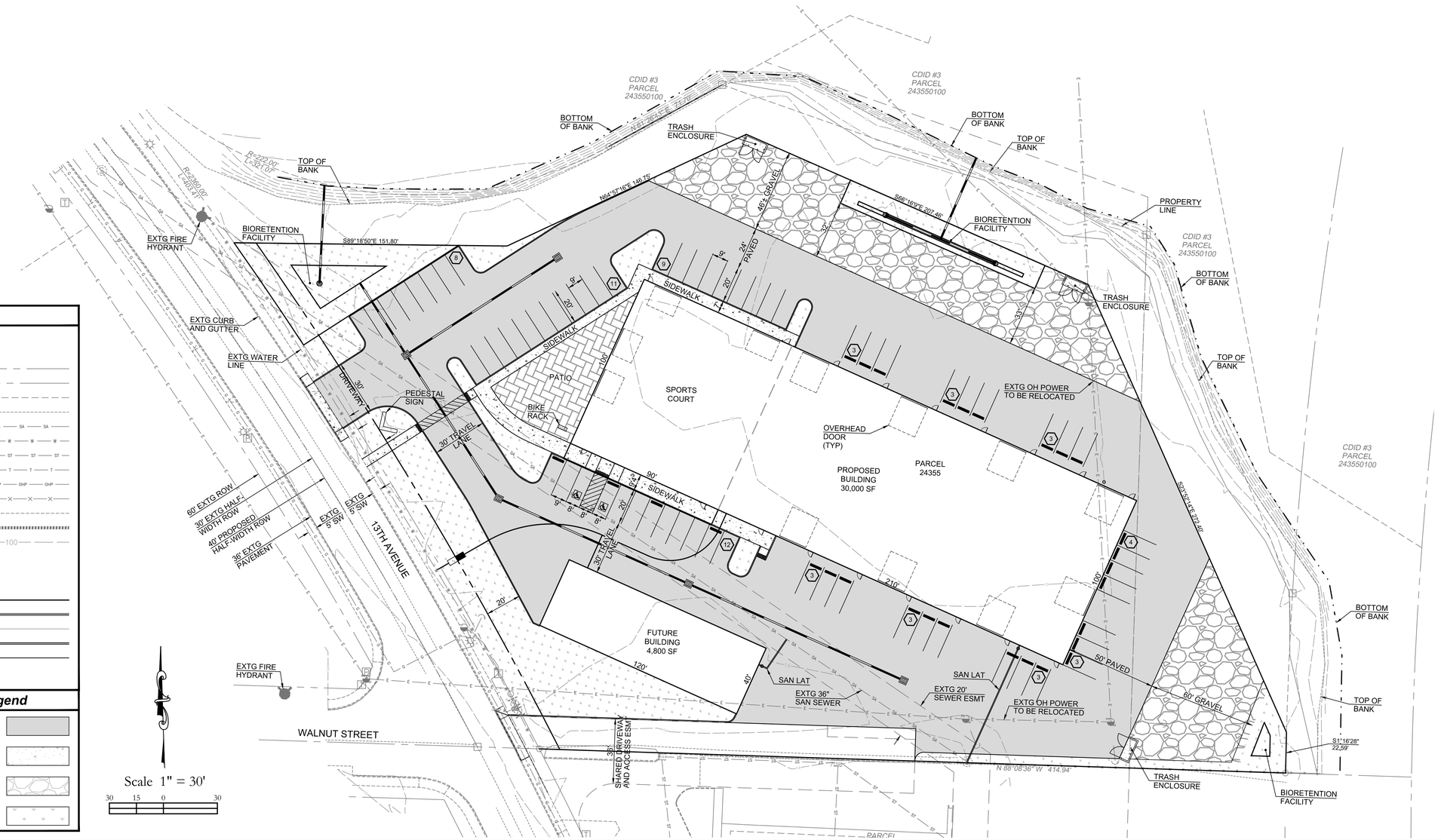
PARKING:
Standard Space = 63
ADA Spaces = 2
Total Spaces = 65

WELLS OR SEPTICS:
None

EXISTING CONDITIONS (ON-SITE):
Per Lawson Land Services survey dated 10/2/07.



VICINITY MAP
NOT TO SCALE



Linetype Legend

Existing	
Existing Road Right-of-Way	
Existing Road Centerline	
Existing Property Line	
Existing Pavement Edge	
Existing Sanitary Sewer	SA SA SA SA
Existing Waterline	W W W W W
Existing Storm Sewer	ST ST ST ST ST
Existing Telephone	T T T T T
Existing Overhead Power	OHP OHP OHP OHP
Existing Fence	X X X X X
Existing Sidewalk	
Existing Paint Striping	
Existing Ground Contour	100
Proposed	
Proposed Property Line	
Proposed Sanitary Lateral	
Proposed Water Service	
Proposed Curb	
Proposed Edge of Pavement	

Proposed Hatching Legend

Proposed Asphalt Section	
Proposed Concrete	
Proposed Gravel	
Proposed Landscaping	

THREE RIVERS LAND SERVICES

Conceptual Site Plan for:
Pacific Tech Construction
Located in Kelso, Washington

Three Rivers Land Services | Consulting Engineers & Planners | 604 N 16th Avenue, Kelso, WA 98626 | PH (360) 431-9988

Revisions			
A	7/14/20	For Review	TSW
B			
1			
2			
3			
4			

Project No.	1053
SCALE:	H: 1" = 30' V: N/A
DESIGNED BY:	TSW
DRAFTED BY:	TSW
REVIEWED BY:	TSW

1
1

APPENDIX D

Geotechnical Report

Geotechnical Site Investigation

Pacific Tech Construction

Kelso, Washington

August 8, 2019

Geotechnical ■ Environmental ■ Special Inspections

Columbia West
Engineering, Inc

11917 NE 95th Street
Vancouver, Washington
98682
Phone: 360-823-2900
Fax: 360-823-2901




www.columbiawestengineering.com

Geotechnical ■ Environmental ■ Special Inspections
Columbia West Engineering, Inc

GEOTECHNICAL SITE INVESTIGATION
PACIFIC TECH CONSTRUCTION
KELSO, WASHINGTON

Prepared For:

Pacific Tech Construction, Inc.
c/o Mr. Tim Wines, PE
Three Rivers Land Services, PLLC
1302 Walnut Street
Kelso, Washington 98626

Site Location:

1303 13th Avenue S
Kelso, Washington
Parcel No. 24355

Prepared By:

Columbia West Engineering, Inc.
11917 NE 95th Street
Vancouver, Washington 98682
Phone: 360-823-2900
Fax: 360-823-2901

Date Prepared:

August 8, 2019

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B	Soil Classification Information
C	Photo Log
D	2008 Exploration Map, Logs, and Laboratory Test Results
E	Liquefaction Evaluation
F	Report Limitations and Important Information

GEOTECHNICAL SITE INVESTIGATION
PACIFIC TECH CONSTRUCTION
KELSO, WASHINGTON

1.0 INTRODUCTION

Columbia West Engineering, Inc. was retained by Pacific Tech Construction to conduct a geotechnical site investigation for a proposed commercial development located in Kelso Washington. The purpose of the investigation was to observe and assess subsurface soil conditions at specific locations and provide subsequent appropriate geotechnical engineering analyses to support property development, planning, and design recommendations. The scope of services was outlined in a proposal contract dated April 22, 2019. Columbia West's previous work at the site included a geotechnical site investigation for the proposed *Pacific Tech Construction* project (Columbia West, 2008). This current report summarizes the investigation and provides field assessment documentation and laboratory analytical test reports. This report is subject to the limitations expressed in Section 6.0, *Conclusion and Limitations* and Appendix F.

1.1 General Site Information

As indicated on Figures 1 and 2, the subject site is located at 1303 13th Avenue S in Kelso, Washington. The site is bounded by 13th Avenue S to the west, an existing commercial property to the south, and a canal to the north and east. The regulatory jurisdictional agency is the City of Kelso, Washington. The approximate latitude and longitude are N 46° 7' 52" and W 122° 54' 7" and the legal description is a portion of the SE ¼ of Section 35, T8N, R2W, Willamette Meridian. The subject property comprises approximately 3.08 acres.

1.2 Proposed Development

Preliminary correspondence with the project civil engineer indicates site development will consist of a 12,000 square-foot manufactured warehouse building, private paved parking areas and access drives, essential underground utilities, and stormwater management appurtenances. Columbia West has not reviewed preliminary grading plans but understands that cut and fill may be proposed at the property. This report is based upon proposed development as described above and may not be applicable if modified.

2.0 REGIONAL GEOLOGY AND SOIL CONDITIONS

The subject site lies within the Kelso-Longview area in southwest Washington, approximately ninety miles east of the Pacific Ocean at the confluence of the Cowlitz and Columbia Rivers. Kelso and Longview are situated between low, broadly eroded rounded hills that form the foothills of the western Cascade Mountain range.

According to the *Geologic Map of Washington – Southwest Quadrant* (Washington Division of Geology and Earth Resources Geologic Map GM-34, 1987) and the *Geologic Map of the Mount St. Helen's Quadrangle, Washington and Oregon* (Washington Division of Geology

and Earth Resources Open File Report 87-4, 1987) near-surface soils are expected to consist of recent Quaternary-aged silt, sand, and gravel alluvium deposits (Qa).

The *Web Soil Survey* (United States Department of Agriculture, Natural Resource Conservation Service [USDA NRCS], 2019 Website) identifies surface soils primarily as Caples silty clay loam. Although soil conditions may vary from the broad USDA descriptions, Caples soils are generally fine textured, somewhat poorly drained soils developed in flood plains derived from alluvial materials. Caples soils exhibit low permeability, high shrink swell potential, low shear strength, and a slight erosion hazard based primarily on grade.

3.0 REGIONAL SEISMOLOGY

Recent research and subsurface mapping investigations within the Pacific Northwest appear to suggest the historic potential risk for a large earthquake event with strong localized ground movement may be underestimated. Past earthquakes in the Pacific Northwest appear to have caused landslides and ground subsidence, in addition to severe flooding near coastal areas. Earthquakes may also induce soil liquefaction, which occurs when elevated horizontal ground acceleration and velocity cause soil particles to interact as a fluid as opposed to a solid. Liquefaction of soil can result in lateral spreading and temporary loss of bearing capacity and shear strength.

There are at least four major known fault zones in the vicinity of the site that may be capable of generating potentially destructive horizontal accelerations. These fault zones are described briefly in the following text.

Portland Hills Fault Zone

The Portland Hills Fault Zone consists of several northwest-trending faults located along the northeastern margin of the Tualatin Mountains, also known as the Portland Hills, and the southwest margin of the Portland Basin. The fault zone is approximately 25 to 30 miles in length and is located approximately 27 miles south of the site. According to *Seismic Design Mapping, State of Oregon* (Geomatrix Consultants, 1995), there is no definitive consensus among geologists as to the zone fault type. Several alternate interpretations have been suggested.

According to the *USGS Earthquake Hazards Program*, the fault was originally mapped as a down-to-the-northeast normal fault, but has also been mapped as part of a regional-scale zone of right-lateral, oblique slip faults, and as a steep escarpment caused by asymmetrical folding above a south-west dipping, blind thrust fault. The Portland Hills fault offsets Miocene Columbia River Basalts, and Miocene to Pliocene sedimentary rocks of the Troutdale Formation. No fault scarps on surficial Quaternary deposits have been described along the fault trace, and the fault is mapped as buried by the Pleistocene-aged Missoula flood deposits.

However, evidence suggests that fault movement has impacted shallow Holocene deposits and deeper Pleistocene sediments. Seismologists recorded a magnitude (M) 3.2 earthquake thought to be associated with the fault zone near Kelly Point Park in November 2012, a M3.9 earthquake thought to be associated with the fault zone near Kelly Point Park

in April 2003, and a M3.5 earthquake possibly associated with the fault zone approximately 1.3 miles east of the fault in 1991. Therefore, the Portland Hills Fault Zone is generally thought to be potentially active and capable of producing possible damaging earthquakes.

Gales Creek-Newberg-Mt. Angel Fault Zone

Located approximately 36 miles southwest of the site, the northwest-striking, approximately 50-mile long Gales Creek-Newberg-Mt. Angel Structural Zone forms the northwestern boundary between the Oregon Coast Range and the Willamette Valley, and consists of a series of discontinuous northwest-trending faults. The southern end of the fault zone forms the southwest margin of the Tualatin basin. Possible late-Quaternary geomorphic surface deformation may exist along the structural zone (Geomatrix Consultants, 1995).

According to the *USGS Earthquake Hazards Program*, the Mount Angel fault is mapped as a high-angle, reverse-oblique fault, which offsets Miocene rocks of the Columbia River Basalts, and Miocene and Pliocene sedimentary rocks. The fault appears to have controlled emplacement of the Frenchman Spring Member of the Wanapum Basalts, and thus must have a history that predates the Miocene age of these rocks. No unequivocal evidence of deformation of Quaternary deposits has been described, but a thick sequence of sediments deposited by the Missoula floods covers much of the southern part of the fault trace.

Although no definitive evidence of impacts to Holocene sediments have clearly been identified, the Mount Angel fault appears to have been the location of minor earthquake swarms in 1990 near Woodburn, Oregon, and a M5.6 earthquake in March 1993 near Scotts Mills, approximately four miles south of the mapped extent of the Mt. Angel fault. It is unclear if the earthquake occurred along the fault zone or a parallel structure. Therefore, the Gales Creek-Newberg-Mt. Angel Structural Zone is considered potentially active.

Lacamas Lake-Sandy River Fault Zone

The northwest-trending Lacamas Lake Fault and northeast-trending Sandy River Fault intersect north of Camas, Washington approximately 43 miles southeast of the site, and form part of the northeastern margin of the Portland basin. According to *Geology and Groundwater Conditions of Clark County Washington* (USGS Water Supply Paper 1600, Mundorff, 1964) and the *Geologic Map of the Lake Oswego Quadrangle* (Oregon DOGAMI Series GMS-59, 1989), the Lacamas Lake fault zone consists of shear contact between the Troutdale Formation and underlying Oligocene andesite-basalt bedrock. Secondary shear contact associated with the fault zone may have produced a series of prominent northwest-southeast geomorphic lineaments in proximity to the site.

According to the *USGS Earthquake Hazards Program* the fault has been mapped as a normal fault with down-to-the-southwest displacement, and has also been described as a steeply northeast or southwest-dipping, oblique, right-lateral, slip-fault. The trace of the Lacamas Lake fault is marked by the linear lower reach of Lacamas Creek. No fault scarps on Quaternary surficial deposits have been described. The Lacamas Lake fault offsets Pliocene-aged sedimentary conglomerates generally identified as the Troutdale formation, and Pliocene- to Pleistocene-aged basalts generally identified as the Boring Lava formation.

Recent seismic reflection data across the probable trace of the fault under the Columbia River yielded no unequivocal evidence of displacement underlying the Missoula flood deposits, however, recorded mild seismic activity during the recent past indicates this area may be potentially seismogenic.

Cascadia Subduction Zone

The Cascadia Subduction Zone has recently been recognized as a potential source of strong earthquake activity in the Portland/Vancouver Basin. This phenomenon is the result of the earth's large tectonic plate movement. Geologic evidence indicates that volcanic ocean floor activity along the Juan de Fuca ridge in the Pacific Ocean causes the Juan de Fuca Plate to perpetually move east and subduct under the North American Continental Plate. The subduction zone results in historic volcanic and potential earthquake activity in proximity to the plate interface, believed to lie approximately 20 to 50 miles west of the general location of the Oregon and Washington coast (Geomatrix Consultants, 1995).

4.0 GEOTECHNICAL AND GEOLOGIC FIELD INVESTIGATION

A geotechnical field investigation consisting of visual reconnaissance and cone penetrometer testing (CPT-1) was conducted at the site on May 31, 2019. Columbia West's previous geotechnical field investigation, *Pacific Tech Construction* project (Columbia West, 2008) consisting of visual reconnaissance and nine test pits (TP-1 through TP-3 and 6 undocumented fill test pits) was conducted at the site on November 1, 2007.

Cone penetrometer testing was conducted with a track-mounted CPT rig. Subsurface soil profiles were logged in accordance with Unified Soil Classification System (USCS) specifications. Subsurface soil behavior was logged in accordance with the *Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils* (ASTM D5778-12). Subsurface exploration logs for the 2019 geotechnical exploration are presented in Appendix A. Disturbed soil samples were collected from relevant soil horizons and submitted for laboratory analysis during the 2008 geotechnical site investigation. Exploration logs, associated laboratory test results, and a exploration location map for geotechnical work conducted in 2008 are provided in Appendix D. Soil descriptions and classification information are provided in Appendix B. A photo log is presented in Appendix C. The 2019 subsurface exploration location and proposed development is indicated on Figure 2.

4.1 Surface Investigation and Site Description

The subject site consists of tax parcel 24355 totaling approximately 3.08 acres and is located at 1303 13th Avenue S in Kelso, Washington. The site is bounded by 13th Avenue S to the west, an existing commercial property to the south, and a canal to the north and east.

The site is accessed via a concrete drive apron stemming from 13th Avenue S. The site is primarily open and covered with grass, shrub, and blackberry vegetation. No existing structures were observed onsite. Observed development consisted of a gravel parking and storage area in the southern area of the site. Field reconnaissance and review of topographic mapping indicates the subject site is relatively flat with site elevations ranging from approximately 14 to 16 feet above mean sea level. Slopes approximately 8 to 10 feet high

with inclinations ranging from 1H:1V to 2H:1V are located along the canal that borders the site to the north and east. An existing sanitary line and power line transect the western portion of the site. No other structures or improvements were observed at the site.

4.2 Subsurface Exploration and Investigation

In 2007, test pit explorations TP-1 through TP-3 were advanced at the site to a maximum depth of approximately 14 feet below ground surface (bgs). Also in 2007, undocumented fill exploration test pits were advanced at the site to a maximum depth of approximately five feet bgs. In 2019, cone penetrometer testing exploration CPT-1 was advanced to a maximum depth of approximately 75 feet bgs. The exploration locations were selected to observe subsurface soil characteristics in proximity to proposed development areas and are indicated on Figure 2 and Appendix D.

4.2.1 Soil Type Description

The field investigation indicated the presence of undocumented fill throughout most of the site at the surface or beneath the topsoil layer with the exception of the northern area. Observed undocumented fill extended to depths of approximately 1 to 5 feet bgs. Approximately 12 inches of vegetation and topsoil was observed in the areas where no fill was observed.

Underlying surface materials as described, subsurface soils resembling the native USDA Caples soil series descriptions were encountered. Subsurface lithology may generally be described by soil types identified in the following text. Field logs of the encountered materials are presented in Appendix A, *Exploration Logs* and Appendix D, *2008 Exploration Map, Logs, and Laboratory Test Results*.

Soil Type 1 - Undocumented FILL

Soil Type 1 represents undocumented FILL and was observed to primarily consist of medium dense sandy gravel intermixed with asphaltic concrete. The asphalt fragments observed were generally 3 to 6 inches thick and 2 to 3 feet in length. Soil Type 1 was encountered at the surface in test pit TP-3 and below the topsoil in undocumented fill test pits. The undocumented fill extended to observed depths ranging from approximately 1 to 5 feet bgs.

Soil Type 2 – SILT / Elastic SILT / Sandy SILT

Soil Type 2 was observed to consist of grey, brown, and blue, mottled, moist to wet, medium stiff to stiff, SILT, elastic SILT, and Sandy SILT. Soil Type 2 was observed below the topsoil layer in test pits TP-1 and TP-2 and below the undocumented fill (Soil Type 1) in TP-3 and extended to the maximum depths explored in test pit explorations.

Analytical laboratory testing conducted upon representative soil samples obtained from test pit TP-1 indicated approximately 56 to 87 percent by weight passing the No. 200 sieve and in situ moisture contents ranging from 31 to 62 percent. Atterberg limits analysis indicated a liquid limit ranging from 65 to 66 and a plasticity index ranging from 27 to 30. Laboratory tested samples of Soil Type 2 are classified SM and ML according to USCS specifications and A-7 and A-6 according to AASHTO specifications.

Soil Type 3 – Silty SAND / SAND

Soil behavior measurements obtained from cone penetration test CPT-1 recorded undrained shear strength, tip resistance, differential pore pressure ratio, and friction ratio to evaluate subsurface properties and classify soils. CPT-1 soil behavior measurements indicated that interbedded layers of sandy SILT (Soil Type 2) and silty SAND (Soil Type 3) were encountered from approximately 10 to 18 feet bgs and silty SAND to SAND (Soil Type 3) with varying stratigraphic sequencing was encountered at approximately 18 feet bgs and extended to the maximum depth of exploration in the CPT exploration location.

4.2.2 Groundwater

Groundwater was observed or measured within subsurface explorations conducted in 2007 and 2019 at depths ranging from approximately 8 to 11 feet bgs. The observed or measured ground water elevations approximately coincided with the elevation of surface water in the existing canal bordering the northern and eastern areas of the site. Mitigation of shallow groundwater within proposed development areas is discussed in greater detail in Section 5.8, *Dewatering* and in Section 5.13*, Drainage.*

Note that groundwater levels are often subject to seasonal variance and may rise during extended periods of increased precipitation. Perched groundwater may also be present in localized areas. Seeps and springs may become evident during site grading, primarily along slopes or in areas cut below existing grade. Structures, roads, and drainage design should be planned accordingly.

5.0 DESIGN RECOMMENDATIONS

The geotechnical site investigation suggests the proposed development is generally compatible with surface and subsurface soils, provided the recommendations presented in this report are utilized and incorporated into the design and construction processes. The primary geotechnical concerns associated with the site are undocumented fill, potentially expansive native soils, and existing canal slopes. Design recommendations are presented in the following text sections.

5.1 Site Preparation and Grading

Vegetation, organic material, unsuitable fill, and deleterious material that may be encountered should be cleared from areas identified for structures and site grading. Vegetation, other organic material, and debris should be removed from the site. Stripped topsoil should also be removed, or used only as landscape fill in nonstructural areas with slopes less than 25 percent. The anticipated stripping depth for sod and highly organic topsoil is approximately 10 to 12 inches. Stripping depths of 1 to 5 feet is anticipated in areas of undocumented fill. Actual stripping depths should be determined based upon visual observations made during construction when soil conditions are exposed. The post-construction maximum depth of landscape fill placed or spread at any location onsite should not exceed one foot.

Previously disturbed soil, debris, or unconsolidated fill encountered during grading or construction activities should be removed completely and thoroughly from structural areas.

This includes old foundations, basement walls, utilities, associated soft soils, and debris. Excavation areas should be backfilled with engineered structural fill. Test pits excavated during site exploration were backfilled loosely with onsite soils. These test pits should be located and properly backfilled with structural fill during site improvements construction. Trees, stumps, and associated roots should also be removed from structural areas, individually and carefully. Resulting cavities and excavation areas should be backfilled with engineered structural fill.

Site grading activities should be performed in accordance with requirements specified in the 2015 *International Building Code* (IBC), Chapter 18 and Appendix J, with exceptions noted in the text herein. Site preparation, soil stripping, and grading activities should be observed and documented by Columbia West.

5.1.1 Undocumented Fill

As described previously and indicated in Appendix D, *2008 Exploration Map, Logs, and Laboratory Test Results*, undocumented fill was observed within areas proposed for development during the 2008 geotechnical site investigation. Undocumented fill material was observed in test pit explorations TP-3 and undocumented fill test pits. The undocumented fill extended to observed depths of approximately one to five feet bgs and primarily consisted of silt, sand, and gravel intermixed with asphaltic concrete.

Undocumented fill and other previously disturbed soils or debris should be removed completely and thoroughly from structural areas. In some areas, undocumented fill may directly overlie vegetation and the original topsoil layer. This material should also be removed completely from structural areas. Upon removal of undocumented fill and disturbed soils, Columbia West should observe the exposed subgrade. It should be noted that due to the lapse of time between explorations and the limited scope of exploration conducted for this investigation, Columbia West cannot wholly eliminate uncertainty regarding the presence of unsuitable soils in areas not explored or the accuracy of the subsurface exploration findings of the 2008 geotechnical site investigation.

Excavation and removal of undocumented fill should extend at least 10 feet laterally beyond the outside edge of proposed building foundations. Future performance of foundations and slabs supported on undocumented fill cannot be predicted. Undocumented fill need not be removed from non-structural areas or proposed pavement areas if the pavement is designed to tolerate anticipated settlements or if increased maintenance or a reduced design life is acceptable to the project stakeholders. Additional recommendations for pavement design and construction are presented in Section 5.14, *Bituminous Asphalt and Portland Cement Concrete*.

Based upon Columbia West's investigation, undocumented fill soils (Soil Type 1) may be acceptable for reuse as structural fill, provided that materials are observed to exhibit index properties similar to those observed during this investigation and that construction adheres to the specifications presented in this report. Minor amounts of asphalt, concrete, and brick debris may also be incorporated into the structural fill provided that individual fragment sizes do not exceed six inches and that materials are well-blended into deeper portions of the fill

under the observation of Columbia West. Recommendations regarding the suitability of reusing undocumented fill soils as structural fill material should be provided in the field by Columbia West during construction.

5.2 Engineered Structural Fill

Areas proposed for fill placement should be appropriately prepared as described in the preceding text. Surface soils should then be scarified and compacted prior to additional fill placement. Engineered structural fill should be placed in loose lifts not exceeding 12 inches in depth and compacted using standard conventional compaction equipment. The soil moisture content should be within two percentage points of optimum conditions. A field density at least equal to 95 percent of the maximum dry density, obtained from the standard Proctor moisture-density relationship test (ASTM D698), is recommended for structural fill placement. Engineered structural fill placed on sloped grades should be benched to provide a horizontal surface for compaction.

Compaction of engineered structural fill should be verified by nuclear gauge field compaction testing performed in accordance with ASTM D6938. Field compaction testing should be performed for each vertical foot of engineered fill placed. Engineered fill placement should be observed by Columbia West.

Engineered structural fill placement activities should be performed during dry summer months if possible. Most clean native soils may be suitable for use as structural fill if adequately dried or moisture-conditioned to achieve recommended compaction specifications. Native soils may require addition of moisture during late summer months or after extended periods of warm dry weather. Compacted fine-textured fill soils should be covered shortly after placement.

Because they are moisture-sensitive, near-surface fine-textured soils are often difficult to excavate and compact during wet weather construction. If adequate compaction is not achievable with clean native soils, import structural fill consisting of granular fill meeting WSDOT specifications for *Gravel Borrow 9-03.14(1)* is recommended.

Representative samples of proposed engineered structural fill should be submitted for laboratory analysis and approval by Columbia West prior to placement. Laboratory analyses should include particle-size gradation and Proctor moisture-density analysis.

5.3 Cut and Fill Slopes

Fill placed on existing grades steeper than 5H:1V should be horizontally benched at least 10 feet into the slope. Fill slopes greater than six feet in height should be vertically keyed into existing subsurface soil. A typical fill slope cross-section is shown in Figure 3. Drainage implementations, including subdrains or perforated drain pipe trenches, may also be necessary in proximity to cut and fill slopes if seeps or springs are encountered. Drainage design may be performed on a case-by-case basis. Extent, depth, and location of drainage may be determined in the field by Columbia West during construction when soil conditions are exposed. Failure to provide adequate drainage may result in soil sloughing, settlement, or erosion.

Final cut or fill slopes at the site should not exceed 2H:1V or 20 feet in height without individual slope stability analysis. The values above assume a minimum horizontal setback for loads of 10 feet from top of cut or fill slope face or overall slope height divided by three (H/3), whichever is greater. A minimum slope setback detail for structures is presented in Figure 4.

Concentrated drainage or water flow over the face of slopes should be prohibited, and adequate protection against erosion is required. Fill slopes should be constructed by placing fill material in maximum 12-inch level lifts, compacting as described in Section 5.2, *Engineered Structural Fill* and horizontally benching where appropriate. Fill slopes should be overbuilt, compacted, and trimmed at least two feet horizontally to provide adequate compaction of the outer slope face. Proper cut and fill slope construction is critical to overall project stability and should be observed and documented by Columbia West.

5.4 Foundations

Based upon correspondence with the project civil engineer, foundation loading information was not currently available at the time of the geotechnical site investigation. Columbia West anticipates foundations will consist of shallow continuous perimeter or column spread footings. Footings should be designed by a licensed structural engineer and conform to the recommendations below. Typical building loads are not expected to exceed approximately 10 kips per foot for perimeter footings or 100 kips per column. If actual loading exceeds anticipated loading, additional analysis should be conducted for the specific load conditions and proposed footing dimensions.

The existing ground surface should be prepared as described in Section 5.1, *Site Preparation and Grading*, and Section 5.2, *Engineered Structural Fill*. Foundations should bear upon firm competent native soil (Soil Types 2 and 3) or engineered structural fill.

To evaluate bearing capacity for proposed structures, serviceability and reliability of shear resistance for subsurface soils was considered. Allowable bearing capacity is typically a function of footing dimension and subsurface soil properties, including settlement and shear resistance. Based upon in situ field testing and laboratory analysis, the estimated allowable bearing capacity for well-drained foundations prepared as described above is 1,000 psf. Bearing capacity may be increased by one-third for transient lateral forces such as seismic or wind. The estimated coefficient of friction between in situ compacted native soil or engineered structural fill and in-place poured concrete is 0.35. Lateral forces may also be resisted by an assumed passive soil equivalent fluid pressure of 250 psf/f against embedded footings. The upper six inches of soil should be neglected in passive pressure calculations.

Footings should extend to a depth at least 18 inches below lowest adjacent grade to provide adequate bearing capacity and protection against frost heave. Foundations constructed during wet weather conditions will require over-excavation of saturated subgrade soils and granular structural backfill prior to concrete placement. Over-excavation recommendations should be provided Columbia West during foundation excavation and construction. Excavations adjacent to foundations should not extend within a 2H:1V angle projected down from the outside bottom footing edge without additional geotechnical analysis.

Foundations should not be permitted to bear upon undocumented fill or disturbed soil (Soil Type 1). Because soil is often heterogeneous and anisotropic, Columbia West should observe foundation excavations prior to placing forms or reinforcing bar to verify subgrade support conditions are as anticipated in this report.

5.5 Slabs on Grade

Slab-on-grade floors should be supported on firm, competent, in situ soil or engineered structural fill. Disturbed soils and unsuitable fills in proposed slab locations should be removed and replaced with structural fill. The modulus of subgrade reaction is estimated to be 100 psi/inch.

Preparation and compaction beneath slabs should be performed in accordance with the recommendations presented in Section 5.1, *Site Preparation and Grading* and Section 5.2, *Engineered Structural Fill*. Slabs should be underlain by at least 6 inches of 1 ¼"-0 crushed aggregate meeting WSDOT 9-03.9(3). Geotextile filter fabric conforming to *WSDOT 2010 Standard Specification M 41-10, 9-33.2(1), Geotextile Properties, Table 3: Geotextile for Separation or Soil Stabilization* may be used below the crushed aggregate to increase subgrade support. If desired, a moisture barrier may be constructed beneath the slabs. Slabs should be appropriately waterproofed in accordance with the desired type of finished flooring. Slab thickness and reinforcement should be designed by an experienced structural engineer in accordance with anticipated loads.

5.6 Static Settlement

Foundation loading information was not currently available at the time of the geotechnical site investigation. Columbia West anticipates foundations will consist of shallow continuous perimeter or column spread footings. Maximum building loads are not expected to exceed approximately 10 kips per foot for perimeter footings or 100 kips per column. Based upon the anticipated foundation loading and allowable soil bearing pressures described above, Columbia West analyzed estimated static settlement for the proposed structure. Settlement analysis was conducted using Schmertmann's (1970, 1978) method to calculate vertical foundation displacement using CPT results. This method for estimating settlement of structures on sand is based upon elastic theory and the strain influence approach where the largest displacements do not occur immediately under the footing, but at the depth of the peak strain influence.

Results from the analysis indicate that total long-term static footing displacement for shallow foundations loaded as described above is not anticipated to exceed approximately 1 inch. Differential settlement between comparably loaded footing elements is not expected to exceed approximately ½ inch over a span of 50 feet. The resulting vertical displacement after loading may be due to elastic distortion, dissipation of excess pore pressure, or soil creep.

Correspondence with the project civil engineer, Three Rivers Land Services, PLLC indicates that site grading will be limited to minor excavation for shallow foundations and underground utility construction. In addition, Columbia West anticipates that slab loading for the proposed building will be less than 200 psf. Therefore, aerial settlement due to engineered fill

placement or large-area slab loading is not anticipated to exceed approximately 1 inch. If final grading plans or slab loading are inconsistent with the assumptions outlined above, Columbia West should be contacted to revise our analysis as necessary.

5.7 Excavation

Soils at the site were explored to a maximum depth of approximately 75 feet using a track-mounted cone penetrometer rig. Bedrock was not encountered and blasting or specialized rock-excavation techniques are not anticipated.

Groundwater was observed or measured within subsurface explorations conducted in 2007 and 2019 at depths ranging from approximately 8 to 11 feet bgs. Perched groundwater layers may exist at shallower depths depending on seasonal fluctuations of the water table. Recommendations as described in Section 5.8, *Dewatering* should be considered in locations where subsurface construction activities intersect the water table.

Based upon laboratory analysis and field testing, near-surface soils may be Washington State Industrial Safety and Health Administration (WISHA) Type C. For temporary open-cut excavations deeper than four feet, but less than 20 feet in soils of these types, the maximum allowable slope is 1.5H:1V. WISHA soil type should be confirmed during field construction activities by the contractor. Soil is often anisotropic and heterogeneous, and it is possible that WISHA soil types determined in the field may differ from those described above.

Site-specific shoring design may be required if open-cut excavations are infeasible or if excavations are proposed adjacent to existing infrastructure. Typical methods for stabilizing excavations consist of soldier piles and timber lagging, sheet pile walls, tiebacks and shotcrete, or pre-fabricated hydraulic shoring. Because lateral earth pressure distributions acting on below-grade structures are dependent upon the type of shoring system used, Columbia West should be contacted to conduct additional analysis when shoring type, excavation depths, and locations are known.

The contractor should be held responsible for site safety, sloping, and shoring. Columbia West is not responsible for contractor activities and in no case should excavation be conducted in excess of all applicable local, state, and federal laws.

5.8 Dewatering

Groundwater elevation and hydrostatic pressure should be carefully considered during design of utilities, retaining walls, or other structures that require below-grade excavation. As described previously, shallow groundwater may be encountered in areas of proposed development. Utility trenches in shallow groundwater areas or excavations and cuts that remain open for even short periods of time may undermine or collapse due to groundwater effects. Placement of layers of riprap or quarry spalls in localized areas on shallow excavation side slopes may be required to limit instability. Over-excavation and stabilization of pipe trenches or other excavations with imported crushed aggregate or gabion rock may also be necessary to provide adequate subgrade support.

Significant pumping and dewatering may be required to temporarily reduce the groundwater elevation to allow construction of proposed below-grade structures, installation of utilities, or

placement of structural fills. Dewatering via a sump within excavation zones may be insufficient to control groundwater and provide excavation side slope stability. Dewatering may be more feasibly conducted by installing a system of temporary well points and pumps around proposed excavation areas or utility trenches. Depending on proposed utility depths, a site-specific dewatering plan may be necessary. Well pumps should remain functioning at all times during the excavation and construction period. Suitable back-up pumps and power supplies should be available to prevent unanticipated shut-down of dewatering equipment. Failure to operate pumps full-time may result in flooding of the excavation zones, resulting in damage to forms, slopes, or equipment.

5.9 Lateral Earth Pressure

If retaining walls are proposed, lateral earth pressures should be carefully considered in the design process. Hydrostatic pressure and additional surcharge loading should also be considered. Retained material may include engineered structural backfill or undisturbed native soil. Structural wall backfill should consist of imported granular material meeting *Section 9-03.12(2)* of *WSDOT Standard Specifications*. Backfill should be prepared and compacted to at least 95 percent of maximum dry density as determined by the modified Proctor test (ASTM D1557). Recommended parameters for lateral earth pressures for retained soils and engineered structural backfill consisting of imported granular fill meeting WSDOT specifications for *Gravel Backfill for Walls 9-03.12(2)* are presented in Table 1.

The design parameters presented in Table 1 are valid for static loading cases only and are based upon in situ soils or compacted granular fill. The recommended earth pressures do not include surcharge loads, dynamic loading, hydrostatic pressure, or seismic design.

Table 1. Lateral Earth Pressure Parameters for Level Backfill

Backfill / Retained Material	Equivalent Fluid Pressure for Level Backfill			Wet Density	Drained Internal Angle of Friction
	At-rest	Active	Passive		
Undisturbed Native SILT / Elastic SILT / Sandy SILT [Soil Type 2]	62 pcf	43 pcf	282 pcf	110 pcf	26°
Undisturbed Native Silty SAND / SAND [Soil Type 3]	58 pcf	38 pcf	345 pcf	115 pcf	30°
Approved Structural Backfill Material	52 pcf	32 pcf	568 pcf	135 pcf	38°
WSDOT 9-03.12(2) compacted aggregate backfill					

** The upper 6 inches of soil should be neglected in passive pressure calculations. If exterior grade from top or toe of retaining wall is sloped, Columbia West should be contacted to provide location-specific lateral earth pressures.*

If seismic design is required for unrestrained walls, seismic forces may be calculated by superimposing a uniform lateral force of $10H^2$ pounds per lineal foot of wall, where H is the total wall height in feet. The resultant force should be applied at 0.6H from the base of the wall. If sloped backfill conditions are proposed for the site, Columbia West should be contacted for additional analysis and associated recommendations.

A continuous one-foot-thick zone of free-draining, washed, open-graded 1-inch by 2-inch drain rock and a 4-inch perforated gravity drain pipe is assumed behind retaining walls. Geotextile filter fabric should be placed between the drain rock and backfill soil.

Specifications for drainpipe design are presented in Section 5.13, *Drainage*. If walls cannot be gravity drained, saturated base conditions and/or applicable hydrostatic pressures should be assumed.

Final retaining wall design should be reviewed and approved by Columbia West. Retaining wall subgrade and backfill activities should also be observed and tested for compliance with recommended specifications by Columbia West during construction.

5.10 Seismic Design Considerations

According to the *American Society of Civil Engineers* (ASCE) *ASCE 7 Hazard Tool,* the anticipated peak ground and maximum considered earthquake spectral response accelerations resulting from seismic activity for the subject site are summarized in Table 2.

Table 2. Approximate Probabilistic Ground Motion Values for 'firm rock' sites based on subject property longitude and latitude

	2% Probability of Exceedance in 50 yrs
Peak Ground Acceleration	0.418 g
0.2 sec Spectral Acceleration	0.948 g
1.0 sec Spectral Acceleration	0.437 g

The listed probabilistic ground motion values are based upon "firm rock" sites with an assumed shear wave velocity of 2,500 ft/s in the upper 100 feet of soil profile. These values should be adjusted for site class effects by applying site coefficients Fa, Fv, and F_{PGA} as defined in *ASCE 7-10, Tables 11.4-1, 11.4-2, and 11.8-1*. The site coefficients are intended to more accurately characterize estimated peak ground and respective earthquake spectral response accelerations by considering site-specific soil characteristics and index properties.

The *Site Class Map of Clark County, Washington* (Washington State Department of Natural Resources, 2004), indicates site soils may be represented by Site Classes D to E. Based upon in situ testing and review of well logs and local geologic maps, site soils may be considered to be Site Class E as defined in *ASCE 7, Chapter 20, Table 20.3-1*.

This site class designation indicates that amplification of seismic energy may occur during a seismic event because of subsurface conditions. Additional seismic information is presented in Section 5.11, *Soil Liquefaction and Dynamic Settlement*.

Due to the presence of potentially liquefiable soils at the site, Site Class F criteria may be met if the fundamental period of vibration for the proposed structure is greater than 0.5 seconds and a site response analysis may be required to determine accelerations for liquefiable soils in accordance with Section 21.1 of *ASCE 7.*

Localized peak ground accelerations exceeding the adjusted values may occur in some areas in direct proximity to an earthquake's origin. This may be a result of amplification of seismic energy due to depth to competent bedrock, compression and shear wave velocity of bedrock, presence and thickness of loose, unconsolidated alluvial deposits, soil plasticity, grain size, and other factors.

Identification of specific seismic response spectra is beyond the scope of this investigation. If site structures are designed in accordance with recommendations specified in the *2015 IBC*, the potential for peak ground accelerations in excess of the adjusted and amplified values should be understood.

5.11 Soil Liquefaction and Dynamic Settlement

According to the *Liquefaction Susceptibility Map of Cowlitz County Washington* (Washington State Department of Natural Resources, 2004), the site is mapped as moderate to high susceptibility for liquefaction. Liquefaction, defined as the transformation of the behavior of a granular material from a solid to a liquid due to increased pore-water pressure and reduced effective stress, may occur when granular materials quickly compact under cyclic stresses caused by a seismic event. The effects of liquefaction may include immediate ground settlement and lateral spreading.

Procedures for evaluation of liquefaction resistance of soils have been developed based upon empirical data from liquefaction case studies and have become standard of practice in the United States. These empirical procedures are based upon correlation with SPT data or CPT data. CPT data obtained in the field are used in a series of empirical equations developed using previous data from liquefaction case studies. The procedure uses the CPT data to calculate two variables: the cyclic stress ratio (CSR), or the demand imposed on the soil layer due to an expected seismic event; and the cyclic resistance ratio (CRR), or the capacity of the soil to resist liquefaction. The ability of a soil to resist liquefaction can be calculated as the ratio of CRR to CSR and represented as a factor of safety. In general, a factor of safety greater than 1.3 is considered an acceptable risk.

Soils most susceptible to liquefaction are generally saturated, cohesionless, loose to medium-dense sands within 50 feet of the ground surface. Recent research has also indicated that low plasticity silts and clays may also be subject to sand-like liquefaction behavior if the plasticity index determined by the Atterberg Limits analysis is less than 8. Potentially liquefiable soils located above the existing, historic, or expected groundwater levels do not generally pose a liquefaction hazard. It is important to note that changes in perched groundwater elevation may occur due to project development or other factors not observed at the time of investigation.

The liquefaction potential for soils underlying the site was analyzed using the CLiq program and the Robertson NCEER method of analysis. Liquefaction analysis was conducted to a critical analysis depth of 60 feet on the soil profile obtained from CPT-1. Using a peak horizontal ground acceleration of 0.42g, an earthquake moment magnitude of 7.0 (based upon deaggregation of seismic hazards for the site using the *National Seismic Hazards Mapping Project, USGS 2008*), and a design groundwater depth of 7 feet below existing grade, the factor of safety was less than 1.3 for several soil layers, indicating high potential for liquefaction during a seismic event.

Based upon the empirical procedures and input data described above, the total estimated settlement due to liquefaction at the analyzed location is presented in Table 3. The analysis output of CLiq is presented in Appendix E. Note that dynamic settlement induced by

liquefaction occurs via different mechanisms than the estimated static settlement described in Section 5.6, *Static Settlement*.

Table 3. Estimated Settlement Induced by Liquefaction

Exploration	Liquefaction Evaluation Method	Anticipated Vertical Settlement with Depth Weighting Factor Applied
CPT-1	Robertson (NCEER 1998, 2009)	15.9 inches

According to Cetin et al, a depth weighting factor may be applied to the analysis of dynamic settlement. The depth weighting factor captures the effects of void ratio redistribution in shallower sublayers, reduced shear stresses and number of shear cycles transmitted to deeper soils due to the liquefaction of shallower soils, and arching of non-liquefiable soil layers.

5.12 Settlement Mitigation and Soil Improvements

As described below, potential earthquake-induced liquefaction settlements may be reduced by soil improvements. One or a combination of these soil improvement or mitigation methods may be desired to increase soil shear strength and reduce the amount of potential settlement.

In-situ soil densification may be considered to reduce potential liquefaction settlement. A variety of soil improvement methods are available. Some improvement methods, such as dynamic compaction, may not be feasible due to observed subsurface conditions. However, other improvement methods such as compaction grouting, rammed-aggregate piers, or stone columns may be possible. The compaction grouting process consists of injecting pressurized grout into the loose or weak soil layer in a closely-spaced grid pattern. Stone columns and rammed-aggregate piers are similarly constructed in a grid pattern and may be installed by vibratory or other methods. Both methods increase relative density by densifying the soil between the grout or stone column locations, thereby reducing potential for liquefaction. Stone columns may also provide drainage pathways to allow pore pressures in potentially liquefiable layers to dissipate more quickly. Other mitigation techniques may include driven grout piles or standard steel or concrete piles. Proposed soil improvement programs should be developed by a specialized contractor working in cooperation with licensed geotechnical and structural engineers.

Soil improvements may reduce the potential liquefaction-induced movements to an acceptable level of risk. After an appropriate mitigation plan is selected, additional in-situ testing prior to construction may be conducted to determine the level of improvement achieved and reevaluate the liquefaction potential. Selection of an appropriate mitigation plan may depend upon site planning, architectural, and structural engineering factors in addition to geotechnical concerns. All parties involved should work closely together to develop a suitable improvement plan with a clear understanding of the risks.

5.13 Drainage

At a minimum, site drainage should include surface water collection and conveyance to properly designed stormwater management structures and facilities. Drainage design in general should conform to City of Kelso Ground regulations. Finished site grading should be conducted with positive drainage away from structures. Depressions or shallow areas that may retain ponding water should be avoided. Roof drains, low-point drains, and perimeter foundation drains are recommended for structures. Drains should consist of separate systems and gravity flow with a minimum two-percent slope away from foundations into the stormwater system or approved discharge location.

Perimeter foundation drains should consist of 3-inch perforated PVC pipe surrounded by a minimum of 1 ft^3 of clean, washed drain rock per linear foot of pipe and wrapped with geotextile filter fabric. Open-graded drain rock with a maximum particle size of 3 inches and less than 2 percent passing the No. 200 sieve is recommended. Geotextile filter fabric should consist of Mirafi 140N or approved equivalent, with AOS between No. 70 and No. 100 sieve. The water permittivity should be greater than 1.5/sec. Figure 5 presents a typical foundation drain. Perimeter drains may limit increased hydrostatic pressure beneath footings and assist in reducing potential perched moisture areas.

Subdrains should also be considered if portions of the site are cut below surrounding grades. Shallow groundwater, springs, or seeps should be conveyed via drainage channel or perforated pipe into the stormwater management system or an approved discharge. Recommendations for design and installation of perforated drainage pipe may be performed on a case-by-case basis by Columbia West during construction. Failure to provide adequate surface and sub-surface drainage may result in soil slumping or unanticipated settlement of structures exceeding tolerable limits. A typical perforated drain pipe trench detail is presented in Figure 6.

Site improvements construction in some areas may occur at or near the shallow seasonal groundwater table, particularly if work is conducted during wet-weather conditions. Dewatering may be necessary and a drainage mat may be required to achieve sufficient elevation for fill placement. A typical drainage mat is shown on Figure 7. Columbia West should determine drainage mat location, extent, and thickness when subsurface conditions are exposed. Drainage mats may need to be constructed in conjunction with subdrains to convey captured water to an approved discharge location.

Foundation drains and subdrains should be closely monitored after construction to assess their effectiveness. If additional surface or shallow subsurface seeps become evident, the drainage provisions may require modification or additional drains. Columbia West should be consulted to provide appropriate recommendations.

5.14 Bituminous Asphalt and Portland Cement Concrete

Based upon review of preliminary site plans, proposed development includes private asphalt paved access drives and parking lots. General recommendations for private onsite flexible pavement sections are summarized below in Table 4. Columbia West recommends

adherence to City of Kelso Ground paving guidelines for roadway improvements in the public right-of-way.

Table 4. Private Onsite Flexible Pavement Section Recommendations

Pavement Section Layer	Minimum Layer Thickness		Specifications
	Passenger Vehicle Parking and Access Drives	*Heavy Truck Access Drives	
Asphalt concrete surface HMA Class ½" PG 64-22	3 inches	4 inches	91 percent of maximum Rice density (ASTM D2041)
Base course (WSDOT 9-03.9(3) 1¼"-0 crushed aggregate	8 inches	12 inches	95 percent of maximum modified Proctor density (ASTM D1557)
Scarified and compacted native soil or engineered structural fill	12 inches	12 inches	Compacted to 95 percent of maximum modified Proctor density (ASTM D1557)

*General recommendation based upon maximum traffic loading of up to 30 heavy trucks per day. If actual truck traffic exceeds 30 trucks per day, reduced pavement serviceability and design life should be expected.

For dry weather construction, pavement surface sections should bear upon competent subgrade consisting of scarified and compacted native soil or engineered structural fill. Wet weather pavement construction is discussed in Section 5.15, *Wet Weather Construction Methods and Techniques*. Subgrade conditions should be evaluated and tested by Columbia West prior to placement of crushed aggregate base. Subgrade evaluation should include nuclear gauge density testing and wheel proof-roll observations conducted with a loaded 12-cubic yard, double-axle dump truck or equivalent. Nuclear gauge density testing should be conducted at 150-foot intervals or as determined by the onsite geotechnical engineer. Subgrade soil should be compacted to at least 95 percent of the modified Proctor dry density, as determined by ASTM D1557. Areas of observed deflection or rutting during proof-roll evaluation should be excavated to a firm surface and replaced with compacted crushed aggregate.

Crushed aggregate base should be compacted and tested in accordance with the specifications outlined above. Asphalt concrete pavement should be compacted to at least 91 percent of maximum Rice density. Nuclear gauge density testing should be conducted to verify adherence to recommended specifications. Testing frequency should be in accordance with Washington Department of Transportation and City of Kelso specifications.

Portland cement concrete curbs and sidewalks should be installed in accordance with City of Kelso specifications. Curb and sidewalk aggregate base should be observed and proof-rolled by Columbia West. Soft areas that deflect or rut should be stabilized prior to pouring concrete. Concrete should be tested during installation in accordance with ASTM C171, C138, C231, C143, C1064, and C31. This includes casting of cylinder specimen at a frequency of four cylinders per 100 cubic yards of poured concrete. Recommended field concrete testing includes slump, air entrainment, temperature, and unit weight.

5.15 Wet Weather Construction Methods and Techniques

Wet weather construction often results in significant shear strength reduction and soft areas that may rut or deflect. Installation of granular working layers may be necessary to provide a firm support base and sustain construction equipment. Granular layers should consist of all-weather gravel, 2- to 4-inch gabion, or other similar material (six-inch maximum size with less than five percent passing the No. 200 sieve).

Construction equipment traffic across exposed soil should be minimized. Equipment traffic induces dynamic loading, which may result in weak areas and significant reduction in shear strength for wet soils. Wet weather construction may also result in generation of significant excess quantities of soft wet soil. This material should be removed from the site or stockpiled in a designated area.

Construction during wet weather conditions may require increased base thickness. Over-excavation of subgrade soils or subgrade amendment with lime and/or cement may be necessary to provide a firm base upon which to place crushed aggregate. Geotextile filter fabric is also recommended. If soil amendment with lime or cement is considered, Columbia West should be contacted to provide appropriate recommendations based upon observed field conditions and desired performance criteria.

Crushed aggregate base should be installed in a single lift with trucks end-dumping from an advancing pad of granular fill. During extended wet periods, stripping activities may also need to be conducted from an advancing pad of granular fill. Once installed, the crushed aggregate base should be compacted with several passes from a static drum roller. A vibratory compactor is not recommended because it may further disturb the subgrade. Subdrains may also be necessary to provide subgrade drainage and maintain structural integrity.

Crushed aggregate base should be compacted to at least 95 percent of maximum dry density according to the modified Proctor density test (ASTM D1557). Compaction should be verified by nuclear gauge density testing. Observation of a proof-roll with a loaded dump truck is also recommended as an indication of the compacted aggregate's performance.

It should be understood that wet weather construction is risky and costly. Columbia West should observe and document wet weather construction activities. Proper construction methods and techniques are critical to overall project integrity.

5.16 Erosion Control Measures

Based upon field observations and laboratory testing, the erosion hazard for site soils in flat to shallow-gradient portions of the property is likely to be low. The potential for erosion generally increases in sloped areas. Therefore, soil disturbance in sloped areas should be minimized during construction activities. Soil is also prone to erosion if unprotected and unvegetated during periods of increased precipitation. Erosion can be minimized by performing construction activities during dry summer months.

Site-specific erosion control measures should be implemented to address the maintenance of exposed areas. This may include silt fence, biofilter bags, straw wattles, or other suitable

methods. During construction activities, exposed areas should be well-compacted and protected from erosion with visqueen, surface tackifier, or other means, as appropriate. Temporary slopes or exposed areas may be covered with straw, crushed aggregate, or riprap in localized areas to minimize erosion. Erosion and water runoff during wet weather conditions may be controlled by application of strategically placed channels and small detention depressions with overflow pipes.

After grading, exposed surfaces should be vegetated as soon as possible with erosion-resistant native vegetation. Jute mesh or straw may be applied to enhance vegetation. Once established, vegetation should be properly maintained. Disturbance to existing native vegetation and surrounding organic soil should also be minimized during construction activities.

5.17 Soil Shrink/Swell Potential

Based upon laboratory analysis of soils collected and submitted during the 2008 geotechnical site investigation, near-surface soils contain approximately 50 to 87 percent by weight passing the No. 200 sieve and exhibit a plasticity index ranging from non-plastic to 30 percent. This indicates the potential for soil shrinking or swelling and underscores the importance of proper moisture conditioning during fill placement. Medium to high plasticity soils, if approved by Columbia West for use as structural fill, should be placed and compacted at a moisture content approximately two percent above optimum as determined by laboratory analysis.

5.18 Utility Installation

Utility installation may require subsurface excavation and trenching. Excavation, trenching and shoring should conform to federal (Occupational Safety and Health Administration) (OSHA) (29 CFR, Part 1926) and *WISHA* (WAC, Chapter 296-155) regulations. Site soils may slough when cut vertically and sudden precipitation events or perched groundwater may result in accumulation of water within excavation zones and trenches.

Utilities should be installed in general accordance with manufacturer's recommendations. Utility trench backfill should consist of *WSDOT 9-03.19 Bank Run Gravel for Trench Backfill, WSDOT 9-03.14(2) Select Borrow* with a maximum particle size of 2 ½-inches, or other granular free-draining material approved by Columbia West. Trench backfill material within 18 inches of the top of utility pipes should be hand compacted (i.e., no heavy compaction equipment). The remaining backfill should be compacted to at least 95 percent of maximum dry density as determined by the modified Proctor moisture-density test (ASTM D1557). Clean, free-draining, fine bedding sand is recommended for use in the pipe zone. With exception of the pipe zone, backfill should be placed in loose lifts not exceeding 12 inches in thickness.

Compaction of utility trench backfill material should be verified by nuclear gauge field compaction testing performed in accordance with ASTM D6938 and City of Kelso specifications.

Field compaction testing should be performed at 200-foot intervals along the utility trench centerline at the surface and midpoint depth of the trench. Compaction frequency and

specifications may be modified for non-structural areas in accordance with recommendations of the site geotechnical engineer.

6.0 CONCLUSION AND LIMITATIONS

This geotechnical site investigation report was prepared in accordance with accepted standard conventional principles and practices of geotechnical engineering. This investigation pertains only to material tested and observed as of the date of this report, and is based upon proposed site development as described in the text herein. This report is a professional opinion containing recommendations established by engineering interpretations of subsurface soils based upon conditions observed during site exploration. Soil conditions may differ between tested locations or over time. Slight variations may produce impacts to the performance of structural facilities if not adequately addressed. This underscores the importance of diligent QA/QC construction observation and testing to verify soil conditions are as anticipated in this report.

Therefore, this report contains several recommendations for field observation and testing by Columbia West personnel during construction activities. Columbia West cannot accept responsibility for deviations from recommendations described in this report. Future performance of structural facilities is often related to the degree of construction observation by qualified personnel. These services should be performed to the full extent recommended.

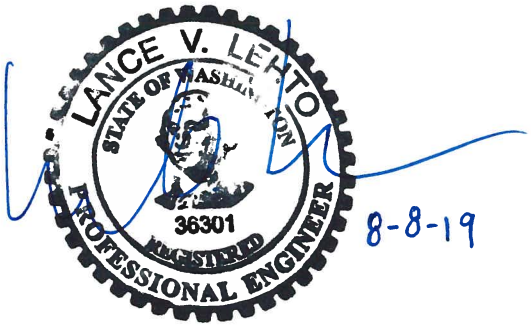
This report is not an environmental assessment and should not be construed as a representative warranty of site subsurface conditions. The discovery of adverse environmental conditions, or subsurface soils that deviate significantly from those described in this report, should immediately prompt further investigation. The above statements are in lieu of all other statements expressed or implied.

This report was prepared solely for the client and is not to be reproduced without prior authorization from Columbia West. Final engineering plans and specifications for the project should be reviewed and approved by Columbia West as they relate to geotechnical and grading issues prior to final design approval. Columbia West is not responsible for independent conclusions or recommendations made by other parties based upon information presented in this report. Unless a particular service was expressly included in the scope, it was not performed and there should be no assumptions based upon services not provided. Additional report limitations and important information about this document are presented in Appendix F. This information should be carefully read and understood by the client and other parties reviewing this document.

Sincerely,

COLUMBIA WEST ENGINEERING, Inc.

Lance V. Lehto, PE, GE
President



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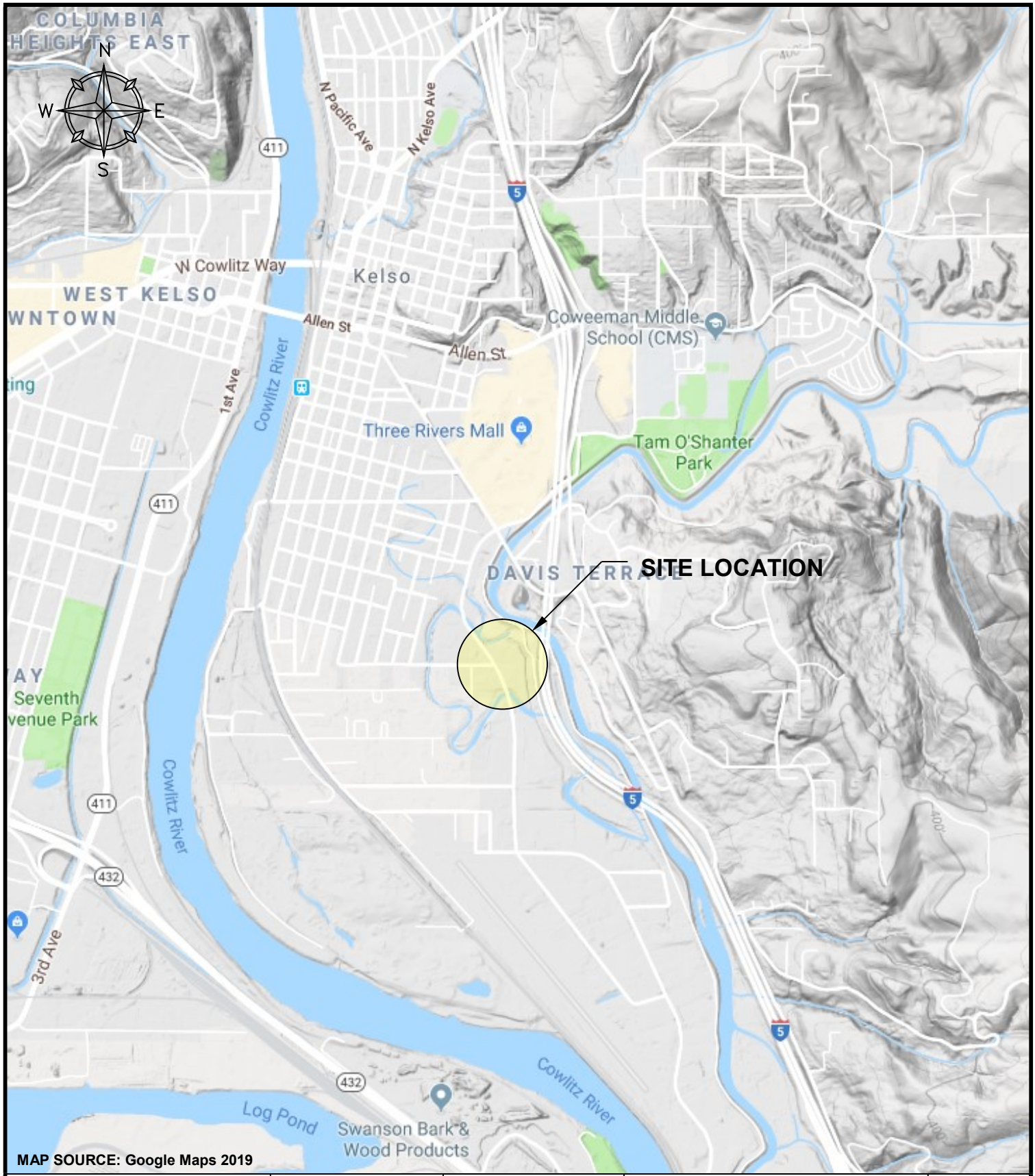
FIGURES



MAP SOURCE: Google Maps 2019

Geotechnical ▪ Environmental ▪ Special Inspections
Columbia West Engineering, Inc
11917 NE 95th Street
Vancouver, Washington 98682
Phone: 360-823-2900, Fax: 360-823-2901
www.columbiawestengineering.com

Design	Drawn: CWS		
Checked: LVL	Date: 7/15/2019		
Client: Pacific Tech	Rev	By	Date
Job No.: 07215			
CAD File: FIGURE 1			
Scale: NTS			

SITE LOCATION MAP

PACIFIC TECH CONSTRUCTION
KELSO, WASHINGTON

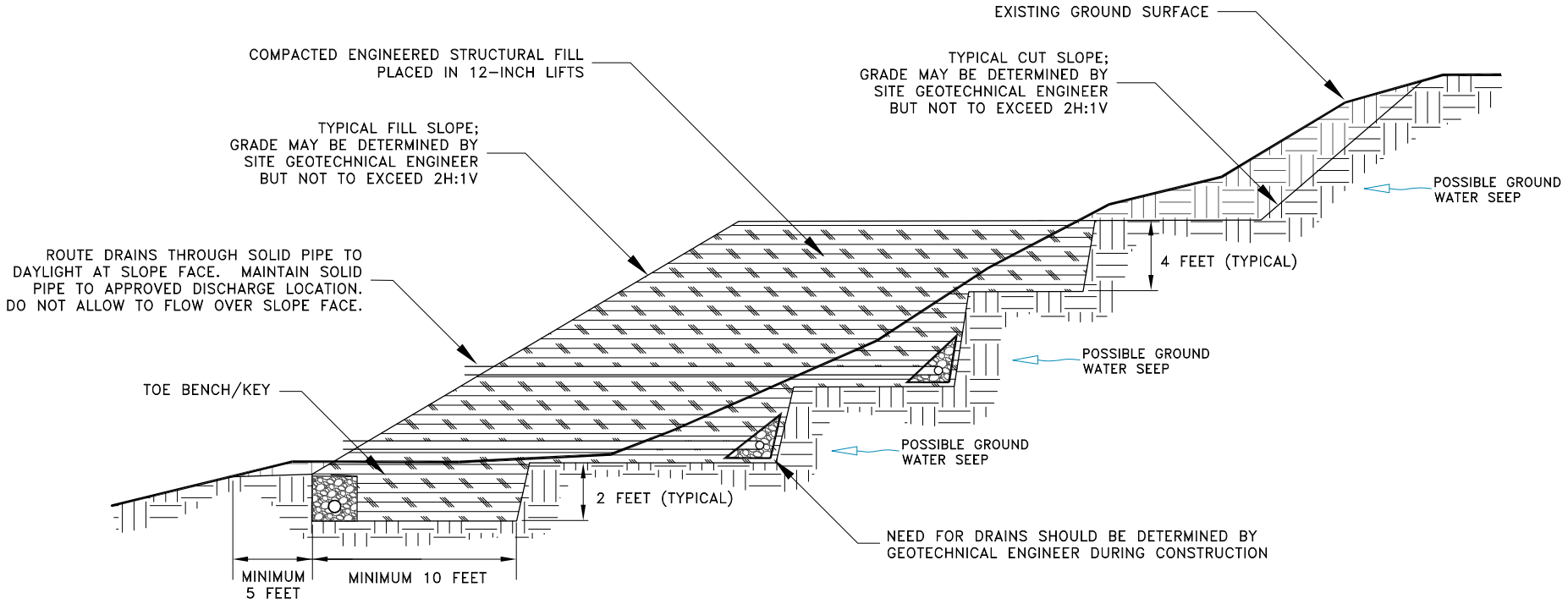
FIGURE 1

NOTES:
1. SITE LOCATION: 1303 13TH AVE S, KELSO, WASHINGTON.
2. SITE CONSISTS OF PARCEL 24355 TOTALING APPROXIMATELY 3.08 ACRES.
3. DRAWING IS NOT TO SCALE.
4. BASE MAP OBTAINED FROM GOOGLE EARTH, 2019. PROPOSED LAYOUT SCHEMATIC PROVIDED BY THREE RIVERS LAND SERVICES, PLLC.
5. SOIL EXPLORATION LOCATION IS APPROXIMATE AND NOT SURVEYED.
6. CPT EXPLORATION BACKFILLED LOOSELY WITH ONSITE SOILS ON MAY 31, 2019.

Geotechnical • Environmental • Special Inspections
Columbia West Engineering, Inc
11917 NE 95th STREET
VANCOUVER, WASHINGTON 98682
PHONE: 360-823-2900 FAX: 360-823-2901
www.columbiawestengineering.com

Design:	Drawn: CWS	EXPLORATION LOCATION MAP	FIGURE 2
Checked: LVL	Date: 7/7/19		
Client: PACIFIC TECH	Rev / By / Date	PACIFIC TECH CONSTRUCTION KELSO, WASHINGTON	
Job No: 07215			
CAD File: FIGURE 2			
Scale: NONE			

TYPICAL CUT AND FILL SLOPE CROSS-SECTION

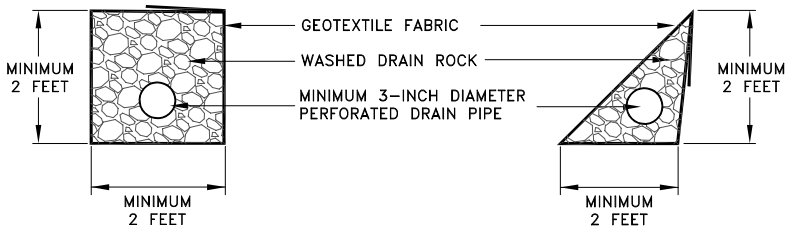


DRAIN SPECIFICATIONS

GEOTEXTILE FABRIC SHALL CONSIST OF MIRAFI 140N OR APPROVED EQUIVALENT WITH AOS BETWEEN No. 70 AND No. 100 SIEVE.

WASHED DRAIN ROCK SHALL BE OPEN-GRADED ANGULAR DRAIN ROCK WITH LESS THAN 2 PERCENT PASSING THE No. 200 SIEVE AND A MAXIMUM PARTICLE SIZE OF 3 INCHES.

TYPICAL DRAIN SECTION DETAIL



NOTES:
1. DRAWING IS NOT TO SCALE.
2. SLOPES AND PROFILES SHOWN ARE APPROXIMATE.
3. DRAWING REPRESENTS TYPICAL FILL AND CUT SLOPE SECTION, AND MAY NOT BE SITE-SPECIFIC.

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VANCOUVER, WASHINGTON 98682
PHONE: 360-823-2900 FAX: 360-823-2901
www.columbiawestengineering.com

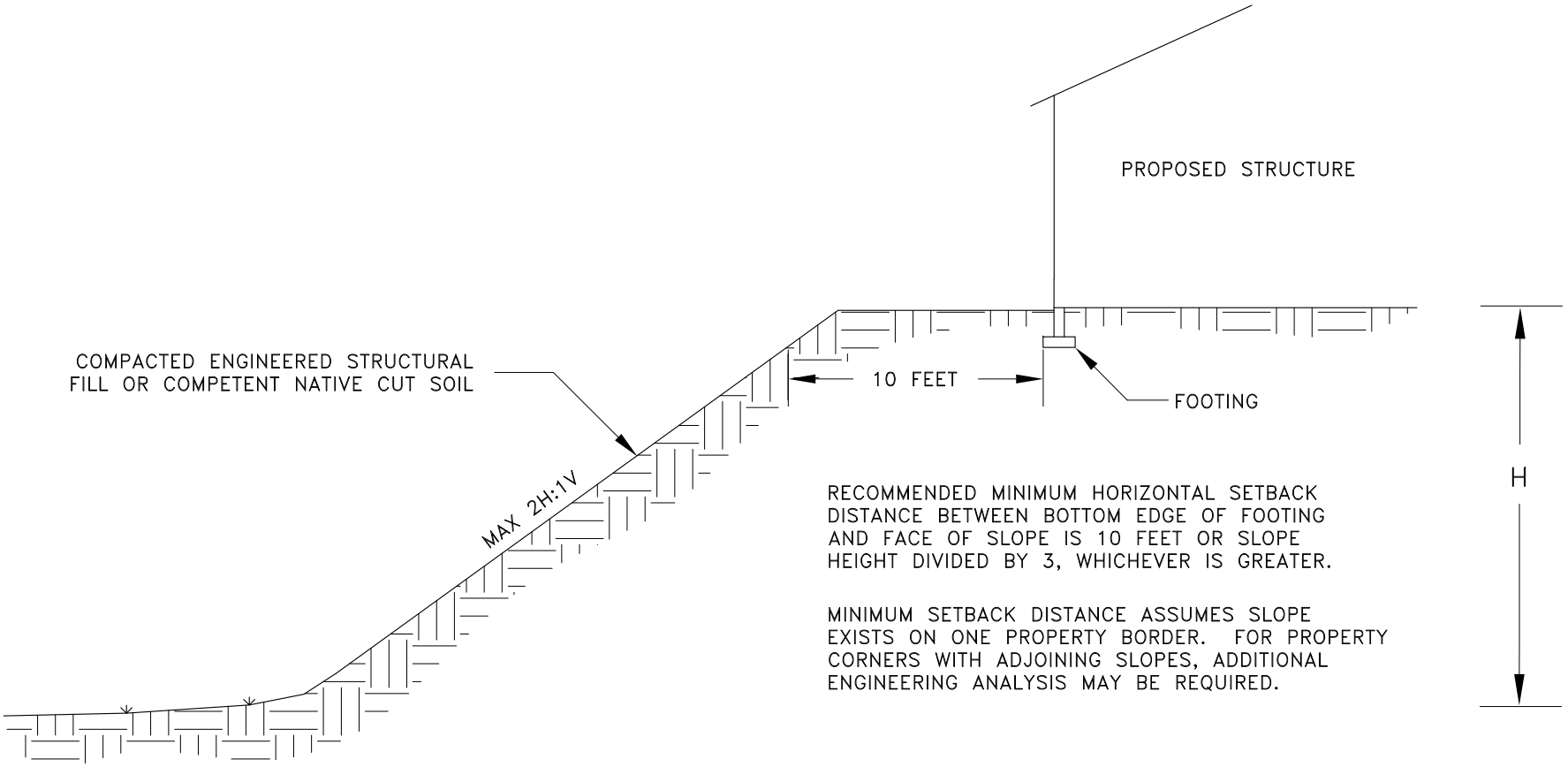
Design:	Drawn: CWS		
Checked: LVL	Date: 7/7/19		
Client: PACIFIC TECH	Rev	By	Date
Job No: 07215			
CAD File: FIGURE 3			
Scale: NONE			

TYPICAL CUT AND FILL SLOPE CROSS-SECTION

PACIFIC TECH CONSTRUCTION
KELSO, WASHINGTON

FIGURE 3

MINIMUM FOUNDATION SLOPE SETBACK DETAIL



RECOMMENDED MINIMUM HORIZONTAL SETBACK DISTANCE BETWEEN BOTTOM EDGE OF FOOTING AND FACE OF SLOPE IS 10 FEET OR SLOPE HEIGHT DIVIDED BY 3, WHICHEVER IS GREATER.

MINIMUM SETBACK DISTANCE ASSUMES SLOPE EXISTS ON ONE PROPERTY BORDER. FOR PROPERTY CORNERS WITH ADJOINING SLOPES, ADDITIONAL ENGINEERING ANALYSIS MAY BE REQUIRED.

NOTES:
1. DRAWING IS NOT TO SCALE.
2. SLOPES AND PROFILES SHOWN ARE APPROXIMATE.
3. DRAWING REPRESENTS TYPICAL FOUNDATION SETBACK DETAIL, AND MAY NOT BE SITE-SPECIFIC.

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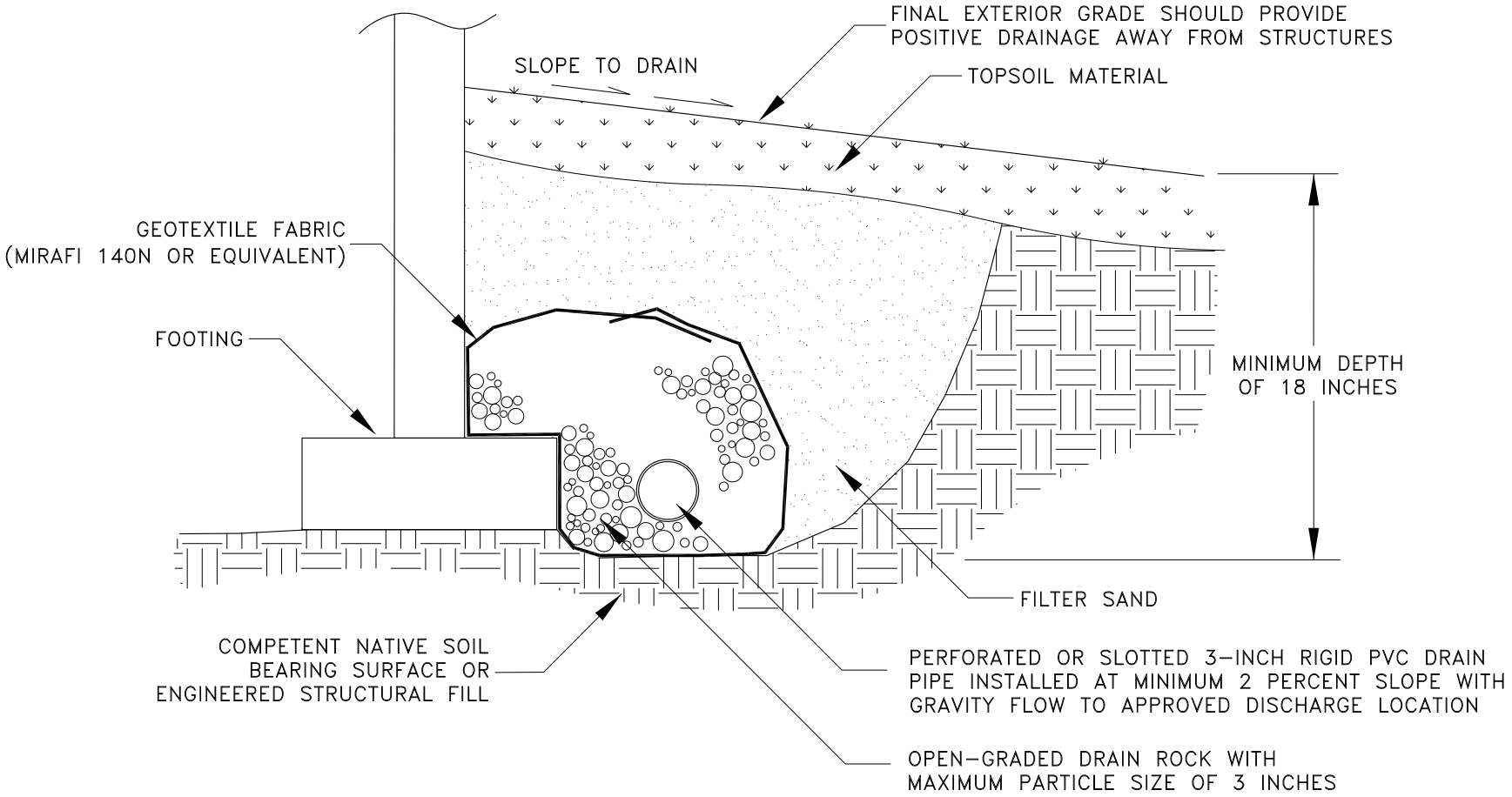
Design:	Drawn: CWS			
Checked: LVL	Date: 7/7/19			
Client: PACIFIC TECH	Rev	By	Date	
Job No: 07215				
CAD File: FIGURE 4				
Scale: NONE				

MINIMUM FOUNDATION SLOPE SETBACK DETAIL

PACIFIC TECH CONSTRUCTION
KELSO, WASHINGTON

FIGURE 4

TYPICAL PERIMETER FOOTING DRAIN DETAIL



NOTES:
1. DRAWING IS NOT TO SCALE.
2. DRAWING REPRESENTS TYPICAL FOOTING DRAIN DETAIL AND MAY NOT BE SITE-SPECIFIC.

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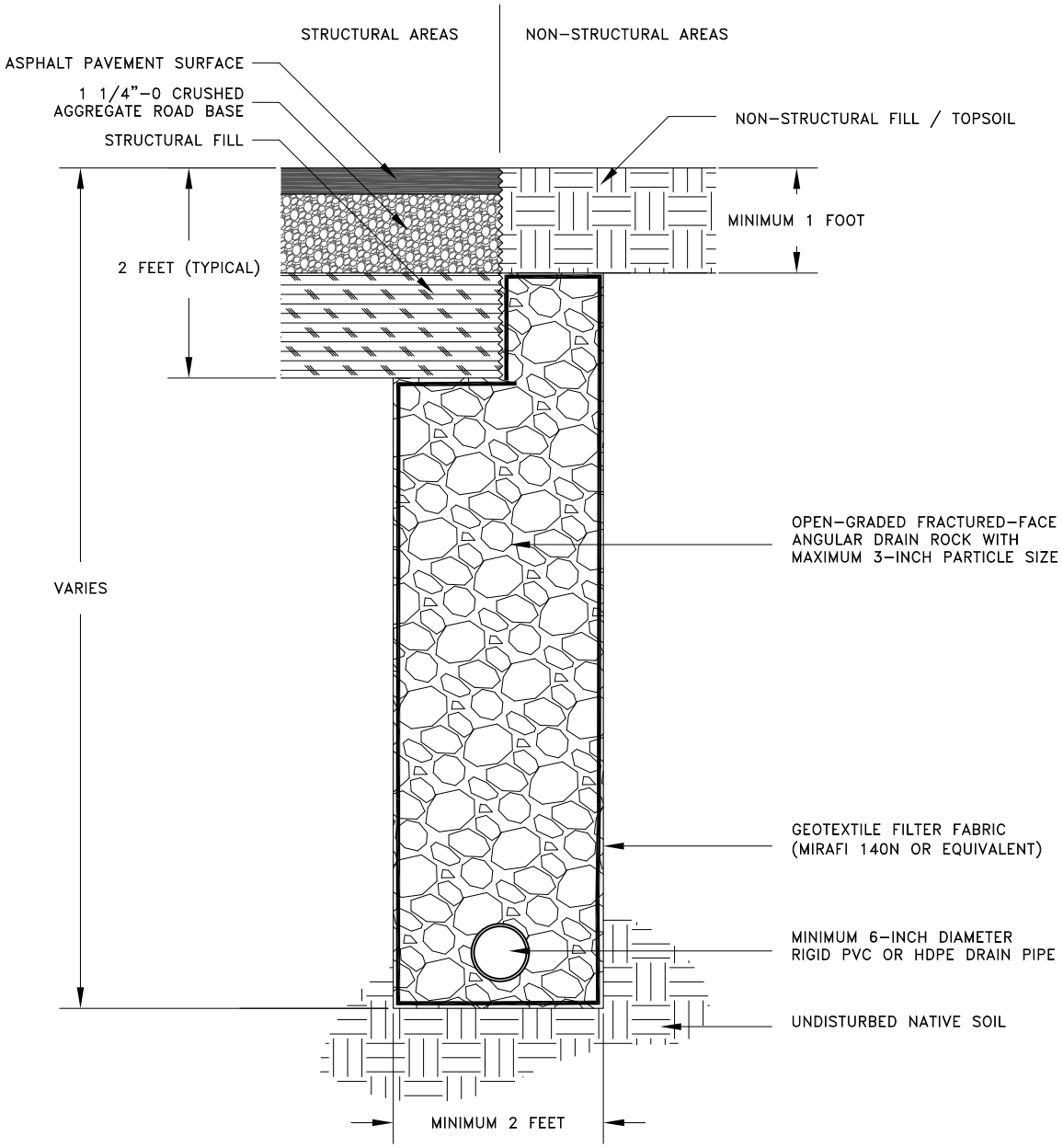
Design:	Drawn: CWS			
Checked: LVL	Date: 7/7/19			
Client: PACIFIC TECH	Rev	By	Date	
Job No: 07215				
CAD File: FIGURE 5				
Scale: NONE				

TYPICAL PERIMETER FOOTING DRAIN DETAIL

PACIFIC TECH CONSTRUCTION
KELSO, WASHINGTON

FIGURE
5

TYPICAL PERFORATED DRAIN PIPE TRENCH DETAIL



NOTE: LOCATION, INVERT ELEVATION, DEPTH OF TRENCH, AND EXTENT OF PERFORATED PIPE REQUIRED MAY BE MODIFIED BY THE GEOTECHNICAL ENGINEER DURING CONSTRUCTION BASED UPON FIELD OBSERVATION AND SITE–SPECIFIC SOIL CONDITIONS.

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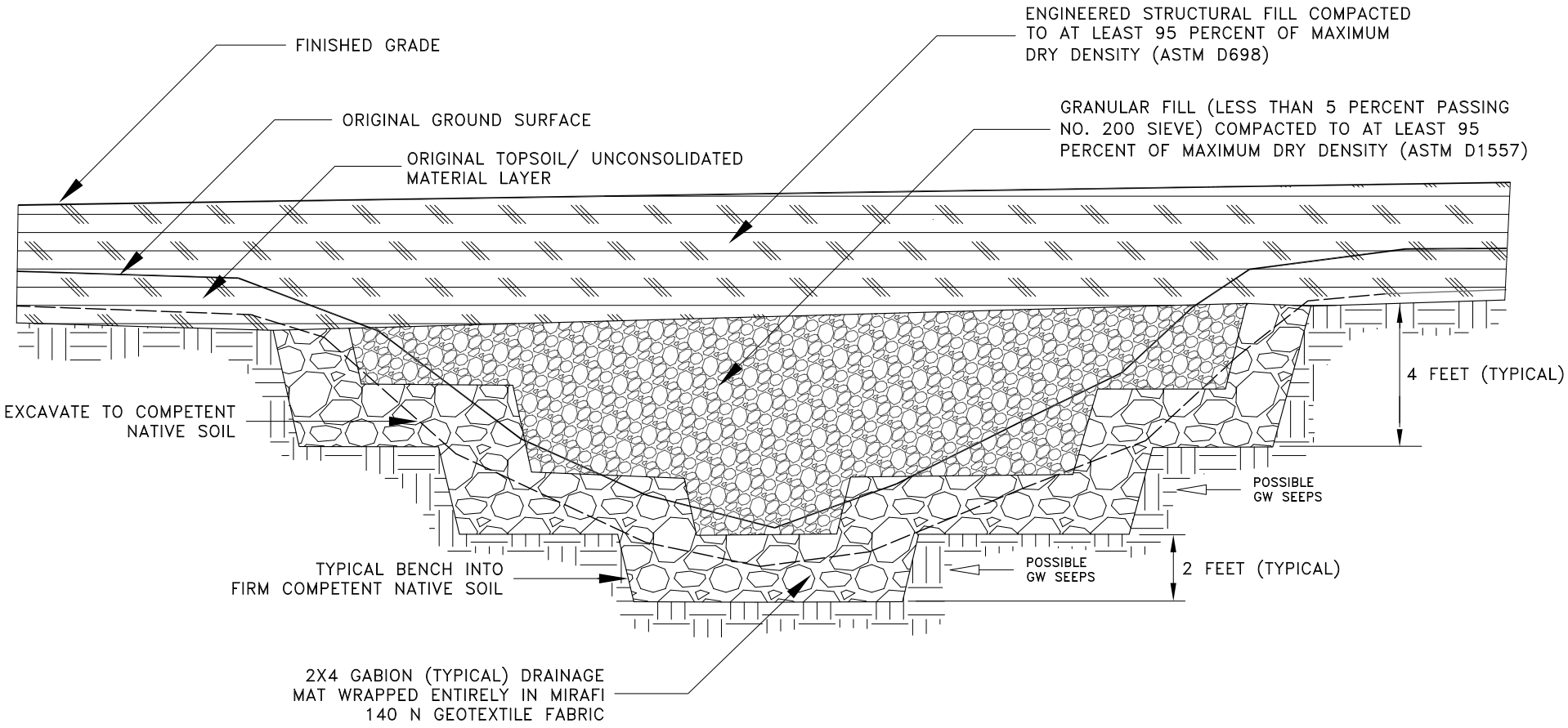
Design:	Drawn: CWS		
Checked: LVL	Date: 7/7/19		
Client: PACIFIC TECH	Rev	By	Date
Job No: 07215			
CAD File: FIGURE 6			
Scale: NONE			

TYPICAL PERFORATED DRAIN PIPE TRENCH DETAIL

PACIFIC TECH CONSTRUCTION
KELSO, WASHINGTON

FIGURE 6

TYPICAL DRAINAGE MAT CROSS-SECTION



NOTES:
1. DRAWING IS NOT TO SCALE.
2. SLOPES AND PROFILES SHOWN ARE APPROXIMATE.
3. DRAWING REPRESENTS TYPICAL DRAINAGE MAT SECTION AND MAY NOT BE SITE-SPECIFIC.
4. DEPTH, LOCATION, EXTENT, AND THICKNESS OF GABION MAT AND GRANULAR FILL LAYER SHOULD BE DETERMINED IN THE FIELD BY COLUMBIA WEST.
5. DRAIN PIPE MAY BE NEEDED AT LOWEST GRADIENT POINT OF DRAINAGE MAT TO CONTROL AND DIRECT FLOW.

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Design:	Drawn: CWS			
Checked: LVL	Date: 7/7/19			
Client: PACIFIC TECH	Rev	By	Date	
Job No: 07215				
CAD File: FIGURE 7				
Scale: NONE				

TYPICAL DRAINAGE MAT SECTION

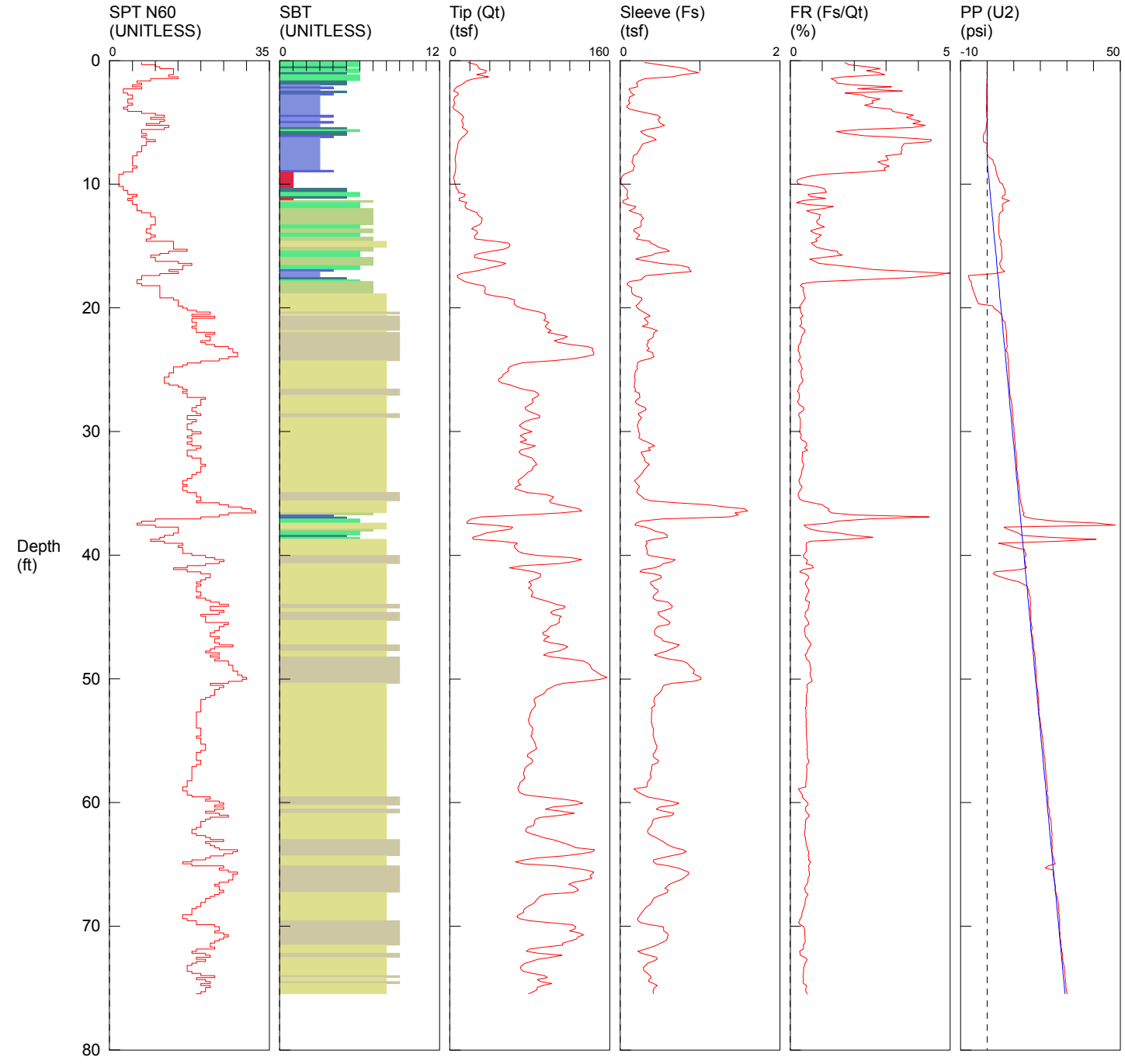
PACIFIC TECH CONSTRUCTION
KELSO, WASHINGTON

FIGURE 7

APPENDIX A
SUBSURFACE EXPLORATION LOGS

Columbia West / CPT-1 / 1600 13th Ave S Kelso

OPERATOR: OGE DMM
CONE ID: DDG1296
HOLE NUMBER: CPT-1
TEST DATE: 5/31/2019 10:21:19 AM
TOTAL DEPTH: 75.459 ft



1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

APPENDIX B
SOIL CLASSIFICATION INFORMATION

SOIL DESCRIPTION AND CLASSIFICATION GUIDELINES

Particle-Size Classification

COMPONENT	ASTM/USCS		AASHTO	
	size range	sieve size range	size range	sieve size range
Cobbles	> 75 mm	greater than 3 inches	> 75 mm	greater than 3 inches
Gravel	75 mm – 4.75 mm	3 inches to No. 4 sieve	75 mm – 2.00 mm	3 inches to No. 10 sieve
Coarse	75 mm – 19.0 mm	3 inches to 3/4-inch sieve	-	-
Fine	19.0 mm – 4.75 mm	3/4-inch to No. 4 sieve	-	-
Sand	4.75 mm – 0.075 mm	No. 4 to No. 200 sieve	2.00 mm – 0.075 mm	No. 10 to No. 200 sieve
Coarse	4.75 mm – 2.00 mm	No. 4 to No. 10 sieve	2.00 mm – 0.425 mm	No. 10 to No. 40 sieve
Medium	2.00 mm – 0.425 mm	No. 10 to No. 40 sieve	-	-
Fine	0.425 mm – 0.075 mm	No. 40 to No. 200 sieve	0.425 mm – 0.075 mm	No. 40 to No. 200 sieve
Fines (Silt and Clay)	< 0.075 mm	Passing No. 200 sieve	< 0.075 mm	Passing No. 200 sieve

Consistency for Cohesive Soil

CONSISTENCY	SPT N-VALUE (BLOWS PER FOOT)	POCKET PENETROMETER (UNCONFINED COMPRESSIVE STRENGTH, tsf)
Very Soft	2	less than 0.25
Soft	2 to 4	0.25 to 0.50
Medium Stiff	4 to 8	0.50 to 1.0
Stiff	8 to 15	1.0 to 2.0
Very Stiff	15 to 30	2.0 to 4.0
Hard	30 to 60	greater than 4.0
Very Hard	greater than 60	-

Relative Density for Granular Soil

RELATIVE DENSITY	SPT N-VALUE (BLOWS PER FOOT)
Very Loose	0 to 4
Loose	4 to 10
Medium Dense	10 to 30
Dense	30 to 50
Very Dense	more than 50

Moisture Designations

TERM	FIELD IDENTIFICATION
Dry	No moisture. Dusty or dry.
Damp	Some moisture. Cohesive soils are usually below plastic limit and are moldable.
Moist	Grains appear darkened, but no visible water is present. Cohesive soils will clump. Sand will bulk. Soils are often at or near plastic limit.
Wet	Visible water on larger grains. Sand and silt exhibit dilatancy. Cohesive soil can be readily remolded. Soil leaves wetness on the hand when squeezed. Soil is much wetter than optimum moisture content and is above plastic limit.

AASHTO SOIL CLASSIFICATION SYSTEM

TABLE 1. Classification of Soils and Soil-Aggregate Mixtures

General Classification	Granular Materials (35 Percent or Less Passing .075 mm)				Silt-Clay Materials (More than 35 Percent Passing 0.075)		
Group Classification	A-1	A-3	A-2	A-4	A-5	A-6	A-7
Sieve analysis, percent passing:							
2.00 mm (No. 10)	-	-	-				
0.425 mm (No. 40)	50 max	51 min	-	-	-	-	-
0.075 mm (No. 200)	25 max	10 max	35 max	36 min	36 min	36 min	36 min
Characteristics of fraction passing 0.425 mm (No. 40)							
Liquid limit				40 max	41 min	40 max	41 min
Plasticity index	6 max	N.P.		10 max	10 max	11 min	11 min
General rating as subgrade	Excellent to good			Fair to poor			

Note: The placing of A-3 before A-2 is necessary in the "left to right elimination process" and does not indicate superiority of A-3 over A-2.

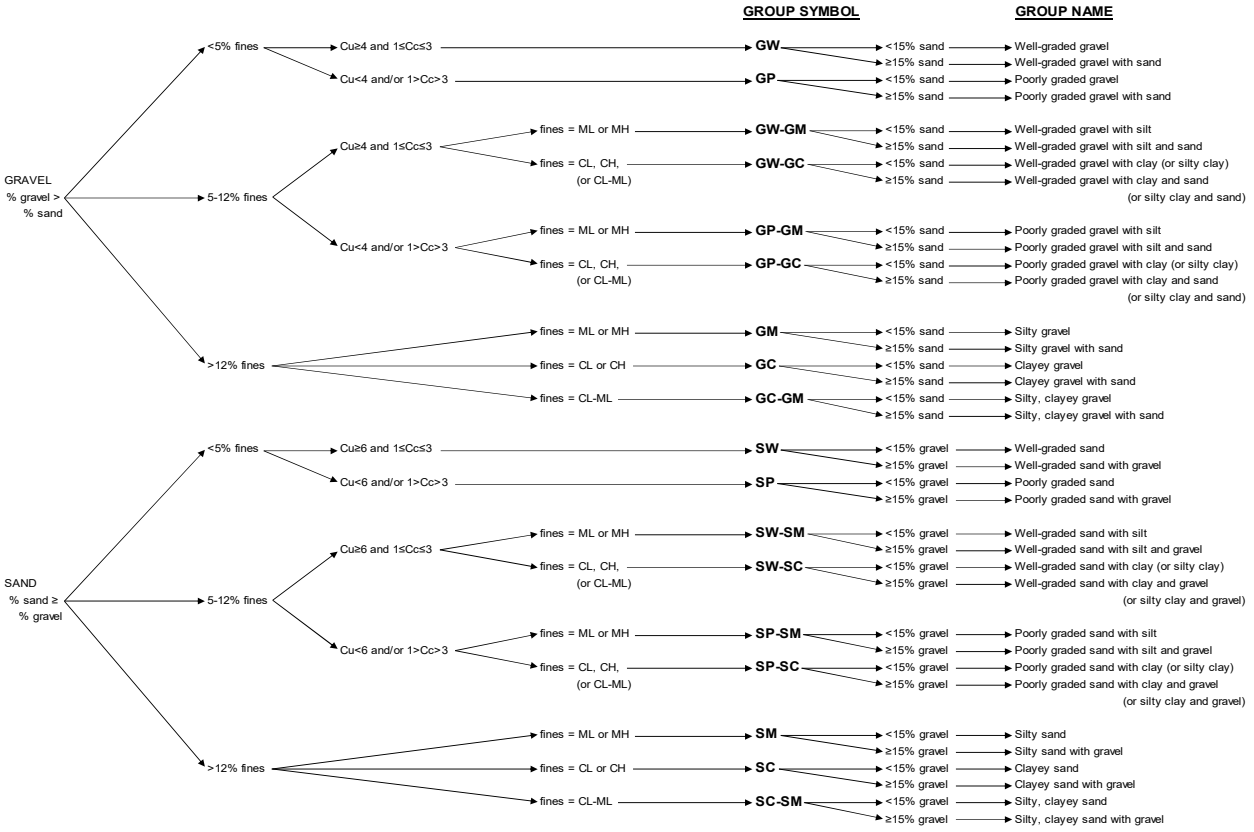
TABLE 2. Classification of Soils and Soil-Aggregate Mixtures

General Classification	Granular Materials (35 Percent or Less Passing 0.075 mm)							Silt-Clay Materials (More than 35 Percent Passing 0.075 mm)			
	A-1			A-2				A-7			
Group Classification	A-1-a	A-1-b	A-3	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7-5, A-7-6
Sieve analysis, percent passing:											
2.00 mm (No. 10)	50 max	-	-	-	-	-	-	-	-	-	-
0.425 mm (No. 40)	30 max	50 max	51 min	-	-	-	-	-	-	-	-
0.075 mm (No. 200)	15 max	25 max	10 max	35 max	35 max	35 max	35 max	36 min	36 min	36 min	36 min
Characteristics of fraction passing 0.425 mm (No. 40)											
Liquid limit				40 max	41 min	40 max	41 min	40 max	41 min	40 max	41 min
Plasticity index	6 max		N.P.	10 max	10 max	11 min	11 min	10 max	10 max	11 min	11min
Usual types of significant constituent materials	Stone fragments, gravel and sand		Fine sand	Silty or clayey gravel and sand				Silty soils		Clayey soils	
General ratings as subgrade	Excellent to Good							Fair to poor			

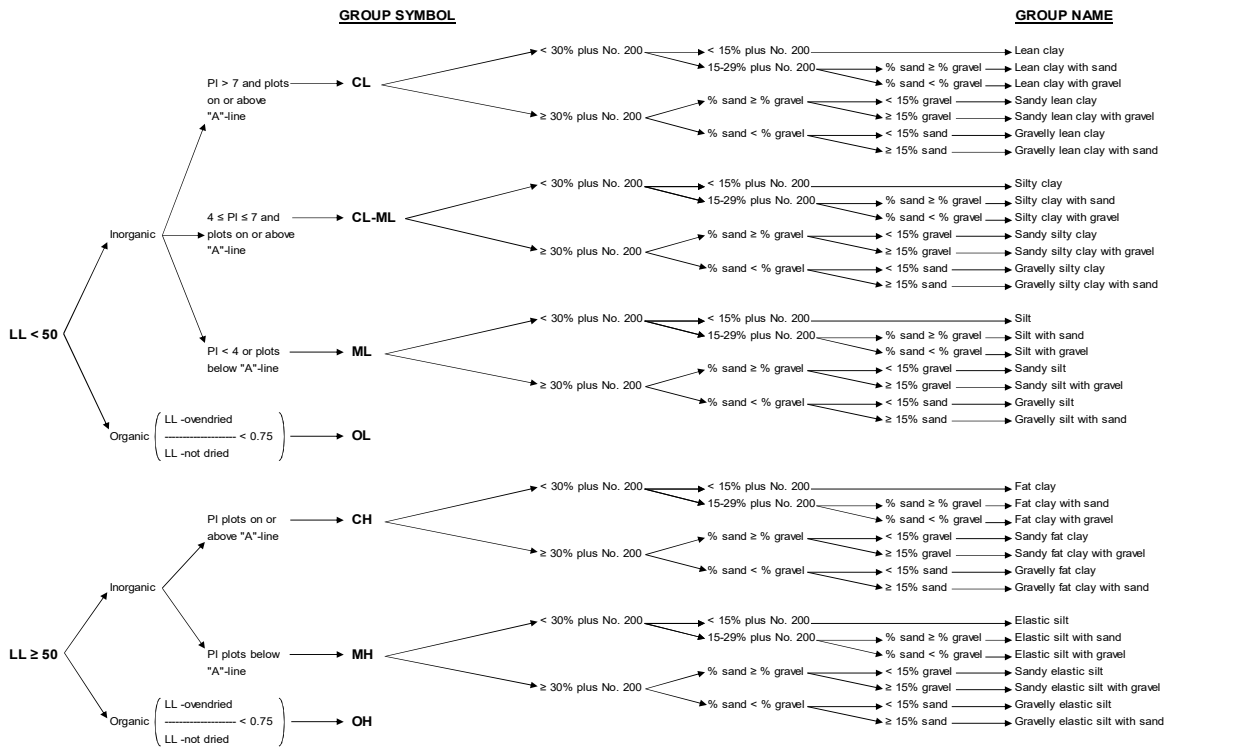
Note: Plasticity index of A-7-5 subgroup is equal to or less than LL minus 30. Plasticity index of A-7-6 subgroup is greater than LL minus 30 (see Figure 2).

AASHTO = American Association of State Highway and Transportation Officials

USCS SOIL CLASSIFICATION SYSTEM



Flow Chart for Classifying Coarse-Grained Soils (More Than 50% Retained on No. 200 Sieve)



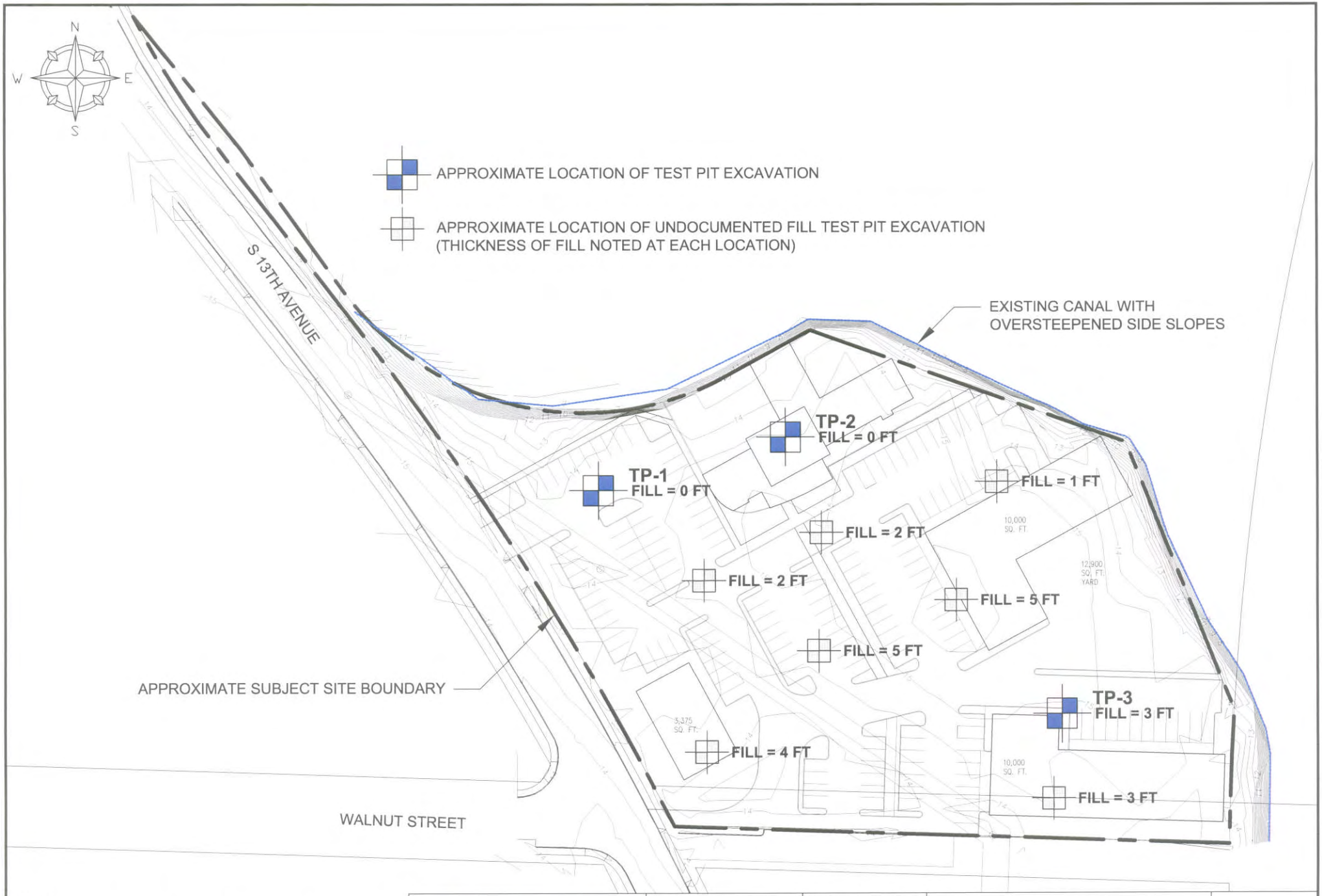
Flow Chart for Classifying Fine-Grained Soil (50% or More Passes No. 200 Sieve)

APPENDIX C
PHOTO LOG

PACIFIC TECH CONSTRUCTION
KELSO, WASHINGTON
PHOTO LOG

Site View, Facing Northeast towards the Proposed Development Site.

APPENDIX D
2008 EXPLORATION MAP, LOGS, AND LABORATORY TEST RESULTS



NOTES:
1. SITE LOCATION: S 13TH AVENUE AND WALNUT STREET.
2. SITE IS APPROXIMATELY 3.9 ACRES IN SIZE.
3. DRAWING IS NOT TO SCALE.
4. BASE MAP PROVIDED BY PRECISION LAND SERVICES INC.
5. TEST PIT LOCATIONS ARE APPROXIMATE AND NOT SURVEYED.
6. ALL TEST PITS BACKFILLED LOOSELY WITH ON-SITE SOIL ON 11/01/07.

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11917 NE 95th Street
Vancouver, Washington 98682
p: 360-823-2900 f: 360-823-2901

Design:	Drawn: EJC	TEST PIT LOCATION MAP	FIGURE 2
Checked: LVL	Date: 11/27/07		
Client: PACIFIC TECH	Rev / By / Date	PACIFIC TECH CONSTRUCTION	
Job No: 07215		KELSO, WASHINGTON	
CAD File: FIGURE 2			
Scale: NONE			

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Pacific Tech Construction	Pacific Tech Development		07215	TP-1
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
Kelso, Washington	Pacific Tech	backhoe	JGH	11/1/07
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUND WATER DEPTH**	**START TIME**	**FINISH TIME**
northwest area	14 feet	8 feet	0930	1010

Depth (feet)	Sample Type	Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Pocket Penetrometer (tsf)	Torvane Shear (tsf)
					OH		TOPSOIL, dark brown, moist, organic						
			Caples silty clay loam		MH		Elastic SILT, grayish brown with various mottles, moist, stiff, moderate to high plasticity, fine to medium-grained sand, trace fine gravel [Soil Type 2]						
	bag	1.1					nuclear density gauge results at 3 feet: wet density = 98.2 pcf, dry density = 71.9 pcf moisture = 36.6%	30.7	55.5			1.5	
5													
	▽						[ground seeps encountered at 8 feet]						
							grades to bluish gray, medium stiff, no gravel						
10	bag	1.2						62.1		66	30		
							Bottom of test pit at 14 feet. Ground water encountered at 8 feet. Excavation backfilled loosely with on-site soil on 11/1/2007.						
15													

CWE TEST PIT PACIFIC TECH CONSTRUCTION.GPJ CWEBORING.GDT 12/21/07

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Pacific Tech Construction	Pacific Tech Development		07215	TP-2
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
Kelso, Washington	Pacific Tech	backhoe	JGH	11/1/07
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUND WATER DEPTH**	**START TIME**	**FINISH TIME**
north central area	15 feet	10 feet	1015	1040

Depth (feet)	Sample Type	Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Pocket Penetrometer (tsf)	Torvane Shear (tsf)
							TOPSOIL, dark brown, moist, organic						
			Caples silty clay loam		MH		Elastic SILT, gray, moist, stiff, moderate to high plasticity, fine to medium-grained sand, trace fine gravel [Soil Type 2]						
5	bag	2.1						58.0		65	27		
					MH		grades to mottled light brown and gray						
10	▽ bag	2.2					[ground seeps encountered at 10 feet]	30.8	86.9				
							Bottom of test pit at 12 feet. Ground water encountered at 10 feet. Excavation backfilled loosely with on-site soil on 11/1/2007.						
15													

CWE TEST PIT PACIFIC TECH CONSTRUCTION.GPJ CWEBORING.GDT 12/21/07

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Pacific Tech Construction	Pacific Tech Development		07215	TP-3
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
Kelso, Washington	Pacific Tech	backhoe	JGH	11/1/07
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUND WATER DEPTH**	**START TIME**	**FINISH TIME**
southeast area	15 feet	11 feet	1045	1115

Depth (feet)	Sample Type	Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Pocket Penetrometer (tsf)	Torvane Shear (tsf)
							FILL - sandy gravel with large asphalt fragments (6 inches thick and 2 to 3 feet across) [Soil Type 1]						
			Caples silty clay loam		MH		Elastic SILT, brown, moist, stiff, moderate plasticity, fine to medium-grained sand [Soil Type 2]						
5													
10	▽						[ground seeps encountered at 11 feet]						
							color grades to mottled light brown and gray						
15							Bottom of test pit at 14 feet. Ground water encountered at 11 feet. Excavation backfilled loosely with on-site soil on 11/1/2007.						

CWE TEST PIT PACIFIC TECH CONSTRUCTION.GPJ CWEBORING.GDT 12/21/07

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PARTICLE-SIZE ANALYSIS REPORT

PROJECT	CLIENT	PROJECT NO.	LAB ID
Pacific Tech Construction Kelso, Washington	Pacific Tech Development c/o Mr. Tim Wines, PE Precision Land Services, Inc. PO Box 821556 Vancouver, Washington 98682	07215	S07-722
		REPORT DATE 11/13/07	FIELD ID TP1.1
		DATE SAMPLED 11/01/07	SAMPLED BY JGH

MATERIAL DATA

MATERIAL SAMPLED	MATERIAL SOURCE	USCS SOIL TYPE
brown sandy silt	Test Pit TP-01, depth = 3 feet	no data provided
SPECIFICATIONS none		AASHTO SOIL TYPE no data provided

LABORATORY TEST DATA

LABORATORY EQUIPMENT
Rainhart "Mary Ann" Sifter 637

TEST PROCEDURE
ASTM D6913, D2487

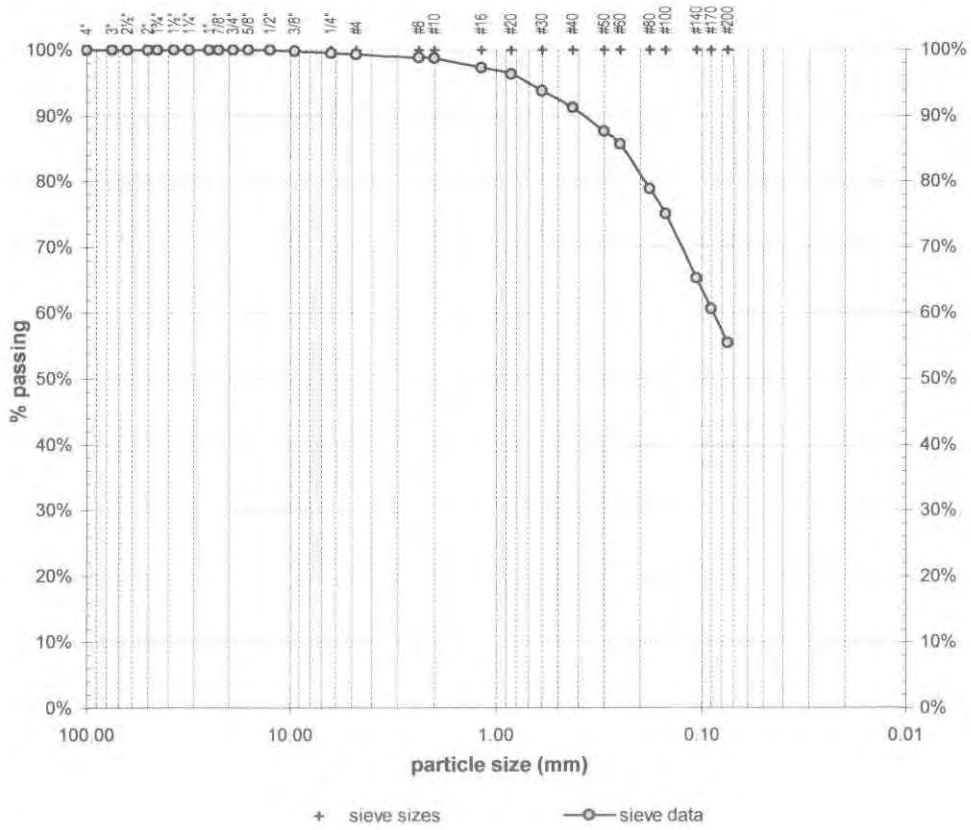
ADDITIONAL DATA

natural moisture content =	30.7%	coefficient of curvature, C_C =	n/a
liquid limit =	n/a	coefficient of uniformity, C_U =	n/a
plastic limit =	n/a	effective size, $D_{(10)}$ =	n/a
plasticity index =	n/a	$D_{(30)}$ =	n/a
fineness modulus =	n/a	$D_{(60)}$ =	0.088 mm

SIEVE DATA

% gravel = 0.7%
% sand = 43.8%
% silt and clay = 55.5%

GRAIN SIZE DISTRIBUTION



	SIEVE SIZE		PERCENT PASSING SIEVE		SPECS	
	US	mm	act.	interp.	max	min
GRAVEL	6.00"	150.0		100.0%		
	4.00"	100.0		100.0%		
	3.00"	75.0		100.0%		
	2.50"	63.0		100.0%		
	2.00"	50.0		100.0%		
	1.75"	45.0		100.0%		
	1.50"	37.5		100.0%		
	1.25"	31.5		100.0%		
	1.00"	25.0		100.0%		
	7/8"	22.4		100.0%		
	3/4"	19.0		100.0%		
	5/8"	16.0		100.0%		
	1/2"	12.5	100.0%			
	3/8"	9.50		99.8%		
	1/4"	6.30		99.5%		
	#4	4.75	99.3%			
SAND	#8	2.36		98.8%		
	#10	2.00	98.7%			
	#16	1.18		97.2%		
	#20	0.850	96.3%			
	#30	0.600		93.7%		
	#40	0.425	91.2%			
	#50	0.300		87.6%		
	#60	0.250	85.7%			
	#80	0.180		78.8%		
	#100	0.150	75.0%			
	#140	0.106		65.3%		
	#170	0.090		60.6%		
	#200	0.075	55.5%			

DATE TESTED	TESTED BY
11/03/07	SMJ

COLUMBIA WEST ENGINEERING, INC. authorized signature

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Geotechnical Engineering and Environmental Consulting Services

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ATTERBERG LIMITS REPORT

PROJECT	CLIENT	PROJECT NO.	LAB ID
Pacific Tech Construction Kelso, Washington	Pacific Tech Development c/o Mr. Tim Wines, PE Precision Land Services, Inc. PO Box 821556 Vancouver, Washington 98682	07215	S07-723
		REPORT DATE: 11/13/07	FIELD ID: TP1.2
		DATE SAMPLED: 11/01/07	SAMPLED BY: JGH

MATERIAL DATA

MATERIAL SAMPLED	MATERIAL SOURCE	USCS SOIL TYPE
bluish gray elastic silt	Test Pit TP-01, depth = 10 feet	no data provided

LABORATORY TEST DATA

LABORATORY EQUIPMENT: Liquid Limit Machine, Plastic Limit Roller

TEST PROCEDURE: ASTM D4318

ATTERBERG LIMITS

liquid limit =	66
plastic limit =	36
plasticity index =	30

LIQUID LIMIT DETERMINATION

	❶	❷	❸	❹
wet soil + pan weight, g =	37.10	37.31	36.61	
dry soil + pan weight, g =	30.62	30.68	30.07	
pan weight, g =	20.54	20.60	20.47	
N (blows) =	29	26	19	
moisture, % =	64.3 %	65.8 %	68.1 %	

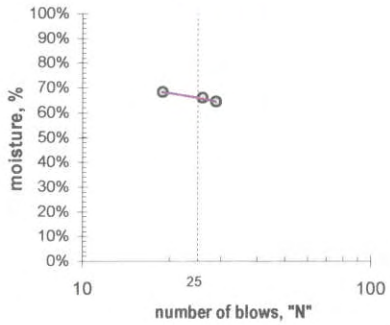
SHRINKAGE

shrinkage limit =	n/a
shrinkage ratio =	n/a

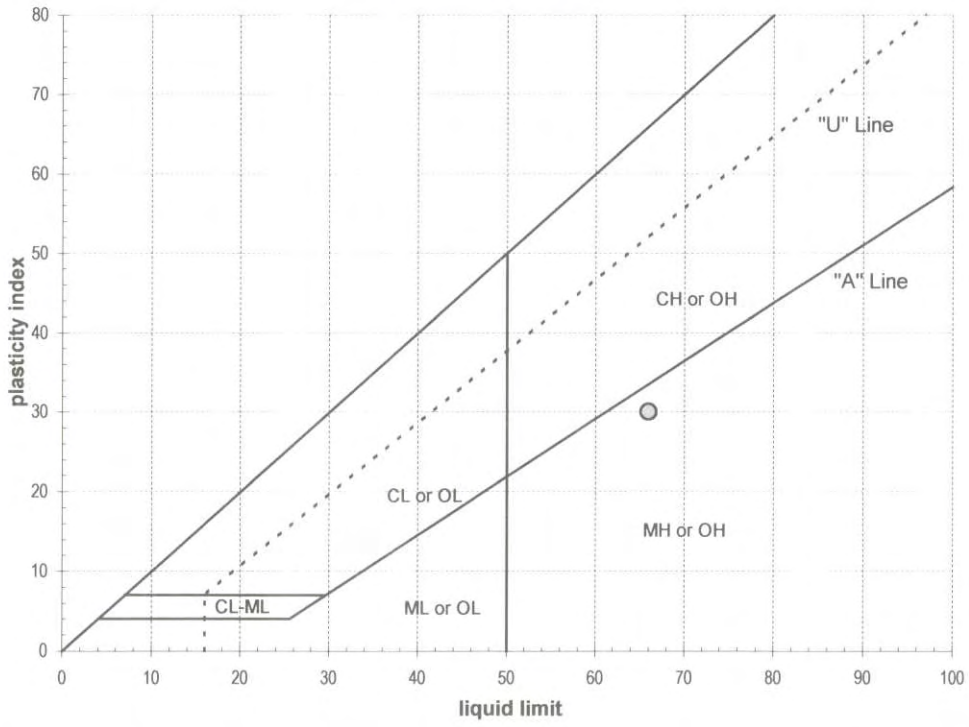
PLASTIC LIMIT DETERMINATION

	❶	❷	❸	❹
wet soil + pan weight, g =	29.32	30.30		
dry soil + pan weight, g =	27.06	27.79		
pan weight, g =	20.72	20.73		
moisture, % =	35.7 %	35.6 %		

LIQUID LIMIT



PLASTICITY CHART



ADDITIONAL DATA

moisture content = 62.1%

DATE TESTED	TESTED BY
11/05/07	SMJ

COLUMBIA WEST ENGINEERING, INC. authorized signature

Columbia West Engineering, Inc.
Geotechnical Engineering and Environmental Consulting Services

11917 NE 95th Street, Vancouver, WA 98682
Phone: 360-823-2900, Fax: 360-823-2901
www.columbiawestengineering.com

ATTERBERG LIMITS REPORT

PROJECT	CLIENT	PROJECT NO.	LAB ID
Pacific Tech Construction Kelso, Washington	Pacific Tech Development c/o Mr. Tim Wines, PE Precision Land Services, Inc. PO Box 821556 Vancouver, Washington 98682	07215	S07-724
		REPORT DATE: 11/13/07	FIELD ID: TP2.1
		DATE SAMPLED: 11/01/07	SAMPLED BY: JGH

MATERIAL DATA

MATERIAL SAMPLED	MATERIAL SOURCE	USCS SOIL TYPE
gray elastic silt	Test Pit TP-02, depth = 6 feet	no data provided

LABORATORY TEST DATA

LABORATORY EQUIPMENT: Liquid Limit Machine, Plastic Limit Roller

TEST PROCEDURE: ASTM D4318

ATTERBERG LIMITS

liquid limit =	65
plastic limit =	38
plasticity index =	27

LIQUID LIMIT DETERMINATION

	❶	❷	❸	❹
wet soil + pan weight, g =	36.94	34.11	33.57	
dry soil + pan weight, g =	30.68	28.90	28.41	
pan weight, g =	20.86	20.86	20.68	
N (blows) =	31	26	19	
moisture, % =	63.8 %	64.8 %	66.8 %	

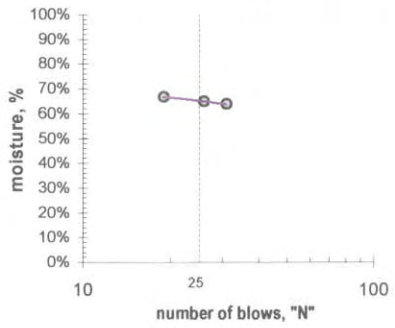
SHRINKAGE

shrinkage limit =	n/a
shrinkage ratio =	n/a

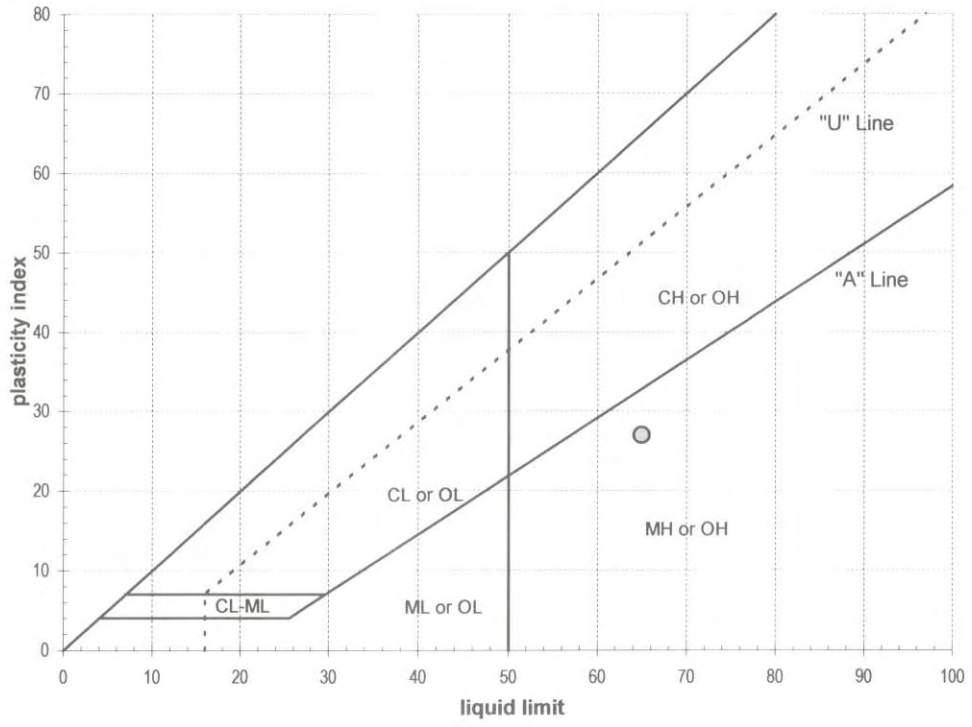
PLASTIC LIMIT DETERMINATION

	❶	❷	❸	❹
wet soil + pan weight, g =	30.07	29.37		
dry soil + pan weight, g =	27.46	26.97		
pan weight, g =	20.58	20.76		
moisture, % =	37.9 %	38.7 %		

LIQUID LIMIT



PLASTICITY CHART



ADDITIONAL DATA

moisture content = 58.0%

DATE TESTED	TESTED BY
11/05/07	SMJ

COLUMBIA WEST ENGINEERING, INC. authorized signature

Columbia West Engineering, Inc.
Geotechnical Engineering and Environmental Consulting Services

11917 NE 95th Street, Vancouver, WA 98682
Phone: 360-823-2900, Fax: 360-823-2901
www.columbiawestengineering.com

PARTICLE-SIZE ANALYSIS REPORT

PROJECT	CLIENT	PROJECT NO.	LAB ID
Pacific Tech Construction Kelso, Washington	Pacific Tech Development c/o Mr. Tim Wines, PE Precision Land Services, Inc. PO Box 821556 Vancouver, Washington 98682	07215	S07-725
		REPORT DATE 11/13/07	FIELD ID TP2.2
		DATE SAMPLED 11/01/07	SAMPLED BY JGH

MATERIAL DATA

MATERIAL SAMPLED	MATERIAL SOURCE	USCS SOIL TYPE
mottled silt	Test Pit TP-02, depth = 10 feet	no data provided
SPECIFICATIONS none		AASHTO SOIL TYPE no data provided

LABORATORY TEST DATA

LABORATORY EQUIPMENT: Rainhart "Mary Ann" Sifter 637

TEST PROCEDURE: ASTM D6913, D2487

ADDITIONAL DATA

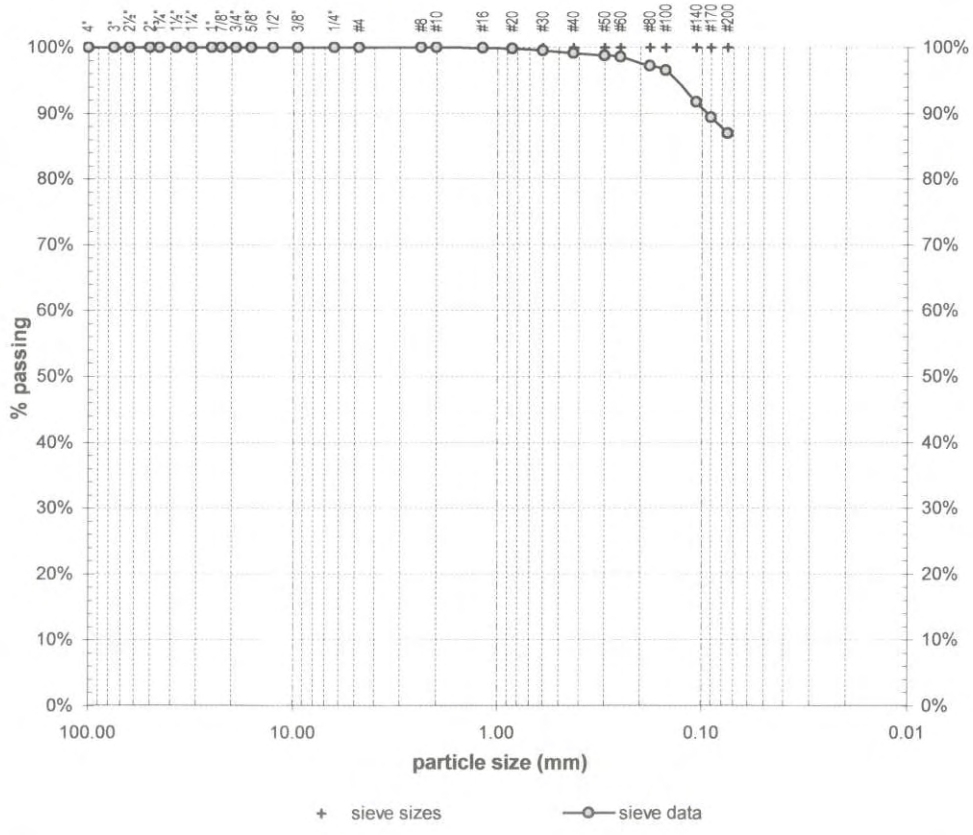
natural moisture content =	30.8%	coefficient of curvature, C_C =	n/a
liquid limit =	n/a	coefficient of uniformity, C_U =	n/a
plastic limit =	n/a	effective size, $D_{(10)}$ =	n/a
plasticity index =	n/a	$D_{(30)}$ =	n/a
fineness modulus =	n/a	$D_{(60)}$ =	n/a

SIEVE DATA

% gravel = 0.0%
% sand = 13.1%
% silt and clay = 86.9%

	SIEVE SIZE		PERCENT PASSING			
			SIEVE		SPECS	
	US	mm	act.	interp.	max	min
GRAVEL	6.00"	150.0		100.0%		
	4.00"	100.0		100.0%		
	3.00"	75.0		100.0%		
	2.50"	63.0		100.0%		
	2.00"	50.0		100.0%		
	1.75"	45.0		100.0%		
	1.50"	37.5		100.0%		
	1.25"	31.5		100.0%		
	1.00"	25.0		100.0%		
	7/8"	22.4		100.0%		
	3/4"	19.0		100.0%		
	5/8"	16.0		100.0%		
	1/2"	12.5		100.0%		
	3/8"	9.50		100.0%		
	1/4"	6.30		100.0%		
	#4	4.75	100.0%			
SAND	#8	2.36		100.0%		
	#10	2.00	100.0%			
	#16	1.18		99.9%		
	#20	0.850	99.8%			
	#30	0.600		99.5%		
	#40	0.425	99.1%			
	#50	0.300		98.7%		
	#60	0.250	98.5%			
	#80	0.180		97.2%		
	#100	0.150	96.5%			
	#140	0.106		91.7%		
	#170	0.090		89.4%		
	#200	0.075	86.9%			

GRAIN SIZE DISTRIBUTION



DATE TESTED	TESTED BY
11/03/07	SMJ

COLUMBIA WEST ENGINEERING, INC. authorized signature

APPENDIX E
LIQUEFACTION EVALUATION

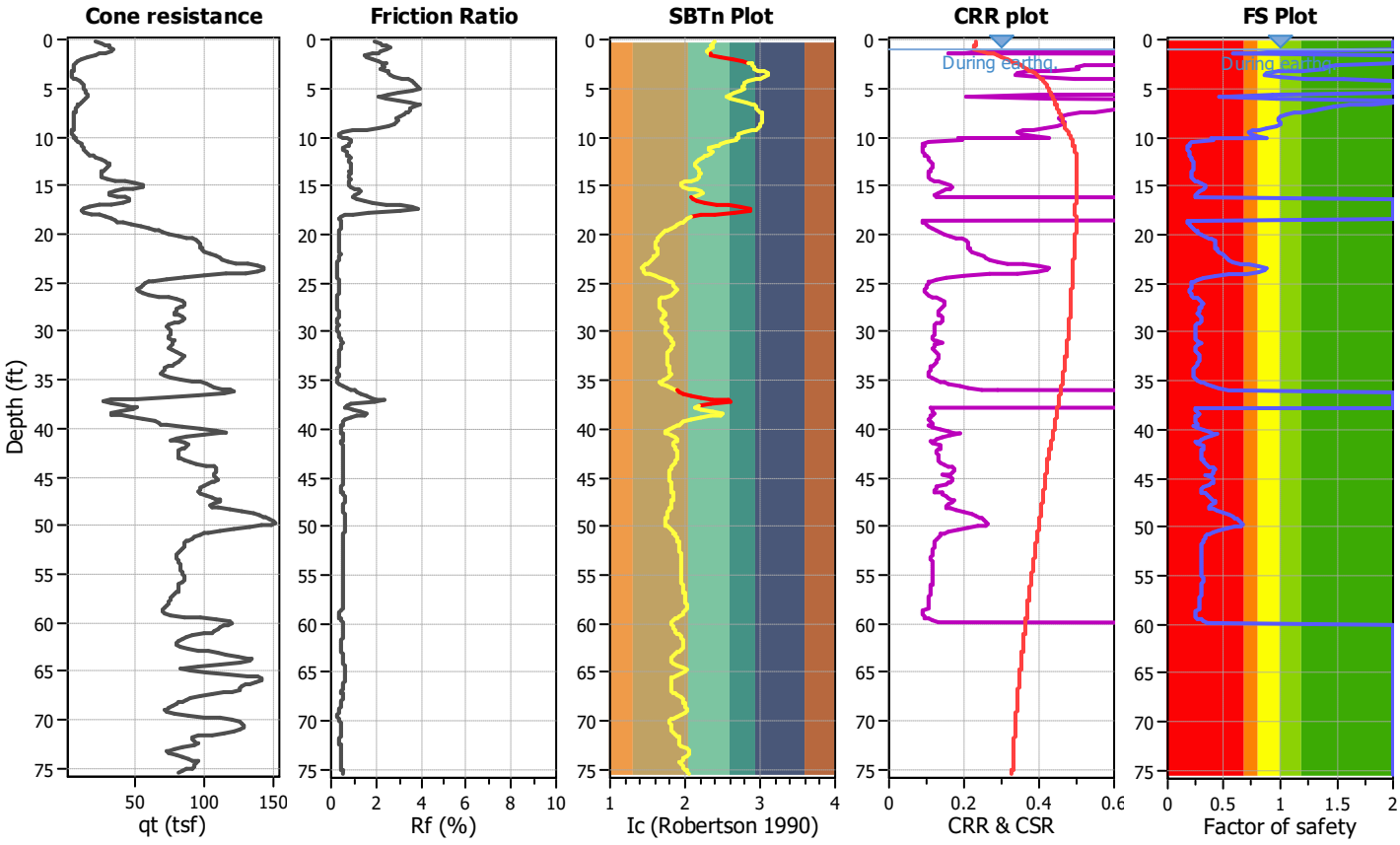
LIQUEFACTION ANALYSIS REPORT

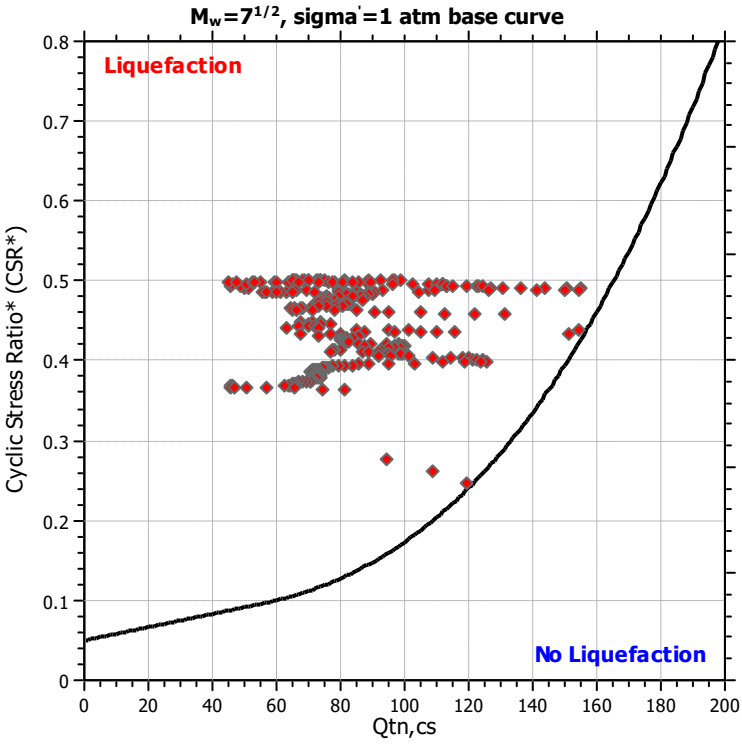
Project title : Pacific Tech Construction **Location : Kelso, Washington**

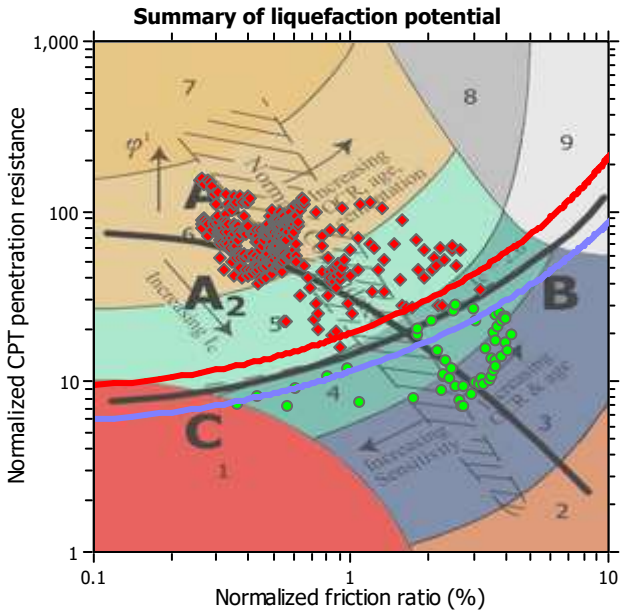
CPT file : 19107 CPT-1 Text File

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	7.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	1.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth:	60.00 ft
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	NCEER, (Youd
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

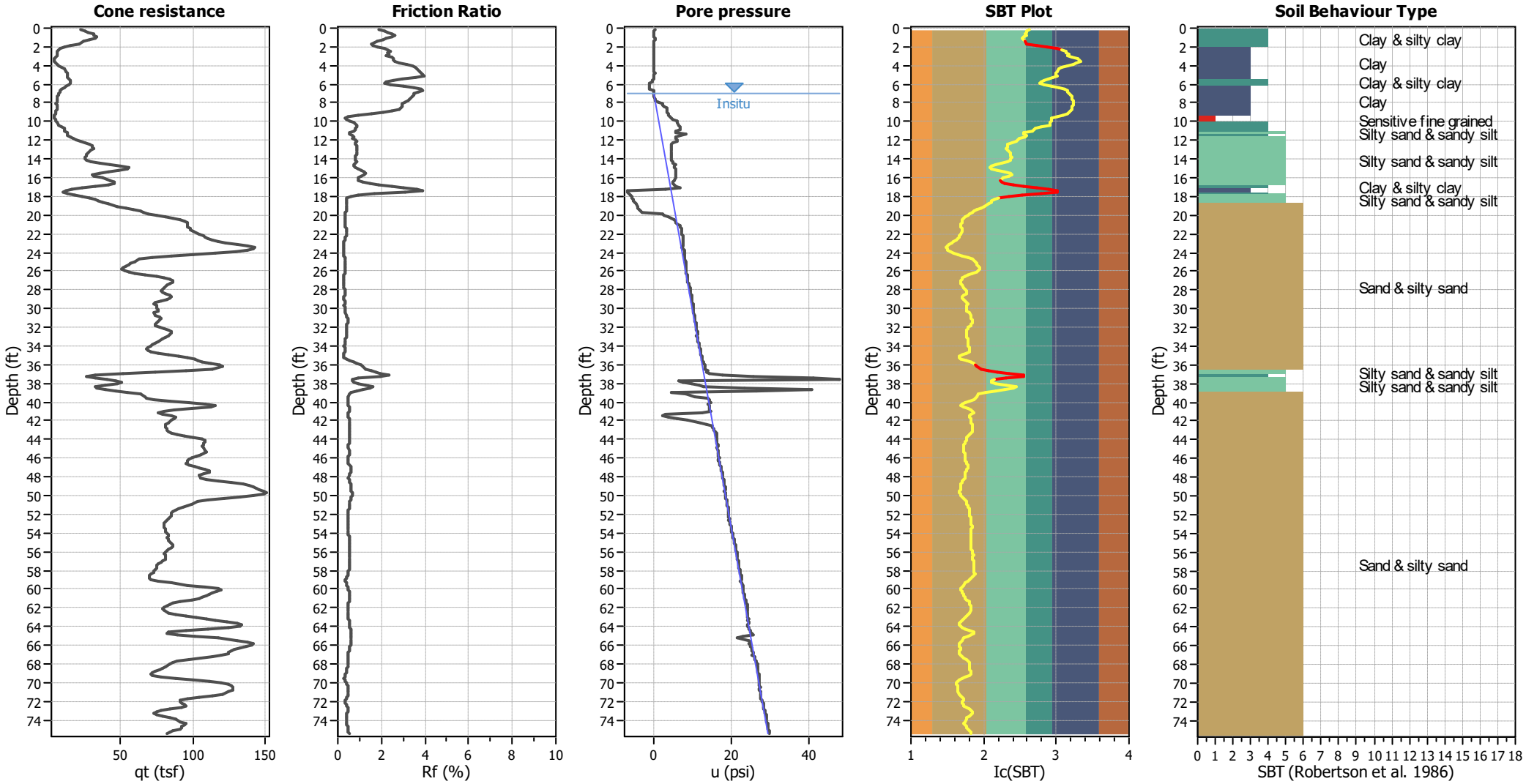






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



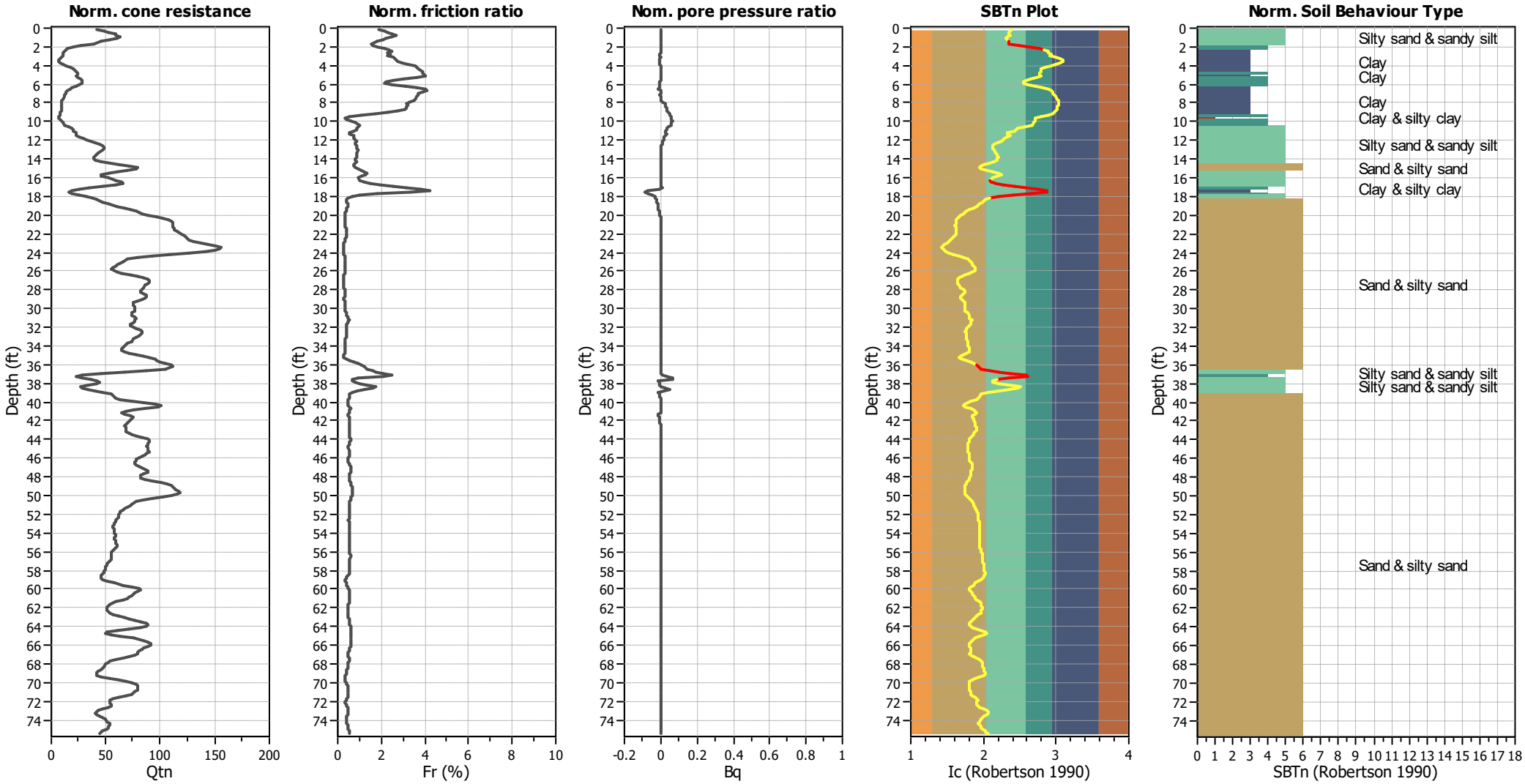
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	1.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



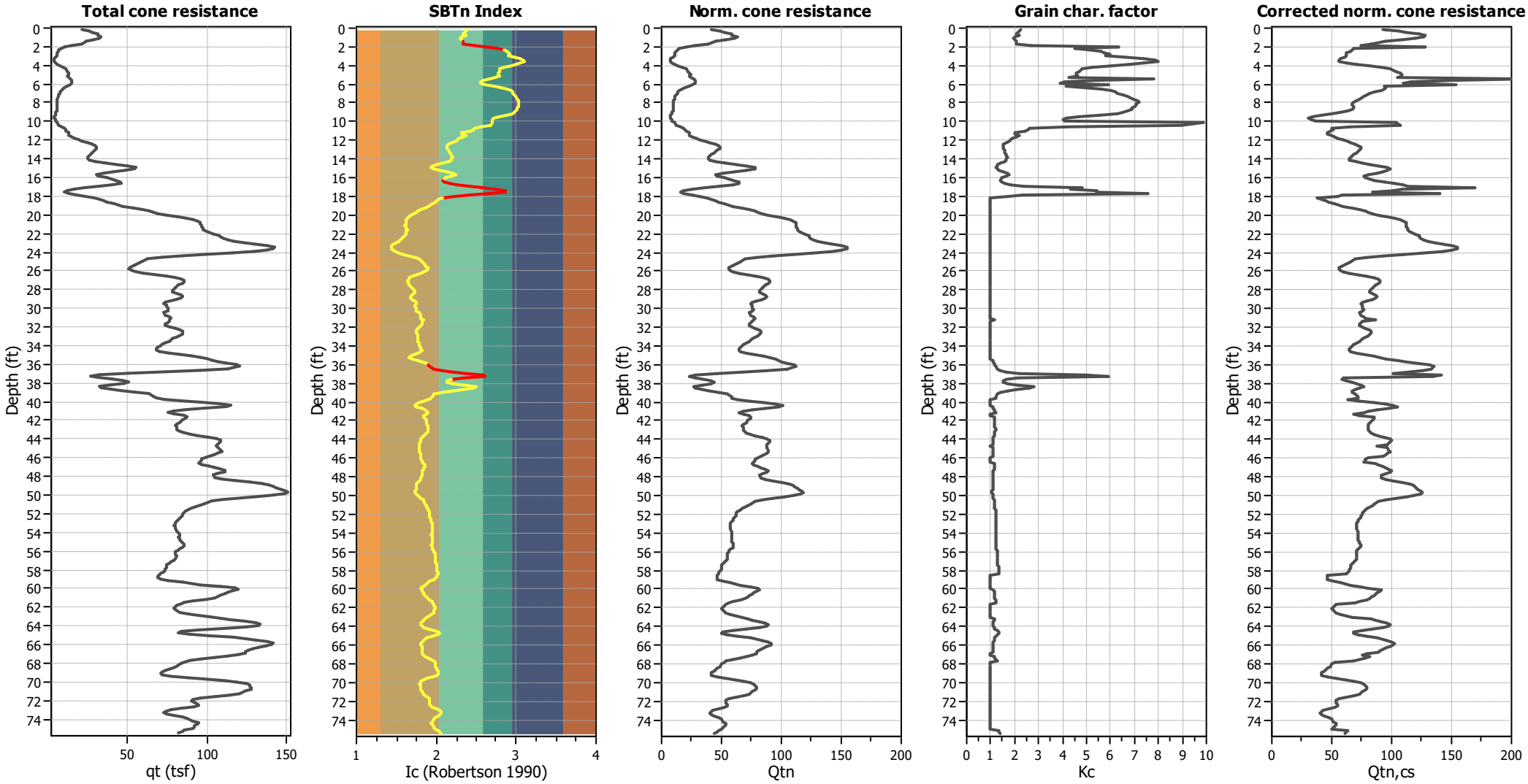
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	1.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

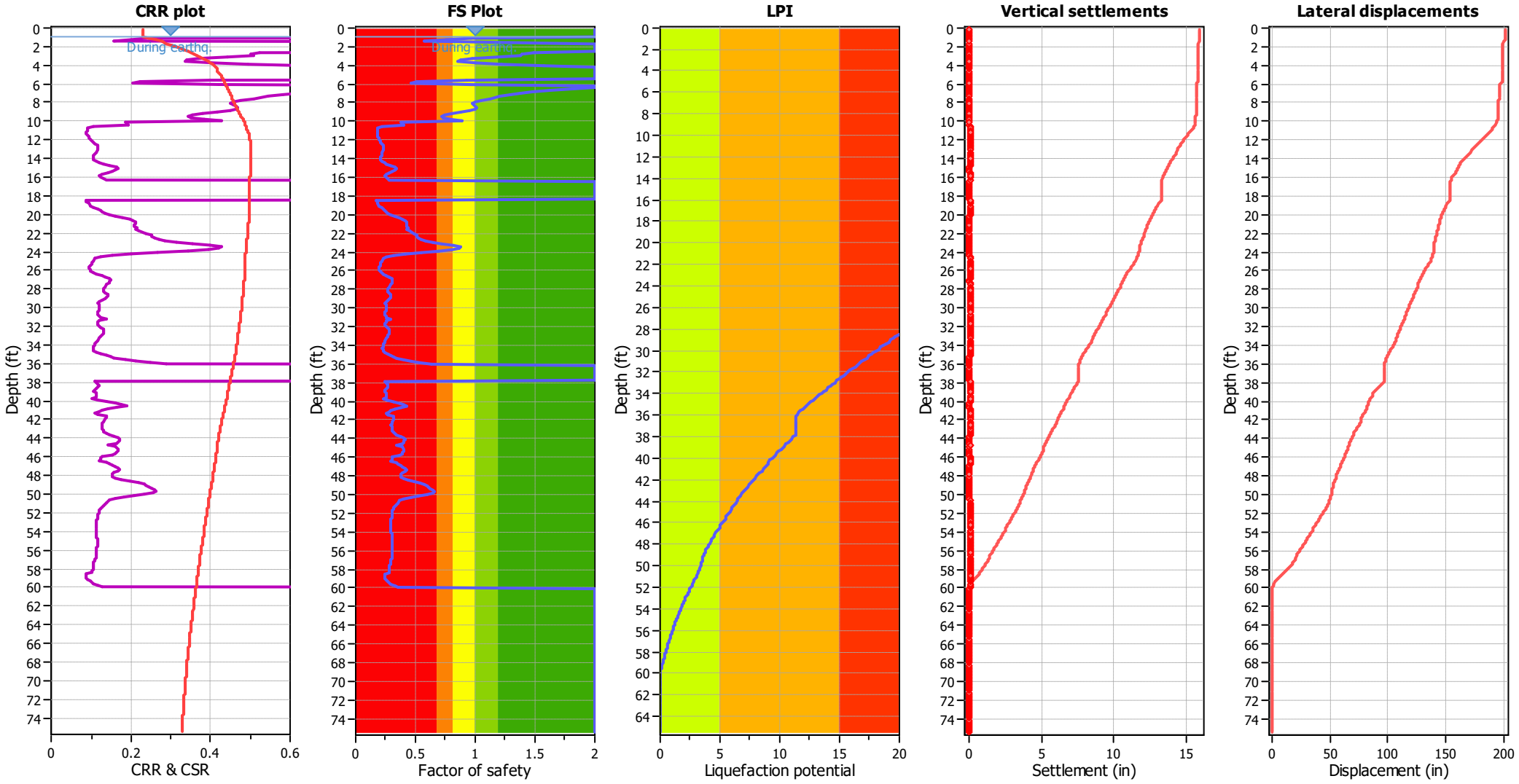
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	1.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	1.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

F.S. color scheme

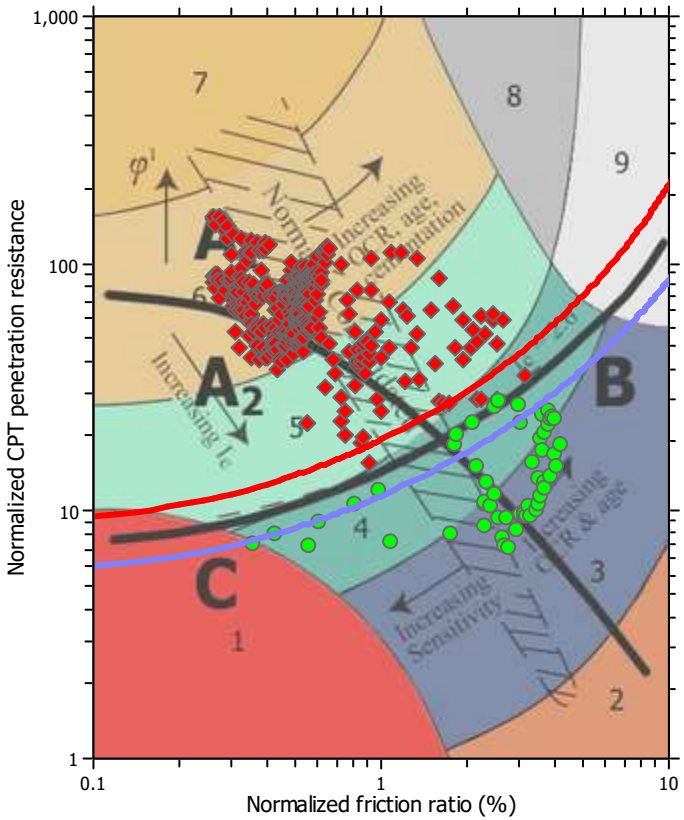
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

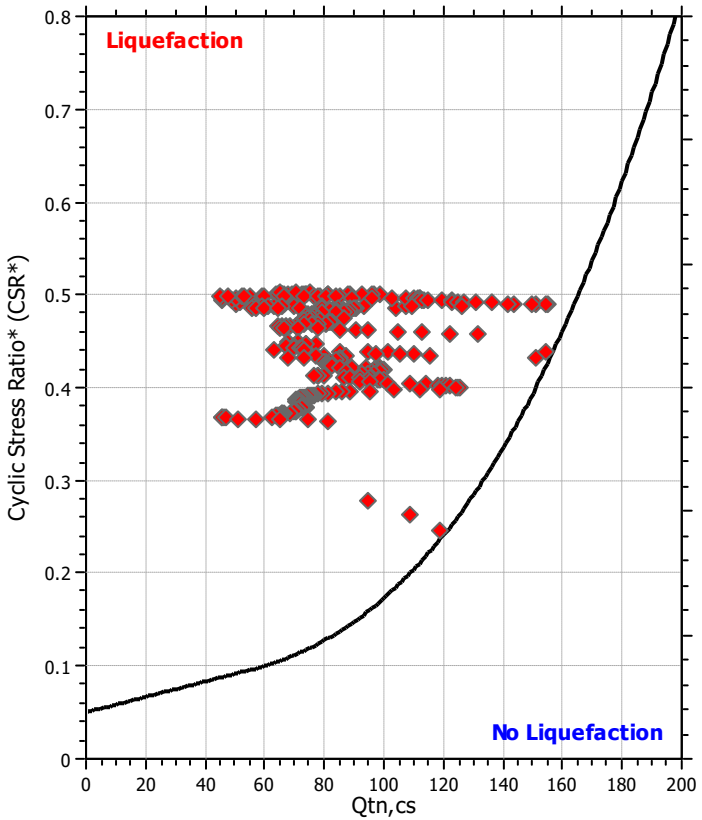
LPI color scheme

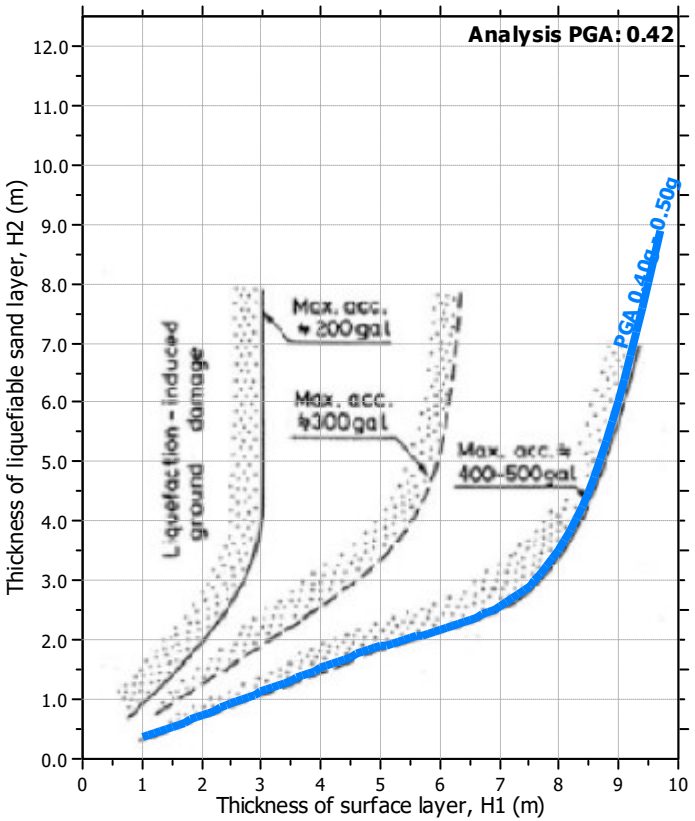
- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots

19107 CPT-1 Text File (45.36)



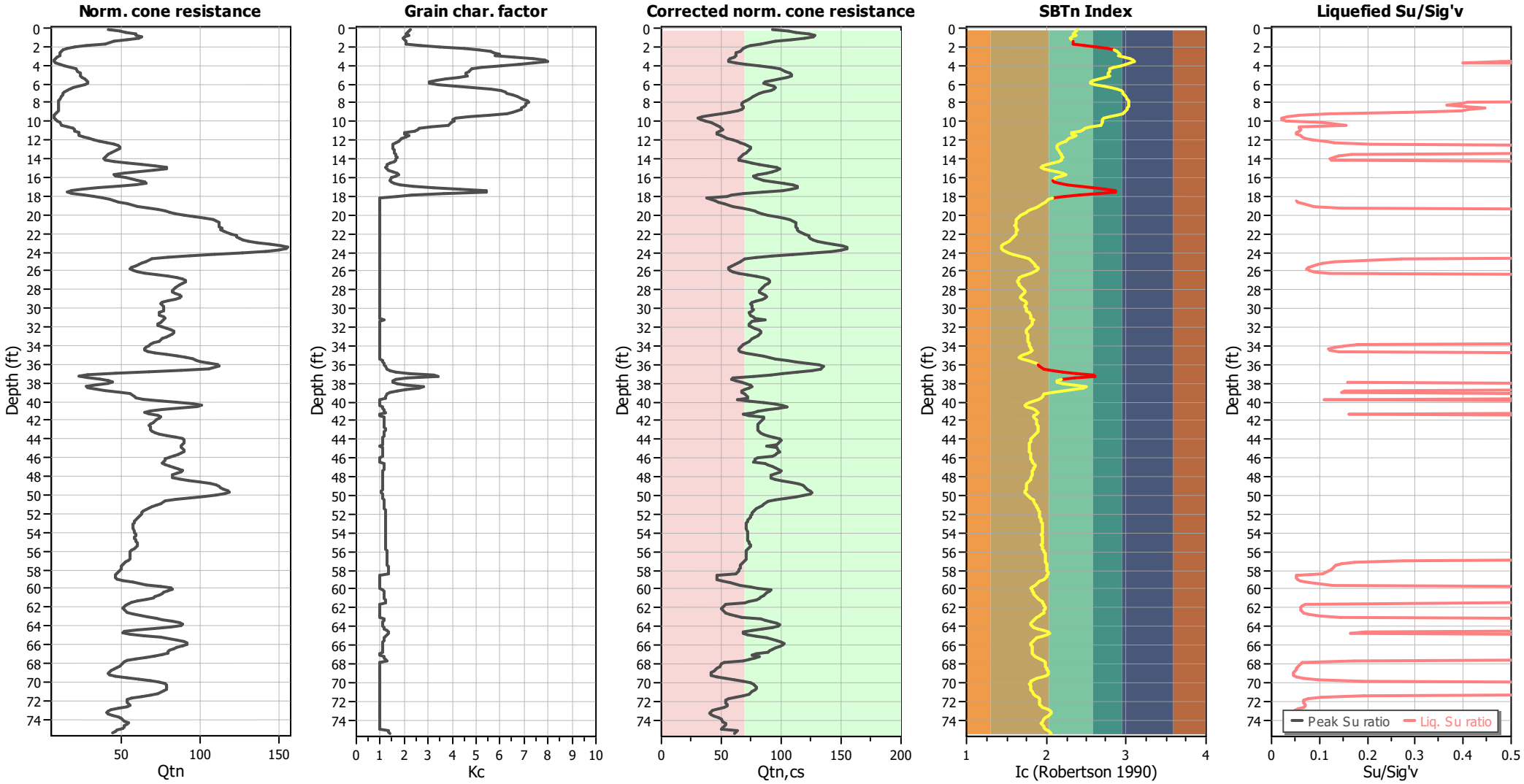




Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	1.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

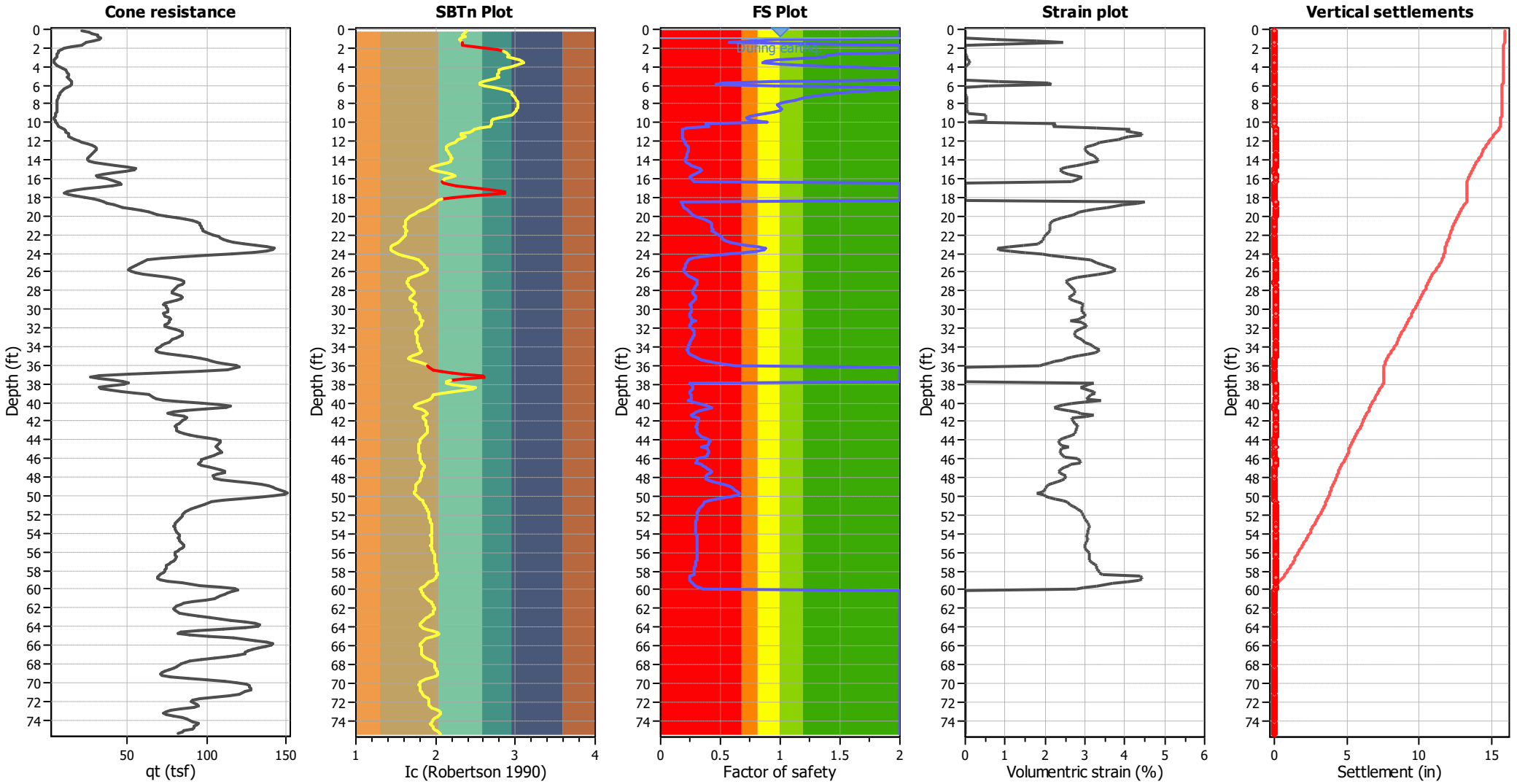
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	1.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

APPENDIX F
REPORT LIMITATIONS AND IMPORTANT INFORMATION

Geotechnical ■ Environmental ■ Special Inspections
Columbia West Engineering, Inc

Date: August 8, 2019
Project: Pacific Tech Construction
Kelso, Washington

Geotechnical and Environmental Report Limitations and Important Information

Report Purpose, Use, and Standard of Care

This report has been prepared in accordance with standard fundamental principles and practices of geotechnical engineering and/or environmental consulting, and in a manner consistent with the level of care and skill typical of currently practicing local engineers and consultants. This report has been prepared to meet the specific needs of specific individuals for the indicated site. It may not be adequate for use by other consultants, contractors, or engineers, or if change in project ownership has occurred. It should not be used for any other reason than its stated purpose without prior consultation with Columbia West Engineering, Inc. (Columbia West). It is a unique report and not applicable for any other site or project. If site conditions are altered, or if modifications to the project description or proposed plans are made after the date of this report, it may not be valid. Columbia West cannot accept responsibility for use of this report by other individuals for unauthorized purposes, or if problems occur resulting from changes in site conditions for which Columbia West was not aware or informed.

Report Conclusions and Preliminary Nature

This geotechnical or environmental report should be considered preliminary and summary in nature. The recommendations contained herein have been established by engineering interpretations of subsurface soils based upon conditions observed during site exploration. The exploration and associated laboratory analysis of collected representative samples identifies soil conditions at specific discreet locations. It is assumed that these conditions are indicative of actual conditions throughout the subject property. However, soil conditions may differ between tested locations at different seasonal times of the year, either by natural causes or human activity. Distinction between soil types may be more abrupt or gradual than indicated on the soil logs. This report is not intended to stand alone without understanding of concomitant instructions, correspondence, communication, or potential supplemental reports that may have been provided to the client.

Because this report is based upon observations obtained at the time of exploration, its adequacy may be compromised with time. This is particularly relevant in the case of natural disasters, earthquakes, floods, or other significant events. Report conclusions or interpretations may also be subject to revision if significant development or other manmade impacts occur within or in proximity to the subject property. Groundwater conditions, if presented in this report, reflect observed conditions at the time of investigation. These conditions may change annually, seasonally or as a result of adjacent development.

Additional Investigation and Construction QA/QC

Columbia West should be consulted prior to construction to assess whether additional investigation above and beyond that presented in this report is necessary. Even slight variations in soil or site conditions may produce impacts to the performance of structural facilities if not adequately addressed. This underscores the importance of diligent QA/QC construction observation and testing to verify soil conditions do not differ materially or significantly from the interpreted conditions utilized for preparation of this report.

Therefore, this report contains several recommendations for field observation and testing by Columbia West personnel during construction activities. Actual subsurface conditions are more readily observed and discerned during the earthwork phase of construction when soils are exposed. Columbia West cannot accept responsibility for deviations from recommendations described in this report or future

performance of structural facilities if another consultant is retained during the construction phase or Columbia West is not engaged to provide construction observation to the full extent recommended.

Collected Samples

Uncontaminated samples of soil or rock collected in connection with this report will be retained for thirty days. Retention of such samples beyond thirty days will occur only at client's request and in return for payment of storage charges incurred. All contaminated or environmentally impacted materials or samples are the sole property of the client. Client maintains responsibility for proper disposal.

Report Contents

This geotechnical or environmental report should not be copied or duplicated unless in full, and even then only under prior written consent by Columbia West, as indicated in further detail in the following text section entitled *Report Ownership*. The recommendations, interpretations, and suggestions presented in this report are only understandable in context of reference to the whole report. Under no circumstances should the soil boring or test pit excavation logs, monitor well logs, or laboratory analytical reports be separated from the remainder of the report. The logs or reports should not be redrawn or summarized by other entities for inclusion in architectural or civil drawings, or other relevant applications.

Report Limitations for Contractors

Geotechnical or environmental reports, unless otherwise specifically noted, are not prepared for the purpose of developing cost estimates or bids by contractors. The extent of exploration or investigation conducted as part of this report is usually less than that necessary for contractor's needs. Contractors should be advised of these report limitations, particularly as they relate to development of cost estimates. Contractors may gain valuable information from this report, but should rely upon their own interpretations as to how subsurface conditions may affect cost, feasibility, accessibility and other components of the project work. If believed necessary or relevant, contractors should conduct additional exploratory investigation to obtain satisfactory data for the purposes of developing adequate cost estimates. Clients or developers cannot insulate themselves from attendant liability by disclaiming accuracy for subsurface ground conditions without advising contractors appropriately and providing the best information possible to limit potential for cost overruns, construction problems, or misunderstandings.

Report Ownership

Columbia West retains the ownership and copyright property rights to this entire report and its contents, which may include, but may not be limited to, figures, text, logs, electronic media, drawings, laboratory reports, and appendices. This report was prepared solely for the client, and other relevant approved users or parties, and its distribution must be contingent upon prior express written consent by Columbia West. Furthermore, client or approved users may not use, lend, sell, copy, or distribute this document without express written consent by Columbia West. Client does not own nor have rights to electronic media files that constitute this report, and under no circumstances should said electronic files be distributed or copied. Electronic media is susceptible to unauthorized manipulation or modification, and may not be reliable.

Consultant Responsibility

Geotechnical and environmental engineering and consulting is much less exact than other scientific or engineering disciplines, and relies heavily upon experience, judgment, interpretation, and opinion often based upon media (soils) that are variable, anisotropic, and non-homogenous. This often results in unrealistic expectations, unwarranted claims, and uninformed disputes against a geotechnical or environmental consultant. To reduce potential for these problems and assist relevant parties in better understanding of risk, liability, and responsibility, geotechnical and environmental reports often provide definitive statements or clauses defining and outlining consultant responsibility. The client is encouraged to read these statements carefully and request additional information from Columbia West if necessary.

SECTION 6

Title Report

Property Detail Report

1303 S 13th Ave, Kelso, WA 98626-2845

APN: 2-4355

Cowlitz County Data as of: 01/03/2020

Owner Information

Owner Name:	Pacific Tech Development LLC		
Vesting:	Corporation		
Mailing Address:	1302 Walnut St, Kelso, WA 98626-2719	Occupancy:	Absentee Owner

Location Information

Legal Description:	Sub:Kelso Outlot Blk:Keol Lot:561, Lot:561B Desc: Keol 561,561B-1,561D-1 Incl Ptn Vac Walnut St Fee 3000980 Exc Keol 561A Fee 861230036 Exc Keol 561Bexc Keol 561C Fee 970721140 Exc Keol 561D Fee 3023546 Sect,Twn,Rng:35-8N-2W Desc: Wallace V Dlc Parcel: 24355			County:	Cowlitz, WA
APN:	2-4355	Alternate APN:	R039159	Census Tract / Block:	001100 / 6000
Munic / Twnshp:	Kelso City Limits	Twnshp-Rng-Sec:	08N-02W-35	Legal Lot / Block:	561 /
Subdivision:	Kelso Outlot Block Keol Lot 561	Tract #:		Legal Book / Page:	
Neighborhood:		School District:	Kelso School District		
Elementary School:	Wallace Elementary...	Middle School:	Coweeman Middle Sc...	High School:	Kelso High School
Latitude:	46.13123	Longitude:	-122.90114		

Last Transfer / Conveyance - Current Owner

Transfer / Rec Date:	11/28/2016 / 12/05/2016	Price:		Transfer Doc #:	3557559
Buyer Name:	Consolidated Diking 3 / Cowlitz	Seller Name:	Pacific Tech Dev LLC	Deed Type:	General Warranty Deed

Last Market Sale

Sale / Rec Date:	01/29/2008 / 02/01/2008	Sale Price / Type:	$500,000 /	Deed Type:	Warranty Deed
Multi / Split Sale:		Price / Sq. Ft.:		New Construction:	
1st Mtg Amt / Type:	$400,000 / Conventional	1st Mtg Rate / Type:		1st Mtg Doc #:	3358198
2nd Mtg Amt / Type:		2nd Mtg Rate / Type:		Sale Doc #:	3358197
Seller Name:	Beach, Lorne T				
Lender:	Twin City Bank			Title Company:	Cowlitz County Tit...

Prior Sale Information

Sale / Rec Date:	08/10/2007 / 08/10/2007	Sale Price / Type:	$53,000 / Confirmed	Prior Deed Type:	Quitclaim
1st Mtg Amt / Type:		1st Mtg Rate / Type:		Prior Sale Doc #:	3343870
Prior Lender:					

Property Characteristics

Gross Living Area:		Total Rooms:	0	Year Built / Eff:	
Living Area:		Bedrooms:		Stories:	
Total Adj. Area:		Baths (F / H):		Parking Type:	
Above Grade:		Pool:		Garage #:	
Basement Area:		Fireplace:		Garage Area:	
Style:		Cooling:		Porch Type:	
Foundation:		Heating:		Patio Type:	
Quality:		Exterior Wall:		Roof Type:	
Condition:		Construction Type:		Roof Material:	

Site Information

Land Use:	Vacant Land (NEC)	Lot Area:	172,498 Sq. Ft.	Zoning:	
State Use:		Lot Width / Depth:		# of Buildings:	
County Use:	903 - 3.01 - 5.00 Acres	Usable Lot:		Res / Comm Units:	
Site Influence:		Acres:	3.96	Water / Sewer Type:	
Flood Zone Code:	X	Flood Map #:	53015C0519G	Flood Map Date:	12/16/2015
Community Name:	City Of Kelso	Flood Panel #:	0519G	Inside SFHA:	False

Tax Information

Assessed Year:	2018	Assessed Value:	$362,100	Market Total Value:	$362,100
Tax Year:	2019	Land Value:	$362,100	Market Land Value:	$362,100
Tax Area:	Kel-458-Lv	Improvement Value:		Market Imprv Value:	
Property Tax:	$5,282.32	Improved %:	100%	Market Imprv %:	100%

Exemption:

Delinquent Year:

Disclaimer: This report is not an insured product or service or a representation of the condition of title to real property. It is not an abstract, legal opinion, opinion of title, title insurance, commitment or preliminary report, or any form of title insurance or guaranty. Estimated property values are: (i) based on available data; (ii) are not guaranteed or warranted; (iii) do not constitute an appraisal; and (iv) should not be relied upon in lieu of an appraisal. This report is issued exclusively for the benefit of the applicant therefor, and may not be used or relied upon by any other person. This report may not be reproduced in any manner without the issuing party's prior written consent. The issuing party does not represent or warrant that the information herein is complete or free from error, and the information herein is provided without any warranties of any kind, as-is, and with all faults. As a material part of the consideration given in exchange for the issuance of this report, recipient agrees that the issuing party's sole liability for any loss or damage caused by an error or omission due to inaccurate information or negligence in preparing this report shall be limited to the fee charged for the report. Recipient accepts this report with this limitation and agrees that the issuing party would not have issued this report but for the limitation of liability described above. The issuing party makes no representation or warranty as to the legality or propriety of recipient's use of the information herein.

Exhibit A

PARCEL A:

A TRACT OF LAND SITUATED IN THE V. M. WALLACE DONATION LAND CLAIM IN SECTION 35, TOWNSHIP 8 NORTH, RANGE 2 WEST OF THE W.M., BEING DESCRIBED AS FOLLOWS:

ALL THAT PORTION OF THE FOLLOWING DESCRIBED PARCEL THAT LIES EAST OF 13TH AVENUE, AS CONVEYED TO THE CITY OF KELSO BY STATUTORY WARRANTY DEED RECORDED DECEMBER 30, 1986 UNDER AUDITOR'S FILE NO. 861230036.

BEGINNING AT A POINT IN THE EASTERLY EXTENSION OF THE NORTHERLY RIGHT-OF-WAY LINE OF WALNUT STREET, SAID POINT BEING 846.56 FEET SOUTH 88° 08' 36" EAST FROM THE INTERSECTION OF THE NORTHERLY RIGHT-OF-WAY LINE OF WALNUT STREET WITH THE EASTERLY RIGHT-OF-WAY LINE OF ELEVENTH STREET;
THENCE NORTH 1° 51' 24" EAST 580.54 FEET TO A POINT IN THE SOUTHWESTERLY BANK OF AN EXISTING DRAINAGE SLOUGH;
THENCE ALONG SAID SOUTHWESTERLY AND SOUTHERLY BANK AS FOLLOWS:

SOUTH 39° 05' 35" EAST 153.79 FEET;
THENCE SOUTH 35° 41' 25" EAST 128.84 FEET;
THENCE EASTERLY 321.07 FEET ALONG A CURVE CONCAVE TO THE NORTH HAVING A RADIUS OF 222.00 FEET TO THE BEGINNING OF THE TANGENT LINE;
THENCE NORTH 61° 26' 39" EAST 152.40 FEET TO A POINT IN THE SOUTHERLY BOUNDARY LINE OF THE DIKING DISTRICT PUMP STATION TRACT;
THENCE ALONG SAID BOUNDARY AS FOLLOWS:

SOUTH 70° 31' 34" EAST 46.31 FEET;
THENCE NORTH 19° 28' 26" EAST 100.00 FEET;
THENCE SOUTH 70° 31' 34" EAST 75.00 FEET;
THENCE NORTH 19° 28' 26" EAST 42.96 FEET;
THENCE SOUTH 68° 07' 34" EAST 7.44 FEET TO A POINT IN THE WESTERLY LINE OF PARCEL "D", AS DESCRIBED UNDER SUPERIOR COURT ORDER NO. 42645, SAID PARCEL *"D" BEING PERPETUALLY VESTED UNTO CONSOLIDATED DIKING IMPROVEMENT* DISTRICT NO. 3 FOR THE PURPOSE THEREIN MENTIONED;
THENCE SOUTH 10° 54' 08" EAST ALONG SAID WESTERLY LINE A DISTANCE OF 340.58 FEET;
THENCE SOUTH 57° 50' 10" EAST 99.84 FEET TO A POINT IN THE WESTERLY RIGHT-OF-WAY LINE OF STATE ROUTE NO. 5, SAID POINT BEING OPPOSITE STATION LC 163+05.37 OF STATE ROUTE NO. 5 AND HAVING A RADIAL LINE WHICH BEARS SOUTH 85° 50' 20" EAST;
THENCE SOUTHERLY ALONG A CURVE CONCAVE TO THE EAST HAVING A RADIUS OF 2296.00 FEET, AN ARC DISTANCE OF 97.69 FEET TO A POINT ON THE EASTERLY EXTENSION OF THE NORTHERLY RIGHT-OF-WAY LINE OF WALNUT STREET;
THENCE NORTH 88° 08' 35" WEST ALONG SAID NORTHERLY RIGHT-OF-WAY LINE A DISTANCE OF 924.59 TO THE POINT OF BEGINNING.

EXCEPTING THEREFROM THAT PORTION CONVEYED TO CONSOLIDATED DIKING IMPROVEMENT DISTRICT NO. 3 UNDER AUDITOR'S FILE NOS. *970701009* AND *3111460*.

PARCEL B:

A PARCEL OF LAND IN THE V. M. WALLACE DONATION LAND CLAIM IN SECTION 35, TOWNSHIP 8 NORTH, RANGE 2 WEST, W.M., COWLITZ COUNTY, WASHINGTON, BEING DESCRIBED AS FOLLOWS:

COMMENCING AT THE CENTERLINE INTERSECTION OF WALNUT STREET WITH 13TH AVENUE AS SHOWN IN RECORD OF SURVEY, BOOK 12, PAGE 13, RECORDS OF COWLITZ COUNTY, WASHINGTON;
THENCE PROCEEDING SOUTH 88° 08' 36" EAST A DISTANCE OF 362.49 FEET ALONG THE EXTENDED CENTERLINE OF WALNUT STREET TO THE TRUE POINT OF BEGINNING OF THIS BOUNDARY DESCRIPTION;
THENCE PROCEEDING NORTH 01° 51' 24" EAST A DISTANCE OF 296.66 FEET;
THENCE PROCEEDING SOUTH 22° 07' 23" EAST A DISTANCE OF 215.24 FEET;
THENCE PROCEEDING SOUTHERLY ALONG A CURVE TO THE LEFT HAVING A RADIAL BEARING OF SOUTH 86° 34' 40" EAST, A RADIUS OF 2366.00 FEET AND AN ARC DISTANCE OF 100.00 FEET;
THENCE PROCEEDING NORTH 88° 08' 36" WEST A DISTANCE OF 86.86 FEET TO THE TRUE POINT OF BEGINNING.

PARCEL A & B ARE TOGETHER WITH THAT PORTION OF WALNUT STREET VACATED PURSUANT TO CITY OF KELSO ORDINANCE NO. 97-3354 AND RECORDED OCTOBER 10, 1997 UNDER AUDITOR'S FILE NO. 3000980, WHICH WOULD ATTACH TO SAID PROPERTY BY OPERATION OF LAW.

SITUATE IN THE COUNTY OF COWLITZ, STATE OF WASHINGTON

_____ _____

Seller **Date** **Buyer** **Date**

_____ _____

Seller **Date** **Buyer** **Date**

When recorded return to:
PACIFIC TECH DEVELOPMENT LLC
1401 INDUSTRIAL WAY #400
LONGVIEW WA 98632

Escrow No.:00154010-BGL

3358197
02/01/2008 11:53:27 AM Pages: 3
Deed COWLITZ COUNTY TITLE COMPANY 44.00
Cowlitz County Washington

Received $ 6400.00 excise tax levied
pursuant to Chap. 11, Laws Ex. 1951
080256 JUDY AINSLIE
AFF. NO. COWLITZ COUNTY TREAS.
Date FEB 01 2008 Deputy

Statutory Warranty Deed

THE GRANTOR LORNE T. BEACH, a married man, as his separate estate for and in consideration of **Ten Dollars and other valuable consideration** in hand paid, conveys and warrants to **PACIFIC TECH DEVELOPMENT LLC, a Washington Limited Liability Company** the following described real estate, situated in the County of **COWLITZ**, State of Washington:

See Exhibit A attached hereto and made a part hereof.

KEOL 561, 561B-1, 561D-1
Tax Parcel Number(s): **2-4355**

SUBJECT TO covenants, conditions, restrictions, reservations, easements and agreements of record, if any.

Dated this **29TH** day of **JANUARY,2008.**

LORNE T. BEACH

STATE OF WASHINGTON
COUNTY OF **COWLITZ** } ss

I certify that I know or have satisfactory evidence that **LORNE T. BEACH** is the person who appeared before me, and said person acknowledged that **HE** signed this instrument and acknowledged it to be **HIS** free and voluntary act for the uses and purposes mentioned in this instrument.

Dated: 1-30-08

BIANCA LEMMONS NOTARY PUBLIC STATE OF WASHINGTON COMMISSION EXPIRES 2-19-11

Bianca Lemmons
Notary Public in and for the State of Washington
Residing at **KELSO**
My appointment expires: **2-19-2011**

Exhibit A

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A TRACT OF LAND SITUATED IN THE V. M. WALLACE DONATION LAND CLAIM IN SECTION 35, TOWNSHIP 8 NORTH, RANGE 2 WEST OF THE W.M., BEING DESCRIBED AS FOLLOWS:

ALL THAT PORTION OF THE FOLLOWING DESCRIBED PARCEL THAT LIES EAST OF 13TH AVENUE, AS CONVEYED TO THE CITY OF KELSO BY STATUTORY WARRANTY DEED RECORDED DECEMBER 30, 1986 UNDER AUDITOR'S FILE NO. 861230036.

BEGINNING AT A POINT IN THE EASTERLY EXTENSION OF THE NORTHERLY RIGHT-OF-WAY LINE OF WALNUT STREET, SAID POINT BEING 846.56 FEET SOUTH 88° 08' 36" EAST FROM THE INTERSECTION OF THE NORTHERLY RIGHT-OF-WAY LINE OF WALNUT STREET WITH THE EASTERLY RIGHT-OF-WAY LINE OF ELEVENTH STREET;
THENCE NORTH 1° 51' 24" EAST 580.54 FEET TO A POINT IN THE SOUTHWESTERLY BANK OF AN EXISTING DRAINAGE SLOUGH;
THENCE ALONG SAID SOUTHWESTERLY AND SOUTHERLY BANK AS FOLLOWS:

SOUTH 39° 05' 35" EAST 153.79 FEET;
THENCE SOUTH 35° 41' 25" EAST 128.84 FEET;
THENCE EASTERLY 321.07 FEET ALONG A CURVE CONCAVE TO THE NORTH HAVING A RADIUS OF 222.00 FEET TO THE BEGINNING OF THE TANGENT LINE;
THENCE NORTH 61° 26' 39" EAST 152.40 FEET TO A POINT IN THE SOUTHERLY BOUNDARY LINE OF THE DIKING DISTRICT PUMP STATION TRACT;
THENCE ALONG SAID BOUNDARY AS FOLLOWS:

SOUTH 70° 31' 34" EAST 46.31 FEET;
THENCE NORTH 19° 28' 26" EAST 100.00 FEET;
THENCE SOUTH 70° 31' 34" EAST 75.00 FEET;
THENCE NORTH 19° 28' 26" EAST 42.96 FEET;
THENCE SOUTH 68° 07' 34" EAST 7.44 FEET TO A POINT IN THE WESTERLY LINE OF PARCEL "D", AS DESCRIBED UNDER SUPERIOR COURT ORDER NO. 42645, SAID PARCEL *"D" BEING PERPETUALLY VESTED UNTO CONSOLIDATED DIKING IMPROVEMENT* DISTRICT NO. 3 FOR THE PURPOSE THEREIN MENTIONED;
THENCE SOUTH 10° 54' 08" EAST ALONG SAID WESTERLY LINE A DISTANCE OF 340.58 FEET;
THENCE SOUTH 57° 50' 10" EAST 99.84 FEET TO A POINT IN THE WESTERLY RIGHT-OF-WAY LINE OF STATE ROUTE NO. 5, *SAID POINT BEING OPPOSITE STATION LC 163+05.37* OF STATE ROUTE NO. 5 AND HAVING A RADIAL LINE WHICH BEARS SOUTH 85° 50' 20" EAST;
THENCE SOUTHERLY ALONG A CURVE CONCAVE TO THE EAST HAVING A RADIUS OF 2296.00 FEET, AN ARC DISTANCE OF 97.69 FEET TO A POINT ON THE EASTERLY EXTENSION OF THE NORTHERLY RIGHT-OF-WAY LINE OF WALNUT STREET;
THENCE NORTH 88° 08' 35" WEST ALONG SAID NORTHERLY RIGHT-OF-WAY LINE A DISTANCE OF 924.59 TO THE POINT OF BEGINNING.

EXCEPTING THEREFROM THAT PORTION CONVEYED TO CONSOLIDATED DIKING IMPROVEMENT DISTRICT NO. 3 UNDER AUDITOR'S FILE NOS. *970701009* AND *3111460*.

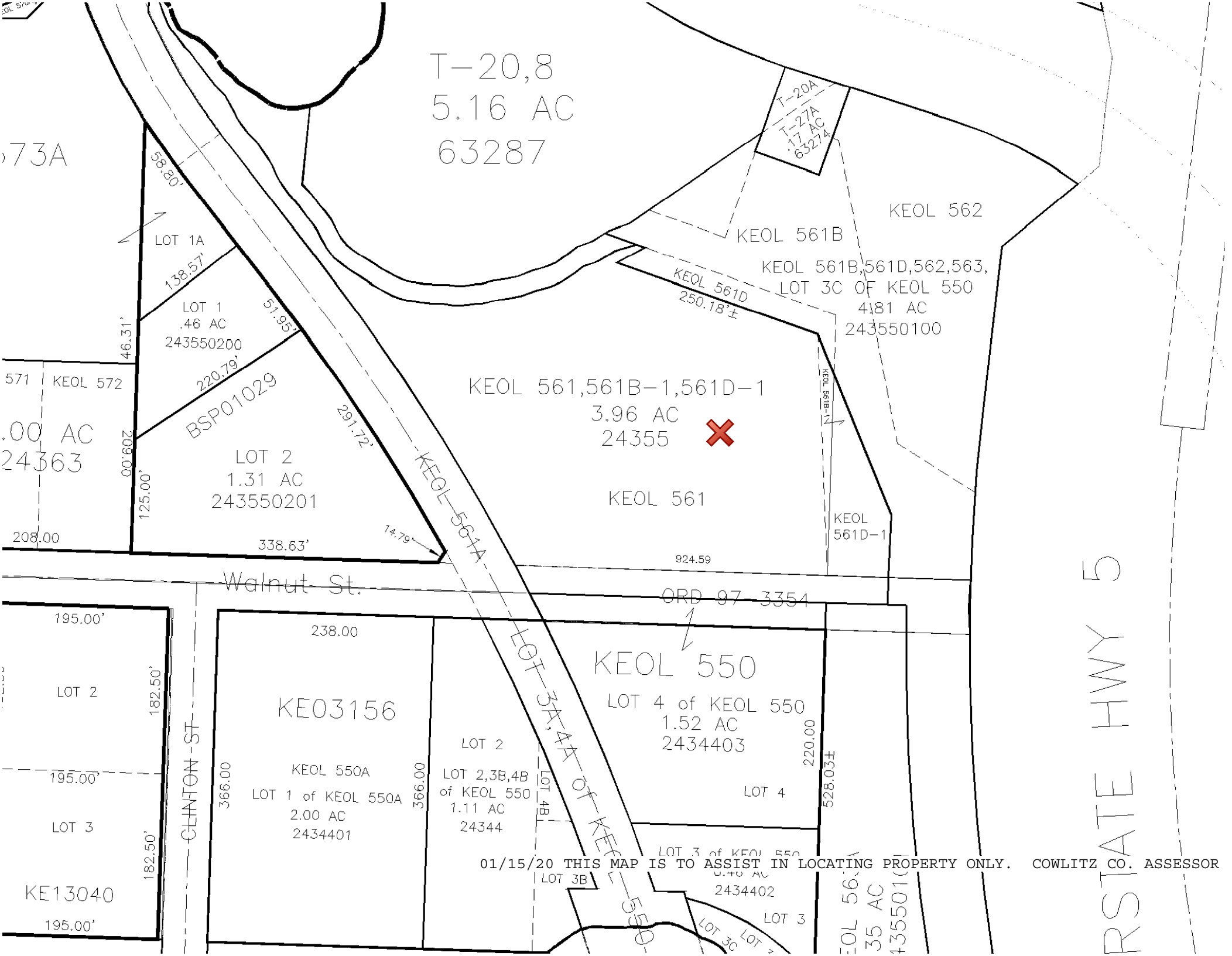
PARCEL B:

A PARCEL OF LAND IN THE V. M. WALLACE DONATION LAND CLAIM IN SECTION 35, TOWNSHIP 8 NORTH, RANGE 2 WEST, W.M., COWLITZ COUNTY, WASHINGTON, BEING DESCRIBED AS FOLLOWS:

COMMENCING AT THE CENTERLINE INTERSECTION OF WALNUT STREET WITH 13TH AVENUE AS SHOWN IN RECORD OF SURVEY, BOOK 12, PAGE 13, RECORDS OF COWLITZ COUNTY, WASHINGTON;
THENCE PROCEEDING SOUTH 88° 08' 36" EAST A DISTANCE OF 362.49 FEET ALONG THE EXTENDED CENTERLINE OF WALNUT STREET TO THE TRUE POINT OF BEGINNING OF THIS BOUNDARY DESCRIPTION;
THENCE PROCEEDING NORTH 01° 51' 24" EAST A DISTANCE OF 296.66 FEET;
THENCE PROCEEDING SOUTH 22° 07' 23" EAST A DISTANCE OF 215.24 FEET;
THENCE PROCEEDING SOUTHERLY ALONG A CURVE TO THE LEFT HAVING A RADIAL BEARING OF SOUTH 86° 34' 40" EAST, A RADIUS OF 2366.00 FEET AND AN ARC DISTANCE OF 100.00 FEET;
THENCE PROCEEDING NORTH 88° 08' 36" WEST A DISTANCE OF 86.86 FEET TO THE TRUE POINT OF BEGINNING.

PARCEL A & B ARE TOGETHER WITH THAT PORTION OF WALNUT STREET VACATED PURSUANT TO CITY OF KELSO ORDINANCE NO. 97-3354 AND RECORDED OCTOBER 10, 1997 UNDER AUDITOR'S FILE NO. 3000980, WHICH WOULD ATTACH TO SAID PROPERTY BY OPERATION OF LAW.

SITUATE IN THE COUNTY OF COWLITZ, STATE OF WASHINGTON



01/15/20 THIS MAP IS TO ASSIST IN LOCATING PROPERTY ONLY. COWLITZ CO. ASSESSOR

3557559
12/05/2016 12:01:23 PM Pages: 5
Deed COWLITZ COUNTY TITLE COMPANY 77.00
Cowlitz County Washington

When recorded return to:

Consolidated Diking Improvement District No. 3
of Cowlitz County, WA
1600 13th Avenue S

Kelso, WA 98626

Received $ EXEMPT Excise Tax Levied
Pursuant to Chap. 11, Laws Ex. 1951

DEC 05 2016
Aff No 164421
Cowlitz County Treasurer Kathy Hanks

STATUTORY WARRANTY DEED

COW3329

THE GRANTOR **Pacific Tech Development, LLC a Washington Limited Liability Company,**

for and in consideration of **Ten Dollars and other valuable consideration**

in hand paid, conveys, and warrants to **Consolidated Diking Improvement District No. 3 of Cowlitz County, WA,**

the following described real estate, situated in the County of Cowlitz, State of Washington:

SEE ATTACHED EXHIBIT "A" and EXHIBIT "B"

Abbreviated Legal: KEOL 561,561B-1,561D-1 IN V. WALLACE DLC

SUBJECT TO covenants, conditions, restrictions, reservations, easements and agreement of record, if any.

Tax Parcel Number(s): **2-4355**

Dated: **November 28, 2016**

Pacific Tech Development, LLC, a Washington Limited Liability Company

By: Joseph Lane
Its: Manager/Member

By: Calvin Miller
Its: Manager/Member

ACCEPTED THIS 1st **DAY OF** December, 2016.

Consolidated Diking Improvement District No. 3 of Cowlitz County, WA

By: Jeff Czech
Its: Chairman

By: Pete Leak
Its: Supervisor

By: Tim Todd
Its: Supervisor

9/11

STATE OF **Washington**

} ss.

COUNTY OF **Cowlitz**

I certify that I know or have satisfactory evidence that **Joseph Lane** (is/are) the person(s) who appeared before me, and said person(s) acknowledged that he signed this instrument, on oath stated that he authorized to execute the instrument and acknowledge it as the **Manager/Member** of **Pacific Tech Development, LLC a Washington Limited Liability Company** to be the free and voluntary act of such party(ies) for the uses and purposes mentioned in this instrument.

Dated: 12/1/16

SHELBY L. CAUFMAN NOTARY PUBLIC COMMISSION EXPIRES 5-19-19 STATE OF WASHINGTON

Shelby Caufman
Notary Public in and for the State of Washington
Residing at Longview
My appointment expires: 05/19/2019

STATE OF **Washington**

} ss.

COUNTY OF **Cowlitz**

I certify that I know or have satisfactory evidence that **Calvin Miller** (is/are) the person(s) who appeared before me, and said person(s) acknowledged that he signed this instrument, on oath stated that he authorized to execute the instrument and acknowledge it as the **Manager/Member** of **Pacific Tech Development, LLC a Washington Limited Liability Company** to be the free and voluntary act of such party(ies) for the uses and purposes mentioned in this instrument.

Dated: 12/1/16

SHELBY L. CAUFMAN NOTARY PUBLIC COMMISSION EXPIRES 5-19-19 STATE OF WASHINGTON

Shelby Caufman
Notary Public in and for the State of Washington
Residing at Longview
My appointment expires: 05/19/2019

EXHIBIT "A"

ALL THAT PORTION OF PARCELS A & B DESCRIBED BELOW LYING NORTH AND EAST OF THE FOLLOWING DESCRIBED LINE:

**COMMENCING AT A BRASS NAIL WITH PUNCH MARK IN CONCRETE AT THE CENTERLINE INTERSECTION OF SOUTH 11TH AVENUE AND WALNUT STREET;
THENCE SOUTH 88° 08' 36" EAST 1285.34 FEET TO THE CENTERLINE INTERSECTION OF SOUTH 13TH AVENUE AND WALNUT STREET;
THENCE SOUTH 88° 08' 36" EAST 449.35 FEET TO A 30 MILLIMETER BRASS DISK IN CONCRETE MARKED "GALLI PLS 41079" AND THE TRUE POINT OF BEGINNING OF THIS LINE DESCRIPTION;
THENCE ALONG THE ARC OF A 2,366.00 FOOT RADIUS CURVE TO THE RIGHT, THROUGH A CENTRAL ANGLE OF 0° 32' 49" (THE LONG CHORD OF WHICH BEARS NORTH 1° 17' 04" EAST 22.59 FEET) AN ARC DISTANCE OF 22.59 FEET TO A 5/8" REBAR WITH YELLOW PLASTIC CAP MARKED "COWLITZ CNTY PLS 41079";
THENCE NORTH 23° 52' 14" WEST 272.40 FEET TO A 5/8" REBAR WITH YELLOW PLASTIC CAP MARKED "COWLITZ CNTY PLS 41079";
THENCE NORTH 66° 16' 09" WEST 207.46 FEET TO A 5/8" REBAR WITH YELLOW PLASTIC CAP MARKED "COWLITZ CNTY PLS 41079";
THENCE SOUTH 64° 57' 16" WEST 146.75 FEET TO A 5/8" REBAR WITH YELLOW PLASTIC CAP MARKED "COWLITZ CNTY PLS 41079";
THENCE NORTH 89° 18' 50" WEST 188.98 FEET, MORE OR LESS, TO A POINT ON THE CENTERLINE OF SOUTH 13TH AVENUE;
THENCE ALONG SAID CENTERLINE THE FOLLOWING THREE COURSES:**

**1) ALONG THE ARC OF A 2,330.00 FOOT RADIUS CURVE TO THE LEFT, THROUGH A CENTRAL ANGLE OF 2° 06' 37" (THE LONG CHORD OF WHICH BEARS NORTH 36° 40' 10" WEST 85.81 FEET) AN ARC DISTANCE OF 85.82 FEET;
2) NORTH 37° 43' 29" WEST 175.90 FEET TO THE BEGINNING OF A 660.00 FOOT RADIUS CURVE TO THE RIGHT;
3) ALONG SAID CURVE, THROUGH A CENTRAL ANGLE OF 53° 42' 47" (THE LONG CHORD OF WHICH BEARS NORTH 10° 52' 05" WEST 596.32 FEET) AN ARC DISTANCE OF 618.73 FEET TO THE POINT OF TERMINUS OF SAID LINE.**

<u>EXCEPTING THEREFROM</u> ANY PORTION THEREOF LYING WITHIN THE EXISTING RIGHT-OF-WAY OF SOUTH 13TH AVENUE.

<u>PARCEL A:</u>

A TRACT OF LAND SITUATED IN THE V. M. WALLACE DONATION LAND CLAIM IN SECTION 35, TOWNSHIP 8 NORTH, RANGE 2 WEST OF THE W.M., BEING DESCRIBED AS FOLLOWS:

ALL THAT PORTION OF THE FOLLOWING DESCRIBED PARCEL THAT LIES EAST OF 13TH AVENUE, AS CONVEYED TO THE CITY OF KELSO BY STATUTORY WARRANTY DEED RECORDED DECEMBER 30, 1986, UNDER AUDITOR'S FILE NO. 861230036.

**BEGINNING AT A POINT IN THE EASTERLY EXTENSION OF THE NORTHERLY RIGHT-OF-WAY LINE OF WALNUT STREET, SAID POINT BEING 846.56 FEET SOUTH 88° 08' 36" EAST FROM THE INTERSECTION OF THE NORTHERLY RIGHT-OF-WAY LINE OF WALNUT STREET WITH THE EASTERLY RIGHT-OF-WAY LINE OF ELEVENTH STREET;
THENCE NORTH 1° 51' 24" EAST 580.54 FEET TO A POINT IN THE SOUTHWESTERLY BANK OF AN EXISTING DRAINAGE SLOUGH;
THENCE ALONG SAID SOUTHWESTERLY AND SOUTHERLY BANK AS FOLLOWS:**

**SOUTH 39° 05' 35" EAST 153.79 FEET;
THENCE SOUTH 35° 41' 25" EAST 128.84 FEET;
THENCE EASTERLY 321.07 FEET ALONG A CURVE CONCAVE TO THE NORTH HAVING A RADIUS OF 222.00 FEET TO THE BEGINNING OF THE TANGENT LINE;
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THENCE ALONG SAID BOUNDARY AS FOLLOWS:**

**SOUTH 70° 31' 34" EAST 46.31 FEET;
THENCE NORTH 19° 28' 26" EAST 100.00 FEET;
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THENCE NORTH 19° 28' 26" EAST 42.96 FEET;**

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THENCE SOUTH 10° 54' 08" EAST ALONG SAID WESTERLY LINE A DISTANCE OF 340.58 FEET;
THENCE SOUTH 57° 50' 10" EAST 99.84 FEET TO A POINT IN THE WESTERLY RIGHT-OF-WAY LINE OF STATE ROUTE NO. 5, SAID POINT BEING OPPOSITE STATION LC 163+05.37 OF STATE ROUTE NO. 5 AND HAVING A RADIAL LINE WHICH BEARS SOUTH 85° 50' 20" EAST;
THENCE SOUTHERLY ALONG A CURVE CONCAVE TO THE EAST HAVING A RADIUS OF 2296.00 FEET, AN ARC DISTANCE OF 97.69 FEET TO A POINT ON THE EASTERLY EXTENSION OF THE NORTHERLY RIGHT-OF-WAY LINE OF WALNUT STREET;
THENCE NORTH 88° 08' 35" WEST ALONG SAID NORTHERLY RIGHT-OF-WAY LINE A DISTANCE OF 924.59 TO THE POINT OF BEGINNING.

EXCEPTING THEREFROM THOSE PORTIONS CONVEYED TO CONSOLIDATED DIKING IMPROVEMENT DISTRICT NO. 3 UNDER AUDITOR'S FILE NOS. 970701009 AND 3111460.

TOGETHER WITH THAT PORTION OF VACATED WALNUT STREET ADJOINING SAID PROPERTY, VACATED BY CITY OF KELSO ORDINANCE NO. 97-3354, RECORDED UNDER AUDITOR'S FILE NO. 3000980, WHICH UPON VACATION ATTACHED BY OPERATION OF LAW.

PARCEL B:

A PARCEL OF LAND IN THE V. M. WALLACE DONATION LAND CLAIM IN SECTION 35, TOWNSHIP 8 NORTH, RANGE 2 WEST, W.M., COWLITZ COUNTY, WASHINGTON, BEING DESCRIBED AS FOLLOWS:

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THENCE PROCEEDING SOUTH 88° 08' 36" EAST A DISTANCE OF 362.49 FEET ALONG THE EXTENDED CENTERLINE OF WALNUT STREET TO THE TRUE POINT OF BEGINNING OF THIS BOUNDARY DESCRIPTION;
THENCE PROCEEDING NORTH 01° 51' 24" EAST A DISTANCE OF 296.66 FEET;
THENCE PROCEEDING SOUTH 22° 07' 23" EAST A DISTANCE OF 215.24 FEET;
THENCE PROCEEDING SOUTHERLY ALONG A CURVE TO THE LEFT HAVING A RADIAL BEARING OF SOUTH 86° 34' 40" EAST, A RADIUS OF 2366.00 FEET AND AN ARC DISTANCE OF 100.00 FEET;
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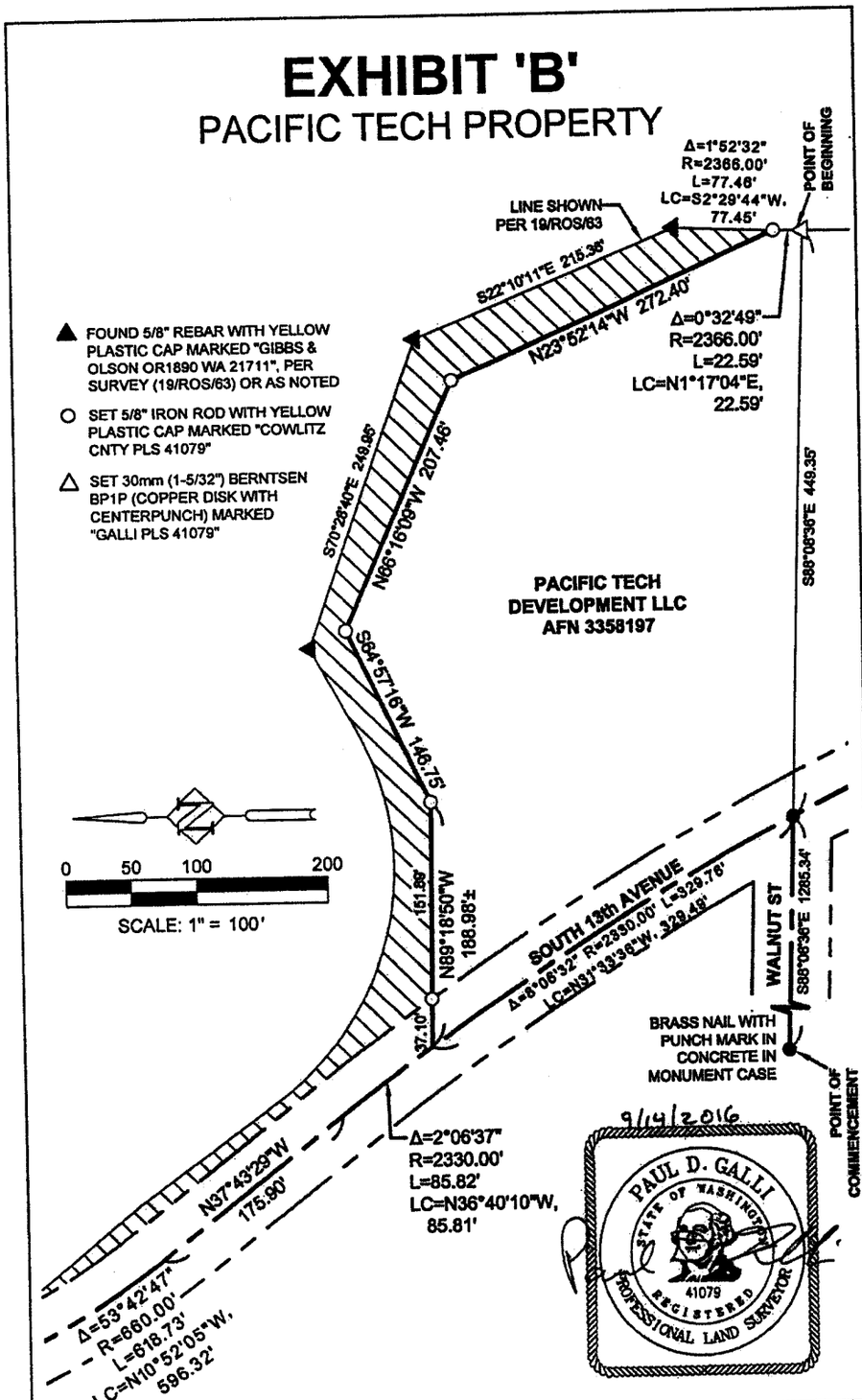
TOGETHER WITH THAT PORTION OF VACATED WALNUT STREET ADJOINING SAID PROPERTY, VACATED BY CITY OF KELSO ORDINANCE NO. 97-3354, RECORDED UNDER AUDITOR'S FILE NO. 3000980, WHICH UPON VACATION ATTACHED BY OPERATION OF LAW.

SITUATE IN THE COUNTY OF COWLITZ, STATE OF WASHINGTON

EXHIBIT 'B'

PACIFIC TECH PROPERTY



PROJECT ID: N/A PARCEL NUMBER: 24355 SW 1/4 S35 T08N R02W

NAME OF OWNER: PACIFIC TECH DEVELOPMENT LLC

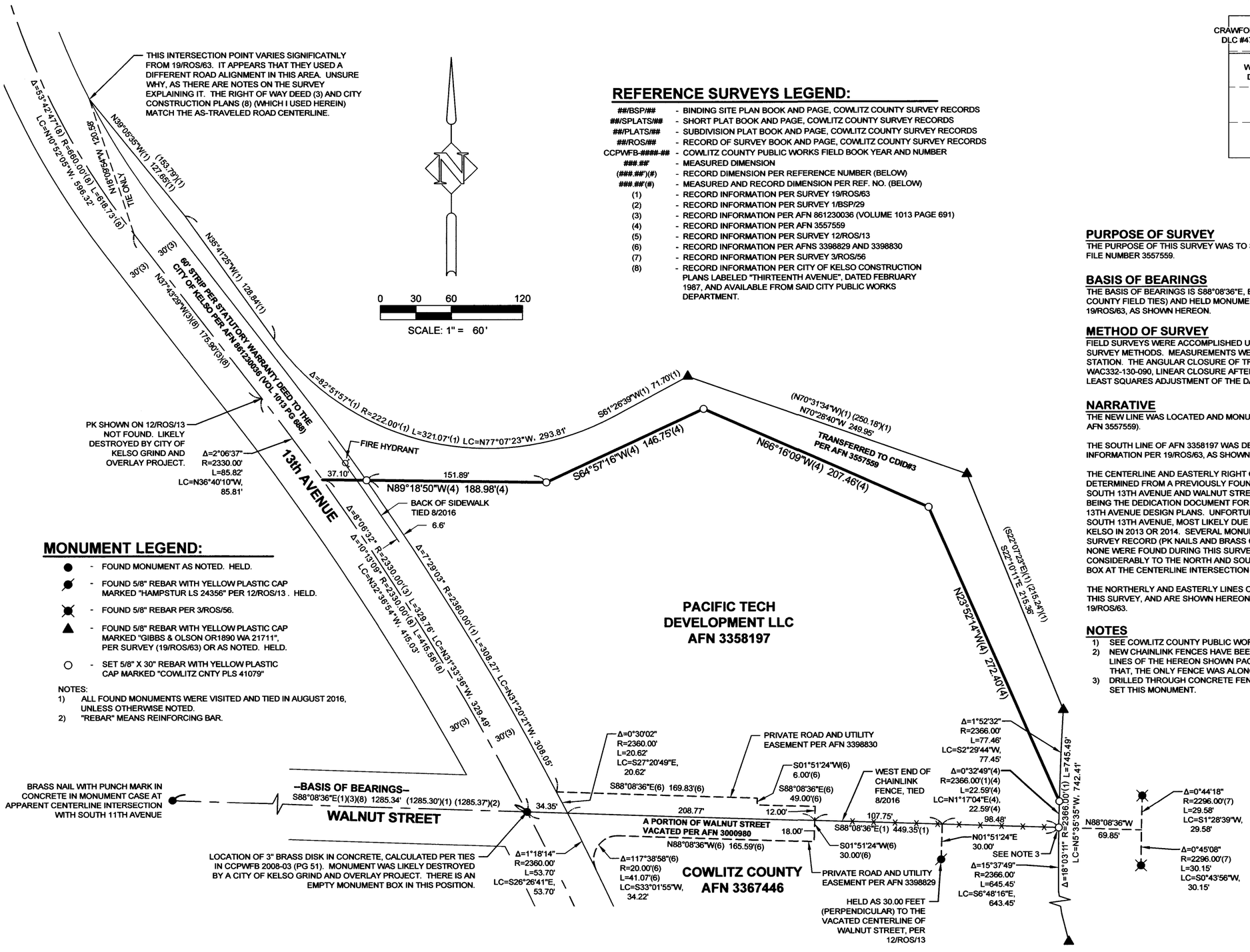
OWNER ADDRESS: 1302 WALNUT STREET
KELSO, WA 98626

PARCEL ADDRESS: 1303 S 13TH AVE
KELSO, WA 98626

DWG: CDID3-PACTECH-ROS.dwg

3558662 V: 36 P: 038
12/21/2016 03:03:28 PM Pages: 1
00Survey COWLITZ COUNTY PUBLIC WORKS
Cowlitz County Washington

157 V.36 P.38



MONUMENT LEGEND:

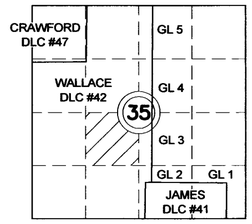
- ● - FOUND MONUMENT AS NOTED. HELD.
- ⌀ - FOUND 5/8" REBAR WITH YELLOW PLASTIC CAP MARKED "HAMPSTUR LS 24356" PER 12/ROS/13 . HELD.
- ✳ - FOUND 5/8" REBAR PER 3/ROS/56.
- ▲ - FOUND 5/8" REBAR WITH YELLOW PLASTIC CAP MARKED "GIBBS & OLSON OR1890 WA 21711", PER SURVEY (19/ROS/63) OR AS NOTED. HELD.
- ○ - SET 5/8" X 30" REBAR WITH YELLOW PLASTIC CAP MARKED "COWLITZ CNTY PLS 41079"

NOTES:
1) ALL FOUND MONUMENTS WERE VISITED AND TIED IN AUGUST 2016, UNLESS OTHERWISE NOTED.
2) "REBAR" MEANS REINFORCING BAR.

REFERENCE SURVEYS LEGEND:

##/BSP/##	- BINDING SITE PLAN BOOK AND PAGE, COWLITZ COUNTY SURVEY RECORDS
##/SPLATS/##	- SHORT PLAT BOOK AND PAGE, COWLITZ COUNTY SURVEY RECORDS
##/PLATS/##	- SUBDIVISION PLAT BOOK AND PAGE, COWLITZ COUNTY SURVEY RECORDS
##/ROS/##	- RECORD OF SURVEY BOOK AND PAGE, COWLITZ COUNTY SURVEY RECORDS
CCPWFB-####.##	- COWLITZ COUNTY PUBLIC WORKS FIELD BOOK YEAR AND NUMBER
###.##	- MEASURED DIMENSION
(###.##')(#)	- RECORD DIMENSION PER REFERENCE NUMBER (BELOW)
###.##'(#)	- MEASURED AND RECORD DIMENSION PER REF. NO. (BELOW)
(1)	- RECORD INFORMATION PER SURVEY 19/ROS/63
(2)	- RECORD INFORMATION PER SURVEY 1/BSP/29
(3)	- RECORD INFORMATION PER AFN 861230036 (VOLUME 1013 PAGE 691)
(4)	- RECORD INFORMATION PER AFN 3557559
(5)	- RECORD INFORMATION PER SURVEY 12/ROS/13
(6)	- RECORD INFORMATION PER AFNS 3398829 AND 3398830
(7)	- RECORD INFORMATION PER SURVEY 3/ROS/56
(8)	- RECORD INFORMATION PER CITY OF KELSO CONSTRUCTION PLANS LABELED "THIRTEENTH AVENUE", DATED FEBRUARY 1987, AND AVAILABLE FROM SAID CITY PUBLIC WORKS DEPARTMENT.

INDEX LOCATION
S35, T8N, R2W, W.M.



PURPOSE OF SURVEY
THE PURPOSE OF THIS SURVEY WAS TO SHOW AND MONUMENT THE NEW LINE PER AUDITOR'S FILE NUMBER 3557559.

BASIS OF BEARINGS
THE BASIS OF BEARINGS IS S88°08'36"E, BETWEEN FOUND (OR CALCULATED FROM PREVIOUS COUNTY FIELD TIES) AND HELD MONUMENTS ALONG THE CENTERLINE OF WALNUT STREET, PER 19/ROS/63, AS SHOWN HEREON.

METHOD OF SURVEY
FIELD SURVEYS WERE ACCOMPLISHED UTILIZING STANDARD CLOSED TRAVERSE AND RADIAL SURVEY METHODS. MEASUREMENTS WERE PERFORMED USING A TOPCON 3-SECOND TOTAL STATION. THE ANGULAR CLOSURE OF TRAVERSE MEETS STANDARDS AS SET FORTH IN WAC332-130-090, LINEAR CLOSURE AFTER AZIMUTH ADJUSTMENT IS GREATER THAN 1:10000. A LEAST SQUARES ADJUSTMENT OF THE DATA WAS PERFORMED.

NARRATIVE
THE NEW LINE WAS LOCATED AND MONUMENTED PER AGREEMENT BETWEEN THE PARTIES (SEE AFN 3557559).

THE SOUTH LINE OF AFN 3358197 WAS DETERMINED FROM FOUND MONUMENTS AND RECORD INFORMATION PER 19/ROS/63, AS SHOWN HEREON.

THE CENTERLINE AND EASTERLY RIGHT OF WAY LINE OF 13TH AVENUE SOUTH WERE DETERMINED FROM A PREVIOUSLY FOUND (IN 2008) MONUMENT AT THE INTERSECTION OF SOUTH 13TH AVENUE AND WALNUT STREET, AND RECORD INFORMATION PER AFN 861230036, BEING THE DEDICATION DOCUMENT FOR 13TH AVENUE SOUTH, AS WELL AS THE 1987 SOUTH 13TH AVENUE DESIGN PLANS. UNFORTUNATELY, THERE ARE NO EXISTING MONUMENTS IN SOUTH 13TH AVENUE, MOST LIKELY DUE TO A GRIND AND REPAVE PROJECT BY THE CITY OF KELSO IN 2013 OR 2014. SEVERAL MONUMENTS ALONG THE CENTERLINE WERE SHOWN IN THE SURVEY RECORD (PK NAILS AND BRASS CAP MONUMENTS) PRIOR TO THE CITY'S PROJECT. NONE WERE FOUND DURING THIS SURVEY, EVEN THOUGH WE EXTENDED OUR SEARCH AREAS CONSIDERABLY TO THE NORTH AND SOUTH OF THE PROJECT. THERE IS AN EMPTY MONUMENT BOX AT THE CENTERLINE INTERSECTION OF WALNUT STREET AND SOUTH 13TH AVENUE.

THE NORTHERLY AND EASTERLY LINES OF SAID AFN 3358197 WERE NOT DETERMINED DURING THIS SURVEY, AND ARE SHOWN HEREON FOR REFERENCE PURPOSES ONLY PER SAID 19/ROS/63.

NOTES
1) SEE COWLITZ COUNTY PUBLIC WORKS FIELD BOOKS 2008-03 & 2016-02.
2) NEW CHAINLINK FENCES HAVE BEEN PLACED ALONG PORTIONS OF THE SOUTH AND WEST LINES OF THE HEREON SHOWN PACIFIC TECH PROPERTY, SINCE AUGUST, 2016. PRIOR TO THAT, THE ONLY FENCE WAS ALONG PART OF THE SOUTH LINE, AS SHOWN HEREON.
3) DRILLED THROUGH CONCRETE FENCE POST FOOTING (ON EAST SIDE OF LAST POST) TO SET THIS MONUMENT.

12/21/2016

PAUL D. GALLI — STATE OF WASHINGTON — 41079 — REGISTERED PROFESSIONAL LAND SURVEYOR

SURVEYOR'S CERTIFICATE
THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE REQUIREMENTS OF THE SURVEY RECORDING ACT AT THE REQUEST OF THE COWLITZ COUNTY ROAD ENGINEER.

Paul D. Galli

PAUL D. GALLI, PLS 41079

AUDITOR'S CERTIFICATE
FILED FOR RECORD THIS 21st DAY OF December, 2016 AT 3:03p M. IN BOOK 36 OF SURVEYS AT PAGE 38 AT THE REQUEST OF THE REQUEST OF THE COWLITZ COUNTY ROAD ENGINEER.

Dyann Campbell

DEPUTY COUNTY AUDITOR

Cowlitz County

DEPARTMENT OF PUBLIC WORKS
1600 13th AVENUE SOUTH
KELSO, WASHINGTON 98626

RECORD OF SURVEY

IN SECTION 35, TOWNSHIP 8 NORTH, RANGE 2 WEST, WILLAMETTE MERIDIAN.

BEING A SURVEY OF THE NEW LINE PER AUDITOR'S FILE NUMBER 3557559, COWLITZ COUNTY RECORDS.

DATE: DECEMBER 20, 2016

PROJECT NUMBER: CDID#3 (PACIFIC TECH PROP. ACQUISITION)

SHEET 1 OF 1

SECTION 7

Geotechnical Report

Geotechnical Site Investigation

Pacific Tech Construction

Kelso, Washington

August 8, 2019

Geotechnical ■ Environmental ■ Special Inspections

Columbia West
Engineering, Inc

11917 NE 95th Street
Vancouver, Washington
98682
Phone: 360-823-2900
Fax: 360-823-2901




www.columbiawestengineering.com

Geotechnical ■ Environmental ■ Special Inspections
Columbia West Engineering, Inc

GEOTECHNICAL SITE INVESTIGATION
PACIFIC TECH CONSTRUCTION
KELSO, WASHINGTON

Prepared For:

Pacific Tech Construction, Inc.
c/o Mr. Tim Wines, PE
Three Rivers Land Services, PLLC
1302 Walnut Street
Kelso, Washington 98626

Site Location:

1303 13th Avenue S
Kelso, Washington
Parcel No. 24355

Prepared By:

Columbia West Engineering, Inc.
11917 NE 95th Street
Vancouver, Washington 98682
Phone: 360-823-2900
Fax: 360-823-2901

Date Prepared:

August 8, 2019

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F	Report Limitations and Important Information

GEOTECHNICAL SITE INVESTIGATION
PACIFIC TECH CONSTRUCTION
KELSO, WASHINGTON

1.0 INTRODUCTION

Columbia West Engineering, Inc. was retained by Pacific Tech Construction to conduct a geotechnical site investigation for a proposed commercial development located in Kelso Washington. The purpose of the investigation was to observe and assess subsurface soil conditions at specific locations and provide subsequent appropriate geotechnical engineering analyses to support property development, planning, and design recommendations. The scope of services was outlined in a proposal contract dated April 22, 2019. Columbia West's previous work at the site included a geotechnical site investigation for the proposed *Pacific Tech Construction* project (Columbia West, 2008). This current report summarizes the investigation and provides field assessment documentation and laboratory analytical test reports. This report is subject to the limitations expressed in Section 6.0, *Conclusion and Limitations* and Appendix F.

1.1 General Site Information

As indicated on Figures 1 and 2, the subject site is located at 1303 13th Avenue S in Kelso, Washington. The site is bounded by 13th Avenue S to the west, an existing commercial property to the south, and a canal to the north and east. The regulatory jurisdictional agency is the City of Kelso, Washington. The approximate latitude and longitude are N 46° 7' 52" and W 122° 54' 7" and the legal description is a portion of the SE ¼ of Section 35, T8N, R2W, Willamette Meridian. The subject property comprises approximately 3.08 acres.

1.2 Proposed Development

Preliminary correspondence with the project civil engineer indicates site development will consist of a 12,000 square-foot manufactured warehouse building, private paved parking areas and access drives, essential underground utilities, and stormwater management appurtenances. Columbia West has not reviewed preliminary grading plans but understands that cut and fill may be proposed at the property. This report is based upon proposed development as described above and may not be applicable if modified.

2.0 REGIONAL GEOLOGY AND SOIL CONDITIONS

The subject site lies within the Kelso-Longview area in southwest Washington, approximately ninety miles east of the Pacific Ocean at the confluence of the Cowlitz and Columbia Rivers. Kelso and Longview are situated between low, broadly eroded rounded hills that form the foothills of the western Cascade Mountain range.

According to the *Geologic Map of Washington – Southwest Quadrant* (Washington Division of Geology and Earth Resources Geologic Map GM-34, 1987) and the *Geologic Map of the Mount St. Helen's Quadrangle, Washington and Oregon* (Washington Division of Geology

and Earth Resources Open File Report 87-4, 1987) near-surface soils are expected to consist of recent Quaternary-aged silt, sand, and gravel alluvium deposits (Qa).

The *Web Soil Survey* (United States Department of Agriculture, Natural Resource Conservation Service [USDA NRCS], 2019 Website) identifies surface soils primarily as Caples silty clay loam. Although soil conditions may vary from the broad USDA descriptions, Caples soils are generally fine textured, somewhat poorly drained soils developed in flood plains derived from alluvial materials. Caples soils exhibit low permeability, high shrink swell potential, low shear strength, and a slight erosion hazard based primarily on grade.

3.0 REGIONAL SEISMOLOGY

Recent research and subsurface mapping investigations within the Pacific Northwest appear to suggest the historic potential risk for a large earthquake event with strong localized ground movement may be underestimated. Past earthquakes in the Pacific Northwest appear to have caused landslides and ground subsidence, in addition to severe flooding near coastal areas. Earthquakes may also induce soil liquefaction, which occurs when elevated horizontal ground acceleration and velocity cause soil particles to interact as a fluid as opposed to a solid. Liquefaction of soil can result in lateral spreading and temporary loss of bearing capacity and shear strength.

There are at least four major known fault zones in the vicinity of the site that may be capable of generating potentially destructive horizontal accelerations. These fault zones are described briefly in the following text.

Portland Hills Fault Zone

The Portland Hills Fault Zone consists of several northwest-trending faults located along the northeastern margin of the Tualatin Mountains, also known as the Portland Hills, and the southwest margin of the Portland Basin. The fault zone is approximately 25 to 30 miles in length and is located approximately 27 miles south of the site. According to *Seismic Design Mapping, State of Oregon* (Geomatrix Consultants, 1995), there is no definitive consensus among geologists as to the zone fault type. Several alternate interpretations have been suggested.

According to the *USGS Earthquake Hazards Program*, the fault was originally mapped as a down-to-the-northeast normal fault, but has also been mapped as part of a regional-scale zone of right-lateral, oblique slip faults, and as a steep escarpment caused by asymmetrical folding above a south-west dipping, blind thrust fault. The Portland Hills fault offsets Miocene Columbia River Basalts, and Miocene to Pliocene sedimentary rocks of the Troutdale Formation. No fault scarps on surficial Quaternary deposits have been described along the fault trace, and the fault is mapped as buried by the Pleistocene-aged Missoula flood deposits.

However, evidence suggests that fault movement has impacted shallow Holocene deposits and deeper Pleistocene sediments. Seismologists recorded a magnitude (M) 3.2 earthquake thought to be associated with the fault zone near Kelly Point Park in November 2012, a M3.9 earthquake thought to be associated with the fault zone near Kelly Point Park

in April 2003, and a M3.5 earthquake possibly associated with the fault zone approximately 1.3 miles east of the fault in 1991. Therefore, the Portland Hills Fault Zone is generally thought to be potentially active and capable of producing possible damaging earthquakes.

Gales Creek-Newberg-Mt. Angel Fault Zone

Located approximately 36 miles southwest of the site, the northwest-striking, approximately 50-mile long Gales Creek-Newberg-Mt. Angel Structural Zone forms the northwestern boundary between the Oregon Coast Range and the Willamette Valley, and consists of a series of discontinuous northwest-trending faults. The southern end of the fault zone forms the southwest margin of the Tualatin basin. Possible late-Quaternary geomorphic surface deformation may exist along the structural zone (Geomatrix Consultants, 1995).

According to the *USGS Earthquake Hazards Program*, the Mount Angel fault is mapped as a high-angle, reverse-oblique fault, which offsets Miocene rocks of the Columbia River Basalts, and Miocene and Pliocene sedimentary rocks. The fault appears to have controlled emplacement of the Frenchman Spring Member of the Wanapum Basalts, and thus must have a history that predates the Miocene age of these rocks. No unequivocal evidence of deformation of Quaternary deposits has been described, but a thick sequence of sediments deposited by the Missoula floods covers much of the southern part of the fault trace.

Although no definitive evidence of impacts to Holocene sediments have clearly been identified, the Mount Angel fault appears to have been the location of minor earthquake swarms in 1990 near Woodburn, Oregon, and a M5.6 earthquake in March 1993 near Scotts Mills, approximately four miles south of the mapped extent of the Mt. Angel fault. It is unclear if the earthquake occurred along the fault zone or a parallel structure. Therefore, the Gales Creek-Newberg-Mt. Angel Structural Zone is considered potentially active.

Lacamas Lake-Sandy River Fault Zone

The northwest-trending Lacamas Lake Fault and northeast-trending Sandy River Fault intersect north of Camas, Washington approximately 43 miles southeast of the site, and form part of the northeastern margin of the Portland basin. According to *Geology and Groundwater Conditions of Clark County Washington* (USGS Water Supply Paper 1600, Mundorff, 1964) and the *Geologic Map of the Lake Oswego Quadrangle* (Oregon DOGAMI Series GMS-59, 1989), the Lacamas Lake fault zone consists of shear contact between the Troutdale Formation and underlying Oligocene andesite-basalt bedrock. Secondary shear contact associated with the fault zone may have produced a series of prominent northwest-southeast geomorphic lineaments in proximity to the site.

According to the *USGS Earthquake Hazards Program* the fault has been mapped as a normal fault with down-to-the-southwest displacement, and has also been described as a steeply northeast or southwest-dipping, oblique, right-lateral, slip-fault. The trace of the Lacamas Lake fault is marked by the linear lower reach of Lacamas Creek. No fault scarps on Quaternary surficial deposits have been described. The Lacamas Lake fault offsets Pliocene-aged sedimentary conglomerates generally identified as the Troutdale formation, and Pliocene- to Pleistocene-aged basalts generally identified as the Boring Lava formation.

Recent seismic reflection data across the probable trace of the fault under the Columbia River yielded no unequivocal evidence of displacement underlying the Missoula flood deposits, however, recorded mild seismic activity during the recent past indicates this area may be potentially seismogenic.

Cascadia Subduction Zone

The Cascadia Subduction Zone has recently been recognized as a potential source of strong earthquake activity in the Portland/Vancouver Basin. This phenomenon is the result of the earth's large tectonic plate movement. Geologic evidence indicates that volcanic ocean floor activity along the Juan de Fuca ridge in the Pacific Ocean causes the Juan de Fuca Plate to perpetually move east and subduct under the North American Continental Plate. The subduction zone results in historic volcanic and potential earthquake activity in proximity to the plate interface, believed to lie approximately 20 to 50 miles west of the general location of the Oregon and Washington coast (Geomatrix Consultants, 1995).

4.0 GEOTECHNICAL AND GEOLOGIC FIELD INVESTIGATION

A geotechnical field investigation consisting of visual reconnaissance and cone penetrometer testing (CPT-1) was conducted at the site on May 31, 2019. Columbia West's previous geotechnical field investigation, *Pacific Tech Construction* project (Columbia West, 2008) consisting of visual reconnaissance and nine test pits (TP-1 through TP-3 and 6 undocumented fill test pits) was conducted at the site on November 1, 2007.

Cone penetrometer testing was conducted with a track-mounted CPT rig. Subsurface soil profiles were logged in accordance with Unified Soil Classification System (USCS) specifications. Subsurface soil behavior was logged in accordance with the *Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils* (ASTM D5778-12). Subsurface exploration logs for the 2019 geotechnical exploration are presented in Appendix A. Disturbed soil samples were collected from relevant soil horizons and submitted for laboratory analysis during the 2008 geotechnical site investigation. Exploration logs, associated laboratory test results, and a exploration location map for geotechnical work conducted in 2008 are provided in Appendix D. Soil descriptions and classification information are provided in Appendix B. A photo log is presented in Appendix C. The 2019 subsurface exploration location and proposed development is indicated on Figure 2.

4.1 Surface Investigation and Site Description

The subject site consists of tax parcel 24355 totaling approximately 3.08 acres and is located at 1303 13th Avenue S in Kelso, Washington. The site is bounded by 13th Avenue S to the west, an existing commercial property to the south, and a canal to the north and east.

The site is accessed via a concrete drive apron stemming from 13th Avenue S. The site is primarily open and covered with grass, shrub, and blackberry vegetation. No existing structures were observed onsite. Observed development consisted of a gravel parking and storage area in the southern area of the site. Field reconnaissance and review of topographic mapping indicates the subject site is relatively flat with site elevations ranging from approximately 14 to 16 feet above mean sea level. Slopes approximately 8 to 10 feet high

with inclinations ranging from 1H:1V to 2H:1V are located along the canal that borders the site to the north and east. An existing sanitary line and power line transect the western portion of the site. No other structures or improvements were observed at the site.

4.2 Subsurface Exploration and Investigation

In 2007, test pit explorations TP-1 through TP-3 were advanced at the site to a maximum depth of approximately 14 feet below ground surface (bgs). Also in 2007, undocumented fill exploration test pits were advanced at the site to a maximum depth of approximately five feet bgs. In 2019, cone penetrometer testing exploration CPT-1 was advanced to a maximum depth of approximately 75 feet bgs. The exploration locations were selected to observe subsurface soil characteristics in proximity to proposed development areas and are indicated on Figure 2 and Appendix D.

4.2.1 Soil Type Description

The field investigation indicated the presence of undocumented fill throughout most of the site at the surface or beneath the topsoil layer with the exception of the northern area. Observed undocumented fill extended to depths of approximately 1 to 5 feet bgs. Approximately 12 inches of vegetation and topsoil was observed in the areas where no fill was observed.

Underlying surface materials as described, subsurface soils resembling the native USDA Caples soil series descriptions were encountered. Subsurface lithology may generally be described by soil types identified in the following text. Field logs of the encountered materials are presented in Appendix A, *Exploration Logs* and Appendix D, *2008 Exploration Map, Logs, and Laboratory Test Results*.

Soil Type 1 - Undocumented FILL

Soil Type 1 represents undocumented FILL and was observed to primarily consist of medium dense sandy gravel intermixed with asphaltic concrete. The asphalt fragments observed were generally 3 to 6 inches thick and 2 to 3 feet in length. Soil Type 1 was encountered at the surface in test pit TP-3 and below the topsoil in undocumented fill test pits. The undocumented fill extended to observed depths ranging from approximately 1 to 5 feet bgs.

Soil Type 2 – SILT / Elastic SILT / Sandy SILT

Soil Type 2 was observed to consist of grey, brown, and blue, mottled, moist to wet, medium stiff to stiff, SILT, elastic SILT, and Sandy SILT. Soil Type 2 was observed below the topsoil layer in test pits TP-1 and TP-2 and below the undocumented fill (Soil Type 1) in TP-3 and extended to the maximum depths explored in test pit explorations.

Analytical laboratory testing conducted upon representative soil samples obtained from test pit TP-1 indicated approximately 56 to 87 percent by weight passing the No. 200 sieve and in situ moisture contents ranging from 31 to 62 percent. Atterberg limits analysis indicated a liquid limit ranging from 65 to 66 and a plasticity index ranging from 27 to 30. Laboratory tested samples of Soil Type 2 are classified SM and ML according to USCS specifications and A-7 and A-6 according to AASHTO specifications.

Soil Type 3 – Silty SAND / SAND

Soil behavior measurements obtained from cone penetration test CPT-1 recorded undrained shear strength, tip resistance, differential pore pressure ratio, and friction ratio to evaluate subsurface properties and classify soils. CPT-1 soil behavior measurements indicated that interbedded layers of sandy SILT (Soil Type 2) and silty SAND (Soil Type 3) were encountered from approximately 10 to 18 feet bgs and silty SAND to SAND (Soil Type 3) with varying stratigraphic sequencing was encountered at approximately 18 feet bgs and extended to the maximum depth of exploration in the CPT exploration location.

4.2.2 Groundwater

Groundwater was observed or measured within subsurface explorations conducted in 2007 and 2019 at depths ranging from approximately 8 to 11 feet bgs. The observed or measured ground water elevations approximately coincided with the elevation of surface water in the existing canal bordering the northern and eastern areas of the site. Mitigation of shallow groundwater within proposed development areas is discussed in greater detail in Section 5.8, *Dewatering* and in Section 5.13*, Drainage.*

Note that groundwater levels are often subject to seasonal variance and may rise during extended periods of increased precipitation. Perched groundwater may also be present in localized areas. Seeps and springs may become evident during site grading, primarily along slopes or in areas cut below existing grade. Structures, roads, and drainage design should be planned accordingly.

5.0 DESIGN RECOMMENDATIONS

The geotechnical site investigation suggests the proposed development is generally compatible with surface and subsurface soils, provided the recommendations presented in this report are utilized and incorporated into the design and construction processes. The primary geotechnical concerns associated with the site are undocumented fill, potentially expansive native soils, and existing canal slopes. Design recommendations are presented in the following text sections.

5.1 Site Preparation and Grading

Vegetation, organic material, unsuitable fill, and deleterious material that may be encountered should be cleared from areas identified for structures and site grading. Vegetation, other organic material, and debris should be removed from the site. Stripped topsoil should also be removed, or used only as landscape fill in nonstructural areas with slopes less than 25 percent. The anticipated stripping depth for sod and highly organic topsoil is approximately 10 to 12 inches. Stripping depths of 1 to 5 feet is anticipated in areas of undocumented fill. Actual stripping depths should be determined based upon visual observations made during construction when soil conditions are exposed. The post-construction maximum depth of landscape fill placed or spread at any location onsite should not exceed one foot.

Previously disturbed soil, debris, or unconsolidated fill encountered during grading or construction activities should be removed completely and thoroughly from structural areas.

This includes old foundations, basement walls, utilities, associated soft soils, and debris. Excavation areas should be backfilled with engineered structural fill. Test pits excavated during site exploration were backfilled loosely with onsite soils. These test pits should be located and properly backfilled with structural fill during site improvements construction. Trees, stumps, and associated roots should also be removed from structural areas, individually and carefully. Resulting cavities and excavation areas should be backfilled with engineered structural fill.

Site grading activities should be performed in accordance with requirements specified in the 2015 *International Building Code* (IBC), Chapter 18 and Appendix J, with exceptions noted in the text herein. Site preparation, soil stripping, and grading activities should be observed and documented by Columbia West.

5.1.1 Undocumented Fill

As described previously and indicated in Appendix D, *2008 Exploration Map, Logs, and Laboratory Test Results*, undocumented fill was observed within areas proposed for development during the 2008 geotechnical site investigation. Undocumented fill material was observed in test pit explorations TP-3 and undocumented fill test pits. The undocumented fill extended to observed depths of approximately one to five feet bgs and primarily consisted of silt, sand, and gravel intermixed with asphaltic concrete.

Undocumented fill and other previously disturbed soils or debris should be removed completely and thoroughly from structural areas. In some areas, undocumented fill may directly overlie vegetation and the original topsoil layer. This material should also be removed completely from structural areas. Upon removal of undocumented fill and disturbed soils, Columbia West should observe the exposed subgrade. It should be noted that due to the lapse of time between explorations and the limited scope of exploration conducted for this investigation, Columbia West cannot wholly eliminate uncertainty regarding the presence of unsuitable soils in areas not explored or the accuracy of the subsurface exploration findings of the 2008 geotechnical site investigation.

Excavation and removal of undocumented fill should extend at least 10 feet laterally beyond the outside edge of proposed building foundations. Future performance of foundations and slabs supported on undocumented fill cannot be predicted. Undocumented fill need not be removed from non-structural areas or proposed pavement areas if the pavement is designed to tolerate anticipated settlements or if increased maintenance or a reduced design life is acceptable to the project stakeholders. Additional recommendations for pavement design and construction are presented in Section 5.14, *Bituminous Asphalt and Portland Cement Concrete*.

Based upon Columbia West's investigation, undocumented fill soils (Soil Type 1) may be acceptable for reuse as structural fill, provided that materials are observed to exhibit index properties similar to those observed during this investigation and that construction adheres to the specifications presented in this report. Minor amounts of asphalt, concrete, and brick debris may also be incorporated into the structural fill provided that individual fragment sizes do not exceed six inches and that materials are well-blended into deeper portions of the fill

under the observation of Columbia West. Recommendations regarding the suitability of reusing undocumented fill soils as structural fill material should be provided in the field by Columbia West during construction.

5.2 Engineered Structural Fill

Areas proposed for fill placement should be appropriately prepared as described in the preceding text. Surface soils should then be scarified and compacted prior to additional fill placement. Engineered structural fill should be placed in loose lifts not exceeding 12 inches in depth and compacted using standard conventional compaction equipment. The soil moisture content should be within two percentage points of optimum conditions. A field density at least equal to 95 percent of the maximum dry density, obtained from the standard Proctor moisture-density relationship test (ASTM D698), is recommended for structural fill placement. Engineered structural fill placed on sloped grades should be benched to provide a horizontal surface for compaction.

Compaction of engineered structural fill should be verified by nuclear gauge field compaction testing performed in accordance with ASTM D6938. Field compaction testing should be performed for each vertical foot of engineered fill placed. Engineered fill placement should be observed by Columbia West.

Engineered structural fill placement activities should be performed during dry summer months if possible. Most clean native soils may be suitable for use as structural fill if adequately dried or moisture-conditioned to achieve recommended compaction specifications. Native soils may require addition of moisture during late summer months or after extended periods of warm dry weather. Compacted fine-textured fill soils should be covered shortly after placement.

Because they are moisture-sensitive, near-surface fine-textured soils are often difficult to excavate and compact during wet weather construction. If adequate compaction is not achievable with clean native soils, import structural fill consisting of granular fill meeting WSDOT specifications for *Gravel Borrow 9-03.14(1)* is recommended.

Representative samples of proposed engineered structural fill should be submitted for laboratory analysis and approval by Columbia West prior to placement. Laboratory analyses should include particle-size gradation and Proctor moisture-density analysis.

5.3 Cut and Fill Slopes

Fill placed on existing grades steeper than 5H:1V should be horizontally benched at least 10 feet into the slope. Fill slopes greater than six feet in height should be vertically keyed into existing subsurface soil. A typical fill slope cross-section is shown in Figure 3. Drainage implementations, including subdrains or perforated drain pipe trenches, may also be necessary in proximity to cut and fill slopes if seeps or springs are encountered. Drainage design may be performed on a case-by-case basis. Extent, depth, and location of drainage may be determined in the field by Columbia West during construction when soil conditions are exposed. Failure to provide adequate drainage may result in soil sloughing, settlement, or erosion.

Final cut or fill slopes at the site should not exceed 2H:1V or 20 feet in height without individual slope stability analysis. The values above assume a minimum horizontal setback for loads of 10 feet from top of cut or fill slope face or overall slope height divided by three (H/3), whichever is greater. A minimum slope setback detail for structures is presented in Figure 4.

Concentrated drainage or water flow over the face of slopes should be prohibited, and adequate protection against erosion is required. Fill slopes should be constructed by placing fill material in maximum 12-inch level lifts, compacting as described in Section 5.2, *Engineered Structural Fill* and horizontally benching where appropriate. Fill slopes should be overbuilt, compacted, and trimmed at least two feet horizontally to provide adequate compaction of the outer slope face. Proper cut and fill slope construction is critical to overall project stability and should be observed and documented by Columbia West.

5.4 Foundations

Based upon correspondence with the project civil engineer, foundation loading information was not currently available at the time of the geotechnical site investigation. Columbia West anticipates foundations will consist of shallow continuous perimeter or column spread footings. Footings should be designed by a licensed structural engineer and conform to the recommendations below. Typical building loads are not expected to exceed approximately 10 kips per foot for perimeter footings or 100 kips per column. If actual loading exceeds anticipated loading, additional analysis should be conducted for the specific load conditions and proposed footing dimensions.

The existing ground surface should be prepared as described in Section 5.1, *Site Preparation and Grading*, and Section 5.2, *Engineered Structural Fill*. Foundations should bear upon firm competent native soil (Soil Types 2 and 3) or engineered structural fill.

To evaluate bearing capacity for proposed structures, serviceability and reliability of shear resistance for subsurface soils was considered. Allowable bearing capacity is typically a function of footing dimension and subsurface soil properties, including settlement and shear resistance. Based upon in situ field testing and laboratory analysis, the estimated allowable bearing capacity for well-drained foundations prepared as described above is 1,000 psf. Bearing capacity may be increased by one-third for transient lateral forces such as seismic or wind. The estimated coefficient of friction between in situ compacted native soil or engineered structural fill and in-place poured concrete is 0.35. Lateral forces may also be resisted by an assumed passive soil equivalent fluid pressure of 250 psf/f against embedded footings. The upper six inches of soil should be neglected in passive pressure calculations.

Footings should extend to a depth at least 18 inches below lowest adjacent grade to provide adequate bearing capacity and protection against frost heave. Foundations constructed during wet weather conditions will require over-excavation of saturated subgrade soils and granular structural backfill prior to concrete placement. Over-excavation recommendations should be provided Columbia West during foundation excavation and construction. Excavations adjacent to foundations should not extend within a 2H:1V angle projected down from the outside bottom footing edge without additional geotechnical analysis.

Foundations should not be permitted to bear upon undocumented fill or disturbed soil (Soil Type 1). Because soil is often heterogeneous and anisotropic, Columbia West should observe foundation excavations prior to placing forms or reinforcing bar to verify subgrade support conditions are as anticipated in this report.

5.5 Slabs on Grade

Slab-on-grade floors should be supported on firm, competent, in situ soil or engineered structural fill. Disturbed soils and unsuitable fills in proposed slab locations should be removed and replaced with structural fill. The modulus of subgrade reaction is estimated to be 100 psi/inch.

Preparation and compaction beneath slabs should be performed in accordance with the recommendations presented in Section 5.1, *Site Preparation and Grading* and Section 5.2, *Engineered Structural Fill*. Slabs should be underlain by at least 6 inches of 1 ¼"-0 crushed aggregate meeting WSDOT 9-03.9(3). Geotextile filter fabric conforming to *WSDOT 2010 Standard Specification M 41-10, 9-33.2(1), Geotextile Properties, Table 3: Geotextile for Separation or Soil Stabilization* may be used below the crushed aggregate to increase subgrade support. If desired, a moisture barrier may be constructed beneath the slabs. Slabs should be appropriately waterproofed in accordance with the desired type of finished flooring. Slab thickness and reinforcement should be designed by an experienced structural engineer in accordance with anticipated loads.

5.6 Static Settlement

Foundation loading information was not currently available at the time of the geotechnical site investigation. Columbia West anticipates foundations will consist of shallow continuous perimeter or column spread footings. Maximum building loads are not expected to exceed approximately 10 kips per foot for perimeter footings or 100 kips per column. Based upon the anticipated foundation loading and allowable soil bearing pressures described above, Columbia West analyzed estimated static settlement for the proposed structure. Settlement analysis was conducted using Schmertmann's (1970, 1978) method to calculate vertical foundation displacement using CPT results. This method for estimating settlement of structures on sand is based upon elastic theory and the strain influence approach where the largest displacements do not occur immediately under the footing, but at the depth of the peak strain influence.

Results from the analysis indicate that total long-term static footing displacement for shallow foundations loaded as described above is not anticipated to exceed approximately 1 inch. Differential settlement between comparably loaded footing elements is not expected to exceed approximately ½ inch over a span of 50 feet. The resulting vertical displacement after loading may be due to elastic distortion, dissipation of excess pore pressure, or soil creep.

Correspondence with the project civil engineer, Three Rivers Land Services, PLLC indicates that site grading will be limited to minor excavation for shallow foundations and underground utility construction. In addition, Columbia West anticipates that slab loading for the proposed building will be less than 200 psf. Therefore, aerial settlement due to engineered fill

placement or large-area slab loading is not anticipated to exceed approximately 1 inch. If final grading plans or slab loading are inconsistent with the assumptions outlined above, Columbia West should be contacted to revise our analysis as necessary.

5.7 Excavation

Soils at the site were explored to a maximum depth of approximately 75 feet using a track-mounted cone penetrometer rig. Bedrock was not encountered and blasting or specialized rock-excavation techniques are not anticipated.

Groundwater was observed or measured within subsurface explorations conducted in 2007 and 2019 at depths ranging from approximately 8 to 11 feet bgs. Perched groundwater layers may exist at shallower depths depending on seasonal fluctuations of the water table. Recommendations as described in Section 5.8, *Dewatering* should be considered in locations where subsurface construction activities intersect the water table.

Based upon laboratory analysis and field testing, near-surface soils may be Washington State Industrial Safety and Health Administration (WISHA) Type C. For temporary open-cut excavations deeper than four feet, but less than 20 feet in soils of these types, the maximum allowable slope is 1.5H:1V. WISHA soil type should be confirmed during field construction activities by the contractor. Soil is often anisotropic and heterogeneous, and it is possible that WISHA soil types determined in the field may differ from those described above.

Site-specific shoring design may be required if open-cut excavations are infeasible or if excavations are proposed adjacent to existing infrastructure. Typical methods for stabilizing excavations consist of soldier piles and timber lagging, sheet pile walls, tiebacks and shotcrete, or pre-fabricated hydraulic shoring. Because lateral earth pressure distributions acting on below-grade structures are dependent upon the type of shoring system used, Columbia West should be contacted to conduct additional analysis when shoring type, excavation depths, and locations are known.

The contractor should be held responsible for site safety, sloping, and shoring. Columbia West is not responsible for contractor activities and in no case should excavation be conducted in excess of all applicable local, state, and federal laws.

5.8 Dewatering

Groundwater elevation and hydrostatic pressure should be carefully considered during design of utilities, retaining walls, or other structures that require below-grade excavation. As described previously, shallow groundwater may be encountered in areas of proposed development. Utility trenches in shallow groundwater areas or excavations and cuts that remain open for even short periods of time may undermine or collapse due to groundwater effects. Placement of layers of riprap or quarry spalls in localized areas on shallow excavation side slopes may be required to limit instability. Over-excavation and stabilization of pipe trenches or other excavations with imported crushed aggregate or gabion rock may also be necessary to provide adequate subgrade support.

Significant pumping and dewatering may be required to temporarily reduce the groundwater elevation to allow construction of proposed below-grade structures, installation of utilities, or

placement of structural fills. Dewatering via a sump within excavation zones may be insufficient to control groundwater and provide excavation side slope stability. Dewatering may be more feasibly conducted by installing a system of temporary well points and pumps around proposed excavation areas or utility trenches. Depending on proposed utility depths, a site-specific dewatering plan may be necessary. Well pumps should remain functioning at all times during the excavation and construction period. Suitable back-up pumps and power supplies should be available to prevent unanticipated shut-down of dewatering equipment. Failure to operate pumps full-time may result in flooding of the excavation zones, resulting in damage to forms, slopes, or equipment.

5.9 Lateral Earth Pressure

If retaining walls are proposed, lateral earth pressures should be carefully considered in the design process. Hydrostatic pressure and additional surcharge loading should also be considered. Retained material may include engineered structural backfill or undisturbed native soil. Structural wall backfill should consist of imported granular material meeting *Section 9-03.12(2)* of *WSDOT Standard Specifications*. Backfill should be prepared and compacted to at least 95 percent of maximum dry density as determined by the modified Proctor test (ASTM D1557). Recommended parameters for lateral earth pressures for retained soils and engineered structural backfill consisting of imported granular fill meeting WSDOT specifications for *Gravel Backfill for Walls 9-03.12(2)* are presented in Table 1.

The design parameters presented in Table 1 are valid for static loading cases only and are based upon in situ soils or compacted granular fill. The recommended earth pressures do not include surcharge loads, dynamic loading, hydrostatic pressure, or seismic design.

Table 1. Lateral Earth Pressure Parameters for Level Backfill

Backfill / Retained Material	Equivalent Fluid Pressure for Level Backfill			Wet Density	Drained Internal Angle of Friction
	At-rest	Active	Passive		
Undisturbed Native SILT / Elastic SILT / Sandy SILT [Soil Type 2]	62 pcf	43 pcf	282 pcf	110 pcf	26°
Undisturbed Native Silty SAND / SAND [Soil Type 3]	58 pcf	38 pcf	345 pcf	115 pcf	30°
Approved Structural Backfill Material	52 pcf	32 pcf	568 pcf	135 pcf	38°
WSDOT 9-03.12(2) compacted aggregate backfill					

** The upper 6 inches of soil should be neglected in passive pressure calculations. If exterior grade from top or toe of retaining wall is sloped, Columbia West should be contacted to provide location-specific lateral earth pressures.*

If seismic design is required for unrestrained walls, seismic forces may be calculated by superimposing a uniform lateral force of $10H^2$ pounds per lineal foot of wall, where H is the total wall height in feet. The resultant force should be applied at 0.6H from the base of the wall. If sloped backfill conditions are proposed for the site, Columbia West should be contacted for additional analysis and associated recommendations.

A continuous one-foot-thick zone of free-draining, washed, open-graded 1-inch by 2-inch drain rock and a 4-inch perforated gravity drain pipe is assumed behind retaining walls. Geotextile filter fabric should be placed between the drain rock and backfill soil.

Specifications for drainpipe design are presented in Section 5.13, *Drainage*. If walls cannot be gravity drained, saturated base conditions and/or applicable hydrostatic pressures should be assumed.

Final retaining wall design should be reviewed and approved by Columbia West. Retaining wall subgrade and backfill activities should also be observed and tested for compliance with recommended specifications by Columbia West during construction.

5.10 Seismic Design Considerations

According to the *American Society of Civil Engineers* (ASCE) *ASCE 7 Hazard Tool,* the anticipated peak ground and maximum considered earthquake spectral response accelerations resulting from seismic activity for the subject site are summarized in Table 2.

Table 2. Approximate Probabilistic Ground Motion Values for 'firm rock' sites based on subject property longitude and latitude

	2% Probability of Exceedance in 50 yrs
Peak Ground Acceleration	0.418 g
0.2 sec Spectral Acceleration	0.948 g
1.0 sec Spectral Acceleration	0.437 g

The listed probabilistic ground motion values are based upon "firm rock" sites with an assumed shear wave velocity of 2,500 ft/s in the upper 100 feet of soil profile. These values should be adjusted for site class effects by applying site coefficients Fa, Fv, and F_{PGA} as defined in *ASCE 7-10, Tables 11.4-1, 11.4-2, and 11.8-1*. The site coefficients are intended to more accurately characterize estimated peak ground and respective earthquake spectral response accelerations by considering site-specific soil characteristics and index properties.

The *Site Class Map of Clark County, Washington* (Washington State Department of Natural Resources, 2004), indicates site soils may be represented by Site Classes D to E. Based upon in situ testing and review of well logs and local geologic maps, site soils may be considered to be Site Class E as defined in *ASCE 7, Chapter 20, Table 20.3-1*.

This site class designation indicates that amplification of seismic energy may occur during a seismic event because of subsurface conditions. Additional seismic information is presented in Section 5.11, *Soil Liquefaction and Dynamic Settlement*.

Due to the presence of potentially liquefiable soils at the site, Site Class F criteria may be met if the fundamental period of vibration for the proposed structure is greater than 0.5 seconds and a site response analysis may be required to determine accelerations for liquefiable soils in accordance with Section 21.1 of *ASCE 7.*

Localized peak ground accelerations exceeding the adjusted values may occur in some areas in direct proximity to an earthquake's origin. This may be a result of amplification of seismic energy due to depth to competent bedrock, compression and shear wave velocity of bedrock, presence and thickness of loose, unconsolidated alluvial deposits, soil plasticity, grain size, and other factors.

Identification of specific seismic response spectra is beyond the scope of this investigation. If site structures are designed in accordance with recommendations specified in the *2015 IBC*, the potential for peak ground accelerations in excess of the adjusted and amplified values should be understood.

5.11 Soil Liquefaction and Dynamic Settlement

According to the *Liquefaction Susceptibility Map of Cowlitz County Washington* (Washington State Department of Natural Resources, 2004), the site is mapped as moderate to high susceptibility for liquefaction. Liquefaction, defined as the transformation of the behavior of a granular material from a solid to a liquid due to increased pore-water pressure and reduced effective stress, may occur when granular materials quickly compact under cyclic stresses caused by a seismic event. The effects of liquefaction may include immediate ground settlement and lateral spreading.

Procedures for evaluation of liquefaction resistance of soils have been developed based upon empirical data from liquefaction case studies and have become standard of practice in the United States. These empirical procedures are based upon correlation with SPT data or CPT data. CPT data obtained in the field are used in a series of empirical equations developed using previous data from liquefaction case studies. The procedure uses the CPT data to calculate two variables: the cyclic stress ratio (CSR), or the demand imposed on the soil layer due to an expected seismic event; and the cyclic resistance ratio (CRR), or the capacity of the soil to resist liquefaction. The ability of a soil to resist liquefaction can be calculated as the ratio of CRR to CSR and represented as a factor of safety. In general, a factor of safety greater than 1.3 is considered an acceptable risk.

Soils most susceptible to liquefaction are generally saturated, cohesionless, loose to medium-dense sands within 50 feet of the ground surface. Recent research has also indicated that low plasticity silts and clays may also be subject to sand-like liquefaction behavior if the plasticity index determined by the Atterberg Limits analysis is less than 8. Potentially liquefiable soils located above the existing, historic, or expected groundwater levels do not generally pose a liquefaction hazard. It is important to note that changes in perched groundwater elevation may occur due to project development or other factors not observed at the time of investigation.

The liquefaction potential for soils underlying the site was analyzed using the CLiq program and the Robertson NCEER method of analysis. Liquefaction analysis was conducted to a critical analysis depth of 60 feet on the soil profile obtained from CPT-1. Using a peak horizontal ground acceleration of 0.42g, an earthquake moment magnitude of 7.0 (based upon deaggregation of seismic hazards for the site using the *National Seismic Hazards Mapping Project, USGS 2008*), and a design groundwater depth of 7 feet below existing grade, the factor of safety was less than 1.3 for several soil layers, indicating high potential for liquefaction during a seismic event.

Based upon the empirical procedures and input data described above, the total estimated settlement due to liquefaction at the analyzed location is presented in Table 3. The analysis output of CLiq is presented in Appendix E. Note that dynamic settlement induced by

liquefaction occurs via different mechanisms than the estimated static settlement described in Section 5.6, *Static Settlement*.

Table 3. Estimated Settlement Induced by Liquefaction

Exploration	Liquefaction Evaluation Method	Anticipated Vertical Settlement with Depth Weighting Factor Applied
CPT-1	Robertson (NCEER 1998, 2009)	15.9 inches

According to Cetin et al, a depth weighting factor may be applied to the analysis of dynamic settlement. The depth weighting factor captures the effects of void ratio redistribution in shallower sublayers, reduced shear stresses and number of shear cycles transmitted to deeper soils due to the liquefaction of shallower soils, and arching of non-liquefiable soil layers.

5.12 Settlement Mitigation and Soil Improvements

As described below, potential earthquake-induced liquefaction settlements may be reduced by soil improvements. One or a combination of these soil improvement or mitigation methods may be desired to increase soil shear strength and reduce the amount of potential settlement.

In-situ soil densification may be considered to reduce potential liquefaction settlement. A variety of soil improvement methods are available. Some improvement methods, such as dynamic compaction, may not be feasible due to observed subsurface conditions. However, other improvement methods such as compaction grouting, rammed-aggregate piers, or stone columns may be possible. The compaction grouting process consists of injecting pressurized grout into the loose or weak soil layer in a closely-spaced grid pattern. Stone columns and rammed-aggregate piers are similarly constructed in a grid pattern and may be installed by vibratory or other methods. Both methods increase relative density by densifying the soil between the grout or stone column locations, thereby reducing potential for liquefaction. Stone columns may also provide drainage pathways to allow pore pressures in potentially liquefiable layers to dissipate more quickly. Other mitigation techniques may include driven grout piles or standard steel or concrete piles. Proposed soil improvement programs should be developed by a specialized contractor working in cooperation with licensed geotechnical and structural engineers.

Soil improvements may reduce the potential liquefaction-induced movements to an acceptable level of risk. After an appropriate mitigation plan is selected, additional in-situ testing prior to construction may be conducted to determine the level of improvement achieved and reevaluate the liquefaction potential. Selection of an appropriate mitigation plan may depend upon site planning, architectural, and structural engineering factors in addition to geotechnical concerns. All parties involved should work closely together to develop a suitable improvement plan with a clear understanding of the risks.

5.13 Drainage

At a minimum, site drainage should include surface water collection and conveyance to properly designed stormwater management structures and facilities. Drainage design in general should conform to City of Kelso Ground regulations. Finished site grading should be conducted with positive drainage away from structures. Depressions or shallow areas that may retain ponding water should be avoided. Roof drains, low-point drains, and perimeter foundation drains are recommended for structures. Drains should consist of separate systems and gravity flow with a minimum two-percent slope away from foundations into the stormwater system or approved discharge location.

Perimeter foundation drains should consist of 3-inch perforated PVC pipe surrounded by a minimum of 1 ft^3 of clean, washed drain rock per linear foot of pipe and wrapped with geotextile filter fabric. Open-graded drain rock with a maximum particle size of 3 inches and less than 2 percent passing the No. 200 sieve is recommended. Geotextile filter fabric should consist of Mirafi 140N or approved equivalent, with AOS between No. 70 and No. 100 sieve. The water permittivity should be greater than 1.5/sec. Figure 5 presents a typical foundation drain. Perimeter drains may limit increased hydrostatic pressure beneath footings and assist in reducing potential perched moisture areas.

Subdrains should also be considered if portions of the site are cut below surrounding grades. Shallow groundwater, springs, or seeps should be conveyed via drainage channel or perforated pipe into the stormwater management system or an approved discharge. Recommendations for design and installation of perforated drainage pipe may be performed on a case-by-case basis by Columbia West during construction. Failure to provide adequate surface and sub-surface drainage may result in soil slumping or unanticipated settlement of structures exceeding tolerable limits. A typical perforated drain pipe trench detail is presented in Figure 6.

Site improvements construction in some areas may occur at or near the shallow seasonal groundwater table, particularly if work is conducted during wet-weather conditions. Dewatering may be necessary and a drainage mat may be required to achieve sufficient elevation for fill placement. A typical drainage mat is shown on Figure 7. Columbia West should determine drainage mat location, extent, and thickness when subsurface conditions are exposed. Drainage mats may need to be constructed in conjunction with subdrains to convey captured water to an approved discharge location.

Foundation drains and subdrains should be closely monitored after construction to assess their effectiveness. If additional surface or shallow subsurface seeps become evident, the drainage provisions may require modification or additional drains. Columbia West should be consulted to provide appropriate recommendations.

5.14 Bituminous Asphalt and Portland Cement Concrete

Based upon review of preliminary site plans, proposed development includes private asphalt paved access drives and parking lots. General recommendations for private onsite flexible pavement sections are summarized below in Table 4. Columbia West recommends

adherence to City of Kelso Ground paving guidelines for roadway improvements in the public right-of-way.

Table 4. Private Onsite Flexible Pavement Section Recommendations

Pavement Section Layer	Minimum Layer Thickness		Specifications
	Passenger Vehicle Parking and Access Drives	*Heavy Truck Access Drives	
Asphalt concrete surface HMA Class ½" PG 64-22	3 inches	4 inches	91 percent of maximum Rice density (ASTM D2041)
Base course (WSDOT 9-03.9(3) 1¼"-0 crushed aggregate	8 inches	12 inches	95 percent of maximum modified Proctor density (ASTM D1557)
Scarified and compacted native soil or engineered structural fill	12 inches	12 inches	Compacted to 95 percent of maximum modified Proctor density (ASTM D1557)

*General recommendation based upon maximum traffic loading of up to 30 heavy trucks per day. If actual truck traffic exceeds 30 trucks per day, reduced pavement serviceability and design life should be expected.

For dry weather construction, pavement surface sections should bear upon competent subgrade consisting of scarified and compacted native soil or engineered structural fill. Wet weather pavement construction is discussed in Section 5.15, *Wet Weather Construction Methods and Techniques*. Subgrade conditions should be evaluated and tested by Columbia West prior to placement of crushed aggregate base. Subgrade evaluation should include nuclear gauge density testing and wheel proof-roll observations conducted with a loaded 12-cubic yard, double-axle dump truck or equivalent. Nuclear gauge density testing should be conducted at 150-foot intervals or as determined by the onsite geotechnical engineer. Subgrade soil should be compacted to at least 95 percent of the modified Proctor dry density, as determined by ASTM D1557. Areas of observed deflection or rutting during proof-roll evaluation should be excavated to a firm surface and replaced with compacted crushed aggregate.

Crushed aggregate base should be compacted and tested in accordance with the specifications outlined above. Asphalt concrete pavement should be compacted to at least 91 percent of maximum Rice density. Nuclear gauge density testing should be conducted to verify adherence to recommended specifications. Testing frequency should be in accordance with Washington Department of Transportation and City of Kelso specifications.

Portland cement concrete curbs and sidewalks should be installed in accordance with City of Kelso specifications. Curb and sidewalk aggregate base should be observed and proof-rolled by Columbia West. Soft areas that deflect or rut should be stabilized prior to pouring concrete. Concrete should be tested during installation in accordance with ASTM C171, C138, C231, C143, C1064, and C31. This includes casting of cylinder specimen at a frequency of four cylinders per 100 cubic yards of poured concrete. Recommended field concrete testing includes slump, air entrainment, temperature, and unit weight.

5.15 Wet Weather Construction Methods and Techniques

Wet weather construction often results in significant shear strength reduction and soft areas that may rut or deflect. Installation of granular working layers may be necessary to provide a firm support base and sustain construction equipment. Granular layers should consist of all-weather gravel, 2- to 4-inch gabion, or other similar material (six-inch maximum size with less than five percent passing the No. 200 sieve).

Construction equipment traffic across exposed soil should be minimized. Equipment traffic induces dynamic loading, which may result in weak areas and significant reduction in shear strength for wet soils. Wet weather construction may also result in generation of significant excess quantities of soft wet soil. This material should be removed from the site or stockpiled in a designated area.

Construction during wet weather conditions may require increased base thickness. Over-excavation of subgrade soils or subgrade amendment with lime and/or cement may be necessary to provide a firm base upon which to place crushed aggregate. Geotextile filter fabric is also recommended. If soil amendment with lime or cement is considered, Columbia West should be contacted to provide appropriate recommendations based upon observed field conditions and desired performance criteria.

Crushed aggregate base should be installed in a single lift with trucks end-dumping from an advancing pad of granular fill. During extended wet periods, stripping activities may also need to be conducted from an advancing pad of granular fill. Once installed, the crushed aggregate base should be compacted with several passes from a static drum roller. A vibratory compactor is not recommended because it may further disturb the subgrade. Subdrains may also be necessary to provide subgrade drainage and maintain structural integrity.

Crushed aggregate base should be compacted to at least 95 percent of maximum dry density according to the modified Proctor density test (ASTM D1557). Compaction should be verified by nuclear gauge density testing. Observation of a proof-roll with a loaded dump truck is also recommended as an indication of the compacted aggregate's performance.

It should be understood that wet weather construction is risky and costly. Columbia West should observe and document wet weather construction activities. Proper construction methods and techniques are critical to overall project integrity.

5.16 Erosion Control Measures

Based upon field observations and laboratory testing, the erosion hazard for site soils in flat to shallow-gradient portions of the property is likely to be low. The potential for erosion generally increases in sloped areas. Therefore, soil disturbance in sloped areas should be minimized during construction activities. Soil is also prone to erosion if unprotected and unvegetated during periods of increased precipitation. Erosion can be minimized by performing construction activities during dry summer months.

Site-specific erosion control measures should be implemented to address the maintenance of exposed areas. This may include silt fence, biofilter bags, straw wattles, or other suitable

methods. During construction activities, exposed areas should be well-compacted and protected from erosion with visqueen, surface tackifier, or other means, as appropriate. Temporary slopes or exposed areas may be covered with straw, crushed aggregate, or riprap in localized areas to minimize erosion. Erosion and water runoff during wet weather conditions may be controlled by application of strategically placed channels and small detention depressions with overflow pipes.

After grading, exposed surfaces should be vegetated as soon as possible with erosion-resistant native vegetation. Jute mesh or straw may be applied to enhance vegetation. Once established, vegetation should be properly maintained. Disturbance to existing native vegetation and surrounding organic soil should also be minimized during construction activities.

5.17 Soil Shrink/Swell Potential

Based upon laboratory analysis of soils collected and submitted during the 2008 geotechnical site investigation, near-surface soils contain approximately 50 to 87 percent by weight passing the No. 200 sieve and exhibit a plasticity index ranging from non-plastic to 30 percent. This indicates the potential for soil shrinking or swelling and underscores the importance of proper moisture conditioning during fill placement. Medium to high plasticity soils, if approved by Columbia West for use as structural fill, should be placed and compacted at a moisture content approximately two percent above optimum as determined by laboratory analysis.

5.18 Utility Installation

Utility installation may require subsurface excavation and trenching. Excavation, trenching and shoring should conform to federal (Occupational Safety and Health Administration) (OSHA) (29 CFR, Part 1926) and *WISHA* (WAC, Chapter 296-155) regulations. Site soils may slough when cut vertically and sudden precipitation events or perched groundwater may result in accumulation of water within excavation zones and trenches.

Utilities should be installed in general accordance with manufacturer's recommendations. Utility trench backfill should consist of *WSDOT 9-03.19 Bank Run Gravel for Trench Backfill, WSDOT 9-03.14(2) Select Borrow* with a maximum particle size of 2 ½-inches, or other granular free-draining material approved by Columbia West. Trench backfill material within 18 inches of the top of utility pipes should be hand compacted (i.e., no heavy compaction equipment). The remaining backfill should be compacted to at least 95 percent of maximum dry density as determined by the modified Proctor moisture-density test (ASTM D1557). Clean, free-draining, fine bedding sand is recommended for use in the pipe zone. With exception of the pipe zone, backfill should be placed in loose lifts not exceeding 12 inches in thickness.

Compaction of utility trench backfill material should be verified by nuclear gauge field compaction testing performed in accordance with ASTM D6938 and City of Kelso specifications.

Field compaction testing should be performed at 200-foot intervals along the utility trench centerline at the surface and midpoint depth of the trench. Compaction frequency and

specifications may be modified for non-structural areas in accordance with recommendations of the site geotechnical engineer.

6.0 CONCLUSION AND LIMITATIONS

This geotechnical site investigation report was prepared in accordance with accepted standard conventional principles and practices of geotechnical engineering. This investigation pertains only to material tested and observed as of the date of this report, and is based upon proposed site development as described in the text herein. This report is a professional opinion containing recommendations established by engineering interpretations of subsurface soils based upon conditions observed during site exploration. Soil conditions may differ between tested locations or over time. Slight variations may produce impacts to the performance of structural facilities if not adequately addressed. This underscores the importance of diligent QA/QC construction observation and testing to verify soil conditions are as anticipated in this report.

Therefore, this report contains several recommendations for field observation and testing by Columbia West personnel during construction activities. Columbia West cannot accept responsibility for deviations from recommendations described in this report. Future performance of structural facilities is often related to the degree of construction observation by qualified personnel. These services should be performed to the full extent recommended.

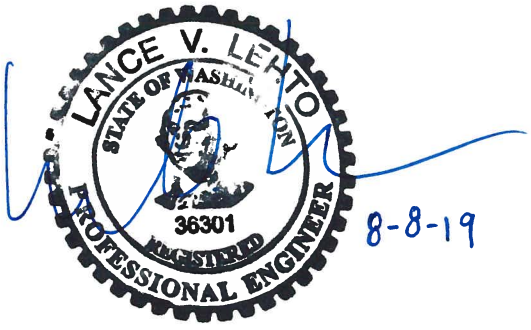
This report is not an environmental assessment and should not be construed as a representative warranty of site subsurface conditions. The discovery of adverse environmental conditions, or subsurface soils that deviate significantly from those described in this report, should immediately prompt further investigation. The above statements are in lieu of all other statements expressed or implied.

This report was prepared solely for the client and is not to be reproduced without prior authorization from Columbia West. Final engineering plans and specifications for the project should be reviewed and approved by Columbia West as they relate to geotechnical and grading issues prior to final design approval. Columbia West is not responsible for independent conclusions or recommendations made by other parties based upon information presented in this report. Unless a particular service was expressly included in the scope, it was not performed and there should be no assumptions based upon services not provided. Additional report limitations and important information about this document are presented in Appendix F. This information should be carefully read and understood by the client and other parties reviewing this document.

Sincerely,

COLUMBIA WEST ENGINEERING, Inc.

Lance V. Lehto, PE, GE
President



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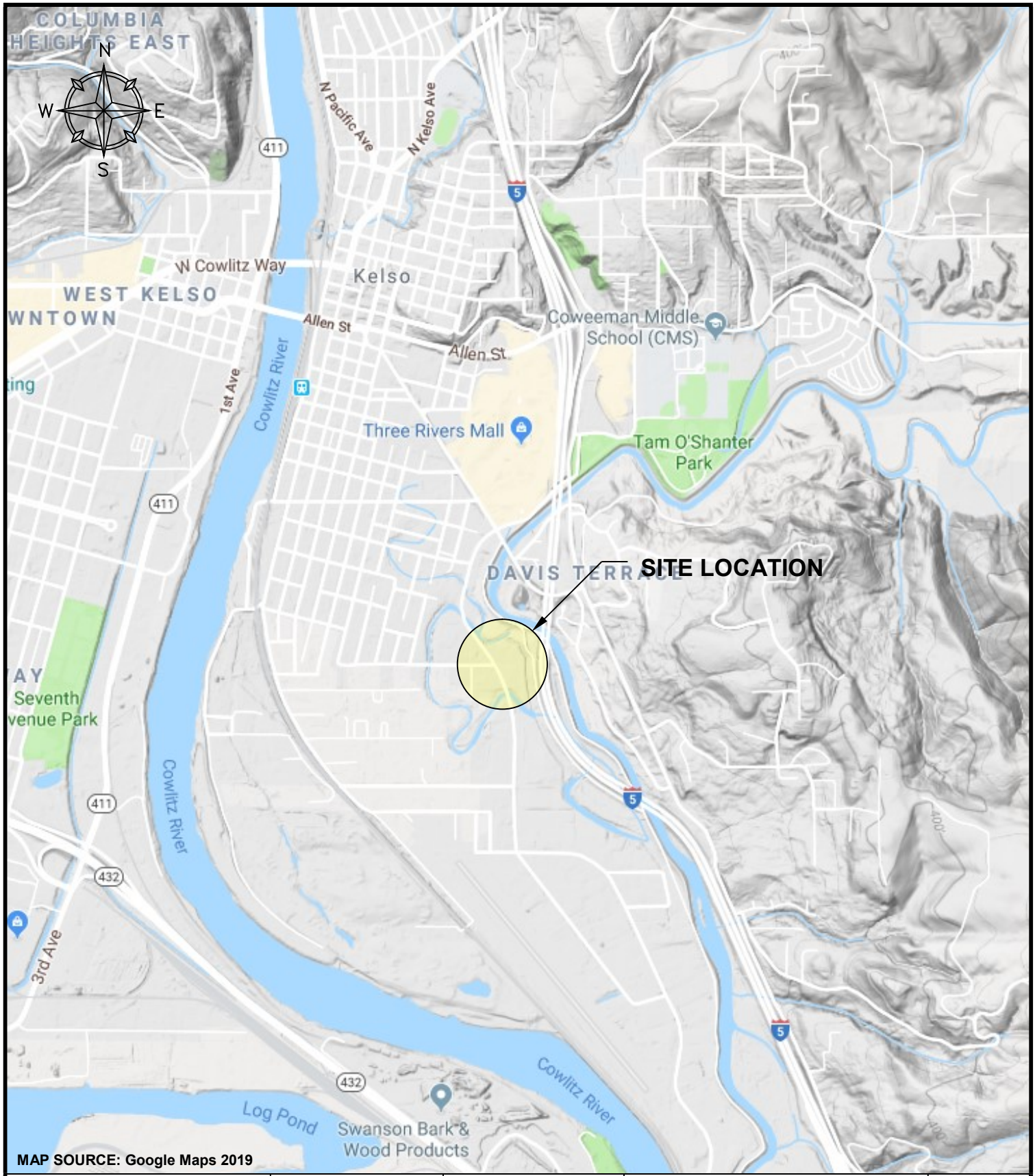
FIGURES



MAP SOURCE: Google Maps 2019

Geotechnical ▪ Environmental ▪ Special Inspections
Columbia West Engineering, Inc
11917 NE 95th Street
Vancouver, Washington 98682
Phone: 360-823-2900, Fax: 360-823-2901
www.columbiawestengineering.com

Design	Drawn: CWS		
Checked: LVL	Date: 7/15/2019		
Client: Pacific Tech	Rev	By	Date
Job No.: 07215			
CAD File: FIGURE 1			
Scale: NTS			

SITE LOCATION MAP

PACIFIC TECH CONSTRUCTION
KELSO, WASHINGTON

FIGURE 1

NOTES:
1. SITE LOCATION: 1303 13TH AVE S, KELSO, WASHINGTON.
2. SITE CONSISTS OF PARCEL 24355 TOTALING APPROXIMATELY 3.08 ACRES.
3. DRAWING IS NOT TO SCALE.
4. BASE MAP OBTAINED FROM GOOGLE EARTH, 2019. PROPOSED LAYOUT SCHEMATIC PROVIDED BY THREE RIVERS LAND SERVICES, PLLC.
5. SOIL EXPLORATION LOCATION IS APPROXIMATE AND NOT SURVEYED.
6. CPT EXPLORATION BACKFILLED LOOSELY WITH ONSITE SOILS ON MAY 31, 2019.

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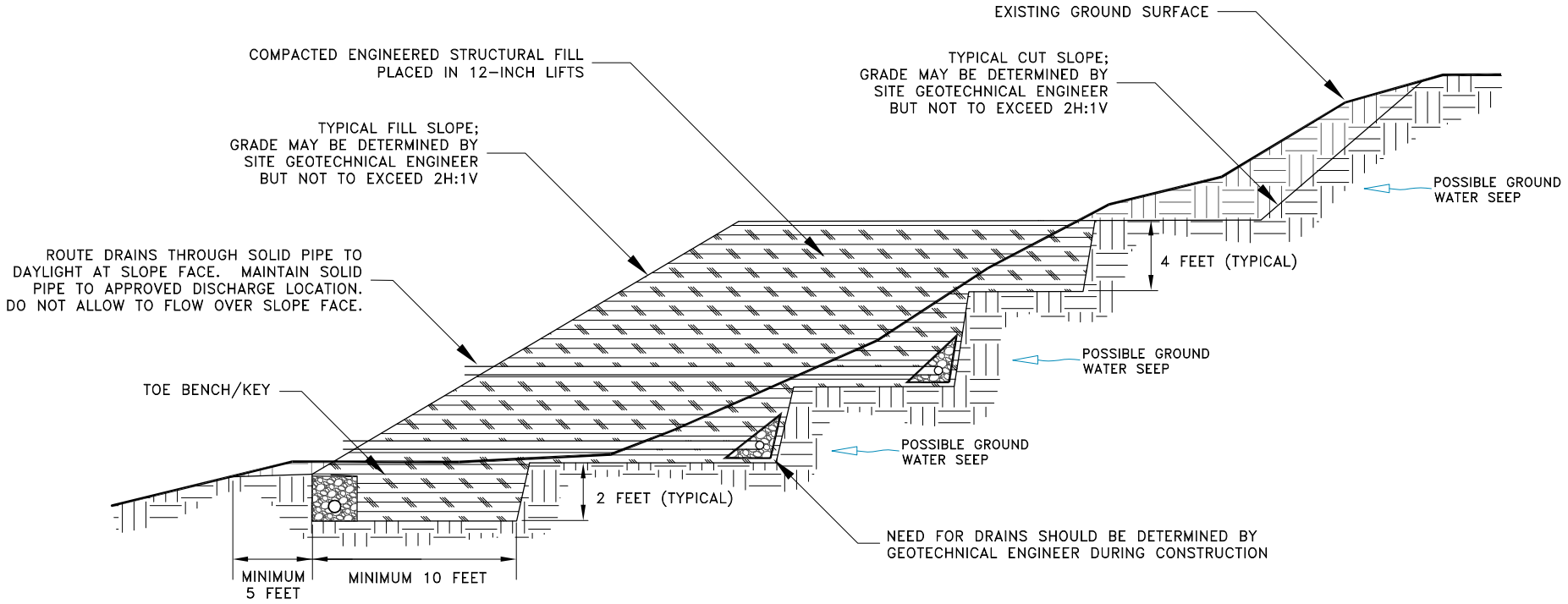
Design:	Drawn: CWS	EXPLORATION LOCATION MAP	FIGURE 2
Checked: LVL	Date: 7/7/19		
Client: PACIFIC TECH	Rev / By / Date	PACIFIC TECH CONSTRUCTION KELSO, WASHINGTON	
Job No: 07215			
CAD File: FIGURE 2			
Scale: NONE			

TYPICAL CUT AND FILL SLOPE CROSS-SECTION

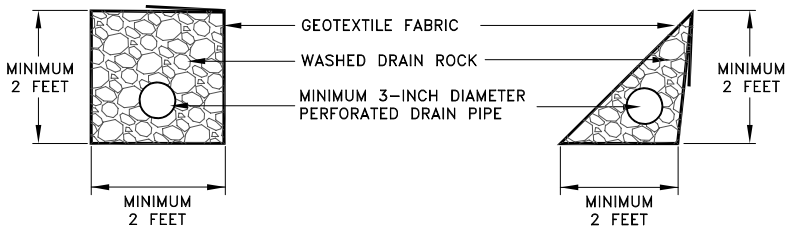


DRAIN SPECIFICATIONS

GEOTEXTILE FABRIC SHALL CONSIST OF MIRAFI 140N OR APPROVED EQUIVALENT WITH AOS BETWEEN No. 70 AND No. 100 SIEVE.

WASHED DRAIN ROCK SHALL BE OPEN-GRADED ANGULAR DRAIN ROCK WITH LESS THAN 2 PERCENT PASSING THE No. 200 SIEVE AND A MAXIMUM PARTICLE SIZE OF 3 INCHES.

TYPICAL DRAIN SECTION DETAIL



NOTES:
1. DRAWING IS NOT TO SCALE.
2. SLOPES AND PROFILES SHOWN ARE APPROXIMATE.
3. DRAWING REPRESENTS TYPICAL FILL AND CUT SLOPE SECTION, AND MAY NOT BE SITE-SPECIFIC.

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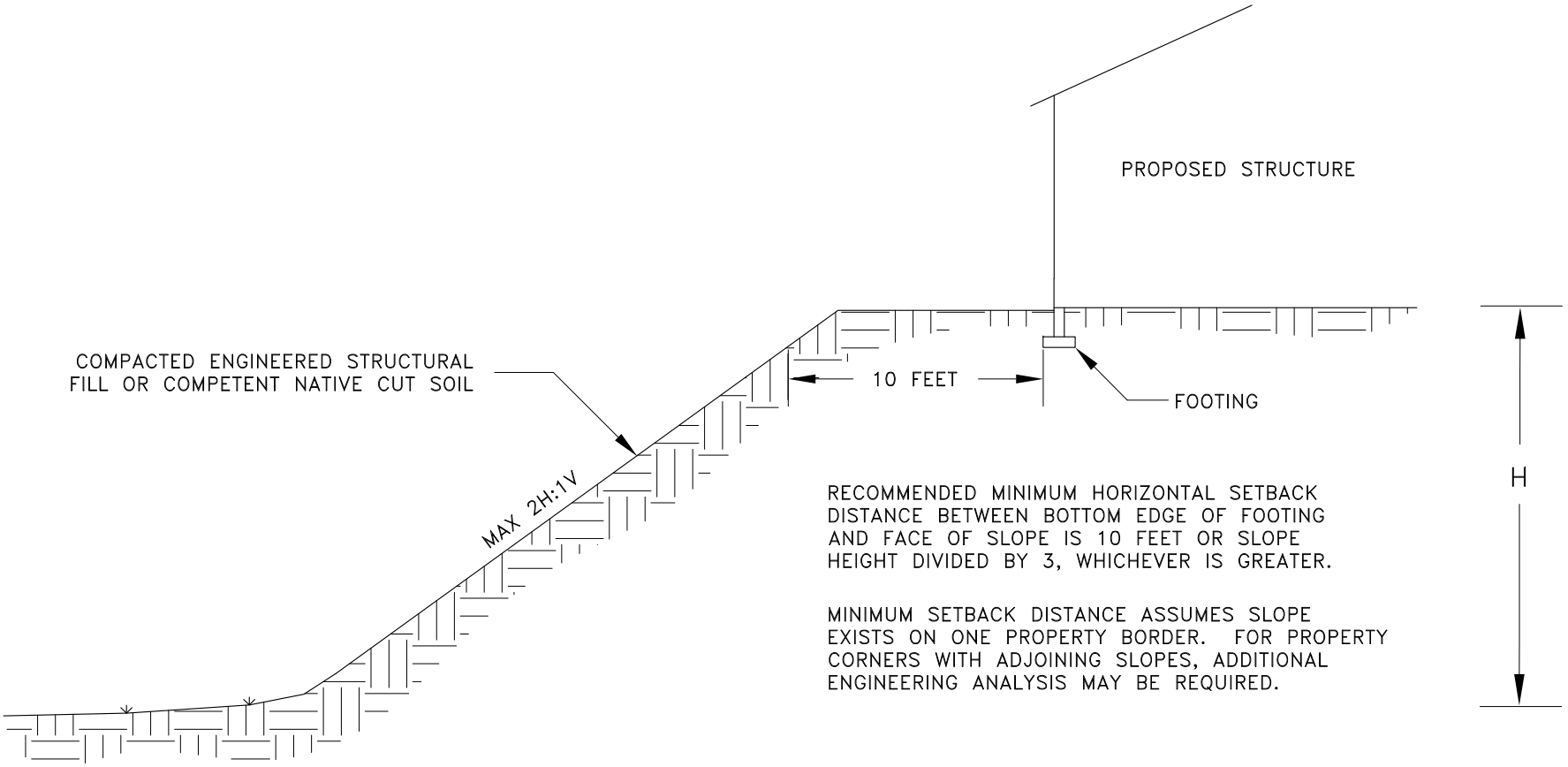
Design:	Drawn: CWS		
Checked: LVL	Date: 7/7/19		
Client: PACIFIC TECH	Rev	By	Date
Job No: 07215			
CAD File: FIGURE 3			
Scale: NONE			

TYPICAL CUT AND FILL SLOPE CROSS-SECTION

PACIFIC TECH CONSTRUCTION
KELSO, WASHINGTON

FIGURE 3

MINIMUM FOUNDATION SLOPE SETBACK DETAIL



RECOMMENDED MINIMUM HORIZONTAL SETBACK DISTANCE BETWEEN BOTTOM EDGE OF FOOTING AND FACE OF SLOPE IS 10 FEET OR SLOPE HEIGHT DIVIDED BY 3, WHICHEVER IS GREATER.

MINIMUM SETBACK DISTANCE ASSUMES SLOPE EXISTS ON ONE PROPERTY BORDER. FOR PROPERTY CORNERS WITH ADJOINING SLOPES, ADDITIONAL ENGINEERING ANALYSIS MAY BE REQUIRED.

NOTES:
1. DRAWING IS NOT TO SCALE.
2. SLOPES AND PROFILES SHOWN ARE APPROXIMATE.
3. DRAWING REPRESENTS TYPICAL FOUNDATION SETBACK DETAIL, AND MAY NOT BE SITE-SPECIFIC.

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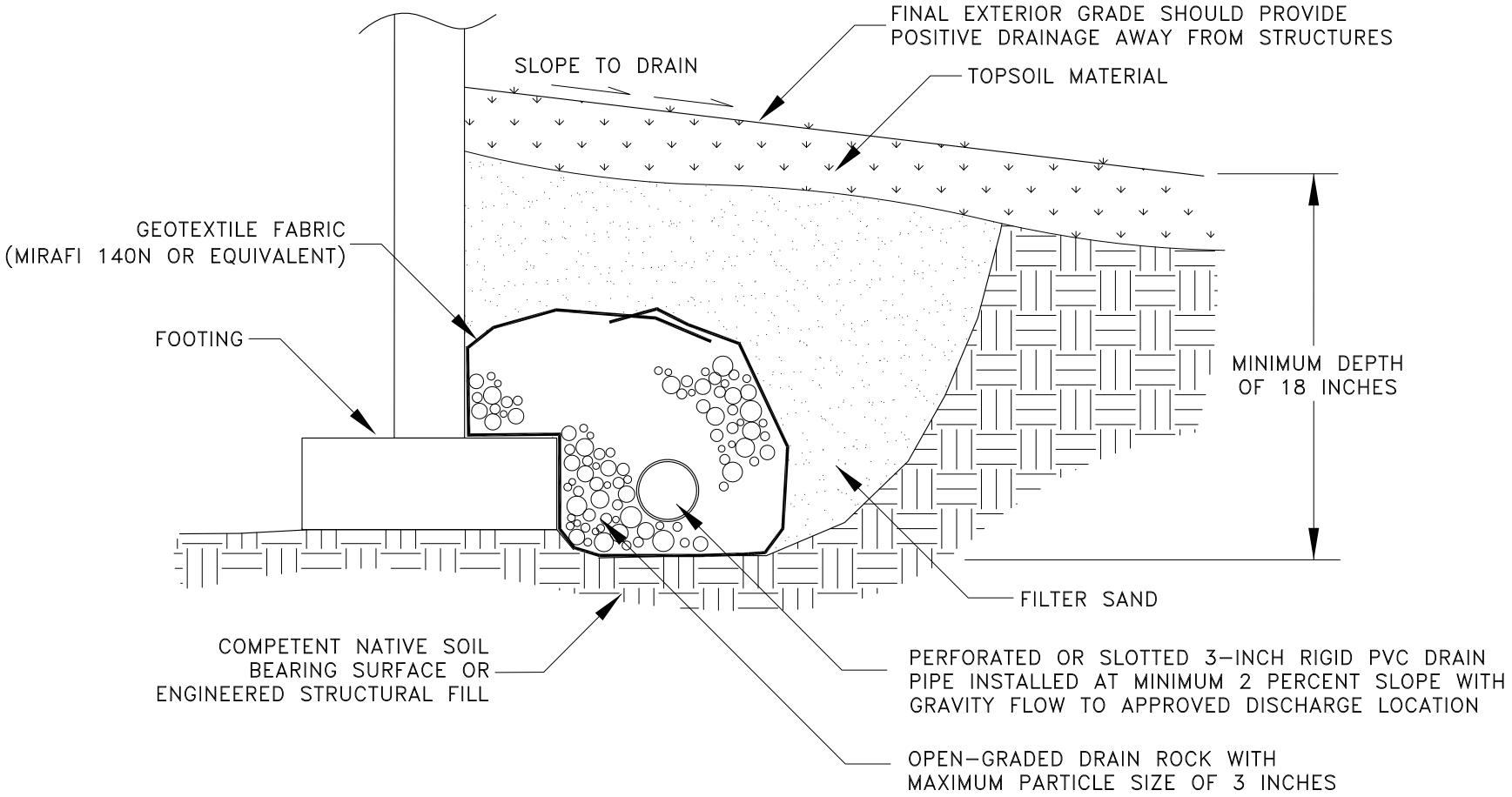
Design:	Drawn: CWS			
Checked: LVL	Date: 7/7/19			
Client: PACIFIC TECH	Rev	By	Date	
Job No: 07215				
CAD File: FIGURE 4				
Scale: NONE				

MINIMUM FOUNDATION SLOPE SETBACK DETAIL

PACIFIC TECH CONSTRUCTION
KELSO, WASHINGTON

FIGURE 4

TYPICAL PERIMETER FOOTING DRAIN DETAIL



NOTES:
1. DRAWING IS NOT TO SCALE.
2. DRAWING REPRESENTS TYPICAL FOOTING DRAIN DETAIL AND MAY NOT BE SITE-SPECIFIC.

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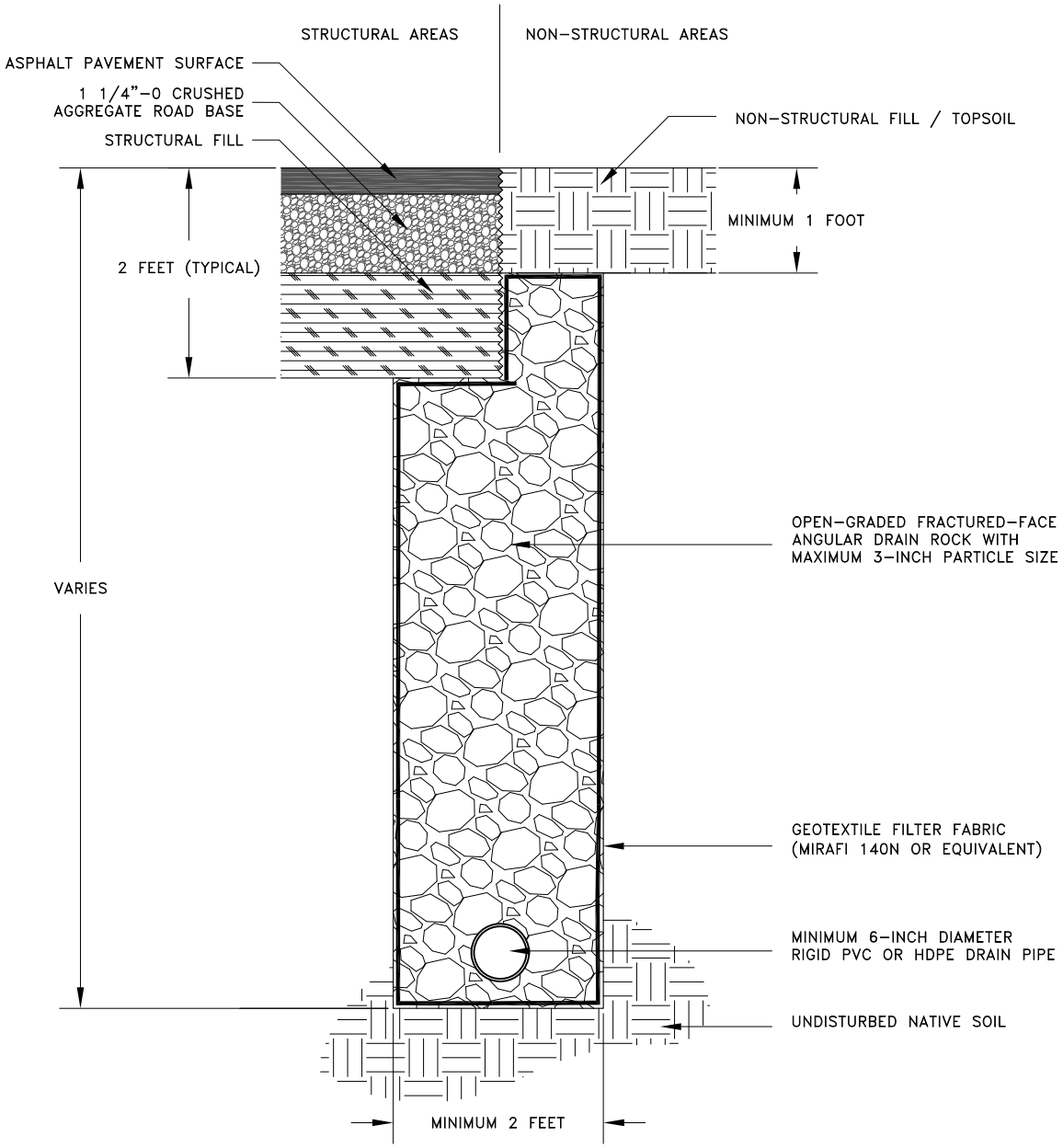
Design:	Drawn: CWS			
Checked: LVL	Date: 7/7/19			
Client: PACIFIC TECH	Rev	By	Date	
Job No: 07215				
CAD File: FIGURE 5				
Scale: NONE				

TYPICAL PERIMETER FOOTING DRAIN DETAIL

PACIFIC TECH CONSTRUCTION
KELSO, WASHINGTON

FIGURE
5

TYPICAL PERFORATED DRAIN PIPE TRENCH DETAIL



NOTE: LOCATION, INVERT ELEVATION, DEPTH OF TRENCH, AND EXTENT OF PERFORATED PIPE REQUIRED MAY BE MODIFIED BY THE GEOTECHNICAL ENGINEER DURING CONSTRUCTION BASED UPON FIELD OBSERVATION AND SITE–SPECIFIC SOIL CONDITIONS.

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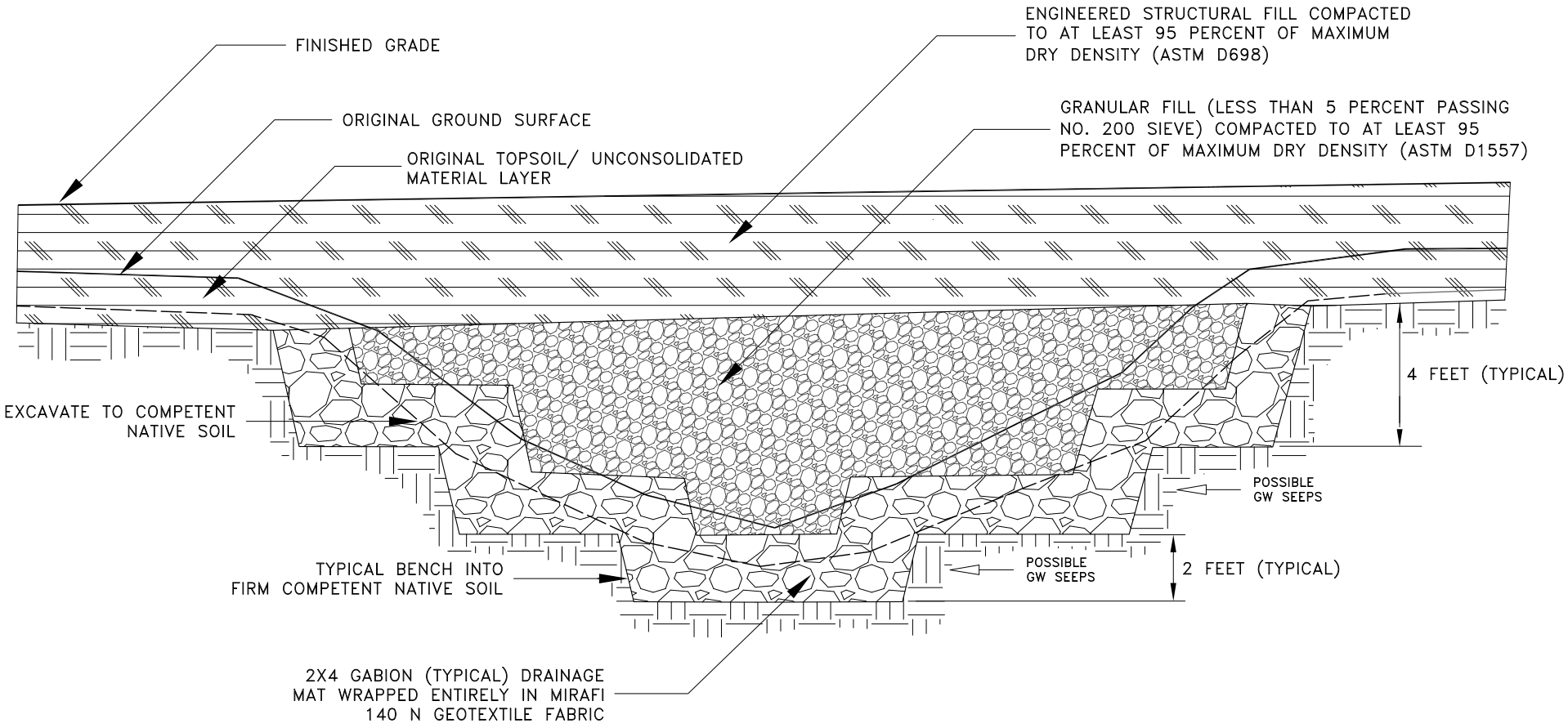
Design:	Drawn: CWS		
Checked: LVL	Date: 7/7/19		
Client: PACIFIC TECH	Rev	By	Date
Job No: 07215			
CAD File: FIGURE 6			
Scale: NONE			

TYPICAL PERFORATED DRAIN PIPE TRENCH DETAIL

PACIFIC TECH CONSTRUCTION
KELSO, WASHINGTON

FIGURE 6

TYPICAL DRAINAGE MAT CROSS-SECTION



NOTES:
1. DRAWING IS NOT TO SCALE.
2. SLOPES AND PROFILES SHOWN ARE APPROXIMATE.
3. DRAWING REPRESENTS TYPICAL DRAINAGE MAT SECTION AND MAY NOT BE SITE-SPECIFIC.
4. DEPTH, LOCATION, EXTENT, AND THICKNESS OF GABION MAT AND GRANULAR FILL LAYER SHOULD BE DETERMINED IN THE FIELD BY COLUMBIA WEST.
5. DRAIN PIPE MAY BE NEEDED AT LOWEST GRADIENT POINT OF DRAINAGE MAT TO CONTROL AND DIRECT FLOW.

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Design:	Drawn: CWS			
Checked: LVL	Date: 7/7/19			
Client: PACIFIC TECH	Rev	By	Date	
Job No: 07215				
CAD File: FIGURE 7				
Scale: NONE				

TYPICAL DRAINAGE MAT SECTION

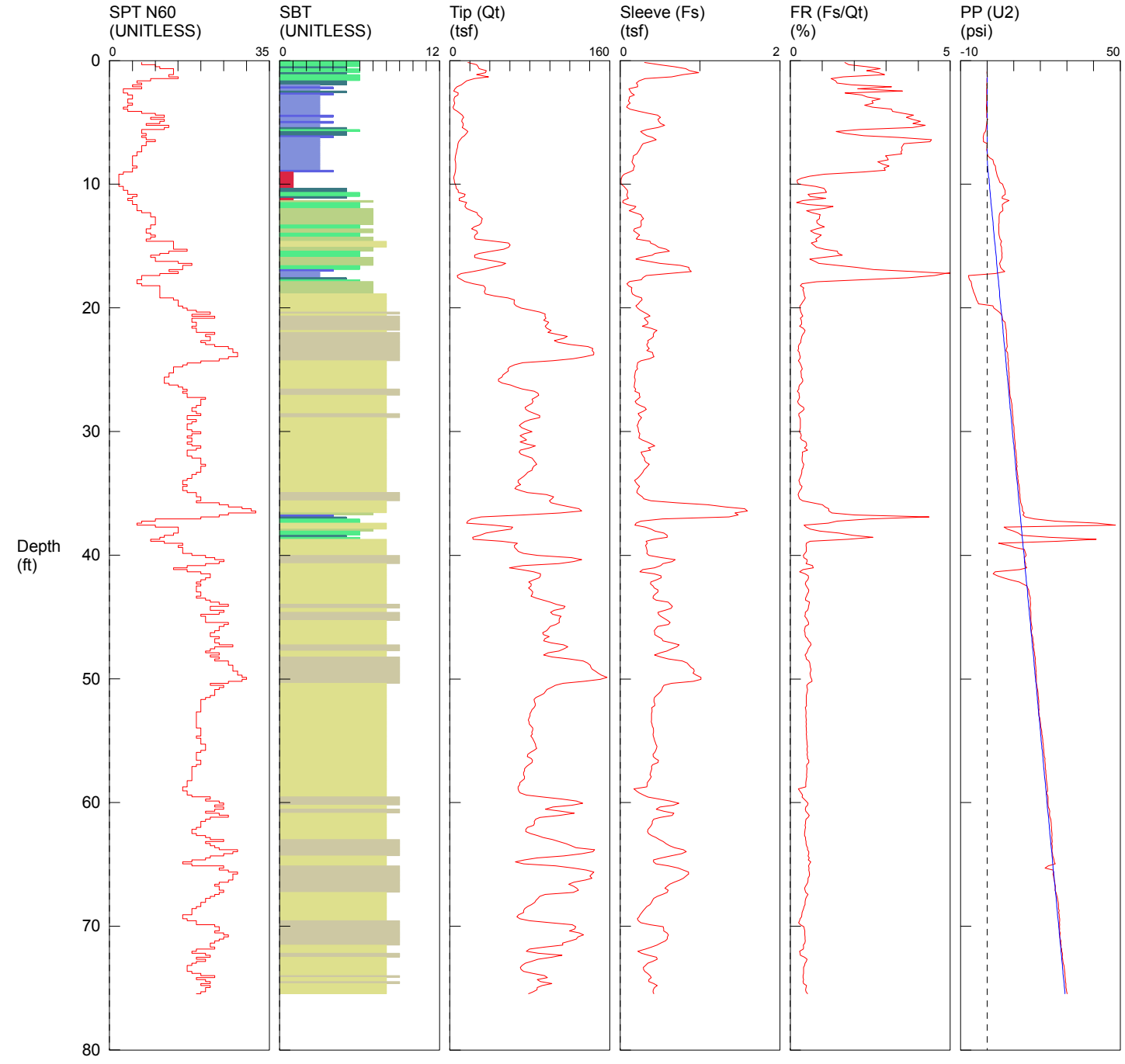
PACIFIC TECH CONSTRUCTION
KELSO, WASHINGTON

FIGURE 7

APPENDIX A
SUBSURFACE EXPLORATION LOGS

Columbia West / CPT-1 / 1600 13th Ave S Kelso

OPERATOR: OGE DMM
CONE ID: DDG1296
HOLE NUMBER: CPT-1
TEST DATE: 5/31/2019 10:21:19 AM
TOTAL DEPTH: 75.459 ft



1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

APPENDIX B
SOIL CLASSIFICATION INFORMATION

SOIL DESCRIPTION AND CLASSIFICATION GUIDELINES

Particle-Size Classification

COMPONENT	ASTM/USCS		AASHTO	
	size range	sieve size range	size range	sieve size range
Cobbles	> 75 mm	greater than 3 inches	> 75 mm	greater than 3 inches
Gravel	75 mm – 4.75 mm	3 inches to No. 4 sieve	75 mm – 2.00 mm	3 inches to No. 10 sieve
Coarse	75 mm – 19.0 mm	3 inches to 3/4-inch sieve	-	-
Fine	19.0 mm – 4.75 mm	3/4-inch to No. 4 sieve	-	-
Sand	4.75 mm – 0.075 mm	No. 4 to No. 200 sieve	2.00 mm – 0.075 mm	No. 10 to No. 200 sieve
Coarse	4.75 mm – 2.00 mm	No. 4 to No. 10 sieve	2.00 mm – 0.425 mm	No. 10 to No. 40 sieve
Medium	2.00 mm – 0.425 mm	No. 10 to No. 40 sieve	-	-
Fine	0.425 mm – 0.075 mm	No. 40 to No. 200 sieve	0.425 mm – 0.075 mm	No. 40 to No. 200 sieve
Fines (Silt and Clay)	< 0.075 mm	Passing No. 200 sieve	< 0.075 mm	Passing No. 200 sieve

Consistency for Cohesive Soil

CONSISTENCY	SPT N-VALUE (BLOWS PER FOOT)	POCKET PENETROMETER (UNCONFINED COMPRESSIVE STRENGTH, tsf)
Very Soft	2	less than 0.25
Soft	2 to 4	0.25 to 0.50
Medium Stiff	4 to 8	0.50 to 1.0
Stiff	8 to 15	1.0 to 2.0
Very Stiff	15 to 30	2.0 to 4.0
Hard	30 to 60	greater than 4.0
Very Hard	greater than 60	-

Relative Density for Granular Soil

RELATIVE DENSITY	SPT N-VALUE (BLOWS PER FOOT)
Very Loose	0 to 4
Loose	4 to 10
Medium Dense	10 to 30
Dense	30 to 50
Very Dense	more than 50

Moisture Designations

TERM	FIELD IDENTIFICATION
Dry	No moisture. Dusty or dry.
Damp	Some moisture. Cohesive soils are usually below plastic limit and are moldable.
Moist	Grains appear darkened, but no visible water is present. Cohesive soils will clump. Sand will bulk. Soils are often at or near plastic limit.
Wet	Visible water on larger grains. Sand and silt exhibit dilatancy. Cohesive soil can be readily remolded. Soil leaves wetness on the hand when squeezed. Soil is much wetter than optimum moisture content and is above plastic limit.

AASHTO SOIL CLASSIFICATION SYSTEM

TABLE 1. Classification of Soils and Soil-Aggregate Mixtures

General Classification	Granular Materials (35 Percent or Less Passing .075 mm)				Silt-Clay Materials (More than 35 Percent Passing 0.075)		
Group Classification	A-1	A-3	A-2	A-4	A-5	A-6	A-7
Sieve analysis, percent passing:							
2.00 mm (No. 10)	-	-	-				
0.425 mm (No. 40)	50 max	51 min	-	-	-	-	-
0.075 mm (No. 200)	25 max	10 max	35 max	36 min	36 min	36 min	36 min
Characteristics of fraction passing 0.425 mm (No. 40)							
Liquid limit				40 max	41 min	40 max	41 min
Plasticity index	6 max	N.P.		10 max	10 max	11 min	11 min
General rating as subgrade	Excellent to good			Fair to poor			

Note: The placing of A-3 before A-2 is necessary in the "left to right elimination process" and does not indicate superiority of A-3 over A-2.

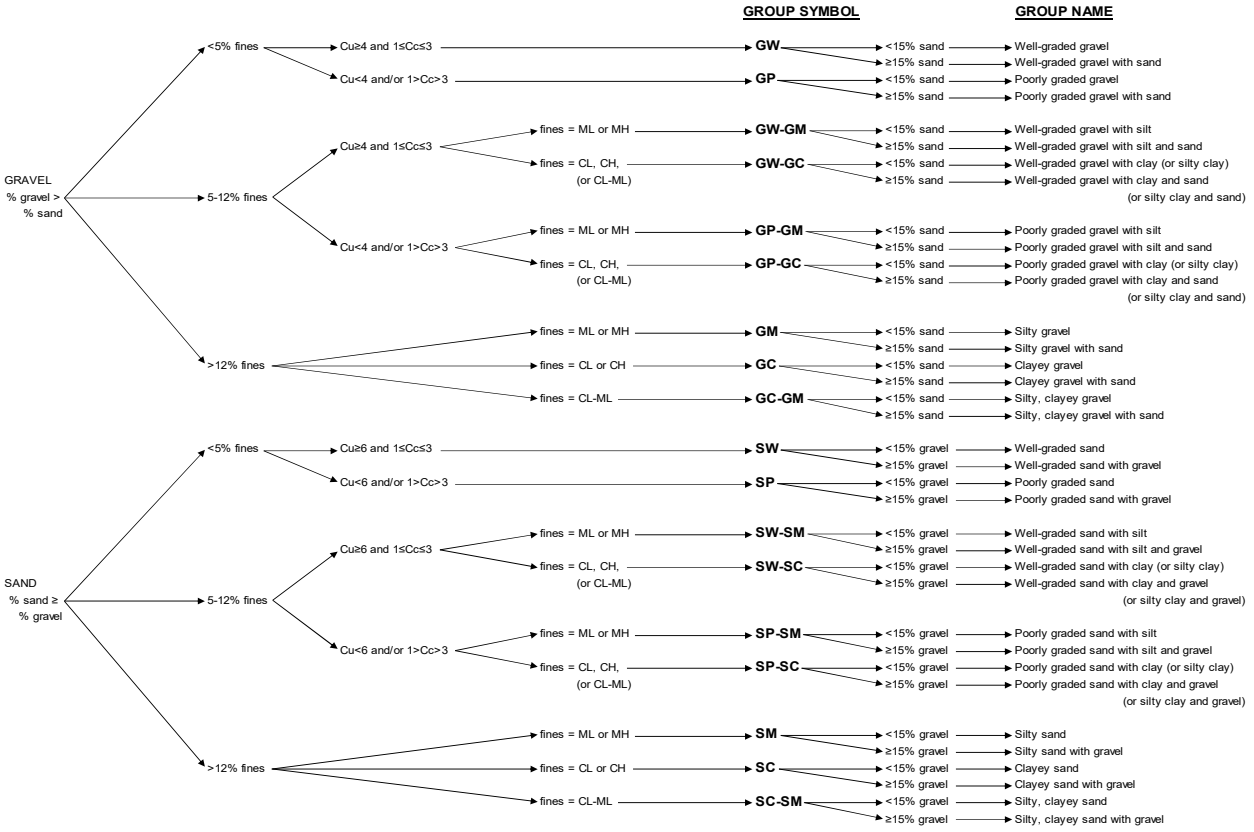
TABLE 2. Classification of Soils and Soil-Aggregate Mixtures

General Classification	Granular Materials (35 Percent or Less Passing 0.075 mm)							Silt-Clay Materials (More than 35 Percent Passing 0.075 mm)			
	A-1			A-2				A-7			
Group Classification	A-1-a	A-1-b	A-3	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7-5, A-7-6
Sieve analysis, percent passing:											
2.00 mm (No. 10)	50 max	-	-	-	-	-	-	-	-	-	-
0.425 mm (No. 40)	30 max	50 max	51 min	-	-	-	-	-	-	-	-
0.075 mm (No. 200)	15 max	25 max	10 max	35 max	35 max	35 max	35 max	36 min	36 min	36 min	36 min
Characteristics of fraction passing 0.425 mm (No. 40)											
Liquid limit				40 max	41 min	40 max	41 min	40 max	41 min	40 max	41 min
Plasticity index	6 max		N.P.	10 max	10 max	11 min	11 min	10 max	10 max	11 min	11min
Usual types of significant constituent materials	Stone fragments, gravel and sand		Fine sand	Silty or clayey gravel and sand				Silty soils		Clayey soils	
General ratings as subgrade	Excellent to Good							Fair to poor			

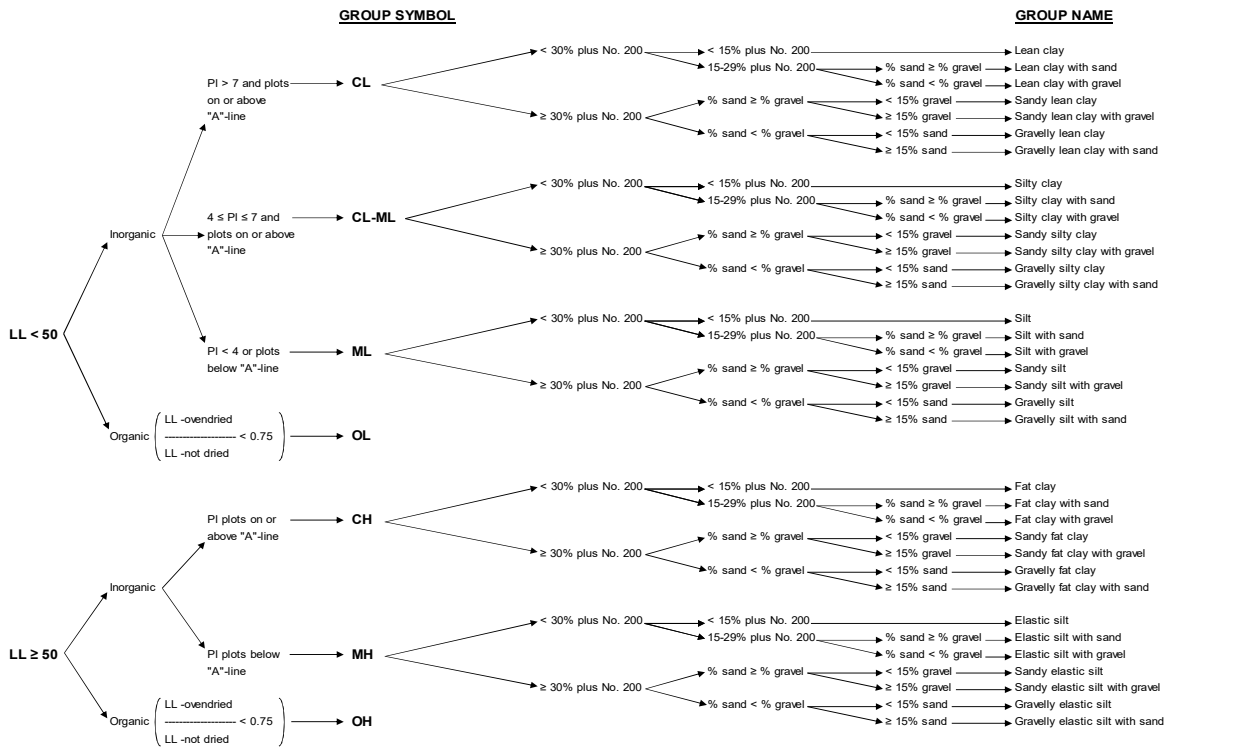
Note: Plasticity index of A-7-5 subgroup is equal to or less than LL minus 30. Plasticity index of A-7-6 subgroup is greater than LL minus 30 (see Figure 2).

AASHTO = American Association of State Highway and Transportation Officials

USCS SOIL CLASSIFICATION SYSTEM



Flow Chart for Classifying Coarse-Grained Soils (More Than 50% Retained on No. 200 Sieve)



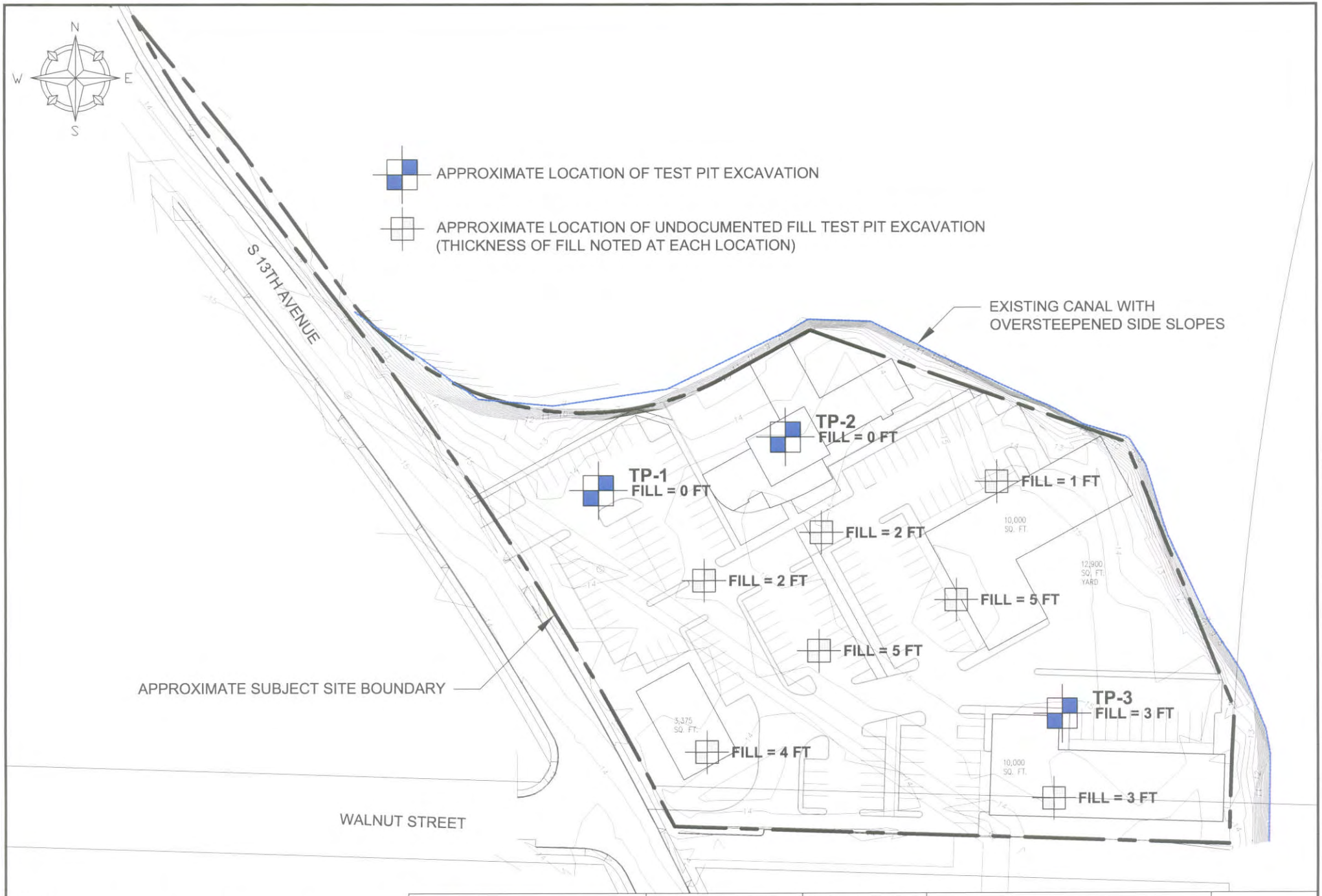
Flow Chart for Classifying Fine-Grained Soil (50% or More Passes No. 200 Sieve)

APPENDIX C
PHOTO LOG

PACIFIC TECH CONSTRUCTION
KELSO, WASHINGTON
PHOTO LOG

Site View, Facing Northeast towards the Proposed Development Site.

APPENDIX D
2008 EXPLORATION MAP, LOGS, AND LABORATORY TEST RESULTS



NOTES:
1. SITE LOCATION: S 13TH AVENUE AND WALNUT STREET.
2. SITE IS APPROXIMATELY 3.9 ACRES IN SIZE.
3. DRAWING IS NOT TO SCALE.
4. BASE MAP PROVIDED BY PRECISION LAND SERVICES INC.
5. TEST PIT LOCATIONS ARE APPROXIMATE AND NOT SURVEYED.
6. ALL TEST PITS BACKFILLED LOOSELY WITH ON-SITE SOIL ON 11/01/07.

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p: 360-823-2900 f: 360-823-2901

Design:	Drawn: EJC	TEST PIT LOCATION MAP	FIGURE 2
Checked: LVL	Date: 11/27/07		
Client: PACIFIC TECH	Rev / By / Date	PACIFIC TECH CONSTRUCTION	
Job No: 07215		KELSO, WASHINGTON	
CAD File: FIGURE 2			
Scale: NONE			

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Pacific Tech Construction	Pacific Tech Development		07215	TP-1
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
Kelso, Washington	Pacific Tech	backhoe	JGH	11/1/07
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUND WATER DEPTH**	**START TIME**	**FINISH TIME**
northwest area	14 feet	8 feet	0930	1010

Depth (feet)	Sample Type	Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Pocket Penetrometer (tsf)	Torvane Shear (tsf)
					OH		TOPSOIL, dark brown, moist, organic						
			Caples silty clay loam		MH		Elastic SILT, grayish brown with various mottles, moist, stiff, moderate to high plasticity, fine to medium-grained sand, trace fine gravel [Soil Type 2]						
	bag	1.1					nuclear density gauge results at 3 feet: wet density = 98.2 pcf, dry density = 71.9 pcf moisture = 36.6%	30.7	55.5			1.5	
5													
	▽						[ground seeps encountered at 8 feet]						
							grades to bluish gray, medium stiff, no gravel						
10	bag	1.2						62.1		66	30		
							Bottom of test pit at 14 feet. Ground water encountered at 8 feet. Excavation backfilled loosely with on-site soil on 11/1/2007.						
15													

CWE TEST PIT PACIFIC TECH CONSTRUCTION.GPJ CWEBORING.GDT 12/21/07

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Pacific Tech Construction	Pacific Tech Development		07215	TP-2
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
Kelso, Washington	Pacific Tech	backhoe	JGH	11/1/07
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUND WATER DEPTH**	**START TIME**	**FINISH TIME**
north central area	15 feet	10 feet	1015	1040

Depth (feet)	Sample Type	Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Pocket Penetrometer (tsf)	Torvane Shear (tsf)
							TOPSOIL, dark brown, moist, organic						
			Caples silty clay loam		MH		Elastic SILT, gray, moist, stiff, moderate to high plasticity, fine to medium-grained sand, trace fine gravel [Soil Type 2]						
5	bag	2.1						58.0		65	27		
					MH		grades to mottled light brown and gray						
10	▽ bag	2.2					[ground seeps encountered at 10 feet]	30.8	86.9				
							Bottom of test pit at 12 feet. Ground water encountered at 10 feet. Excavation backfilled loosely with on-site soil on 11/1/2007.						
15													

CWE TEST PIT PACIFIC TECH CONSTRUCTION.GPJ CWEBORING.GDT 12/21/07

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TEST PIT LOG

PROJECT NAME	CLIENT		PROJECT NO.	TEST PIT NO.
Pacific Tech Construction	Pacific Tech Development		07215	TP-3
PROJECT LOCATION	**CONTRACTOR**	**EQUIPMENT**	**ENGINEER**	**DATE**
Kelso, Washington	Pacific Tech	backhoe	JGH	11/1/07
TEST PIT LOCATION	**APPROX. SURFACE ELEVATION**	**GROUND WATER DEPTH**	**START TIME**	**FINISH TIME**
southeast area	15 feet	11 feet	1045	1115

Depth (feet)	Sample Type	Field ID	SCS Soil Survey Description	AASHTO Soil Type	USCS Soil Type	Graphic Log	LITHOLOGIC DESCRIPTION AND REMARKS	Moisture Content (%)	Passing No. 200 Sieve (%)	Liquid Limit	Plasticity Index	Pocket Penetrometer (tsf)	Torvane Shear (tsf)
							FILL - sandy gravel with large asphalt fragments (6 inches thick and 2 to 3 feet across) [Soil Type 1]						
			Caples silty clay loam		MH		Elastic SILT, brown, moist, stiff, moderate plasticity, fine to medium-grained sand [Soil Type 2]						
5													
10	▽						[ground seeps encountered at 11 feet]						
							color grades to mottled light brown and gray						
15							Bottom of test pit at 14 feet. Ground water encountered at 11 feet. Excavation backfilled loosely with on-site soil on 11/1/2007.						

CWE TEST PIT PACIFIC TECH CONSTRUCTION.GPJ CWEBORING.GDT 12/21/07

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PARTICLE-SIZE ANALYSIS REPORT

PROJECT	CLIENT	PROJECT NO.	LAB ID
Pacific Tech Construction Kelso, Washington	Pacific Tech Development c/o Mr. Tim Wines, PE Precision Land Services, Inc. PO Box 821556 Vancouver, Washington 98682	07215	S07-722
		REPORT DATE 11/13/07	FIELD ID TP1.1
		DATE SAMPLED 11/01/07	SAMPLED BY JGH

MATERIAL DATA

MATERIAL SAMPLED	MATERIAL SOURCE	USCS SOIL TYPE
brown sandy silt	Test Pit TP-01, depth = 3 feet	no data provided
SPECIFICATIONS none		AASHTO SOIL TYPE no data provided

LABORATORY TEST DATA

LABORATORY EQUIPMENT
Rainhart "Mary Ann" Sifter 637

TEST PROCEDURE
ASTM D6913, D2487

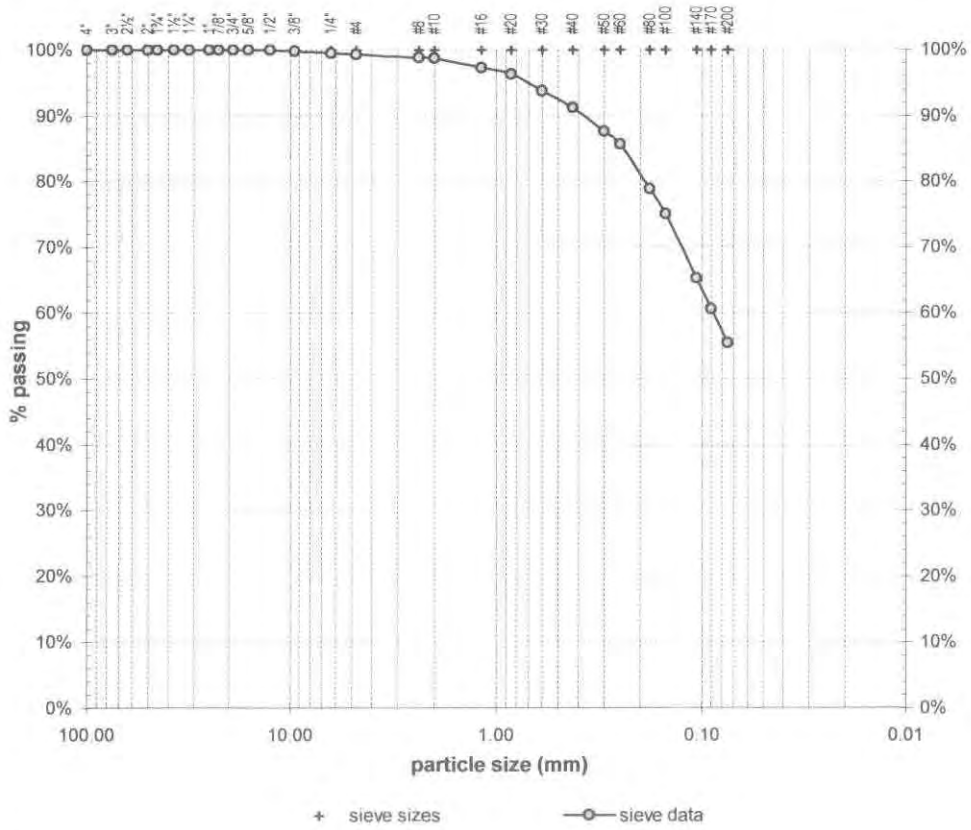
ADDITIONAL DATA

natural moisture content =	30.7%	coefficient of curvature, C_C =	n/a
liquid limit =	n/a	coefficient of uniformity, C_U =	n/a
plastic limit =	n/a	effective size, $D_{(10)}$ =	n/a
plasticity index =	n/a	$D_{(30)}$ =	n/a
fineness modulus =	n/a	$D_{(60)}$ =	0.088 mm

SIEVE DATA

% gravel = 0.7%
% sand = 43.8%
% silt and clay = 55.5%

GRAIN SIZE DISTRIBUTION



	SIEVE SIZE		PERCENT PASSING SIEVE		SPECS	
	US	mm	act.	interp.	max	min
GRAVEL	6.00"	150.0		100.0%		
	4.00"	100.0		100.0%		
	3.00"	75.0		100.0%		
	2.50"	63.0		100.0%		
	2.00"	50.0		100.0%		
	1.75"	45.0		100.0%		
	1.50"	37.5		100.0%		
	1.25"	31.5		100.0%		
	1.00"	25.0		100.0%		
	7/8"	22.4		100.0%		
	3/4"	19.0		100.0%		
	5/8"	16.0		100.0%		
	1/2"	12.5	100.0%			
	3/8"	9.50		99.8%		
	1/4"	6.30		99.5%		
	#4	4.75	99.3%			
SAND	#8	2.36		98.8%		
	#10	2.00	98.7%			
	#16	1.18		97.2%		
	#20	0.850	96.3%			
	#30	0.600		93.7%		
	#40	0.425	91.2%			
	#50	0.300		87.6%		
	#60	0.250	85.7%			
	#80	0.180		78.8%		
	#100	0.150	75.0%			
	#140	0.106		65.3%		
	#170	0.090		60.6%		
	#200	0.075	55.5%			

DATE TESTED	TESTED BY
11/03/07	SMJ

COLUMBIA WEST ENGINEERING, INC. authorized signature

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11917 NE 95th Street, Vancouver, WA 98682
Phone: 360-823-2900, Fax: 360-823-2901
www.columbiawestengineering.com

ATTERBERG LIMITS REPORT

PROJECT	CLIENT	PROJECT NO.	LAB ID
Pacific Tech Construction Kelso, Washington	Pacific Tech Development c/o Mr. Tim Wines, PE Precision Land Services, Inc. PO Box 821556 Vancouver, Washington 98682	07215	S07-723
		REPORT DATE: 11/13/07	FIELD ID: TP1.2
		DATE SAMPLED: 11/01/07	SAMPLED BY: JGH

MATERIAL DATA

MATERIAL SAMPLED	MATERIAL SOURCE	USCS SOIL TYPE
bluish gray elastic silt	Test Pit TP-01, depth = 10 feet	no data provided

LABORATORY TEST DATA

LABORATORY EQUIPMENT: Liquid Limit Machine, Plastic Limit Roller

TEST PROCEDURE: ASTM D4318

ATTERBERG LIMITS

liquid limit =	66
plastic limit =	36
plasticity index =	30

LIQUID LIMIT DETERMINATION

	❶	❷	❸	❹
wet soil + pan weight, g =	37.10	37.31	36.61	
dry soil + pan weight, g =	30.62	30.68	30.07	
pan weight, g =	20.54	20.60	20.47	
N (blows) =	29	26	19	
moisture, % =	64.3 %	65.8 %	68.1 %	

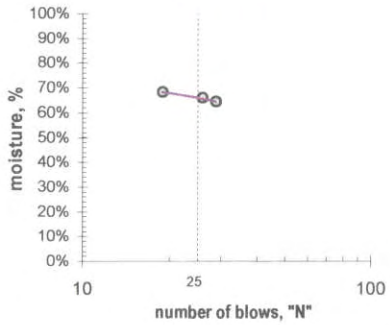
SHRINKAGE

shrinkage limit =	n/a
shrinkage ratio =	n/a

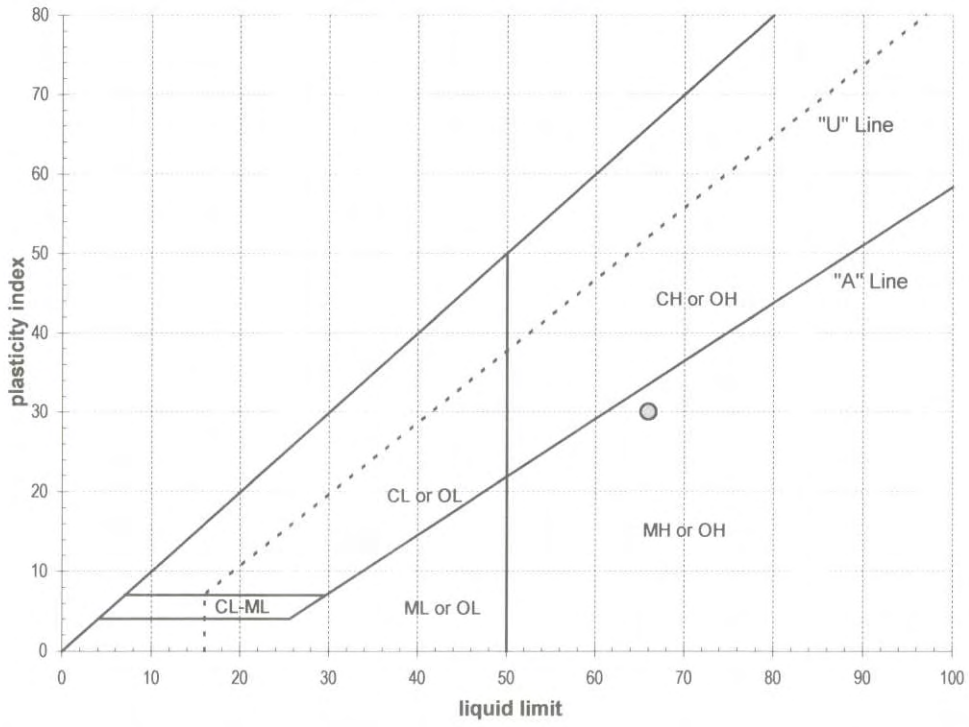
PLASTIC LIMIT DETERMINATION

	❶	❷	❸	❹
wet soil + pan weight, g =	29.32	30.30		
dry soil + pan weight, g =	27.06	27.79		
pan weight, g =	20.72	20.73		
moisture, % =	35.7 %	35.6 %		

LIQUID LIMIT



PLASTICITY CHART



ADDITIONAL DATA

moisture content = 62.1%

DATE TESTED	TESTED BY
11/05/07	SMJ

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Geotechnical Engineering and Environmental Consulting Services

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ATTERBERG LIMITS REPORT

PROJECT	CLIENT	PROJECT NO.	LAB ID
Pacific Tech Construction Kelso, Washington	Pacific Tech Development c/o Mr. Tim Wines, PE Precision Land Services, Inc. PO Box 821556 Vancouver, Washington 98682	07215	S07-724
		REPORT DATE: 11/13/07	FIELD ID: TP2.1
		DATE SAMPLED: 11/01/07	SAMPLED BY: JGH

MATERIAL DATA

MATERIAL SAMPLED	MATERIAL SOURCE	USCS SOIL TYPE
gray elastic silt	Test Pit TP-02, depth = 6 feet	no data provided

LABORATORY TEST DATA

LABORATORY EQUIPMENT: Liquid Limit Machine, Plastic Limit Roller

TEST PROCEDURE: ASTM D4318

ATTERBERG LIMITS

liquid limit =	65
plastic limit =	38
plasticity index =	27

LIQUID LIMIT DETERMINATION

	❶	❷	❸	❹
wet soil + pan weight, g =	36.94	34.11	33.57	
dry soil + pan weight, g =	30.68	28.90	28.41	
pan weight, g =	20.86	20.86	20.68	
N (blows) =	31	26	19	
moisture, % =	63.8 %	64.8 %	66.8 %	

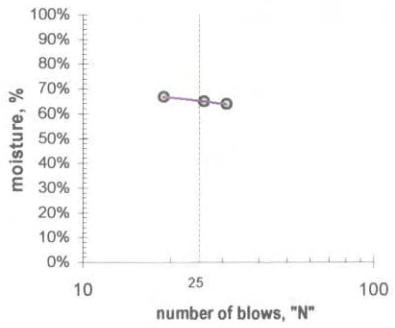
SHRINKAGE

shrinkage limit =	n/a
shrinkage ratio =	n/a

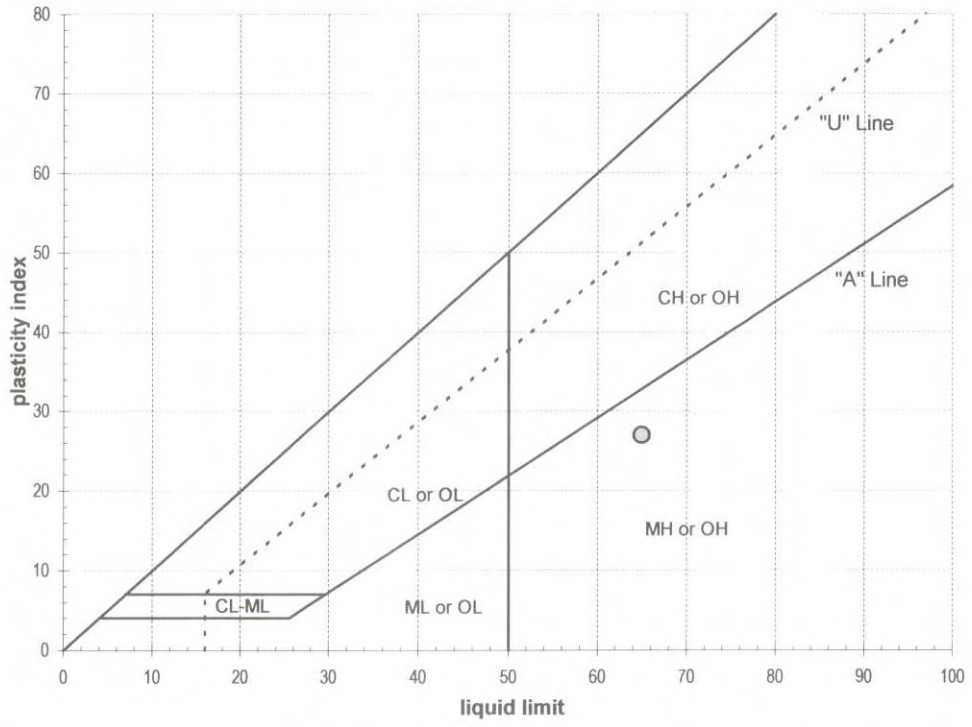
PLASTIC LIMIT DETERMINATION

	❶	❷	❸	❹
wet soil + pan weight, g =	30.07	29.37		
dry soil + pan weight, g =	27.46	26.97		
pan weight, g =	20.58	20.76		
moisture, % =	37.9 %	38.7 %		

LIQUID LIMIT



PLASTICITY CHART



ADDITIONAL DATA

moisture content = 58.0%

DATE TESTED	TESTED BY
11/05/07	SMJ

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www.columbiawestengineering.com

PARTICLE-SIZE ANALYSIS REPORT

PROJECT	CLIENT	PROJECT NO.	LAB ID
Pacific Tech Construction Kelso, Washington	Pacific Tech Development c/o Mr. Tim Wines, PE Precision Land Services, Inc. PO Box 821556 Vancouver, Washington 98682	07215	S07-725
		REPORT DATE 11/13/07	FIELD ID TP2.2
		DATE SAMPLED 11/01/07	SAMPLED BY JGH

MATERIAL DATA

MATERIAL SAMPLED	MATERIAL SOURCE	USCS SOIL TYPE
mottled silt	Test Pit TP-02, depth = 10 feet	no data provided
SPECIFICATIONS none		AASHTO SOIL TYPE no data provided

LABORATORY TEST DATA

LABORATORY EQUIPMENT: Rainhart "Mary Ann" Sifter 637

TEST PROCEDURE: ASTM D6913, D2487

ADDITIONAL DATA

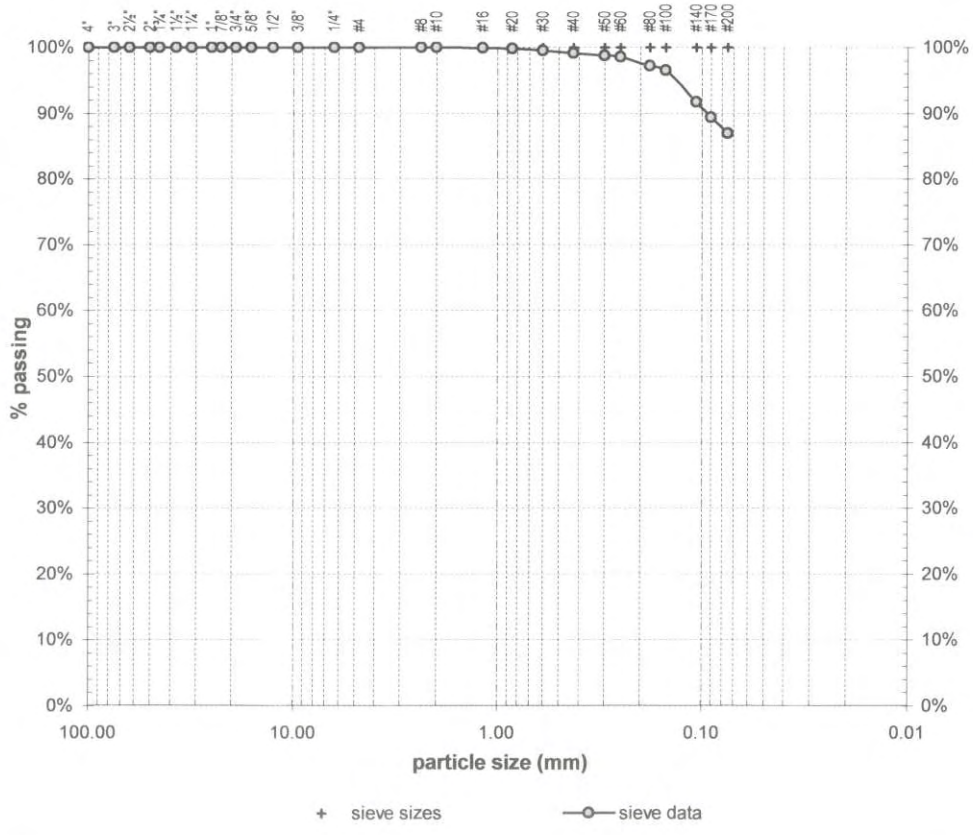
natural moisture content =	30.8%	coefficient of curvature, C_C =	n/a
liquid limit =	n/a	coefficient of uniformity, C_U =	n/a
plastic limit =	n/a	effective size, $D_{(10)}$ =	n/a
plasticity index =	n/a	$D_{(30)}$ =	n/a
fineness modulus =	n/a	$D_{(60)}$ =	n/a

SIEVE DATA

% gravel = 0.0%
% sand = 13.1%
% silt and clay = 86.9%

	SIEVE SIZE		PERCENT PASSING			
			SIEVE		SPECS	
	US	mm	act.	interp.	max	min
GRAVEL	6.00"	150.0		100.0%		
	4.00"	100.0		100.0%		
	3.00"	75.0		100.0%		
	2.50"	63.0		100.0%		
	2.00"	50.0		100.0%		
	1.75"	45.0		100.0%		
	1.50"	37.5		100.0%		
	1.25"	31.5		100.0%		
	1.00"	25.0		100.0%		
	7/8"	22.4		100.0%		
	3/4"	19.0		100.0%		
	5/8"	16.0		100.0%		
	1/2"	12.5		100.0%		
	3/8"	9.50		100.0%		
	1/4"	6.30		100.0%		
	#4	4.75	100.0%			
SAND	#8	2.36		100.0%		
	#10	2.00	100.0%			
	#16	1.18		99.9%		
	#20	0.850	99.8%			
	#30	0.600		99.5%		
	#40	0.425	99.1%			
	#50	0.300		98.7%		
	#60	0.250	98.5%			
	#80	0.180		97.2%		
	#100	0.150	96.5%			
	#140	0.106		91.7%		
	#170	0.090		89.4%		
	#200	0.075	86.9%			

GRAIN SIZE DISTRIBUTION



DATE TESTED	TESTED BY
11/03/07	SMJ

COLUMBIA WEST ENGINEERING, INC. authorized signature

APPENDIX E
LIQUEFACTION EVALUATION

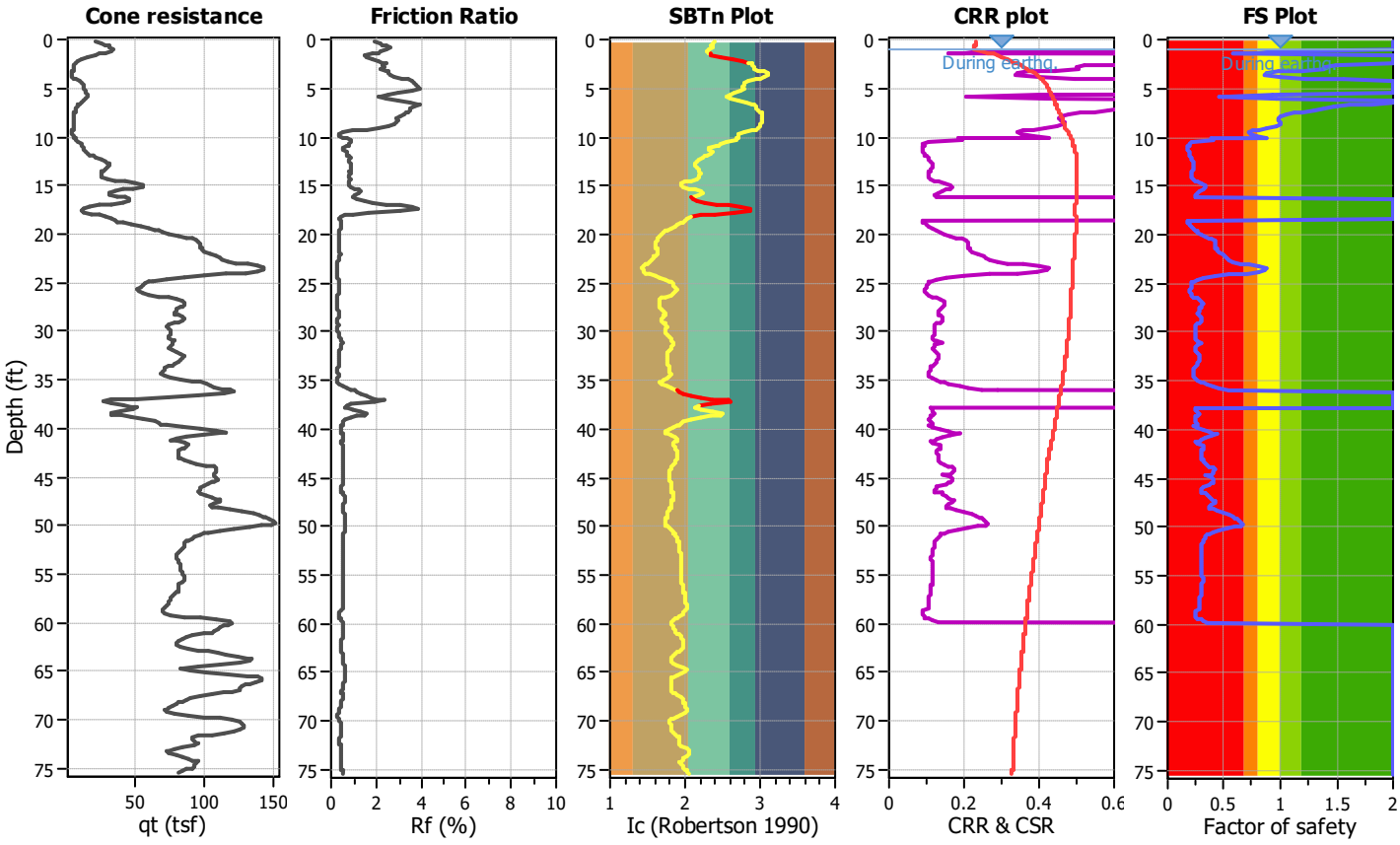
LIQUEFACTION ANALYSIS REPORT

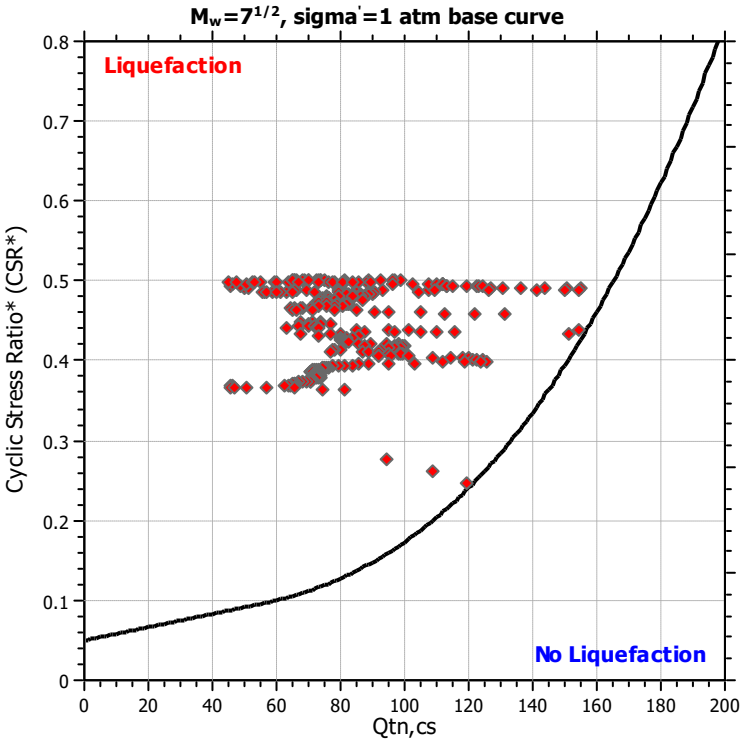
Project title : Pacific Tech Construction **Location : Kelso, Washington**

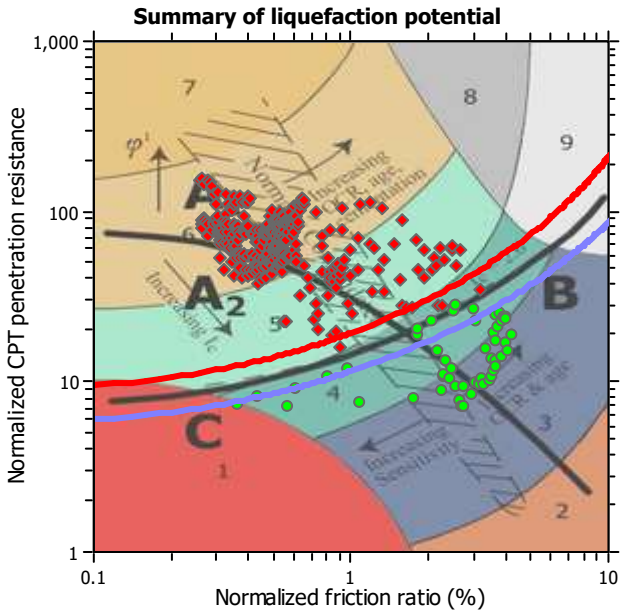
CPT file : 19107 CPT-1 Text File

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	7.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	1.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth:	60.00 ft
Earthquake magnitude M_w:	7.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	NCEER, (Youd
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

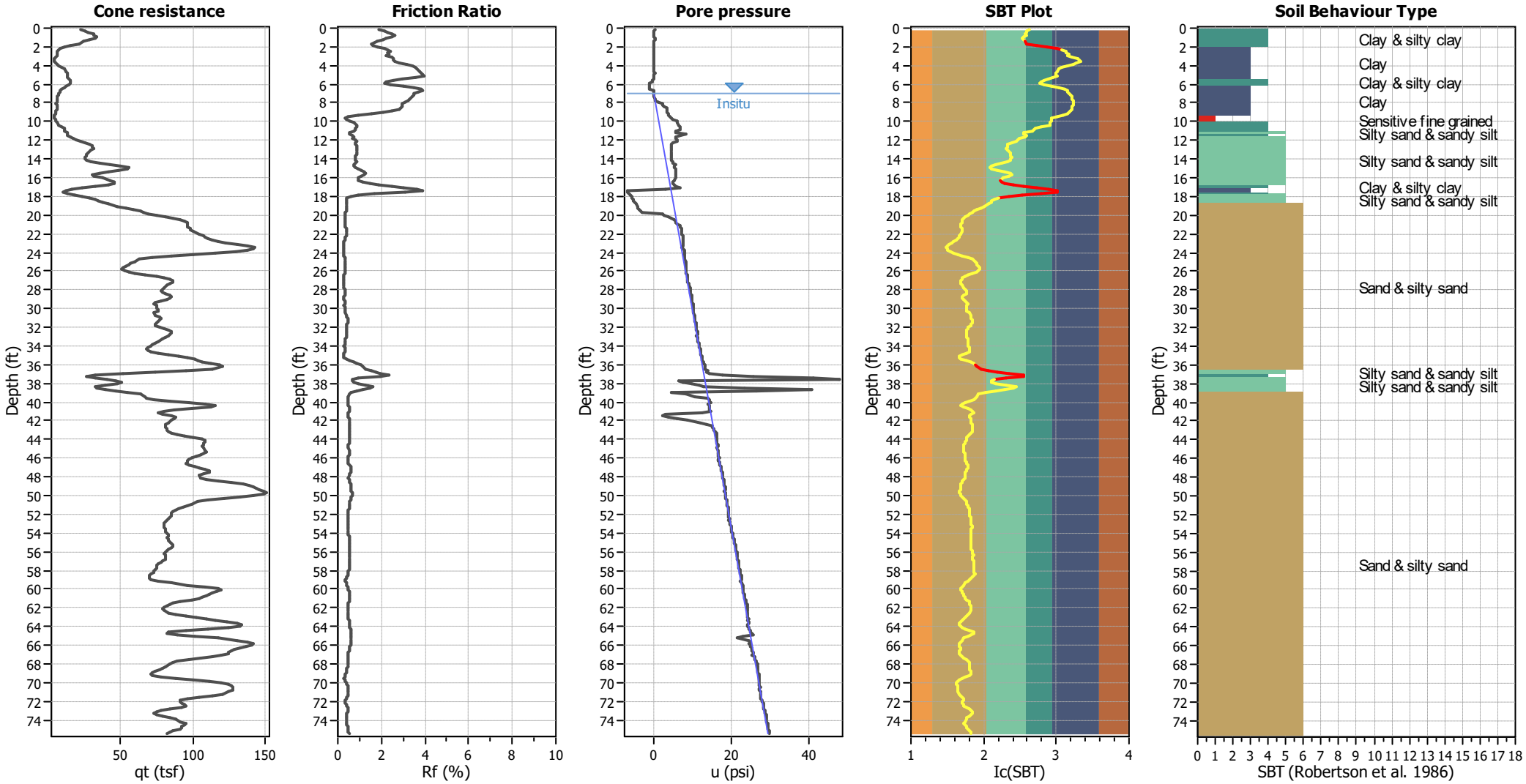






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



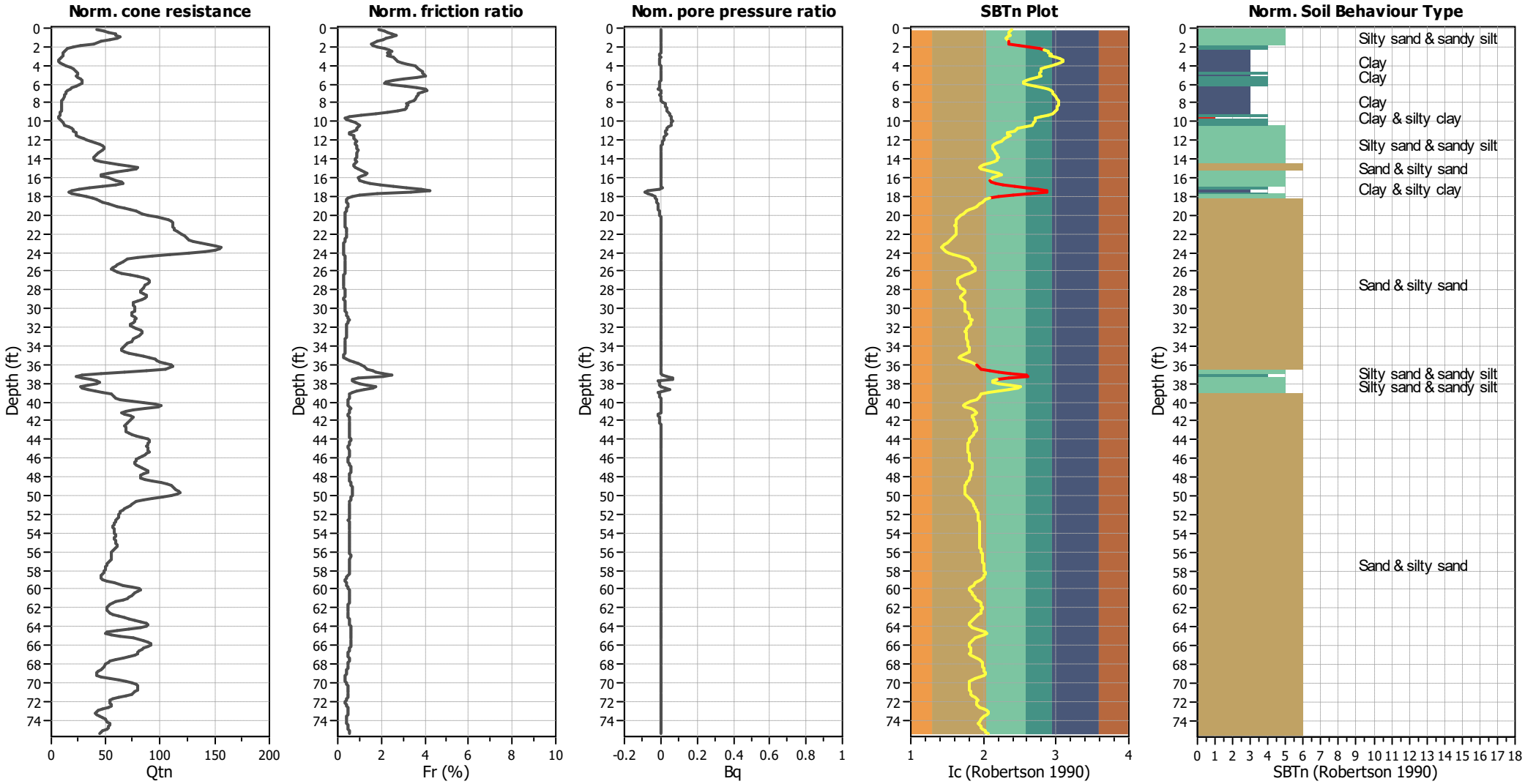
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	1.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



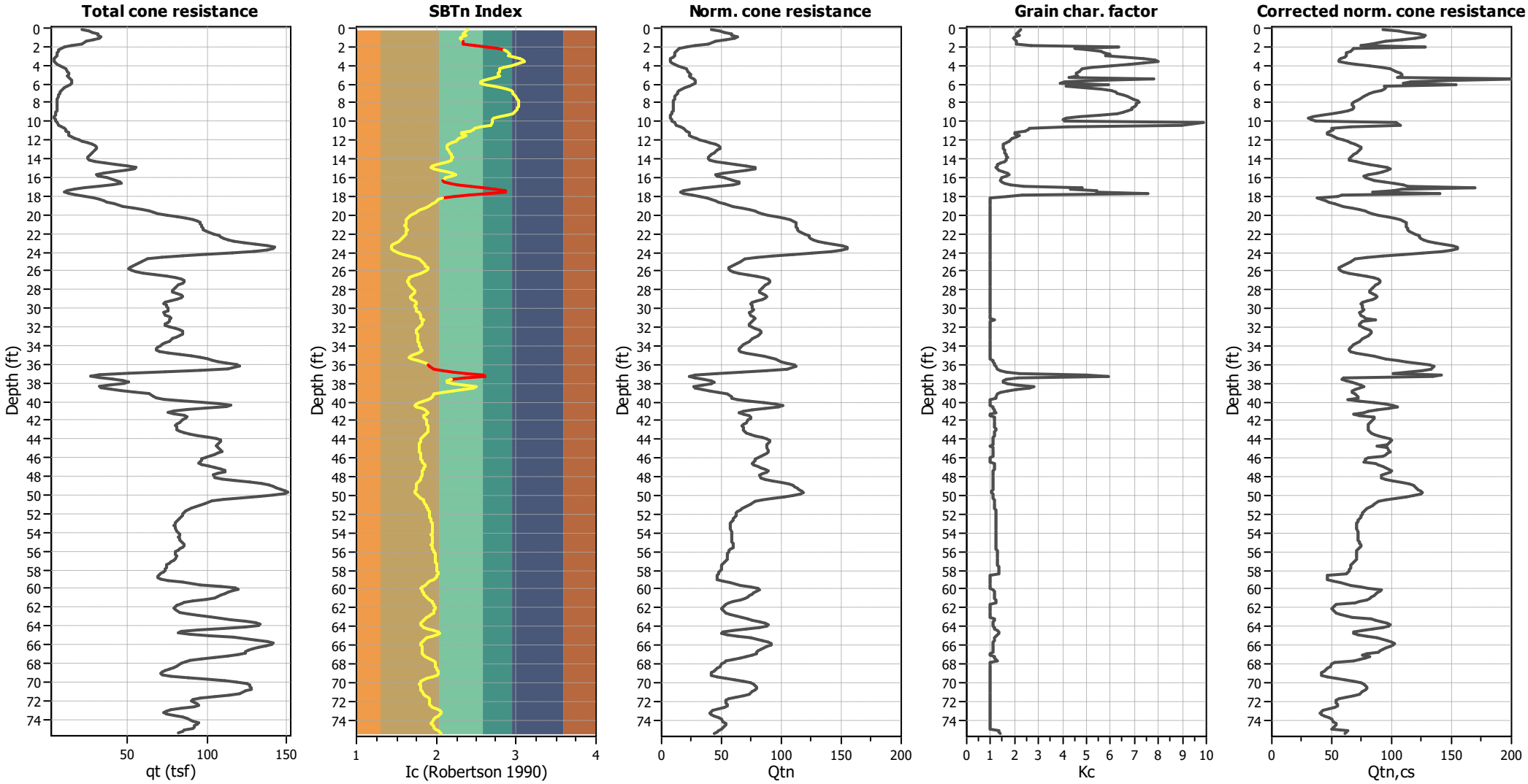
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	1.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

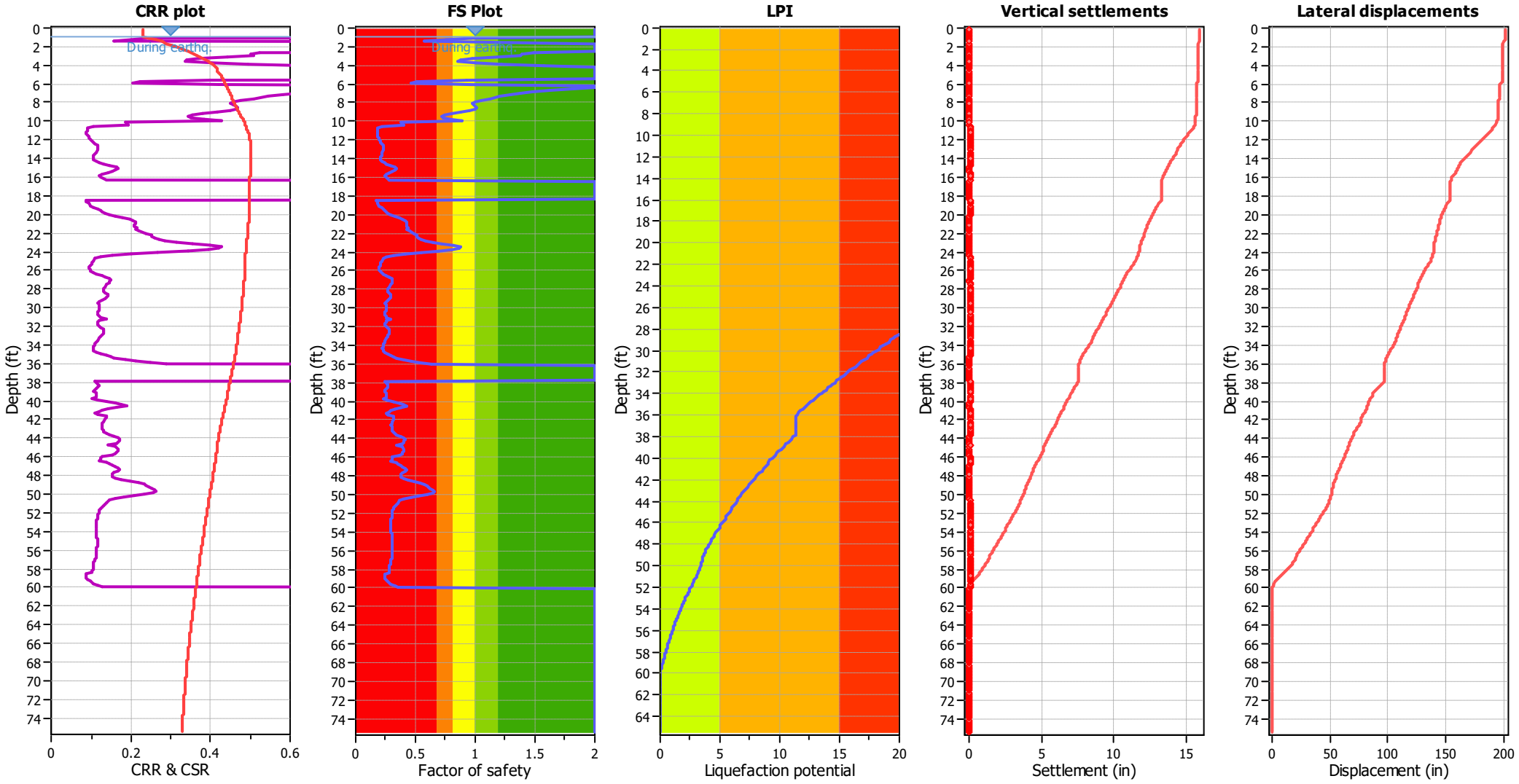
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	1.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	1.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

F.S. color scheme

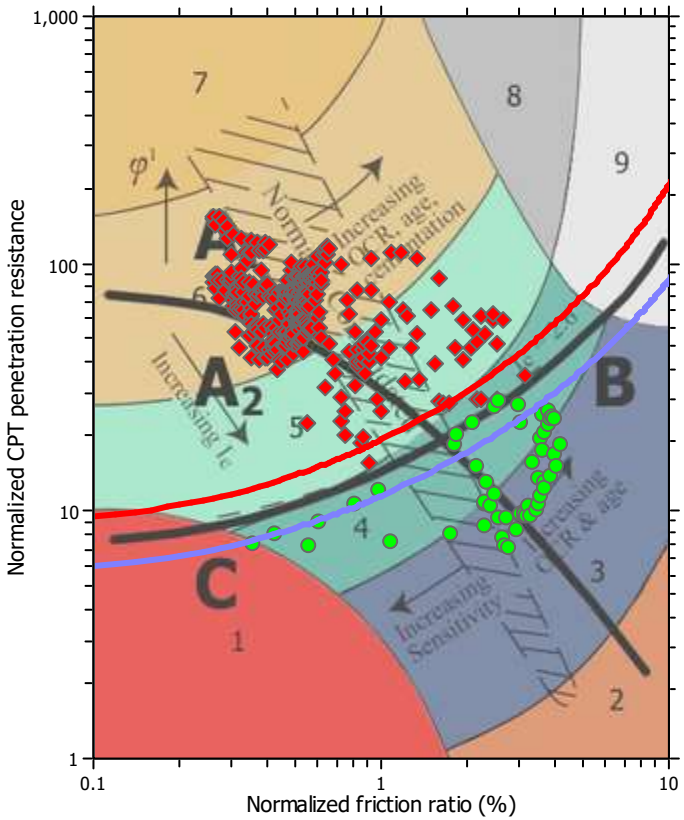
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

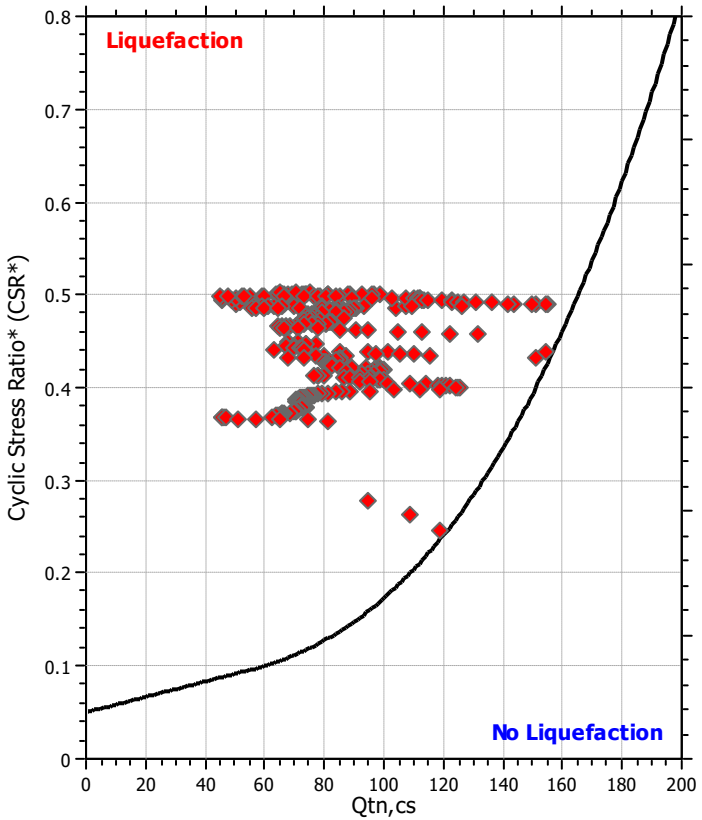
LPI color scheme

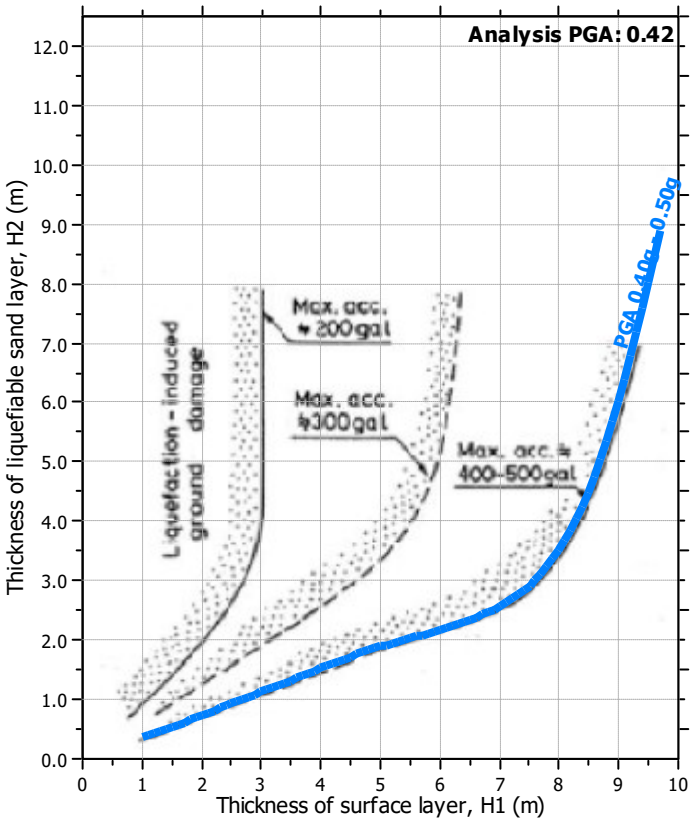
- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots

19107 CPT-1 Text File (45.36)



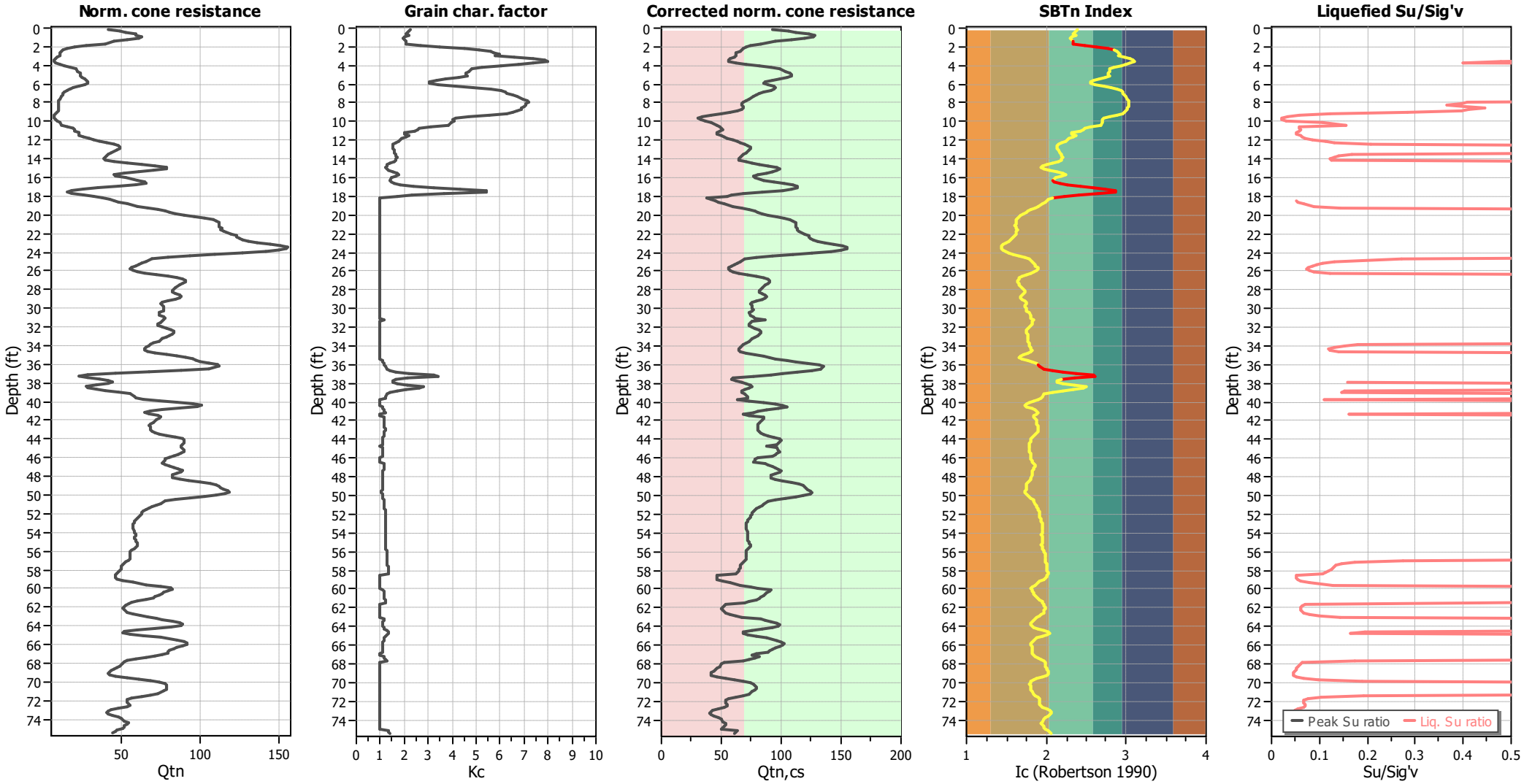




Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	1.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

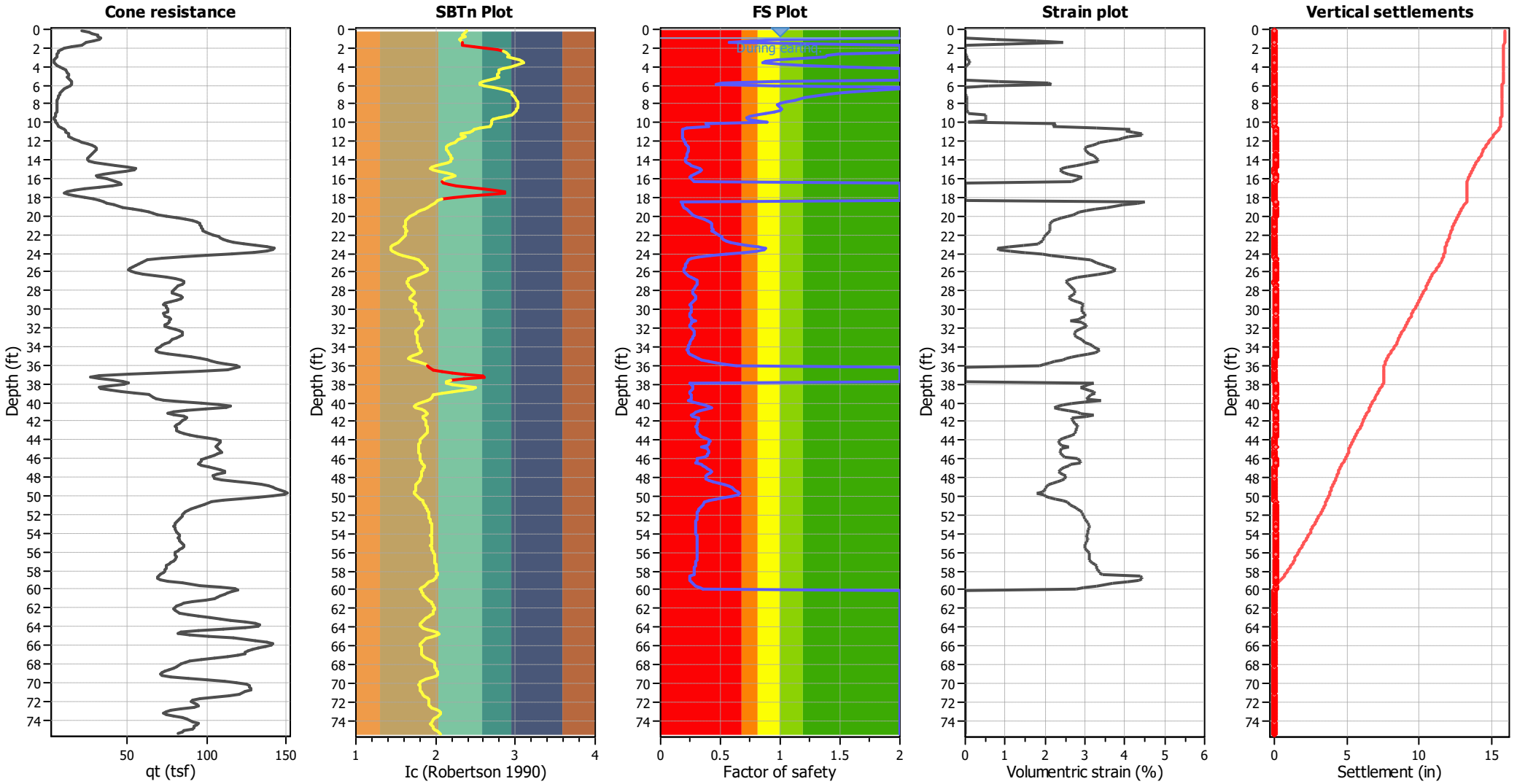
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	1.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

APPENDIX F
REPORT LIMITATIONS AND IMPORTANT INFORMATION

Geotechnical ■ Environmental ■ Special Inspections
Columbia West Engineering, Inc

Date: August 8, 2019
Project: Pacific Tech Construction
Kelso, Washington

Geotechnical and Environmental Report Limitations and Important Information

Report Purpose, Use, and Standard of Care

This report has been prepared in accordance with standard fundamental principles and practices of geotechnical engineering and/or environmental consulting, and in a manner consistent with the level of care and skill typical of currently practicing local engineers and consultants. This report has been prepared to meet the specific needs of specific individuals for the indicated site. It may not be adequate for use by other consultants, contractors, or engineers, or if change in project ownership has occurred. It should not be used for any other reason than its stated purpose without prior consultation with Columbia West Engineering, Inc. (Columbia West). It is a unique report and not applicable for any other site or project. If site conditions are altered, or if modifications to the project description or proposed plans are made after the date of this report, it may not be valid. Columbia West cannot accept responsibility for use of this report by other individuals for unauthorized purposes, or if problems occur resulting from changes in site conditions for which Columbia West was not aware or informed.

Report Conclusions and Preliminary Nature

This geotechnical or environmental report should be considered preliminary and summary in nature. The recommendations contained herein have been established by engineering interpretations of subsurface soils based upon conditions observed during site exploration. The exploration and associated laboratory analysis of collected representative samples identifies soil conditions at specific discreet locations. It is assumed that these conditions are indicative of actual conditions throughout the subject property. However, soil conditions may differ between tested locations at different seasonal times of the year, either by natural causes or human activity. Distinction between soil types may be more abrupt or gradual than indicated on the soil logs. This report is not intended to stand alone without understanding of concomitant instructions, correspondence, communication, or potential supplemental reports that may have been provided to the client.

Because this report is based upon observations obtained at the time of exploration, its adequacy may be compromised with time. This is particularly relevant in the case of natural disasters, earthquakes, floods, or other significant events. Report conclusions or interpretations may also be subject to revision if significant development or other manmade impacts occur within or in proximity to the subject property. Groundwater conditions, if presented in this report, reflect observed conditions at the time of investigation. These conditions may change annually, seasonally or as a result of adjacent development.

Additional Investigation and Construction QA/QC

Columbia West should be consulted prior to construction to assess whether additional investigation above and beyond that presented in this report is necessary. Even slight variations in soil or site conditions may produce impacts to the performance of structural facilities if not adequately addressed. This underscores the importance of diligent QA/QC construction observation and testing to verify soil conditions do not differ materially or significantly from the interpreted conditions utilized for preparation of this report.

Therefore, this report contains several recommendations for field observation and testing by Columbia West personnel during construction activities. Actual subsurface conditions are more readily observed and discerned during the earthwork phase of construction when soils are exposed. Columbia West cannot accept responsibility for deviations from recommendations described in this report or future

performance of structural facilities if another consultant is retained during the construction phase or Columbia West is not engaged to provide construction observation to the full extent recommended.

Collected Samples

Uncontaminated samples of soil or rock collected in connection with this report will be retained for thirty days. Retention of such samples beyond thirty days will occur only at client's request and in return for payment of storage charges incurred. All contaminated or environmentally impacted materials or samples are the sole property of the client. Client maintains responsibility for proper disposal.

Report Contents

This geotechnical or environmental report should not be copied or duplicated unless in full, and even then only under prior written consent by Columbia West, as indicated in further detail in the following text section entitled *Report Ownership*. The recommendations, interpretations, and suggestions presented in this report are only understandable in context of reference to the whole report. Under no circumstances should the soil boring or test pit excavation logs, monitor well logs, or laboratory analytical reports be separated from the remainder of the report. The logs or reports should not be redrawn or summarized by other entities for inclusion in architectural or civil drawings, or other relevant applications.

Report Limitations for Contractors

Geotechnical or environmental reports, unless otherwise specifically noted, are not prepared for the purpose of developing cost estimates or bids by contractors. The extent of exploration or investigation conducted as part of this report is usually less than that necessary for contractor's needs. Contractors should be advised of these report limitations, particularly as they relate to development of cost estimates. Contractors may gain valuable information from this report, but should rely upon their own interpretations as to how subsurface conditions may affect cost, feasibility, accessibility and other components of the project work. If believed necessary or relevant, contractors should conduct additional exploratory investigation to obtain satisfactory data for the purposes of developing adequate cost estimates. Clients or developers cannot insulate themselves from attendant liability by disclaiming accuracy for subsurface ground conditions without advising contractors appropriately and providing the best information possible to limit potential for cost overruns, construction problems, or misunderstandings.

Report Ownership

Columbia West retains the ownership and copyright property rights to this entire report and its contents, which may include, but may not be limited to, figures, text, logs, electronic media, drawings, laboratory reports, and appendices. This report was prepared solely for the client, and other relevant approved users or parties, and its distribution must be contingent upon prior express written consent by Columbia West. Furthermore, client or approved users may not use, lend, sell, copy, or distribute this document without express written consent by Columbia West. Client does not own nor have rights to electronic media files that constitute this report, and under no circumstances should said electronic files be distributed or copied. Electronic media is susceptible to unauthorized manipulation or modification, and may not be reliable.

Consultant Responsibility

Geotechnical and environmental engineering and consulting is much less exact than other scientific or engineering disciplines, and relies heavily upon experience, judgment, interpretation, and opinion often based upon media (soils) that are variable, anisotropic, and non-homogenous. This often results in unrealistic expectations, unwarranted claims, and uninformed disputes against a geotechnical or environmental consultant. To reduce potential for these problems and assist relevant parties in better understanding of risk, liability, and responsibility, geotechnical and environmental reports often provide definitive statements or clauses defining and outlining consultant responsibility. The client is encouraged to read these statements carefully and request additional information from Columbia West if necessary.