CITY OF OREGON CITY
PLANNING COMMISSION
AGENDA

Commission Chambers, Libke Public Safety Facility, 1234 Linn Ave, Oregon City
Monday, August 08, 2022 at 7:00 PM

This meeting will be held in person and online via Zoom; please contact ocplanning@orcity.org for the meeting link.

CALL TO ORDER

PUBLIC COMMENT

Citizens are allowed up to 3 minutes to present information relevant to the Planning Commission but not listed as an item on the agenda. Prior to speaking, citizens shall complete a comment form and deliver it to the Chair/City Staff. The Commission does not generally engage in dialog with those making comments but may refer the issue to the City Staff. Complaints shall first be addressed at the department level prior to addressing the Commission.

PUBLIC HEARING

1. Request for Continuance GLUA-22-00015 SP-22-00050 VAR-22-00 Variance (Corner 14)
2. GLUA-22-00016 CU-22-00001 NROD-22-00010 Willamette Falls Hospital Helipad Relocation

COMMUNICATIONS

ADJOURNMENT

PUBLIC COMMENT GUIDELINES

Complete a Comment Card prior to the meeting and submit it to the City Recorder. When the Mayor/Chair calls your name, proceed to the speaker table, and state your name and city of residence into the microphone. Each speaker is given three (3) minutes to speak. To assist in tracking your speaking time, refer to the timer on the table.

As a general practice, the City Commission does not engage in discussion with those making comments.

Electronic presentations are permitted but shall be delivered to the City Recorder 48 hours in advance of the meeting.

ADA NOTICE

The location is ADA accessible. Hearing devices may be requested from the City Recorder prior to the meeting. Individuals requiring other assistance must make their request known 48 hours preceding the meeting by contacting the City Recorder's Office at 503-657-0891.

Agenda Posted at City Hall, Pioneer Community Center, Library, City Website.

Video Streaming & Broadcasts: The meeting is streamed live on the Oregon City's website at www.orcity.org and available on demand following the meeting. The meeting can be viewed on Willamette Falls Television channel 28 for Oregon City area residents as a rebroadcast. Please contact WFMC at 503-650-0275 for a programming schedule.

625 Center Street
Oregon City, OR 97045
503-657-0891

CITY OF OREGON CITY

Staff Report

To: Planning Commission **Agenda Date:** 08/08/2022

From: Christina Robertson- Gardiner Senior Planner

SUBJECT:

Request for Continuance GLUA-22-00015 SP-22-00050 VAR-22-00 Variance (Corner 14)

STAFF RECOMMENDATION:

Continue GLUA-22-00016 CU-22-00001 NROD-22-00010 to the September 12, 2022 Planning Commission Meeting.

EXECUTIVE SUMMARY: The applicant is requesting a continuance to the September 12, 2022 Planning Commission Meeting for a variance to the rear yard setback abutting a residential zone to allow for the relocation of existing non-transitory mobile food units.

The applicant is proposing that five existing non-transitory mobile food units centrally located on site be relocated along the southern property line to unify the existing seating areas. The existing non-transitory mobile food units to be relocated were previously approved in previous land use actions: GLUA-21-00044 / SP-21-00085 / VAR-21-00004 / FP-21-00004 and the quantity of non-transitory mobile food units are not changing. No intensity of use is planned to occur by moving existing non-transitory mobile food units.

OPTIONS:

1. Continue GLUA-22-00016 CU-22-00001 NROD-22-00010 to the September 12, 2022 Planning Commission Meeting.

CITY OF OREGON CITY

625 Center Street
Oregon City, OR 97045
503-657-0891

Staff Report

To: Planning Commission **Agenda Date:** 08/08/2022

From: Christina Robertson- Gardiner Senior Planner

SUBJECT:

GLUA-22-00016 CU-22-00001 NROD-22-00010 Willamette Falls Hospital Helipad Relocation

STAFF RECOMMENDATION:

Approval of GLUA-22-00016 CU-22-00001 NROD-22-00010 with conditions.

EXECUTIVE SUMMARY:
Providence Willamette Falls Medical Center was granted approval of a hospital expansion on the east side of the campus under GLUA-20-00003/MAS-20-000001 for a new cancer center. As part of that project, the helipad was relocated to a temporary location to accommodate the building expansion approved under that application.

Over the course of a year, the Applicant worked to determine the best location for patients, emergency room staff, EMTs, and neighbors. The final proposed location is not too far from the original location, limits the removal of parking spaces, and does not impact the Natural Resources or Geologic Hazards Overlay District.

This proposal requires approval of the following land use permits:

- Conditional Use Review for the Helipad
- NROD exemption. (NROD 22-00010 (Exhibit 4)
- Minor Type I Site Plan Review, Development Services Grading Permits (submitted upon approval of the Conditional Use)

The Applicant has provided findings to support the Conditional Use request along with a landscape plan that addresses required replacement trees, additional stormwater planting upgrades, and mitigation trees.

BACKGROUND:

Prior to the construction of the new hospital wing, the helipad was temporarily relocated to the existing parking lot, which was processed as a Type II Site Plan Review (GLUA-21-00053: SP 21-0097) as it was located closer to the residential neighborhood than the original location. The temporary loss of parking spaces was allowed as the hospital is above its minimum required parking spaces. The current temporary helipad location requires the removal of 17 vehicles in the area, when needed, to create the required FAA space for safe helicopter landing and takeoff. The City let the Applicant know that the permanent relocation of the helipad would be processed as a Type III Conditional Use Review if the new location was situated closer to the abutting residential uses than the original location. The proposed permeant location is approximatly100 feet closer to residential development.

OPTIONS:

1. Approval with Conditions of GLUA-22-00016 CU-22-00001 NROD-22-00010
2. Denial of GLUA-22-00016 CU-22-00001 NROD-22-00010
3. Continue GLUA-22-00016 CU-22-00001 NROD-22-00010 to the September 12, 2022 Planning Commission Hearing

Community Development – Planning

695 Warner Parrott Road | Oregon City OR 97045
Ph (503) 722-3789 | Fax (503) 722-3880

TYPE III STAFF RECOMMENDATION
August 1, 2022

A preliminary analysis of the applicable approval criteria is enclosed within the following staff report. All applicable criteria shall be met, or met with conditions in order to be approved. The Planning Commission may choose to adopt the findings as recommended by staff or alter any finding as determined appropriate.

FILE NUMBER: GLUA-22-00016 CU-22-00001 NROD-22-00010 Willamette Falls Hospital Helipad Relocation CU

APPLICANT: PKA Architects c/o Josh Kolberg
6969 SW Hampton Street
Portland, OR 97223

Application Submitted: 05/31/2022
Application Paid: 06/13/2022
Application Complete: 07/11/2022
120-Day Decision Deadline: 11/08/2022

OWNER: Providence Medical Center
1500 Division Street
Oregon City, OR 97405

REQUEST: The Applicant proposes the relocation of an existing helipad from its interim location in a parking lot, to a permanent location east of the existing heli-pad

LOCATION: 1500 Division Street
Oregon City, OR 97405
2-2E32AB-02100

REVIEWER: Christina Robertson-Gardiner, Senior Planner AICP
Josh Wheeler, Assistant City Engineer

DECISION: Approval with Conditions.

PROCESS: Type III decisions involve the greatest amount of discretion and evaluation of subjective approval standards, yet are not required to be heard by the city commission, except upon appeal. Applications evaluated through this process include conditional use permits. The process for these land use decisions is controlled by ORS 197.763. Notice of the application and the planning commission hearing is published and mailed to the Applicant, recognized neighborhood association and property owners within three hundred feet of the subject property. Notice must be issued at least twenty days pre-hearing, and the staff report must be available at least seven days pre-hearing. At the evidentiary hearing held before the planning commission, all issues are addressed. The decision is final unless appealed and description of the requirements for perfecting an appeal. The decision of the planning commission is appealable to the city commission within fourteen days of the issuance of the final decision. The city commission hearing on appeal is on the record and no new evidence shall be allowed. Only those persons or a city-recognized neighborhood association who have participated either orally or in writing have standing to appeal the decision of the planning commission. Grounds for appeal are limited to those issues raised either orally or in writing before the close of the public record. A city-recognized neighborhood association requesting an appeal fee waiver pursuant to OCMC 17.50.290.C must officially approve the request through a vote of its general membership or board at a duly announced meeting prior to the filing of an appeal. The city commission decision on appeal from the planning commission is the City's final decision and is appealable to the Land Use Board of Appeals (LUBA) within twenty-one days of when it becomes final.

Conditions of Approval
Planning File GLUA-22-00016 CU-22-00001 NROD-22-00010

(P) = Verify that condition of approval has been met with the Planning Division.
(DS) = Verify that condition of approval has been met with the Development Services Division.
(B) = Verify that condition of approval has been met with the Building Division.
(F) = Verify that condition of approval has been met with Clackamas Fire Department.

The Applicant shall include the following information with the submittal of a public improvement and/or grading permit associated with the proposed application. The information shall be approved prior to issuance.

1. The Applicant shall submit a revision to the existing stormwater and grading permit for the hospital east expansion approved under GLUA-20-00003/MAS-20-000001 for the helipad construction (DS)
2. Prior to approval of a grading permit or other required Development Services permits, the Applicant shall submit for and receive approval for a Type I Site Plan Review for the removal of the trees, additional landscaping per plan sheet L.10, and construction of the helipad. (P)

The Applicant shall include the following information prior to the issuance of final inspection associated with the proposed application. The information shall be approved prior to issuance.

3. The Applicant shall ensure that all proposed plantings, including mitigation trees, are planted onsite per the proposed landscape plan. (P)

I. BACKGROUND:

1. Existing Conditions

The Willamette Falls Medical Center is bordered by Davis Road to the north, Trillium Park Drive to the east, Division Street to the west, and medical offices and an assisted-living facility to the south. The campus is within the Mixed-Use Employment district. The property to the north and west is within the Mixed-Use Employment district. Property to the east and south are within residential districts, R-10 and R-2, respectively. The medical center is developed with a hospital building, medical office buildings, a parking garage, paved parking areas, a helipad, and other improvements. A Natural Resource Overlay District and Geological Hazard area are present on the eastern portion of the site.

Figure 1. Vicinity Map

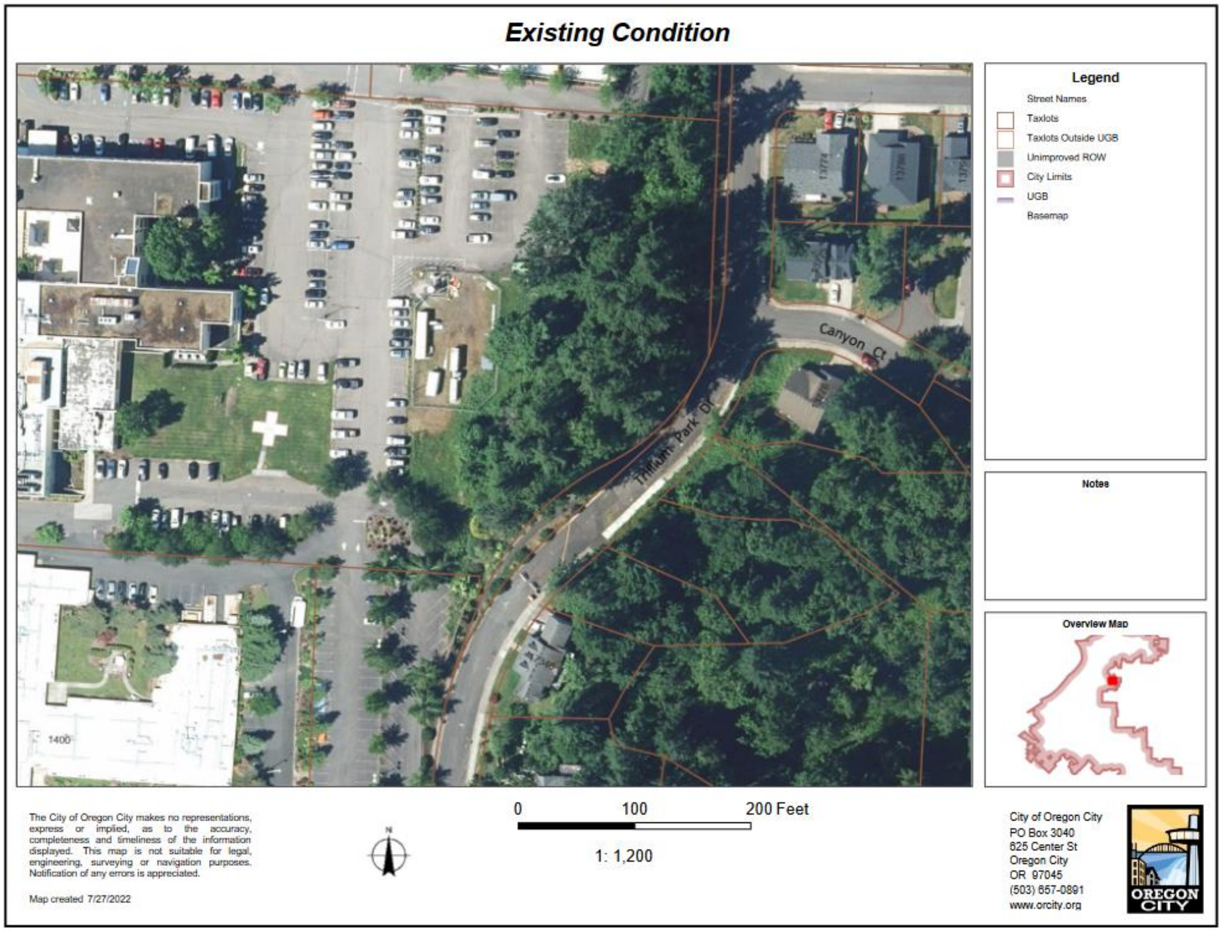


Figure 2: Existing Conditions – Aerial Image

Zoning Map

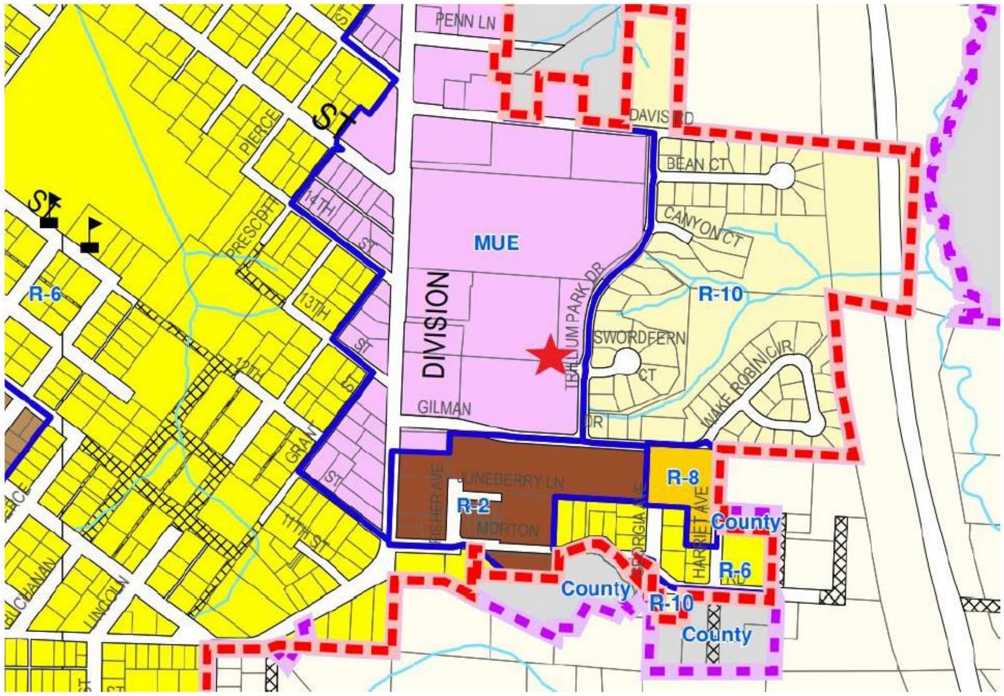


Figure 3- Zoning Map

2. Project Description

Providence Willamette Falls Medical Center was granted approval of a hospital expansion on the east side of the campus under GLUA-20-00003/MAS-20-000001 for a new cancer center. As part of that project, the helipad was relocated to a temporary location to accommodate the building expansion approved under that application.

Prior to the construction of the new hospital wing, the helipad was temporarily relocated to the existing parking lot, which was processed as a Type II Site Plan Review (GLUA-21-00053: SP 21-0097) as it was located closer to the residential neighborhood than the original location. The temporary loss of parking spaces was allowed as the hospital is above its minimum required parking spaces. The current temporary helipad location requires the removal of 17 vehicles in the area, when needed, to create the required FAA space for safe helicopter landing and takeoff. The City let the Applicant know that the permanent relocation of the helipad would be processed as a Type III Conditional Use Review if the new location was situated closer to the abutting residential uses than the original location. The proposed permeant location is approximatly100 feet closer to residential development.

Over the course of a year, the Applicant worked to determine the best location for patients, emergency room staff, EMTs, and neighbors. The final proposed location is not too far from the original location, limits the removal of parking spaces, and does not impact the Natural Resources or Geologic Hazards Overlay District. The Applicant has also submitted stormwater and geotechnical memos that address the helipad's impact on the site, which will be part of any required Development Services permit approval.

The memo found that *"Stormwater water quality and quantity for the new impervious area will be provided and managed by the stormwater swale proposed under the Providence Willamette Falls East Expansion. The stormwater swale facility was designed using the City's BMP sizing tool to manage the new impervious surface. The proposed stormwater management system meets the pollution reduction and flow control requirements of the City of Oregon City".*

This proposal requires approval of the following land use permits:

- Conditional Use Review for the Helipad
- NROD exemption. (NROD 22-00010 (Exhibit 4)
- Minor Type I Site Plan Review, Development Services Grading Permits (submitted upon approval of the Conditional Use)

The Applicant has provided findings to support the Conditional Use request along with a landscape plan that addresses required replacement trees, additional stormwater planting upgrades, and mitigation trees.

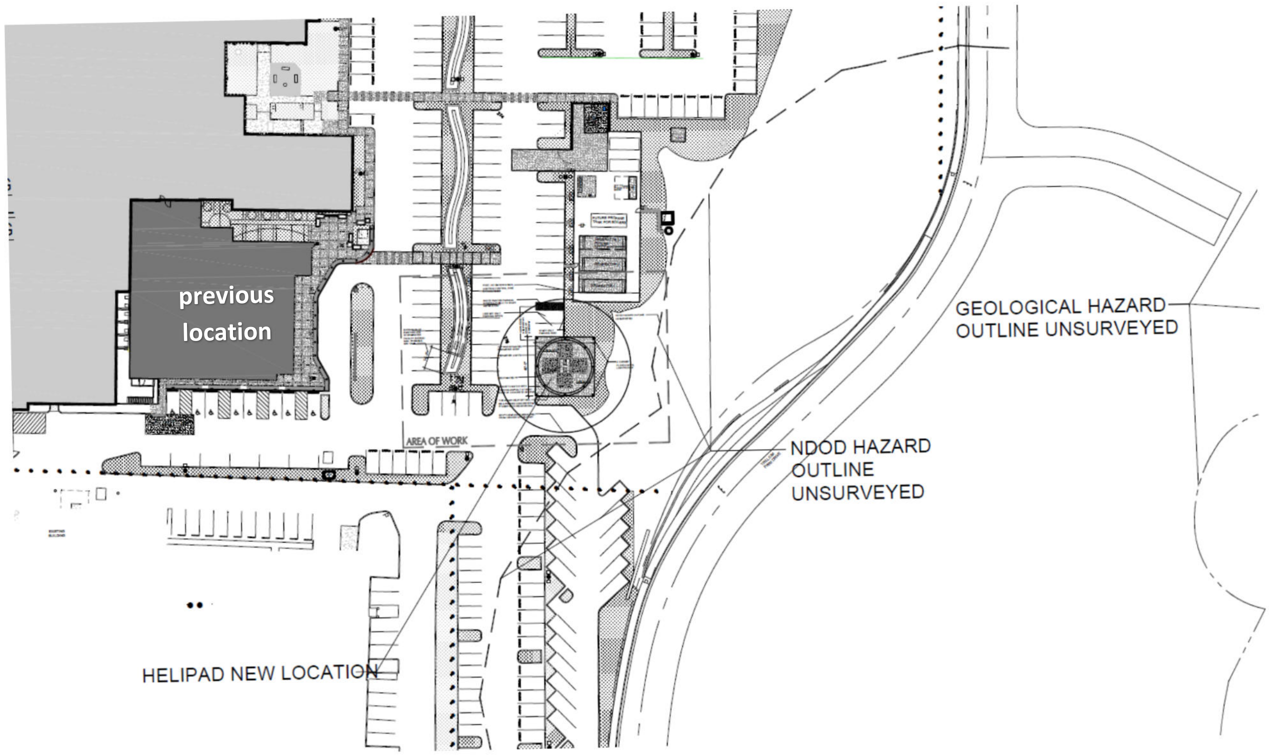


Figure 4: Proposed Site Plan

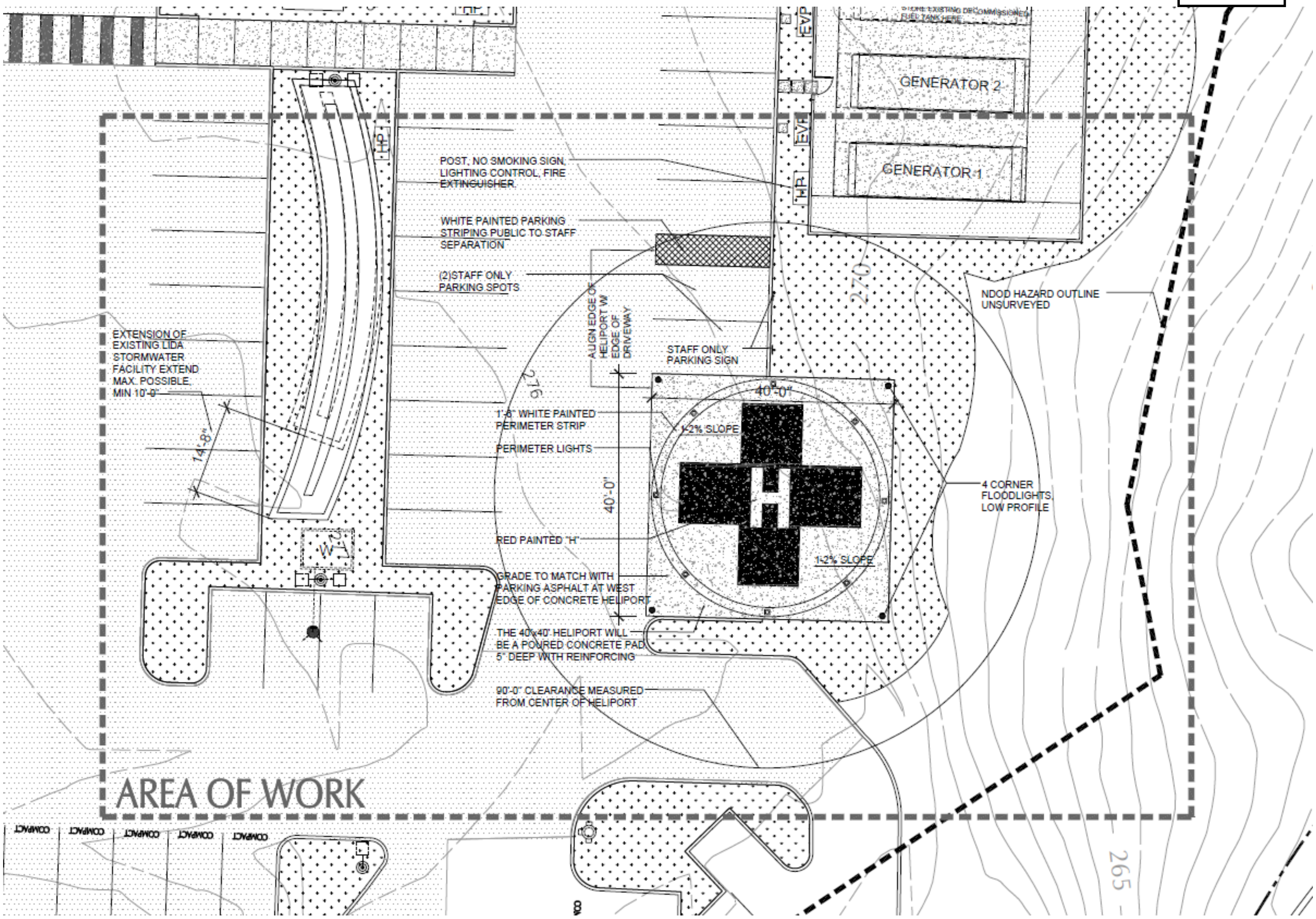


Figure 5: Area of Work

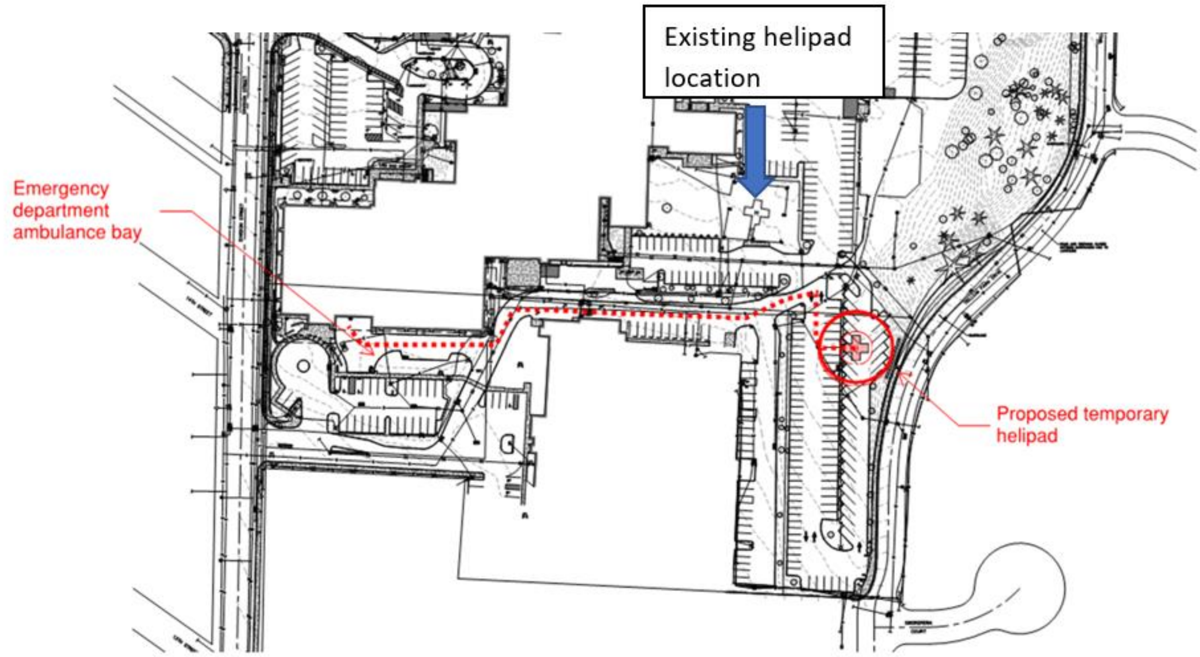


Figure 6: Current temporary helipad location (GLUA-21-00053: SP 21-0097)

3. **Permits and Approvals:** The Applicant is responsible for obtaining approval and permits from each applicable governmental agency and department in Oregon City, including but not limited to the Engineering and Building Divisions.

4. **Public Comment**

   Public comments submitted include (Exhibit 3):

   Wes Rogers- Oregon City School District: The proposal does not conflict with our interests.
   Betty Johnson- Clackamas River Water: The proposal does not conflict with our interests.
   Jim Sayers- Building Official: The proposal does not conflict with our interests.

   None of the comments provided indicate that an approval criterion has not been met or cannot be met through the Conditions of Approval attached to this Staff Report.

II. ANALYSIS AND FINDINGS:

Municipal Code Standards and Requirements: The following sections of the Oregon City Municipal Code are applicable to this land use approval:

CHAPTER 17.31 MIXED USE EMPLOYMENT
CHAPTER 17.41 TREE PROTECTION, PRESERVATION, REMOVAL AND REPLANTING STANDARDS
CHAPTER 17.44 GEOLOGIC HAZARDS
CHAPTER 17.49 NATURAL RESOURCES OVERLAY DISTRICT
CHAPTER 17.50 ADMINISTRATION AND PROCEDURES
CHAPTER 17.56 CONDITIONAL USES

CHAPTER 17.31 MUE MIXED USE EMPLOYMENT DISTRICT

17.31.020 - Permitted uses.
Permitted uses in the MUE district are defined as:
A. Banquet, conference facilities and meeting rooms;
B. Child care centers, nursery schools;
C. Medical and dental clinics, outpatient; infirmary services;
D. Distributing, wholesaling and warehousing;
E. Health and fitness clubs;
F. Hospitals;
G. Emergency service facilities (police and fire), excluding correctional facilities;
H. Industrial uses limited to the design, light manufacturing, processing, assembly, packaging, fabrication and treatment of products made from previously prepared or semi-finished materials;
I. Offices;
J. Outdoor markets, such as produce stands, craft markets and farmers markets that are operated on the weekends and after six p.m. during the weekday;
K. Postal services;
L. Parks, playfields and community or neighborhood centers;
M. Research and development offices and laboratories, related to scientific, educational, electronics and communications endeavors;
N. Passenger terminals (water, auto, bus, train);
O. Utilities. Basic and linear facilities, such as water, sewer, power, telephone, cable, electrical and natural gas lines, not including major facilities such as sewage and water treatment plants, water tanks, telephone exchange and cell towers;
P. Transportation facilities;
Q. Marijuana processors, processing sites, wholesaling and laboratories;
R. Transitory mobile food units.
Finding: Complies The primary use on site is the Willamette Falls Medical Center, a hospital, which is permitted outright in the Mixed-Use Employment zone. The helipad proposed to be relocated is accessory to the hospital and according to staff, considered a conditional use.

17.31.030 - Limited uses.
The following permitted uses, alone or in combination, shall not exceed twenty percent of the total gross floor area of all of the other permitted and conditional uses within the MUE development site or complex. The total gross floor area of two or more buildings may be used, even if the buildings are not all on the same parcel or owned by the same property owner, as long as they are part of the same development site, as determined by the community development director.
A. Retail services, including but not limited to personal, professional, educational and financial services, marijuana, laundry and dry cleaning;
B. Restaurants, eating and drinking establishments;
C. Retail shops, provided the maximum footprint for a stand-alone building with a single store does not exceed sixty thousand square feet;
D. Public and/or private educational or training facilities;
E. Custom or specialized vehicle alterations or repair wholly within a building.
Finding: Not Applicable. None of the above uses are proposed for this project. Therefore, this criterion does not apply.

17.31.040 - Conditional uses.

The following conditional uses are permitted when authorized and in accordance with the process and standards contained in OCMC 17.56.

A. Correctional, detention and work release facilities;
B. Drive-through facilities;
C. Hotels, motels and commercial lodging;
D. Outdoor markets that do not meet the criteria of OCMC 17.31.020.J;
E. Public utilities and services such as pump stations and sub-stations;
F. Religious institutions;
G. Veterinary or pet hospital, dog day care.

Finding: Complies with Conditions. A helipad is not an outright conditional use in the Mixed-Use Employment district. The existing helipad has been approved as a conditional accessory use to the medical center. Helipads are listed as general Conditional Uses in Chapter 17.56. The Applicant is proposing the relocation of an existing helipad approximately 100 feet south and east of the current facility. Please see sheet (LUA.300) of the plan set.

17.31.050 - Prohibited uses.
The following uses are prohibited in the MUE district:

A. Outdoor sales or storage;
B. Kennels;
C. Gas/Convenience stations;
D. Motor vehicle parts stores;
E. Motor vehicle sales and incidental service;
F. Heavy equipment service, repair, sales, storage or rental[2] (including but not limited to construction equipment and machinery and farming equipment);
G. Recreation vehicle, travel trailer, motorcycle, truck, manufactured home, leasing, rental or storage;
H. Self-storage facilities;
I. Marijuana production.

Finding: Not Applicable. The helipad is not listed as a prohibited use.

17.31.060 - Dimensional standards.

A. Minimum lot areas: None.
B. Minimum Floor Area Ratio: 0.25.
C. Maximum building height: except as otherwise provided in subsection C.1. of this section building height shall not exceed sixty feet.
1. In that area bounded by Leland Road, Warner Milne Road and Molalla Avenue, and located in this zoning district, the maximum building height shall not exceed eighty-five feet in height.
D. Minimum required interior and rear yard setbacks if abutting a residential zone: twenty feet, plus one-foot additional yard setback for every one foot of building height over thirty-five feet.
E. Maximum allowed setbacks: None
F. Maximum site coverage of the building and parking lot: Eighty percent.

Finding**: Not Applicable.** The helipad is not a building.

G. Minimum landscape requirement (including the parking lot): Twenty percent.
The design and development of the landscaping in this district shall:

1. Enhance the appearance of the site internally and from a distance;
2. Include street trees and street side landscaping;

3. Provide an integrated open space and pedestrian way system within the development with appropriate connections to surrounding properties;
4. Include, as appropriate, a bikeway walkway or jogging trail;
5. Provide buffering or transitions between uses;
6. Encourage outdoor eating areas appropriate to serve all the uses within the development;
7. Encourage outdoor recreation areas appropriate to serve all the uses within the development.

Finding: Complies. The relocation of the helipad to the proposed location does not affect the internal hospital and pedestrian/open space planning. The hospital is currently 28% landscaped; the removal of the grassy area to construct the helipad will not bring the site under the 20% landscaping requirement.

CHAPTER 17.44 – GEOLOGIC HAZARDS

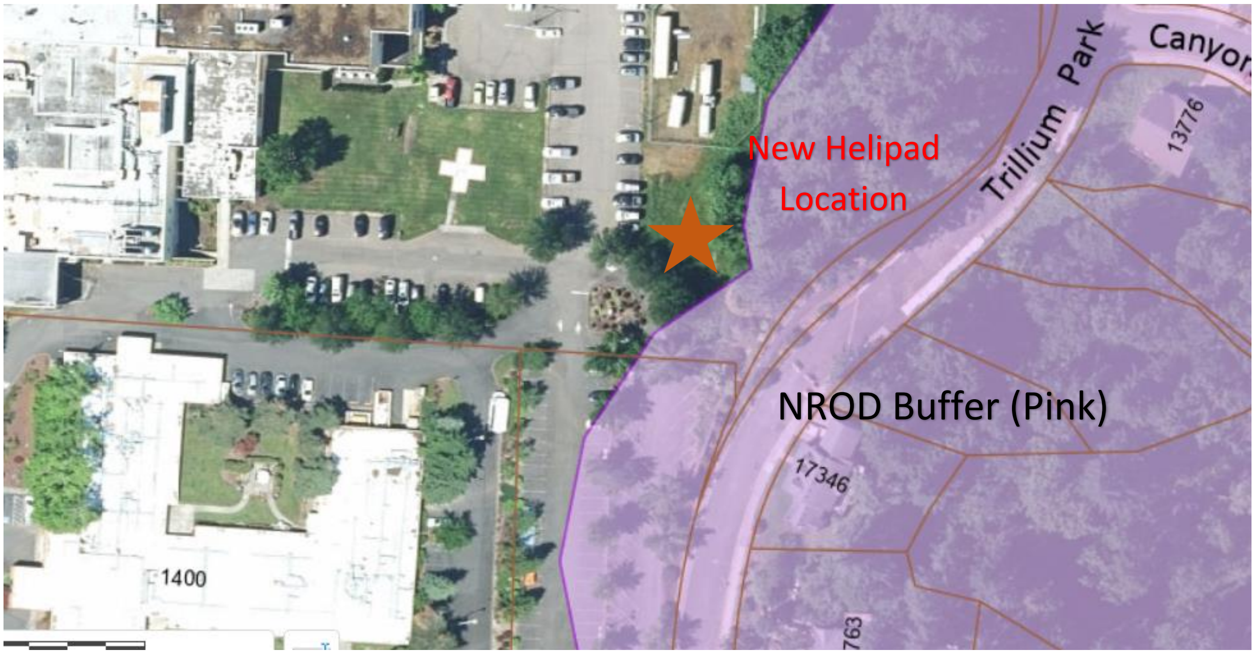
17.44.025 *- When required; regulated activities; permit and approval requirements.*

No person shall develop land, construct, reconstruct, structurally alter, relocate or enlarge any building or structure for which a land development, sign, or building permit is required on a property that contains an area mapped within the adopted Oregon City Geologic Hazards Overlay Zone without first obtaining permits or approvals as required by this Chapter.The requirements of this Chapter are in addition to other provisions of the Oregon City Municipal Code. Where the provisions of this chapter conflict with other provisions of the Oregon City Municipal Code, the provisions that are the more restrictive of regulated development activity shall govern.

Finding: Not Applicable. The development property contains an area mapped within the adopted Oregon City Geologic Hazards Overlay Zone. However, the helipad proposal falls outside of the mapped geologic hazard or its buffer. Therefore, this specific project is exempt from this Chapter.

CHAPTER 17.49 NATURAL RESOURCE OVERLAY DISTRICT

Finding: Not Applicable: The proposed permanent location of the helipad is adjacent to, but not within, the Natural Resource Overlay District (NROD) on the project site. The proposed location of the helipad was selected to avoid impacts to the Natural Resource Overlay District on site. An approved NROD exemption request is included with this narrative as NROD 22-0010 (Exhibit 4). Projects that fall outside of the City's map buffer are exempt from further review of this Chapter.


New Helipad
Location
NROD Buffer (Pink)
Trillium Park
Canyon
13776
17346
1400

Chapter 17.41 – TREE PROTECTION, PRESERVATION, REMOVAL AND REPLANTING STANDARDS

17.41.60– Tree removal and replanting – Mitigation (Option 1).

A. Applicants for development who select this option shall ensure that all healthy trees shall be preserved outside the construction area as defined in OCMC 17.04 to the extent practicable.Preserved trees are subject to Option 3 of this Chapter. Compliance with these standards shall be demonstrated in a tree mitigation plan report prepared by a certified arborist, horticulturalist or forester or other environmental professional with experience and academic credentials in forestry or arboriculture. Tree inventories for the purposes of mitigation calculations may be prepared by a licensed surveyor. At the Applicant's expense, the City may require the report to be reviewed by a consulting arborist. The number of replacement trees required on a development site shall be calculated separately from, and in addition to, any public or street trees in the public right-of-way required under OCMC 12.08, Public and Street Trees, any required tree planting in parking lots, and any trees planted in pedestrian and bicycle accessways.

B. The Applicant shall determine the number of trees to be mitigated on the site by counting all of the trees six-inch DBH (minimum four and one-half feet from the ground) or larger on the entire site and either:

1. Trees that are removed outside of the construction area shall be replanted with the number of trees specified in Column 1 of Table 17.41.060-1. Trees that are removed within the construction area shall be replanted with the number of replacement trees required in Column 2; or

2. Dying, diseased or hazardous trees, when the condition is verified by a certified arborist to be consistent with the definitions in OCMC 17.04, may be removed from the tree replacement calculation. Dead trees may also be removed from the calculation, with the condition of the tree verified either by the community development director or by a certified arborist at the Applicant's expense, when the community development director cannot make a determination. To the extent that the community development director determines that the dead, dying, hazardous or diseased condition of the tree is the result of intentional action, the removal of that tree shall require mitigation pursuant to Column 2 of Table 17.41.060-1.

Finding: Complies with Condition. Each tree removed requires one replacement tree to be planted. Four trees are proposed to be removed from within the construction area. The Applicant is proposing the removal of four existing maple trees and will be relocating four trees within an adjacent parking lot landscape planter out of the way of the flight path. The trees have a DBH of 10", which requires mitigation. The Applicant is proposing to plant eight replacement trees at the end of the extended stormwater planter and nearby parking island trees as mitigation see sheet L.1.0.00 of the plan set preoared by Brian Bannison, a licenced landscape architect. All trees proposed to be removed are from within the construction area and illustrated within the landscape plan provided as sheet L.1.0.00 of the plan set. Prior to approval of a grading permit, the Applicant shall submit for and receive approval for a Type I Site Plan review for the removal of the trees, replacement landscaping, and construction of the helipad.

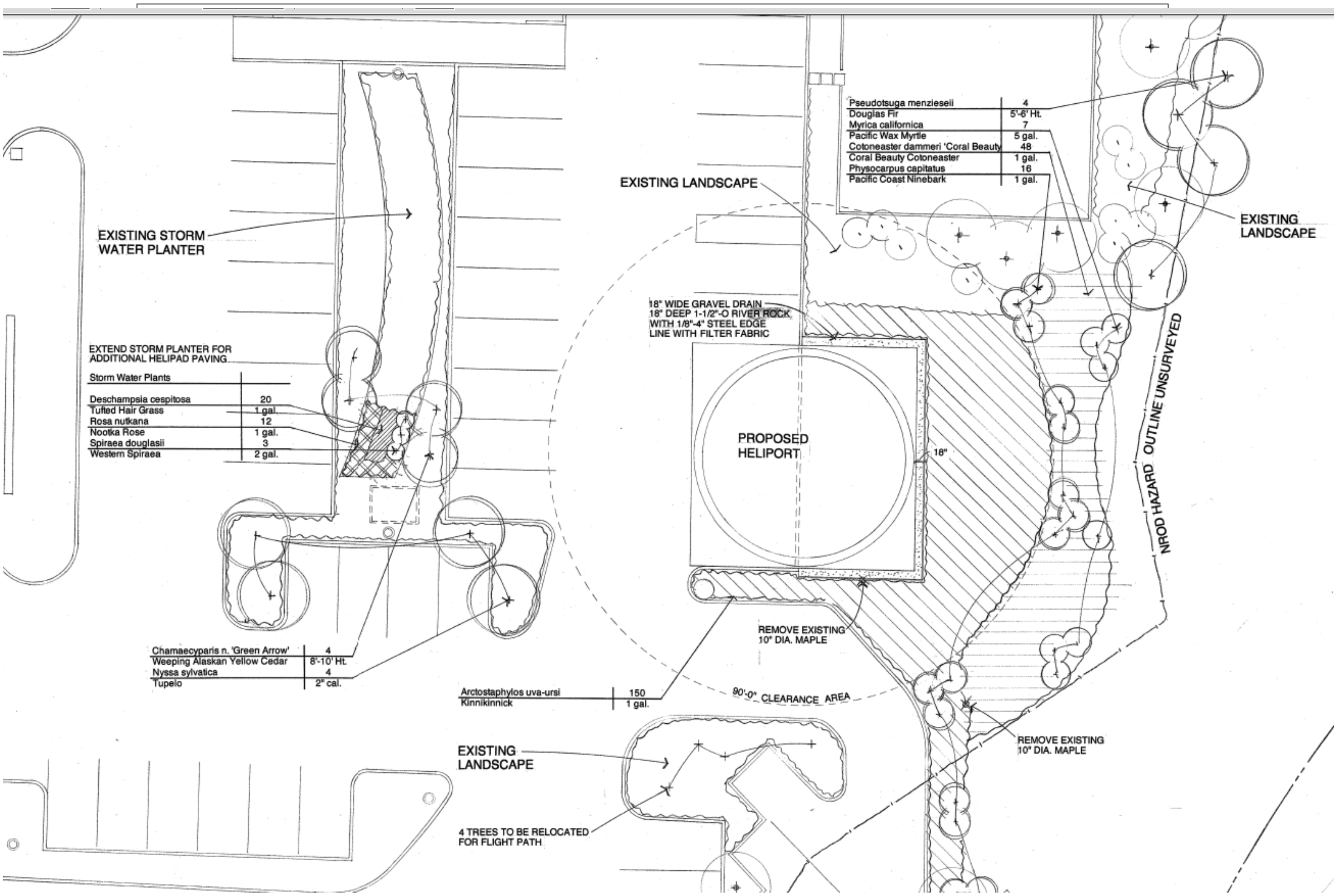


Figure 7. Landscape Plan -Sheet L1.0

17.50.050 – Pre-application conference.

A Pre-application Conference. Prior to a Type II – IV or Legislative application, excluding Historic Review, being deemed complete, the Applicant shall schedule and attend a pre-application conference with City staff to discuss the proposal, unless waived by the Community Development Director. The purpose of the pre-application conference is to provide an opportunity for staff to provide the Applicant with information on the likely impacts, limitations, requirements, approval standards, fees and other information that may affect the proposal.

1. To schedule a pre-application conference, the Applicant shall contact the Planning Division, submit the required materials, and pay the appropriate conference fee.

2. At a minimum, an applicant should submit a short narrative describing the proposal and a proposed site plan, drawn to a scale acceptable to the City, which identifies the proposed land uses, traffic circulation, and public rights-of-way and all other required plans.

3. The Planning Division shall provide the Applicant (s) with the identity and contact persons for all affected neighborhood associations as well as a written summary of the pre-application conference.

B. A pre-application conference shall be valid for a period of six months from the date it is held. If no application is filed within six months of the conference or meeting, the Applicant shall schedule and attend another conference before the City will accept a permit application. The Community Development Director may waive the pre-application requirement if, in the Director's opinion, the development has not changed significantly and the applicable municipal code or standards have not been significantly amended. In no case shall a pre-application conference be valid for more than one year.

Finding: Complies. The Pre-application conference PA 21-57 was held on December 21, 2021.

17.50.055 - Neighborhood association meeting.

Neighborhood Association Meeting. The purpose of the meeting with the recognized neighborhood association is to inform the affected neighborhood association about the proposed development and to receive the preliminary responses and suggestions from the neighborhood association and the member residents.

A. Applicants applying for annexations, zone change, comprehensive plan amendments, conditional use, Planning Commission variances, subdivision, or site plan and design review (excluding minor site plan and design review), general development master plans or detailed development plans applications shall schedule and attend a meeting with the City-recognized neighborhood association in whose territory the application is proposed no earlier than one year prior to the date of application. Although not required for other projects than those identified above, a meeting with the neighborhood association is highly recommended.

B. The Applicant shall request via email or regular mail a request to meet with the neighborhood association chair where the proposed development is located. The notice shall describe the proposed project. A copy of this notice shall also be provided to the chair of the Citizen Involvement Committee.

C. A meeting shall be scheduled within thirty days of the date that the notice is sent. A meeting may be scheduled later than thirty days if by mutual agreement of the Applicant and the neighborhood association. If the neighborhood association does not want to, or cannot meet within thirty days, the Applicant shall host a meeting inviting the neighborhood association, Citizen Involvement Committee, and all property owners within three hundred feet to attend. This meeting shall not begin before six p.m. on a weekday or may be held on a weekend and shall occur within the neighborhood association boundaries or at a City facility.

D. If the neighborhood association is not currently recognized by the City, is inactive, or does not exist, the Applicant shall request a meeting with the Citizen Involvement Committee.

E. To show compliance with this section, the Applicant shall submit a copy of the email or mail notice to the neighborhood association and CIC chair, a sign-in sheet of meeting attendees, and a summary of issues discussed at the meeting. If the Applicant held a separately noticed meeting, the Applicant shall submit a copy of the meeting flyer, postcard or other correspondence used, and a summary of issues discussed at the meeting and submittal of these materials shall be required for a complete application.

Finding: Complies The project location is within the McLoughlin Neighborhood Association boundary. A meeting with the neighborhood was held on Thursday, May 5, 2022 at 7:00PM. An e-mail requesting time on the neighborhood associations agenda for their May 5 meeting, notes with meeting attendants listed, the PowerPoint presentation, and an e-mail providing a summary of the meeting are provided in the Applicant's Submittal.

B. Notice of Public Hearing on a Type III or IV Quasi-Judicial Application. Notice for all public hearings concerning a quasi-judicial application shall conform to the requirements of this subsection. At least twenty days prior to the hearing, the City shall prepare and send, by first class mail, notice of the hearing to all record owners of property within three hundred feet of the subject property and to any city-recognized neighborhood association whose territory includes the subject property. The City shall also *publish the notice on the city website within the City at least twenty days prior to the hearing. Pursuant to OCMC 17.50.080.H, the Applicant is responsible for providing an accurate and complete set of mailing labels for these property owners and for posting the subject property with the city-prepared notice in accordance with OCMC 17.50.100. Notice of the application hearing shall include the following information:*

1.

The time, date and location of the public hearing;

2. Street address or other easily understood location of the subject property and city-assigned planning file number;

3. A description of the Applicant's proposal, along with a list of citations of the approval criteria that the City will use to evaluate the proposal;

4. A statement that any interested party may testify at the hearing or submit written comments on the proposal at or prior to the hearing and that a staff report will be prepared and made available to the public at least seven days prior to the hearing;

5. A statement that any issue which is intended to provide a basis for an appeal to the city commission shall be raised before the close of the public record. Issues must be raised and accompanied by statements or evidence sufficient to afford the City and all parties to respond to the issue;

6. The notice shall state that a city-recognized neighborhood association requesting an appeal fee waiver pursuant to OCMC 17.50.290.C must officially approve the request through a vote of its general membership or board at a duly announced meeting prior to the filing of an appeal;

7. A statement that the application and all supporting materials and evidence submitted in support of the application may be inspected at no charge and that copies may be obtained at reasonable cost at the planning division offices during normal business hours; and

8. The name and telephone number of the planning staff person responsible for the application or is otherwise available to answer questions about the application.

C. Notice of Public Hearing on a Legislative Proposal. At least twenty days prior to a public hearing at which a legislative proposal to amend or adopt the City's land use regulations or comprehensive plan is to be considered, the community development director shall issue a public notice that conforms to the requirements of this subsection. Notice shall be sent to affected governmental entities, special districts, providers of urban services, including Tri-Met, Oregon Department of Transportation and Metro, any affected recognized neighborhood associations and any party who has requested in writing such notice. Notice shall also be published on the city website. Notice issued under this subsection shall include the following information:

1. The time, date and location of the public hearing;

2. The city-assigned planning file number and title of the proposal;

3. A description of the proposal in sufficient detail for people to determine the nature of the change being proposed;

4. A statement that any interested party may testify at the hearing or submit written comments on the proposal at or prior to the hearing; and

5. The name and telephone number of the planning staff person responsible for the proposal and who interested people may contact for further information.

Finding: Complies A public notice was sent to all properties within 300 feet of the site and signs were placed on the property within 20 days of the scheduled hearing. Copies of the public notice and affidavit of sign posting are in the record

17.50.100 - Notice posting requirements.

Where this Chapter requires notice of a pending or proposed permit application or hearing to be posted on the subject property, the requirements of this section shall apply.

A. City Guidance and the Applicant's Responsibility. The City shall supply all of the notices which the Applicant is required to post on the subject property and shall specify the dates the notices are to be posted and the earliest date on which they may be removed. The City shall also provide a statement to be signed and returned by the Applicant certifying that the notice(s) were posted at the correct time and that if there is any delay in the City's land use process caused by the Applicant's failure to correctly post the subject property for the required period of time and in the correct location, the Applicant agrees to extend the applicable decision-making time limit in a timely manner.

B. Number and Location. The Applicant shall place the notices on each frontage of the subject property. If the property's frontage exceeds six hundred feet, the Applicant shall post one copy of the notice for each six hundred feet or fraction thereof. Notices do not have to be posted adjacent to alleys or unconstructed right-of-way. Notices shall be posted within ten feet of the street and shall be visible to pedestrians and motorists. Notices shall not be posted within the public right-of-way or on trees. The Applicant shall remove all signs within ten days following the event announced in the notice.

Finding: Complies A public notice was sent to all properties within 300 feet of the site and signs were placed on the property within 20 days of the scheduled hearing. Copies of the public notice and affidavit of sign posting are in the record

17.50.140 – Financial guarantees.

When conditions of permit approval require a permitee to construct certain public improvements, the City shall require the permitee to provide financial guarantee for construction of the certain public improvements. Financial guarantees shall be governed by this section.

A. Form of Guarantee. Guarantees shall be in a form approved by the City Attorney. Approvable forms of guarantee include irrevocable standby letters of credit to the benefit of the City issued by a recognized lending institution, certified checks, dedicated bank accounts or allocations of construction loans held in reserve by the lending institution for the benefit of the City. The form of guarantee shall be specified by the City Engineer and, prior to execution and acceptance by the City shall be reviewed and approved by the City Attorney. The guarantee shall be filed with the City Engineer.

B. Performance Guarantees. A permittee shall be required to provide a performance guarantee as follows.

1. After Final Approved Design by The City: The City may request the Permittee to submit a Performance Guarantee for construction of certain public improvements. A permitee may request the option of submitting a Performance Guarantee when prepared for temporary/final occupancy. The guarantee shall be one hundred twenty percent of the estimated cost of constructing the public improvements as submitted by the permittee's engineer. The engineer's estimated costs shall be supported by a verified engineering estimate and approved by the City Engineer.

2. Before Complete Design Approval and Established Engineered Cost Estimate: The City may request a permittee to submit a Performance Guarantee for construction of certain public improvements. A permitee may request the option of submitting a performance guarantee before public improvements are designed and completed. The guarantee shall be one hundred fifty percent of the estimated cost of constructing the public improvements as submitted by *the permittee's engineer and approved by the City Engineer. The engineer's estimated costs shall be supported by a verified engineering estimate and approved by the City Engineer.*

C. Release of Guarantee. The guarantee shall remain in effect until the improvement is actually constructed and accepted by the City. Once the City has inspected and accepted the improvement, the City shall release the guarantee to the permittee. If the improvement is not completed to the City's satisfaction within the time limits specified in the permit approval, the City Engineer may, at their discretion, draw upon the guarantee and use the proceeds to construct or complete construction of the improvement and for any related administrative and legal costs incurred by the City in completing the construction, including *any costs incurred in attempting to have the permittee complete the improvement. Once constructed and approved by the City, any remaining funds shall be refunded to the permittee. The City shall not allow a permittee to defer construction of improvements by using a performance guarantee, unless the permittee agrees to construct those improvements upon written notification by the City, or at some other mutually agreed-to time. If the permittee fails to commence construction of the required improvements within six months of being instructed to do so, the City may, without further notice, undertake the construction of the improvements and draw upon the permittee's performance guarantee to pay those costs.*

D. Fee-in-lieu. When conditions of approval or the City Engineer allows a permittee to provide a fee-in-lieu of actual construction of public improvements, the fee shall be one hundred fifty percent of the estimated cost of constructing the public improvements as submitted by the permittee's engineer and approved by the City Engineer. The percentage required is to ensure adequate funds for the future work involved in design, bid, contracting, and construction management and contract closeout. The engineer's estimated costs shall be supported by a verified engineering estimate and approved by the City Engineer. The fee-in-lieu shall be submitted as cash, certified check, or other negotiable instrument acceptable by the City Attorney.

Finding: Not Applicable. No financial guarantees are anticipated for this application**.**

17.50.141 – Public improvements – Warranty

All public improvements not constructed by the City, shall be maintained and under warranty provided by the property owner or developer constructing the facilities until the City accepts the improvements at the end of the warranty period. The warranty is to be used at the discretion of the City Engineer or designee to correct deficiencies in materials or maintenance of constructed public infrastructure, or to address any failure of engineering design.

A. Duration of Warranty. Responsibility for maintenance of public improvements shall remain with the property owner or developer for a warranty period of two years.

B. Financial Guarantee. Approvable forms of guarantee include irrevocable standby letters of credit to the benefit of the City issued by a recognized lending institution, bond, certified checks, dedicated bank accounts or allocations of construction loans held in reserve by the lending institution for the benefit of the City. The form of guarantee shall be specified by the City Engineer and, prior to execution and acceptance by the City shall be reviewed and approved by the City Attorney. The guarantee shall be filed with the City Engineer.

C. Amount of Warranty. The amount of the warranty shall be equal to fifteen percent of the estimated cost of construction of all public improvements (including those improvements that will become owned and maintained by the City at the end of the two year maintenance period), and shall be supported by a verified engineering estimate and approved by the City Engineer. Upon expiration of the warranty period and acceptance by the City as described below, the City shall be responsible for maintenance of those improvements.

D. Transfer of Maintenance. The City will perform an inspection of all public improvements approximately forty-five days before the two-year warranty period expires. The public improvements shall be found to be in a clean, functional condition by the City Engineer before acceptance of maintenance responsibility by the City. Transfer of maintenance of public improvements shall occur when the City accepts the improvements at the end of the two year warranty period.

Finding: Not Applicable. There are no proposed public improvements with this request. This section is not applicable to the proposed development.

CHAPTER 17.56 CONDITIONAL USES

17.56.010 - Permit—Authorization—Standards—Conditions.
A conditional use listed in this title may be permitted, enlarged or altered upon authorization of the Planning Commission in accordance with the standards and procedures of this title. A conditional use permit listed in this section may be permitted, enlarged or altered upon authorization of the Planning Commission or City Commission in accordance with the standards and procedures of this section. Any expansion to, alteration of, or accessory use to a conditional use shall require Planning Commission or City Commission approval of a modification to the original conditional use permit unless authorized in this Chapter.
Finding: Complies. The Applicant has propsed an new location for the exiting helipad, which is a Conditional Use.

A. Conditional uses, because of their public convenience and necessity and their effect upon the neighborhood shall be permitted only upon the approval of the Planning Commission or City Commission after due notice and public hearing, according to procedure as provided in OCMC 17.50. The Applicant shall provide evidence substantiating that all the requirements of this title relative to the proposed use are satisfied, and demonstrate that the proposed use also satisfies the following criteria:
1. The use is listed as a conditional use in the underlying district;
Finding: Complies The Applicant has submitted an application that adequately describes the Conditions Use project, its impacts, and potential mitigation**.**

2. The characteristics of the site are suitable for the proposed use considering size, shape, location, topography, existence of improvements and natural features;
Finding: Complies The area proposed for the permanent helipad location has a minor slope of 1-2%. The area is adjacent to, but outside of the NROD and Geological Hazard zones. Relocating the helipad in this area will require the removal of 5 parking spaces. This is fewer than the fourteen parking spaces currently affected by the temporary location of the helipad and the total number of parking spaces will continue to exceed the minimum parking requirements set forth by the Oregon City Municipal Code.

3. Development shall demonstrate compliance with OCMC 16.12;

Finding: Complies with Condition The only component of the proposed development subject to Chapter 16.12 is the grading section 16.12.065. A grading permit is a condition of this application. There do not appear to be any other applicable sections of this Chapter.

4. The proposed use will not alter the character of the surrounding area in a manner which substantially limits, impairs or precludes the use of surrounding properties for the primary uses listed in the underlying district;
Finding: Complies The Applicant is proposing to relocate an existing helipad. The existing helipad was relocated to its current temporary location to accommodate the construction of the new east wing. Although the proposed location is closer to the neighborhood, the nearby tree canopy located in the NROD will continue to provide a vegetated buffer that screens the helipad from residential uses. The helipad is only utilized when a patient needs to be transferred quickly and is expected to accommodate between 6-7 flights annually unless a disaster were to occur within the region. The location is 100 feet closer to the residential uses but still located within the same area of the campus. The proposed location is now approximately 150 feet from the nearest residence at 17346 Trillium Park Drive rather than 250 feet. Residents in the nearby neighborhoods are not expected to experience any increased noise or glare with the new helipad location. Lighting is low level and proposed to be activated only during takeoff and

landing. A memorandum from David Ketchum, the founder and PrimaryPlanner with Airsafe, a firm that provides consultation and design of general aviation facilities is included (Exhibit 2G). The memorandum is a list of points related to the operation of the proposed helipad.

5. The proposal satisfies the goals and policies of the city comprehensive plan which apply to the proposed use.

Finding: Complies as Conditioned.

Goal 6.3 Nightlighting

Protect the night skies above Oregon City and facilities that utilize the night sky, such as the Haggart Astronomical Observatory, while providing for nightlighting at appropriate levels to ensure safety for residents, businesses, and

users of transportation facilities, to reduce light trespass onto neighboring properties, to conserve energy, and to reduce light pollution via use of night-friendly lighting.

Policy 6.3.1

Minimize light pollution and reduce glare from reaching the sky and trespassing onto adjacent properties.

Finding: The proposed Helipad will be lit only during operation and will be provided with low level lighting. A photometric plan is provided as sheet E4.0.01 no fugitive lighting (lighting associated with takeoff and landing) is proposed off of the heli-pad. There may be lights associated with the aircraft itself; those impacts are limited to takeoff and landing of the aircraft as well and will not be permanent impacts to the site or neighborhood.

Goal 6.4 Noise

Prevent excessive noise that may jeopardize the health, welfare, and safety of the citizens or degrade the quality of life.

Policy 6.4.1

Provide for noise abatement features such as sound-walls, soil berms, vegetation, and setbacks, to buffer neighborhoods from vehicular noise and industrial uses.

Finding: Complies. According to the Applicant, the noise associated with the proposed helipad is expected to occur 6-7 times a year. The existing vegetation that currently screens the neighborhood from activities on site will remain the same. The location is 100 feet closer to the residential uses but still located within the same area of the campus. The proposed location is now approximately 150 feet from the nearest residence at 17346 Trillium Park Drive rather than 250 feet.

The modern helicopter that is likely to serve the hospital are newer generation helicopters that are quieter than their predecessors by improvements made to the aircraft's engine and frame. Finally, a noise memorandum was provided by Erik Miller-Klein, PE and Principal of Acoustical Engineering at Tenor-Engineering (Exhibit 2F) narrative. Mr. Miller-Klein concludes that the new proposed location is acoustically similar to the original heliport location and will be significantly quieter than the current temporary location. The neighborhood is not expected to experience an increase in noise beyond what occurs today, given that the frequency of operations is not expected to increase.

B. Permits for conditional uses shall stipulate restrictions or conditions which may include, but are not limited to, a definite time limit to meet such conditions, provisions for a front, side or rear yard greater than the minimum dimensional standards of the zoning ordinance, suitable landscaping, off-street parking, and any other reasonable restriction, condition or safeguard that would uphold the spirit and intent of the zoning ordinance, and mitigate adverse effect upon the neighborhood properties by reason of the use, extension, construction or alteration allowed as set forth in the findings of the Planning Commission.

Finding: Complies with Conditions. Staff supports the additional mitigation trees along the existing forested buffer with the neighbors. The Applicant has proposed existing mitigation trees as part of this application along with general findings for no increase in community impact.

C. Any conditional use shall meet the dimensional standards of the zone in which it is to be located pursuant to subsection B. of this section unless otherwise indicated, as well as the minimum conditions listed below.

Finding: Complies. The proposed helipad is not a structure in the conventional sense of the term, but it has been designed and located to exceed the required setbacks of the MUE zone. Overall, the development will continue to comply with the findings and conditions of the previously approved detailed development plan and master plan approvals that were issued in June of 2020 under file number GLUA-20-00003 and NAS-20-0000.

D. In the case of a use existing prior to the effective date of the ordinance codified in this title and classified in this title as a conditional use, any change of use expansion of lot area or expansion of structure shall conform with the requirements for conditional use.

Finding: Complies with Conditions: This is a proposal to relocate an existing helipad approximately 100 feet south and east of the existing helipad that was demolished to make way for a new cancer center at the hospital.

E. The Planning Commission may specifically permit, upon approval of a conditional use, further expansion to a specified maximum designated by the Planning Commission without the need to return for additional review.

Finding: Not Applicable. The proposed helipad is not expected to be expanded anytime in the near future, and the applicant is not requesting approval of any future expansion. Any future changes, and modifications will be reviewed to see if they trigger a modification to this Conditional Use approval.

17.56.020 - Permit—Application.

A. A property owner or authorized agent shall initiate a request for a conditional use by filing an application with the city recorder. The Applicant shall submit a site plan, drawn to scale, showing the dimensions and arrangement of the proposed development. The application shall be accompanied by the filing fee listed in OCMC 17.50.080 to defray the costs of publication, investigation and processing.

Finding: Complies. The Applicant has submitted and paid for a Conditional Use application.

B. Before the Planning Commission or City Commission may act on a conditional use application, it shall hold a public hearing thereon, following procedure as established in OCMC 17.50.

Finding: Complies A Public Hearing was noticed for this file for August 8, 2022

17.56.025 - Minor modifications to legal conditional uses.
Minor modifications to an approved conditional use permit may be permitted. If permitted, the modification shall be reviewed as a minor site plan and design review. A minor modification to an approved conditional use permit is considered one of the following:
A. Modification to a structure for the purpose of enhancing the aesthetics of the building and there is no increase in the interior usable space;
Finding: Not Applicable. The City has determined that the relocation of the helipad to a site closer to the neighboring subdivision does not fall under the criterion for a minor modification. Therefore, the Applicant is requesting a Type III Conditional Use review in front of the Planning Commission**.**

A. Helipad Landing Facility.

1. Size of runways and landing areas;

Finding: Complies. According to the Applicant, the helipad is proposed to have an area of approximately 1,600 square feet. The helipad has been designed in accordance with the standards of the Federal Aviation Commission and will support near vertical takeoff and landings.

2. Approaches and obstructions within the runways and landing areas;

Finding: Complies. According to the Applicant, there are four existing trees that are proposed to be removed in support of the proposed helipad. Those trees have been identified as possible obstructions and will be mitigated for by planting eight new trees nearby (4 tree in excess of the required mitigation trees). The applicant has indicated that there may be an indicator light placed upon an existing light pole just south and west of the helipad to ensure that pilots are aware of the pole.

3. Fencing and/or screening to provide visual and noise buffering and to deflect winds or blast due to aircraft operation;

Finding: Complies. According to the Applicant, the helipad is proposed to be relocated approximately 100 feet to the south and east of the previous location, and no changes in the frequency of use are anticipated. The helipad is operational six to seven times a year. The relocated helipad will be buffered by existing vegetation and according to David Ketchum's findings, the helicopters would not be expected to have an audible impact on nearby residences beyond what they already experience with the existing location.

4. Fire protection measures and equipment;

Finding: Complies. According to the Applicant, a fire extinguisher will be provided at the helipad location, and emergency access to the helipad is provided through the previously approved on site circulation.

5. Night illumination adequate for operations, and its effects upon surrounding property;

Finding: Complies. According to the Applicant, the proposed lighting and landing markers are very specific. As described in Appendix 2F, "…*pilots use night vision goggles that become nearly useless at brightly lighted heliports. Modern helipad design calls for light fixtures that produce barely noticeable light impacts beyond the helipad area. The design goal of using just enough of the right kind of light to provide pilots with a safe NVG operating environment has the added benefit of reduced light impacts on surrounding communities. Light fixtures at the helipad will consist of eight (8) embedded, flush-mounted, green LED perimeter lights and four (4) downward-focused flood lights to provide a safe patient-transfer working environment. Floodlights will be on only during transfers of patients from gurneys to helicopters. A lighted wind indicator and a yet-to-be-determined number of roof-mounted LED obstruction lights will be used. Operational lights at the helipad will only be on during helicopter operations. Depending on operator-specific NVG policies and procedures helicopter pilots may use on-board landing lights as they approach and depart the helipad."* A lighting plan illustrating that the proposed lighting on the helipad will only affect the landing surface is included with the plan set.

6. *Landing markers;*

Finding: Complies: Landing markers will be provided in accordance with FAA requirements.

7. *Structural adequacy of runways, pads and other structures;*

Finding: Complies. According to the Applicant, the proposed helipad has been designed in consultation with a Geotech engineer based on the operational characteristics of the site and weight of the aircraft. The Geotech also evaluated the soils on site and the presence of an existing landslide. That report is attached as Appendix 005 of the Applicant's submittal and concludes that the proposed structure will be structurally sound and is not expected to compromise the integrity of the nearby geohazard.

8. *Paving and ground cover materials in relation to noise and down wash.*

Finding: Complies. According to the Applicant, the helipad is proposed to be concrete with low lying landscape around the facility.

17.56.060 - Revocation of conditional use permits.

The Planning Commission or the City Commission may initiate administrative action under Chapter 17.50 to revoke any conditional use permit previously issued by the City or, with regard to lands annexed by the City, those such permits issued by the county. The Planning Commission or the City Commission, may revoke such permit upon determining:

A. One or more conditions attached to the grant of the conditional use permit have not been fulfilled; and

B. The unfulfilled condition is substantially related to the issuance of the conditional use permit.

Finding: Not Applicable at this time. The Planning Commission can choose to revoke this permit if the Applicant does not implement the conditions of approval for this application.

Community Development – Planning

695 Warner Parrott Road | Oregon City OR 97045
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17.56.070 - Periodic review of conditional use permits.
A. The City Commission may provide for the periodic review of some or all of the conditional use permits previously issued by the City, or, with regard to lands annexed by the City, those such permits issued by the county. In providing for such review, the City Commission may designate classes of such previously issued permits for which periodic review shall be undertaken.
B. Such review shall be accomplished as an administrative action under Chapter 17.50 and shall be limited to the question of whether additional conditions should be imposed on a conditional use in the light of changing circumstances and more efficient implementation of the City's comprehensive plan.
C. Notwithstanding the provisions of Chapter 17.58, any additional conditions shall be met as a requirement for continued operation of the conditional use.
Finding: Complies. Staff does not recommend a periodic review for this use as it is a simple relocation of an existing Conditional Use. There is no anticipated expansion of the use based on the relocation**.**

CONCLUSION AND RECOMMENDATION:

Based on the Applicant's proposal and the analysis and findings described above, staff recommends the relocation of the existing helipad at the Willamette Falls Hospital located at 1500 Division Street and identified as Clackamas County 2-2E32AB-02100 meets the requirements of the Oregon City Municipal Code. Therefore, the Community Development Director recommends the Planning Commission approve files GLUA-22-00016 CU-22-00001 NROD-22-00010 Willamette Falls Hospital Helipad Relocation CU, based upon the findings and exhibits contained in this staff report.

EXHIBITS

1. Vicinity Map
2. A. Applicant's Narrative
   B. Plans
   C. Stormwater Memo
   D. Geotechnical Memo
   E. CCFD#1 Comments
   F. Noise Memo
   G Operational Aspects Memo
   H. McLoughlin Neighborhood Association Presentation
3. Public Comments
4. NROD 22-0010

GLUA-22-00016 CU-22-00001 NROD-22-00010 Willamette Falls Hospital Helipad Relocation CU

Legend

Street Names

Taxlots

Taxlots Outside UGB

Unimproved ROW

City Limits

UGB

Basemap

Notes

Overview Map

The City of Oregon City makes no representations, express or implied, as to the accuracy, completeness and timeliness of the information displayed. This map is not suitable for legal, engineering, surveying or navigation purposes. Notification of any errors is appreciated.

Map created 7/12/2022

N

0 400 800 Feet

1: 4,800

City of Oregon City
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Oregon City
OR 97045
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www.orcity.org

Willamette Falls Medical Center Helipad

Type III Conditional Use & Minor Type I Site Plan Review

Applicant:	
Property Owner:	Providence Medical Center 1500 Division Street Oregon City, OR 97405
Architect/Applicant:	PKA Architects Josh Kolberg 6969 SW Hampton Street Portland, OR 97223 (503) 968-6800 josh@pkaarchitects.com
Planner:	Harper Houf Peterson Righellis, Inc. Brad Kilby, AICP 205 SE Spokane Street, Suite 200 Portland, OR 97202 (503) 221-1131 bradk@hhpr.com
Tax Lot:	2-2E32AB-02100
Site Address:	1500 Division Street Oregon City, OR 97405
Property Size:	~8.36 acres
Zoning:	Mixed-Use Employment (MUE)
Proposal Summary:	The applicant proposes the relocation of an existing helipad from its interim location in a parking lot, to a permanent location east of the existing heli-pad.
Date:	May 26, 2022

Contents

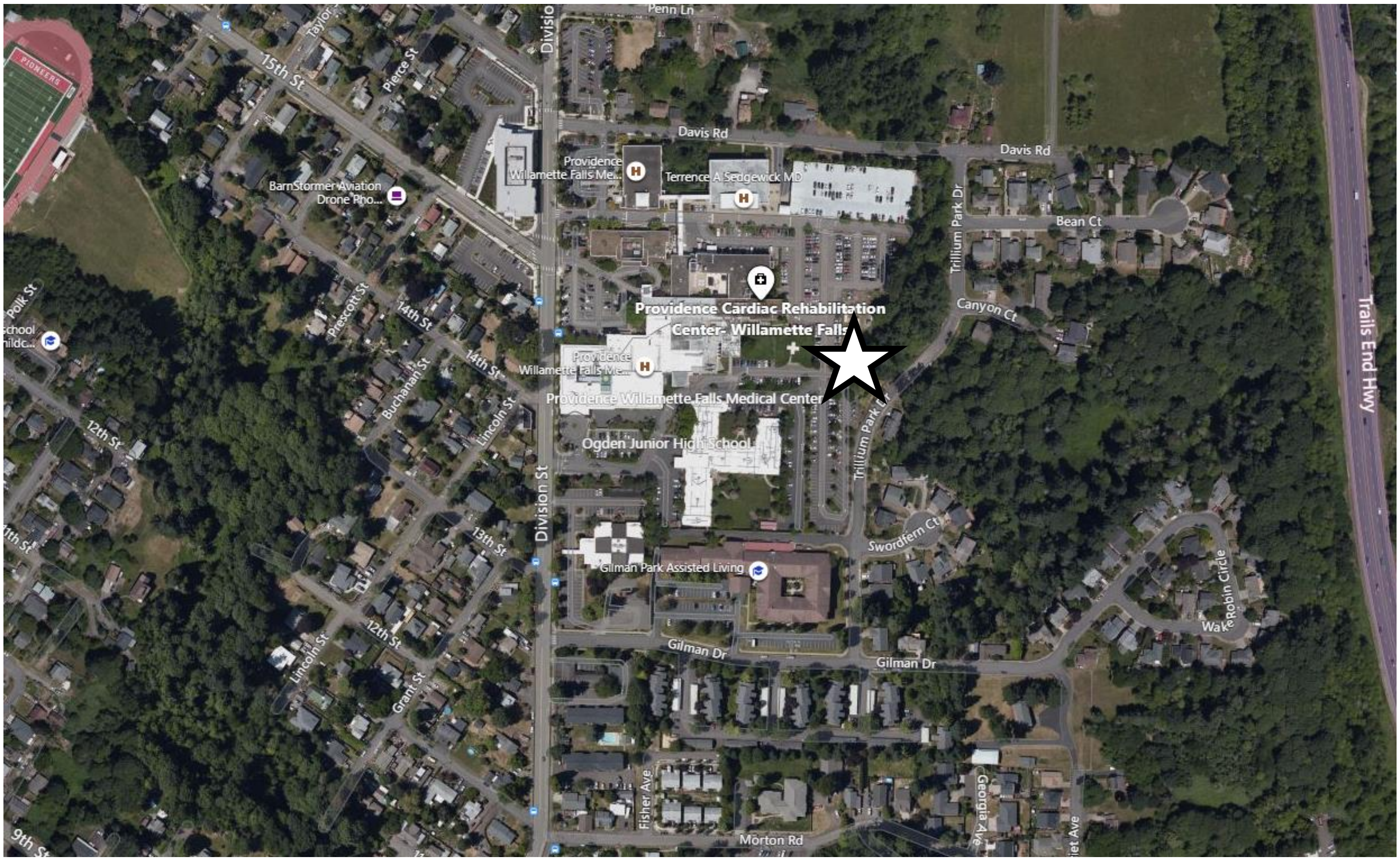
I. Project Summary and Background

Existing Conditions

The Willamette Falls Medical Center is bordered by Davis Road to the north, Trillium Park Drive to the east, Division Street to the west, and medical offices and an assisted-living facility to the southThe campus is within the Mixed-Use Employment district. Property to the north and west is within the Mixed-Use Employment district. Property to the east and south are within residential districts, R-10 and R-2, respectively. The medical center is developed with a hospital building, medical office buildings, a parking garage, paved parking areas, a helipad, and other improvements. A Natural Resource Overlay District and Geological Hazard area are present on the eastern portion of the site.

Providence Willamette Falls Medical Center was granted approval of a hospital expansion on the east side of the campus under GLUA-20-00003/MAS-20-000001. As part of that project, the helipad was relocated to a temporary location to accommodate the building expansion approved under that application.

Vicinity Map

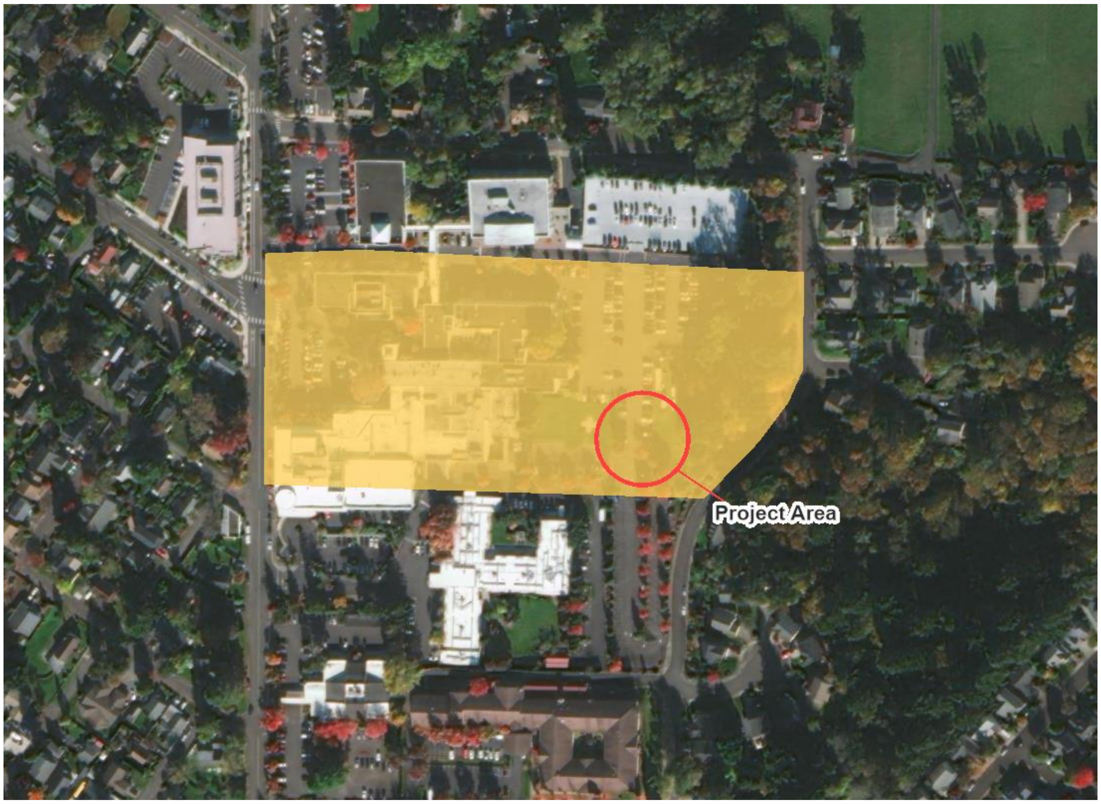


Project Description

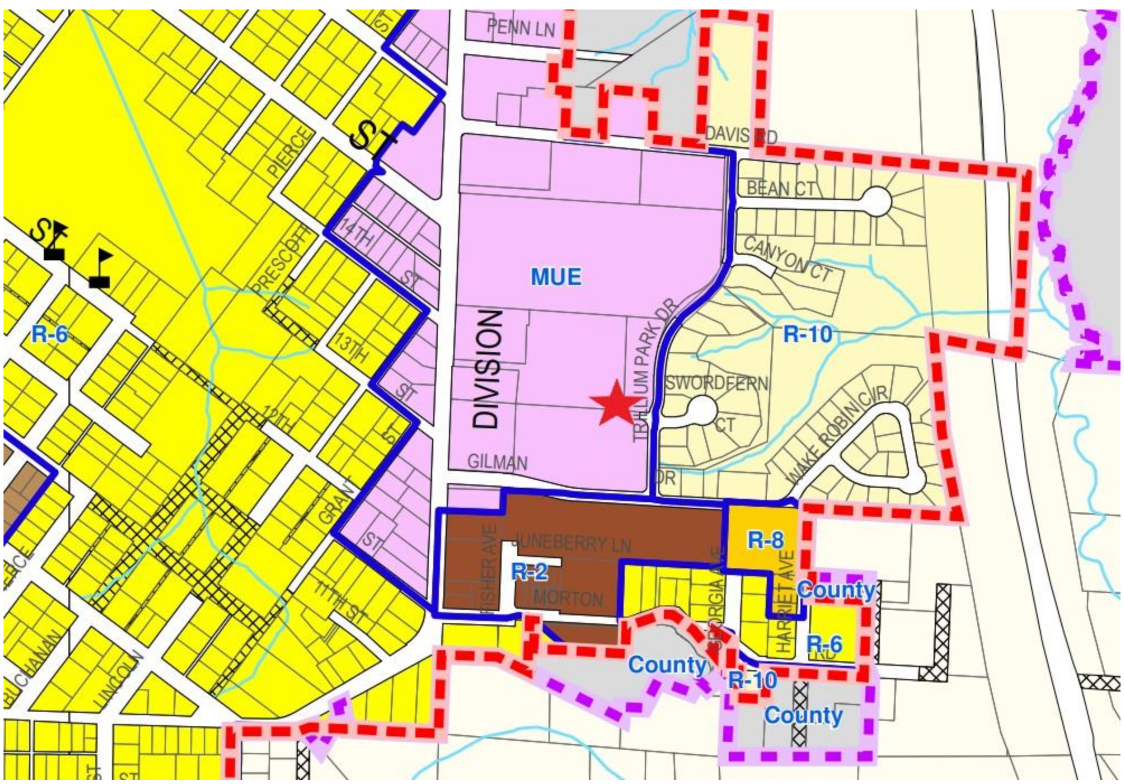
The current helipad location requires the removal of 17 vehicles in the area, when needed, to create the required FAA space for safe helicopter landing and takeoff. The applicant is proposing the relocation of the helipad to a permanent location between the east parking lot and Trillium Park Drive. The relocation will mitigate the burden of moving the vehicles. Multiple locations have been considered for the permanent helipad. The proposed location abuts, but is not within, a Natural Resource Overlay District or the Geological Hazard zone illustrated on the City's GIS. The proposed location of the helipad does not impact either area. This proposal requires approval of the following land use permits:

- Conditional Use review for the helipad,
- Minor Type I Site Plan review, and
- NROD exemption.

Project Map



Zoning Map



II. Approval Criteria and Development Standards

CHAPTER 13.12 STORMWATER MANAGEMENT

13.12.050 - Applicability and exemptions.

This chapter establishes performance standards for stormwater conveyance, quantity and quality. Additional performance standards for erosion prevention and sediment control are established in OCMC 17.47.

A. *Stormwater Conveyance. The stormwater conveyance requirements of this chapter shall apply to all stormwater systems constructed with any development activity, except as follows:*
   1. *The conveyance facilities are located entirely on one privately owned parcel;*
   2. *The conveyance facilities are privately maintained; and*
   3. *The conveyance facilities receive no stormwater runoff from outside the parcel's property limits.*

Those facilities exempted from the stormwater conveyance requirements by the above subsection will remain subject to the requirements of the Oregon Uniform Plumbing Code. Those exempted facilities shall be reviewed by the Building Official.

Applicant's Response: This proposal will not result in the addition of impervious surface area as . Water quality treatment and detention is proposed to occur within a recently constructed stormwater swale that is being constructed as part of the Providence Willamette Falls East Expansion. A preliminary stormwater memo addressing the City's stormwater standards has been prepared by Ryan Halvorson, PE, a professional and licensed civil engineer with DOWL. Mr. Halvorson's report is attached to this application as Appendix 004.

B. *Water Quality and Flow Control. The water quality and flow control requirements of this chapter shall apply to the following proposed uses or developments, unless exempted under subsection C:*
   1. *Activities located wholly or partially within water quality resource areas pursuant to OCMC 17.49 that will result in the creation of more than five hundred square feet of impervious surface within the NROD or will disturb more than one thousand square feet of existing impervious surface within the NROD as part of a commercial or industrial redevelopment project. These square footage measurements will be considered cumulative for any given five-year period; or*
   2. *Activities that create or replace more than five thousand square feet of impervious surface, cumulated over any given five-year period.*

Applicant's Response: The proposed location for the helipad is not within a Natural Resource Overlay District. The helipad is proposed to be approximately 1,600 square feet of impervious surface, which essentially replaces an existing 1,600 square foot helipad approximately 100 feet west of the proposed location. While this project itself does not trigger the need for water quality and flow control the larger improvements approved in 2020 include new stormwater facilities to treat and detain stormwater for this part of the campus.

C. *Exemptions. The following exemptions to subsection B of this section apply:*

1. *An exemption to the flow control requirements of this chapter will be granted when the development site discharges to the Willamette River, Clackamas River or Abernethy Creek; and either lies within the one hundred-year floodplain or is up to ten feet above the design flood elevation as defined in OCMC 17.42, provided that the following conditions are met:*
    a. *The project site is drained by a conveyance system that is comprised entirely of manmade elements (e.g. pipes, ditches, culverts outfalls, outfall protection, etc.) and extends to the ordinary high water line of the exempt receiving water; and*
    b. *The conveyance system between the project site and the exempt receiving water has sufficient hydraulic capacity and erosion stabilization measures to convey discharges from the proposed conditions of the project site and the existing conditions from non-project areas from which runoff is collected.*
2. *Projects in the following categories are generally exempt from the water quality and flow control requirements:*
    a. *Stream enhancement or restoration projects approved by the City.*
    b. *Farming practices as defined by ORS 30.960 and farm use as defined in ORS 214.000; except that buildings associated with farm practices and farm use are subject to the requirements of this chapter.*
    c. *Actions by a public utility or any other governmental agency to remove or alleviate an emergency condition.*
    d. *Road and parking area preservation/maintenance projects such as pothole and square cut patching, surface sealing, replacing or overlaying of existing asphalt or concrete pavement, provided the preservation/maintenance activity does not expand the existing area of impervious coverage above the thresholds in subsection B of this section.*
    e. *Pedestrian and bicycle improvements (sidewalks, trails, pathways, and bicycle paths/lands) where no other impervious surfaces are created or replaced, built to direct stormwater runoff to adjacent vegetated areas.*
    f. *Underground utility projects that replace the ground surface with in-kind material or materials with similar runoff characteristics.*
    g. *Maintenance or repair of existing utilities.*

Applicant's Response: The proposed helipad relocation stormwater run-off was considered in the approval of GLUA-20-00003: MAS20-00001 the Willamette Falls Hospital East Expansion project.

D. *Uses Requiring Additional Management Practices. In addition to any other applicable requirements of this chapter, the following uses are subject to additional management practices, as defined in the Public Works Stormwater and Grading Design Standards:*
    1. *Bulk petroleum storage facilities;*
    2. *Above ground storage of liquid materials;*
    3. *Solid waste storage areas, containers, and trash compactors for commercial, industrial, or multi-family uses;*
    4. *Exterior storage of bulk construction materials;*
    5. *Material transfer areas and loading docks;*

6. *Equipment and/or vehicle washing facilities;*
7. *Development on land with suspected or known contamination;*
8. *Covered vehicle parking for commercial or industrial uses;*
9. *Industrial or commercial uses locating in high traffic areas, defined as average daily count trip of two thousand five hundred or more trips per day; and*
10. *Land uses subject to DEQ 1200-Z Industrial Stormwater Permit Requirements.*

Applicant's Response: None of the above uses are proposed, or exist, for this project. Therefore, the above criterion does not apply. The remaining sections of this Chapter have been previously addressed as summarized in Appendix 004 to this narrative and are not addressed within this narrative.

CHAPTER 15.48 - GRADING, FILLING AND EXCAVATING

15.48.030 Applicability—Grading permit required.

A. *A city-issued grading permit shall be required before the commencement of any of the following filling or grading activities:*
   1. *Grading activities in excess of ten cubic yards of earth;*
   2. *Grading activities which may result in the diversion of existing drainage courses, both natural and man-made, from their natural point of entry or exit from the grading site;*
   3. *Grading and paving activities resulting in the creation of impervious surfaces greater than two thousand square feet or more in area;*
   4. *Any excavation beyond the limits of a basement or footing excavation, having an unsupported soil height greater than five feet after the completion of such a structure; or*
   5. *Grading activities involving the clearing or disturbance of one-half acres (twenty-one thousand seven hundred eighty square feet) or more of land.*

Applicant's Response: If the proposed relocation is approved, a grading permit will be applied for with the City's building department, and will be proposed in a way that meets the applicable standards of the City and DEQ.

15.48.040 - Grading permit exemptions.

The following filling and grading activities shall not require the issuance of a grading permit:

A. *Excavation for utilities, or for wells or tunnels allowed under separate permit by other governmental agencies;*
B. *An excavation below finished grade for basements and footings of a building, retaining wall or other structure authorized by a valid building permit. The placement of any fill material removed from such an excavation requires a grading permit if:*
   1. *It exceeds fifty cubic yards,*
   2. *More than ten cubic yards are removed from the site, or*
   3. *The fill is placed on the site to a depth greater than one foot;*
C. *Farming practices as defined in ORS 30.930 and farm uses as defined in ORS 215.203, except that buildings associated with farm practices and farm uses are subject to the requirements of this chapter;*
D. *Excavation for cemetery graves;*
E. *Sandbagging, diking, ditching, filling or similar work when done to protect life or property during an emergency;*

F. *Repaving of existing paved surfaces that does not alter existing drainage patterns;*
G. *Maintenance work on public roads performed under the direction of the city, Clackamas County or Oregon State Department of Transportation personnel.*

Applicant's Response: The proposed helipad will result in the excavation of more than 50 cubic yards of material and is therefore not exempt from the issuance of a grading permit.

15.48.090 Submittal requirements.

An engineered grading plan or an abbreviated grading plan shall be prepared in compliance with the submittal requirements of the Public Works Stormwater and Grading Design Standards whenever a city approved grading permit is required. In addition, a geotechnical engineering report and/or residential lot grading plan may be required pursuant to the criteria listed below.

A. *Abbreviated Grading Plan. The city shall allow the applicant to submit an abbreviated grading plan in compliance with the submittal requirements of the Public Works Stormwater and Grading Design Standards if the following criteria are met:*
   1. *No portion of the proposed site is within the flood management area overlay district pursuant to Chapter 17.42, the unstable soils and hillside constraints overlay district pursuant to Chapter 17.44, or a water quality resource area pursuant to Chapter 17.49; and*
   2. *The proposed filling or grading activity does not involve more than fifty cubic yards of earth.*

B. *Engineered Grading Plan. The city shall require an engineered grading plan in compliance with the submittal requirements of the Public Works Stormwater and Grading Design Standards to be prepared by a professional engineer if the proposed activities do not qualify for abbreviated grading plan.*
C. *Geotechnical Engineering Report. The city shall require a geotechnical engineering report in compliance with the minimum report requirements of the Public Works Stormwater and Grading Design Standards to be prepared by a professional engineer who specializes in geotechnical work when any of the following site conditions may exist in the development area:*
   1. *When any publicly maintained facility (structure, street, pond, utility, park, etc.) will be supported by any engineered fill;*
   2. *When an embankment for a stormwater pond is created by the placement of fill;*
   3. *When, by excavation, the soils remaining in place are greater than three feet high and less than twenty feet wide.*

D. *Residential Lot Grading Plan. The city shall require a residential lot grading plan in compliance with the minimum report requirements of the Public Works Stormwater and Grading Design Standards to be prepared by a professional engineer for all land divisions creating new residential building lots or where a public improvement project is required to provide access to an existing residential lot.*

Applicant's Response: An engineered grading plan in compliance with the will be submitted to the City with proposed construction plans if the project is approved. This narrative includes both a preliminary geotechnical report and preliminary stormwater memo that demonstrate that compliance with Oregon

City Public Works Stormwater and Grading Design Standards is feasible. Please see appendices 004 and 005 to this report.

CHAPTER 17.31 MUE MIXED-USE EMPLOYMENT DISTRICT

17.31.020 – Permitted uses

Permitted uses in the MUE district are defined as:

- *A. Banquet, conference facilities and meeting rooms;*
- *B. Child care centers, nursery schools;*
- *C. Medical and dental clinics, outpatient; infirmary services;*
- *D. Distributing, wholesaling and warehousing*
- *E. Health and fitness clubs;*
- *F. Hospitals;*
- *G. Emergency service facilities (police and fire), excluding correctional facilities;*
- *H. Industrial uses limited to the design, light manufacturing, processing, assembly, packaging, fabrication and treatment of products made from previously prepared or semi-finished materials;*
- *I. Offices;*
- *J. Outdoor markets, such as produce stands, craft markets and farmers markets that are operated on the weekends and after six p.m. during the weekday;*
- *K. Postal service;*
- *L. Parks, playfields and community or neighborhood centers;*
- *M. Research and development offices and laboratories, related to scientific, educational, electronics and communications endeavors;*
- *N. Passenger terminals (water, auto, bus, train);*
- *O. Utilities: Basic and linear facilities, such as water, sewer, power, telephone, cable, electrical and natural gas lines, not including major facilities such as sewage and water treatment plants, water tanks, telephone exchange and cell towers;*
- *P. Transportation facilities;*
- *Q. Marijuana processors, processing sites, wholesaling and laboratories;*
- *R. Transitory mobile food units,*

Applicant's Response: The primary use on site is the Willamette Falls Medical Center, a hospital, which is permitted outright in the Mixed-Use Employment zone. The helipad proposed to be relocated is accessory to the hospital and according to staff, considered a conditional use.

17.31.030 – Limited uses

The following permitted uses, alone or in combination, shall not exceed twenty percent of the total gross floor area of all of the other permitted and conditional uses within the MUE development site or complex. The total gross floor area of two or more buildings may be used, even if the buildings are not all on the same parcel or owned by the same property owner, as long as they are part of the same development site, as determined by the community development director:

- *A. Retail services, including but not limited to personal, professional, educational and financial services, marijuana, laundry and dry-cleaning;*
- *B. Restaurants, eating and drinking establishments;*

C. Retail shops, provided the maximum footprint for a stand-alone building with a single store does not exceed sixty thousand square feet;
D. Public and/or private educational or training facilities;
E. Custom or specialized vehicle alterations or repair wholly within a building.

Response: None of the above uses are proposed for this project. Therefore, this criterion does not apply.

17.31.040 – Conditional uses

The following conditional uses are permitted when authorized and in accordance with the process and standards contained in OCMC 17.56.

A. Correctional, detention and work release facilities;
B. Drive-through facilities;
C. Hotels, motels and commercial lodging;
D. Outdoor markets that do not meet the criteria of OCMC 17.31.020.J;
E. Public utilities and services such as pump stations and sub-stations;
F. Religious institutions;
G. Veterinary or pet hospital, dog day care.

Response: A helipad is not an outright conditional use in the Mixed-Use Employment district. The existing helipad has been approved as a conditional accessory use to the medical center. The applicant is proposing relocation of an existing helipad approximately 100 feet south and east of the current facility. Please see sheet (LUA.300), the project site plan within Appendix 006 the plan set.

17.31.050 – Prohibited uses

The following uses are prohibited in the MUE district:

A. Outdoor sales or storage;
B. Kennels;
C. Gas/convenience stations;
D. Motor vehicle parts stores;
E. Motor vehicle sales and incidental service;
F. Heavy equipment service, repair, sales, storage or rental (including but not limited to construction equipment and machinery and farming equipment);
G. Recreation vehicle, travel trailer, motorcycle, truck, manufactured home, leasing, rental or storage;
H. Self-storage facilities;
I. Marijuana production.

Response: A helipad is not listed as a prohibited use in the Mixed-Use Employment district.

Chapter 17.41 – TREE PROTECTION, PRESERVATION, REMOVAL AND REPLANTING STANDARDS

17.41.060 – Tree removal and replanting – Mitigation (Option 1).

A. Applicants for development who select this option shall ensure that all healthy trees shall be preserved outside the construction area as defined in OCMC 17.04 to the extent practicable.

Preserved trees are subject to Option 3 of this chapter. Compliance with these standards shall be demonstrated in a tree mitigation plan report prepared by a certified arborist, horticulturalist or forester or other environmental professional with experience and academic credentials in forestry or arboriculture. Tree inventories for the purposes of mitigation calculations may be prepared by a licensed surveyor. At the applicant's expense, the city may require the report to be reviewed by a consulting arborist. The number of replacement trees required on a development site shall be calculated separately from, and in addition to, any public or street trees in the public right-of-way required under OCMC 12.08, Public and Street Trees, any required tree planting in parking lots, and any trees planted in pedestrian and bicycle accessways.

B. *The applicant shall determine the number of trees to be mitigated on the site by counting all of the trees six-inch DBH (minimum four and one-half feet from the ground) or larger on the entire site and either:*
   1. *Trees that are removed outside of the construction area shall be replanted with the number of trees specified in Column 1 of Table 17.41.060-1. Trees that are removed within the construction area shall be replanted with the number of replacement trees required in Column 2; or*
   2. *Dying, diseased or hazardous trees, when the condition is verified by a certified arborist to be consistent with the definitions in OCMC 17.04, may be removed from the tree replacement calculation. Dead trees may also be removed from the calculation, with the condition of the tree verified either by the community development director or by a certified arborist at the applicant's expense, when the community development director cannot make a determination. To the extent that the community development director determines that the dead, dying, hazardous or diseased condition of the tree is the result of intentional action, the removal of that tree shall require mitigation pursuant to Column 2 of Table 17.41.060-1.*

Applicant's Response: The applicant is proposing the removal of four existing maple trees. The trees have a DBH of 10", requiring mitigation. All trees proposed to be removed are from within the construction area and illustrated within the landscape plan provided as sheet L.1.0.00 of the plan set.

Table 17.41.060-1 Tree Replacement Requirements	
Size of Tree Removed (DBH)	Column 2: Number of Trees to be Planted (If removed within the construction area)
6 to 12"	1

Applicant's Response: Each tree removed requires one replacement tree to be planted. Four trees are proposed to be removed from within the construction area. The applicant is proposing to plant 8 replacement trees at the end of the extended stormwater planter and nearby parking island trees as mitigation. Please see sheet L.1.0.00 of the plan set.

CHAPTER 17.44 GEOLOGICAL HAZARDS

Applicant's Response: The standards of this section are not applicable to this request. The proposed permanent location of the helipad is adjacent to, but not within, a Geological Hazard area. The proposed location of the helipad was specifically selected to avoid impacts to the Geological Hazard area.

OCMC 17.47 – EROSION AND SEDIMENT CONTROL

17.47.030 - Applicability.

A. *This chapter, which may also be referred to as "erosion control" in this Code, applies to development that may cause visible or measurable erosion on any property within the city limits of Oregon City.*

B. *This chapter does not apply to work necessary to protect, repair, maintain or replace existing structures, utility facilities, roadways, driveways, accessory uses and exterior improvements in response to emergencies, provided that after the emergency has passed, adverse impacts are mitigated in accordance with applicable standards.*

Applicant's Response: Grading activities will occur in support of this request, it is assumed that erosion control will be required for the construction of the new helipad and associated improvements. An erosion control plan will be provided along with the requested grading permit.

17.47.070 - Erosion and sediment control plans.

A. *An application for an erosion and sediment control permit shall include an erosion and sediment control plan, which contains methods and interim measures to be used during and following construction to prevent or control erosion prepared in compliance with City of Oregon City public works standards for erosion and sediment control. These standards are incorporated herein and made a part of this title and are on file in the office of the city recorder.*

B. *Approval Standards. An erosion and sediment control plan shall be approved only upon making the following findings:*

   1. *The erosion and sediment control plan meets the requirements of the City of Oregon City public works standards for erosion and sediment control incorporated by reference as part of this chapter;*
   2. *The erosion and sediment control plan indicates that erosion and sediment control measures will be managed and maintained during and following development. The erosion and sediment control plan indicates that erosion and sediment control measures will remain in place until disturbed soil areas are permanently stabilized by landscaping, grass, approved mulch or other permanent soil stabilizing measures.*

C. *The erosion and sediment control plan shall be reviewed in conjunction with the requested development approval. If the development does not require additional review, the manager may approve or deny the permit with notice of the decision to the applicant.*

D. *The city may inspect the development site to determine compliance with the erosion and sediment control plan and permit.*

E. *Erosion that occurs on a development site that does not have an erosion and sediment control permit, or that results from a failure to comply with the terms of such a permit, constitutes a violation of this chapter.*

F. *If the manager finds that the facilities and techniques approved in an erosion and sediment control plan and permit are not sufficient to prevent erosion, the manager shall notify the owner or his/her designated representative. Upon receiving notice, the owner or his/her designated representative shall immediately install interim erosion and sediment control measures as specified in the City of Oregon City public works standards for erosion and sediment control. Within three days from the date of notice, the owner or his/her designated representative shall submit a revised erosion and sediment control plan to the city. Upon approval of the revised plan* *and issuance of an amended permit, the owner or his/her designated representative shall immediately implement the revised plan.*

G. Approval of an erosion and sediment control plan does not constitute an approval of permanent road or drainage design (e.g., size and location of roads, pipes, restrictors, channels, retention facilities, utilities, etc.).

Applicant's Response: Erosion and sediment control plans satisfying these standards will be provided with the proposed grading permit at the time of construction.

17.47.080 - Plan implementation.

An approved erosion control and sediment control plan shall be implemented and maintained as follows:

A. Plan approval, where required, shall be obtained prior to clearing or grading. No grading, clearing or excavation of land requiring a plan shall be undertaken prior to approval of the plan.
B. The erosion and sediment control facilities shall be constructed prior to any clearing and grading activities, and maintained in such a manner as to ensure that sediment laden water does not enter the drainage system or violate applicable water standards.
C. The implementation of an erosion and sediment control plan and the construction, maintenance, replacement, and upgrading of erosion and sediment control facilities is the responsibility of the owner or his/her designated representative until all construction is completed and approved, and vegetation, landscaping or approved finished surfaces is established.
D. The erosion and sediment control facilities herein are the minimum requirements for anticipated site conditions. During the construction period, these erosion and sediment control facilities shall be upgraded as needed for unexpected storm events and to ensure that sediment-laden water does not leave the site.
E. Any observation of visible or measurable erosion, or an observation of more than a ten-percent increase in downstream channel turbidities, will result in an enforcement action by the city.
F. The owner or his/her designated representative shall implement the measures and construct facilities as provided for and according to the implementation schedule in the approved plan. The manager shall be allowed reasonable access to the development site for inspection purposes.

Applicant's Response: The applicant is aware of these requirements and will comply with the City's requirements during construction.

17.47.090 - Plan performance guarantee and security.

After the plan is approved by the manager and prior to construction or grading, the owner shall provide a financial guarantee. Erosion and sediment control shall be included in the cost estimate for the primary project, such as land division or site plan, and included in that project's performance guarantee.

Applicant's Response: Noted. The owner will comply with this requirement. A preliminary grading and erosion control plan are provided as plan sheet LUC.1.00 in the plan set attached as Appendix 006.

CHAPTER 17.49 NATURAL RESOURCE OVERLAY DISTRICT

Applicant's Response: The proposed permanent location of the helipad is adjacent to, but not within, the Natural Resource Overlay District on the project site. The proposed location of the helipad was selected to avoid impacts to the Natural Resource Overlay District on site. An NROD exemption request is included with this narrative as Appendix 007.

CHAPTER 17.50 ADMINISTRATION AND PROCEDURES

17.50.050 – Pre-application conference.

A. *Pre-application Conference. Prior to a Type II – IV or Legislative application, excluding Historic Review, being deemed complete, the applicant shall schedule and attend a pre-application conference with City staff to discuss the proposal, unless waived by the Community Development Director. The purpose of the pre-application conference is to provide an opportunity for staff to provide the applicant with information on the likely impacts, limitations, requirements, approval standards, fees and other information that may affect the proposal.*

   1. *To schedule a pre-application conference, the applicant shall contact the Planning Division, submit the required materials, and pay the appropriate conference fee.*

   2. *At a minimum, an applicant should submit a short narrative describing the proposal and a proposed site plan, drawn to a scale acceptable to the City, which identifies the proposed land uses, traffic circulation, and public rights-of-way and all other required plans.*

   3. *The Planning Division shall provide the applicant(s) with the identity and contact persons for all affected neighborhood associations as well as a written summary of the pre-application conference.*

B. *A pre-application conference shall be valid for a period of six months from the date it is held. If no application is filed within six months of the conference or meeting, the applicant shall schedule and attend another conference before the City will accept a permit application. The Community Development Director may waive the pre-application requirement if, in the Director's opinion, the development has not changed significantly and the applicable municipal code or standards have not been significantly amended. In no case shall a pre-application conference be valid for more than one year.*

Applicant's Response: A pre-application conference was held on December 22, 2021 for the proposed project. This application is being submitted within 6 months of the pre-app date and the notes from the pre-application conference are provided as appendices 008 and 009 to this narrative.

17.50.055 - Neighborhood association meeting.

Neighborhood Association Meeting. The purpose of the meeting with the recognized neighborhood association is to inform the affected neighborhood association about the proposed development and to receive the preliminary responses and suggestions from the neighborhood association and the member residents.

A. *Applicants applying for annexations, zone change, comprehensive plan amendments, conditional use, Planning Commission variances, subdivision, or site plan and design review (excluding minor site plan and design review), general development master plans or detailed development plans applications shall schedule and attend a meeting with the City-recognized neighborhood association in whose territory the application is proposed no earlier than one year prior to the date of application. Although not required for other projects than those identified above, a meeting with the neighborhood association is highly recommended.*

B. *The applicant shall request via email or regular mail a request to meet with the neighborhood association chair where the proposed development is located. The notice shall describe the* *proposed project. A copy of this notice shall also be provided to the chair of the Citizen Involvement Committee.*

C. A meeting shall be scheduled within thirty days of the date that the notice is sent. A meeting may be scheduled later than thirty days if by mutual agreement of the applicant and the neighborhood association. If the neighborhood association does not want to, or cannot meet within thirty days, the applicant shall host a meeting inviting the neighborhood association, Citizen Involvement Committee, and all property owners within three hundred feet to attend. This meeting shall not begin before six p.m. on a weekday or may be held on a weekend and shall occur within the neighborhood association boundaries or at a City facility.

D. If the neighborhood association is not currently recognized by the City, is inactive, or does not exist, the applicant shall request a meeting with the Citizen Involvement Committee.

E. To show compliance with this section, the applicant shall submit a copy of the email or mail notice to the neighborhood association and CIC chair, a sign-in sheet of meeting attendees, and a summary of issues discussed at the meeting. If the applicant held a separately noticed meeting, the applicant shall submit a copy of the meeting flyer, postcard or other correspondence used, and a summary of issues discussed at the meeting and submittal of these materials shall be required for a complete application.

Applicant's Response: The project location is within the McLoughlin Neighborhood Association boundary. A meeting with the neighborhood was held on Thursday, May 5th, 2022 at 7:00PM. An e-mail requesting time on the neighborhood associations agenda for their May 5th meeting, notes with meeting attendants listed, the PowerPoint presentation, and an e-mail providing a summary of the meeting are provided as appendices 010-013 to this narrative.

17.50.100 - Notice posting requirements.

Where this chapter requires notice of a pending or proposed permit application or hearing to be posted on the subject property, the requirements of this section shall apply.

A. City Guidance and the Applicant's Responsibility. The City shall supply all of the notices which the applicant is required to post on the subject property and shall specify the dates the notices are to be posted and the earliest date on which they may be removed. The City shall also provide a statement to be signed and returned by the applicant certifying that the notice(s) were posted at the correct time and that if there is any delay in the City's land use process caused by the applicant's failure to correctly post the subject property for the required period of time and in the correct location, the applicant agrees to extend the applicable decision-making time limit in a timely manner.

B. Number and Location. The applicant shall place the notices on each frontage of the subject property. If the property's frontage exceeds six hundred feet, the applicant shall post one copy of the notice for each six hundred feet or fraction thereof. Notices do not have to be posted adjacent to alleys or unconstructed right-of-way. Notices shall be posted within ten feet of the street and shall be visible to pedestrians and motorists. Notices shall not be posted within the public right-of-way or on trees. The applicant shall remove all signs within ten days following the event announced in the notice.

Applicant's Response: The applicant's representative will post the project site as required.

17.50.140 – Financial guarantees.

When conditions of permit approval require a permitee to construct certain public improvements, the City shall require the permitee to provide financial guarantee for construction of the certain public improvements. Financial guarantees shall be governed by this section.

A. Form of Guarantee. Guarantees shall be in a form approved by the City Attorney. Approvable forms of guarantee include irrevocable standby letters of credit to the benefit of the City issued by a recognized lending institution, certified checks, dedicated bank accounts or allocations of construction loans held in reserve by the lending institution for the benefit of the City. The form of guarantee shall be specified by the City Engineer and, prior to execution and acceptance by the City shall be reviewed and approved by the City Attorney. The guarantee shall be filed with the City Engineer.

B. Performance Guarantees. A permittee shall be required to provide a performance guarantee as follows.

1. After Final Approved Design by The City: The City may request the Permittee to submit a Performance Guarantee for construction of certain public improvements. A permitee may request the option of submitting a Performance Guarantee when prepared for temporary/final occupancy. The guarantee shall be one hundred twenty percent of the estimated cost of constructing the public improvements as submitted by the permittee's engineer. The engineer's estimated costs shall be supported by a verified engineering estimate and approved by the City Engineer.

2. Before Complete Design Approval and Established Engineered Cost Estimate: The City may request a permittee to submit a Performance Guarantee for construction of certain public improvements. A permitee may request the option of submitting a performance guarantee before public improvements are designed and completed. The guarantee shall be one hundred fifty percent of the estimated cost of constructing the public improvements as submitted by *the permittee's engineer and approved by the City Engineer. The engineer's estimated costs shall be supported by a verified engineering estimate and approved by the City Engineer.*

C. Release of Guarantee. The guarantee shall remain in effect until the improvement is actually constructed and accepted by the City. Once the City has inspected and accepted the improvement, the City shall release the guarantee to the permittee. If the improvement is not completed to the City's satisfaction within the time limits specified in the permit approval, the City Engineer may, at their discretion, draw upon the guarantee and use the proceeds to construct or complete construction of the improvement and for any related administrative and legal costs incurred by the City in completing the construction, including any costs incurred in attempting to have the permittee complete the improvement. Once constructed and approved by the City, any remaining funds shall be refunded to the permittee. The City shall not allow a permittee to defer construction of improvements by using a performance guarantee, unless the permittee agrees to construct those improvements upon written notification by the City, or at some other mutually agreed-to time. If the permittee fails to commence construction of the required improvements within six months of being instructed to do so, the City may, without *further notice, undertake the construction of the improvements and draw upon the permittee's performance guarantee to pay those costs.*

D. *Fee-in-lieu. When conditions of approval or the City Engineer allows a permittee to provide a fee-in-lieu of actual construction of public improvements, the fee shall be one hundred fifty percent of the estimated cost of constructing the public improvements as submitted by the permittee's engineer and approved by the City Engineer. The percentage required is to ensure adequate funds for the future work involved in design, bid, contracting, and construction management and contract closeout. The engineer's estimated costs shall be supported by a verified engineering estimate and approved by the City Engineer. The fee-in-lieu shall be submitted as cash, certified check, or other negotiable instrument acceptable by the City Attorney.*

Applicant's Response: Where financial guarantees are necessary and required, the applicant will comply.

17.50.141 – Public improvements – Warranty

All public improvements not constructed by the City, shall be maintained and under warranty provided by the property owner or developer constructing the facilities until the City accepts the improvements at the end of the warranty period. The warranty is to be used at the discretion of the City Engineer or designee to correct deficiencies in materials or maintenance of constructed public infrastructure, or to address any failure of engineering design.

A. *Duration of Warranty. Responsibility for maintenance of public improvements shall remain with the property owner or developer for a warranty period of two years.*
B. *Financial Guarantee. Approvable forms of guarantee include irrevocable standby letters of credit to the benefit of the City issued by a recognized lending institution, bond, certified checks, dedicated bank accounts or allocations of construction loans held in reserve by the lending institution for the benefit of the City. The form of guarantee shall be specified by the City Engineer and, prior to execution and acceptance by the City shall be reviewed and approved by the City Attorney. The guarantee shall be filed with the City Engineer.*
C. *Amount of Warranty. The amount of the warranty shall be equal to fifteen percent of the estimated cost of construction of all public improvements (including those improvements that will become owned and maintained by the City at the end of the two year maintenance period), and shall be supported by a verified engineering estimate and approved by the City Engineer. Upon expiration of the warranty period and acceptance by the City as described below, the City shall be responsible for maintenance of those improvements.*
D. *Transfer of Maintenance. The City will perform an inspection of all public improvements approximately forty-five days before the two-year warranty period expires. The public improvements shall be found to be in a clean, functional condition by the City Engineer before acceptance of maintenance responsibility by the City. Transfer of maintenance of public improvements shall occur when the City accepts the improvements at the end of the two year warranty period.*

Applicant's Response: There are no proposed public improvements with this request. This section is not applicable to the proposed development.

CHAPTER 17.52 OFF-STREET PARKING AND LOADING

17.52.020 – Number of automobile spaces required.

A. *The number of parking spaces shall comply with the minimum and maximum standards listed in Table 17.52.020. The parking requirements are based on spaces per one thousand square feet net leasable area unless otherwise stated.*

Table 17.52.020		
Land Use	**Parking Requirements**	
	Minimum	**Maximum**
Hospital	2.00	4.00

Applicant's Response: The previously approved development, approved under file number GLUA-20-00003, addresses the required and provided parking for the Willamette Falls Medical Center. According to that land use decision, the campus requires 801 parking stalls. These minimum requirements still apply as there will not be an increase in the net leasable area. Currently, there are 840 parking stalls on site. The relocation of the helipad will result in a loss of 5 parking spaces. The remaining 835 parking spaces will continue to exceed the minimum parking requirements without impacting any designated ADA or car/vanpool spaces. The helipad does not result in any additional traffic or parking demand. The relocation of the helipad will not result in the loss of parking that impacts the required minimum number of spaces. The criteria of this Chapter have been previously satisfied under the prior development approvals.

CHAPTER 17.56 CONDITIONAL USES

17.56.010 - Permit—Authorization—Standards—Conditions.

A conditional use listed in this title may be permitted, enlarged or altered upon authorization of the Planning Commission in accordance with the standards and procedures of this title. A conditional use permit listed in this section may be permitted, enlarged or altered upon authorization of the Planning Commission or City Commission in accordance with the standards and procedures of this section. Any expansion to, alteration of, or accessory use to a conditional use shall require Planning Commission or City Commission approval of a modification to the original conditional use permit unless authorized in this chapter.

Applicant's Response: Acknowledged by the applicant. The applicant is aware that the proposed relocation of the helipad will require conditional use approval from the Planning Commission and is supporting this narrative and all accompanying attachments to support the request.

A. *Conditional uses, because of their public convenience and necessity and their effect upon the neighborhood shall be permitted only upon the approval of the Planning Commission or City Commission after due notice and public hearing, according to procedure as provided in OCMC 17.50. The applicant shall provide evidence substantiating that all the requirements of this title relative to the proposed use are satisfied, and demonstrate that the proposed use also satisfies the following criteria:*
   1. *The use is listed as a conditional use in the underlying district;*

Applicant's Response: The applicant is proposing the relocation of an existing helipad from a temporary location to a permanent location. A helipad is not listed as a conditional use within the Mixed-Use Employment district, but a helipad landing facility is permitted subject to the criteria and standards for conditional uses within section 17.56.040. Those provisions are discussed in greater detail below.

2. *The characteristics of the site are suitable for the proposed use considering size, shape, location, topography, existence of improvements and natural features;*

Applicant's Response: The area proposed for the permanent helipad location has a minor slope of 1-2%. The area is adjacent to, but outside of the NROD and Geological Hazard zones. Relocating the helipad in this area will require the removal of 5 parking spaces. This is fewer than the fourteen parking spaces currently affected by the temporary location of the helipad and the total number of parking spaces will continue to exceed the minimum parking requirements set forth by the Oregon City Municipal Code.

3. *Development shall demonstrate compliance with OCMC 16.12;*

Applicant's Response: The only component of the proposed development subject to Chapter 16.12 is the grading section 16.12.065. As stated previously in this narrative, the applicant will request a grading permit upon approval of this application. There do not appear to be any other applicable sections of this Chapter.

4. *The proposed use will not alter the character of the surrounding area in a manner which substantially limits, impairs or precludes the use of surrounding properties for the primary uses listed in the underlying district;*

Applicant's Response: The applicant is proposing to relocate an existing helipad. The existing helipad was relocated to its current location under GLUA-20-00003/MAS-20-000001, to accommodate construction. Although the proposed location is closer to the neighborhood, the nearby tree canopy located in the NROD will continue to provide a vegetated buffer that screens the helipad from the residential uses. The helipad is only utilized when a patient needs to be transferred quickly and is expected to accommodate between 6-7 flights annually unless a disaster were to occur within the region. The location is 100-feet closer to the residential uses, but still located within the same area of the campus. Residents in the nearby neighborhoods are not expected to experience any increased noise or glare with the new helipad location. Lighting is low level and proposed to be activated only during take-off and landing. Appendix 14, is a memorandum from David Ketchum, the founder and Primary Planner with Airsafe a firm that provides consultation and design of general aviation facilities. The memorandum is a list of points related to the operation of the proposed helipad. The firm has worked on over 300 hospital heliport projects around the country.

5. *The proposal satisfies the goals and policies of the city comprehensive plan which apply to the proposed use.*

Applicant's Response: In preparing this neighborhood, only the following goals and policies appear to apply to the proposed helipad use.

Goal 6.3 Nightlighting

Protect the night skies above Oregon City and facilities that utilize the night sky, such as the Haggart Astronomical Observatory, while providing for nightlighting at appropriate levels to ensure safety for residents, businesses, and *users of transportation facilities, to reduce light trespass onto neighboring properties, to conserve energy, and to reduce light pollution via use of night-friendly lighting.*

Policy 6.3.1

Minimize light pollution and reduce glare from reaching the sky and trespassing onto adjacent properties.

Applicant's Response: The proposed helipad will be lit only during operation and will be provided with low level lighting. According to David Ketchum's memorandum, most pilots will utilize night vision goggles. A photometric plan is provided as sheet E4.0.01 no fugitive lighting is proposed off of the heli-pad. There may be lights associated with the aircraft itself those impacts are limited to take-off and landing of the aircraft as well and will not be permanent impacts to the site or neighborhood.

Goal 6.4 Noise

Prevent excessive noise that may jeopardize the health, welfare, and safety of the citizens or degrade the quality of life.

Policy 6.4.1

Provide for noise abatement features such as sound-walls, soil berms, vegetation, and setbacks, to buffer neighborhoods from vehicular noise and industrial uses.

Applicant's Response: The noise associated with the proposed helipad is expected to occur 6-7 times a year. The existing vegetation that currently screens the neighborhood from activities on site will remain the same. As provided in Appendix 14, the modern helicopter that is likely to serve the hospital are newer generation helicopters that are quieter than their predecessors by improvements made to the aircraft's engine and frame. Finally, a noise memorandum provided by Erik Miller-Klein, PE and Principal of Acoustical Engineering at Tenor-Engineering has been provided as appendix 017 to this narrative. Mr. Miller-Klein concludes that the new proposed location is acoustically similar to the original heliport location and will be significantly quieter than the current temporary location. The neighborhood is not expected to experience an increase in noise beyond what occurs today given that the frequency of operations is not expected to increase.

B. Permits for conditional uses shall stipulate restrictions or conditions which may include, but are not limited to, a definite time limit to meet such conditions, provisions for a front, side or rear yard greater than the minimum dimensional standards of the zoning ordinance, suitable landscaping, off-street parking, and any other reasonable restriction, condition or safeguard that would uphold the spirit and intent of the zoning ordinance, and mitigate adverse effect upon the neighborhood properties by reason of the use, extension, construction or alteration allowed as set forth in the findings of the Planning Commission.

Applicant's Response: The applicant and owner would accept reasonable restrictions and conditions on the proposed development provided they were warranted and proportional to the impacts created by the proposed development.

C. Any conditional use shall meet the dimensional standards of the zone in which it is to be located pursuant to subsection B. of this section unless otherwise indicated, as well as the minimum conditions listed below.

Applicant's Response: The proposed helipad is not a structure in the conventional sense of the term, but it has been designed and located to exceed the required setbacks of the MUE zone. Overall, the development will continue to comply with the findings and conditions of the previously approved detailed development plan and master plan approvals that were issued in June of 2020 under file number GLUA-20-00003 and NAS-20-0000.

D. In the case of a use existing prior to the effective date of the ordinance codified in this title and classified in this title as a conditional use, any change of use expansion of lot area or expansion of structure shall conform with the requirements for conditional use.

Applicant's Response: This is a proposal to relocate an existing helipad approximately 100 feet south and east of the existing helipad that was demolished to make way for a new cancer center at the hospital. The hospital will comply with the requirements for the conditional use as required.

E. The Planning Commission may specifically permit, upon approval of a conditional use, further expansion to a specified maximum designated by the Planning Commission without the need to return for additional review.

Applicant's Response: Noted by the applicant. The proposed helipad is not expected to be expanded anytime in the near future and this request does not request approval of any future expansion. Any future changes, modifications, or expansion plans will be coordinated with city staff and the Planning Commission if warranted.

17.56.020 - Permit—Application.

A. A property owner or authorized agent shall initiate a request for a conditional use by filing an application with the city recorder. The applicant shall submit a site plan, drawn to scale, showing the dimensions and arrangement of the proposed development. The application shall be accompanied by the filing fee listed in OCMC 17.50.080 to defray the costs of publication, investigation and processing.

Applicant's Response: This application, narrative, and all accompanying documentation is being filed on behalf of the owner and initiated by the applicant. All required plans, reports, and fees have been submitted along with this request as required.

B. Before the Planning Commission or City Commission may act on a conditional use application, it shall hold a public hearing thereon, following procedure as established in OCMC 17.50.

Applicant's Response: The team is aware of this requirement and will attend the hearing to provide testimony once the hearing has been scheduled.

17.56.025 - Minor modifications to legal conditional uses.

Minor modifications to an approved conditional use permit may be permitted. If permitted, the modification shall be reviewed as a minor site plan and design review. A minor modification to an approved conditional use permit is considered one of the following:

A. Modification to a structure for the purpose of enhancing the aesthetics of the building and there is no increase in the interior usable space;

B. Except for shelters, a maximum addition of up to one thousand square feet to a commercial, office, institutional, public, multi-family, or industrial building provided that the addition is not more than thirty-five percent of the original building square footage; or

C. Revisions to parking alignment and/or related vehicle circulation patterns.

Applicant's Response: The proposed development will not impact the building aesthetics or interior, will be larger than 1,000 square feet, and will result in the removal of 5 existing parking spaces. This proposal is not a minor modification.

17.56.040 - Criteria and standards for conditional uses.

In addition to the standards listed herein in OCMC 17.56.010, which are to be considered in the approval of all conditional uses and the standards of the zone in which the conditional use is located, the following additional standards shall be applicable:

A. Building Openings. The city may limit or prohibit building openings within fifty feet of residential property in a residential zone if the openings will cause glare, excessive noise or excessive traffic which would adversely affect adjacent residential property as set forth in the findings of the Planning Commission.

Applicant's Response: There are no proposed alterations to any building openings with this request. This criterion is not applicable to the proposed development.

B. Additional Street Right-of-Way. The dedication of additional right-of-way may be required where the city plan indicates need for increased width and where the street is inadequate for its use; or where the nature of the proposed development warrants increased street width.

Applicant's Response: This request will not impact any adjacent street and is access to the site is not impacted by this request. It would not appear that additional street right of way is warranted or proportional to the impacts associated with the proposed helipad relocation. The applicant is not proposing any dedication with this proposal.

C. Public Utility or Communication Facility. Such facilities as a utility substation, water storage tank, radio or television transmitter, tower, tank, power transformer, pumping station and similar structures shall be located, designed and installed with suitable regard for aesthetic values. The base of these facilities shall not be located closer to the property line than a distance equal to the height of the structure. Hydroelectric generation facilities shall not exceed ninety megawatts of generation capacity.

Applicant's Response: The proposed development does not include any of the facilities listed above. This criterion is not applicable to this proposal.

D. Schools. The site shall be located to best serve the intended area, shall be in conformance with the city plan, shall have adequate access, and shall be in accordance with appropriate State standards.

Applicant's Response: The proposed development does not include a school or school facility. This criterion is not applicable to this proposal.

E. Helipad Landing Facility.

1. Size of runways and landing areas;

Applicant's Response: The helipad is proposed to have an area of approximately 1,600 square feet. The helipad has been designed in accordance with the standards of the Federal Aviation Commission and will support near vertical take-off and landings.

2. Approaches and obstructions within the runways and landing areas;

Applicant's Response: There are four existing trees that are proposed to be removed in support of the proposed helipad. Those trees have been identified as possible obstructions and will be mitigated for by planting 8 new trees nearby. There may be an indicator light placed upon an existing light pole just south and west of the helipad to ensure that pilots are aware of the pole.

3. Fencing and/or screening to provide visual and noise buffering and to deflect winds or blast due to aircraft operation;

Applicant's Response: The helipad is proposed to be relocated approximately 100 feet to the south and east of the previous location, and no changes in the frequency of use are anticipated. The helipad is operational six to seven times a year. The relocated helipad will be buffered by existing vegetation and according to David Ketchum's findings, the helicopters would not be expected to impact nearby residences beyond what they already experience with the existing location.

4. Fire protection measures and equipment;

Applicant's Response: A fire extinguisher will be provided at the helipad location and emergency access to the helipad is provided through the previously approved circulation through the site.

5. Night illumination adequate for operations, and its effects upon surrounding property;

Applicant's Response: The proposed lighting and landing markers are very specific. As described in Appendix 14, "…pilots use night vision goggles that become nearly useless at brightly lighted heliports. Modern helipad design calls for light fixtures that produce barely noticeable light impacts beyond the helipad area. The design goal of using just enough of the right kind of light to provide pilots with a safe NVG operating environment has the added benefit of reduced light impacts on surrounding communities. Light fixtures at the helipad will consist of eight (8) embedded, flush-mounted, green LED perimeter lights and four (4) downward focused flood lights to provide a safe patient-transfer working environment. Floodlights will be on only during transfers of patients from gurneys to helicopters. A lighted wind indicator and a yet to be determined number of roof-mounted LED obstruction lights will be used. Operational lights at the helipad will only be on during helicopter operations. Depending on operator specific NVG policies and procedures helicopter pilots may use on-board landing lights as they approach and depart the helipad." A lighting plan illustrating that the proposed lighting on the helipad will only affect the landing surface is included with the plan set.

6. Landing markers;

Applicant's Response: Landing markers will be provided in accordance with FAA requirements.

7. Structural adequacy of runways, pads and other structures;

Applicant's Response: The proposed helipad has been designed in consultation with a Geotech engineer based on the operational characteristics of the site and weight of the aircraft. The Geotech also evaluated the soils on site and the presence of an existing landslide. That report is attached as Appendix

005 to this report and concludes that the proposed structure will be structurally sound and is not expected to compromise the integrity of the nearby geohazard.

8. Paving and ground cover materials in relation to noise and down wash.

Applicant's Response: The helipad is proposed to be concrete with low lying landscape around the facility. To the extent additional improvements are found to be warranted and conditioned, the applicant will comply.

F. Residential Care Facilities.

1. In addition to the general provisions of OCMC 17.56.020, any application shall include a description of the proposed use, including the number of residents and the nature of the condition or circumstances for which care, or a planned treatment or training program will be provided, the number of staff and the estimated length of stay per resident and the name of the agency responsible for regulating or sponsoring the use.

Applicant's Response: The proposed development does not include a residential care facility. These criteria are not applicable to this development.

G. Bed and Breakfast Inns.

1. The bed and breakfast inn shall maintain all applicable licenses required by governmental agencies for the use described in the application.

Applicant's Response: The proposed development does not include a bed and breakfast. These criteria are not applicable to this development.

H. Shelters.

1. Shelters shall be processed as a Type IV review.

Applicant's Response: The proposed development does not include a shelter. These criteria are not applicable to this development.

17.56.060 - Revocation of conditional use permits.

The Planning Commission or the City Commission may initiate administrative action under Chapter 17.50 to revoke any conditional use permit previously issued by the city or, with regard to lands annexed by the city, those such permits issued by the county. The Planning Commission or the City Commission, may revoke such permit upon determining:

A. One or more conditions attached to the grant of the conditional use permit have not been fulfilled; and
B. The unfulfilled condition is substantially related to the issuance of the conditional use permit.

Applicant's Response: The applicant acknowledges the events that may result in a revocation of a conditional use permit.

17.56.070 - Periodic review of conditional use permits.

A. The City Commission may provide for the periodic review of some or all of the conditional use permits previously issued by the city, or, with regard to lands annexed by the city, those such permits issued by the county. In providing for such review, the City Commission may designate classes of such previously issued permits for which periodic review shall be undertaken.

B. Such review shall be accomplished as an administrative action under Chapter 17.50 and shall be limited to the question of whether additional conditions should be imposed on a conditional use in the light of changing circumstances and more efficient implementation of the city's comprehensive plan.

C. Notwithstanding the provisions of Chapter 17.58, any additional conditions shall be met as a requirement for continued operation of the conditional use.

Applicant's Response: The applicant acknowledges the periodic review of some or all of the conditional use permit(s) issued by the City.

CHAPTER 17.62 SITE PLAN AND DESIGN REVIEW

17.62.035 – Minor site plan and design review.

This section provides for a minor site plan and design review process. Minor site plan review is a Type I or Type II decision, as described in OCMC 17.62.035.A, subject to administrative proceedings described in OCMC 17.50 and may be utilized as the appropriate review process only when authorized by the community development director. The purpose of this type of review is to expedite design review standards for uses and activities that require only a minimal amount of review, typical of minor modifications and/or changes to existing uses or buildings.

A. Type I Minor Site Plan and Design Review.

1. Applicability. Type I applications involve no discretion and are typically processed concurrently with a building permit application. The Type I process is not applicable for:

a. Any activity which is included with or initiates actions that require Type II—IV review.

b. Any increase in square footage of a conditional or nonconforming use (excluding nonconforming structures).

c. Any proposal in which nonconforming upgrades are required under OCMC 17.58.

d. Any proposal in which modifications are proposed under OCMC 17.62.015.

Applicant's Response: The proposed project is subject to a Minor Type I Site Plan review. A Conditional Use review, Type III, is required for the helipad. In accordance with the policies of the City of Oregon City, the Minor Type I Site Plan review will be reviewed as a Type III.

III. Conclusion

This narrative along with the supporting documentation and appendices demonstrate that the proposed development is an allowed conditional use and that it is feasible for the proposed development to comply with the applicable provisions of the Oregon City Municipal Code and Comprehensive Plan. The applicant respectfully requests approval of the proposed helipad relocation.

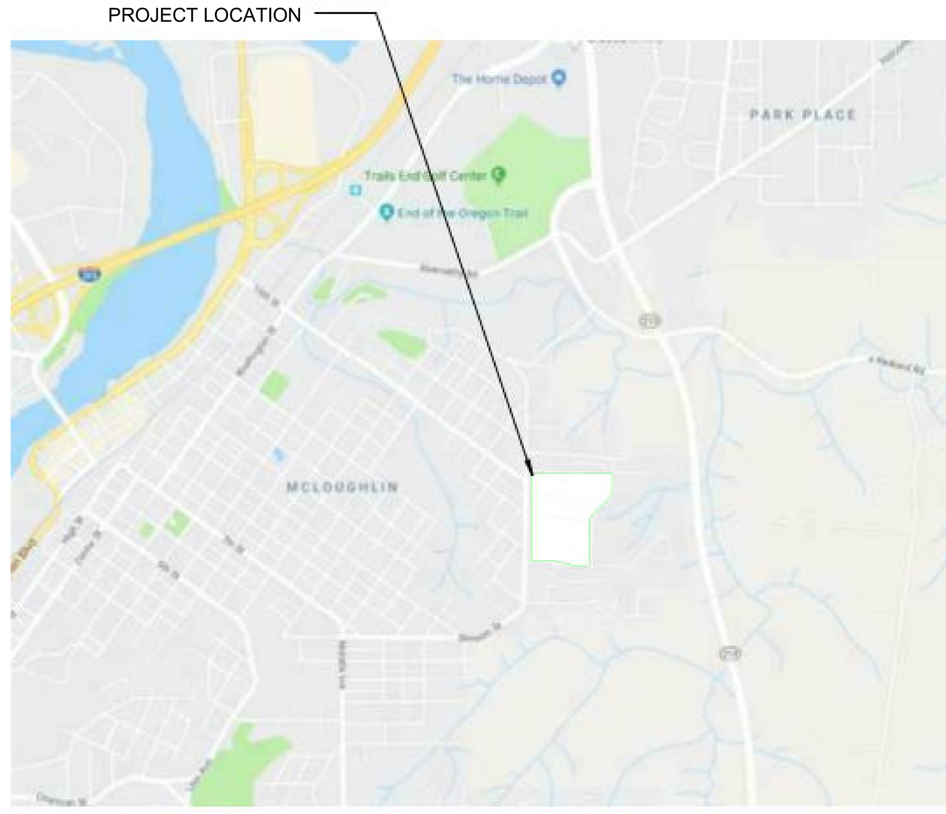
PWF Helipad Relocation

Providence Willamette Falls

1500 Division St., Oregon City, OR 97045

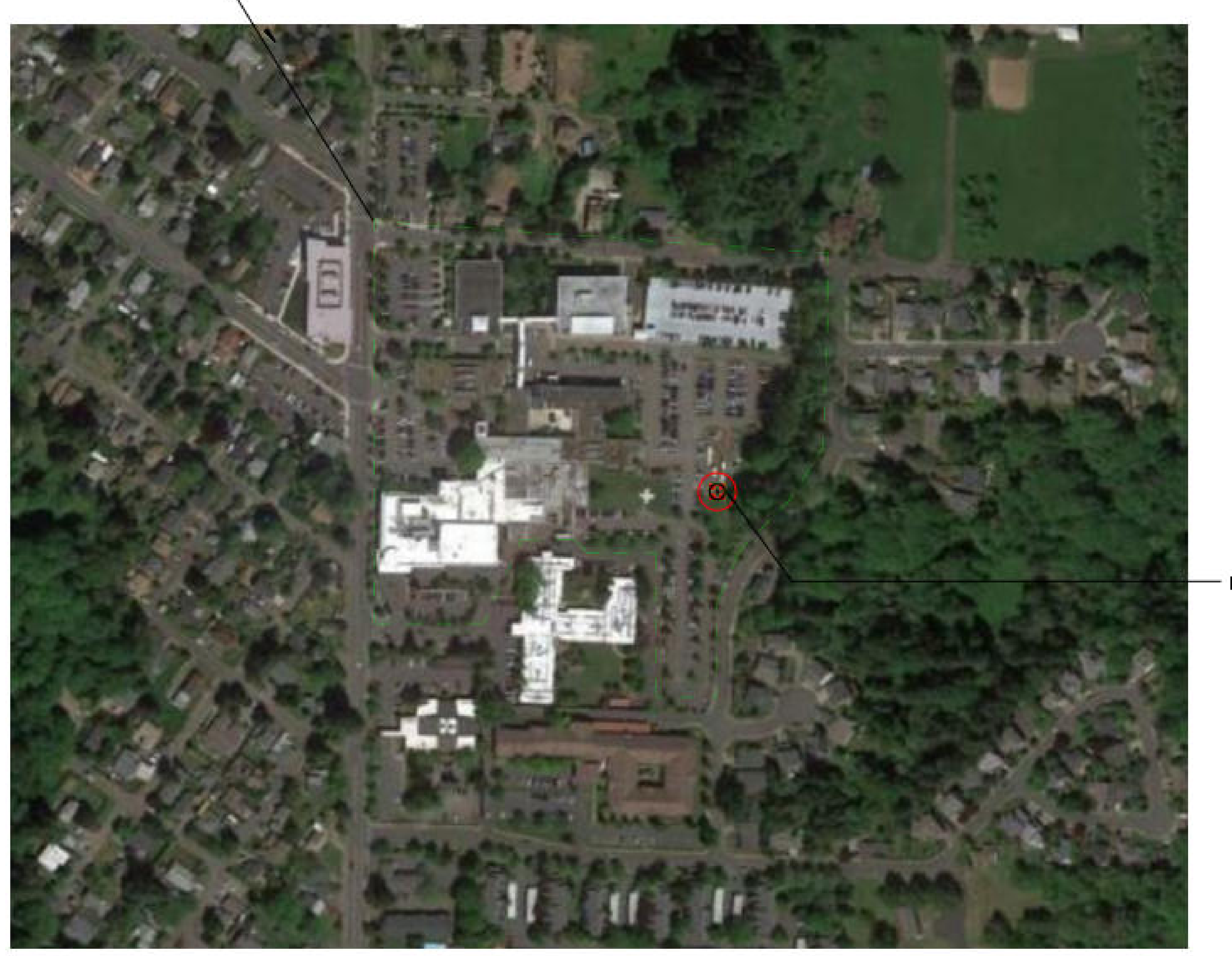
VICINITY MAP

PROJECT LOCATION



CAMPUS MAP

AREA OF WORK



HELIADP LOCATION

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PAE ENGINEERS
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SHEET INDEX

24 May 2022 - Land Use App.

PROVIDENCE Health & Services

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Consultant:

Project Title:
East Expansion Helipad

PKA Project Number: 171101T

Providence Willamette Falls
1500 Division St. Oregon City
OR 97045

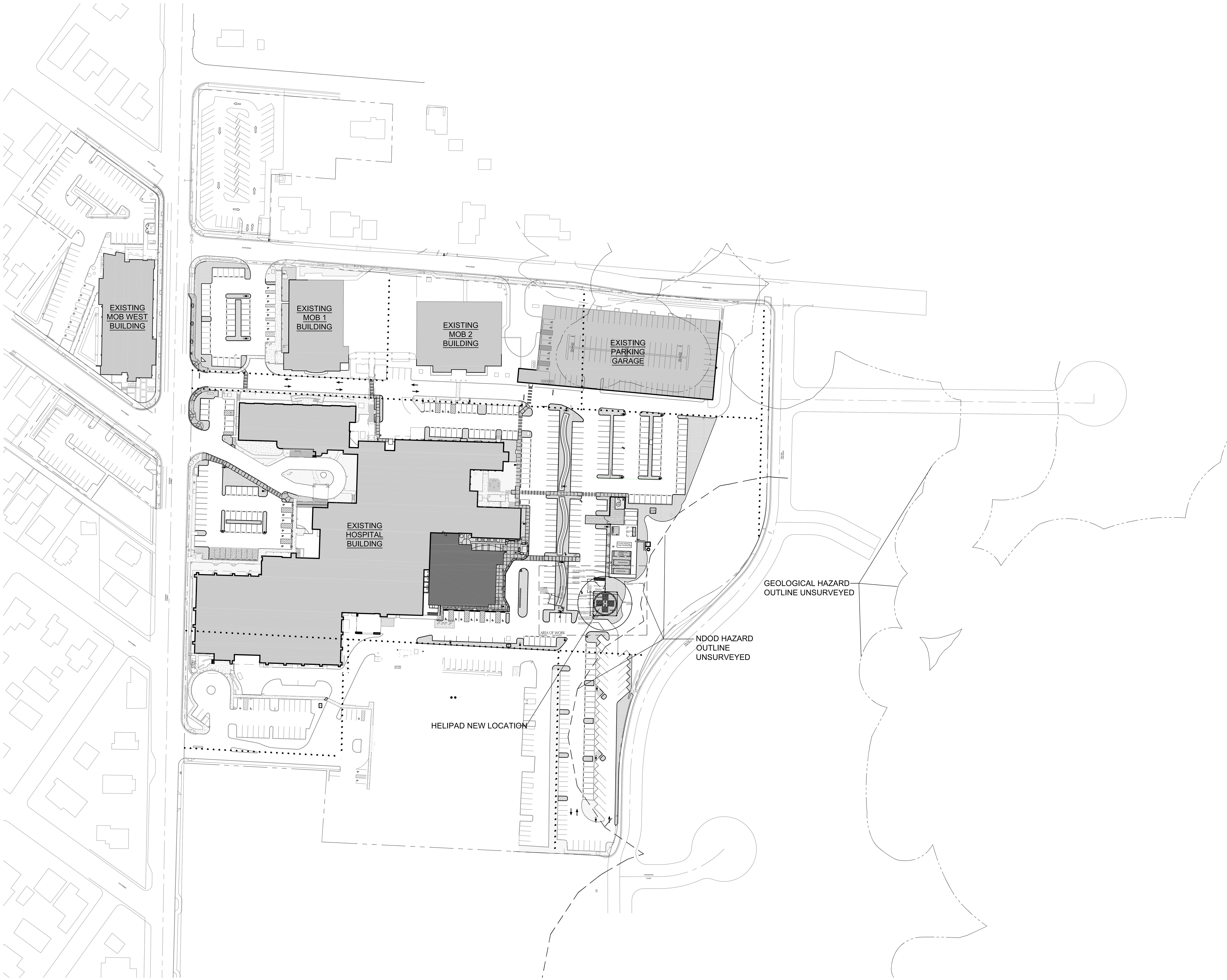
Key Plan

Revisions shown below may not apply to this publication

Revison	Date

Sheet Title
Cover Sheet

Sheet Number:
LUA.00



Overall Site Plan - Helipad 1
1/64" = 1'-0"
ACTUAL NORTH

24 May 2022 - Land Use App.

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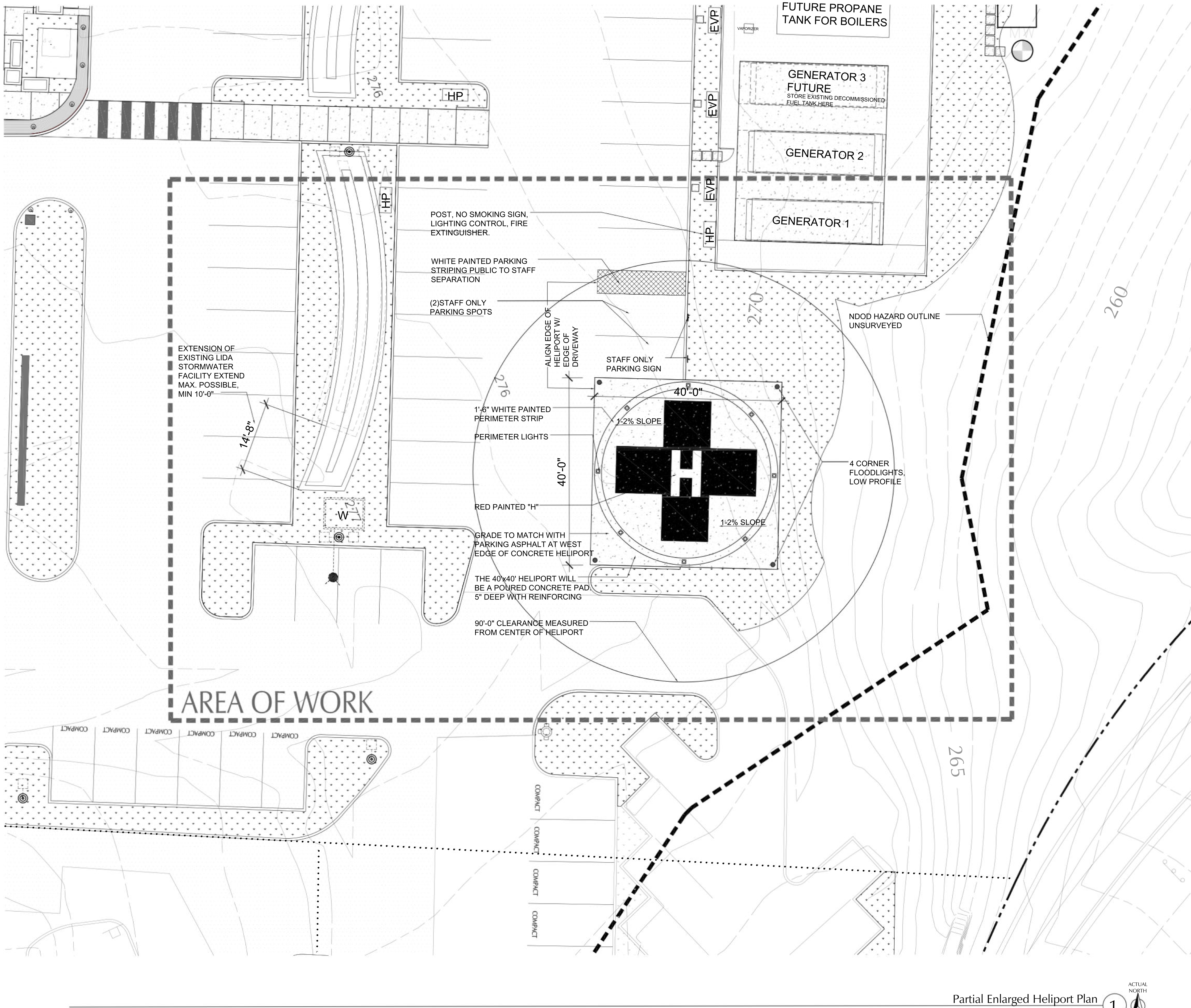
Key Plan

Revisions shown below may not apply to this publication

Revison	Date

Sheet Title:
Overall Site Plan Helipad Relocation

Sheet Number:
LUA 3.00



Partial Enlarged Heliport Plan 1
1/8" = 1'-0"
ACTUAL NORTH

Site Plan Legend:

- Property Line
- Tax Lot Line
- Easements
- Road center line
- Helipad area
- Geological Hazard Outline Unsurveyed
- NDOD Hazard Outline Unsurveyed
- Area Of Work
- Existing Building
- Site Pole Lights with precast concrete bases. See Specifications and Electrical Drawings.
- New Landscape Area: See Landscape drawings for planting types.
- New Concrete Sidewalk & slabs: See Civil drawings. Broom finish with control and expansion joints as shown.
- New Asphalt Pavement: See Civil drawings.
- Detention Facility.
- P — Power Vault.
- W — Water Vault.
- FH — Fire Hydrant
- FDC — Fire Department Connection
- (E) — Existing
- Painted Curb: See associated keynote.
- B — Concrete Bollard
- EVP — Electric Vehicle Power Charger
- HP — Helipad signage

Site Plan Keynotes:

S1 Painted ADA markings. See detail 9/A1.8.01.
S2 Handicap Accessible sign: relocate existing signs on new poles, remainder of signs to be new to match existing. See also Site Demolition Plan. . See 2/A1.8.01 for typical handicap parking stall layout.
S3 Painted crosswalk: See 13/A1.8.01.
S4 Painted stop bar on pavement: See 11/A1.8.01.
S5 Painted yield line on pavement: See 12/A1.8.01.
S6 Wheel stop: See 10/A1.8.01 and Civil drawings.
S7 Concrete Bollard. Keep 9'-0" max. distance between bollards.
S8 Painted traffic striping. See detail 11/A1.8.01.
S9 Painted striping: See Specifications for color and size.
S10 Concrete curb: See Civil drawings for details.
S11 Existing parking spaces to remain. Repaint existing striping.
S12 Existing concrete walkway to remain. Adjacent new concrete walkway to be flush with existing.
S13 Existing light pole and electric utility to remain. Protect from damage.
S14 Chain link fence: See Civil drawings.
S15 Fire hydrant: See Civil drawings. Provide blue reflective hydrant markers adjacent and to the side of the centerline of the access roadway per Tualatin Valley Fire & Rescue requirements.
S16 Asphalt paving: See Civil drawings.
S17 Stop Sign: relocate existing signs on new poles where possible, remainder to be new.
S18 Concrete walkway raised ½" above adjacent asphalt (no curb).
S19 Relocated Van Accessible sign on new pole. See also Site Demolition Plan.
S20 Pedestrian ramp: See Civil drawings.
S21 Retaining wall: See Civil drawings.
S22 3'-0" wide detectable warning strip (6" curb flat with warning strip), grooved parallel to curb: See Civil drawings.
S23 Clean up and check drainage in remaining slab where oxygen equipment is mounted.
S24 Helipad area. Paint curbs, landing signs, parking strips and helipad related signs in orange color.
S25 Concealed landing lights.
S26 Existing EV chargers.
S27 Proposed location for future EV chargers. 18"X18" Conc. slab for charger mounting
~~S28 Concrete scoring. 6'-0" X 6'-0" Pattern.~~
S29 Existing concrete pad, electrical vault hatch and transformer. Paint transformer to match building panel color MP-4.
S30 Exposed concrete planter for building column protection.
S31 Align warning strip edge with tree well as shown.
S32 Concrete wheel stop. TYP.
S33 Tree wells. Refer to civil & landscape.
S34 Refer to structural for retaining wall.
S35 Refer to new building drawings for stairs and emergency exit.
S36 Painted steel bike racks. Keep clearances as per code requirements.
S37 Concrete planter. Finish exposed or painted. See details.
S38 Precast concrete bench.
~~S39 Relocated 2 existing store containers.~~
S40 13'-0" X 8'-0" 2 leaves (4' + 9') gate with lock, heavy duty wheel on both leaves, and drop bolt. Infill to match adjacent metal fence.
S41 Concrete slab to support 3 generators + fuel tanks, weight 20,000 lbs. per unit. Refer to structural.
S42 12'-0"X14'-0" concrete slab for electrical gear.
S43 4'-0"X8'-0" gate infill to match adjacent chain link fence.
S44 Existing Shack.
S45 Existing well head.
S46 Concrete slab for maintenance access. Refer to civil drawings.
S47 Metal panel fence. Panel AEP Span, concealed fastener, Flex Series 1.2FX10-12, color to match East Addition Building mechanical screen. refer to structural for poles and foundation.
S48 Waste receptacle.

24 May 2022 - Land Use App.

PROVIDENCE Health & Services

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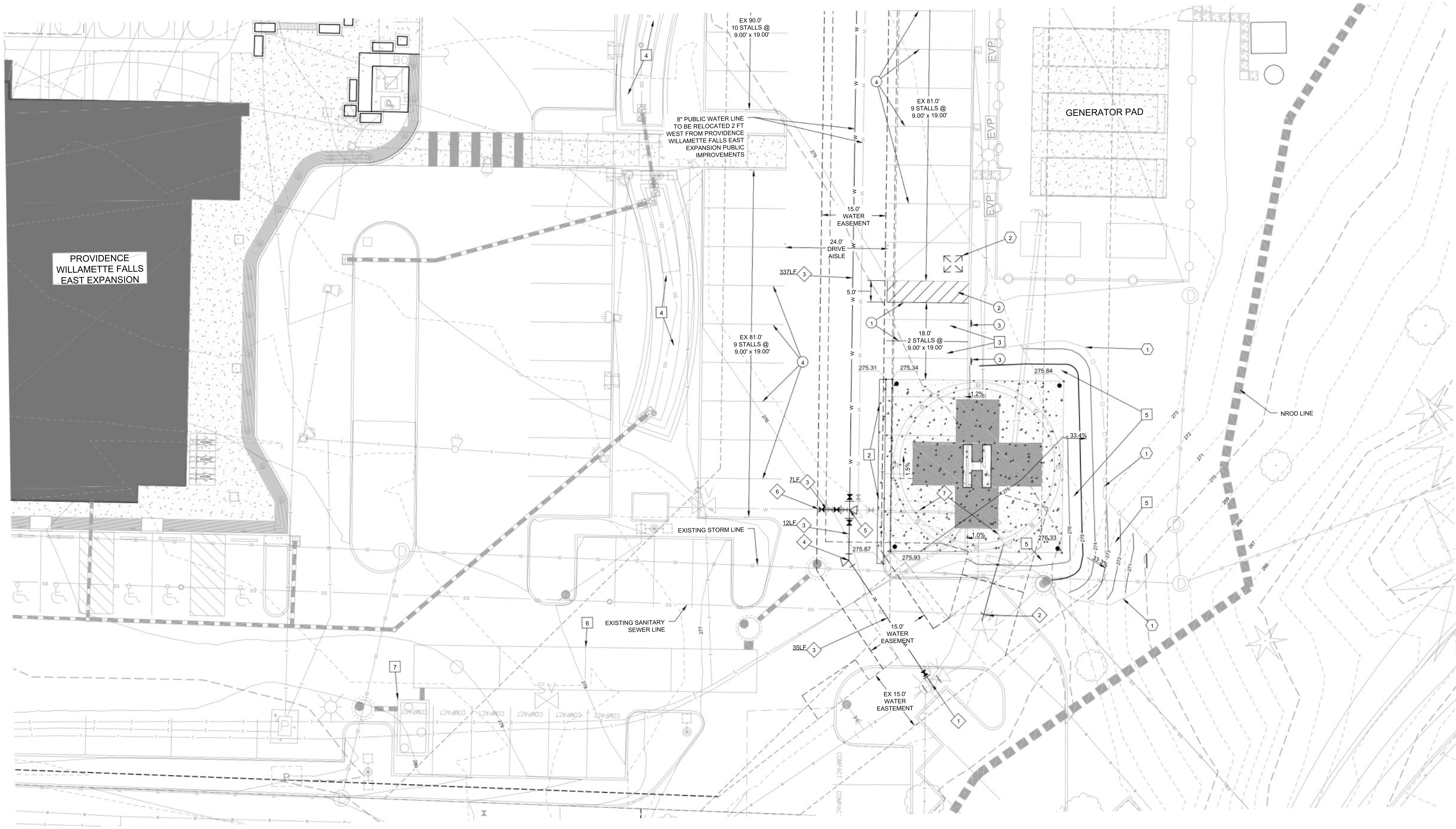
Revison	Date
ASI 004	07 Apr 2022

Sheet Title
Partial Enlarged Heliport Relocation Plan

Sheet Number:
LUA 3.01



LEGEND

- RIGHT OF WAY LINE
- EXISTING CURB
- EXISTING SIDEWALK
- EXISTING STRIPING
- PROPOSED STRIPING
- EXISTING SAWCUT
- EXISTING STORMWATER PIPE
- SS EXISTING SANITARY SEWER PIPE
- W PROPOSED WATER LINE
- PROPOSED CONCRETE
- EXISTING PLANTER AREA
- EXISTING STORMWATER MANHOLE
- EXISTING STORMWATER AREA DRAIN
- EXISTING STORMWATER VAULT
- EXISTING DETENTION FACILITY
- EXISTING SANITARY SEWER MANHOLE
- EXISTING SANITARY SEWER MANHOLE
- EXISTING WATER VAULT
- SEDIMENT BARRIER (PERIMETER)
- CONCRETE WASHOUT

SITE CONSTRUCTION NOTES

1. INSTALL CONCRETE HELIPAD. SEE HELIPAD PLANS FOR STRIPPING AND LIGHT DESIGN.
2. INSTALL P.C. CONCRETE VALLEY GUTTER
3. INSTALL HOSPITAL STAFF PARKING STALL
4. STORMWATER SWALE UNDER PROVIDENCE WILLAMETTE FALLS EAST EXPANSION PUBLIC IMPROVEMENTS.
5. INSTALL 1FT BENCH AROUND HELIPAD AND SLOPE AT 3:1 MAX CATCH GRADING
6. UNDERGROUND STORMWATER DETENTION SYSTEM INSTALLED UNDER PROVIDENCE WILLAMETTE FALLS PUBLIC IMPROVEMENTS
7. MECHANICAL WATER QUALITY FILTERS INSTALLED UNDER PROVIDENCE WILLAMETTE FALLS PUBLIC IMPROVEMENTS

SIGNING AND STRIPING CONSTRUCTION NOTES

1. INSTALL 4" WIDE WHITE PARKING STRIPE. 2 COATS MINIMUM.
2. INSTALL 4" WIDE WHITE STRIPE OUT. 2 COATS MINIMUM.
3. INSTALL HOSPITAL STAFF PARKING SIGN ON STEEL BREAKAWAY SIGN.
4. EXISTING PARKING STALL INSTALLED UNDER PROVIDENCE WILLAMETTE FALLS EAST EXPANSION PROJECT.

WATER CONSTRUCTION NOTES

1. CONNECT TO EXISTING PUBLIC WATER MAIN. CONTRACTOR TO POTHOLE AND VERIFY CONNECTION PRIOR TO CONSTRUCTION AND TO NOTIFY ENGINEER OF ANY DISCREPANCIES.
   INSTALL-
   8" TEE (MJ)
   (1)-8" GATE VALVE (MJ)
   THRUST BLOCK
2. INSTALL CAP ON EXISTING WATER LINE AFTER EXISTING TEE FITTING.
3. INSTALL 8" PUBLIC CLASS 52 DUCTILE IRON WATER LINE. SEE PLAN FOR LENGTH. PIPE TO HAVE PUSH ON JOINTS WITH RUBBER GASKETS AND RESTRAINED JOINTS.
4. INSTALL-
   8"-11.25° BEND
   8"-22.5° BEND
   THRUST BLOCK
   BEND TO BE FULLY RESTRAINED
5. INSTALL-
   8" TEE (MJ)
   (3)-GATE VALVES (MJ)
   THRUST BLOCK
6. CONNECT TO FIRE SERVICE LINE INSTALLED UNDER PROVIDENCE WILLAMETTE FALLS EAST EXPANSION.
7. PUBLIC WATER LINE UNDER PROVIDENCE WILLAMETTE FALLS EAST EXPANSION TO BE RELOCATED.

EROSION CONTROL NOTES

1. INSTALL AND MAINTAIN SEDIMENT FENCE PARALLEL TO SLOPE CONTOURS.
2. INSTALL 7' X 7' ECOPAN CONCRETE WASHOUT (OR APPROVED EQUAL). LOCATION MAY VARY DUE TO CONSTRUCTION. CONTRACTOR TO CLEAN OUT AREA AS NECESSARY TO MAINTAIN CAPACITY. DO NOT DISPOSE OF WASHOUT WATER INTO STORM DRAINS OR COMBINED SERER DRAINS. SEE DETAIL ON SHEET C501.

GENERAL GRADING NOTES

1. ALL EROSION CONTROL MEASURES ARE TO BE IN PLACE PER OREGON CITY STANDARDS.
2. SLOPE/DIRECTION ARROWS SHOWN ARE FOR REFERENCE ONLY.
3. ALL SPOT GRADE ELEVATIONS SHOWN ARE INTENDED TO TIE INTO EXISTING GRADES. GRADES SHOWN ARE MEANT TO FACILITATE DRAINAGE TOWARD THE NEAREST CATCH BASIN. NOTIFY ENGINEER IMMEDIATELY IN CASE OF DISCREPANCIES.
4. ALL EXISTING CONTOURS SHOWN ARE APPROXIMATE AND ARE PROVIDED FOR REFERENCE ONLY.
5. CONTRACTOR TO PROTECT EXISTING SUBGRADE AND STORMWATER BASIN AREA DURING CONSTRUCTION FROM SEDIMENT LADEN WATER.

N

20 0 20 40
SCALE IN FEET

24 May 2022 - Land Use App.

PROVIDENCE Health & Services

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Stamp:

Not For Construction

Consultant:

DOWL
DOWL PROJECT NO. 14594-03

Project Title:

East Expansion Helipad

PKA Project Number:

Willamette Falls Medical Center
1500 Division St, Oregon City OR 97045

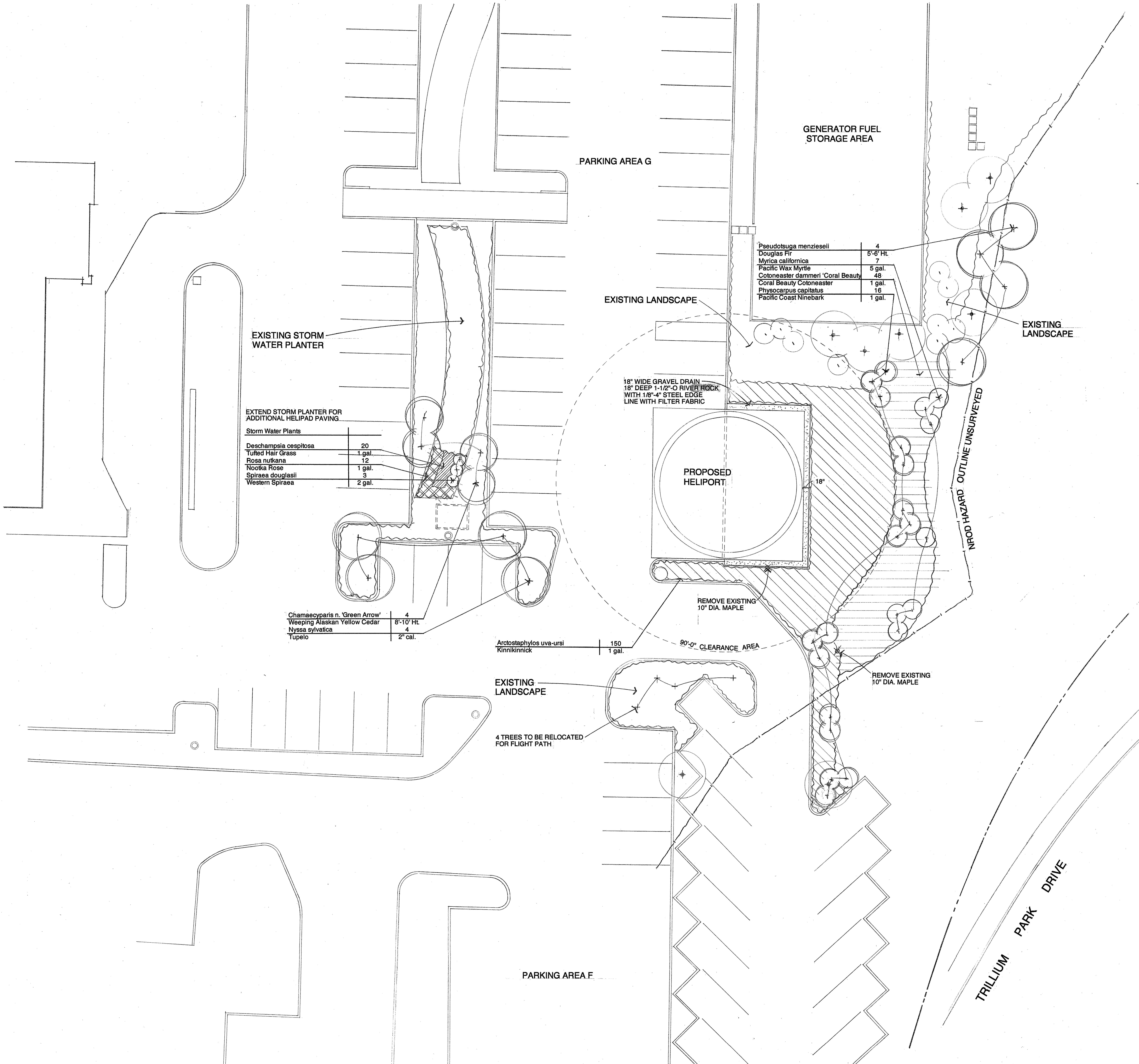
Key Plan

Revisions shown below may not apply to this publication

Revison	Date

Sheet Title
GRADING, EROSION CONTROL, AND UTILITY PLAN

Sheet Number:
C100



1 PARTIAL ENLARGED HELIPORT LANDSCAPE PLAN
SCALE: 1" = 10' - 0"

PLANTING NOTES

1. Layout all plant material within a defined area at the same time, prior to planting, for layout and adjustment approval by Landscape Architect. Land. Arch. reserves the right to order adjustments and changes in plant locations. Notify Land. Arch. minimum of 72 hours in advance of inspection for layout.
2. **Submit within 7 days after contract award date**, a list of plant material and verification of source and quality specified. If specified plant material is not available, submit proof of non-availability and proposed substitutions for Land. Arch. approval.
3. Locate existing underground utilities in the areas of work. Protect as necessary; repair any damaged utility at no cost to the Owner or the utility owner. Where underground construction or obstructions will not permit the planting of plant materials in accordance with the plans, new locations for the plant material will be designated by the Land. Arch.
4. Sitework Protection; cover and protect all existing sitework as necessary, repair any damages.
5. The Contractor shall at all times keep the job site clean and free from accumulation of waste materials, debris and rubbish.
6. Remove all debris and stones over 2" from top 6" of existing soil.
7. Grade all areas smooth insuring positive drainage.
8. Soil amendment: Till 4" min. depth of organic amendment (2/3 Rexius "Love Food not Waste Compost mixed with 1/3 Rexius "Bio-Tope" or approved equal) into the top 12" inches of topsoil. Provide receipts to Land. Arch. verifying source of material and quantities. Install sandy loam topsoil to raise grade as required in all planting beds and planters. Incorporate with subsoil to eliminate any hard pan.
9. Pocket plant all plants on slopes exceeding 4:1. Excavate planting pits twice as wide as root ball and backfill with equal parts compost (same blended compost as listed above) and native soil, mix prior to backfilling.
10. Mulch all planting beds at new planting installation with 3" min. depth composted bark or approved equal.
11. Set top of root balls 2" higher than and shrub root balls 1" higher than adjacent grades. Form saucer with mulch.
12. Plant material shall conform to ANSI Z60.1 "American Standard for Nursery Stock" (AAN). all trees shall be B&B or container stock unless noted otherwise.
13. When conditions detrimental to plant growth are encountered, correct before planting or adding soil amendment. Do not proceed with work until unsatisfactory grades or other conditions have been corrected.
14. Warrantee all plants for one year from the date of final acceptance of the plant installation. The contractor shall make all necessary effort to avoid plant mortality during the warrantee period and shall review planting conditions at least three time during the warrantee period.
15. Install actual quantities required by plan. Any quantities listed are for estimating purposes only.
16. Fill all planters and new planting areas with a minimum of 18" of sandy loam topsoil and required soil amendment to within 3" of top of planter. Scarify sub-grade below platers and planting area to insure no hardpan layer is created.

PLANTING SCHEDULE

QTY	SCIENTIFIC NAME	COMMON NAME	SIZE	SPACING
TREES				
4	Nyssa sylvatica	Tupelo	2" cal.	AS SHOWN
4	Pseudotsuga menzieseii	Douglas Fir	5'-6' Ht.	AS SHOWN
EVERGREEN TREES				
4	Chamaecyparis nootkatensis 'Green Arrow'	Weeping Alaskan Yellow Cedar	8'-10' Ht.	AS SHOWN
SHRUBS				
48	Cotoneaster dammeri 'Coral Beauty'	Coral Beauty Cotoneaster	1 gal.	36" o.c.
7	Myrica californica	Pacific Wax Myrtle	5 gal.	AS SHOWN
16	Physocarpus capitatus	Pacific Coast Ninebark	1 gal.	AS SHOWN
3	Spiraea douglasii	Western Spiraea	2 gal.	36" o.c.
ROSES				
12	Rosa nutkana	Nootka Rose	1 gal.	36" o.c.
GRASSES				
20	Deschampsia cespitosa	Tufted Hair Grass	1 gal.	24" o.c.
GROUNDCOVERS				
150	Arctostaphylos uva-ursi	Kinnikinnick	1 gal.	18" o.c.

PARKING AREA LANDSCAPE NOTES:

- Heliport will eliminate 3 parking spaces
- Heliport changes do not require any additional interior parking lot landscape, no change to interior landscape area proposed
- 2 existing trees will be removed to provide clear flight path for heliport. 12 new trees are proposed

PARKING AREA LANDSCAPE TABLE

General Parking Lot Information		Interior Parking Lot Landscaping Area			Interior Parking Area Trees	
Parking Lot	Number of Parking Spaces	Parking Lot Area (SF)	Interior Landscaped Area (SF)	Interior Percentage Landscaped	Required	Provided
F	91	36,431	4,159	11.4%	15	30
G	182	78,073	9,563	12.2%	30	62

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REGISTERED 352 BRIAN E. BAINNSON OREGON 07/26/1996 LANDSCAPE ARCHITECT
EXP. 7.31.2022

Consultant:

Quatrefoil Inc.
Design • Landscape Architecture • Space Planning
415 NE 65th Ave. Portland, Oregon 97213
Tel: (503) 256-8955

Project Title:

East Expansion

PKA Project Number: 171101N

Willamette Falls Medical Center

1500 Division St., Oregon City, OR 97045

Landscape Plan

Revisions shown below may not apply to this publication

△ Revision | Date

24 May 2022 - Land Use App.

Sheet Title

Partial Enlarged Heliport Relocation Landscape Plan

Sheet Number:

L.1.0.00

Item #2

STANDARD ELECTRICAL ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR	KVA	KILOVOLT AMP
A	AMPERE (AMP)	KVAR	KILOVOLT AMPS REACTIVE
AL	ALUMINUM	LA	LIGHTNING ARRESTOR
ARCH	ARCHITECT / ARCHITECTURAL	LTG	LIGHTING
ATS	AUTOMATIC TRANSFER SWITCH	LV	LOW VOLTAGE
CB	CIRCUIT BREAKER	MATV	MASTER ANTENNA TELEVISION
C	CONDUIT	MCA	MINIMUM CIRCUIT AMPS
CCTV	CLOSED CIRCUIT TELEVISION	MCB	MAIN CIRCUIT BREAKER
CKT	CIRCUIT	MCC	MOTOR CONTROL CENTER
CLG	CEILING	MDP	MAIN DISTRIBUTION PANEL
CT	CURRENT TRANSFORMER	MECH	MECHANICAL
CU	COPPER	MH	METAL HALIDE
DN	DOWN	MLO	MAIN LUGS ONLY
EMERG	EMERGENCY	MV	MERCURY VAPOR
EMT	ELECTRIC METALLIC TUBING	MTS	MANUAL TRANSFER SWITCH
EP	EXPLOSION PROOF	NIC	NOT IN CONTRACT
EPO	EMERGENCY POWER OFF	NL	NIGHT LIGHT CIRCUIT
EWC	ELECTRIC WATER COOLER	PA	PUBLIC ADDRESS
FA	FIRE ALARM	PE	PHOTO ELECTRIC CELL
FLA	FULL LOAD AMPS	PF	POWER FACTOR
FLUOR	FLUORESCENT	PNL	PANELBOARD
FCIC	FURNISHED BY CONTRACTOR INSTALLED BY CONTRACTOR	PVC	POLYVINYL CHLORIDE CONDUIT
		PWR	POWER
FOIC	FURNISHED BY OWNER INSTALLED BY CONTRACTOR	SDP	SUB-DISTRIBUTION PANEL
		STR	STARTER
FOIO	FURNISHED BY OWNER INSTALLED BY OWNER	SV	SOLENOID VALVE
		SW	SWITCH
GFP	GROUND FAULT PROTECTION	TD	TIME DELAY
GFI	GROUND FAULT INTERRUPTER	TP	TAMPERPROOF
GFCI	GROUND FAULT CIRCUIT INTERRUPTER	TTB	TELEPHONE TERMINAL BOARD
		TTC	TELEPHONE TERMINAL CABINET
GRC	GALVANIZED RIGID CONDUIT	TV	TELEVISION
GRD	GROUND	TYP	TYPICAL
HP	HORSEPOWER	UG	UNDERGROUND
HPS	HIGH PRESSURE SODIUM	UPS	UNINTERRUPTABLE POWER SUPPLY
HV	HIGH VOLTAGE		
HZ	HERTZ	V	VOLTAGE
IG	ISOLATED GROUND	VA	VOLT AMPERES
INC	INCANDESCENT	VP	VAPOR PROOF
JB	JUNCTION BOX	W	WATTS
KW	KILOWATT	WP	WEATHER PROOF
KWH	KILOWATT HOUR	XFMR	TRANSFORMER
KV	KILOVOLT	XFSW	TRANSFER SWITCH

ELECTRICAL EQUIPMENT DESIGNATION

E 4 LRC - 01 - 1A - A

POWER TYPE:
- BLANK - NORMAL POWER
- E - EMERGENCY POWER
- U - UNINTERRUPTIBLE POWER

VOLTAGE:
- 2 - 208Y/120V
- 4 - 480Y/277V
- 5 - 4160Y/2400V
- 15 - 12470Y/7200V

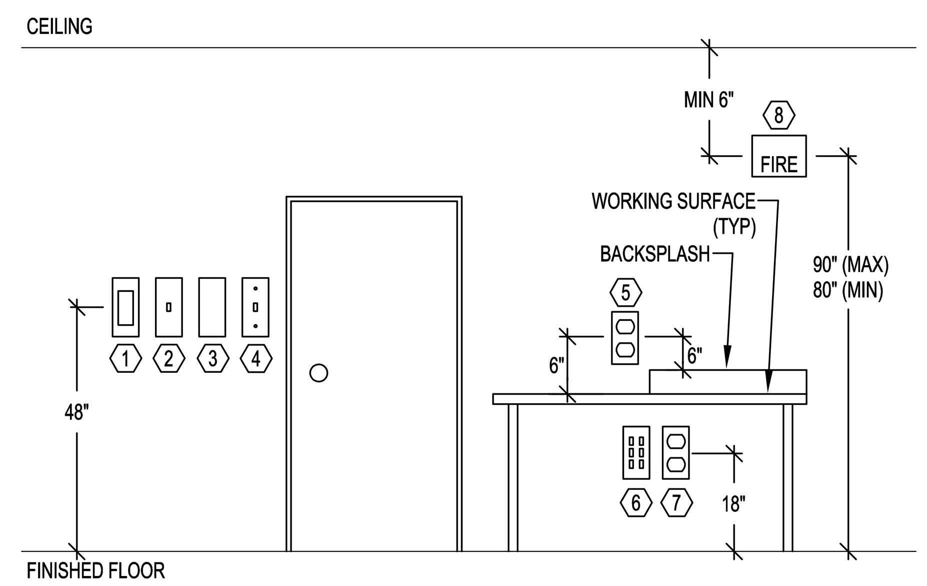
EQUIPMENT:
- D - MAIN DISTRIBUTION PANEL
- S - SUB DISTRIBUTION PANEL
- B - BUSWAY
- M - MOTOR CONTROL CENTER
- A - AUTOMATIC TRANSFER SWITCH
- P - POWER PANEL
- L - LIGHTING PANEL
- T - TRANSFORMER
- U - UPS
- LRC - LIGHTING RELAY CONTROL PANEL

BUILDING LEVEL:
- 00 - BASEMENT
- 01 - FIRST LEVEL
- 02 - SECOND LEVEL
- 03 - THIRD LEVEL
- 04 - FOURTH LEVEL
- ETC.

GRID LOCATION:
- 1A - NEAR INTERSECTION OF GRID LINES 1 AND A

IDENTIFIER:
- A - FIRST IN SERIES OF EQUIPMENT
- B - SECOND IN SERIES OF EQUIPMENT
- ETC.

DEVICE MOUNTING HEIGHTS



GENERAL NOTES:

A. LOCATE ALL FIRE ALARM DEVICES PER CODE.

B. LOCATE ALL ACCESSIBLE SWITCHES PER ADA GUIDELINES.

C. FIELD COORDINATE ALL ABOVE COUNTER DEVICES WITH MILLWORK CONTRACTOR.

D. IF APPLICABLE, TELCOM CONSULTANTS DRAWINGS TAKE PRECEDENCE OVER THIS DETAIL FOR TELCOM DEVICES.

NOTES:

1. FIRE ALARM PULL STATION
2. LIGHT SWITCH
3. CARD READER
4. WALL PHONE
5. ABOVE COUNTER DEVICE MAINTAIN A CONSISTENT HEIGHT THROUGHOUT SPACE
6. TELECOM OUTLET
7. RECEPTACLE
8. FIRE ALARM STROBE

GENERAL NOTE

THIS IS A STANDARD LEGEND SHEET, THEREFORE, SOME SYMBOLS MAY APPEAR ON THIS SHEET THAT DO NOT APPEAR ON THE DRAWINGS.

LIGHTING

- CEILING LUMINAIRE: SURFACE, RECESSED
- CEILING LUMINAIRE: PENDANT MOUNTED
- CEILING LUMINAIRE: PENDANT LINEAR
- WALL LUMINAIRE: SURFACE, RECESSED
- WALL WASHER: SURFACE, RECESSED
- TRACK WITH HEADS LOCATED
- FLUORESCENT LUMINAIRE: SURFACE, RECESSED
- FLUORESCENT LUMINAIRE: WALL MOUNTED
- FLUORESCENT LUMINAIRE: BARE LAMP
- POLE LIGHT: LUMINAIRES AS SHOWN
- DESIGNATES LIGHT ON EMERGENCY CIRCUIT
- EXIT LIGHT: CEILING, WALL (ARROWS AS SHOWN)
- BOLLARD
- EMERGENCY BATTERY LIGHT: HEADS AS SHOWN
- $ / $2 — WALL SWITCH: 1 POLE, 2 POLE
- $3 / $4 — WALL SWITCH: 3 WAY, 4 WAY
- $K / $M — WALL SWITCH: KEY LOCK, MOMENTARY
- $LV / $P — WALL SWITCH: LOW VOLTAGE, PILOT
- $T / $D — WALL SWITCH: TIMER, MANUAL DIMMER
- A — DESIGNATES LUMINAIRE TYPE (SEE LUMINAIRE SCHEDULE)
- NL — DESIGNATES NIGHT LIGHT CIRCUIT
- PHOTOELECTRIC CELL: WALL MOUNTED, CEILING MOUNTED
- OCCUPANCY SENSOR: CEILING OR WALL MOUNTED

"X" DESIGNATES DEVICE TYPE:
S: IN COMBINATION WITH WALL SWITCH
U: ULTRASONIC
R: INFRARED
UR: DUAL TECHNOLOGY, ULTRASONIC/INFRARED

EQUIPMENT

- ELECTRICAL EQUIPMENT
- PANELBOARD: SURFACE, RECESSED
- CABINET: SURFACE, RECESSED
- TRANSFORMER
- GROUND ROD, IN TEST WELL
- GROUND PAD
- EQUIPMENT WITH DERIVED GROUND
- VOLTMETER, AMMETER
- SELECTOR SWITCH: VOLTMETER, AMMETER
- KWH / PF — METER: KILOWATT HOUR, POWER FACTOR
- PT — POTENTIAL TRANSFORMER
- CT — CURRENT TRANSFORMER
- CABLE TRAY: CENTER SUPPORT, OUTER SUPPORTS

POWER

- WALL RECEPTACLE: SINGLE, DUPLEX
- WALL RECEPTACLE: EMERGENCY, 4-PLEX
- WALL RECEPTACLE: ISOLATED GROUND
- CEILING RECEPTACLE: DUPLEX
- FIRE RATED FLOOR POKE-THRU
- CONNECTION TO EQUIPMENT PROVIDED BY OTHERS
- DENOTES RECEPTACLE ABOVE COUNTER
- SPECIAL PURPOSE OUTLET AS NOTED, EMERGENCY
- JUNCTION BOX
- FLUSH IN-FLOOR OUTLET: DUPLEX, COMBINATION
- PEDESTAL OUTLET: POWER, SIGNAL, COMBINATION
- SURFACE OUTLET STRIP: DIMENSION AS SHOWN
- TELEPOWER POLE, POWER, COMBINATION
- CLOCK HANGER RECEPTACLE
- DISCONNECT SWITCH: FUSED, NON-FUSED
- MOTOR STARTER: MANUAL, MAGNETIC, COMBINATION
- MOTOR CONNECTION
- CONTACTOR, RELAY, SOLENOID
- PUSH BUTTON STATION
- WIRING CONCEALED IN CEILING OR WALL
- WIRING CONCEALED IN FLOOR OR UNDERGROUND
- INDICATES INSULATED GREEN GROUND WIRE
- HOME RUN DESTINATION SHOWN
- CONDUIT ELL: UP, DN.

ONE-LINE

- CIRCUIT BREAKER
- SWITCH, FUSED SWITCH
- BUSS
- AUTOMATIC SWITCH
- METER
- PANEL
- FEEDER CALLOUT
- XXX — FAULT CURRENT CALLOUT
- GENERATOR

DESIGNATION SYMBOLS

- 123 — EQUIPMENT DESIGNATOR SEE SCHEDULE.
- E / X — EXISTING TO REMAIN, EXISTING TO BE REMOVED
- R / F — EXISTING TO BE RELOCATED, FUTURE
- N / C — NEW, CONNECT TO
- 1 — NOTE

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Project Title:

East Expansion

PKA Project Number: 171101N

Willamette Falls Medical Center

1500 Division St., Oregon City, OR 97045

Key Plan

Revision	Date
ASI 003	10/04/2021
ASI 006	11/08/21

24 May 2022 - Land Use App.

Sheet Title

Symbols, Legends And Abbreviations

Sheet Number:

E0.0.01

Date: 5/16/22 Time: 2:41pm File: \\pae-engineers.com\Projects\2017\17-2064 - Providence Willamette Falls Expansion\01 Production\02 CAD\HELIPAD\E0.0.01 .dwg User: philip.marks

Item #2

GENERAL NOTES:

A. REFER TO HELISTOP CONSULTANT DRAWINGS FOR ADDITIONAL FIXTURE INFORMATION AND REQUIREMENTS.

B. EQUIPMENT SHOWN AS EXISTING TO REMAIN UNLESS OTHERWISE NOTED

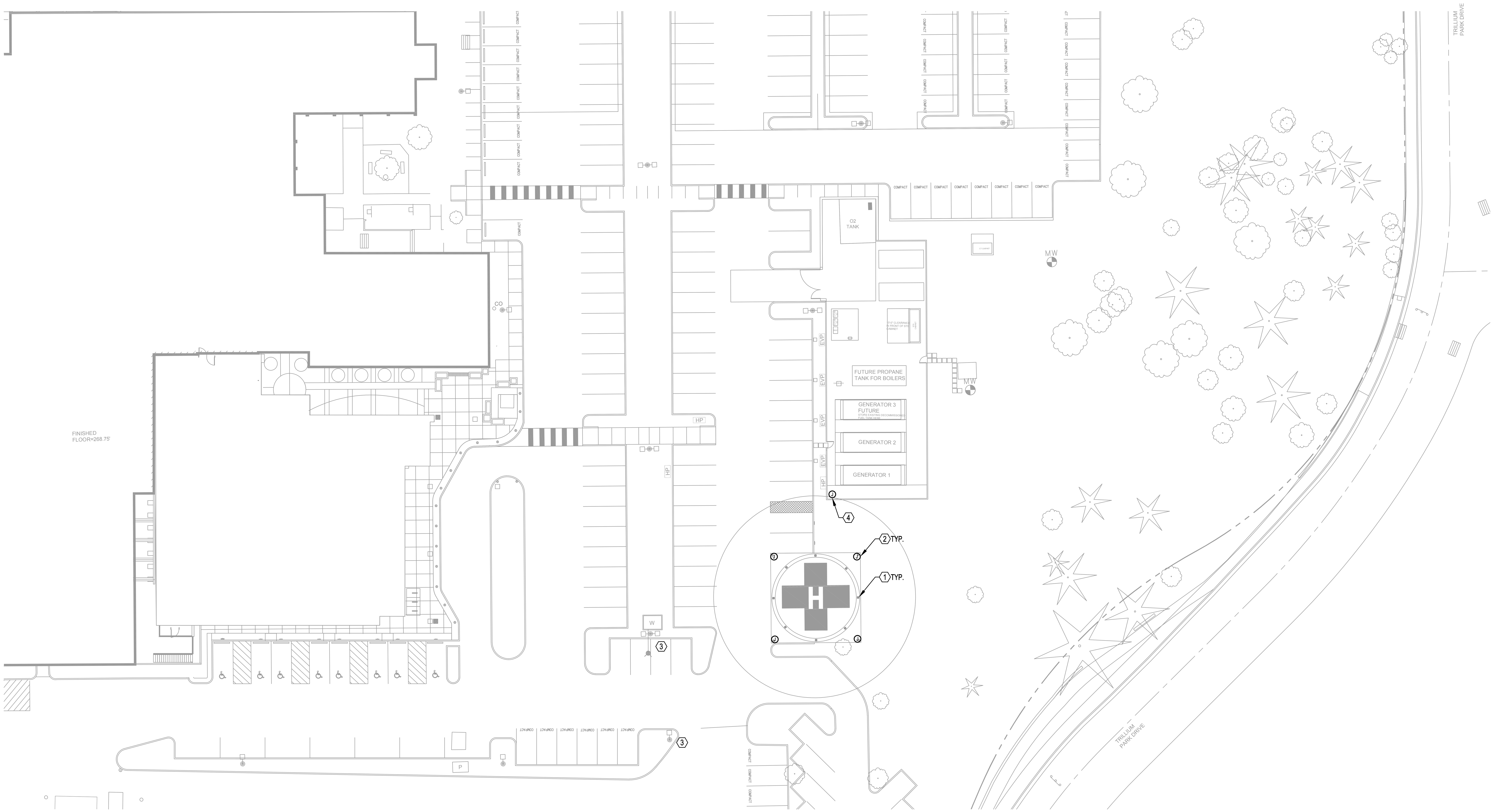
NOTES:

1. PROVIDE (8) NEW PERIMETER IN-GROUND LIGHTING FIXTURES FOR HELISTOP. PROVIDE (1) 1" CONDUIT BETWEEN TRANSPONDER LOCATION WITHIN GEN YARD AND IN-GROUND LIGHTING. CONFIRM SCOPE AND FINAL LOCATION OF TRANSPONDER PRIOR TO PROCUREMENT.

2. PROVIDE (4) LOW PROFILE PSF-53063-6 TYPE FLOODLIGHTS AT THE FOUR CORNERS OF THE HELIPAD. PROVIDE (1) 1" CONDUIT BETWEEN REMOTE CONTROL STATION AND FLOODLIGHTS.

3. EQUIP EXISTING POLE LIGHT WITH OBSTRUCTION BEACON POL-21006-1F-R-34B-S2 TYPE. PROVIDE (1) 1" CONDUIT BETWEEN TRANSPONDER LOCATION WITHIN GEN YARD AND IN-GROUND LIGHTING. CONFIRM SCOPE AND FINAL LOCATION OF TRANSPONDER PRIOR TO PROCUREMENT.

4. PROVIDE LIFE SAFETY CONNECTION TO HELIPAD TRANSPONDER. BOD: FLIGHT LIGHT HL-RC-AC1-DC23-D. COORDINATE LOCATION WITH ARCHITECT.



1 E2.0.04 SITE PLAN - ZONE 4
SCALE: 1" = 20'

24 May 2022 - Land Use App.

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Key Plan

Revision	Date
ASI 003	10/04/2021
ASI 006	11/08/21

Sheet Title
Site Plan - Zone 4 - Electrical

Sheet Number:
E2.0.04

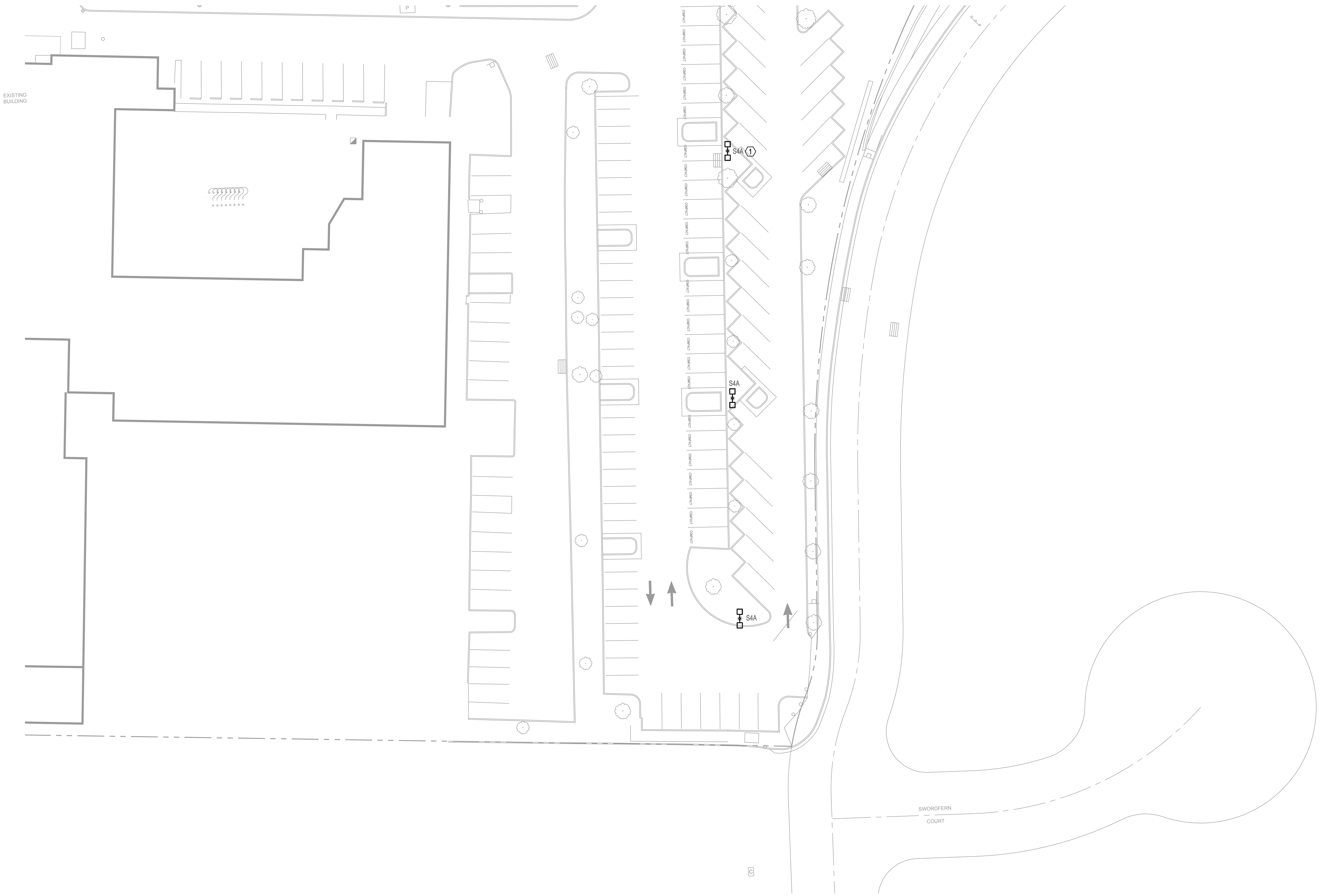
GENERAL NOTES:

A. REFER TO HELISTOP CONSULTANT DRAWINGS FOR ADDITIONAL FIXTURE INFORMATION AND REQUIRMENTS.

B. EQUIPMENT SHOWN AS EXISTING TO REMAIN UNLESS OTHERWISE NOTED.

NOTES:

1. EQUIP EXISTING POLE LIGHT WITH OBSTRUCTION BEACON POL-21006-1F-R-34B-S2 TYPE. PROVIDE (1) 1" CONDUIT BETWEEN TRANSPONDER LOCATED ON EXPANSION ROOF AND OBSTRUCTION BEACON LIGHTING.



1 E2.0.06 SITE PLAN - ZONE 6
SCALE: 1" = 20'

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Project Title:
East Expansion

PKA Project Number: 171101N

Willamette Falls Medical Center

1500 Division St., Oregon City, OR 97045

Key Plan

Revision	Date
ASI 003	10/04/2021
ASI 006	11/08/21

24 May 2022 - Land Use App.

Sheet Title
Site Plan - Zone 6 - Electrical

Sheet Number:
E2.0.06

Date: 5/16/22 Time: 2:41pm File: \\pae-engineers.com\Projects\2017\17-2064 - Providence Willamette Falls Expansion\01 Production\02 CAD\HELIPAD\E2.0.06.dwg User: philip.marks

Item #2.

GENERAL NOTES:

A. REFER TO HELISTOP CONSULTANT DRAWINGS FOR ADDITIONAL FIXTURE INFORMATION AND REQUIREMENTS.

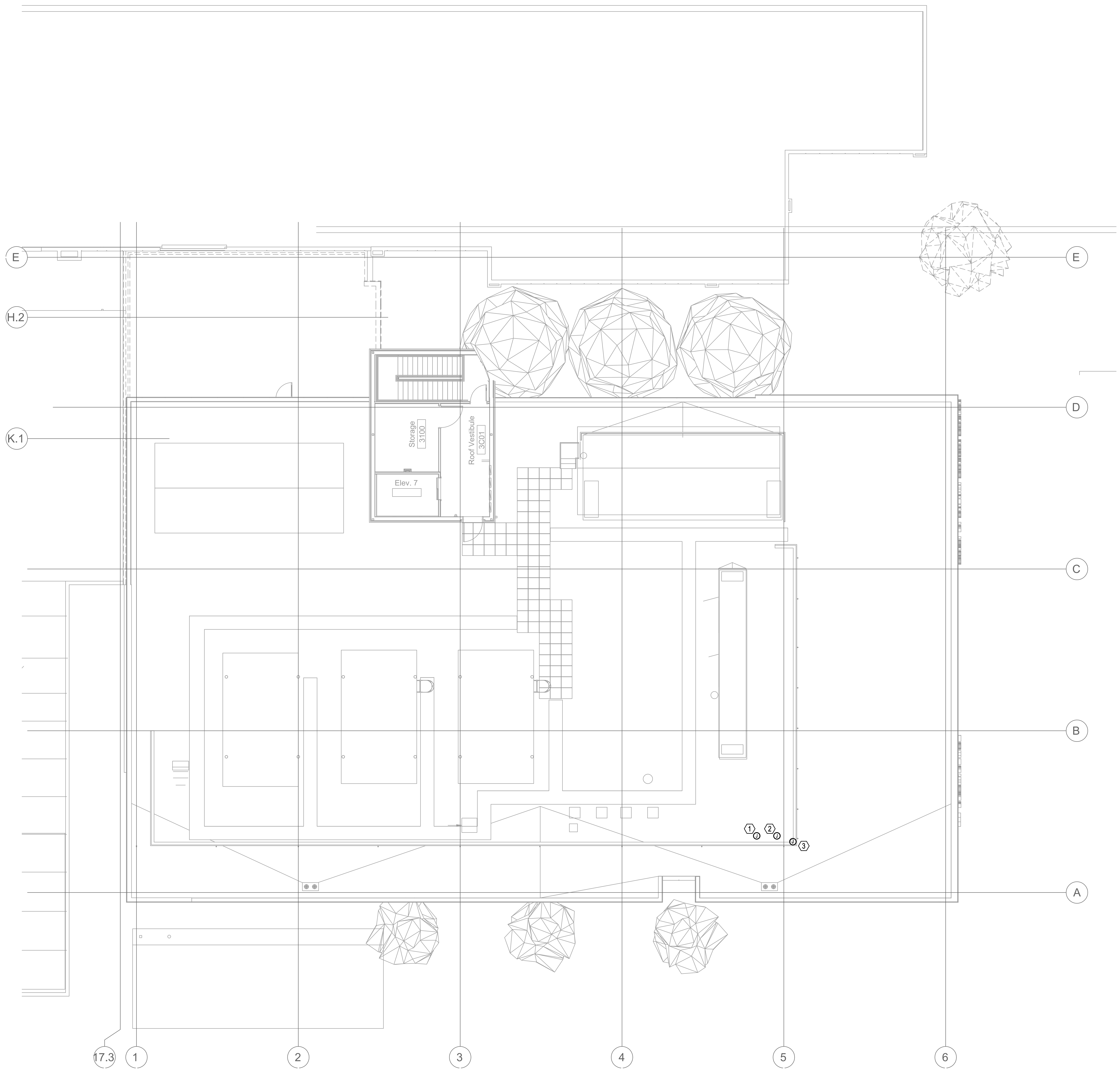
B. EQUIPMENT SHOWN AS EXISTING TO REMAIN UNLESS OTHERWISE NOTED.

NOTES:

1. PROVIDE LIFE SAFETY CONNECTION TO NEW HELIPAD WIND CONE L806 TYPE. REFER TO HELIPAD DRAWINGS FOR ADDITIONAL INFORMATION.

2. PROVIDE LIFE SAFETY CONNECTION TO HELIPAD TRANSPONDER. BOD: FLIGHT LIGHT HL-RC-AC1-DC23-D. COORDINATE LOCATION WITH ARCHITECT.

2. EQUIP EDGE OF ROOF WITH NEW OBSTRUCTION BEACON POL-21006-1F-R-34B-S2 TYPE. PROVIDE (1) 1" CONDUIT BETWEEN TRANSPONDER AND OBSTRUCTION BEACON LIGHTING.



1 E2.3.F0 Power Plan - Level 3 Sector F - Electrical

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

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1500 Division St., Oregon City, OR 97045

Key Plan

Revision	Date
ASI 003	10/04/2021
ASI 006	11/08/21

24 May 2022 - Land Use App.

Sheet Title

Power Plan - Level 3 Sector F - Electrical

Sheet Number:

E2.3.F0

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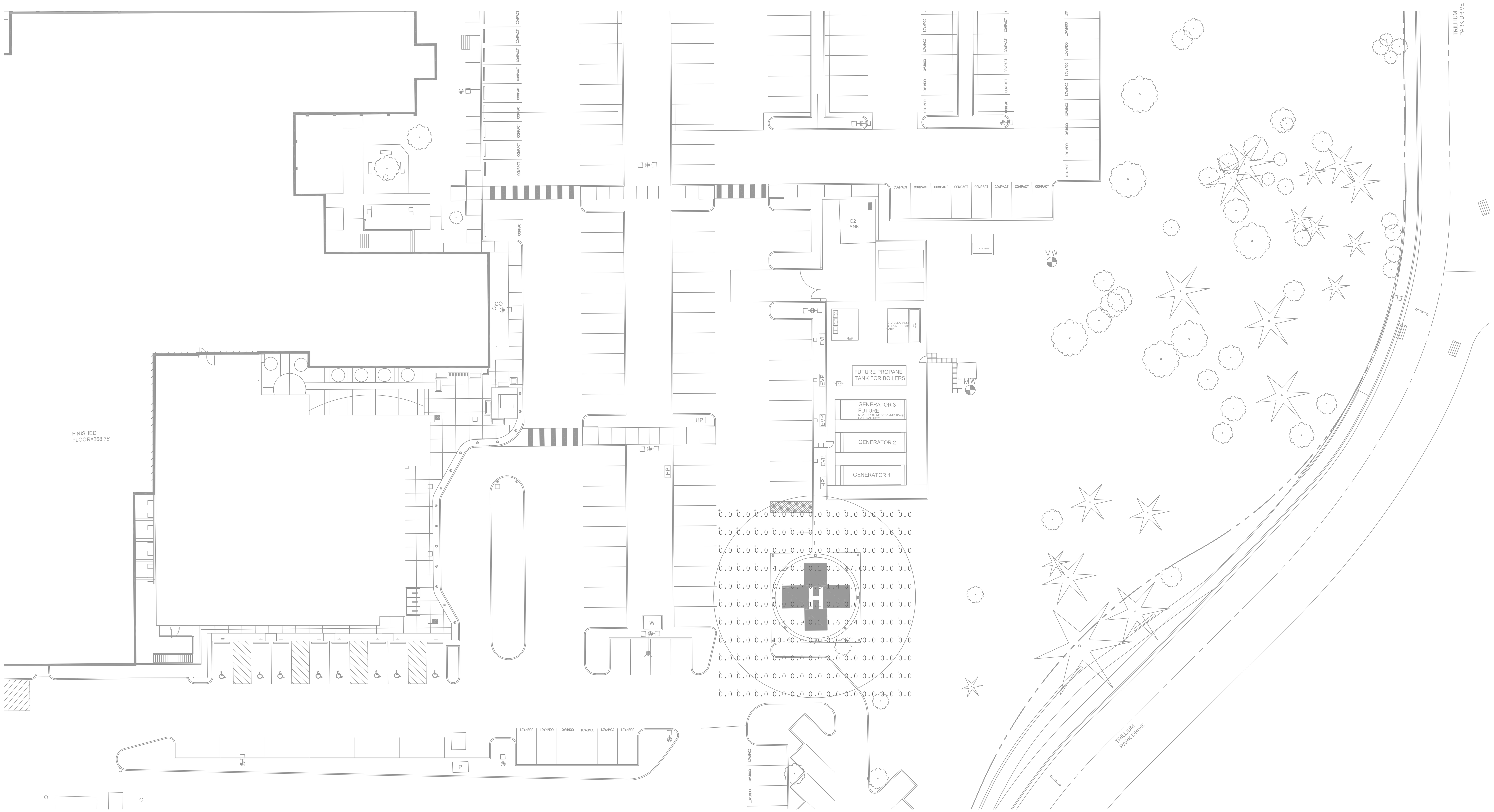
HELIPAD ILLUMINANCE (Fc)
AVERAGE = 5.35
MAXIMUM = 62.7
MINIMUM = 0.0



1 E4.0.01 Partial Site Plan - Photometrics
SCALE: 1" = 20'

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ASI 003	10/04/2021
ASI 006	11/08/21

24 May 2022 - Land Use App.

Sheet Title
Partial Site Plan - Photometrics

Sheet Number:
E4.0.01

Date: 5/16/22 Time: 2:40pm File: \\pae-engineers.com\Projects\2017\17-2064 – Providence Willamette Falls Expansion\01 Production\02 CAD\HELIPAD\E4.0.01.dwg User: philip.marks

DOWL

MEMORANDUM

TO:	City of Oregon City
FROM:	Ryan Halvorson, PE
DATE:	May 16, 2022
SUBJECT:	Stormwater Management Analysis – Providence WF Helipad Relocation

Overview:
The Providence Willamette Falls Expansion project is located at 1500 Division Street in Oregon City, Oregon. The improvements include a p.c. concrete helipad, restripe parking lot, public water line improvements, and associated landscaping. The stormwater approach for the site follows Chapter 13.12 – Stormwater Conveyance, Quantity and Quality and the City of Oregon City's Stormwater and Grading Design Standards dated February 2015. The Providence Willamette Falls East Expansion incorporated Low Impact Development (LID) swales to achieve water quality and quantity. This project will utilize the LID swale

Site soils are Sauvie and Rafton silt loam, which are classified as C and B/D soils respectively. The existing site is 100% pervious surface; no water quality or detention exists on the site. The proposed project will create new impervious surface and provide water quality treatment in planter facilities. No improvements to the public ROW are proposed.

The underlying soil types on the site, as classified by the United States Department of Agriculture Soil Survey of Clackamas County, Oregon are identified in Table 1 (See Technical Appendix: Hydrologic Soils Map - Clackamas County).

Table 1: Soil Characteristics

Soil Type	Hydrologic Group
Aloha Silt Loam	C/D
Saum Silt Loam	C
Woodburn Silt Loam	C
Xerochrepts and Haploxerolls	C

The entire site has conservatively been assigned a soil Group D, since the Aloha Silt Loam makes up over 90% of the project area. Group D soils have very slow infiltration rates when thoroughly saturated. A complete geotechnical report is provided in the Technical Appendix. A supplemental memo was provided by GRI which confirms the site contains D soils (See Technical Appendix: Providence Willamette Falls East Expansion Drainage Report).

Table 2 lists the new helipad basin area under both existing and proposed conditions. Table 3 lists the combined new additional work limits added to the East Basin under the Providence Willamette Falls East Expansion project (See attached: Figure 1 - Existing Conditions and Figure 2 - Proposed Conditions).

Table 2: Helipad Basin Areas

Development Condition	Impervious Area (ac)	Pervious Area (ac)	Total Area (ac)
Existing	0.00	0.201	0.201
Proposed	0.201	0.00	0.201

Table 3: East Basin Combined Areas

Development Condition	Impervious Area (ac)	Pervious Area (ac)	Total Area (ac)
Existing	1.48	0.42	1.90
Proposed	1.68	0.22	1.90

Water Quality and Quantity:
The site will use LID rain gardens and vegetated swales to treat site runoff and a planter to treat street runoff. The rain garden design will be used in the west facility where slopes are less than 0.5%. The vegetated swale design will be used in the east facility where slopes exceed 0.5% (See Technical Appendix – BMP Sizing Tool Report).

LID facilities provide pollutant reduction and flow attenuation to reduce hydraulic impacts from urban developments on downstream rivers. Vegetation within facilities and the underground rock reservoirs help cool stormwater runoff prior to leaving the site.

The runoff from the water quality and detention events will infiltrate through 18 inches of growing medium, followed by 12 inches of drain rock. A 6-inch perforated pipe will be located within the drain rock. The maximum ponding depth within the facilities is 12-inches.

Table 4 lists the impervious area to be treated by each facility, the LID facility type, the required facility size, and the orifice size to manage flow control (See Technical Appendix: BMP Sizing Report).

Table 2: Stormwater Facility Summary

Basin	Impervious Area (ac)	Required Swale Area (sf)	Orifice Dia (in)
East Swale	1.68	2,865*	3.0

* The east swale will be designed per Section 4.3.3 of the Oregon City Design Standards. The growing media depth will be increased by 12”, which allows the required facility size be reduced by 20%. The BMP Sizing Tool lists a required facility size of 3,583 SF. Reducing this size by 20% results in the required facility size listed above in Table 6-1.

Flow Control:
The project is located in the Multnomah County Drainage District (MCDD); therefore, it is designed under Hierarchy 3 and flow control is not required. Stormwater from the site will exit the planter facilities and tie in to the existing BES 48” diameter storm main in NE 138th Ave. The storm main flows north approximately 600 LF and then outfalls to the Columbia Slough (managed by MCDD).

Conveyance Analysis and Design:
The analysis and design criteria described in this section will follow the City of Oregon City Stormwater and Grading Design Standards. Chapter 5 – Conveyance System Design requires storm drainage system and facilities draining between 0 and 40 acres be designed to convey the 10-year storm event without surcharge.

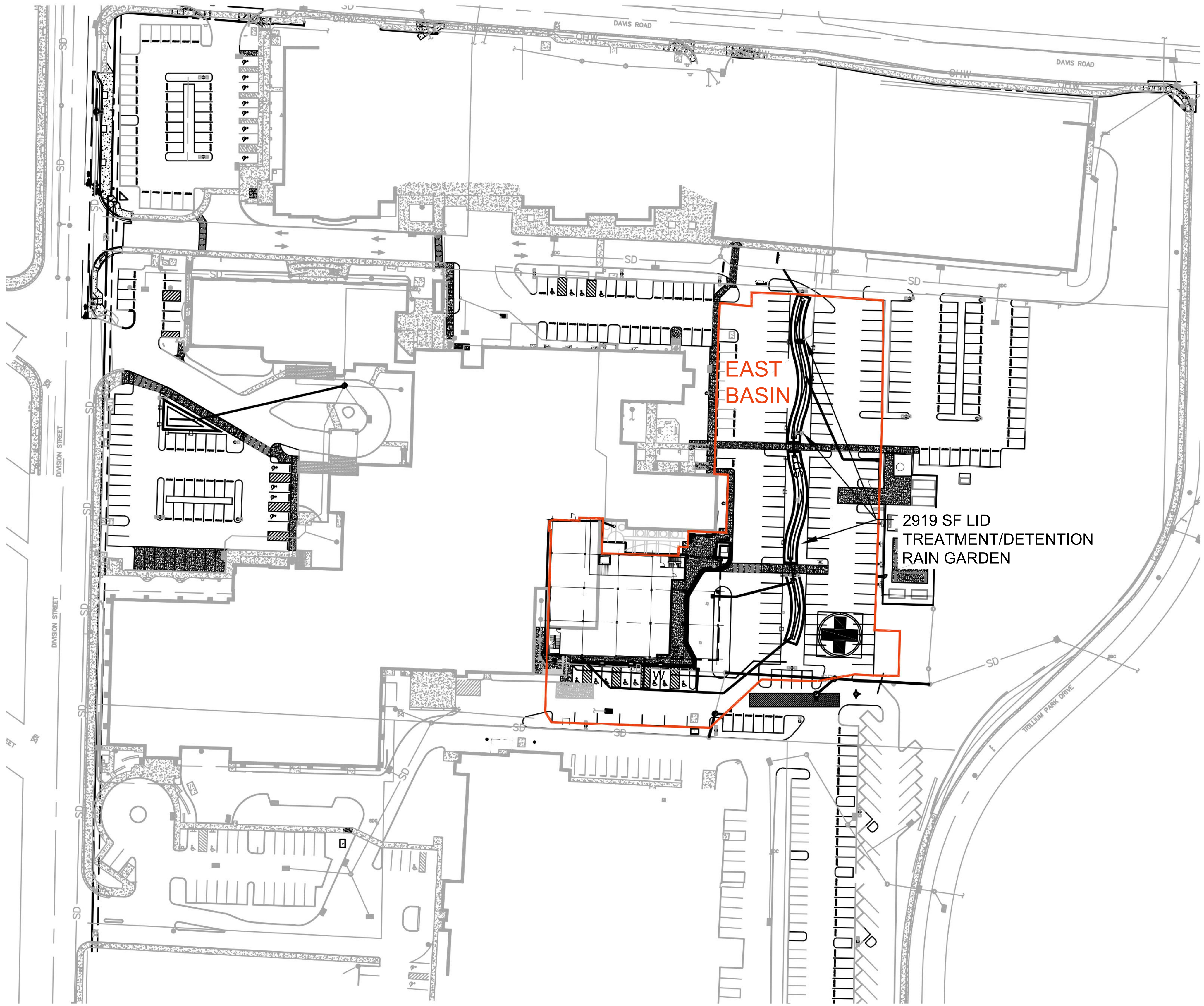
The conveyance system analysis found the proposed pipe network has sufficient capacity to handle the 10-yr storm event per the City of Oregon City design standards.

The overland emergency overflow path is generally on the east / north side of the site. The property is mostly developed, and the proposed site work is designed to tie into the existing grades, curb lines, and storm system at various points throughout the property. If there was a failure in any of the existing or proposed stormwater infrastructure, surface runoff would flow overland through the parking lot to the east / north and eventually flow down the hill towards Trillium Park Drive.

Conclusion:
Stormwater water quality and quantity for the new impervious area will be provided managed by the stormwater swale proposed under the Providence Willamette Falls East Expansion. The stormwater swale facility was designed using the City's BMP sizing tool to manage the new impervious surface. The proposed stormwater management system meets the pollution reduction and flow control requirements of the City of Oregon City.

Attachments:

- Figure 1 – Existing Conditions
- Figure 2 – Proposed Conditions
- Hydrologic Soil Group Report
- BMP Sizing Tool Results
- Providence Willamette Falls East Expansion Drainage Report



EXISTING BASIN AREAS

EAST BASIN:

IMPERVIOUS AREA:	1.48 AC
PERVIOUS AREA:	0.42 AC
TOTAL AREA:	1.90 AC

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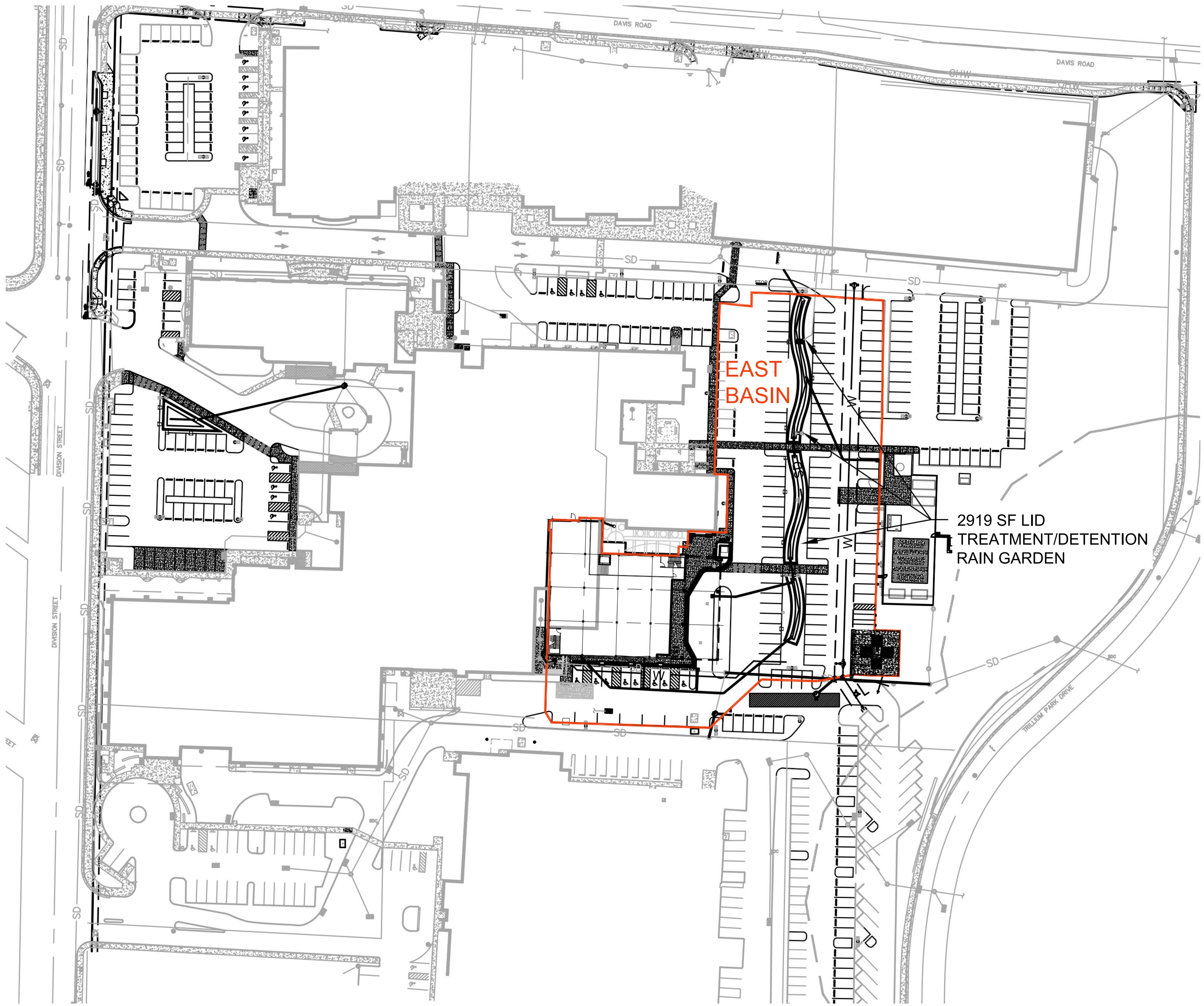
PROVIDENCE WILLAMETTE FALLS HELIPAD RELOCATION
EXISTING CONDITIONS
OREGON CITY, OR

PROJECT	14594-03
DATE	5/16/2022

FIGURE 1



PROPOSED BASIN AREAS

EAST BASIN:

IMPERVIOUS AREA:	1.68 AC
PERVIOUS AREA:	0.22 AC
TOTAL AREA:	1.90 AC

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971-280-8641

PROVIDENCE WILLAMETTE FALLS HELIPAD RELOCATION
PROPOSED CONDITIONS
OREGON CITY, OR

PROJECT 14594-03
DATE 5/16/2022

FIGURE 2

Map Scale: 1:2,350 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 30, 60, 120, 180

Feet: 0, 100, 200, 400, 600

N

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

USDA

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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: Clackamas County Area, Oregon
Survey Area Data: Version 15, Sep 10, 2019

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

Date(s) aerial images were photographed: Jun 13, 2019—Jul 25, 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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1A	Aloha silt loam, 0 to 3 percent slopes	C/D	17.7	90.4%
78C	Saum silt loam, 8 to 15 percent slopes	C	0.4	2.1%
91B	Woodburn silt loam, 3 to 8 percent slopes	C	0.2	1.1%
92F	Xerochrepts and Haploxerolls, very steep	B	1.3	6.4%
Totals for Area of Interest			**19.5**	**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

Tie-break Rule: Higher

WES BMP Sizing Software Version 1.6.0.2, May 2018

WES BMP Sizing Report

Project Information

Project Name	Providence Willamette Falls Expansion
Project Type	Addition
Location	
Stormwater Management Area	150063
Project Applicant	
Jurisdiction	HappyValleyCCSD1

Drainage Management Area

Name	Area (sq-ft)	Pre-Project Cover	Post-Project Cover	DMA Soil Type	BMP
South Basin - Imp	76,230	Forested	ConventionalConcrete	D	120in CMP System
South Basin - Per	13,939	Forested	LandscapeDsoil	D	120in CMP System
West Basin - Imp	12,196	Forested	ConventionalConcrete	D	West Rain Garden
West Basin - Per	872	Forested	LandscapeDsoil	D	West Rain Garden
East Basin - Roof	12,600	Forested	Roofs	D	East Swale
East Basin - Parking	52,141	Forested	ConventionalConcrete	D	East Swale
East Basin - Per	9,869	Forested	LandscapeDsoil	D	East Swale

LID Facility Sizing Details

LID ID	Design Criteria	BMP Type	Facility Soil Type	Minimum Area (sq-ft)	Planned Areas (sq-ft)	Orifice Diameter (in)
West Rain Garden	FlowControlAndTreatment	Rain Garden - Filtration	Lined	512.3	584.0	1.1
East Swale	FlowControlAndTreatment	Vegetated Swale - Filtration	Lined	3,582.5	2,919.0	3.0

Facility designed with an additional 12" of media. Per Section 4.3.3 of the Oregon City Design Standards, this allows the minimum area calculated by the BMP Sizing Tool to be reduced by 20%.

3583 * 0.8 = 2866 SF minimum area

Drainage Report

Providence Willamette Falls Expansion

2322.14594.01

PR-000151-2020

Prepared for

PKA Architects

6969 SW Hampton St

Portland, Oregon 97223

October 27, 2021

Prepared for	PKA Architects
Document	Drainage Report
Job Number	2322.14594.01
Date	October 27, 2021

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Name	Title	Date	Revision	Reviewer
Mike Gillette	Civil Designer	12/17/2019	0	Ryan Halvorson
Mike Gillette	Civil Engineer	03/25/2021	1	Ryan Halvorson
Mike Gillette	Civil Engineer	06/11/2021	2	Ryan Halvorson
Mike Gillette	Civil Engineer	07/23/2021	3	Ryan Halvorson
Mike Gillette	Civil Engineer	10/27/2021	4	Ryan Halvorson

Executive Summary

The Providence Willamette Falls Expansion project is located at 1500 Division Street in Oregon City, Oregon (See Figure 1-1 Vicinity Map). The project will include a new building addition, parking lot and landscaping improvements, and construction of stormwater treatment and detention facilities. There will also be frontage improvements along Division Street.

Standards

The stormwater approach for the site follows Chapter 13.12 – Stormwater Conveyance, Quantity and Quality and the City of Oregon City's *Stormwater and Grading Design Standards* dated February 2015. By incorporating Low Impact Development (LID) methods such as LID rain gardens, planters and swales, downstream impacts and water quality protection will be achieved.

Area Swap

The proposed project disturbs at various areas around the existing hospital campus. Due to existing drainage patterns and the desire to limit the amount of disturbed area, an area swap is proposed (See Technical Appendix: Figure 3 – Proposed Area Swap). Impervious area from the south west parking lot and a portion of the medical center roof currently leaves the site untreated and undetained. A Bayfilter treatment vault and StormTech chamber system are proposed to bring the southwest area up to current Oregon City design standards. The area treated and detained at this location is proposed to offset the amount of disturbed impervious area elsewhere on the medical center campus. These areas include portions of the parking lots unable to be routed to rain gardens, swales, and the ROW improvement areas in Division Street.

Undisturbed impervious area to be treated: 1.75 ac

Disturbed impervious area unable to be treated: 0.24 ac

Water Quality & Flow Control

Stormwater treatment will be provided to the maximum extent practicable through the use of LID rain gardens and vegetated swales. LID facilities are landscaped reservoirs that collect and treat stormwater runoff through vegetation and soil media. LID facilities provide pollutant reduction and flow attenuation to reduce hydraulic impacts from urban developments on downstream rivers. Vegetation within facilities and the underground rock reservoirs help cool stormwater runoff prior to leaving the site. ADS Bayfilters and underground detention pipe will be used for water quality and flow control in areas where it is infeasible to construct LID facilities.

Impervious Area Draining to LID facilities = 1.76 acres

Impervious Area Draining to Bayfilters/Underground Detention = 1.75 acres

A Bayfilter vault is proposed to treat the undisturbed area at the south end of the site described in the section above. This area already has existing storm catch basins and conveyance pipe and is graded to fit this design. It is infeasible to add LID facilities to treat this basin since it would require regrading in areas that would otherwise remain undisturbed. Therefore, mechanical treatment and underground detention are proposed at this location.

LID facilities will be used to treat and detain the remaining on-site disturbed impervious area. The Oregon City BMP Sizing Tool was used to size the LID facilities for treatment and flow control. The underground detention system was sized by finding the required storage volume using the BMP tool, then designing the chambers to this volume.

The proposed conveyance network is designed to convey the 25-year storm event.

Downstream Analysis

A downstream analysis was completed to evaluate the capacity of the receiving storm system. The site discharges at two locations; one to north in the Abernethy Basin and one to the east in the Newell Basin. The hydraulic analysis extends from the point where water exits the project site, to the point in the basin 1,500 ft downstream. As-builts were provided by Oregon City for some of the off-site areas (Trillium Estates basins), and the remaining areas were assumed to be some portion impervious depending on land use (See Technical Appendix – Figures 4 and 5).

North Outlet:

The total contributing area is approximately 21 acres. To be consistent across the project, the 25-year 24-hour storm event was used to evaluate the downstream system, since this storm is required to review the East outlet.

This basin includes the north portion of the medical center campus, Division St, Davis Rd, and residential area north of the site. Runoff exits the site through an 18” culvert under Davis Rd, and daylights in a gulley which drains down to Abernethy Creek and eventually meets Newell Creek on the east side of Hwy 213. The conveyance system has sufficient capacity downstream of the site, with 17 feet of freeboard in the gulley downstream of the culvert.

East Outlet:

The total contributing area is approximately 50 acres; therefore, the 25-year 24-hour storm event was used to evaluate the downstream system per Oregon City Code.

This basin includes the remainder of the medical center campus, the Trillium Park Estates developments, and the residential/commercial buildings south of Gilman St. Runoff exits the site through a 16” culvert under Trillium Park Dr, and daylights in a gulley which drains down to Newell Creek. The downstream analysis extends to the existing culvert that routes flows from the gulley under Hwy 213 and into the main stem of Newell Creek. The conveyance system has sufficient capacity downstream of the site, with 17 feet of freeboard in the gulley upstream of the culvert. The culvert is modeled as a 36” pipe at 1%, which results in the pipe being 68% full during the 25-year 24-hour storm event.

Table of Contents

Tables

Figures

1 Project Overview

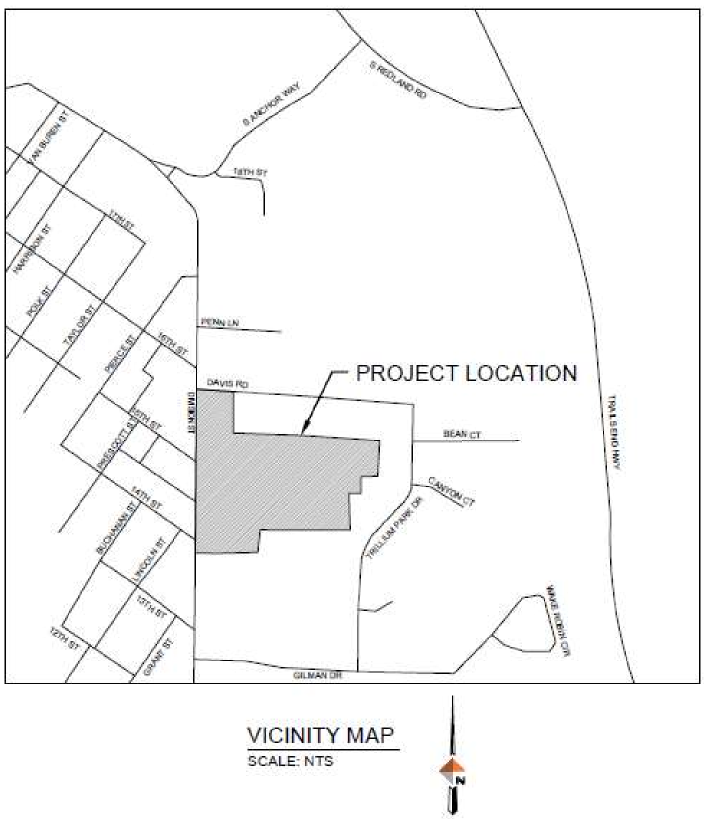
1.1 Project Overview

The Providence Willamette Falls Expansion project will include a new building addition, parking lot and landscaping improvements, and construction of stormwater treatment and detention facilities. There will also be frontage improvements along Division Street.

1.2 Location

The Providence Willamette Falls Expansion project is located at 1500 Division Street in Oregon City, Oregon (See Figure 1-1 Vicinity Map).

Figure 1-1 Vicinity Map



1.3 Methodology

The stormwater approach for the site follows Chapter 13.12 – Stormwater Conveyance, Quantity and Quality and the City of Oregon City's *Stormwater and Grading Design Standards* dated February 2015. By incorporating Low Impact Development methods such as LID rain gardens, and mechanical treatment and underground detention systems, downstream impacts will be mitigated, and water quality protection will be achieved.

The site is located within the Abernathy and Newell drainage basins. Both site outlets ultimately drain to Newell Creek and to the Willamette River. The site does not drain to the Clackamas River and is not required to meet OAR 340-41-470 (Three Basin Rule).

2 Existing Conditions

2.1 Topography

The existing site contains the medical center buildings, parking, and landscaping. Site slopes range from 1 to 7 percent, sloping downward towards the northeast. Elevations range from a maximum of 286’ in the southwest project corner to a minimum elevation of 270’ in the northeast project corner.

2.2 Climate

The site is located in Oregon City approximately 90 miles inland from the Pacific Ocean. There is a gradual change in seasons with defined seasonal characteristics. Average daily temperatures range from 35°F to 82°F. Average annual rainfall recorded in this area is 47 inches.

2.3 Site Geology

The underlying soil types on the site, as classified by the United States Department of Agriculture Soil Survey of Clackamas County, Oregon are identified in Table 2-1 (See Technical Appendix: Hydrologic Soils Map - Clackamas County).

Table 2-1 Soil Characteristics

Soil Type	Hydrologic Group
Aloha Silt Loam	C/D
Saum Silt Loam	C
Woodburn Silt Loam	C
Xerochrepts and Haploxerolls	C

The entire site has conservatively been assigned a soil Group D, since the Aloha Silt Loam makes up over 90% of the project area. Group D soils have very slow infiltration rates when thoroughly saturated. A complete geotechnical report is provided in the Technical Appendix. A supplemental memo was provided by GRI which confirms the site contains D soils (See Technical Appendix: Geotechnical Memo).

2.4 Infiltration

Infiltration is infeasible at this site due to the D soils and proximity of the site to the slope stability hazard area east of the site. The supplemental memo provided by GRI provides more detail and analysis describing why infiltration is not desired on site (See Technical Appendix: Geotechnical Report and Memo). All proposed LID facilities were modeled as lined systems to prevent further stability issues in the area.

2.5 Groundwater

Groundwater has been measured between 10-15 feet below the surface. (See Technical Appendix: Geotechnical Report).

2.6 Hydrology

Runoff from the existing site is collected in the existing storm system via overland flow and roof leaders routed into catch basins. There is an existing sand filter and detention pond providing treatment and detention for the north portion of the site. The southern portion of the site is currently untreated and utilizes an existing detention pipe to provide some flow control. However, reports have stated this pipe is failing, so it was assumed the pipe currently provides no function for the purposes of this analysis. This pipe will be decommissioned by plugging the connection to this pipe in the existing manhole on the east side of the site.

2.7 Basin Areas

Surface areas impacted by this project are shown in Table 2-2. The pre-developed site is defined as the condition of the land prior to the original development. Pre-developed conditions were likely forested. (See Technical Appendix: Figure 1 – Existing Conditions).

Table 2-2 Predeveloped and Existing Basin Areas

Basin	Impervious Area (ac)	Pervious Area (ac)	Total Area (ac)
Pre-Developed	0.00	4.07	4.07
Existing	3.65	0.42	4.07

3 Proposed Conditions

3.1 Hydrology

Stormwater treatment will be provided to the maximum extent practicable through the use of LID rain gardens, vegetated swales, and mechanical treatment systems. LID facilities are landscaped reservoirs that collect and treat stormwater runoff through vegetation and soil media. LID facilities provide pollutant reduction and flow attenuation to reduce hydraulic impacts from urban developments on downstream rivers. Vegetation within facilities and the underground rock reservoirs help cool stormwater runoff prior to leaving the site. ADS Bayfilters and underground detention pipe will be used for water quality and flow control in areas where it is infeasible to construct LID facilities.

Impervious Area Draining to LID facilities = 1.76 acres

Impervious Area Draining to Bayfilters/Underground Detention = 1.75 acres

A Bayfilter vault is proposed to treat the undisturbed area at the south end of the site described in the section above. This area already has existing storm catch basins and conveyance pipe and is graded to fit this design. It is infeasible to add LID facilities to treat this basin since it would require regrading in areas that would otherwise remain undisturbed. Therefore, mechanical treatment and underground detention are proposed at this location.

LID facilities will be used to treat and detain the remaining on-site disturbed impervious area. The Oregon City BMP Sizing Tool was used to size the LID facilities for treatment and flow control. The underground detention system was sized by finding the required storage volume using the BMP tool, then designing the detention pipe to this volume.

3.2 Curve Number

The curve number represents runoff potential from the soil. The major factors for determining the CN values are hydrologic soil group, cover type, treatment, hydrologic condition and antecedent runoff condition. The selected pervious curve number is 86 – Open Space in good Condition (See Technical Appendix: Table 2-2 – Runoff Curve Numbers for Selected Agricultural, Suburban, and Urban Areas Composite Curve Number Calculations).

3.3 Time of Concentration

The time of concentration (T_C) as described in NEH-4 Chapter 15 is defined in two ways; the time for runoff to travel from the furthermost point of the watershed to the point in question, and the time from the end of excess rainfall to the point of inflection on the trailing limb of the unit hydrograph. Time of concentration can be estimated from several formulas.

The minimum time of concentration is 5 minutes in highly developed urban areas (i.e. parking lots) and the maximum is 100 minutes in rural areas. A time of concentration of 5 minutes was used for each sub-basin.

3.4 Proposed Area Swap

The proposed disturbed areas on the project are at various locations around the existing hospital campus. Due to existing drainage patterns and the desire to limit the disturbed area limits, an area swap is proposed (See Technical Appendix: Figure 3 – Proposed Area Swap). Impervious area from the south west parking lot and a portion of the medical center roof currently leaves the site untreated and undetained. A Bayfilter treatment vault and CMP detention system are proposed to be added to this storm line to bring these areas up to current Oregon City design standards. The area treated and detained at this location is proposed to offset the amount of disturbed impervious area elsewhere on the medical center campus. These areas include portions of the parking lots unable to be routed to rain gardens, and the ROW improvement areas in Division Street.

3.5 Basin Area

Impervious and pervious surface areas for the proposed conditions are shown in Table 3-1. (See Technical Appendix: Figure 2 – Proposed Basin Delineation).

Table 3-1 Basin Areas

Basin	Impervious Area (ac)	Pervious Area (ac)	Total Area (ac)
Proposed	3.51	0.56	4.07

4 Hydrologic and Hydraulic Analysis

4.1 Design Guidelines

The analysis and design criteria used for stormwater management described in this section will follow the City of Oregon City *Stormwater and Grading Design Standards* dated February 2015.

4.2 Hydrologic Method

Rainstorms occur naturally over long periods of time. The most effective way of estimating storm rainfall is by using the hydrograph method. The hydrograph method generates storm runoff based on physical characteristics of the site. The Santa Barbara Urban Hydrograph (SBUH) was used for this analysis. The SBUH method is based on the curve number (CN) approach, and uses the Soil Conservation Service's (SCS) equations for computing soil absorption and precipitation excess. The SBUH method converts the incremental runoff depths into instantaneous hydrographs, which are then routed through an imaginary reservoir with a time delay equal to the basin time of concentration.

Xpswmm Version 17 was used for our hydrology and hydraulics analysis. Xpswmm is based on the public domain xpswmm program and is an approved method of analysis by the City of Oregon City.

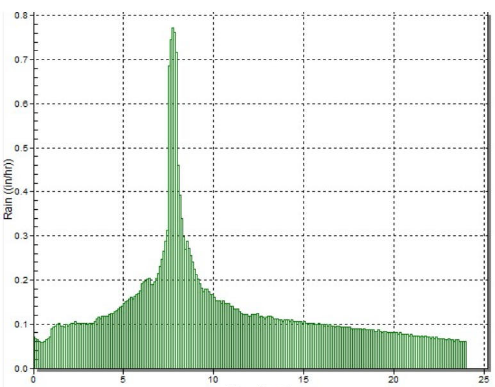
4.3 Design Storm

The rainfall distribution to be used within the City of Oregon City is the design storm of 24-hour duration based on the standard King County rainfall distribution. A typical King County 24-hour rainfall distribution for a 10-year storm event is shown in Figure 4-1.

Table 4-1 Precipitation Depth

Recurrence interval (years)	Total Precipitation Depth (in)
WQ	1.00
2	2.80
10	3.50
25	4.00
100	4.50

Figure 4-1 10-Year Type 1A Rainfall Ditribution



5 Conveyance Analysis

5.1 Design Guidelines

The analysis and design criteria described in this section will follow the City of Oregon City *Stormwater and Grading Design Standards*. Chapter 5 – Conveyance System Design requires storm drainage system and facilities draining between 0 and 40 acres be designed to convey the 10-year storm event without surcharge.

5.2 System Capacity

The proposed conveyance system is designed to convey and contain the peak runoff from the 10-year design storm (See Technical Appendix: XPSWMM Results – Runoff and Conveyance Data).

The proposed conveyance system will have sufficient capacity to handle all storm events up to and including the 100-year storm event.

5.3 System Performance

The conveyance system analysis found the proposed pipe network has sufficient capacity to handle the 10-yr storm event per the City of Oregon City design standards.

The overland emergency overflow path is generally on the east / north side of the site. The property is mostly developed, and the proposed site work is designed to tie into the existing grades, curb lines, and storm system at various points throughout the property. If there was a failure in any of the existing or proposed stormwater infrastructure, surface runoff would flow overland through the parking lot to the east / north and eventually flow down the hill towards Trillium Park Drive.

6 Water Quality and Flow Control

6.1 Design Guidelines

All water quality and flow control facilities were designed per criteria set forth by the *City of Oregon City Stormwater and Grading Design Standards* to facilitate the treatment of all stormwater runoff from the proposed site. The facilities will be designed to capture and treat runoff from the 1" storm over 24-hours.

Flow control facilities will be designed so that the duration of peak flow rates from post-development conditions will be less than or equal to the duration of peak flow rates from pre-development conditions for all peak flows between 42 percent of the 2-year peak flow rate up to the 10-year peak flow rate.

6.2 Water Quality – LID Rain Gardens and Vegetated Swales

The site will use LID rain gardens and vegetated swales to treat site runoff and a planter to treat street runoff. The rain garden design will be used in the west facility where slopes are less than 0.5%. The vegetated swale design will be used in the east facility where slopes exceed 0.5% (See Technical Appendix – BMP Sizing Tool Report).

LID facilities provide pollutant reduction and flow attenuation to reduce hydraulic impacts from urban developments on downstream rivers. Vegetation within facilities and the underground rock reservoirs help cool stormwater runoff prior to leaving the site.

The runoff from the water quality and detention events will infiltrate through 18 inches of growing medium, followed by 12 inches of drain rock. A 6-inch perforated pipe will be located within the drain rock. The maximum ponding depth within the facilities is 12-inches.

Table 6-1 lists the impervious area to be treated by each facility, the LID facility type, the required facility size, and the orifice size to manage flow control (See Technical Appendix: BMP Sizing Report).

Table 6-1 LID Facilities Table

Facility	Impervious Area (ac)	Required Planter Size (sf)	Orifice Diameter (in)
West Raingarden	0.280	596	1.1
East Swale	1.480	2854*	3.0

* The east swale will be designed per Section 4.3.3 of the Oregon City Design Standards. The growing media depth will be increased by 12", which allows the required facility size be reduced by 20%. The BMP Sizing Tool lists a required facility size of 3,568 SF. Reducing this size by 20% results in the required facility size listed above in Table 6-1.

6.3 Water Quality – Bayfilter Vault

A Bayfilter vault is the selected water quality facility for the equivalent disturbed area that cannot drain to an LID facility. The Bayfilter vault will utilize the 545 cartridge size with a 34-inch drop and have a treatment capacity of 0.10 cfs (45 gpm). The water quality flow generated from the basin is 0.463 cfs, which corresponds with (5) – 545 cartridges. The selected Bayfilters are designed to remove sediment, metals, and stormwater pollutants from stormwater runoff and are an approved method of treatment by the City of Portland, as required by the City of Oregon City.

6.4 Flow Control – Underground CMP Detention System

The LID facilities described in Section 6.1 above were sized for both treatment and flow control using the BMP Sizing Tool. The southwest basin unable to be routed through an LID facility requires flow control in an underground detention system. The BMP Sizing Tool was used to size the required detention facilities. The facilities were modeled as ponds with no side slopes. The water quantity volume required by the BMP Sizing Tool is provided onsite within a 120in CMP detention pipe. The required detention volume is provided in the BMP Sizing Report, under table Pond Sizing Details, column Water Storage Vol (See Technical Appendix: BMP Sizing Tool Report).

120in CMP detention pipe was selected for this project. The Contech DYODS Tool was used to design the layout of the CMP system. The calculated water quantity generated from the BMP Sizing Tool was entered into the DYODS Tool to determine how much 120in pipe is required (See Technical Appendix: Contech DYODS Tool Report). The system was designed to be 80 LF of 120in CMP, with 3” of stone below, 12” of stone above, and 12” stone surrounding the system. The BMP Sizing Tool lists a required facility volume of 7,216 CF, and the CMP system provides up to 8,198 CF, thus meeting the requirement. The flow control tee at the outlet of the CMP system was designed in the BMP Sizing Tool, and is shown below:

Figure 6-1 StormTech Chamber Flow Control Tee

Outlet Structure Details

Lower Orifice Invert (ft)	0.0
Lower Orifice Dia (in)	1.9
Upper Orifice Invert(ft)	5.4
Upper Orifice Dia (in)	4.4
Overflow Weir Invert(ft)	7.0
Overflow Weir Length (ft)	6.3

7 Downstream Analysis

7.1 Design Guidelines

The City of Oregon City requires a review of the downstream conveyance system. Section 5.2.4 of standards require the downstream conveyance system to have sufficient capacity to a distance where the site contributes less than 15% of the upstream drainage area or 1,500 feet downstream of the project, whichever is greater.

Several sources of information were used to complete this downstream analysis. City GIS and Metro Data were used for this analysis, as well as As-Builts of the existing Medical Center campus and surrounding residential developments provided by the City. The Oregon City Drainage Master Plan, dated July 2019, was also reviewed.

7.2 Contributing Areas

The Downstream Basin Delineation (See Technical Appendix - Figures 4 and 5) shows the contributing basins for each outlet. Each basin was assigned an impervious percentage based on aerial photos and as built information Impervious percentages range from 50 to 90 percent. The contributing basin area is built-out.

7.3 Hydrologic & Hydraulic Analysis

An xpswmm model was created for the downstream system to analyze the conveyance capacity of the public storm sewer. The contributing area is between 40 and 640 acres; therefore, the conveyance design storm was analyzed for the 25-year, 24-hour storm event per Table 5-1 Conveyance System Design Storms of the Oregon City Stormwater and Grading Design Standards.

North Outlet:

The total contributing area is approximately 21 acres. To be consistent across the project, the 25-year 24-hour storm event was used to evaluate the downstream system, since this storm is required to review the East outlet.

This basin includes the north portion of the medical center campus, Division St, Davis Rd, and residential area north of the site. Runoff exits the site through an 18” culvert under Davis Rd, and daylights in a gulley which drains down to Abernethy Creek and eventually meets Newell Creek on the east side of Hwy 213. The conveyance system has sufficient capacity downstream of the site, with 17 feet of freeboard in the gulley downstream of the culvert.

East Outlet:

The total contributing area is approximately 50 acres; therefore, the 25-year 24-hour storm event was used to evaluate the downstream system per Oregon City Code.

This basin includes the remainder of the medical center campus, the Trillium Park Estates developments, and the residential/commercial buildings south of Gilman St. Runoff exits the site through a 16” culvert under Trillium Park Dr, and daylights in a gulley which drains down to Newell Creek. The downstream analysis extends to the existing culvert that routes flows from the gulley under Hwy 213 and into the main stem of Newell Creek. The conveyance system has sufficient capacity downstream of the site, with 17 feet of freeboard in the gulley upstream of the culvert. The culvert is modeled as a 36” pipe at 1%, which results in the pipe being 68% full during the 25-year 24-hour storm event.

7.4 Downstream Conclusion

The downstream conveyance systems at both outlet locations are adequate to convey the runoff from the proposed development. The proposed improvements do not add enough area or flow to the existing basins to require additional on-site detention and/or flow control.

8 Summary

The proposed stormwater management approach follows the *City of Oregon City Stormwater and Grading Design Standards.* The proposed project was designed to provide water quality treatment by LID facilities and a Bayfilter vault, while flow control will be provided LID facilities and underground detention pipe. An area swap is proposed so that the equivalent disturbed area is able to be treated without the need for additional regrading in areas that would otherwise remain undisturbed. In conclusion, the proposed stormwater management system will meet the requirements of the City of Oregon City.

Technical Appendix

Technical Appendix

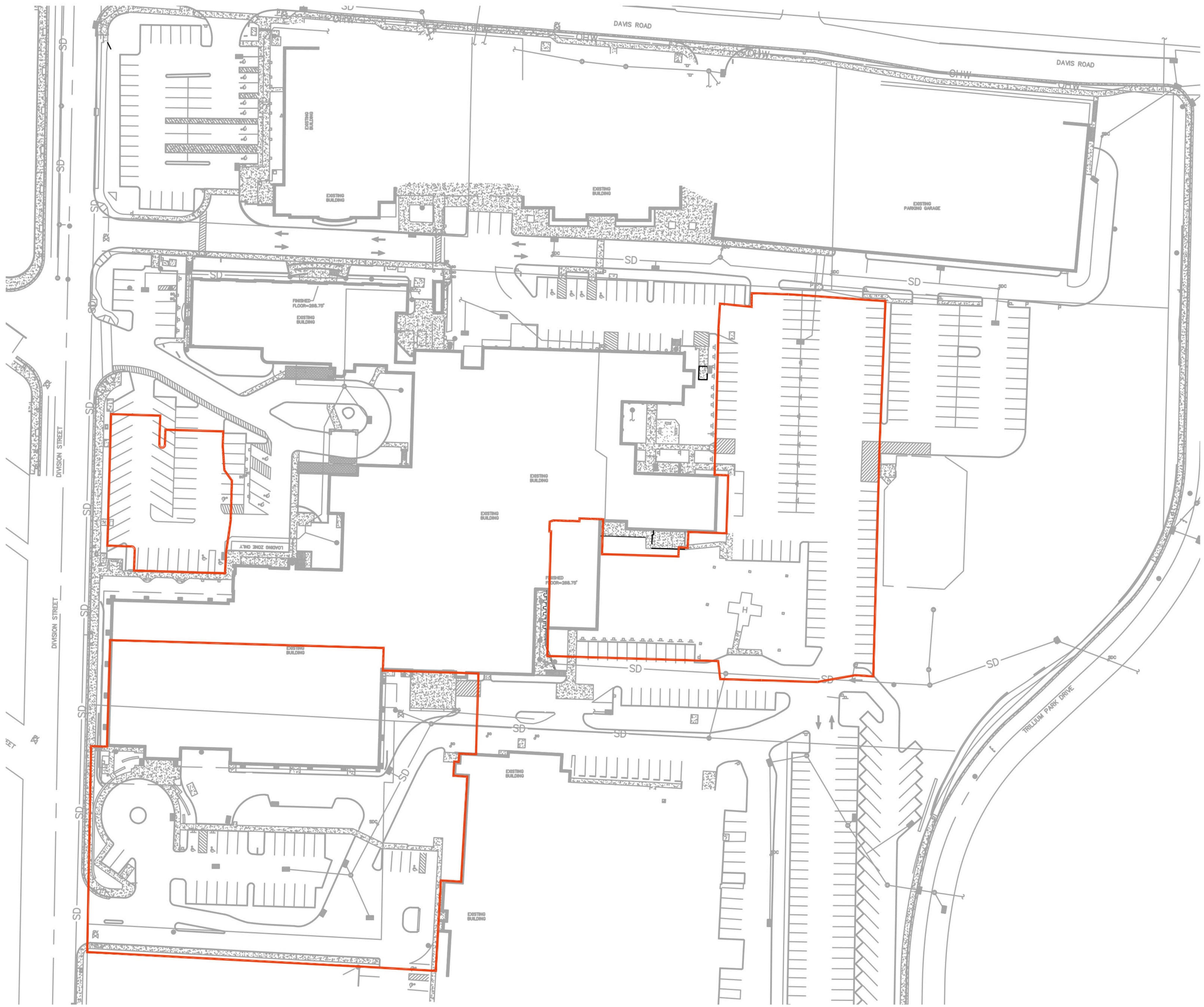
- Figure 1 – Existing Conditions
- Figure 2 – Proposed Conditions
- Figure 3 – Proposed Area Swap
- Figure 4 – Downstream Analysis – North Outlet
- Figure 5 – Downstream Analysis – East Outlet

- Hydrologic Soils Group – Clackamas County
- Table 2-2 – Runoff Curve Numbers for Selected Agricultural, Suburban, and Urban Areas
- BMP Sizing Tool Report
- Contech DYODS Tool Report

- XPSWMM Outputs
  - Schematic Layout
  - Runoff Data
  - Conveyance Data
  - Bayfilter Sizing Hydrograph
  - Downstream Analysis
    - North Outlet Conveyance
    - East Outlet Conveyance

- Geotechnical Report
- Operations and Maintenance Manual
- Landscaping Plan for LID Facilities
- Site Assessment Form

- Trillium Park Estates As-Builts
- Providence Willamette Falls Medical Center Final Storm Drainage Study, KPFF, 2012



PROJECT EXISTING BASIN AREAS

IMPERVIOUS AREA: 158,994 SF
PERVIOUS AREA: 1,017 SF
TOTAL AREA: 160,011 SF

N

100 0 100
SCALE IN FEET

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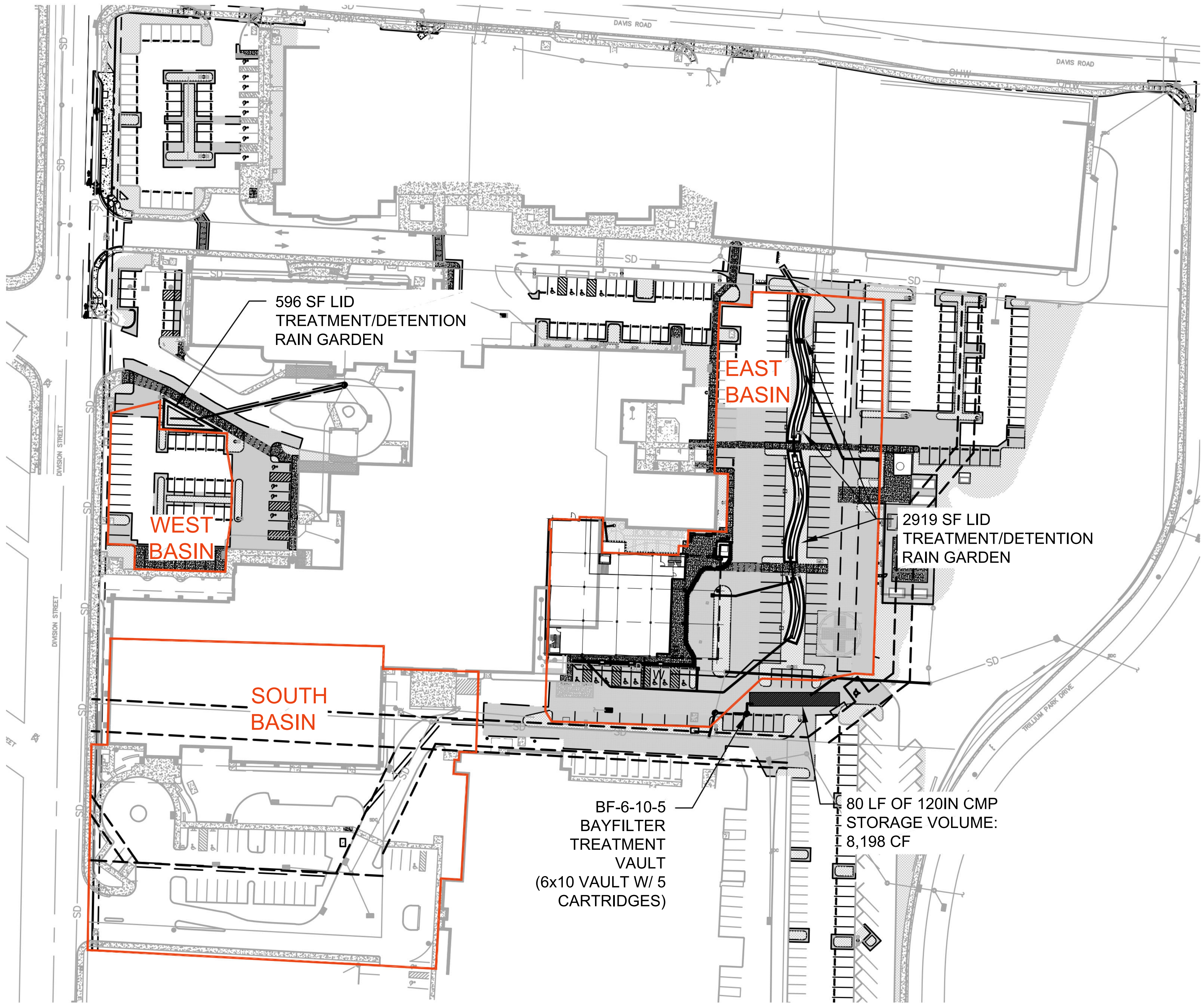
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

PROVIDENCE WILLAMETTE FALLS EXPANSION
EXISTING CONDITIONS
OREGON CITY, OR

PROJECT	14594-01
DATE	12/17/2019

FIGURE 1

\\BIL-FS\BIL-projects\22\14594-01\40Study\Drain\Exhibits\existing.dwg PLOT DATE 2019-12-17 15:03 SAVED DATE 2019-12-17 15:02 USER: mgillette



PROPOSED BASIN AREAS

SOUTH BASIN:

IMPERVIOUS AREA:	1.75 AC
PERVIOUS AREA:	0.32 AC
TOTAL AREA:	2.07 AC

WEST BASIN:

IMPERVIOUS AREA:	0.28 AC
PERVIOUS AREA:	0.02 AC
TOTAL AREA:	0.30 AC

EAST BASIN:

IMPERVIOUS AREA:	1.48 AC
PERVIOUS AREA:	0.22 AC
TOTAL AREA:	1.70 AC

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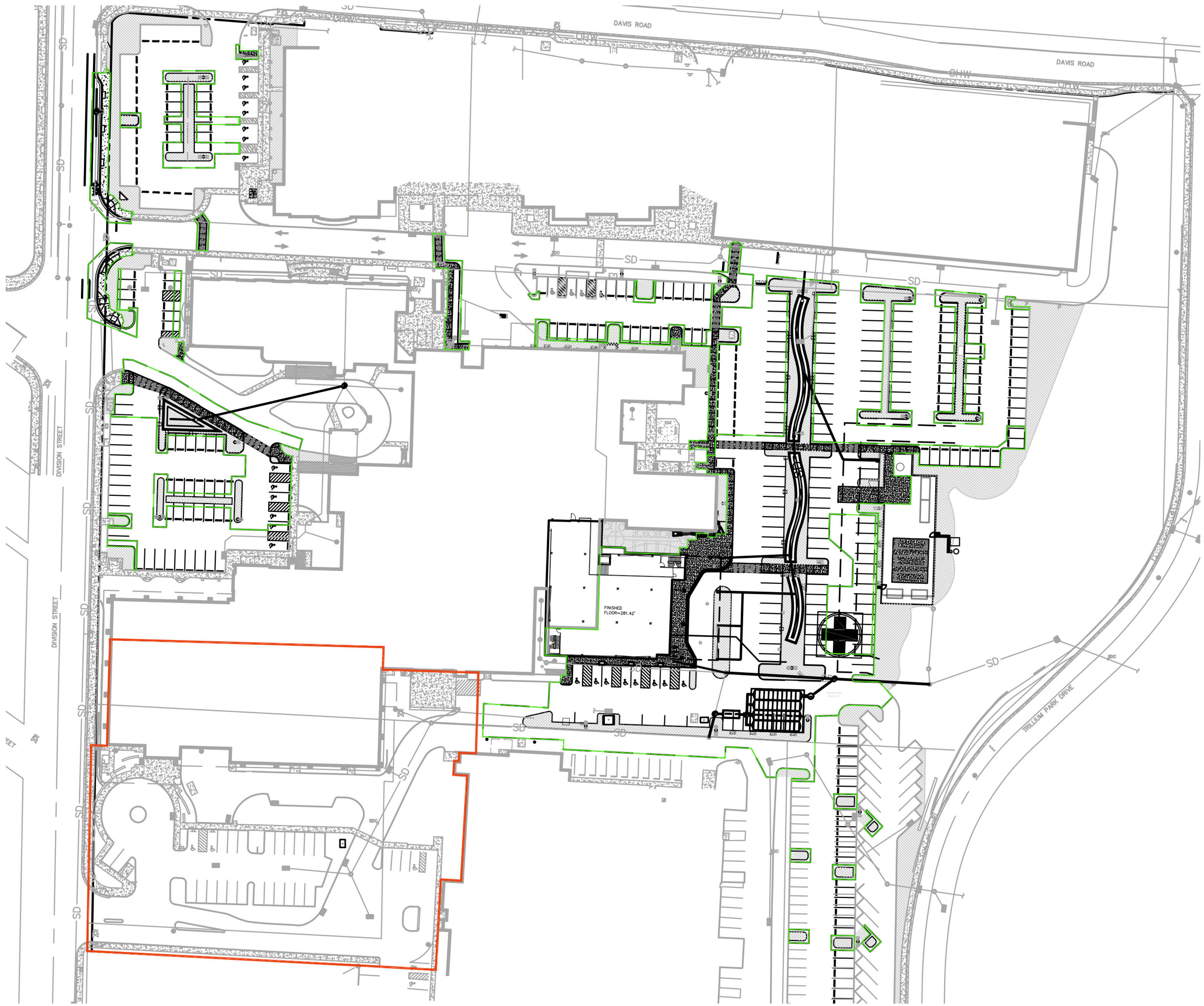
PROVIDENCE WILLAMETTE FALLS EXPANSION
PROPOSED CONDITIONS
OREGON CITY, OR

PROJECT	14594-01
DATE	10/27/2021

FIGURE 2

Q:\22\14594-01\40Study\Drain\Exhibits\proposed.dwg PLOT DATE 2021-10-27 15:32 SAVED DATE 2021-03-29 13:24 USER: mgillette



LEGEND

- SD — EXISTING STORM LINE
- EXISTING BOUNDARY LINE
- EXISTING STORM DRAIN MANHOLE
- EXISTING CATCH BASIN
- -- EXISTING UNTREATED BASIN AREA TO BE ROUTED PROPOSED TREATMENT/DETENTION FACILITIES
- -- PROPOSED NEW/REPLACED IMPERVIOUS AREA LIMITS

UNDISTURBED IMPERVIOUS AREA TO BE TREATED = 1.75 AC

DISTURBED IMPERVIOUS AREA UNABLE TO BE ROUTED TO A TREATMENT FACILITY = 0.24 AC

100 0 100
SCALE IN FEET

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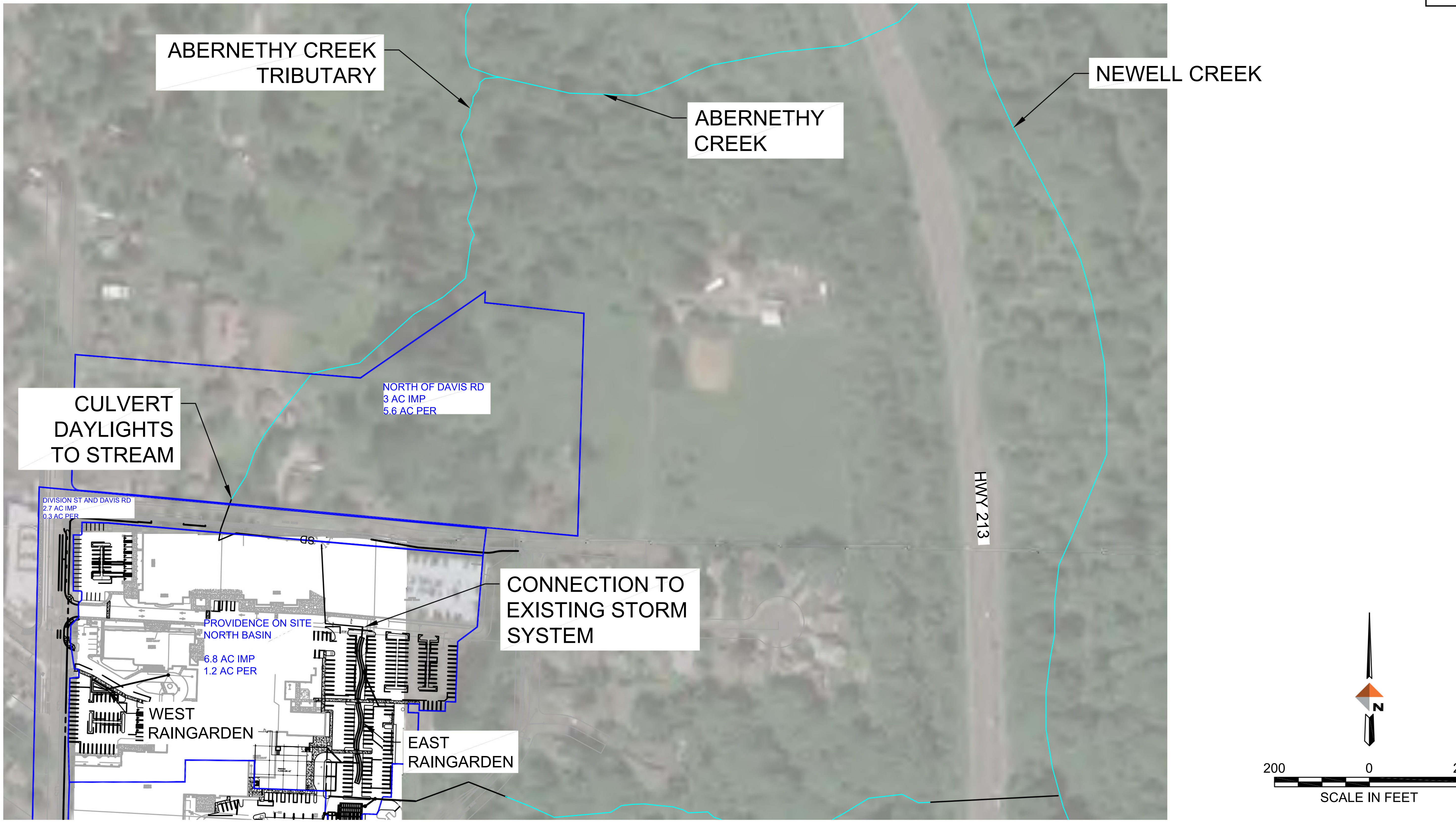
PROVIDENCE WILLAMETTE FALLS EXPANSION
PROPOSED AREA SWAP
OREGON CITY, OR

PROJECT	14594-01
DATE	03/25/2021

FIGURE 3

\\BIL-FS\BIL-projects\22\14594-01\40Study\Drain\Exhibits\Area Swap.dwg PLOT DATE 2021-3-29 13:18 SAVED DATE 2021-03-28 18:05 USER: mgillette



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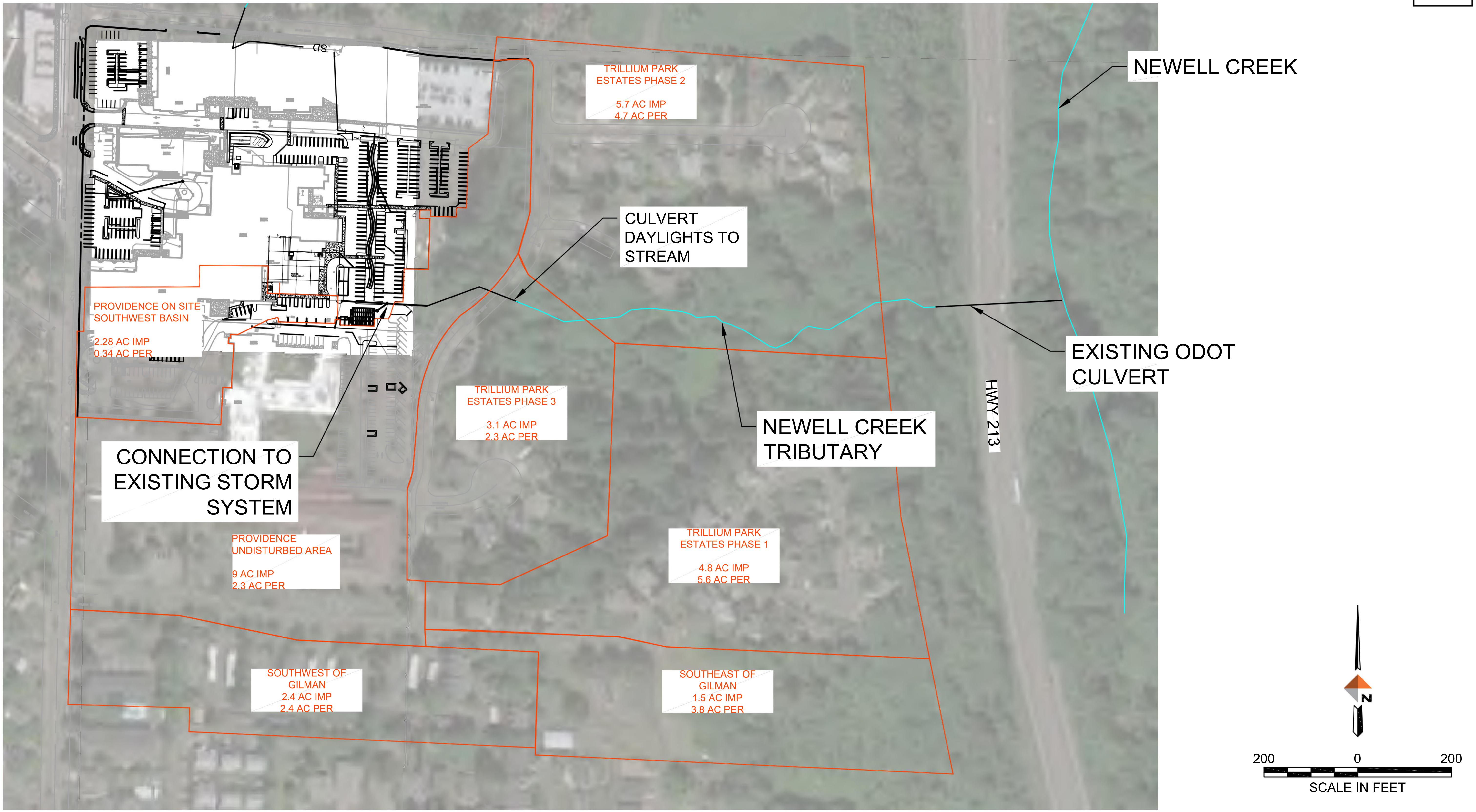
PROVIDENCE WILLAMETTE FALLS EXPANSION
DOWNSTREAM ANALYSIS - NORTH OUTLET
OREGON CITY, OR

PROJECT	14594-01
DATE	12/17/2019

FIGURE 4

\\BIL-FS\BIL-projects\22\14594-01\40Study\Drain\Downstream Analysis\BASINS.dwg PLOT DATE 2019-12-16 17:03 SAVED DATE 2019-12-16 16:57 USER: mgillette



\\BIL-FS\BIL-projects\22\14594-01\40Study\Drain\Downstream Analysis\BASINS.dwg PLOT DATE 2019-12-16 17:02 SAVED DATE 2019-12-16 16:57 USER: mgillette

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PROVIDENCE WILLAMETTE FALLS EXPANSION
DOWNSTREAM ANALYSIS - EAST OUTLET
OREGON CITY, OR

PROJECT	14594-01
DATE	12/17/2019

FIGURE 5

Map Scale: 1:2,350 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 30, 60, 120, 180

Feet: 0, 100, 200, 400, 600

N

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

USDA

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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: Clackamas County Area, Oregon
Survey Area Data: Version 15, Sep 10, 2019

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

Date(s) aerial images were photographed: Jun 13, 2019—Jul 25, 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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1A	Aloha silt loam, 0 to 3 percent slopes	C/D	17.7	90.4%
78C	Saum silt loam, 8 to 15 percent slopes	C	0.4	2.1%
91B	Woodburn silt loam, 3 to 8 percent slopes	C	0.2	1.1%
92F	Xerochrepts and Haploxerolls, very steep	B	1.3	6.4%
Totals for Area of Interest			**19.5**	**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

Tie-break Rule: Higher

Table 2.2
Runoff Curve Numbers for Selected Agricultural, Suburban, and Urban Areas

(Sources: TR 55, 1986, and Stormwater Management Manual, 1992. See Section 2.1.1 for explanation)

Cover type and hydrologic condition.			CNs for hydrologic soil group A	B	C	D
Curve Numbers for Pre-Development Conditions						
Pasture, grassland, or range-continuous forage for grazing:						
Fair condition (ground cover 50% to 75% and not heavily grazed).			49	69	79	84
Good condition (ground cover >75% and lightly or only occasionally grazed)			39	61	74	80
Woods:						
Fair (Woods are grazed but not burned, and some forest litter covers the soil).			36	60	73	79
Good (Woods are protected from grazing, and litter and brush adequately cover the soil).			30	55	70	77
Curve Numbers for Post-Development Conditions						
Open space (lawns, parks, golf courses, cemeteries, landscaping, etc.)[1]						
Fair condition (grass cover on 50% - 75% of the area).			77	85	90	92
Good condition (grass cover on >75% of the area)			68	80	86	90
Impervious areas:						
Open water bodies: lakes, wetlands, ponds etc.			100	100	100	100
Paved parking lots, roofs[2], driveways, etc. (excluding right-of-way)			98	98	98	98
Permeable Pavement (See Appendix C to decide which condition below to use)						
Landscaped area			77	85	90	92
50% landscaped area/50% impervious			87	91	94	96
100% impervious area			98	98	98	98
Paved			98	98	98	98
Gravel (including right-of-way)			76	85	89	91
Dirt (including right-of-way)			72	82	87	89
Pasture, grassland, or range-continuous forage for grazing:						
Poor condition (ground cover <50% or heavily grazed with no mulch).			68	79	86	89
Fair condition (ground cover 50% to 75% and not heavily grazed).			49	69	79	84
Good condition (ground cover >75% and lightly or only occasionally grazed)			39	61	74	80
Woods:						
Poor (Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning).			45	66	77	83
Fair (Woods are grazed but not burned, and some forest litter covers the soil).			36	60	73	79
Good (Woods are protected from grazing, and litter and brush adequately cover the soil).			30	55	70	77
Single family residential[3]**:** Dwelling Unit/Gross Acre	Should only be used for subdivisions > 50 acres	Average Percent impervious area[3,4]				
1.0 DU/GA		15	Separate curve number			
1.5 DU/GA		20	shall be selected for			
2.0 DU/GA		25	pervious & impervious			
2.5 DU/GA		30	portions of the site or			
3.0 DU/GA		34	basin			
3.5 DU/GA		38				
4.0 DU/GA		42				
4.5 DU/GA		46				
5.0 DU/GA		48				
5.5 DU/GA		50				
6.0 DU/GA		52				
6.5 DU/GA		54				
7.0 DU/GA		56				
7.5 DU/GA		58				
PUD's, condos, apartments, commercial businesses, industrial areas & & subdivisions < 50 acres	%impervious must be computed	Separate curve numbers shall be selected for pervious and impervious portions of the site				
For a more detailed and complete description of land use curve numbers refer to chapter two (2) of the Soil Conservation Service's Technical Release No. 55 , (210-VI-TR-55, Second Ed., June 1986).						

[1] Composite CN's may be computed for other combinations of open space cover type.
[2]Where roof runoff and driveway runoff are infiltrated or dispersed according to the requirements in Chapter 3, the average percent impervious area may be adjusted in accordance with the procedure described under "Flow Credit for Roof Downspout Infiltration" (Section 3.1.1), and "Flow Credit for Roof Downspout Dispersion" (Section 3.1.2).
[3]Assumes roof and driveway runoff is directed into street/storm system.
[4]All the remaining pervious area (lawn) are considered to be in good condition for these curve numbers.

WES BMP Sizing Software Version 1.6.0.2, May 2018

WES BMP Sizing Report

Project Information

Project Name	Providence Willamette Falls Expansion
Project Type	Addition
Location	
Stormwater Management Area	150063
Project Applicant	
Jurisdiction	HappyValleyCCSD1

Drainage Management Area

Name	Area (sq-ft)	Pre-Project Cover	Post-Project Cover	DMA Soil Type	BMP
South Basin - Imp	76,230	Forested	ConventionalConcrete	D	Stormtech Chambers
South Basin - Per	13,939	Forested	LandscapeDsoil	D	Stormtech Chambers
West Basin - Imp	12,196	Forested	ConventionalConcrete	D	West Rain Garden
West Basin - Per	872	Forested	LandscapeDsoil	D	West Rain Garden
East Basin - Roof	12,600	Forested	Roofs	D	East Swale
East Basin - Parking	51,868	Forested	ConventionalConcrete	D	East Swale
East Basin - Per	9,869	Forested	LandscapeDsoil	D	East Swale

LID Facility Sizing Details

LID ID	Design Criteria	BMP Type	Facility Soil Type	Minimum Area (sq-ft)	Planned Areas (sq-ft)	Orifice Diameter (in)
West Rain Garden	FlowControlAndTreatment	Rain Garden - Filtration	Lined	512.3	584.0	1.1
East Swale	FlowControlAndTreatment	Vegetated Swale - Filtration	Lined	3,568.8	2,919.0	3.0

Facility designed with an additional 12" of media. Per Section 4.3.3 of the Oregon City Design Standards, this allows the minimum area calculated by the BMP Sizing Tool to be reduced by 20%.

3568 * 0.8 = 2854 SF minimum area

Pond ID	Design Criteria(1)	Facility Soil Type	Max Depth (ft)(2)	Top Area (sq-ft)	Side Slope (1:H)	Facility Vol. (cu-ft)(3)	Water Storage Vol. (cu-ft)(4)	Adequate Size?
Stormtech Chambers	FCWQT	Lined	8.00	895.0	0	7,160.0	5,549.0	Yes

1. FCWQT = Flow control and water quality treatment, WQT = Water quality treatment only

2. Depth is measured from the bottom of the facility and includes the three feet of media (drain rock, separation layer and growing media).

3. Maximum volume of the facility. Includes the volume occupied by the media at the bottom of the facility.

4. Maximum water storage volume of the facility. Includes water storage in the three feet of soil media assuming a 40 percent porosity.

Simple Pond Geometry Configuration

Pond ID: Stormtech Chambers
Design: FlowControlAndTreatment

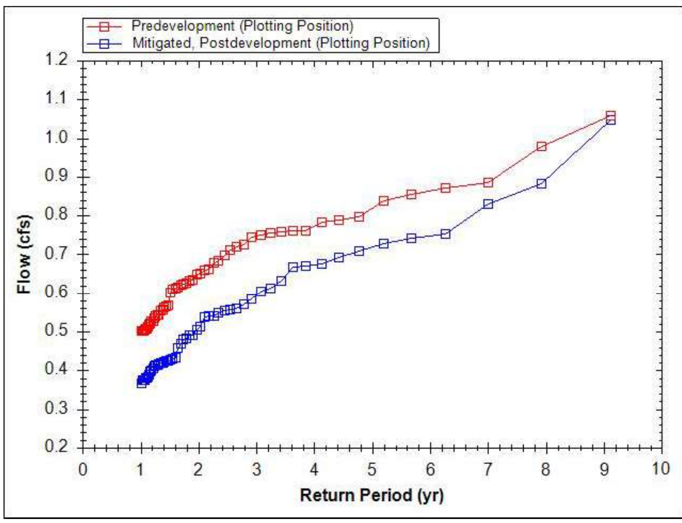
Shape Curve

Depth (ft)	Area (sq ft)
8.0	895.0

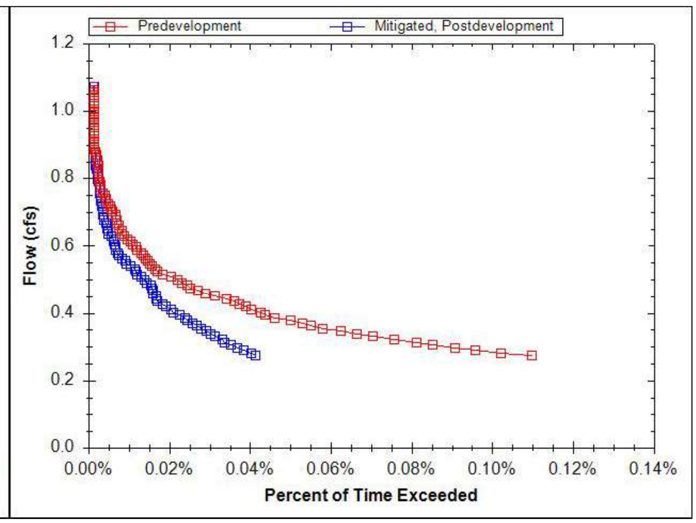
Outlet Structure Details

Lower Orifice Invert (ft)	0.0
Lower Orifice Dia (in)	1.9
Upper Orifice Invert(ft)	5.4
Upper Orifice Dia (in)	4.3
Overflow Weir Invert(ft)	7.0
Overflow Weir Length (ft)	6.3

Flow Frequency Chart



Flow Duration Chart



CONTECH ENGINEERED SOLUTIONS

Date: 10/19/2021
Project Name: 120 Option - 10493 (10-19-2021 23-27-57)

City / County:
State:

CMP: Underground Detention System
Storage Volume Estimation

Designed By:
Company:
Telephone:

=Adjustable Input Cells

Contech Engineered Solutions, LLC is pleased to offer the following estimate of storage volume for the above named project. The results are submitted as an estimate only, without liability on the part of Contech Engineered Solutions, LLC for accuracy or suitability to any particular applicaton and are subject to verification of the Engineer of Record. **This tool is only applicable for rectangular shaped systems.**

Summary of Inputs

System Information		Backfill Information		Pipe & Analysis Information	
Out-to-out length (ft):	80.0	Backfill Porosity (%):	40%	System Diameter (in):	120
Out-to-out width (ft):	10.0	Depth Above Pipe (in):	12.0	Pipe Spacing (in):	36
Number of Manifolds (ea):	1.0	Depth Below Pipe (in):	3.0	Incremental Analysis (in):	1
Number of Barrels (ea):	1.0	Width At Ends (ft):	1.0	System Invert (Elevation):	262
		Width At Sides (ft):	1.0		

Storage Volume Estimation

System		Pipe		Stone		Total System		Miscellaneous	
Depth (ft)	Elevation (ft)	Incremental Storage (cf)	Cumulative Storage (cf)	Incremental Storage (cf)	Cumulative Storage (cf)	Incremental Storage (cf)	Cumulative Storage (cf)	Percent Open Storage (%)	Ave. Surface Area (sf)
0.00	262.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	393.6
0.08	262.08	0.0	0.0	32.8	32.8	32.8	32.8	0.0%	393.6
0.17	262.16	0.0	0.0	32.8	65.6	32.8	65.6	0.0%	393.6
0.25	262.25	0.0	0.0	32.8	98.4	32.8	98.4	0.0%	393.6
0.33	262.33	8.1	8.1	29.6	128.0	37.7	136.1	5.9%	480.9
0.42	262.41	14.7	22.8	26.9	154.9	41.6	177.7	12.9%	516.5
0.50	262.50	19.0	41.8	25.2	180.1	44.2	221.9	18.9%	543.5
0.58	262.58	22.4	64.3	23.8	203.9	46.2	268.2	24.0%	565.9
0.67	262.66	25.3	89.6	22.7	226.6	48.0	316.1	28.3%	585.4
0.75	262.75	27.9	117.5	21.7	248.2	49.5	365.7	32.1%	602.8
0.83	262.83	30.2	147.6	20.7	269.0	50.9	416.6	35.4%	618.6
0.92	262.91	32.3	179.9	19.9	288.8	52.2	468.7	38.4%	633.1
1.00	263.00	34.2	214.1	19.1	308.0	53.3	522.1	41.0%	646.5
1.08	263.08	36.0	250.1	18.4	326.4	54.4	576.5	43.4%	658.9
1.17	263.16	37.7	287.8	17.7	344.1	55.4	631.9	45.5%	670.6
1.25	263.25	39.2	327.0	17.1	361.2	56.3	688.2	47.5%	681.6
1.33	263.33	40.7	367.7	16.5	377.7	57.2	745.4	49.3%	692.0
1.42	263.41	42.1	409.9	15.9	393.7	58.1	803.5	51.0%	701.8
1.50	263.50	43.5	453.3	15.4	409.1	58.9	862.4	52.6%	711.1
1.58	263.58	44.7	498.0	14.9	424.0	59.6	922.0	54.0%	719.9
1.67	263.66	45.9	543.9	14.4	438.4	60.3	982.4	55.4%	728.4
1.75	263.75	47.1	591.0	14.0	452.4	61.0	1,043.4	56.6%	736.4
1.83	263.83	48.1	639.1	13.5	465.9	61.7	1,105.1	57.8%	744.1
1.92	263.91	49.2	688.3	13.1	479.1	62.3	1,167.4	59.0%	751.4
2.00	264.00	50.2	738.5	12.7	491.8	62.9	1,230.3	60.0%	758.4
2.08	264.08	51.1	789.6	12.3	504.1	63.5	1,293.8	61.0%	765.1
2.17	264.16	52.0	841.7	12.0	516.1	64.0	1,357.8	62.0%	771.5
2.25	264.25	52.9	894.6	11.6	527.8	64.5	1,422.4	62.9%	777.6
2.33	264.33	53.7	948.3	11.3	539.1	65.0	1,487.4	63.8%	783.5
2.42	264.41	54.5	1,002.9	11.0	550.0	65.5	1,552.9	64.6%	789.1
2.50	264.50	55.3	1,058.2	10.7	560.7	66.0	1,618.9	65.4%	794.5
2.58	264.58	56.0	1,114.2	10.4	571.1	66.4	1,685.3	66.1%	799.6
2.67	264.66	56.7	1,171.0	10.1	581.2	66.8	1,752.2	66.8%	804.6
2.75	264.75	57.4	1,228.4	9.8	591.1	67.2	1,819.4	67.5%	809.3
2.83	264.83	58.1	1,286.4	9.6	600.6	67.6	1,887.1	68.2%	813.8
2.92	264.91	58.7	1,345.1	9.3	610.0	68.0	1,955.1	68.8%	818.1
3.00	265.00	59.3	1,404.3	9.1	619.1	68.4	2,023.4	69.4%	822.3
3.08	265.08	59.8	1,464.1	8.9	627.9	68.7	2,092.1	70.0%	826.2

These results are submitted to you as a guideline only, without liability on the part of CONTECH Engineered Solutions, LLC for accuracy or suitability to any particular application, and are subject to your verification.

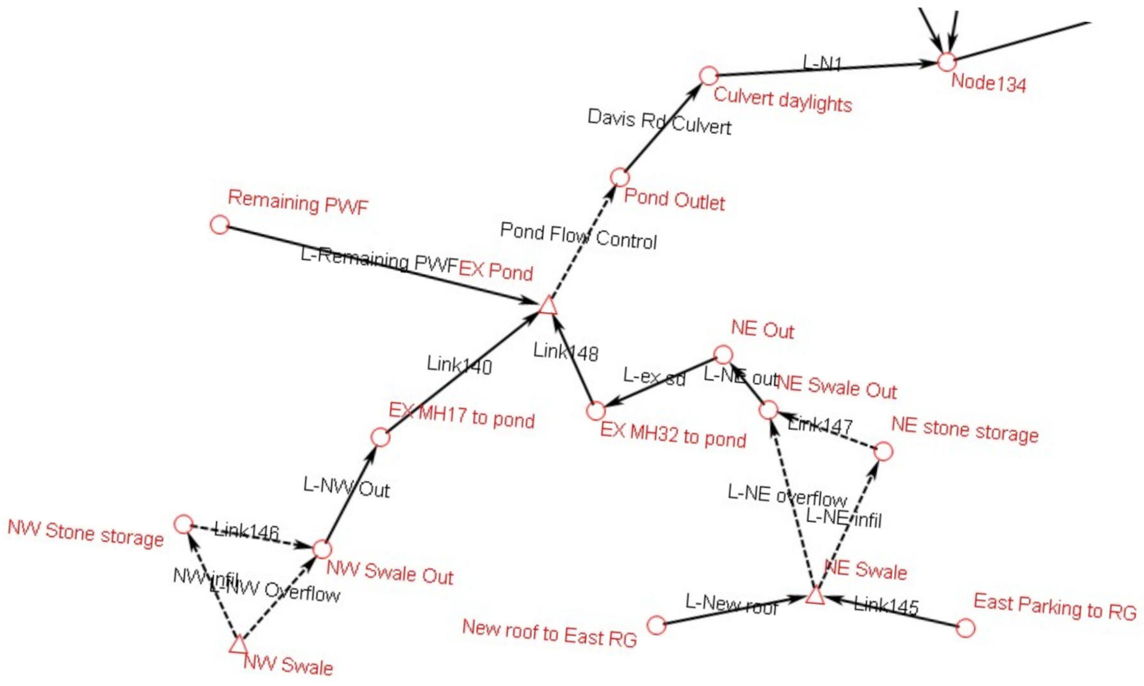
3.17	265.16	60.3	1,524.5	8.7	636.6	69.0	2,161.1	70.5%	829.9
3.25	265.25	60.9	1,585.3	8.5	645.1	69.3	2,230.4	71.1%	833.5
3.33	265.33	61.3	1,646.7	8.3	653.3	69.6	2,300.0	71.6%	836.9
3.42	265.41	61.8	1,708.5	8.1	661.4	69.9	2,369.9	72.1%	840.2
3.50	265.50	62.2	1,770.7	7.9	669.3	70.1	2,440.0	72.6%	843.2
3.58	265.58	62.7	1,833.4	7.7	677.0	70.4	2,510.4	73.0%	846.1
3.67	265.66	63.0	1,896.4	7.6	684.6	70.6	2,581.1	73.5%	848.9
3.75	265.75	63.4	1,959.8	7.4	692.1	70.9	2,651.9	73.9%	851.5
3.83	265.83	63.8	2,023.6	7.3	699.4	71.1	2,723.0	74.3%	853.9
3.92	265.91	64.1	2,087.7	7.2	706.5	71.3	2,794.2	74.7%	856.2
4.00	266.00	64.4	2,152.1	7.0	713.6	71.4	2,865.7	75.1%	858.4
4.08	266.08	64.7	2,216.8	6.9	720.5	71.6	2,937.3	75.5%	860.4
4.17	266.16	65.0	2,281.8	6.8	727.3	71.8	3,009.1	75.8%	862.2
4.25	266.25	65.2	2,347.0	6.7	734.0	71.9	3,081.0	76.2%	863.9
4.33	266.33	65.4	2,412.4	6.6	740.6	72.1	3,153.0	76.5%	865.5
4.42	266.41	65.6	2,478.0	6.5	747.2	72.2	3,225.2	76.8%	866.9
4.50	266.50	65.8	2,543.9	6.5	753.7	72.3	3,297.5	77.1%	868.2
4.58	266.58	66.0	2,609.8	6.4	760.1	72.4	3,369.9	77.4%	869.3
4.67	266.66	66.1	2,676.0	6.3	766.4	72.5	3,442.4	77.7%	870.3
4.75	266.75	66.3	2,742.3	6.3	772.7	72.6	3,515.0	78.0%	871.2
4.83	266.83	66.4	2,808.6	6.2	778.9	72.6	3,587.6	78.3%	871.9
4.92	266.91	66.5	2,875.1	6.2	785.2	72.7	3,660.3	78.5%	872.5
5.00	267.00	66.6	2,941.7	6.2	791.3	72.7	3,733.0	78.8%	873.0
5.08	267.08	66.6	3,008.3	6.2	797.5	72.8	3,805.8	79.0%	873.3
5.17	267.16	66.6	3,074.9	6.1	803.6	72.8	3,878.6	79.3%	873.5
5.25	267.25	66.7	3,141.6	6.1	809.8	72.8	3,951.4	79.5%	873.6
5.33	267.33	66.7	3,208.3	6.1	815.9	72.8	4,024.2	79.7%	873.5
5.42	267.41	66.6	3,274.9	6.1	822.0	72.8	4,096.9	79.9%	873.3
5.50	267.50	66.6	3,341.5	6.2	828.2	72.8	4,169.7	80.1%	873.0
5.58	267.58	66.6	3,408.1	6.2	834.4	72.7	4,242.4	80.3%	872.5
5.67	267.66	66.5	3,474.5	6.2	840.6	72.7	4,315.1	80.5%	871.9
5.75	267.75	66.4	3,540.9	6.2	846.8	72.6	4,387.8	80.7%	871.2
5.83	267.83	66.3	3,607.2	6.3	853.1	72.6	4,460.3	80.9%	870.3
5.92	267.91	66.1	3,673.3	6.3	859.5	72.5	4,532.8	81.0%	869.3
6.00	268.00	66.0	3,739.3	6.4	865.9	72.4	4,605.2	81.2%	868.2
6.08	268.08	65.8	3,805.2	6.5	872.3	72.3	4,677.5	81.4%	866.9
6.17	268.16	65.6	3,870.8	6.5	878.9	72.2	4,749.7	81.5%	865.5
6.25	268.25	65.4	3,936.2	6.6	885.5	72.1	4,821.7	81.6%	863.9
6.33	268.33	65.2	4,001.4	6.7	892.2	71.9	4,893.7	81.8%	862.2
6.42	268.41	65.0	4,066.4	6.8	899.0	71.8	4,965.4	81.9%	860.4
6.50	268.50	64.7	4,131.1	6.9	906.0	71.6	5,037.0	82.0%	858.4
6.58	268.58	64.4	4,195.5	7.0	913.0	71.4	5,108.5	82.1%	856.2
6.67	268.66	64.1	4,259.6	7.2	920.2	71.3	5,179.7	82.2%	853.9
6.75	268.75	63.8	4,323.3	7.3	927.5	71.1	5,250.8	82.3%	851.5
6.83	268.83	63.4	4,386.8	7.4	934.9	70.9	5,321.7	82.4%	848.9
6.92	268.91	63.0	4,449.8	7.6	942.5	70.6	5,392.3	82.5%	846.1
7.00	269.00	62.7	4,512.5	7.7	950.2	70.4	5,462.7	82.6%	843.2
7.08	269.08	62.2	4,574.7	7.9	958.1	70.1	5,532.8	82.7%	840.2
7.17	269.16	61.8	4,636.5	8.1	966.2	69.9	5,602.7	82.8%	836.9
7.25	269.25	61.3	4,697.8	8.3	974.5	69.6	5,672.3	82.8%	833.5
7.33	269.33	60.9	4,758.7	8.5	982.9	69.3	5,741.6	82.9%	829.9
7.42	269.41	60.3	4,819.0	8.7	991.6	69.0	5,810.6	82.9%	826.2
7.50	269.50	59.8	4,878.8	8.9	1,000.5	68.7	5,879.3	83.0%	822.3
7.58	269.58	59.3	4,938.1	9.1	1,009.6	68.4	5,947.7	83.0%	818.1
7.67	269.66	58.7	4,996.8	9.3	1,018.9	68.0	6,015.7	83.1%	813.8
7.75	269.75	58.1	5,054.8	9.6	1,028.5	67.6	6,083.3	83.1%	809.3
7.83	269.83	57.4	5,112.2	9.8	1,038.3	67.2	6,150.5	83.1%	804.6
7.92	269.91	56.7	5,169.0	10.1	1,048.4	66.8	6,217.4	83.1%	799.6
8.00	270.00	56.0	5,225.0	10.4	1,058.8	66.4	6,283.8	83.2%	794.5
8.08	270.08	55.3	5,280.3	10.7	1,069.5	66.0	6,349.8	83.2%	789.1
8.17	270.16	54.5	5,334.9	11.0	1,080.5	65.5	6,415.3	83.2%	783.5
8.25	270.25	53.7	5,388.6	11.3	1,091.8	65.0	6,480.4	83.2%	777.6
8.33	270.33	52.9	5,441.5	11.6	1,103.4	64.5	6,544.9	83.1%	771.5
8.42	270.41	52.0	5,493.5	12.0	1,115.4	64.0	6,608.9	83.1%	765.1
8.50	270.50	51.1	5,544.7	12.3	1,127.7	63.5	6,672.4	83.1%	758.4
8.58	270.58	50.2	5,594.9	12.7	1,140.5	62.9	6,735.3	83.1%	751.4
8.67	270.66	49.2	5,644.0	13.1	1,153.6	62.3	6,797.6	83.0%	744.1
8.75	270.75	48.1	5,692.2	13.5	1,167.1	61.7	6,859.3	83.0%	736.4
8.83	270.83	47.1	5,739.2	14.0	1,181.1	61.0	6,920.3	82.9%	728.4
8.92	270.91	45.9	5,785.2	14.4	1,195.5	60.3	6,980.7	82.9%	719.9

9.00	271.00	44.7	5,829.9	14.9	1,210.5	59.6	7,040.3	82.8%	711.1
9.08	271.08	43.5	5,873.3	15.4	1,225.9	58.9	7,099.2	82.7%	701.8
9.17	271.16	42.1	5,915.5	15.9	1,241.8	58.1	7,157.3	82.6%	692.0
9.25	271.25	40.7	5,956.2	16.5	1,258.3	57.2	7,214.5	82.6%	681.6
9.33	271.33	39.2	5,995.4	17.1	1,275.4	56.3	7,270.9	82.5%	670.6
9.42	271.41	37.7	6,033.1	17.7	1,293.2	55.4	7,326.3	82.3%	658.9
9.50	271.50	36.0	6,069.1	18.4	1,311.6	54.4	7,380.7	82.2%	646.5
9.58	271.58	34.2	6,103.3	19.1	1,330.7	53.3	7,434.0	82.1%	633.1
9.67	271.66	32.3	6,135.6	19.9	1,350.6	52.2	7,486.1	82.0%	618.6
9.75	271.75	30.2	6,165.7	20.7	1,371.3	50.9	7,537.0	81.8%	602.8
9.83	271.83	27.9	6,193.6	21.7	1,393.0	49.5	7,586.6	81.6%	585.4
9.92	271.91	25.3	6,218.9	22.7	1,415.6	48.0	7,634.6	81.5%	565.9
10.00	272.00	22.4	6,241.3	23.8	1,439.5	46.2	7,680.8	81.3%	543.5
10.08	272.08	19.0	6,260.3	25.2	1,464.7	44.2	7,725.0	81.0%	516.5
10.17	272.16	14.7	6,275.1	26.9	1,491.6	41.6	7,766.7	80.8%	480.9
10.25	272.25	8.1	6,283.2	29.6	1,521.1	37.7	7,804.3	80.5%	393.6
10.33	272.33	0.0	6,283.2	32.8	1,553.9	32.8	7,837.1	80.2%	393.6
10.42	272.41	0.0	6,283.2	32.8	1,586.7	32.8	7,869.9	79.8%	393.6
10.50	272.50	0.0	6,283.2	32.8	1,619.5	32.8	7,902.7	79.5%	393.6
10.58	272.58	0.0	6,283.2	32.8	1,652.3	32.8	7,935.5	79.2%	393.6
10.67	272.66	0.0	6,283.2	32.8	1,685.1	32.8	7,968.3	78.9%	393.6
10.75	272.75	0.0	6,283.2	32.8	1,717.9	32.8	8,001.1	78.5%	393.6
10.83	272.83	0.0	6,283.2	32.8	1,750.7	32.8	8,033.9	78.2%	393.6
10.92	272.91	0.0	6,283.2	32.8	1,783.5	32.8	8,066.7	77.9%	393.6
11.00	273.00	0.0	6,283.2	32.8	1,816.3	32.8	8,099.5	77.6%	393.6
11.08	273.08	0.0	6,283.2	32.8	1,849.1	32.8	8,132.3	77.3%	393.6
11.17	273.16	0.0	6,283.2	32.8	1,881.9	32.8	8,165.1	77.0%	393.6
11.25	273.25	0.0	6,283.2	32.8	1,914.7	32.8	8,197.9	76.6%	393.6

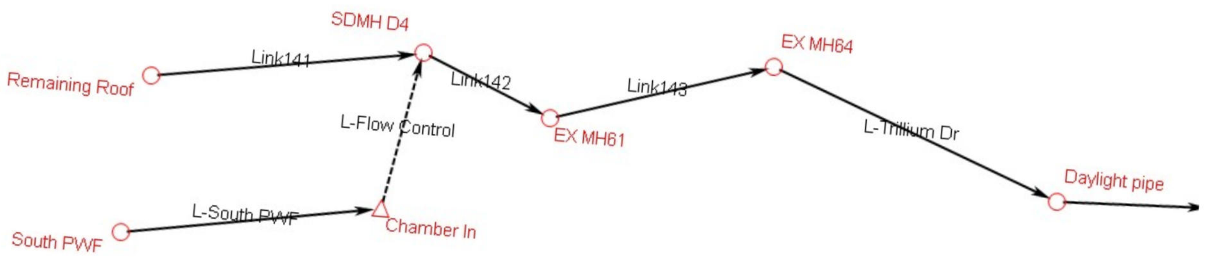
Providence Willamette Falls Expansion

Xpswmm Schematic Layout

West and East Basins:



South Basin:



Providence Willamette Falls Expansion

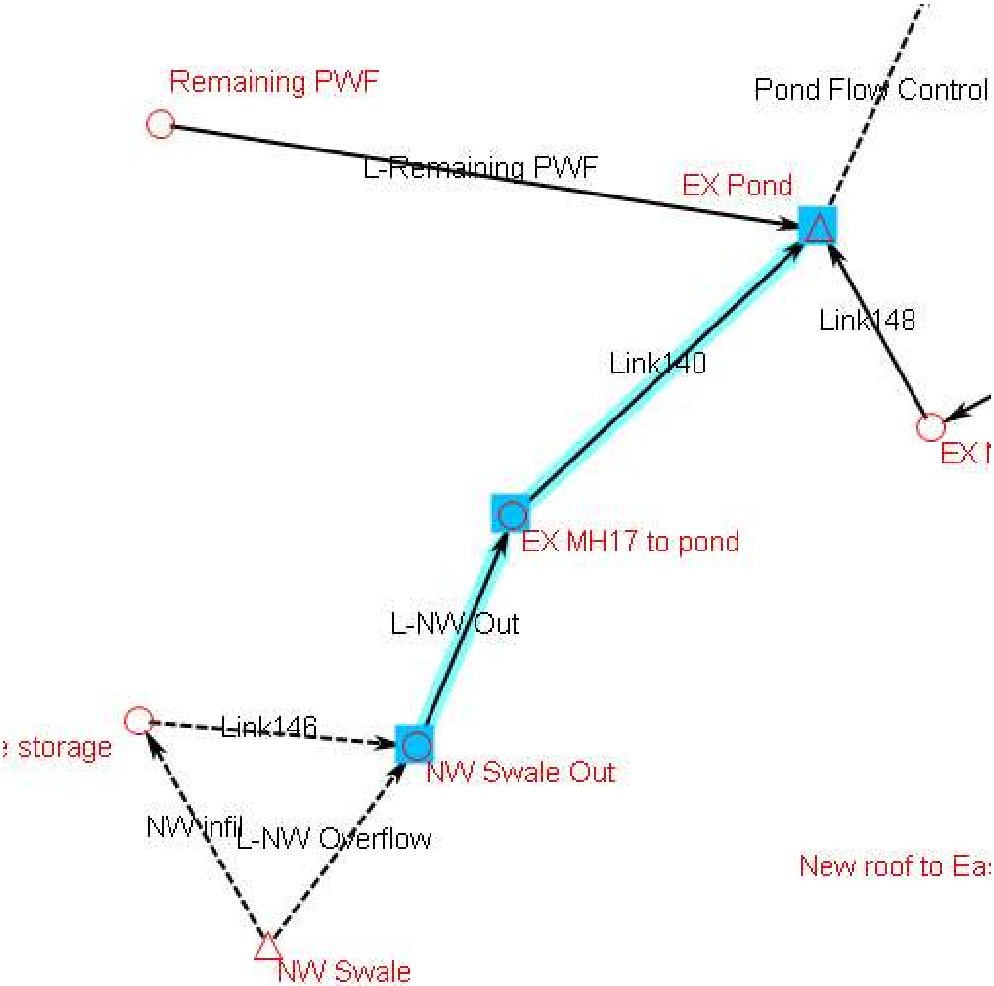
Runoff Data:

XPSWMM RUNOFF DATA Providence Willamette Falls Expansion						
Node Information					Runoff Information	
Node Name	Area	Impervious	Pervious SCS Curve Number	Tc	Rainfall	Surface Runoff
	acre	%		min.	in	cfs
10-Year Storm Event						
East Parking to RG	0.65	100	98	5	3.58	0.71
New roof to East RG	0.35	100	98	5	3.58	0.38
NW Swale	0.29	100	98	5	3.58	0.32
Remaining PWF	6.80	100	98	5	3.58	8.35
Remaining PWF	1.20	0	90	5	3.58	
Remaining Roof	0.53	100	98	5	3.58	0.57
South PWF	1.75	100	98	5	3.58	2.18
South PWF	0.34	0	90	5	3.58	

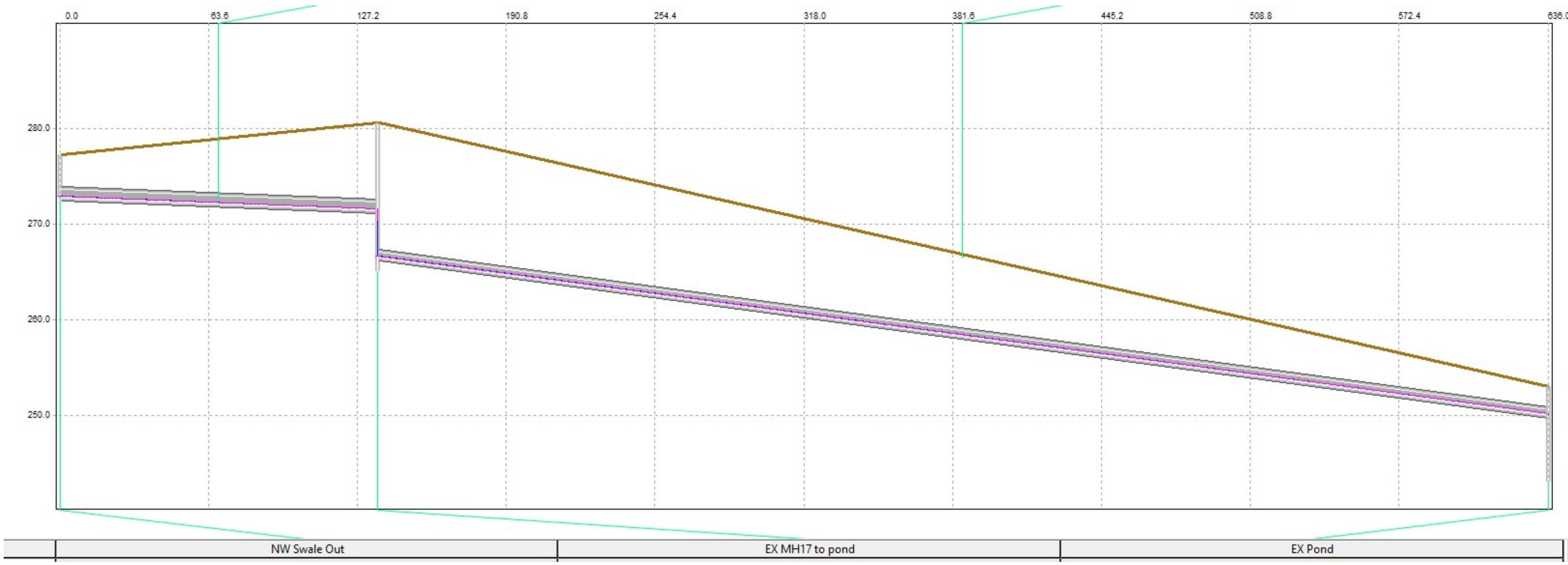
Providence Willamette Falls Expansion

Conveyance Data:

Profile 1

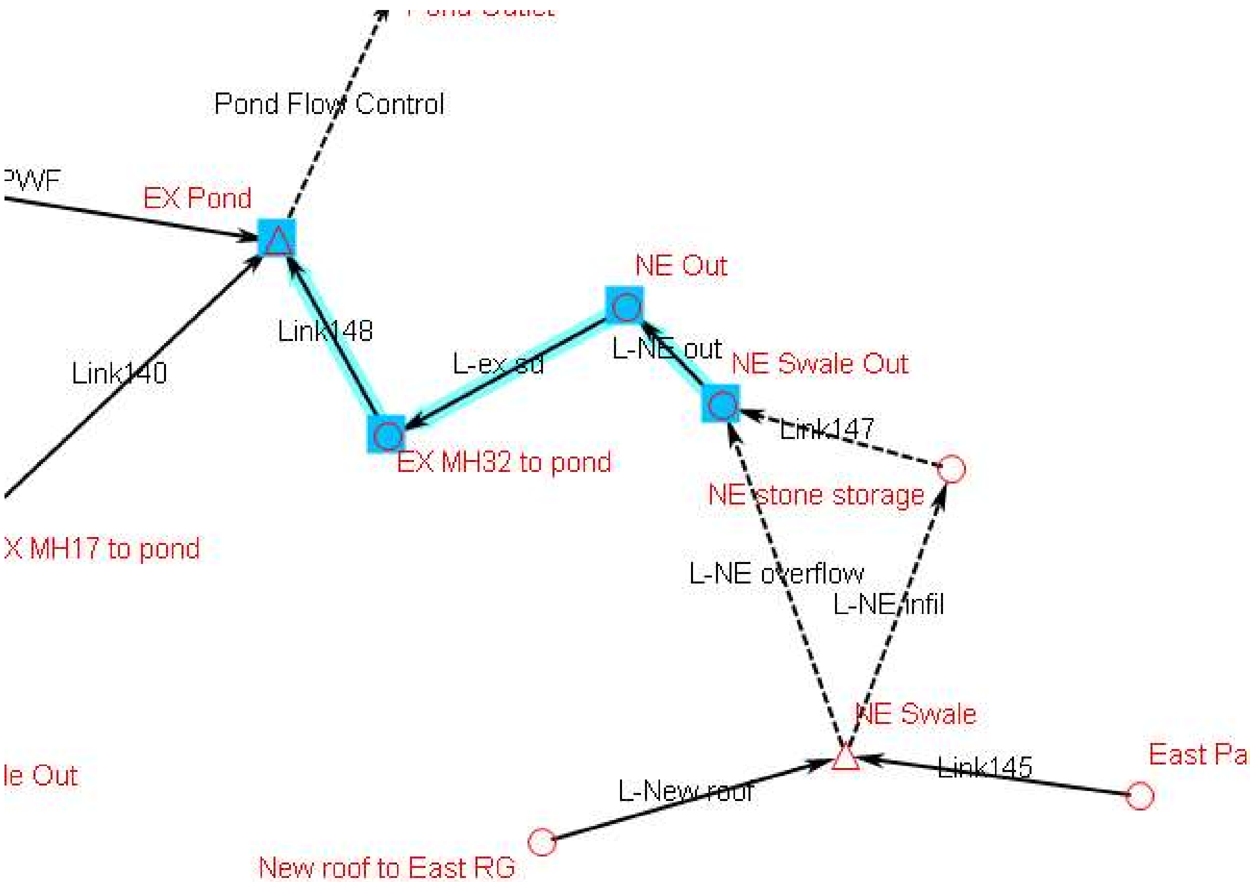


Profile 1

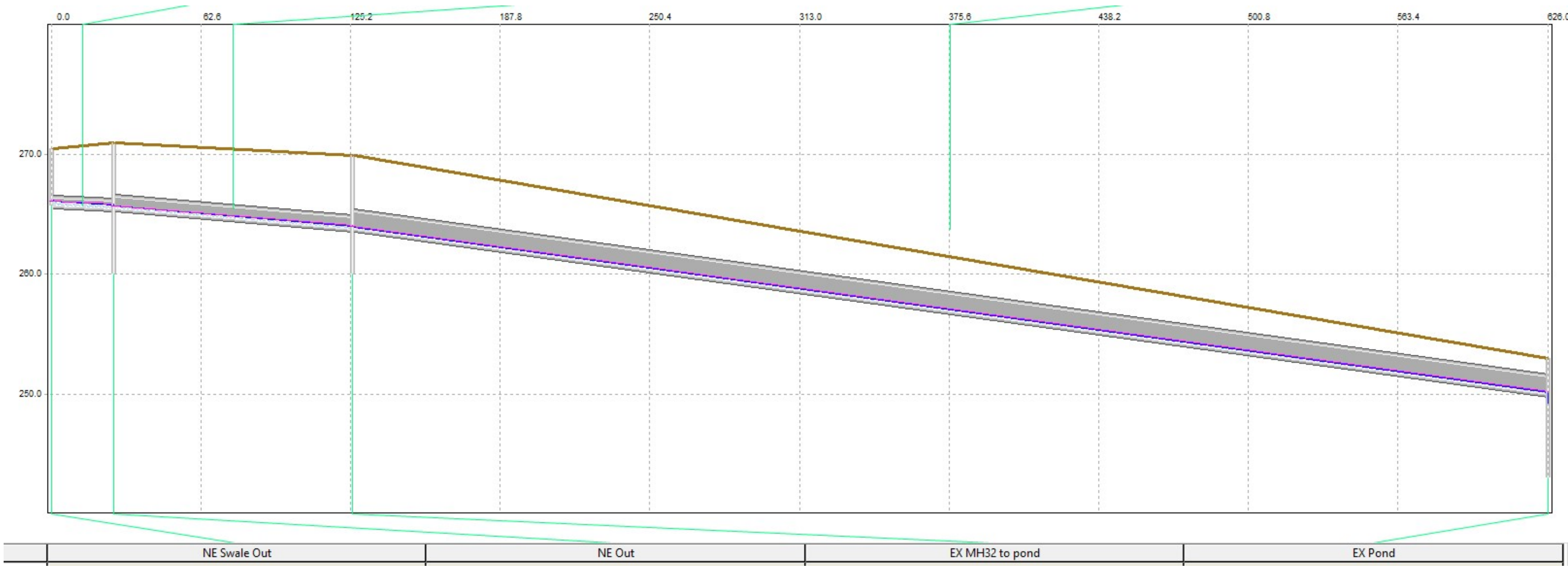

0.0
63.6
127.2
190.8
254.4
318.0
381.6
445.2
508.8
572.4
636.0
280.0
270.0
260.0
250.0
NW Swale Out
EX MH17 to pond
EX Pond

<u>Conveyance Data:</u>

Profile 2

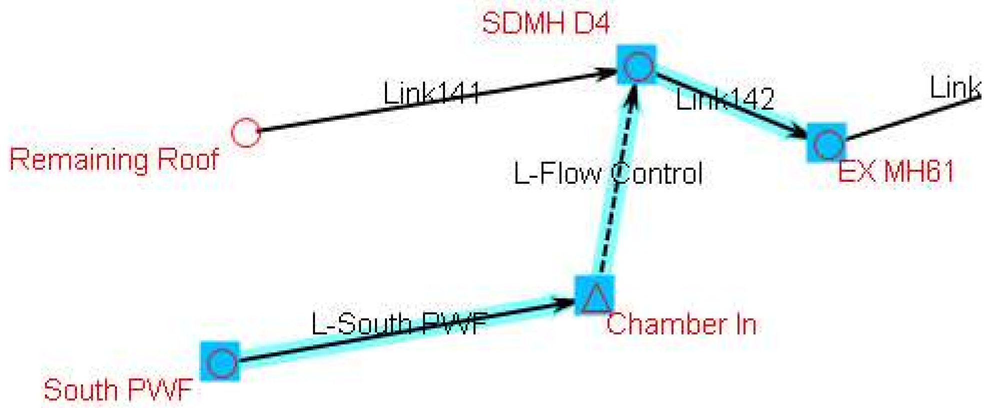


Profile 2

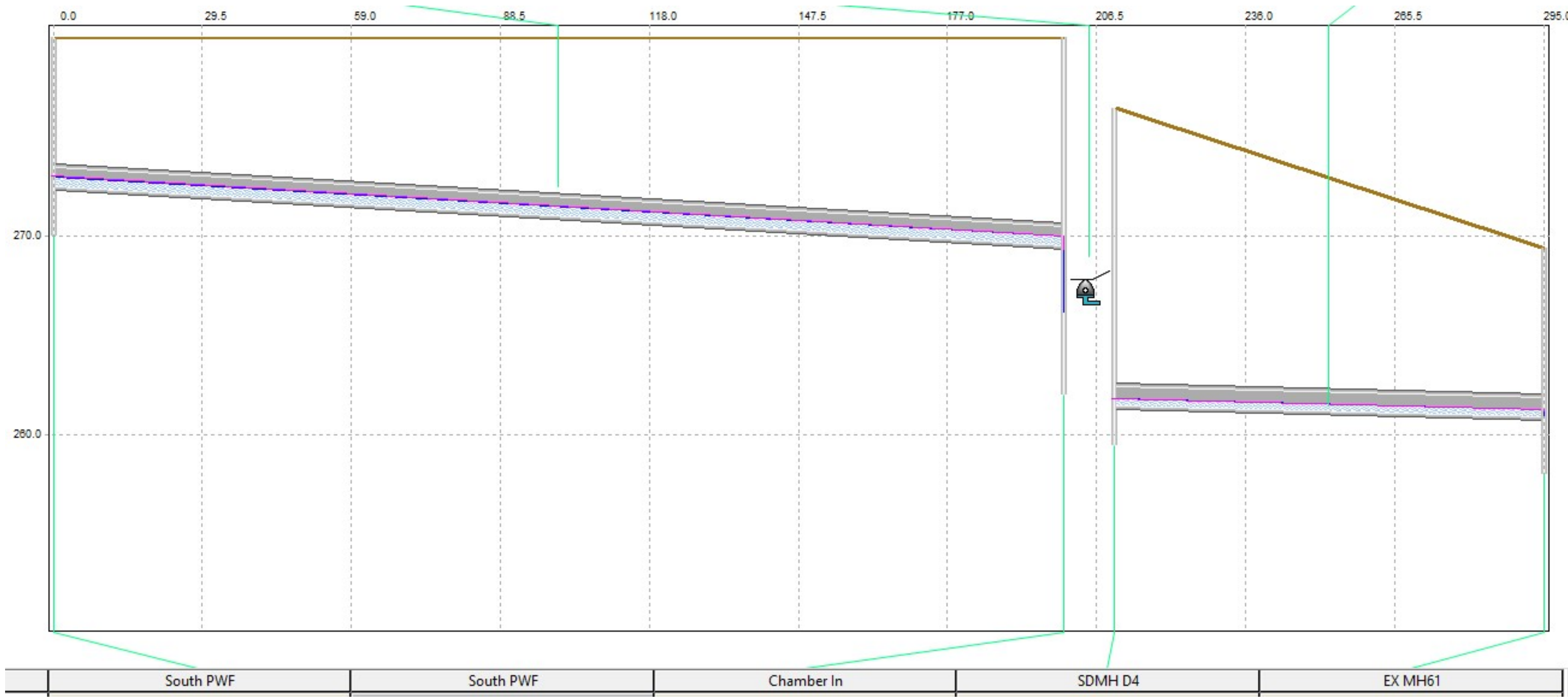

0.0
62.6
125.2
187.8
250.4
313.0
375.6
438.2
500.8
563.4
270.0
260.0
250.0
NE Swale Out
NE Out
EX MH32 to pond
EX Pond

Conveyance Data:

Profile 3



Profile 3

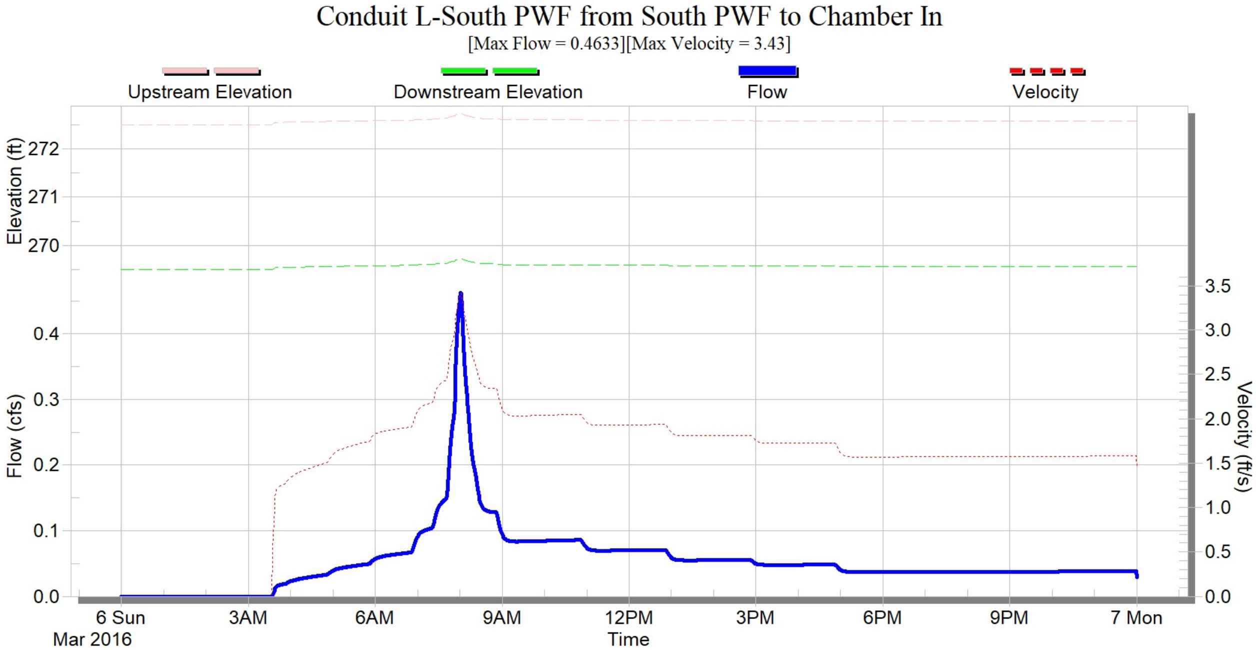


0.0
29.5
59.0
88.5
118.0
147.5
177.0
206.5
236.0
265.5
295.0
270.0
260.0
South PWF
South PWF
Chamber In
SDMH D4
EX MH61

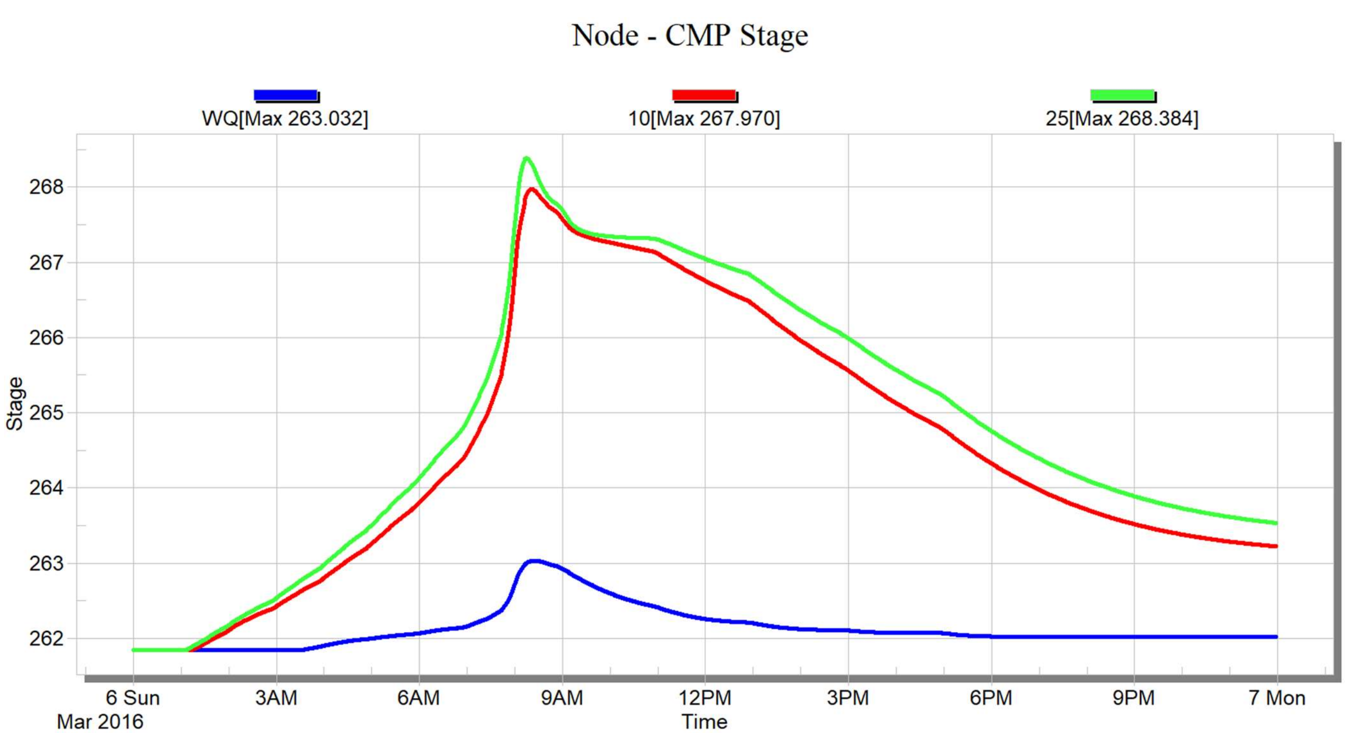
Providence Willamette Falls Expansion

Bayfilter Vault Hydrograph:

1.75 ac impervious; 0.344 ac pervious; CN = 98; TC = 5 min



CMP Stage Graph:

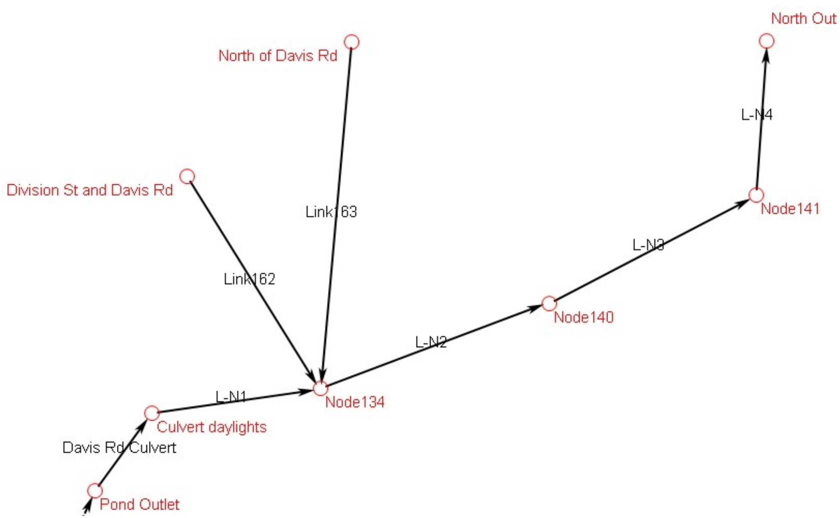


Downstream Analysis Results:

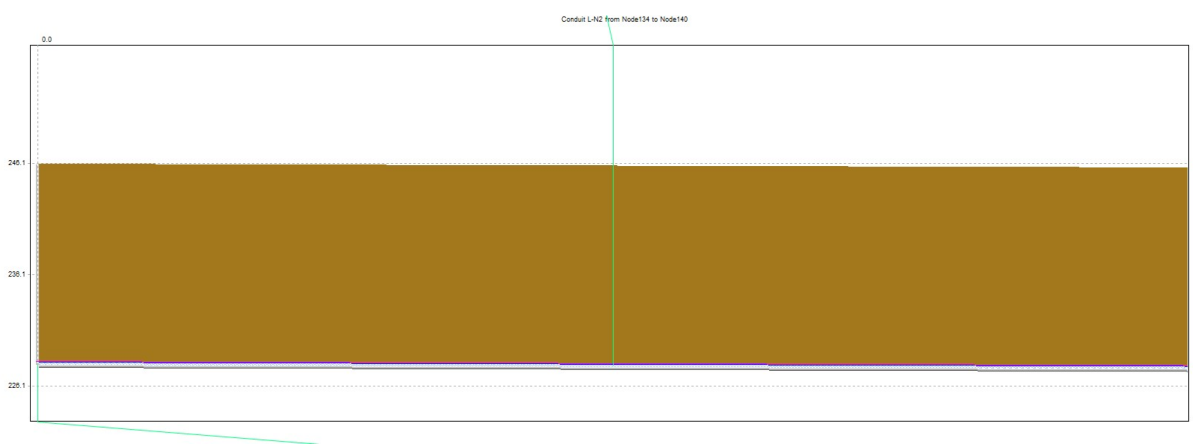
Storm Event: KC24HR 25yr with 3.98x multiplier

<u>North Outlet:</u>

Xpswmm Schematic Layout:

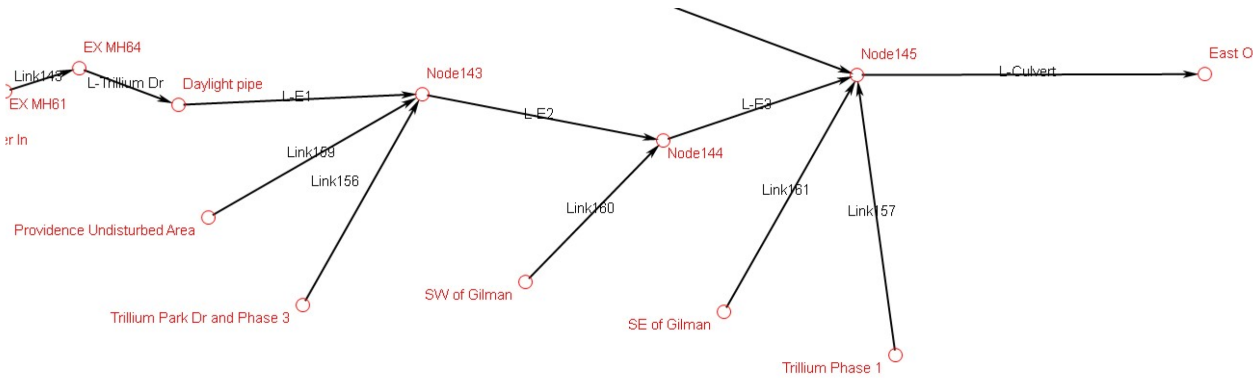


Stream stage downstream of project outfall:

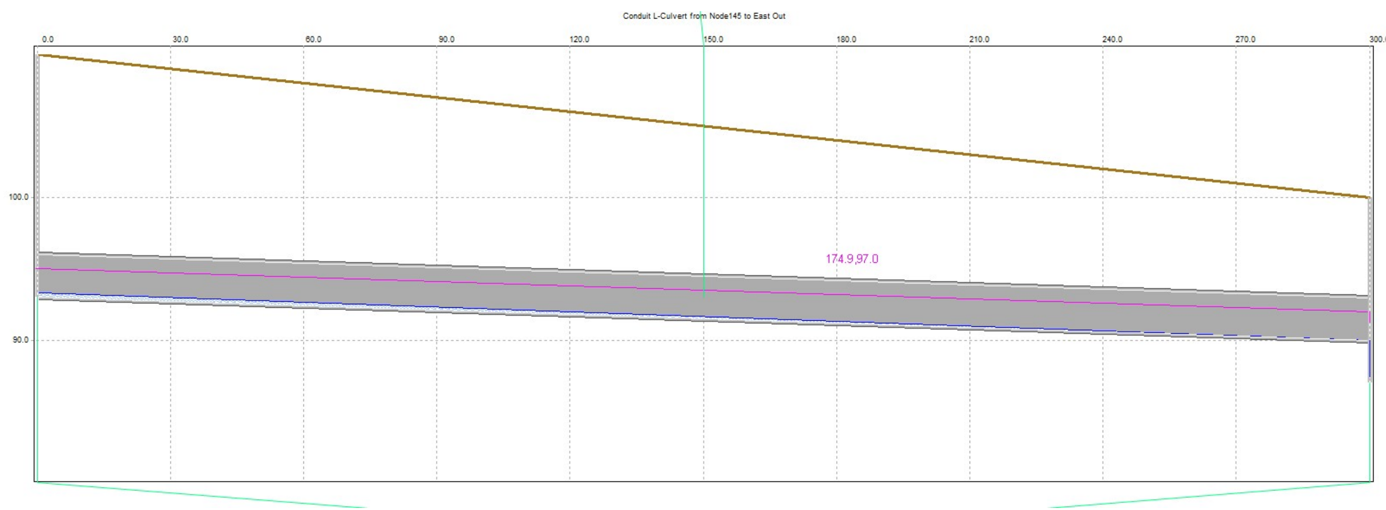


East Outlet:

Xpswmm Schematic Layout:



Culvert stage downstream of project outfall:



GRI
9750 SW Nimbus Avenue
Beaverton, OR 97008-7172
503-641-3478 | www.gri.com

June 14, 2021 6138 REVIEW COMMENT RESPONSE LTR

Providence Health Services
4000 NE Halsey Street, Building 2, Suite 190
Portland, OR 97213

Attention: Jeff Taylor

SUBJECT: Review Comment Response
Providence Willamette Falls Hospital Expansion
1500 Division Street
Oregon City, Oregon

At the request of Ryan Halvorson with DOWL, the project civil engineer, GRI reviewed the following review comments for the Providence Willamette Falls Expansion project:

1) USDA Soil Classification: "The geotechnical report needs to state this assignment (from C to D) and justify why."

2) Infiltration: "The geotech report must be updated to match this paragraph."

GRI completed a geotechnical investigation for the project, the results of which were provided to Providence Health Services in our October 9, 2019, report titled "Geotechnical Investigation and Site-Specific Seismic-Hazard Evaluation, Providence Willamette Falls Hospital Expansion, 1500 Division Street, Oregon City, Oregon." Our review of the Overall Stormwater Drainage Plan (Drawing No. C400) indicates an underground stormwater detention facility will be located immediately southeast of the proposed hospital addition, and surface stormwater basins will be located on the west and east sides of the hospital. Information provided by DOWL indicates an underground detention facility will be constructed about 12 feet to 15 feet below existing site grades and the surface facilities will be depressed about 5 feet below existing site grades.

RESPONSES

Comment 1: USDA Soil Classification

The soils mantling the site in the locations of the planned stormwater facilities generally consists of medium-stiff to stiff silt with clay that transition to medium-stiff to stiff silty clay below depths of about 12 feet to 15 feet. Based on our review of the U.S. Department of Agriculture (USDA) Soil Survey of Clackamas County, we understand over 90% of the soils mantling the site are classified as Aloha Silt Loam, which is assigned a C/D hydrologic group rating. In general, silt and clay soils have a relatively low permeability when saturated, resulting in poor drainage characteristics. In our opinion, based on our review of the subsurface explorations and USDA Web Soil Survey, we recommend the entire site be classified as Soil Group D.

Comment 2: Infiltration

As discussed in our geotechnical report, a landslide occurred on Trillium Park Drive near the eastern property boundary during an unusually wet and prolonged winter. In addition, groundwater level readings indicate the phreatic surface at the site slopes towards the eastern property boundary and existing landslide. In this regard, we do not recommend infiltration of stormwater at the site due to the potential risk of increasing the driving forces in the landslide mass and the low infiltration rate of the silt and clay soils mantling the site.

LIMITATIONS

This letter has been prepared to aid the project team in the design and construction of this project and should be considered an addendum to our October 9, 2019, report and is subject to the limitations stated therein. Please contact the undersigned if you have any questions or require additional information.

Submitted for GRI,

REGISTERED PROFESSIONAL ENGINEER 18281 OREGON JAN 16, 1998 WESLEY SPANG

Expires 06-2022

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This document has been submitted electronically.

6138 REVIEW COMMENT RESPONSE LTR

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6138 GEOTECHNICAL RPT

August 31, 2018

Providence Health Services
4400 NE Halsey Street, Building 2, Suite 190
Portland, OR 97213

DRAFT

Attention: Jeff Taylor

**SUBJECT: Geotechnical Investigation and Site-Specific Seismic-Hazard Evaluation
Providence Willamette Falls Hospital Expansion
1500 Division Street
Oregon City, Oregon**

As requested, GRI completed a geotechnical investigation and site-specific seismic hazard evaluation for the planned expansion of the Providence Willamette Falls Hospital in Oregon City, Oregon. The Vicinity Map, Figure 1, shows the general location of the site. The purpose of the investigation was to evaluate subsurface conditions at the site and develop geotechnical recommendations for use in the design and construction of the proposed improvements. The investigation included a review of existing geotechnical information for the site and surrounding area, subsurface explorations, laboratory testing, and engineering analyses. As part of our investigation, GRI completed a site-specific seismic hazard evaluation to satisfy the requirements of the 2019 Oregon Structural Specialty Code (OSSC). This report describes the work accomplished and provides conclusions and recommendations for use in the design and construction of the proposed project. In addition, this report was prepared to fulfill City of Oregon City Municipal Code (OCMC) Chapter 17.44 requirements related to geologic hazards.

BACKGROUND INFORMATION

GRI personnel previously provided geotechnical services for several projects on the hospital campus. The following reports were reviewed, and relevant information was used for this investigation:

GRI, May 5, 2017, "Geotechnical Findings, Providence Willamette Falls Medical Center, Emergency Generator/Oxygen Tank Area, Oregon City, Oregon," prepared for Providence Willamette Falls Medical Center.

Geocon Northwest, May 16, 2001, "Geotechnical Investigation, Site-Specific Seismic Hazard Evaluation, Willamette Falls Hospital, Medical Offices Building, Oregon City, Oregon," prepared for Willamette Falls Hospital.

Geocon Northwest, August 3, 2001, "Geotechnical Investigation, Site-Specific Seismic Hazard Evaluation, Willamette Falls Hospital, Parking Structure, Oregon City, Oregon," prepared for Willamette Falls Hospital.

PROJECT DESCRIPTION

The project will consist of a two-story Outpatient Surgery/Medical Office Building (MOB) expansion and a new, one-story Central Utility Plant (CUP) building. The proposed locations of the MOB and CUP are still being evaluated. Preliminary plans provided by PKA Architects, the project architect, indicate potential locations for the MOB include east of the existing main hospital building in the helipad area or immediately north of the helipad area; and potential locations for the CUP include in the basement beneath the MOB footprint, along the slope at the eastern property line, and in the helipad area immediately east of the existing main hospital building. We understand the MOB may be constructed with a below-grade level that would house the CUP, parking and entry, or corridor access to the main hospital. Information provided by KPFF, the project structural engineer, indicates the maximum column and wall loads will be on the order of 450 kips and 8 kips/ft, respectively. We understand the new structures will be designed in accordance with the new 2019 OSSC, which will reference the new 2016 American Society of Civil Engineers (ASCE) 7-16 document, titled Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7-16).

All elevations stated in this report were based on the preliminary plans provided by PKA Architects, which reference original drawings and a site survey completed for the hospital; however, the datum used for the survey is unknown at this time. Based on our review of the preliminary plans, we estimate an excavation on the order of 10 to 15 ft will be required to construct the below-grade level. The main hospital building was constructed with a below-grade level; therefore, we anticipate temporary excavation slopes will be used to found the below-grade level and a shoring system will not be necessary. We anticipate the finished floor elevation for the ground floor of the MOB and CUP will generally be consistent with existing site grades, and the maximum height of cuts and fills to establish grade for the ground floor will generally be less than 5 ft.

New parking areas and driveways may be constructed around the new MOB and CUP buildings. We anticipate the new parking areas and driveways will be paved with asphalt concrete (AC) pavement, and areas subjected to frequent heavy-truck traffic, such as trash-enclosure areas, will be paved with Portland cement concrete (PCC) pavement.

SITE DESCRIPTION

General

The existing hospital campus is bordered by Davis Road on the north, Trillium Park Drive on the east, an assisted living facility and independent MOB on the south, and Division Street on the west. The hospital campus is developed with the main hospital building, several MOBs, a parking garage, paved parking areas, and other associated improvements. The new MOB and CUP will generally be located between the existing main hospital building and the slope along the eastern property boundary.

Off-Site Landslide Background

On February 16, 2017, a landslide occurred on Trillium Park Drive following an unusually wet and prolonged winter. The head scarp of the landslide appears to extend northwestward across Trillium Park Drive to the base of the slope that defines the northeastern boundary of the hospital campus. The landslide resulted in localized pavement and ground cracks as well as water-line breakage along Trillium Park Drive. At present, the City of Oregon City has closed Trillium Park Drive between Swordfern Court and Canyon Court and red-tagged one residence, located at 13776 Canyon Court, that appears to be within the landslide mass.

Topography and Geology

Review of topographic information provided on the preliminary plans indicates the ground surface in the project area gently slopes from west to east towards the eastern property boundary and slopes down towards

Trillium Park Drive at about 3H:1V (Horizontal to Vertical) or flatter. The eastern property boundary is located within an identified Oregon City Geologic Hazards area due to the slope inclination of 15 to 25%. Geologic units mapped in the vicinity of the hospital campus, from oldest to youngest, include Miocene Wanapum Basalt, Miocene/Pliocene Troutdale Formation, Pliocene Boring Lava Basalt, Quaternary Missoula flood deposits, and Quaternary Landslide deposits (Madin, 2009).

Published geologic mapping indicates the project area is mantled with Missoula flood deposits, locally referred to as the Willamette Silt formation. In general, Willamette Silt consists of silt and fine sand deposited by late-Pleistocene glacial-outburst floods (Gannet and Caldwell, 1998). The Willamette Silt is underlain by residual soils produced from the weathering of the underlying Boring Lava Basalt. These residual soils typically consist of very stiff to hard clay and silt soils with scattered boulders. With increased depth, the residual soil becomes more granular and progressively transitions to weathered basalt. The Boring Lavas are Pliocene/Pleistocene-age basalts that are light gray and vary in thickness. They occur as blocky, intracanyon flows; volcanic cones; and shield volcanoes composed of thick basalt flows (Schlicker and Finlayson, 1979).

In the area of the February 2017 landslide, Trillium Park Drive is situated on a fill constructed across a small drainage that flows eastward into the larger Newell Creek drainage. Published geologic mapping indicates the area within the active landslide mass to the east is underlain by Tertiary Sandy River Mudstone, a fine-grained sedimentary unit of the Troutdale Formation susceptible to landslides. The slope below the hospital campus is within a larger area mapped as “landslide topography” by the Oregon Department of Geology and Mineral Industries (DOGAMI) (Schlicker and Finlayson, 1979).

SUBSURFACE CONDITIONS

General

Subsurface materials and conditions at the site were investigated between July 16 and August 1, 2018, with six borings, designated B-1 through B-6; two cone penetrometer test (CPT) probes, designated CPT-1 and CPT-2; and two dilatometer (DMT) soundings, designated DMT-1 and DMT-2. The borings were advanced to depths of about 41.5 to 61.5 ft, the CPT probes to depths of about 59.5 to 68.2 ft, and the DMT soundings to depths of about 32.2 to 42 ft below existing site grades. The approximate locations of the explorations completed for this investigation are shown on Figure 2. Logs of the borings, CPT probes, and DMT soundings are provided on Figures 1A through 12A. The field and laboratory programs conducted to evaluate the physical engineering properties of the materials encountered in the explorations are described in Appendix A. The terms and symbols used to describe the materials encountered in the explorations are defined in Tables 1A through 3A and on the attached legend.

Several borings were completed in the vicinity of the project site for some of the geotechnical investigations referenced in the Background Information section of this report. Relevant borings reviewed for this investigation include borings completed in September 2006 and April 2017. One of the previous borings was advanced in Trillium Park Drive to a depth of about 90 ft and the other was advanced to a depth of about 62.5 ft at the top of the slope along the eastern property boundary. Logs of these previous borings are provided in Appendix B for reference.

Sampling

In general, disturbed and undisturbed soil samples were obtained from the borings at 2.5-ft intervals of depth in the upper 15 ft and 5-ft intervals below 15 ft. Disturbed soil samples were obtained using a 2-in.-outside-diameter (O.D.) standard split-spoon sampler or a larger 3-in.-O.D. California-modified split-spoon (CMS) sampler. The CMS sampler was used when sample recovery was not possible with the split-spoon sampler due to the particle size of the material being sampled. Standard Penetration Tests (SPT) were conducted by driving the samplers into the soil a distance of 18 in. using a 140-lb hammer dropped 30 in. The number of blows required to drive the SPT sampler the last 12 in. is known as the Standard Penetration Resistance, or SPT N-value. The number of blows required to drive the CMS sampler the last 12 in. is denoted as the SPT N*-value. The SPT N- and N*-values provide a measure of the relative density of granular soils and relative consistency of cohesive soils. Relatively undisturbed soil samples were collected by pushing a 3-in.-O.D. Shelby tube into the undisturbed soil a maximum of 24 in. using the hydraulic ram of the drill rig. The soil in the Shelby tubes was extruded in our laboratory and Torvane shear strength measurements were recorded on selected samples.

Soils

For the purpose of discussion, the materials disclosed by our investigation have been grouped into the following categories based on their physical characteristics and engineering properties:

1. **PAVEMENT**
2. **FILL**
3. **SILT (Missoula Flood Deposits)**
4. **Silty CLAY (Missoula Flood Deposits)**
5. **Sandy SILT (Residual Soil)**
6. **GRAVEL (Decomposed Basalt)**
7. **BASALT (Boring Lava)**

The following paragraphs provide a description of the materials encountered in the explorations completed by GRI for this investigation and a discussion of the groundwater conditions at the site.

1. PAVEMENT. Explorations B-1, B-3, B-5, B-6, CPT-1, CPT-2, and DMT-1 were advanced in existing paved areas and encountered approximately 3 in. of AC pavement at the ground surface. The pavement is underlain by about 6 in. of crushed-rock base (CRB) course.

2. FILL. Silt fill was encountered at the ground surface in explorations B-4 and DMT-2 and beneath pavement in explorations B-5, B-6, and CPT-2. The silt fill extends to depths of about 5 to 7.5 ft and is generally brown with varying degrees of rust and gray mottling. The silt fill has a variable clay content ranging from trace to some clay and contains some fine- to coarse-grained sand and a trace of subangular to angular gravel.

The relative consistency of the silt fill is medium stiff to very stiff based on SPT N-values of 8 to 11 blows/ft, CPT tip resistance values of about 23 to 38 tsf, and DMT constrained modulus values of about 288 to 1,344 tsf and is typically medium stiff to stiff. The natural moisture content of the silt fill ranges from 25 to 42%.

3. SILT (Missoula Flood Deposits). Silt, interpreted to be Missoula Flood Deposits, was encountered at the ground surface in exploration B-2; beneath pavement in explorations B-1, B-3, CPT-1, and DMT-1; and beneath fill in explorations B-4 through B-6, CPT-2, and DMT-2. The silt extends to depths of about 12 to 27 ft, is generally brown, and grades to gray below depths of about 10 to 12.5 ft. The silt has a variable clay content ranging from trace clay to clayey and contains a variable amount of fine- to medium-grained sand ranging from trace sand to sandy. The natural moisture content of the silt ranges from 25 to 38%.

The relative consistency of the silt is soft to hard based on SPT N-values of 3 to 23 blows/ft, CPT tip resistance values of about 6 to 294 tsf, DMT constrained modulus values of about 102 to 995 tsf, and Torvane shear strength values of 0.3 to 0.4 tsf and is typically medium stiff to stiff. A one-dimensional consolidation test was completed on a sample of the silt obtained at a depth of about 11 ft in boring B-3. Test results indicate the silt is overconsolidated and has a relatively low compressibility in the preconsolidated range of pressures and a low to moderate compressibility in the normally consolidated range of pressures, see Figure 14A.

4. Silty CLAY (Missoula Flood Deposits). Silty clay, interpreted to be Missoula Flood Deposits, was encountered beneath silt in all of the explorations. The silty clay extends to depths of about 15 to 67.6 ft, is generally gray mottled rust, and contains a trace of fine- to medium-grained sand. The natural moisture content of the silty clay ranges from 28 to 71%. Atterberg limits testing indicates the silty clay has a liquid limit ranging from 59 to 73% and a plasticity index ranging from 29 to 44%, see Figure 13A.

The relative consistency of the silt is soft to hard based on SPT N-values of 1 to 34 blows/ft, CPT tip resistance values of about 13 to 111 tsf, DMT constrained modulus values of about 175 to 1,258 tsf, and Torvane shear strength values of 0.2 to 0.45 tsf. In general, the silty clay is very soft to soft to a depth of 30 ft, soft to medium stiff to a depth of 45 ft, and stiff to very stiff below a depth of 45 ft. One-dimensional consolidation tests were completed on samples of silty clay obtained at depths of about 21.7 and 36.2 ft in borings B-3 and B-5, respectively. Test results indicate the silty clay is overconsolidated and has a relatively low compressibility in the preconsolidated range of pressures and a moderate to high compressibility in the normally consolidated range of pressures, see Figures 15A and 16A.

Explorations B-1 through B-3, B-5, B-6, and DMT-1 were terminated in silty clay at depths ranging from 41.5 to 61.5 ft.

5. Sandy SILT (Residual Soil). Residual soil consisting of sandy silt was encountered beneath Missoula Flood Deposits in explorations B-4, CPT-1, CPT-2, and DMT-2 at depths ranging from about 15 to 66 ft. The residual soil is derived from the weathering of the underlying Boring Lava Basalt and is generally red-brown mottled black with fine- to coarse-grained sand and contains gravel-sized fragments of predominantly decomposed basalt. Relict rock structure was present throughout the unit.

The relative consistency of the sandy silt is very stiff to hard based on an SPT N-value of 24 blows/ft, CPT tip resistance values of about 101 to 223 tsf, and DMT constrained modulus values of about 147 to 594 tsf and is typically very stiff. The natural moisture content of the residual soil is about 39%.

6. GRAVEL (Decomposed Basalt). Decomposed basalt in the form of gravel was encountered beneath residual soils in explorations B-4, CPT-1, CPT-2, and DMT-2 at depths of about 20 to 68 ft. The gravel is subangular and contains a varying amount of fine- to coarse-grained sand and silt ranging from some sand to sandy and trace to some silt. Our drilling for this project and experience in the immediate site vicinity indicate this deposit usually contains abundant cobbles, scattered boulders of decomposed basalt, and zones of less-weathered basalt.

The relative density of the gravel is loose to medium dense based on SPT N-values of 9 to 23 blows/ft and an SPT N*-Values of 27 blows/ft and is typically medium dense. It should be noted the relative density of very coarse, granular material, such as gravel, tends to be overestimated using the SPT and CMS samplers. Circulation of drilling fluid was lost in the decomposed basalt at a depth of 32.5 ft in boring B-4. Loss of circulation is an indication movement of perched groundwater towards the slope along the eastern property boundary may have caused migration of soil in decomposing fractures and joints, creating preferential paths for water to flow. Preferential pathways may be capable of accepting large volumes of drilling fluid or grout. This is an important consideration for grouted anchors or cast-in-place concrete piles extending into the decomposed basalt layer.

Explorations CPT-1, CPT-2, and DMT-2 were terminated on decomposed basalt at depths ranging from 32.2 to 68.2 ft.

7. BASALT (Boring Lava). Extremely soft to medium-hard (R0 to R3), gray Boring Lava basalt was encountered beneath gravel (decomposed basalt) in boring B-4 at a depth of 35 ft. The Boring Lava basalt typically consists of a gray, massive to platy, fine-grained basalt. The upper surface of the basalt is extremely soft to soft (R0) to (R2) and predominantly decomposed to decomposed. Typically, the basalt becomes less weathered with depth; however, a 4-ft-thick zone of residual soil consisting of clayey silt was encountered at a depth of 45 in boring B-4. Below a depth of 49 ft, the basalt is very soft to medium hard (R1 to R3) and moderately weathered to predominantly decomposed. Throughout the formation, the joints and fractures display some staining and are filled with secondary mineralization.

SPT N-values of 50 blows for 1 to 2.5 in. of sampler penetration and an SPT N*-value of 100 blows for 2 in. of sampler penetration were recorded in the basalt. The relative consistency of the 4-ft-thick layer of residual soil interbedded between layers of basalt in boring B-4 is stiff based on an SPT N-value of 13 blows/ft. The natural moisture content of the zone of residual soils is about 72%.

Exploration B-4 was terminated in basalt at a depth of about 50.1 ft.

Groundwater

The borings were completed with mud-rotary drilling techniques, which do not allow the measurement of groundwater levels. The regional groundwater level typically occurs at depth in the highly fractured, hard basalt that underlies the site. However, our work in the area indicates perched groundwater conditions can occur in the silt fill, Missoula Flood Deposits, or residual soil that mantle the site, particularly during the wet winter and spring months or during periods of heavy or prolonged precipitation. To allow measurement and periodic monitoring of perched groundwater levels at the site, a vibrating-wire piezometer was installed at a depth of 48 ft in boring B-2. In addition, a vibrating-wire piezometer was installed at a depth of 59 ft in the boring, designated B-1, completed by GRI in April 2017 near the Emergency Generator/Oxygen Tank Area. Perched groundwater measurements recorded in the piezometers are tabulated below by date.

PERCHED GROUNDWATER DEPTH

Date	Boring B-2	Boring B-1 (2017)
5/3/17	N/A	28.8 ft
8/9/18	15.8 ft	35.9 ft

The groundwater-level readings indicate the phreatic surface at the site slopes toward the Newell Creek Drainage located immediately east of the hospital campus. A sloping phreatic surface is an indication groundwater movement through the decomposed basalt is likely occurring. We anticipate the perched groundwater level in the project area will typically occur at depths of 10 to 20 ft near the helipad area and 25 to 35 ft near the eastern property boundary; however, localized areas of perched groundwater may occur at shallower depths during the wet winter and spring months or during periods of heavy or prolonged precipitation.

LANDSLIDE MONITORING

In 2017, GRI installed a 60-ft-long inclinometer in boring B-1 (2017) to assess the potential impact of the off-site Trillium Park Drive landslide on the Emergency Generator/Oxygen Tank Area located along the eastern property boundary. Following installation, a benchmark reading was taken on April 17, 2017, with subsequent readings taken on May 3, 2017; February 7, 2018; and August 17, 2018. The inclinometer benchmark and subsequent readings are shown on Figure 3. Interpretation of recent inclinometer data indicates no movement related to the Trillium Park Drive landslide has occurred since the inclinometer was installed.

CONCLUSIONS AND RECOMMENDATIONS

General

Subsurface explorations completed for this project and available geologic information for the project area indicate subsurface conditions can vary significantly across the hospital campus. The southeastern portion of the project area is mantled with fill soils likely associated with previous phases of development on campus. Missoula flood deposits mantle the ground surface in the northwestern portion of the project area and underlie the fills soils in the southeastern portion. The Missoula flood deposits are underlain by residual soils produced by the weathering of the Boring Lava Basalt that underlies the site. We anticipate the perched groundwater level is typically at least 10 to 15 ft below the ground surface throughout the year; however, shallower perched groundwater can develop in the upper silt soils that mantle the site during periods of heavy or prolonged rainfall.

In our opinion, foundation support for new structural loads can be provided by conventional spread and wall foundations established in firm, undisturbed, native soil or compacted structural fill, except along the eastern property boundary. Based on the potential for seismically induced horizontal displacement of the landslide adjacent to the eastern property boundary, it is our opinion it will be necessary to support the CUP structure in this area on a deep foundation system tied together with a structural floor slab.

The primary geotechnical considerations associated with construction of the proposed structure(s) include the presence of fine-grained soils at the ground surface that are extremely sensitive to moisture content; the potential for shallow, perched groundwater conditions; deep foundations; and the potential for seismically induced movement of the landslide adjacent to the eastern property boundary.

With respect to OCMC Chapter 17.44 requirements related to geologic hazards, provided the proposed development is constructed in accordance with the recommendations provided in this report, it is our opinion, from the standpoints of geotechnical engineering and engineering geology, the proposed development is reasonably likely to be safe and prevent landslide or other damage to other properties over the long term.

The following sections of this report provide our conclusions and recommendations for use in the design and construction of the project.

Seismic Considerations

General. We understand the project will be designed in accordance with the 2019 OSSC. For seismic design, the 2019 OSSC will reference the new ASCE 7-16 document. A site-specific seismic hazard evaluation was completed for the project in accordance with the 2019 OSSC. Details of the site-specific seismic hazard evaluation and the development of the recommended response spectrum are provided in Appendix C.

Code Background. The ASCE 7-16 seismic hazard levels are based on a Risk-Targeted Maximum Considered Earthquake (MCE_R) with the intent of including the probability of structural collapse. Based on generalized building fragility curves, seismic design of a structure using the probabilistic MCE_R represents a targeted risk level of 1% in 50 years probability of collapse in the direction of maximum horizontal response. In general, these risk-targeted ground motions are developed by applying adjustment factors of directivity and risk coefficients to the 2% probability of exceedance in 50 years (2,475-year return period hazard level) ground motions developed from the recently updated 2014 U.S. Geological Survey (USGS) probabilistic seismic hazard maps. The risk-targeted probabilistic values are also subject to a deterministic check, which is computed from the models of earthquake sources and ground-motion propagation that form the basis of the 2014 USGS National Seismic Hazard Maps (NSHMs). ASCE 7-16 defines the site-specific deterministic MCE_R ground motions in terms of 84th-percentile, 5%-damped response spectral acceleration in the direction of maximum horizontal response. The MCE_R ground motions are taken as the lesser of the probabilistic and deterministic spectral accelerations.

Site Response. The ASCE methodology uses two bedrock spectral response parameters, S_S and S_1, corresponding to periods around 0.2 and 1.0 sec to develop the MCE_R response spectrum. To establish the ground-surface MCE_R spectrum, these bedrock spectral parameters are adjusted for site class using the short- and long-period site coefficients, F_a and F_v, in accordance with Section 11.4.3 of ASCE 7-16, which includes new seismic site coefficients to adjust the mapped values for soil properties.

The S_S and S_1 parameters for the site located at the approximate latitude and longitude coordinates of 45.3561° N and 122.5871° W are 0.83 and 0.37 g, respectively, for Site Class B, or bedrock conditions. In accordance with Chapter 20 of ASCE 7-16, the site is classified as Site Class D, or a stiff-soil site, based on an estimated average shear-wave velocity (V_{S30}) of 1,050 ft/sec. Site coefficients F_a and F_v of 1.17 and 1.93, respectively, were used to develop the Site Class D MCE_R-level spectrum in accordance with Section 11.4 of ASCE 7-16. The design-level response spectrum is calculated as two-thirds of the ground-surface MCE_R spectrum.

The recommended MCE_R- and design-level spectral response parameters for Site Class D conditions are tabulated below and discussed in further detail in Appendix C.

RECOMMENDED SEISMIC DESIGN PARAMETERS (2019 OSSC/ ASCE 7-16)

Seismic Parameter	Recommended Value
Site Class	D
MCE_R 0.2-Sec Period Spectral Response Acceleration, S_{MS}	0.97 g
MCE_R 1.0-Sec Period Spectral Response Acceleration, S_{M1}	0.71 g
Design-Level 0.2-Sec Period Spectral Response Acceleration, S_{DS}	0.64 g
Design-Level 1.0-Sec Period Spectral Response Acceleration, S_{D1}	0.48 g

Seismically Induced Slope Instability. Slope movement during a seismic event occurs in response to the combination of gravitational forces and inertial forces generated by an earthquake acting upon the soil mass. Stability analysis of the slope along the eastern property boundary during a code-based seismic event was performed with the aid of the software program SLIDE 8.0, developed by Rocscience, Inc., of Toronto, Canada. The static and seismic equilibrium of the slope was evaluated using Spencer and Morgenstern-Price's method of slices, which satisfies both force and moment equilibrium. The output of the analysis is the factor of safety defined as the ratio of the forces and moments resisting movement to the forces and moments driving movement of the soil mass. These calculated results are used as a relative measure of the overall stability of the slope. As the factor of safety decreases and approaches 1.0, the relative stability of the slope is considered to decrease. A factor of safety less than 1.0 infers that the soil mass is not in equilibrium, and movement is likely to occur.

Topographic information shown on the preliminary plans and generalized subsurface conditions were used to evaluate the static and seismic stability of the existing slope. The model used for global stability analyses was developed from a cross section and generalized subsurface profile considered representative of the slope in the project area. The generalized subsurface profile for the model was based on our subsurface explorations and laboratory-test results. For our analyses, we assumed a horizontal pseudo-static coefficient of 0.28 for the code-based earthquake, which is equal to about two-thirds of the MCE_G-level PGA, and a groundwater level that slopes from about 15 ft in the helipad area to 25 ft at the top of the slope along the eastern property boundary, which corresponds to the anticipated sloping phreatic surface.

The following table provides the engineering properties of the soil layers used for our analysis.

SOIL PROPERTIES FOR SLOPE STABILITY ANALYSIS

Layer	Unit Weight γ, pcf	Strength Type	Friction Angle ϕ'	Shear Strength, psf	SHANSEP, S	SHANSEP, m	OCR
FILL	130	Mohr-Coulomb	35°	0	-	-	-
SILT (Missoula Flood Deposits)	125	Mohr-Coulomb	32°	0	-	-	-
Silty CLAY (Missoula Flood Deposits)	100	SHANSEP	-	-	0.2	0.8	3
Sandy SILT (Residual Soil)/GRAVEL (Decomposed Basalt)	125	Mohr-Coulomb	38°	0	-	-	-
BASALT (Boring Lava)	150	Infinite Strength					

Layer	Unit Weight γ, pcf	Strength Type	Friction Angle ϕ′	Shear Strength, psf	SHANSEP, S	SHANSEP, m	OCR
MUDSTONE (Troutdale Formation)	115	Mohr-Coulomb	26°	0	-	-	-

Our analyses indicate the static and seismic global factors of safety for the existing slope are about 2.9 and 1.2, respectively. The static and seismic slope models used for our analyses are provided on Figures 4 and 5, and the location of the cross section is shown on Figure 2. Typically, static and seismic factors of safety greater than 1.3 and 1.1, respectively, indicate the risk of slope movement is generally low. However, due to the slope being situated adjacent to an active landslide, it is reasonable to assume there could be a risk of slope movement along the eastern property boundary during a code-based earthquake.

Other Seismic Hazards. Based on the relative density of the granular soils and stress history, shear-strength characteristics, and moderate to high plasticity of the fine-grained soils below the groundwater level, it is our opinion the risk of liquefaction and/or significant cyclic softening is generally low during a code-based seismic event. The risk of damage by tsunami and/or seiche at the site is absent. The USGS considers the Bolton Fault, located about 1.2 km northeast of the site, to be the closest crustal fault source contributing to the overall seismic hazard at the site (Personius et al., 2003). Unless occurring on a previously unmapped or unknown fault, it is our opinion the risk of ground rupture at the site is low.

Earthwork

General. The fine-grained soils that mantle the site are sensitive to moisture, and perched groundwater may approach the ground surface during the wet winter months. Therefore, it is our opinion earthwork can be completed most economically during the dry summer months, typically extending from June to mid-October. It has been our experience that the moisture content of the upper few feet of silty soils will decrease during extended warm, dry weather. However, below this depth, the moisture content of the soil tends to remain relatively unchanged and well above the optimum moisture content for compaction. As a result, the contractor must use construction equipment and procedures that prevent disturbance and softening of the subgrade soils. To minimize disturbance of the moisture-sensitive silt soils, site grading can be completed using track-mounted, hydraulic excavators. The excavation should be finished using a smooth-edge bucket to produce a firm, undisturbed surface. It may also be necessary to construct granular haul roads and work pads concurrently with excavation to minimize subgrade disturbance. If the subgrade is disturbed during construction, soft, disturbed soils should be overexcavated to firm soil and backfilled with structural fill.

If construction occurs during wet ground conditions, granular work pads will be required to protect the underlying silt subgrade and provide a firm working surface for construction activities. In our opinion, a 12- to 18-in.-thick granular work pad should be sufficient to prevent disturbance of the subgrade by lighter construction equipment and limited traffic by dump trucks. Haul roads and other high-density traffic areas will require a minimum of 18 to 24 in. of fragmental rock, up to 6-in. nominal size, to reduce the risk of subgrade deterioration. The use of a geotextile fabric over the subgrade may reduce maintenance during construction. Haul roads can also be constructed by placing a thickened section of pavement base course and subsequently spreading and grading the excess CRB after earthwork is complete.

Site Preparation. Demolition of the existing improvements within the limits of the new building(s) should include removal of existing pavements, floor slabs, foundations, walls, and underground utilities (if present).

The ground surface within all building areas, paved areas, walkways, and areas to receive structural fill should be stripped of existing vegetation, surface organics, and loose surface soils. We anticipate stripping up to a depth of about 4 to 6 in. will likely be required to construct the building(s) in landscaped areas; however, deeper grubbing may be required to remove brush and tree roots. All demolition debris, trees, brush, and surficial organic material should be removed from within the limits of the proposed improvements. Excavations required to remove existing improvements, brush, and trees should be backfilled with structural fill. Organic strippings should be disposed of off site or stockpiled on site for use in landscaped areas.

Following stripping or excavation to subgrade level, the exposed subgrade should be evaluated by a qualified member of GRI's geotechnical engineering staff or an engineering geologist. Proof rolling with a loaded dump truck may be part of this evaluation. Any soft areas or areas of unsuitable material disclosed by the evaluation should be overexcavated to firm material and backfilled with structural fill. Due to previous development at the site and the presence of fill soils, it should be anticipated some overexcavation of subgrade will be required.

Structural Fill. We anticipate minor amounts of structural fill will be placed for this project. We recommend structural fill consist of granular material, such as sand, sandy gravel, or crushed rock with a maximum size of 2 in. Granular material that has less than 5% passing the No. 200 sieve (washed analysis) can usually be placed during periods of wet weather. Granular backfill should be placed in lifts and compacted with vibratory equipment to at least 95% of the maximum dry density determined in accordance with ASTM D698. Appropriate lift thicknesses will depend on the type of compaction equipment used. For example, if hand-operated vibratory-plate equipment is used, lift thicknesses should be limited to 6 to 8 in. If smooth-drum vibratory rollers are used, lift thicknesses up to 12 in. are appropriate, and if backhoe- or excavator-mounted vibratory plates are used, lift thicknesses up to 2 ft may be acceptable.

On-site, fine-grained soils and site strippings free of debris may be used as fill in landscaped areas. These materials should be placed at about 90% of the maximum dry density as determined by ASTM D698. The moisture contents of soils placed in landscaped areas is not as critical as the moisture contents of soils placed in developed areas provided construction equipment can effectively handle the materials.

Utility Excavations. In our opinion, there are three major considerations associated with the design and construction of new utilities.

1) Provide stable excavation side slopes or support for trench sidewalls to minimize loss of ground.
2) Provide a safe working environment during construction.
3) Minimize post-construction settlement of the utility and ground surface.

The method of excavation and design of trench support are the responsibilities of the contractor and subject to applicable local, state, and federal safety regulations, including the current Occupational Safety and Health Administration (OSHA) excavation and trench safety standards. The means, methods, and sequencing of construction operations and site safety are also the responsibilities of the contractor. The information provided below is for the use of our client and should not be interpreted to mean we are assuming responsibility for the contractor's actions or site safety.

According to current OSHA regulations, the majority of the soils encountered in the explorations may be classified as Type B. In our opinion, trenches less than 4 ft deep that do not encounter groundwater may be cut vertically and left unsupported during the normal construction sequence, assuming trenches are excavated and backfilled in the shortest possible sequence and excavations are not allowed to remain open longer than 24 hr. Excavations more than 4 ft deep should be laterally supported or alternatively provided with side slopes of 1H:1V or flatter. In our opinion, adequate lateral support may be provided by common methods, such as the use of a trench shield or hydraulic shoring systems.

Groundwater seepage, running-soil conditions, and unstable trench sidewalls or soft trench subgrades, if encountered during construction, will require dewatering of the excavation and trench-sidewall support. The impact of these conditions can be reduced by completing trench excavation during the summer months, when groundwater levels are lowest, and limiting the depths of the trenches. We anticipate groundwater seepage, if encountered, can generally be controlled by pumping from sumps. To facilitate dewatering, it will be necessary to overexcavate the trench bottom to permit installation of a granular working blanket. We estimate the required thickness of the granular working blanket will be on the order of 1 ft or as required to maintain a stable trench bottom. The actual required depth of overexcavation will depend on the conditions exposed in the trench and the effectiveness of the contractor's dewatering efforts. The thickness of the granular blanket must be evaluated on the basis of field observations during construction. We recommend the use of relatively clean, free-draining material, such as 2- to 4-in.-minus crushed rock, for this purpose. The use of a geotextile fabric over the trench bottom will assist in trench-bottom stability and dewatering.

All utility trench excavations within building and pavement areas should be backfilled with relatively clean, granular material, such as sand, sandy gravel, or crushed rock of up to 1 1/2-in. maximum size and having less than 5% passing the No. 200 sieve (washed analysis). The bottom of the excavation should be thoroughly cleaned to remove loose materials and the utilities should be underlain by a minimum 6-in. thickness of bedding material. The granular backfill material should be compacted to at least 95% of the maximum dry density as determined by ASTM D698 in the upper 5 ft of the trench and at least 92% of this density below a depth of 5 ft. The use of hoe-mounted vibratory-plate compactors is usually most efficient for this purpose. Flooding or jetting as a means of compacting the trench backfill should not be permitted.

Excavation and Shoring

General. We estimate an excavation on the order of 10 to 15 ft will be required to found below-grade levels. We understand the existing hospital has a below-grade basement; therefore, we anticipate the majority of excavations may be made with temporary excavation slopes. However, shoring may be required where excavations extend below the base of the hospital foundations or are in close proximity to remaining infrastructure. The method of excavation and design of excavation support are the responsibilities of the subcontractor and should conform to applicable local, state, and federal regulations. The information provided below is for the use of our client and should not be interpreted to imply we are assuming responsibility for the subcontractor's actions or site safety.

Groundwater Management. Depending on the time of year, excavations may encounter perched groundwater. We anticipate groundwater seepage, if encountered, can be controlled by pumping from temporary sumps in the bottom of the excavation. Problems associated with the control of groundwater can be reduced if the work is scheduled for the dry season, when groundwater levels are at their lowest.

Temporary Excavations. The inclination of temporary excavation slopes will depend, in part, on the groundwater conditions encountered at the time of construction and the contractor's ability to control these conditions. In this regard, we anticipate temporary excavation slopes can be cut at 1H:1V to a maximum depth of 15 ft if groundwater levels are maintained at least 2 ft below the bottom of the excavation. If the excavation depth exceeds 15 ft, the temporary excavation slopes should be cut at 1.5H:1V or flatter. Flatter slopes will be necessary if significant seepage conditions are encountered. Some minor amounts of sloughing, slumping, or running of temporary slopes should be anticipated shortly after groundwater seepage occurs. A blanket of relatively clean, well-graded crushed rock placed on the slopes may be required to reduce the risk of raveling-soil conditions if temporary excavation slopes encounter perched groundwater. We recommend the use of relatively clean, free-draining material, such as 2- to 4-in.-minus crushed rock, for this purpose. The thickness of the granular blanket should be evaluated based on actual conditions but would likely be in the range of 12 to 24 in.

In our opinion, the short-term stability of temporary slopes will be adequate if surcharge loads due to existing footings, construction traffic, vehicle parking, material laydown, etc., are maintained an equal distance to the height of the slope away from the top of the open cut. Other measures that should be implemented to reduce the risk of localized failures of temporary slopes include 1) using geotextile fabric to protect the exposed cut slopes from surface erosion; 2) providing positive drainage away from the tops and bottoms of the cut slopes; 3) constructing and backfilling walls as soon as practical after completing the excavation; 4) backfilling overexcavated areas as soon as practical after completing the excavation; and 5) periodically monitoring the area around the top of the excavation for evidence of ground cracking. It must be emphasized that following these recommendations will not guarantee sloughing or movement of the temporary cut slopes will not occur; however, the measures should serve to reduce the risk of a major slope failure. It should be realized, however, that blocks of ground and/or localized slumps may tend to move into the excavation during construction.

Shoring Criteria. We recommend using shoring to support the excavation in the following areas: 1) where site constraints do not permit the excavation sidewalls to be sloped at about 1H:1V or flatter, and 2) where existing improvements (utilities, adjacent structures, etc.) are located within a setback zone defined by a plane that extends upward at 1.5H:1V from the toe of the excavation and an equal distance to the height of the cut from where the plane intersects the top of the slope. It is common practice in the region to use shoring systems consisting of soldier piles and lagging or interlocked sheet piles, either cantilevered or restrained, with tie-back anchors or soil-nail support. Depending on the proximity of the shoring to any existing improvements requiring protection, it may be necessary to leave portions of the temporary shoring system permanently in place to limit the risk of future settlement associated with completely removing the shoring.

The design of temporary shoring systems depends on the total magnitude of forces the system is designed to resist and the tolerable yielding of the system and surrounding ground. The pattern and intensity of the lateral earth pressures on the shoring will be governed by the height of the wall, soil type, the degree to which the walls are structurally supported, and whether the walls are drained. The lateral earth pressure criteria shown on Figure 6 can be used for the design of cantilevered shoring systems, assuming the shoring can be allowed to yield somewhat into the excavation during construction and settlement behind the system can also be tolerated. The lateral earth pressure criteria shown on Figure 7 can be used for shoring restrained with horizontal bracing, tieback anchors, or soil nails to resist larger forces and/or reduce the amount of yielding of the shoring toward the excavation. Additional lateral pressures due to surcharge loads, such as existing structures, behind the shoring systems should be added to the earth pressures shown on Figures 6 and 7. These additional loads can be computed in accordance with the criteria presented on Figure 8; however, we recommend a minimum vertical surcharge pressure of 250 psf be added behind the walls.

Additional Shoring Considerations. For a tied-back soldier-pile shoring system, we recommend all tie-back anchors develop their pull-out resistance beyond a no-load zone defined by a plane, as shown on Figure 7. Verification tests should be completed for at least one anchor per level for each side of the excavation. Verification-anchor tests should be conducted to at least 150% of the design anchor load. The results of the tests will be used to review and revise, if necessary, the anchor-design criteria. In addition, each production anchor should be proof tested to at least 133% of the design load. The shoring contractor should have a proven record of successful shoring and tie-back installations in similar materials.

If shoring is required, we recommend the following monitoring and performance provisions be included in the project specifications.

1) Horizontal movement of the shoring system in the vicinity of adjacent improvements, such as structures, should be accurately measured and recorded at each stage of the excavation by the contractor. Horizontal movement should be measured at the top and each intermediate bracing level on at least every second soldier pile, or about every 10 ft. Settlement of the ground surface near adjacent structures should be monitored at a minimum spacing of 20 ft along the building edge closest to the excavation.

2) Horizontal movement of the shoring system should not exceed ½ in. toward the excavation.

3) Lagging should be installed and any voids backfilled using controlled-density fill, if necessary, as the excavation proceeds.

4) The excavation should not extend more than about 1 ft below a bracing level until the tie backs, lagging, and backfill at that level are in place.

Foundation Support

General. We understand the column and wall loads will be on the order of 150 to 450 kips and 2 to 8 kips/ft, respectively. In our opinion, the proposed structural loads can be supported on conventional spread and wall footings in accordance with the following design criteria, except along the eastern property boundary. Due to the presence of the landslide on Trillium Park Drive and the high risk of earthquake-induced slope instability near the landslide, structural loads for the CUP building in this area will likely need to be supported on deep foundations embedded in the moderately weathered basalt that underlies the site. Based on the subsurface information and magnitude of the foundation loads, micropiles would be suited to support the structural loads and are typically more cost-effective than drilled shafts. Therefore, our studies have primarily considered micropile foundations for the CUP along the eastern property boundary. We should be contacted if other deep foundations elements, such as drilled shafts or augercast piles, are being considered.

Foundation design and construction criteria are discussed below.

Shallow Foundations

General. Excavations for all foundations should be made with a smooth-edged bucket, and all footing excavations should be observed by a member of GRI's geotechnical engineering staff. Soft or otherwise unsuitable material encountered at foundation subgrade level should be overexcavated and backfilled with granular structural fill. Our experience indicates the subgrade soils are easily disturbed by excavation and construction activities. Due to these considerations and to provide more uniform support, we recommend installing a minimum 6-in.-thick layer of compacted crushed rock in the bottom of all footing excavations. Relatively clean, 3/4-in.-minus, crushed rock is suitable for this purpose.

Axial Design Criteria. Footings established in accordance with these criteria can be designed on the basis of an allowable soil bearing pressure of 3,000 psf. The footing width should not be less than 24 in. for isolated column footings and 18 in. for wall footings, and the base of all new footings should be established at a minimum depth of 18 in. below the lowest adjacent finished grade. This bearing pressure has a factor of safety of at least 3.0 against a bearing-capacity failure. The allowable soil bearing pressure can be increased by 500 psf for each additional foot of foundation width up to a maximum of 4,000 and 4,500 psf for continuous wall and column footings, respectively. For example 2-ft by 2-ft and 5-ft by 5-ft column footings and allowable soil bearing pressures of 3,000 and 4,500 psf, respectively, can likely be used for foundation design. These values apply to the total of dead load and frequently applied live loads and can be increased by one-third for the total of all loads: dead, live, and wind or seismic. We estimate the total settlement of footings designed in accordance with the recommendations presented above will be less than 1 in. for footings supporting wall and column loads of up to 8 kips/ft and 450 kips, respectively. Differential settlements between adjacent, comparably loaded footings should be less than half the total settlement.

Lateral Design Criteria. Horizontal shear forces can be resisted partially or completely by frictional forces developed between the base of footings and the underlying soil and by soil passive resistance. The total frictional resistance between the footing and the soil is the normal force times the coefficient of friction between the soil and the base of the footing. We recommend an ultimate value of 0.40 for the coefficient of friction for footings cast on native or structural-fill soils. The normal force is the sum of the vertical forces (dead load plus real live load). If additional lateral resistance is required, passive earth pressures against embedded footings in native soil can be computed on the basis of equivalent fluids having unit weights of 300 and 200 pcf for foundations supporting at-grade and below-grade levels, respectively. These design passive earth pressures would be applicable only if the footings are cast neat against undisturbed soil or if backfill for the footings is placed as granular structural fill and assumes up to ½ in. of lateral movement of the structure will occur in order for the soil to develop this resistance. These values also assume the ground surface in front of the foundation is horizontal, i.e., does not slope downward away from the toe of the footing.

Micropiles

General. The specific design and installation procedures for micropiles are typically developed by specialty contractors based on the performance criteria provided by the owner's geotechnical and structural engineers. Prior to the installation of production micropiles at the site, at least two verification-test piles should be installed near the production-pile locations. Verification load tests should be performed to confirm the design capacities of the micropiles and the optimum length of the bond zone. A verification load test taken to failure can provide valuable information regarding the ultimate value of bond-zone resistance. Each verification-test pile should be loaded to a minimum of 200% of the maximum allowable design capacity (in uplift or compression) in accordance with ASTM D3689. We also recommend proof testing 10 to 20% of the production piles to 150% of the design load. The proof test for the compression loads may be performed in tension to facilitate the testing. A successful verification or proof test will typically sustain the test load for at least one log cycle of time (1 to 10 min) with less than 0.04 in. of movement. In addition, the measured deflection at the design load needs to be less than the maximum allowable deflection specified by the structural engineer.

Axial Design Criteria. Based on our previous experience and discussions with a local micropile specialty contractor, we anticipate a 7 5/8-in.-diameter micropile can develop an allowable compressive (and uplift) capacity of at least 250 kips with a bond zone in the range of 10 ft in the underlying, moderately weathered basalt located at a depth of about 50 ft along the eastern property boundary. This value applies to the total of dead load plus frequently and/or permanently applied live loads and can be increased by one-third for the total of all loads: dead, live, and wind or seismic. It should be noted that more-permeable zones of decomposed basalt were encountered during the explorations at the site and should be taken into consideration during design of the micropiles. To provide adequate spacing between individual piles to avoid group reductions in capacity, all piles should be installed with a minimum center-to-center spacing of at least 3 ft.

It should be noted that larger-diameter micropiles may be considered for this project, but our experience indicates larger-diameter piles will be more difficult to install given the highly variable decomposition of the underlying basalt.

Lateral Loading Considerations. Micropiles will resist lateral loads by the structural strength of the pile in bending and by passive soil resistance. Conditions of lateral loading can be evaluated using the computer software, LPILE, developed by Ensoft, Inc., of Austin, Texas. Lateral pile capacities and corresponding estimated horizontal deflections can be developed once the pile diameter is selected and the layout developed for the project. Additional resistance to lateral loads can be provided by passive soil resistance against the pile caps. We recommend this resistance be evaluated on the basis of an equivalent fluid having a unit weight of 300 pcf. This value assumes the pile cap excavations will cast neat against firm, undisturbed soil or the pile-cap excavation will be backfilled with granular structural fill.

Micropile Installation Criteria. Micropiles consist of high-capacity, small-diameter (typically 5 to 10 in.), drilled-and-grouted, steel-cased piles. A micropile is typically constructed by drilling a cased hole to the desired depth into the bearing layer, placing a reinforcing bar to the bottom of the hole, and pumping grout under pressure into the casing to form a bond zone as the casing is withdrawn. Bond-zone lengths are generally limited to about 40 ft, and a minimum free length, or unbonded zone, of 10 to 15 ft is typically provided above the bond zone. A permanent section of steel casing extends from the pile cap connection to slightly below the top of the bond zone to provide load transfer through the free length and into the bond zone and structural rigidity within the upper portion of the pile.

The estimated micropile capacities provided above assume the piles will be constructed in accordance with Section 1810.4.10 of the 2019 OSSC. Our review of the subsurface explorations completed at the site and experience in the vicinity of the site indicate the decomposed basalt unit usually contains scattered bouldersize fragments of less-weathered basalt. It is also common to encounter zones of decomposed basalt capable of accepting large volumes of drilling fluid or grout, as indicated by the loss of drilling fluid encountered in the decomposed basalt unit while drilling boring B-4. The highly variable weathering of the basalt underlying the eastern property boundary and the potential for grout loss may affect the efficiency and cost of micropile installation and should be addressed in the contract documents.

Subdrainage/Floor Support

In our opinion, slab-on-grade floor slabs are suitable for floor support in all the potential building locations, except along the eastern property boundary. Due to the presence of the landslide on Trillium Park Drive and the high risk of earthquake-induced slope instability near the landslide, a structural floor slab will be required for the CUP building in this area.

To provide a capillary break and reduce the risk of damp floors, floor slabs established at or above adjacent final site grades should be underlain by a minimum 8 in. of free-draining, clean, angular rock. This material should consist of angular rock such as 1½- to ¾-in. crushed rock with less than 2% passing the No. 200 sieve (washed analysis) and be placed in one lift and compacted to at least 95% of the maximum dry density (ASTM D698) or until well keyed. To improve workability, the drain rock should be capped with a 2-in.-thick layer of compacted, ¾-in.-minus, crushed rock. In areas where floor coverings will be provided or moisture-sensitive materials stored, it would be appropriate to also install a vapor-retarding membrane. The membrane should be installed as recommended by the manufacturer. In addition, a foundation drain should be installed around the building perimeter to collect water that could potentially infiltrate beneath the foundations and should discharge to an approved storm drain.

Unless the below-grade levels are designed to be watertight and resist hydrostatic pressures, subdrainage should be provided for structures established below final site grades. A subdrainage system will reduce hydrostatic pressure and the risk of groundwater entering through the embedded wall and floor slabs. Typical subdrainage details for embedded structures are shown on Figure 9. The figure shows peripheral subdrains to drain embedded walls and an interior granular drainage blanket beneath the concrete floor slab, which is drained by a system of subslab drainage pipes. All perched groundwater collected should be drained by gravity or pumped from sumps into the stormwater disposal facility. If the water is pumped, an emergency power supply should be included to prevent flooding due to power loss.

In our opinion, it is appropriate to assume a coefficient of subgrade reaction, k, of 175 pci to characterize the subgrade support for point loading with 10 in. of compacted crushed rock beneath the floor slab.

Retaining/Embedded Walls

Construction of the below-grade levels will require embedded walls with a maximum height of about 10 to 15 ft. We anticipate the walls will be cast in place and supported on wall or spread foundations. Foundation design and subgrade preparation should conform to the recommendations provided above for foundation support

Design lateral earth pressures for retaining walls depend on the type of construction, i.e., the ability of the wall to yield. Possible conditions are 1) a wall laterally supported at its base and top and therefore unable to yield to the active state; and 2) a retaining wall, such as a typical cantilever or gravity wall, that yields to the active state by tilting about its base. A conventional basement wall and cantilever retaining wall are examples of non-yielding and yielding walls, respectively. For completely drained, horizontal backfill, yielding and non-yielding walls may be designed on the basis of equivalent fluid unit weights of 35 and 50 pcf, respectively. To account for seismic loading, the earth pressures should be increased by 7 and 15 pcf for yielding and non-yielding walls, respectively. This results in a triangular distribution, with the resultant acting at 1/3 H up from the base of the wall, where H is the height of the wall in feet. Additional lateral loading due to surcharge loads can be evaluated using the criteria shown on Figure 8.

The lateral earth pressure design criteria presented above are appropriate if the embedded walls are drained. Although the permanent groundwater level likely occurs below the base of the proposed structure, perched groundwater may occur within the shallow silty soils and existing utility trenches during periods of prolonged or intense precipitation. We recommend installation of permanent drainage behind all embedded walls. For walls constructed adjacent to an open cut, we recommend placing a drainage blanket of rock that contains less than 2% fines between the backfill and the face of the wall. The drainage blanket should have a minimum width of 12 in. and can be drained through a perforated pipe at the base of the drainage blanket. A typical drainage system for walls constructed without shoring is shown on Figure 9. If shoring is used, we recommend installing continuous drainage panels on the embedded wall, which is a typical practice for similar applications in the region. The drainage panels should extend to the base of the wall, where water should be collected in a perforated plastic pipe and discharged to a sump or approved storm drain. In addition, the wall design should include positive drainage measures to prevent ponding of surface water behind the top of the wall.

In areas where it is not practical to completely drain the backfill and the walls will be designed as undrained and watertight structures, yielding and non-yielding walls can be designed on the basis of equivalent fluid unit weights of 80 and 90 pcf, respectively.

Overcompaction of backfill behind walls should be avoided. Heavy compactors and large pieces of construction equipment should not operate within 5 ft of any embedded wall to avoid the buildup of excessive lateral earth pressures. Compaction close to the walls should be accomplished with hand-operated vibratory-plate compactors. Overcompaction of backfill could significantly increase lateral earth pressures behind walls.

Pavement Design

We anticipate any new parking areas and driveways will be subjected primarily to automobile and light-truck traffic, with occasional heavy-truck traffic. We anticipate the majority of the site will be paved with AC pavement; however, areas subjected to repeated heavy-truck traffic, such as trash-enclosure areas, may be paved with PCC pavement. Traffic estimates for the driveways and parking areas are presently unknown.

Based on our experience with similar projects and subgrade soil conditions, we recommend the following pavement sections.

RECOMMENDED AC PAVEMENT SECTIONS

	CRB Thickness, in.	AC Thickness, in.
Areas Subjected to Occasional Heavy-Truck Traffic	12	4
Areas Subjected to Primarily Automobile Traffic and Parking	8	3

RECOMMENDED PCC PAVEMENT SECTIONS

	CRB Thickness, in.	PCC Thickness, in.
Areas Subjected to Repeated Heavy-Truck Traffic (trash-enclosure area)	6	6

The recommended pavement sections should be considered minimum thicknesses and underlain by a woven geotextile fabric. It should be assumed some maintenance will be required over the life of the pavement (15 to 20 years). The recommended pavement section is based on the assumption pavement construction will be accomplished during the dry season and after construction of the other improvements is complete. If wet-weather pavement construction is considered, it will likely be necessary to increase the thickness of CRB to support construction equipment and protect the subgrade from disturbance. The indicated sections are not intended to support extensive construction traffic, such as dump trucks and concrete trucks. Pavements subject to construction traffic may require repair.

For the above-indicated sections, drainage is an essential aspect of pavement performance. We recommend all paved areas be provided positive drainage to remove surface water and water within the base course. This will be particularly important in cut sections or at low points within the paved areas, such as at catch basins. Effective methods to prevent saturation of the base course materials include providing weep holes in the sidewalls of catch basins, subdrains in conjunction with utility excavations, and separate trench-drain systems. To ensure quality materials and construction practices, we recommend the pavement work conform to Oregon Department of Transportation standards.

Prior to placing base course materials, all pavement areas should be proof rolled with a fully loaded, 10-cy dump truck. Any soft areas detected by the proof rolling should be overexcavated to firm ground and backfilled with compacted structural fill.

Provided the pavement section is installed in accordance with the recommendations provided above, it is our opinion the site-access areas will support infrequent traffic by an emergency vehicle having a gross vehicle weight (GVW) of up to 75,000 lbs. For the purposes of this evaluation, “infrequent” can be defined as once a month or less.

DESIGN REVIEW AND CONSTRUCTION SERVICES

We welcome the opportunity to review and discuss construction plans and specifications for this project as they are being developed. In addition, GRI should be retained to review all geotechnical-related portions of the plans and specifications to evaluate whether they are in conformance with the recommendations provided in our report. To observe compliance with the intent of our recommendations, our design concepts, and the plans and specifications, we are of the opinion all construction operations dealing with earthwork and foundations should be observed by a GRI representative. Our construction-phase services will allow for timely design changes if site conditions are encountered that are different from those described in our report. If we do not have the opportunity to confirm our interpretations, assumptions, and analyses during construction, we cannot be responsible for the application of our recommendations to subsurface conditions different from those described in this report.

LIMITATIONS

This report has been prepared to aid the architect and engineer in the design of this project. The scope is limited to the specific project and location described herein, and our description of the project represents our understanding of the significant aspects of the project relevant to the design and construction of the new foundations and floors. In the event any changes in the design and location of the project elements as outlined in this report are planned, we should be given the opportunity to review the changes and modify or reaffirm the conclusions and recommendations of this report in writing.

The conclusions and recommendations submitted in this report are based on the data obtained from the explorations made at the locations indicated on Figure 2 and other sources of information discussed in this report. In the performance of subsurface investigations, specific information is obtained at specific locations at specific times. However, it is acknowledged variations in soil conditions may exist between exploration locations. This report does not reflect any variations that may occur between these explorations. The nature and extent of variation may not become evident until construction. If, during construction, subsurface conditions differ from those encountered in the explorations, we should be advised at once so we can observe and review these conditions and reconsider our recommendations where necessary.

Please contact the undersigned if you have any questions.

Submitted for GRI,

A. Wesley Spang, PhD, PE, GE	George A. Freitag, CEG	Nicholas M. Hatch, PE	Thomas J. O'Dell, PE
Principal	Principal	Senior Engineer	Project Engineer

This document has been submitted electronically.

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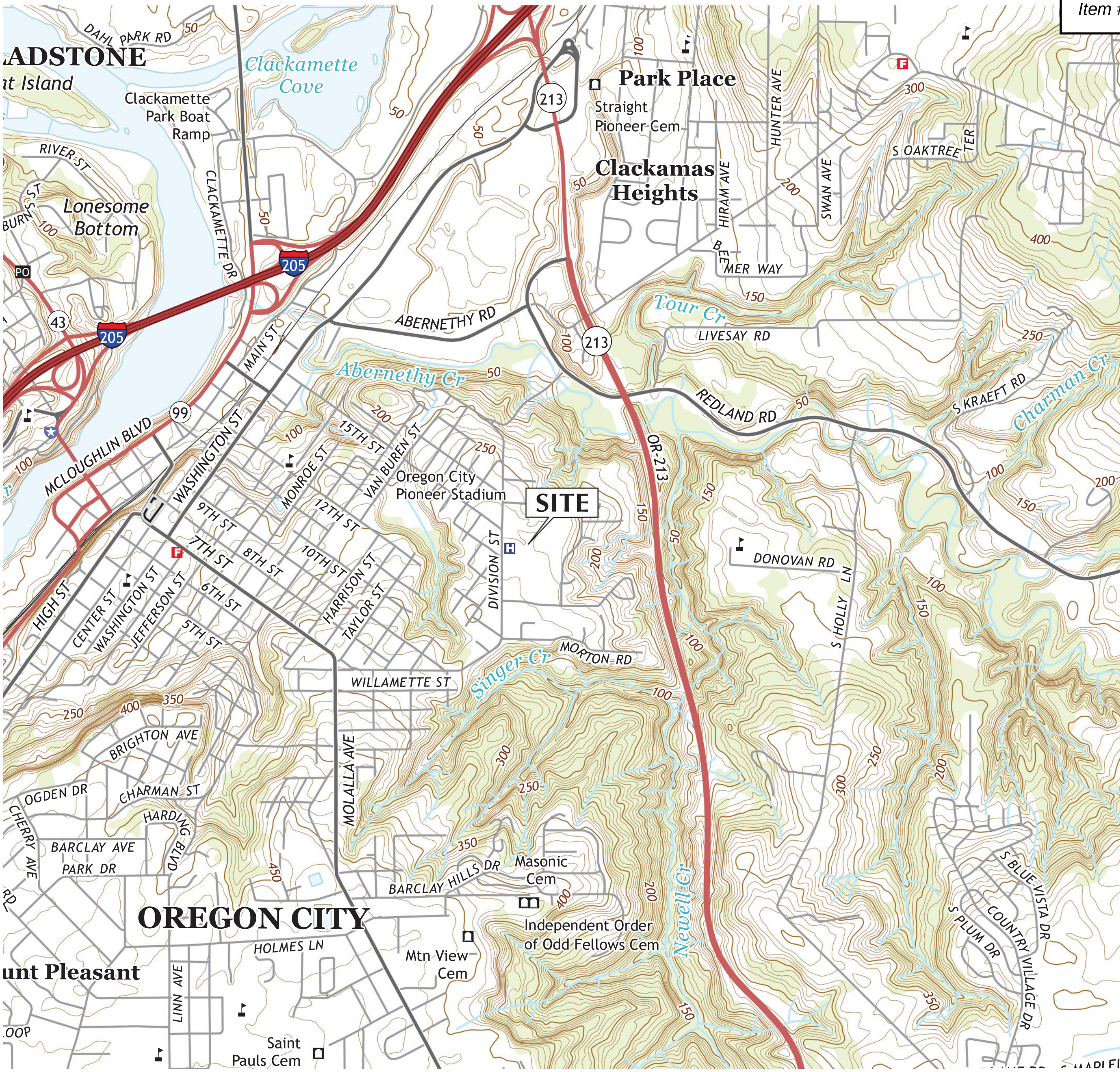


USGS TOPOGRAPHIC MAP
OREGON CITY, OREG. (2014)

North

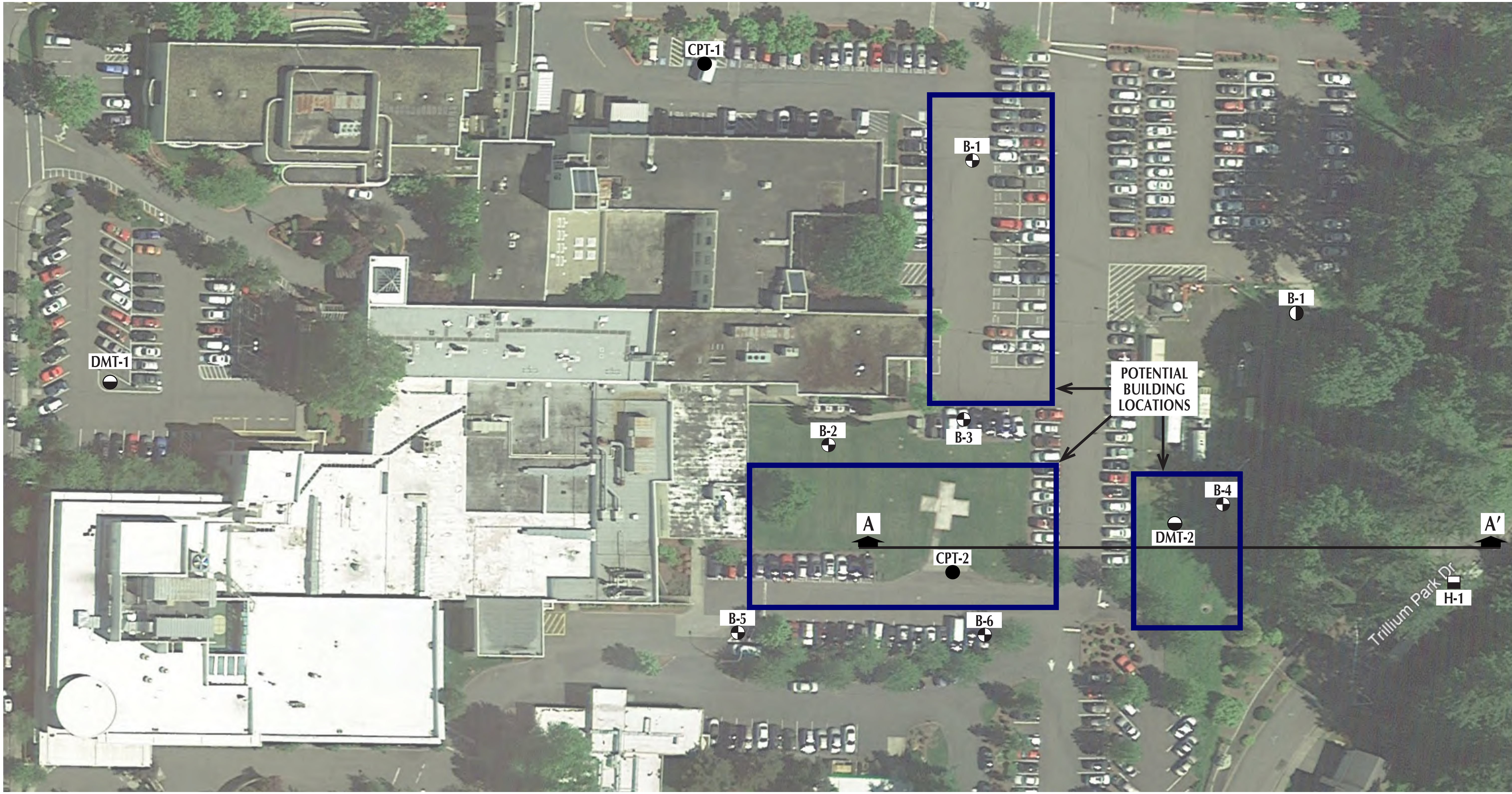
0 1/2 1 MILE

GRI

PROVIDENCE HEALTH SERVICES
WILLAMETTE FALLS HOSPITAL EXPANSION

VICINITY MAP

AUG. 2018 JOB NO. 6138 FIG. 1



SITE PLAN FROM FILE BY GOOGLE EARTH (IMAGE CAPTURED AUGUST 3, 2018)

BORING COMPLETED BY GRI (JULY 30 - AUGUST 1, 2018)

BORING COMPLETED BY GRI (APRIL 10, 2017)

BORING COMPLETED OFFSITE FOR CITY OF OREGON CITY (SEPTEMBER 21, 2006)

A A' SLOPE STABILITY CROSS SECTION (SEE FIGURES 4 AND 5)

CONE PENETRATION TEST COMPLETED BY GRI (JULY 17 - 24, 2018)

DILATOMETER TEST COMPLETED BY GRI (JULY 16, 2018)

North

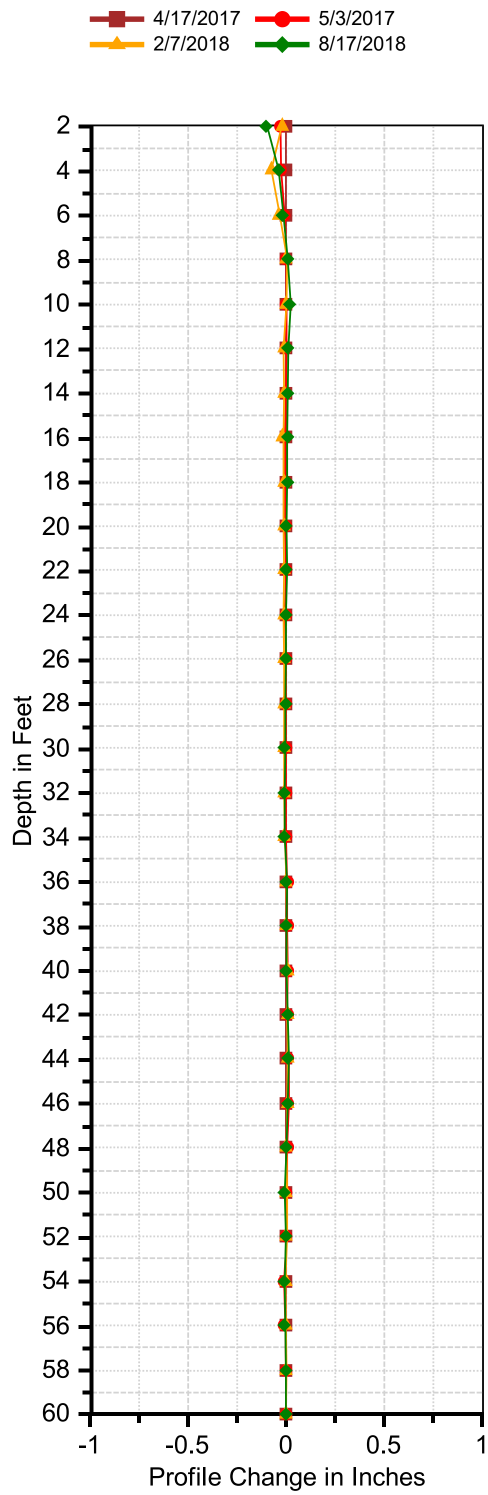
0 60 120 FT

GRI

PROVIDENCE HEALTH SERVICES
WILLAMETTE FALLS HOSPITAL EXPANSION

SITE PLAN

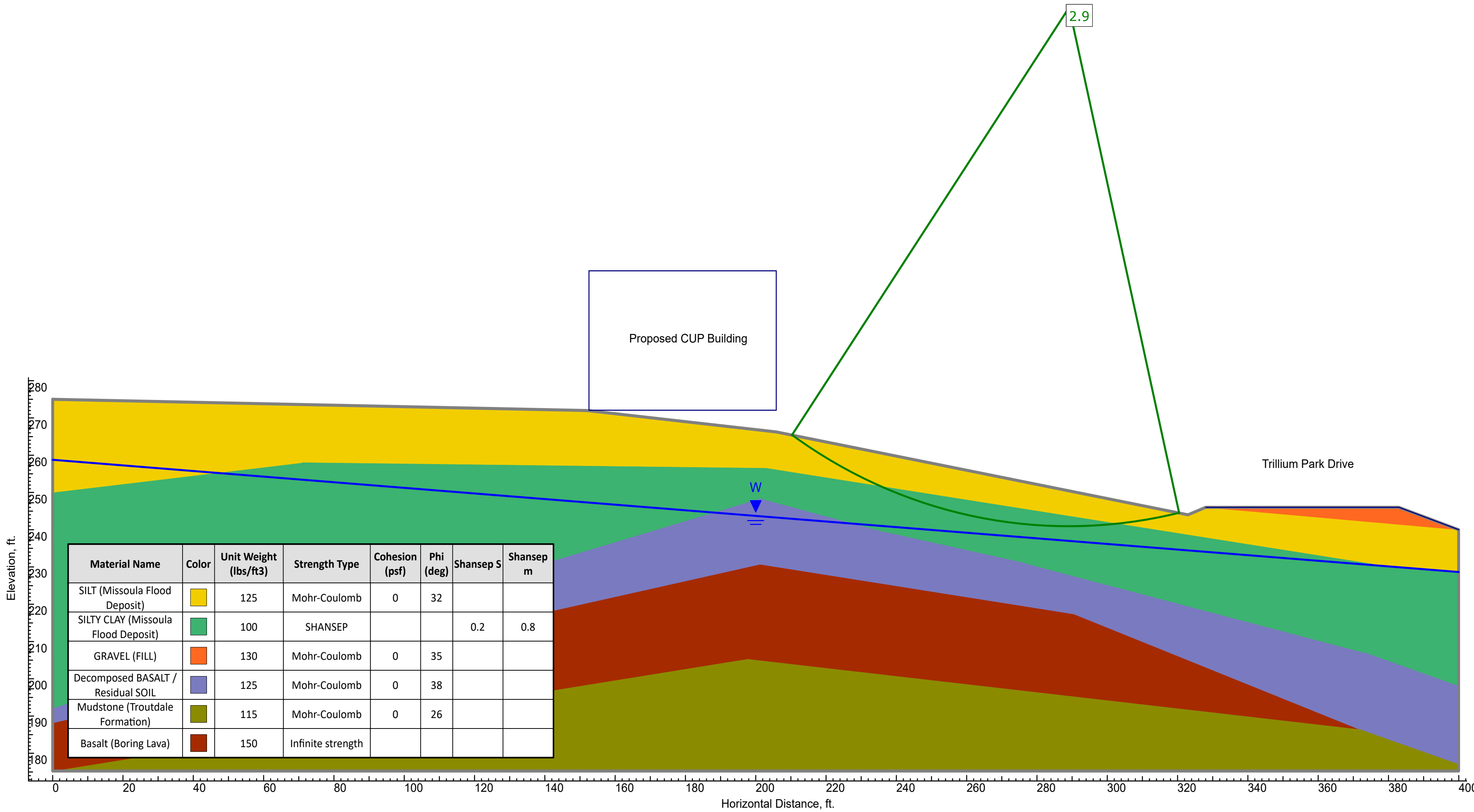
AUG. 2018 JOB NO. 6138



GRI

PROVIDENCE HEALTH SERVICES
WILLAMETTE FALLS HOSPITAL EXPANSION

INCLINOMETER READINGS



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shansep S	Shansep m
SILT (Missoula Flood Deposit)		125	Mohr-Coulomb	0	32		
SILTY CLAY (Missoula Flood Deposit)		100	SHANSEP			0.2	0.8
GRAVEL (FILL)		130	Mohr-Coulomb	0	35		
Decomposed BASALT / Residual SOIL		125	Mohr-Coulomb	0	38		
Mudstone (Troutdale Formation)		115	Mohr-Coulomb	0	26		
Basalt (Boring Lava)		150	Infinite strength				

GRI

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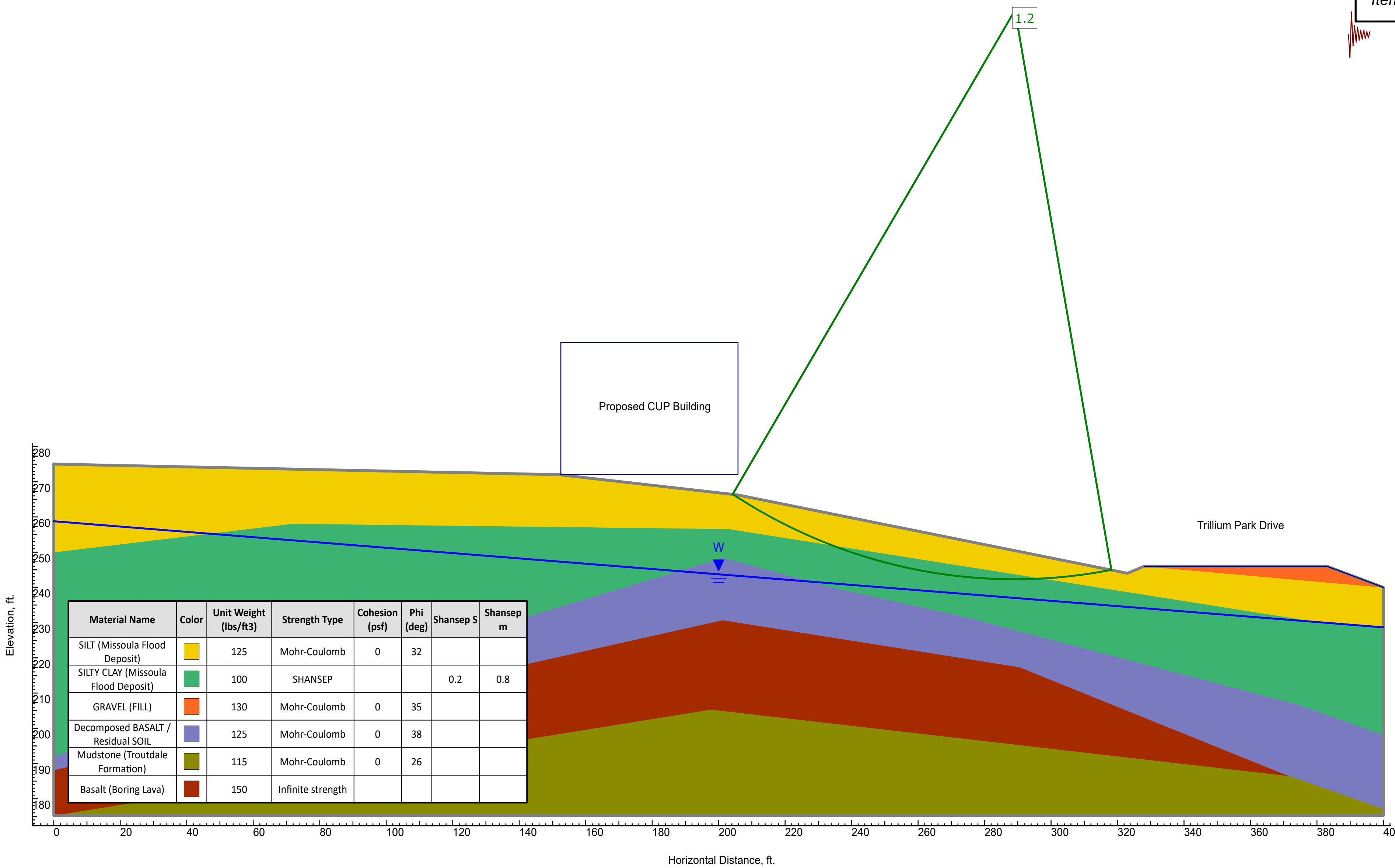
WILLAMETTE FALLS HOSPITAL EXPANSION

SLOPE STABILITY
(STATIC MODEL)

AUG. 2018 JOB NO. 6138



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shansep S	Shansep m
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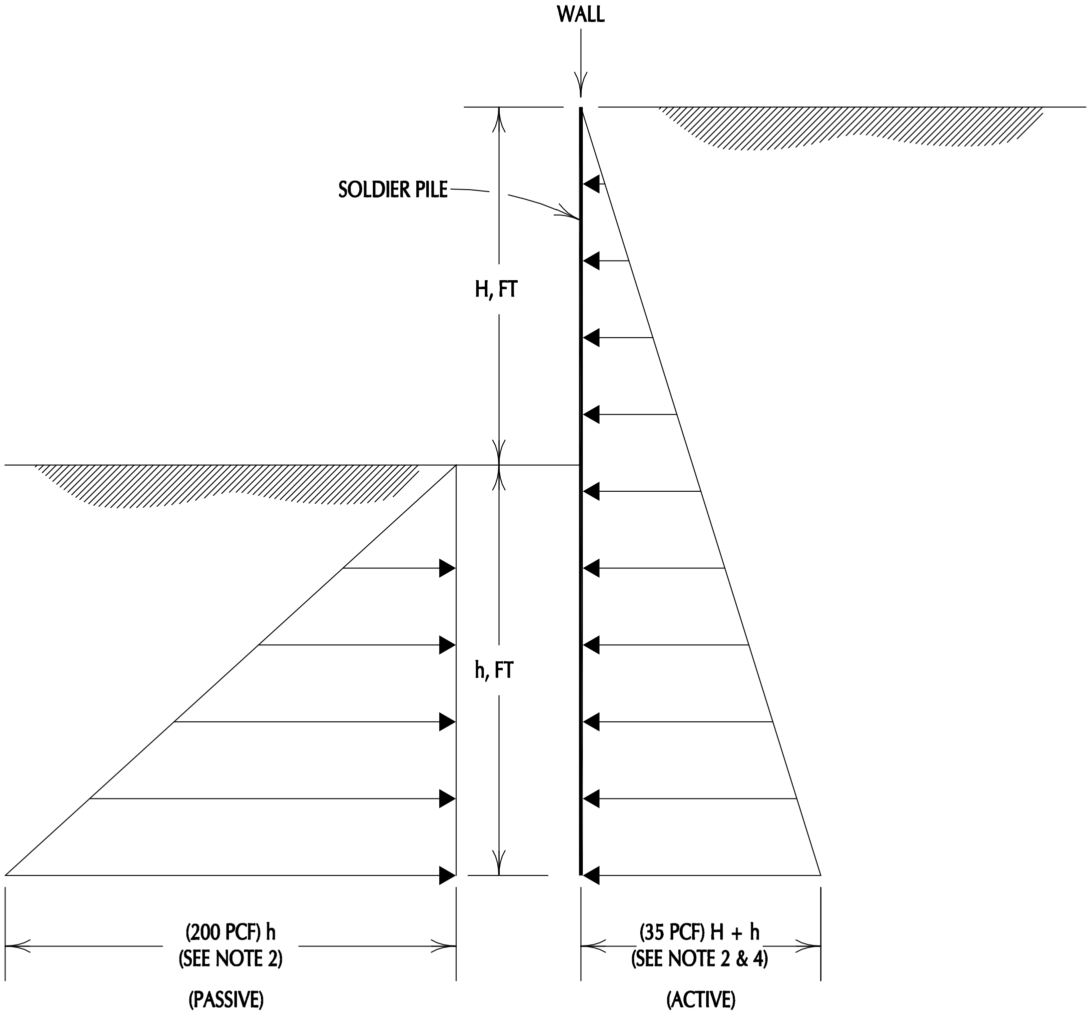
Decomposed BASALT / Residual SOIL		125	Mohr-Coulomb	0	38		
Mudstone (Troutdale Formation)		115	Mohr-Coulomb	0	26		
Basalt (Boring Lava)		150	Infinite strength				

GRI

PROVIDENCE HEALTH SERVICES
WILLAMETTE FALLS HOSPITAL EXPANSION

SLOPE STABILITY
(SEISMIC MODEL)

AUG. 2018 JOB NO. 6138



NOTES:

1) SURCHARGE EFFECTS FROM TRAFFIC, CONSTRUCTION EQUIPMENT, ETC., SHOULD BE ADDED TO THE ABOVE DESIGN PRESSURES. LATERAL LOADS ON THE SHORING DUE TO SURCHARGE EFFECTS CAN BE COMPUTED USING THE CRITERIA PROVIDED IN FIGURE 8. THE ACTUAL AMOUNT OF THIS SURCHARGE WILL DEPEND ON THE CONTRACTOR'S APPROACH TO THE WORK; HOWEVER, WE RECOMMEND A MINIMUM ADDITIONAL VERTICAL PRESSURE OF 250 PSF BE ADDED BEHIND THE WALL.

2) FOR CANTILEVERED SOLDIER PILES WITH LAGGING, BELOW THE BOTTOM OF THE EXCAVATION, PASSIVE PRESSURE ACTS OVER TWO PILE DIAMETERS (ACTUAL AREA), AND ACTIVE PRESSURE ACTS OVER ONE PILE DIAMETER (ACTUAL AREA) ASSUMES A MINIMUM SOLDIER PILE SPACING OF THREE DIAMETERS.

3) DESIGN PRESSURES ASSUME FULLY DRAINED CONDITIONS.

4) ACTIVE PRESSURE ACTS OVER THE ENTIRE EXPOSED SHORING AND / OR WALL AREA.

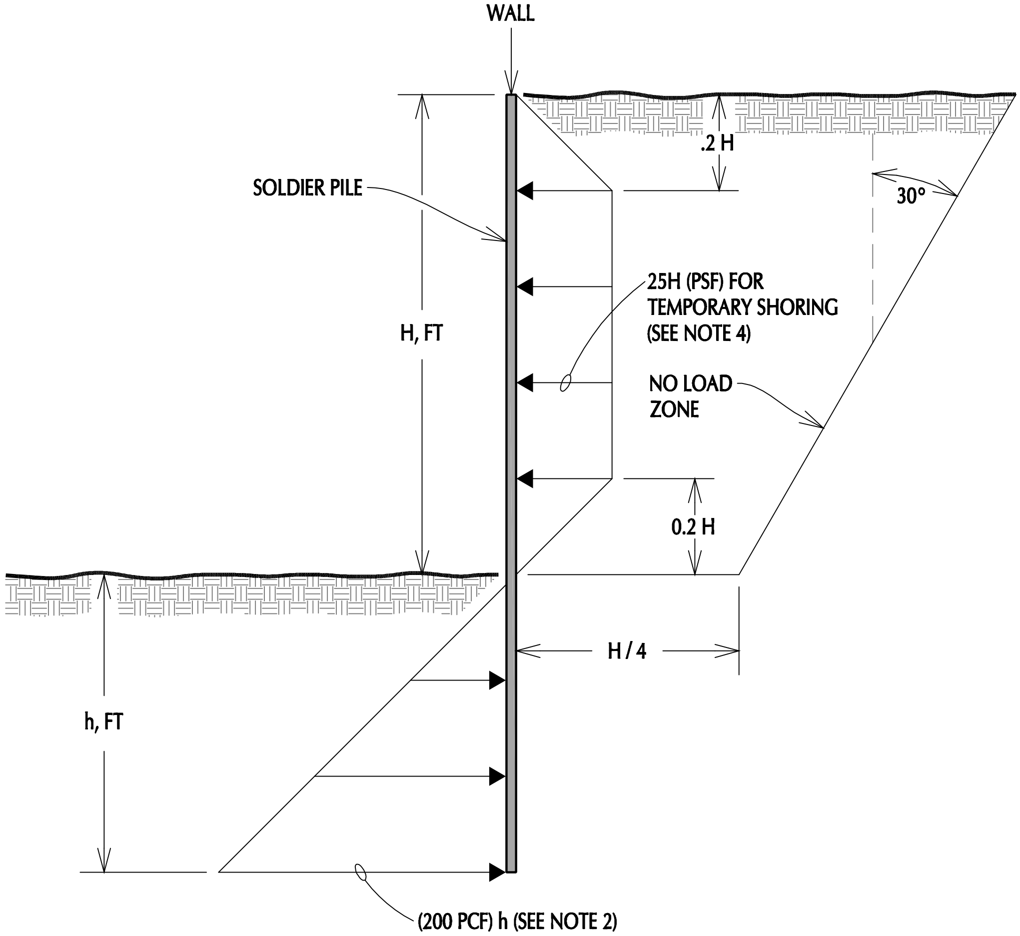
5) SOLDIER PILES SHOULD EXTEND AT LEAST 8 FT BELOW THE LOWEST ADJACENT EXCAVATION LEVEL.

GRI

PROVIDENCE HEALTH SERVICES
WILLAMETTE FALLS HOSPITAL EXPANSION

EARTH PRESSURES FOR CANTILEVER SHORING

AUG. 2018 | JOB NO. 6138 | FIG. 6



NOTES:

1) SURCHARGE EFFECTS FROM TRAFFIC, CONSTRUCTION EQUIPMENT, ETC., SHOULD BE ADDED TO THE ABOVE DESIGN PRESSURES. LATERAL LOADS ON THE SHORING DUE TO SURCHARGE EFFECTS CAN BE COMPUTED USING THE CRITERIA PROVIDED IN FIGURE 8. THE ACTUAL AMOUNT OF THIS SURCHARGE WILL DEPEND ON THE CONTRACTOR'S APPROACH TO THE WORK; HOWEVER, WE RECOMMEND A MINIMUM ADDITIONAL VERTICAL PRESSURE OF 250 PSF BE ADDED BEHIND THE WALL.

2) PASSIVE PRESSURE ACTS OVER TWO DIAMETER (ACTUAL AREA) OF THE SOLDIER PILE ASSUMES A MINIMUM SOLDIER PILE SPACING OF THREE DIAMETERS.

3) DESIGN PRESSURES ASSUME FULLY DRAINED CONDITIONS.

4) ACTIVE PRESSURE ACTS OVER THE ENTIRE EXPOSED SHORED AND / OR WALL AREA.

5) SOLDIER PILES SHOULD EXTEND AT LEAST 8 FT BELOW THE LOWEST ADJACENT EXCAVATION LEVEL.

GRI

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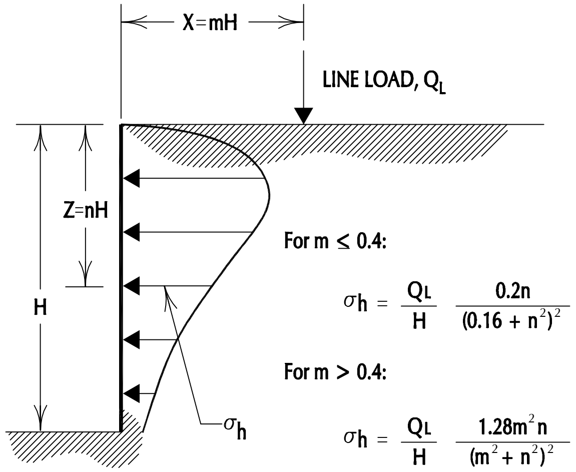
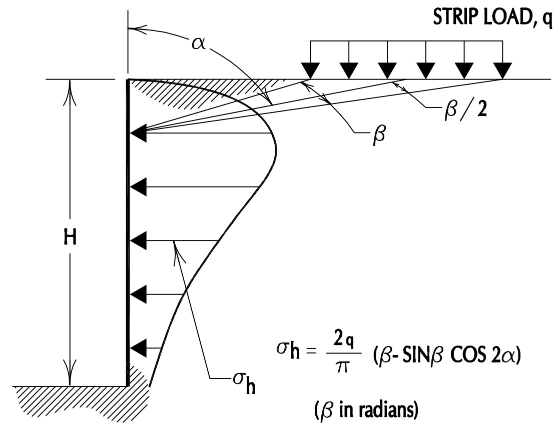
WILLAMETTE FALLS HOSPITAL EXPANSION

EARTH PRESSURES FOR BRACED SHORING

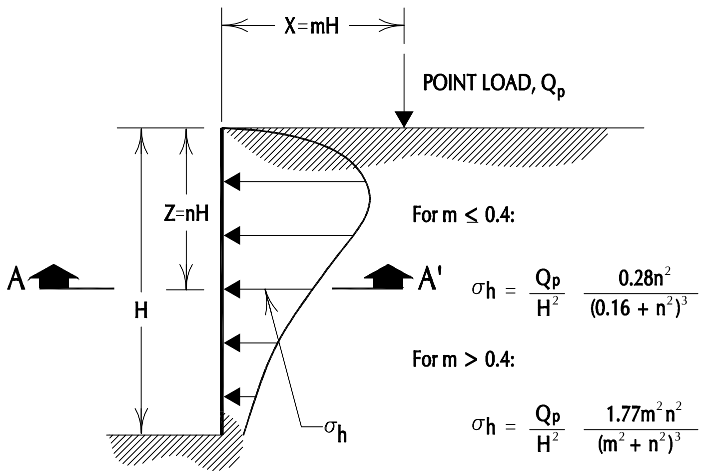
AUG. 2018 | JOB NO. 6138 | FIG. 7

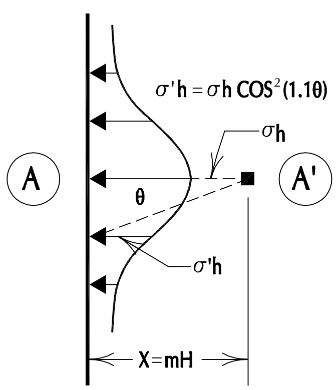


LINE LOAD PARALLEL TO WALL



STRIP LOAD PARALLEL TO WALL





DISTRIBUTION OF HORIZONTAL PRESSURES

VERTICAL POINT LOAD

NOTES:

1. THESE GUIDELINES APPLY TO RIGID WALLS WITH POISSON'S RATIO ASSUMED TO BE 0.5 FOR BACKFILL MATERIALS.

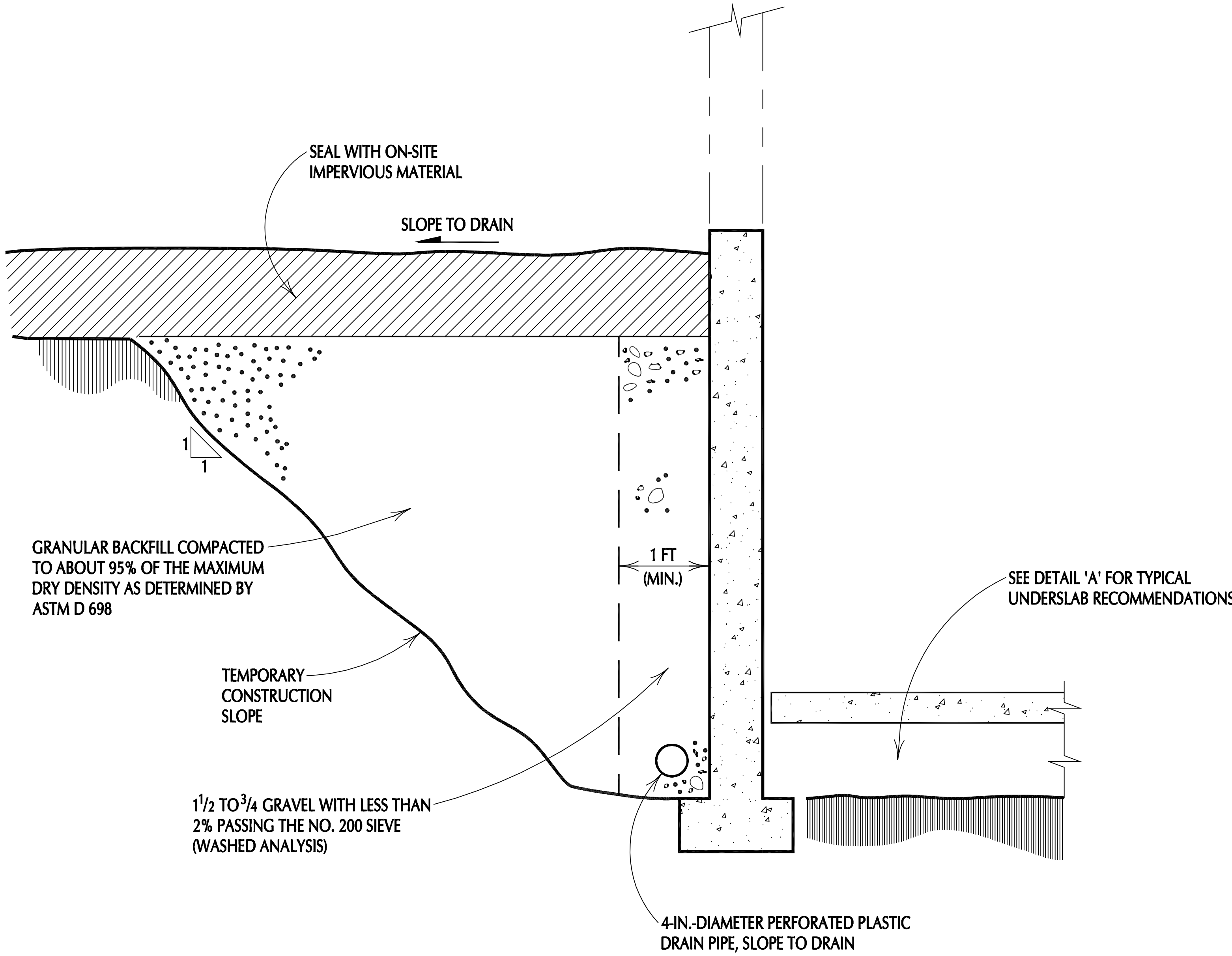
2. LATERAL PRESSURES FROM ANY COMBINATION OF ABOVE LOADS MAY BE DETERMINED BY THE PRINCIPLE OF SUPERPOSITION.

GRI

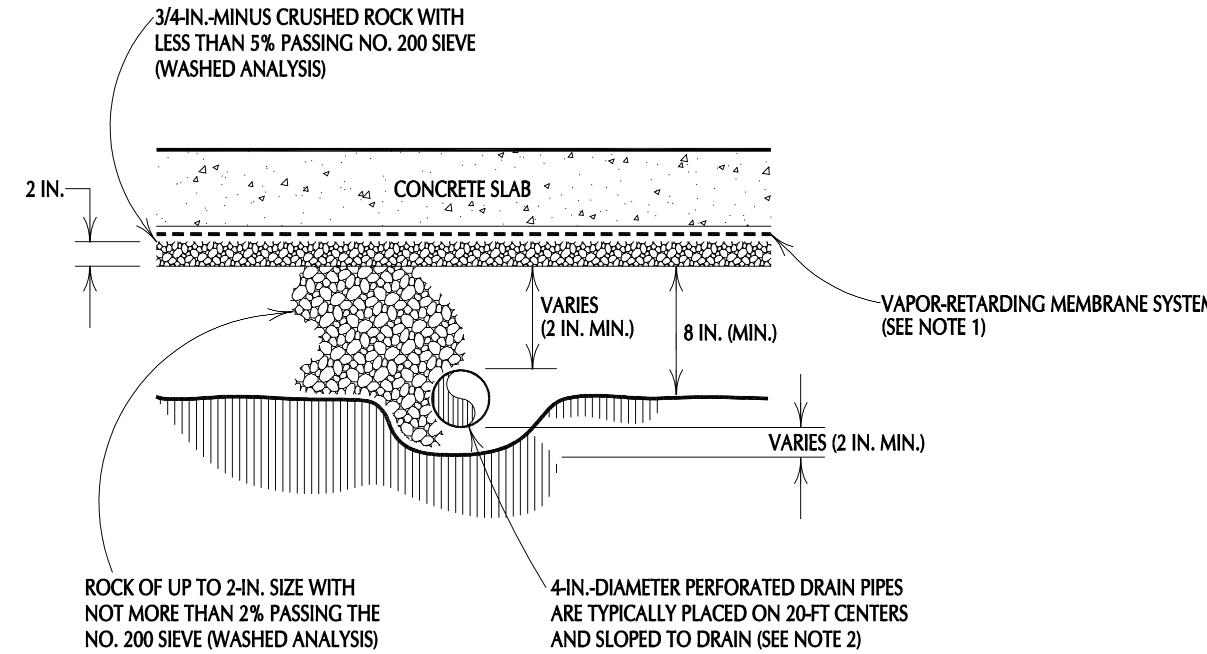
PROVIDENCE HEALTH SERVICES
WILLAMETTE FALLS HOSPITAL EXPANSION

SURCHARGE-INDUCED LATERAL PRESSURE

AUG. 2018 | JOB NO. 6138 | FIG. 8



PERIMETER DRAIN



DETAIL 'A'

NOT TO SCALE

UNDERSLAB DRAIN

NOTES:

1) A VAPOR-RETARDING MEMBRANE SYSTEM IS RECOMMENDED FOR MOISTURE-SENSITIVE AREAS AND SHOULD BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

2) INTERNAL 4-IN.-DIAMETER PERFORATED DRAIN PIPES ARE TYPICALLY NOT NECESSARY IN THOSE AREAS WHERE THE FINISH FLOOR WILL BE ABOVE EXISTING SITE GRADES.

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PROVIDENCE HEALTH SERVICES
WILLAMETTE FALLS HOSPITAL EXPANSION

TYPICAL SUBDRAINAGE DETAILS

AUG. 2018 | JOB NO. 6138 | FIG. 9

APPENDIX A

Field Explorations and Laboratory Testing

APPENDIX A

FIELD EXPLORATIONS AND LABORATORY TESTING

FIELD EXPLORATIONS

Subsurface materials and conditions at the site were investigated between July 16 and August 1, 2018, with six borings, designated B-1 through B-6; two cone penetrometer test (CPT) soundings, designated CPT-1 and CPT-2; and two dilatometer (DMT) soundings, designated DMT-1 and DMT-2. The approximate locations of the explorations completed for this investigation are shown on Figure 2. Logs of the borings, CPT probes, and DMT soundings are provided on Figures 1A through 12A. The field exploration work was coordinated and documented by an experienced member of GRI's geotechnical engineer staff, who maintained a log of the materials and conditions disclosed during the course of work.

Borings

The borings were advanced to depths of about 41.5 to 61.5 ft below existing site grades with mud-rotary drilling techniques using a truck-mounted drill rig provided and operated by Western States Soil Conservation of Hubbard, Oregon. Disturbed soil samples were obtained using a 2-in.-outside-diameter (O.D.) standard split-spoon sampler or a larger 3-in.-O.D. California-modified split-spoon (CMS) sampler. The CMS sampler was used when sample recovery was not possible with the split-spoon sampler due to the particle size of the material being sampled. Standard Penetration Tests (SPT) were conducted by driving the samplers into the soil a distance of 18 in. using a 140-lb hammer dropped 30 in. The number of blows required to drive the SPT sampler the last 12 in. is known as the Standard Penetration Resistance, or SPT N-value. The number of blows required to drive the CMS sampler the last 12 in. is denoted as the SPT N*-value. The SPT N- and N*-values provide a measure of the relative density of granular soils and relative consistency of cohesive soils. Relatively undisturbed soil samples were collected by pushing a 3-in.-O.D. Shelby tube into the undisturbed soil a maximum of 24 in. using the hydraulic ram of the drill rig. The soil in the Shelby tubes was extruded in our laboratory and Torvane shear strength measurements were recorded on selected samples.

Logs of the borings are provided on Figures 1A through 6A. Each log presents a descriptive summary of the various types of materials encountered in the borings and notes the depths at which the materials and/or characteristics of the materials change. To the right of the descriptive summary, the numbers and types of samples are indicated. Farther to the right, SPT N-values are shown graphically, along with the natural moisture contents, Torvane shear strength values, Atterberg Limits, and percent passing the No. 200 sieve, where applicable. The terms and symbols used to describe the materials encountered in the borings are defined in Table 1A and the attached legend.

Cone Penetration Test

The CPT probes were advanced to depths of about 59.5 to 68.2 ft using a truck-mounted CPT rig provided and operated by Oregon Geotechnical Explorations, Inc., of Keizer, Oregon. During the CPT, a steel cone is forced vertically into the soil at a constant rate of penetration. The force required to cause penetration at a constant rate can be related to the bearing capacity of the soil immediately surrounding the point of the penetrometer cone. This force is measured and recorded every 8 in. In addition to the cone measurements, measurements are obtained of the magnitude of force required to force a friction sleeve, attached above the cone, through the soil. The force required to move the friction sleeve can be related to the undrained shear strength of fine-grained soils. The dimensionless ratio of sleeve friction to point bearing capacity provides an indicator of the type of soil penetrated. The cone-penetration resistance and sleeve friction can be used to evaluate the relative consistency of cohesionless and cohesive soils, respectively. In addition, a piezometer fitted between the cone and the sleeve measures changes in water pressures as the probe is advanced and can also be used to measure the depth of the top of the groundwater table. The probe was also operated using an accelerometer fitted to the probe, which allows measurement of the arrival time of shear waves from impulses generated at the ground surface. This allows calculation of shear-wave velocities for the surrounding soil profile.

Logs of the CPT probes are provided on Figures 7A and 9A, which present a graphical summary of the tip resistance, local (sleeve) friction, friction ratio, pore pressure, and soil behavior type (SBT) index. The terms used to describe the soils encountered in the probe are defined in Table 2A. Shear-wave velocity measurements were recorded in the CPT probes and are shown on Figures 8A and 10A.

Dilatometer Test

The DMT soundings were advanced to depths of about 32.2 to 42 ft using a truck-mounted CPT rig provided and operated by Oregon Geotechnical Explorations, Inc., of Keizer, Oregon. DMT soundings provide additional geotechnical information to characterize the subsurface materials. The dilatometer test is performed by pushing a blade-shaped instrument into the soil. The blade is equipped with an expandable membrane on one side that is pressurized until the membrane moves horizontally into the surrounding soil. Readings of the pressures required to move the membrane to a point flush with the blade (P_0 – pressure) and 1.1 mm into the surrounding soil (P_1 – pressure) are recorded. The test sequence was performed at 8-in. intervals to obtain a comprehensive soil profile. A material index (I_D), horizontal stress index (K_D), and dilatometer modulus (E_D) are obtained directly from the dilatometer data. The constrained modulus (M) is then obtained from the dilatometer data.

The dilatometer test results are summarized on Figures 11A and 12A. The results show the dilatometer pressure readings (P_0, P_1) and three dilatometer-derived parameters: horizontal stress index (K_D), material index (I_D), and constrained modulus (M). The terms used to describe the materials encountered in the sounding are defined in Table 3A.

LABORATORY TESTING

General

The samples obtained from the borings were examined in our laboratory, where the physical characteristics of the samples were noted and the field classifications modified where necessary. At the time of classification, the natural moisture content of each sample was determined. Additional testing included dry unit weight, Atterberg limits, one-dimensional consolidation, and grain-size analyses. A summary of the laboratory test results has been provided in Table 4A. The following sections describe the testing program in more detail.

Natural Moisture Content

Natural moisture content determinations were made in conformance with ASTM D2216. The results are summarized on Figures 1A through 6A and in Table 4A.

Undisturbed Unit Weight

The unit weight, or density, of undisturbed soil samples was determined in the laboratory in conformance with ASTM D2937. The results are summarized on Figures 1A, 3A, 5A, and 6A and in Table 4A.

Atterberg Limits

Atterberg-limits testing was performed on samples of silty clay in conformance with ASTM D4318. The test results are summarized on the Plasticity Chart, Figure 13A, and Figures 1A, 3A, and 6A and in Table 4A.

One-Dimensional Consolidation

One-dimensional consolidation test was performed in conformance with ASTM D2435 on relatively undisturbed soil samples extruded from a Shelby tube. This test provides data on the compressibility of underlying fine-grained soils, necessary for settlement studies. The test results are summarized on Figures 14A through 16A in the form of a curve showing percent strain versus applied effective stress. The initial dry unit weight and moisture content of the sample are also shown on the figure.

Grain-Size Analysis

Washed-Sieve Method. To assist in classification of the soils, samples of known dry weight were washed over a No. 200 sieve. The material retained on the sieve was oven-dried and weighed. The percentage of material passing the No. 200 sieve was then calculated. The results are summarized on Figures 1A through 6A and in Table 4A.

Table 1A

GUIDELINES FOR CLASSIFICATION OF SOIL

Description of Relative Density for Granular Soil

Relative Density	Standard Penetration Resistance (N-values), blows per ft
very loose	0 - 4
loose	4 - 10
medium dense	10 - 30
dense	30 - 50
very dense	over 50

Description of Consistency for Fine-Grained (Cohesive) Soils

Consistency	Standard Penetration Resistance (N-values), blows per ft	Torvane or Undrained Shear Strength, tsf
very soft	0 - 2	less than 0.125
soft	2 - 4	0.125 - 0.25
medium stiff	4 - 8	0.25 - 0.50
stiff	8 - 15	0.50 - 1.0
very stiff	15 - 30	1.0 - 2.0
hard	over 30	over 2.0

Grain-Size Classification

Boulders:
>12 in.

Cobbles:
3 - 12 in.

Gravel:
1/4 - 3/4 in. (fine)
3/4 - 3 in. (coarse)

Sand:
No. 200 - No. 40 sieve (fine)
No. 40 - No. 10 sieve (medium)
No. 10 - No. 4 sieve (coarse)

Silt/Clay:
pass No. 200 sieve

Modifier for Subclassification

Adjective	Primary Constituent SAND or GRAVEL — Percentage of Other Material (by weight)	Primary Constituent SILT or CLAY — Percentage of Other Material (by weight)
trace:	5 - 15 (sand, gravel)	5 - 15 (sand, gravel)
some:	15 - 30 (sand, gravel)	15 - 30 (sand, gravel)
sandy, gravelly:	30 - 50 (sand, gravel)	30 - 50 (sand, gravel)
trace:	<5 (silt, clay)	*Relationship of clay and silt determined by plasticity index test*
some:	5 - 12 (silt, clay)	
silty, clayey:	12 - 50 (silt, clay)	

Table 2A: CONE PENETRATION TEST (CPT) CORRELATIONS

COHESIVE SOILS

Cone-Tip Resistance, tsf	Consistency
<5	Very Soft
5 to 15	Soft to Medium Stiff
15 to 30	Stiff
30 to 60	Very Stiff
>60	Hard

COHESIONLESS SOILS

Cone-Tip Resistance, tsf	Relative Density
<20	Very Loose
20 to 40	Loose
40 to 120	Medium
120 to 200	Dense
>200	Very Dense

Reference

Kulhawy, F.H., and Mayne, P.W., 1990, Manual on estimating soil properties for foundation design: Electric Power Research Institute, EL-6800.

Table 3A: SOIL CHARACTERIZATION BASED ON MARCHETTI FLAT-PLATE DILATOMETER TEST

Description of Consistency for Fine-Grained (Cohesive) Soils

	Soil Type(1)	
	CH, CL	ML, MH
	DMT Constrained Modulus (M_{DMT}), tsf	
Consistency	$I_D^{(2)} < 0.6$	$0.6 < I_D^{(2)} < 1.8$
Very Soft	0 -30	0 - 50
Soft	30 - 60	50 - 100
Medium Stiff	60 - 100	100 - 200
Stiff	100 - 175	200 - 375
Very Stiff	175 +	375 +

Description of Relative Density for Granular Soils

	Soil Type(1)	
	SM, SC	SP, SW
	DMT Constrained Modulus (M_{DMT}), tsf	
Relative Density	$1.8 < I_D^{(2)} < 3.3$	$3.3 < I_D^{(2)}$
Very Loose	0 -75	0 - 100
Loose	75 - 150	100 - 200
Medium Dense	150 - 300	200 - 425
Dense	300 - 550	425 - 850
Very Dense	550 +	850 +

1) Unified Soil Classification System
2) I_D = Material Index

Table 4A

SUMMARY OF LABORATORY RESULTS

Sample Information						Atterberg Limits			
Location	Sample	Depth, ft	Elevation, ft	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Fines Content, %	Soil Type
B-1	S-2	5.0	--	38	--	--	--	62	Sandy SILT
	S-3	7.5	--	35	--	--	--	--	SILT
	S-4	10.0	--	29	--	--	--	--	SILT
	S-5	13.0	--	26	99	--	--	--	Clayey SILT
	S-6	14.5	--	46	--	--	--	--	Clayey SILT
	S-7	20.0	--	56	--	59	29	--	Silty CLAY
	S-8	25.0	--	54	--	--	--	--	Silty CLAY
	S-9	30.7	--	63	--	--	--	--	Silty CLAY
	S-9	31.3	--	63	64	--	--	--	Silty CLAY
	S-10	32.0	--	66	--	--	--	--	Silty CLAY
	S-11	35.0	--	68	--	--	--	--	Silty CLAY
	S-12	40.0	--	50	--	--	--	--	Silty CLAY
B-2	S-1	2.5	--	29	--	--	--	--	SILT
	S-2	5.0	--	30	--	--	--	--	Sandy SILT
	S-3	7.5	--	31	--	--	--	--	Sandy SILT
	S-4	10.0	--	34	--	--	--	--	Sandy SILT
	S-5	12.5	--	32	--	--	--	--	Sandy SILT
	S-6	15.0	--	25	--	--	--	57	Sandy SILT
	S-7	20.0	--	46	--	--	--	--	Silty CLAY
	S-8	25.0	--	53	--	--	--	--	Silty CLAY
	S-9	30.0	--	57	--	--	--	--	Silty CLAY
	S-10	35.0	--	65	--	--	--	--	Silty CLAY
	S-11	40.0	--	64	--	--	--	--	Silty CLAY
	S-12	45.0	--	53	--	--	--	--	Silty CLAY
	S-13	50.0	--	65	--	--	--	--	Silty CLAY
B-3	S-1	2.5	--	29	--	--	--	--	SILT
	S-2	5.0	--	31	--	--	--	--	SILT
	S-3	7.5	--	33	--	--	--	76	SILT
	S-4	10.8	--	27	100	--	--	--	SILT
	S-4	11.8	--	27	--	--	--	--	SILT
	S-5	12.0	--	34	--	66	37	--	Silty CLAY
	S-6	15.0	--	49	--	--	--	--	Silty CLAY
	S-7	20.5	--	45	77	--	--	--	Silty CLAY
	S-7	21.9	--	54	--	--	--	--	Silty CLAY
	S-8	22.0	--	54	--	--	--	--	Silty CLAY
	S-9	25.0	--	55	--	--	--	--	Silty CLAY
	S-10	30.8	--	62	65	--	--	--	Silty CLAY
	S-10	31.8	--	62	--	--	--	--	Silty CLAY
	S-11	32.0	--	49	--	--	--	--	Silty CLAY
	S-12	35.0	--	69	--	--	--	--	Silty CLAY

Table 4A

SUMMARY OF LABORATORY RESULTS

Sample Information						Atterberg Limits			
Location	Sample	Depth, ft	Elevation, ft	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Fines Content, %	Soil Type
B-3	S-13	40.0	–	64	–	–	–	–	Silty CLAY
	S-14	45.0	–	53	–	–	–	–	Silty CLAY
	S-15	50.0	–	57	–	–	–	–	Silty CLAY
	S-16	55.0	–	69	–	–	–	–	Silty CLAY
	S-17	60.0	–	71	–	–	–	–	Silty CLAY
B-4	S-1	2.5	–	25	–	–	–	–	FILL
	S-2	5.0	–	34	–	–	–	–	FILL
	S-3	7.5	–	30	–	–	–	–	SILT
	S-4	10.0	–	31	–	–	–	–	SILT
	S-5	12.5	–	28	–	–	–	–	Silty CLAY
	S-6	15.0	–	39	–	–	–	57	Sandy SILT
	S-13	45.0	–	72	–	–	–	–	Clayey SILT
B-5	S-1	2.5	–	32	–	–	–	–	FILL
	S-2	5.0	–	29	–	–	–	59	Sandy SILT
	S-3	7.5	–	29	–	–	–	–	Sandy SILT
	S-4	10.0	–	37	–	–	–	–	Sandy SILT
	S-5	12.5	–	30	–	–	–	–	Sandy SILT
	S-6	15.0	–	27	–	–	–	46	Silty SAND
	S-7	20.0	–	28	–	–	–	73	SILT
	S-8	25.5	–	29	–	–	–	–	Silty CLAY
	S-8	26.3	–	28	100	–	–	–	Silty CLAY
	S-9	27.0	–	32	–	–	–	–	Silty CLAY
	S-10	30.0	–	43	–	–	–	–	Silty CLAY
	S-11	35.3	–	60	–	–	–	–	Silty CLAY
	S-11	36.6	–	53	71	–	–	–	Silty CLAY
	S-12	37.0	–	64	–	–	–	–	Silty CLAY
	S-13	40.0	–	68	–	–	–	–	Silty CLAY
	S-14	45.8	–	68	61	–	–	–	Silty CLAY
	S-14	46.3	–	66	–	–	–	–	Silty CLAY
	S-15	47.0	–	62	–	–	–	–	Silty CLAY
	S-16	50.0	–	47	–	–	–	–	Silty CLAY
	S-17	55.0	–	69	–	–	–	–	Silty CLAY
	S-18	60.0	–	62	–	–	–	–	Silty CLAY
B-6	S-1	2.5	–	42	–	–	–	–	FILL
	S-2	5.0	–	37	–	–	–	–	SILT
	S-3	7.5	–	30	–	–	–	67	Sandy SILT
	S-4	10.0	–	28	–	–	–	44	Silty SAND
	S-5	12.5	–	34	–	–	–	–	Sandy SILT
	S-6	15.0	–	30	–	–	–	–	Silty CLAY
	S-7	20.0	–	42	–	–	–	–	Silty CLAY

Table 4A

SUMMARY OF LABORATORY RESULTS

Sample Information						Atterberg Limits			
Location	Sample	Depth, ft	Elevation, ft	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Fines Content, %	Soil Type
B-6	S-8	25.4	--	52	--	--	--	--	Silty CLAY
	S-8	26.3	--	55	70	--	--	--	Silty CLAY
	S-9	27.0	--	49	--	--	--	--	Silty CLAY
	S-10	30.0	--	55	--	--	--	--	Silty CLAY
	S-11	35.0	--	59	--	--	--	--	Silty CLAY
	S-12	40.0	--	64	--	73	44	--	Silty CLAY
	S-13	50.0	--	58	--	--	--	--	Silty CLAY

BORING AND TEST PIT LOG LEGEND

SOIL SYMBOLS

Symbol	Typical Description
	LANDSCAPE MATERIALS
	FILL
	GRAVEL; clean to some silt, clay, and sand
	Sandy GRAVEL; clean to some silt and clay
	Silty GRAVEL; up to some clay and sand
	Clayey GRAVEL; up to some silt and sand
	SAND; clean to some silt, clay, and gravel
	Gravelly SAND; clean to some silt and clay
	Silty SAND; up to some clay and gravel
	Clayey SAND; up to some silt and gravel
	SILT; up to some clay, sand, and gravel
	Gravelly SILT; up to some clay and sand
	Sandy SILT; up to some clay and gravel
	Clayey SILT; up to some sand and gravel
	CLAY; up to some silt, sand, and gravel
	Gravelly CLAY; up to some silt and sand
	Sandy CLAY; up to some silt and gravel
	Silty CLAY; up to some sand and gravel
	PEAT

BEDROCK SYMBOLS

Symbol	Typical Description
	BASALT
	MUDSTONE
	SILTSTONE
	SANDSTONE

SURFACE MATERIAL SYMBOLS

Symbol	Typical Description
	Asphalt concrete PAVEMENT
	Portland cement concrete PAVEMENT
	Crushed rock BASE COURSE

SAMPLER SYMBOLS

Symbol	Sampler Description
	2.0-in. O.D. split-spoon sampler and Standard Penetration Test with recovery (ASTM D1586)
	Shelby tube sampler with recovery (ASTM D1587)
	3.0-in. O.D. split-spoon sampler with recovery (ASTM D3550)
	Grab Sample
	Rock core sample interval
	Sonic core sample interval
	Geoprobe sample interval

INSTALLATION SYMBOLS

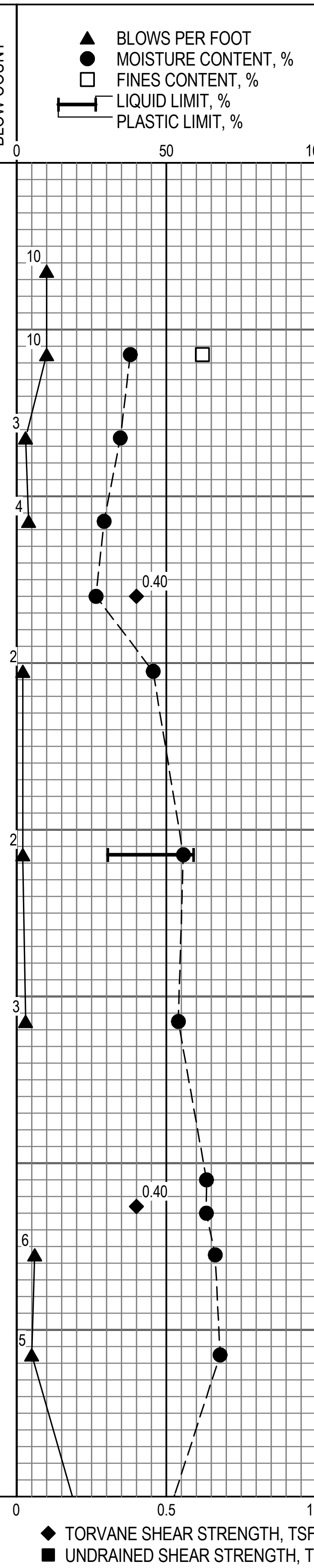
Symbol	Symbol Description
	Flush-mount monument set in concrete
	Concrete, well casing shown where applicable
	Bentonite seal, well casing shown where applicable
	Filter pack, machine-slotted well casing shown where applicable
	Grout, vibrating-wire transducer cable shown where applicable
P	Vibrating-wire pressure transducer
	1-in.-diameter solid PVC
	1-in.-diameter hand-slotted PVC
	Grout, inclinometer casing shown where applicable

FIELD MEASUREMENTS

Symbol	Typical Description
	Groundwater level during drilling and date measured
	Groundwater level after drilling and date measured
	Rock core recovery (%)
	Rock quality designation (RQD, %)

Item #2.

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
		Surface Elevation: Not Available						
		Asphalt concrete PAVEMENT (3 in.) over crushed rock BASE COURSE (6 in.)	0.8					
		Sandy SILT, trace clay, brown, stiff, fine-grained sand (Missoula Flood Deposits)			S-1		4 5 5	
5					S-2		3 5 5	
		---some clay and sand, soft to medium stiff below 7.5 ft			S-3		0 1 2	
10		---gray-brown mottled rust below 10 ft			S-4		1 1 3	
		---clayey below 12.5 ft			S-5			Dry Density = 99 pcf
15		Silty CLAY, trace fine-grained sand, gray mottled rust, very soft to soft (Missoula Flood Deposits)	15.0		S-6		0 0 2	
20					S-7		0 0 2	
25		---soft, contains organics at 25 ft			S-8		0 1 2	
30		---medium stiff below 30 ft			S-9			Dry Density = 64 pcf
					S-10		1 1 5	
35					S-11		1 1 4	
40								



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Logged By: C. Smerdon	**Drilled by:** Western States Soil Conservation, Inc.
Date Started: 7/31/18	**GPS Coordinates:** Not Available
Drilling Method: Mud Rotary **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 73%
Note: See Legend for Explanation of Symbols	

GRI

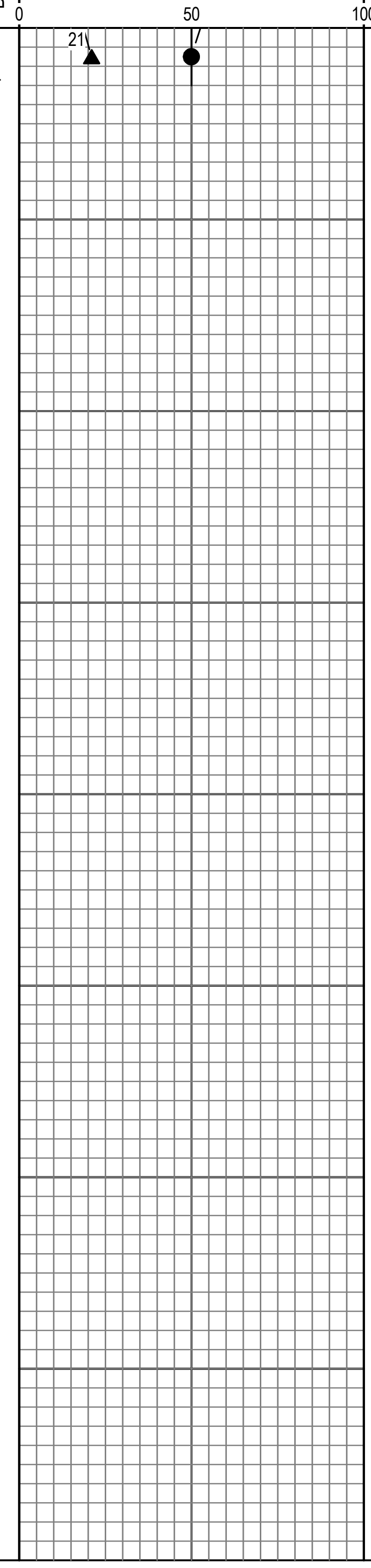
BORING B-1

AUG. 2018 JOB NO. 6138

Item #2.

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
		Surface Elevation: Not Available						
		Silty CLAY, trace fine-grained sand, gray mottled rust, very stiff (Missoula Flood Deposits)	41.5		S-12		4 7 14	
		(7/31/2018)						
45								
50								
55								
60								
65								
70								
75								
80								

▲ BLOWS PER FOOT
● MOISTURE CONTENT, %
□ FINES CONTENT, %
LIQUID LIMIT, %
PLASTIC LIMIT, %



◆ TORVANE SHEAR STRENGTH, TSF
■ UNDRAINED SHEAR STRENGTH, TSF

GRI BORING LOG (GPS) - NO ELEV GRI DATA TEMPLATE.GDT 8/21/18

GRI

BORING B-1

AUG. 2018 JOB NO. 6138

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
		Surface Elevation: Not Available						

Surface Elevation: Not Available

SILT, trace clay and fine-grained sand, gray-brown mottled rust, stiff, 6-in.-thick heavily rooted zone at ground surface (Missoula Flood Deposits)

5 ---sandy, brown below 5 ft

---medium stiff at 7.5 ft

10 ---very stiff below 10 ft

---soft to medium stiff at 12.5 ft, gray below 12.5 ft

15

20 Silty CLAY, trace fine-grained sand, gray mottled rust, stiff (Missoula Flood Deposits) — 20.0

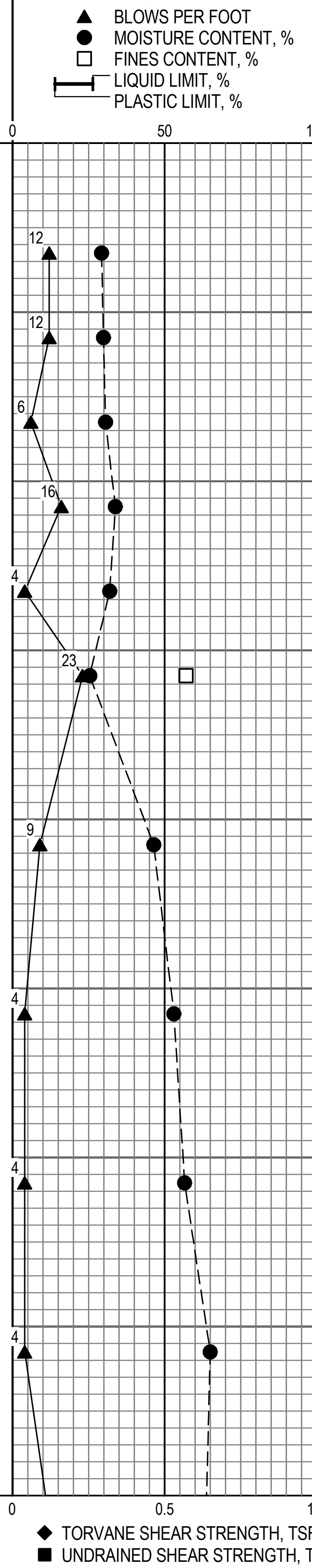
25 ---soft to medium sitff below 25 ft

30

35

40

Sample No.	Blow Count	Blows per Foot
S-1	4, 4, 8	12
S-2	3, 6, 6	12
S-3	2, 3, 3	6
S-4	2, 6, 10	16
S-5	2, 2, 2	4
S-6	4, 9, 14	23
S-7	3, 4, 5	9
S-8	1, 1, 3	4
S-9	0, 1, 3	4
S-10	0, 1, 3	4



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Logged By: C. Smerdon	**Drilled by:** Western States Soil Conservation, Inc.
Date Started: 7/31/18	**GPS Coordinates:** Not Available
Drilling Method: Mud Rotary **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 73%
Note: See Legend for Explanation of Symbols	

GRI

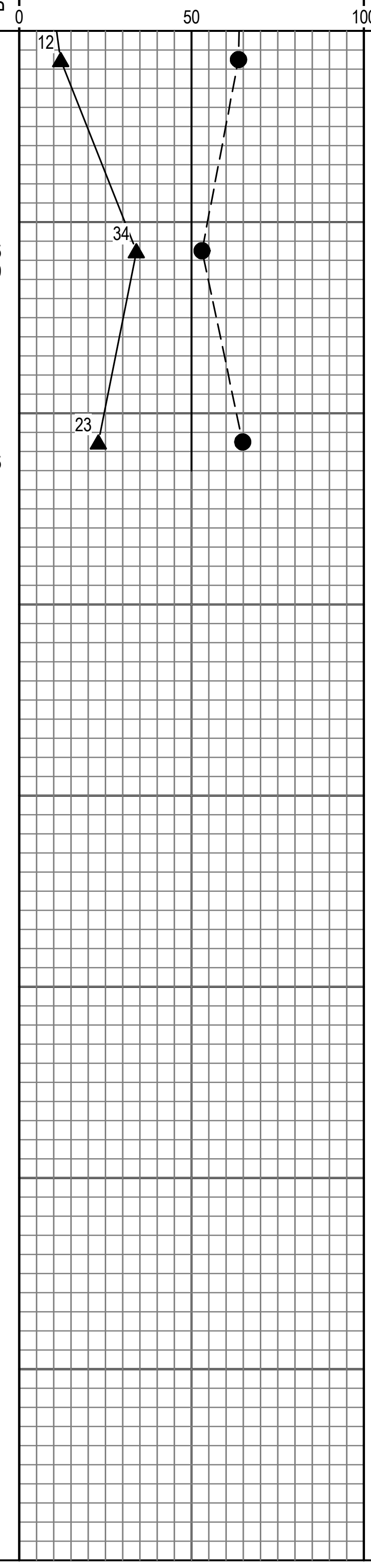
BORING B-2

AUG. 2018 JOB NO. 6138

Item #2.

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
		Surface Elevation: Not Available						
		Silty CLAY, trace fine-grained sand, gray, stiff (Missoula Flood Deposits)			S-11	I	2 4 8	
45		---hard at 45 ft			S-12	I	7 15 19	
50		---very stiff at 50 ft			S-13	I	7 8 15	
		(7/31/2018)	51.5					
55								
60								
65								
70								
75								
80								

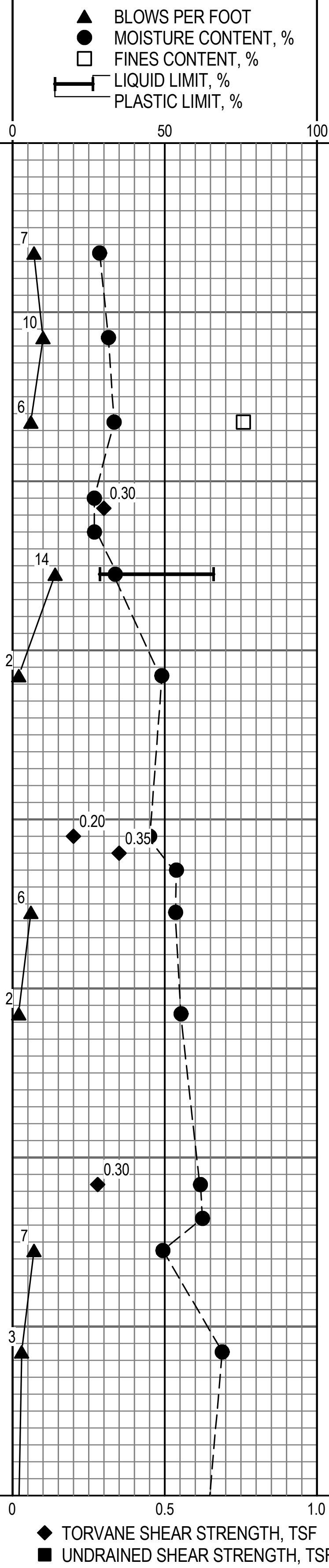
▲ BLOWS PER FOOT
● MOISTURE CONTENT, %
□ FINES CONTENT, %
LIQUID LIMIT, %
PLASTIC LIMIT, %



◆ TORVANE SHEAR STRENGTH, TSF
■ UNDRAINED SHEAR STRENGTH, TSF

GRI BORING LOG (GPS) - NO ELEV GRI DATA TEMPLATE.GDT 8/21/18

DEPTH, FT	CLASSIFICATION OF MATERIAL	DEPTH, FT	SAMPLE NO.	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
	Surface Elevation: Not Available				
	Asphalt concrete PAVEMENT (3 in.) over crushed rock BASE COURSE (6 in.)	0.8			
	SILT, some clay, trace fine-grained sand, gray-brown mottled rust, medium stiff (Missoula Flood Deposits)		S-1	2 3 4	
5	---stiff at 5 ft, some sand, trace clay, brown below 5 ft		S-2	3 5 5	
			S-3	2 3 3	
10	---some clay to clayey, trace fine- to medium-grained sand below 10 ft		S-4		Dry Density = 100 pcf
	Silty CLAY, trace fine- to medium-grained sand, brown mottled rust, stiff (Missoula Flood Deposits)	12.0	S-5	4 6 8	
15	---gray mottled rust, very soft to soft below 15 ft		S-6	1 1 1	
20	---soft to medium stiff at 20 ft, trace fine-grained sand below 20 ft		S-7		Dry Density = 77 pcf
			S-8	0 2 4	
25			S-9	0 0 2	
30	---soft to medium stiff below 30 ft		S-10		Dry Density = 65 pcf
			S-11	1 2 5	
35			S-12	0 1 2	
40					



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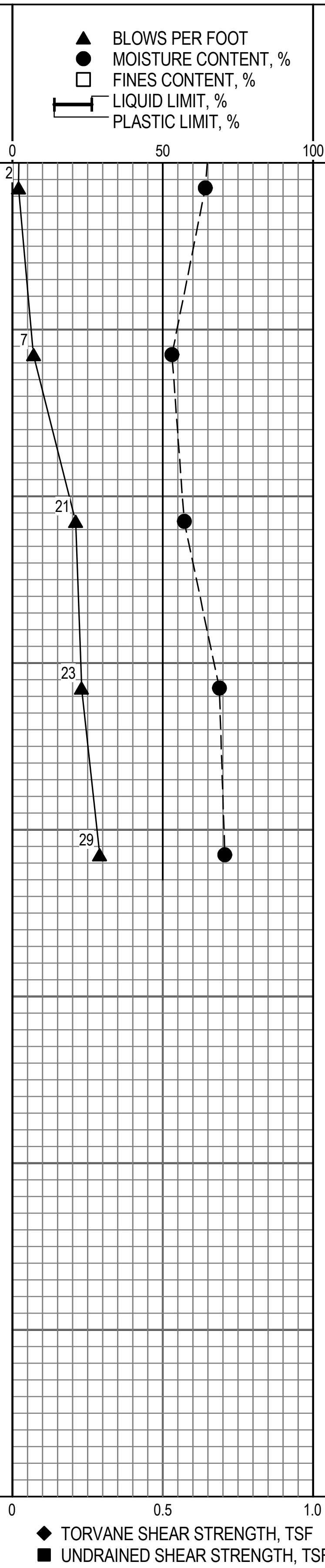
Logged By: C. Smerdon	**Drilled by:** Western States Soil Conservation, Inc.
Date Started: 7/30/18	**GPS Coordinates:** Not Available
Drilling Method: Mud Rotary **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 73%
Note: See Legend for Explanation of Symbols	

GRI

BORING B-3

AUG. 2018 JOB NO. 6138

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
		Surface Elevation: Not Available						
		Silty CLAY, trace fine-grained sand, gray, very soft to soft (Missoula Flood Deposits)			S-13		0 0 2	
45		---medium stiff at 45 ft			S-14		3 2 5	
50		---very stiff below 50 ft			S-15		5 7 14	
55					S-16		5 8 15	
60					S-17		6 10 19	
		(7/30/2018)	61.5					
65								
70								
75								
80								



GRI BORING LOG (GPS) - NO ELEV GRI DATA TEMPLATE.GDT 8/21/18

GRI

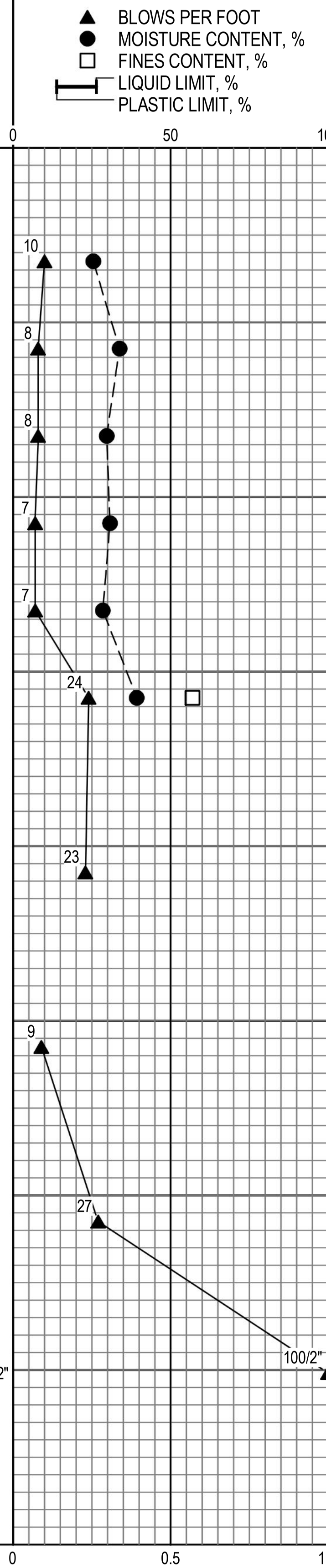
BORING B-3

AUG. 2018 JOB NO. 6138

CLASSIFICATION OF MATERIAL

Surface Elevation: Not Available

DEPTH, FT	CLASSIFICATION OF MATERIAL	DEPTH, FT	SAMPLE NO.	BLOW COUNT
0–7.5	SILT, some fine- to coarse-grained sand, trace clay and subangular to angular gravel, brown mottled rust and gray, stiff, contains wood debris, 6-in.-thick heavily rooted zone at ground surface (Fill) ---some clay, medium stiff to stiff below 5 ft	7.5	S-1 S-2 S-3	8 5 5 2 3 5 3 3 5
7.5–12.5	SILT, some clay and fine-grained sand, brown, medium stiff to stiff (Missoula Flood Deposits) ---medium stiff below 10 ft	12.5	S-4	3 3 4
12.5–15.0	Silty CLAY, trace fine-grained sand, brown, medium stiff (MIssoula Flood Deposits)	15.0	S-5	3 3 4
15.0–20.0	Sandy SILT, some clay, red-brown mottled black, very stiff, fine- to coarse-grained sand, relict rock structure, contains gravel-sized fragments of decomposed basalt (Residual Soil)	20.0	S-6	5 6 18
20.0–35.0	GRAVEL, some fine- to coarse-grained sand to sandy, trace to some silt, medium dense, subangular (Decomposed Basalt) ---loose at 25 ft	35.0	S-7 S-8 S-9 S-10	40 11 12 16 5 4 76 13 14
35.0–40	BASALT, gray, predominantly decomposed to decomposed, extremely soft to soft (R0 to R2) (Boring Lava)		S-11	100/2"



COMMENTS AND ADDITIONAL TESTS

(CONTINUED NEXT PAGE)

Logged By: C. Smerdon | **Drilled by:** Western States Soil Conservation, Inc.
Date Started: 8/1/18 | **GPS Coordinates:** Not Available
Drilling Method: Mud Rotary
Equipment: CME 75 HT Truck-Mounted Drill Rig
Hole Diameter: 5 in.
Hammer Type: Auto Hammer
Weight: 140 lb
Drop: 30 in.
Energy Ratio: 73%
Note: See Legend for Explanation of Symbols

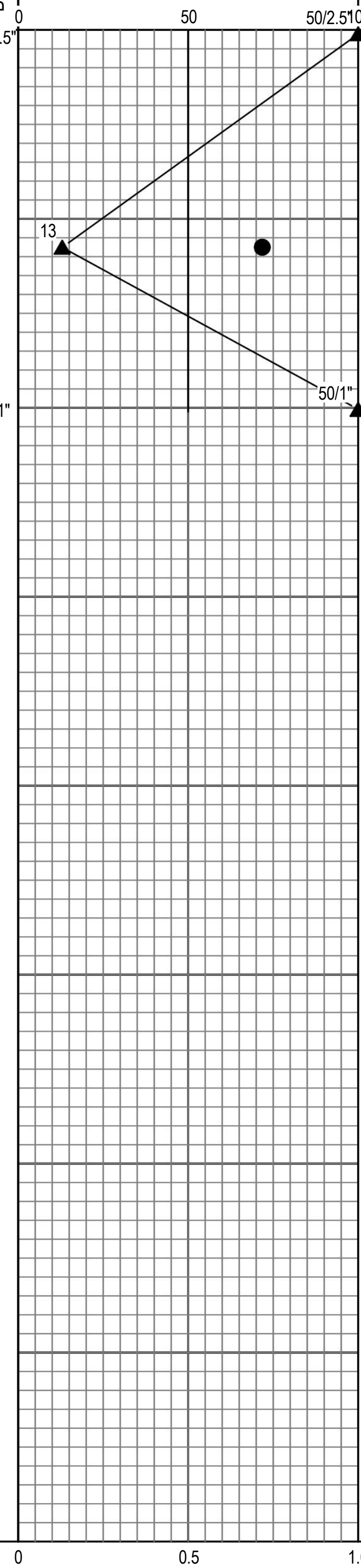
GRI

BORING B-4

AUG. 2018 JOB NO. 6138

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL Surface Elevation: Not Available	DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
		BASALT, gray, predominantly decomposed to decomposed, extremely soft to soft (R0 to R2), joints and fractures are stained rust and filled with black secondary mineralization (Boring Lava)			S-12		50/2.5"	
45		Clayey SILT, some fine- to coarse-grained sand, red-brown mottled black, stiff, relict rock structure, contains gravel-sized fragments of decomposed basalt (Residual Soil)	45.0		S-13		5 5 8	
		BASALT, gray, moderately weathered to predominantly decomposed, very soft to medium hard (R1 to R3), joints and fractures are stained rust and filled with black secondary mineralization (Boring Lava)	49.0					Increased drilling resistance below 49 ft
50		(8/1/2018)	50.1		S-14		50/1"	
55								
60								
65								
70								
75								
80								

▲ BLOWS PER FOOT
● MOISTURE CONTENT, %
□ FINES CONTENT, %
LIQUID LIMIT, %
PLASTIC LIMIT, %



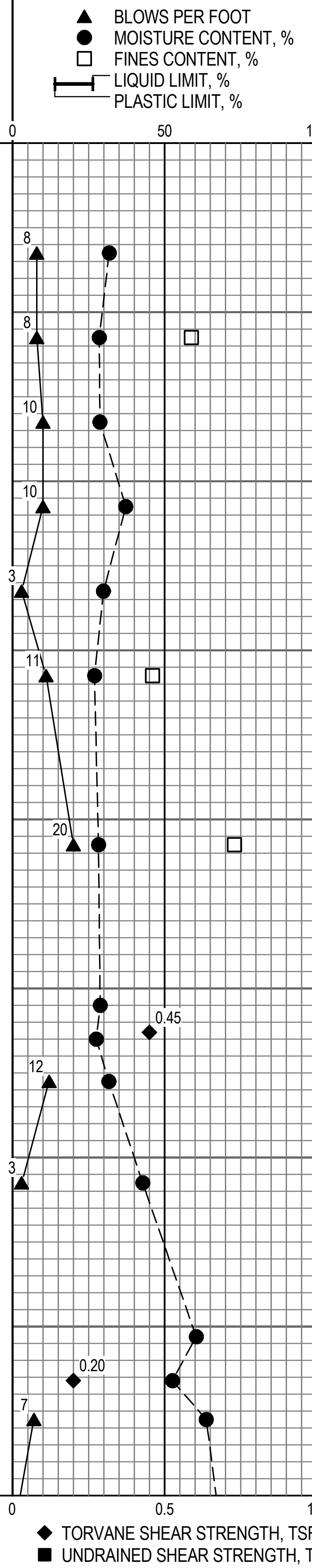
◆ TORVANE SHEAR STRENGTH, TSF
■ UNDRAINED SHEAR STRENGTH, TSF

GRI

BORING B-4

AUG. 2018 JOB NO. 6138

DEPTH, FT	CLASSIFICATION OF MATERIAL	DEPTH, FT	SAMPLE NO.	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
	Surface Elevation: Not Available				
0	Asphalt concrete PAVEMENT (3 in.) over crushed rock BASE COURSE (6 in.)	0.8			
	SILT, some fine- to coarse-grained sand, trace clay and subangular to angular gravel, brown, medium stiff to stiff, contains organics (Fill)		S-1	4 3 5	
5	Sandy SILT, brown, medium stiff to stiff, fine-grained sand (Missoula Flood Deposits)	5.0	S-2	2 4 4	
	---stiff below 7.5 ft		S-3	2 4 6	
10			S-4	2 4 6	
	---soft at 12.5 ft, gray below 12.5 ft		S-5	4 1 2	
15	---interbedded with 18-in.-thick layer of silty, fine-grained sand at 15 ft		S-6	4 4 7	
20	---some sand, very stiff below 20 ft		S-7	7 10 10	
25	Silty CLAY, trace fine-grained sand, gray mottled rust, stiff (Missoula Flood Deposits)	25.0	S-8		Dry Density = 100 pcf
			S-9	4 4 8	
30	---soft below 30 ft		S-10	1 1 2	
35			S-11		
	---medium stiff at 37 ft		S-12	1 2 5	Dry Density = 71 pcf
40					



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Logged By: C. Smerdon	**Drilled by:** Western States Soil Conservation, Inc.
Date Started: 7/30/18	**GPS Coordinates:** Not Available
Drilling Method: Mud Rotary **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 73%
Note: See Legend for Explanation of Symbols	

GRI

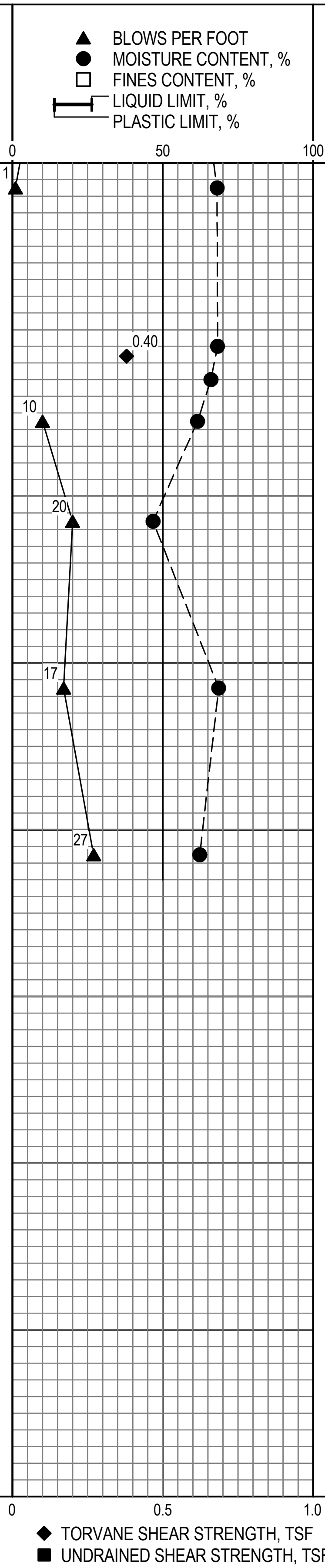
BORING B-5

AUG. 2018 JOB NO. 6138

GRI BORING LOG (GPS) - NO ELEV GRI DATA TEMPLATE.GDT 8/21/18

Item #2.

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL **Surface Elevation:** Not Available	DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
		Silty CLAY, trace fine-grained sand, gray mottled rust, very soft (Missoula Flood Deposits)			S-13		0 0 1	
45		---medium stiff at 45 ft			S-14			Dry Density = 61 pcf
		---stiff at 47 ft, gray below 47 ft			S-15		2 3 7	
50		---very stiff below 50 ft			S-16		4 9 11	
55					S-17		4 5 12	
60					S-18		6 9 18	
		(7/30/2018)	61.5					
65								
70								
75								
80								



GRI BORING LOG (GPS) - NO ELEV GRI DATA TEMPLATE.GDT 8/21/18

GRI

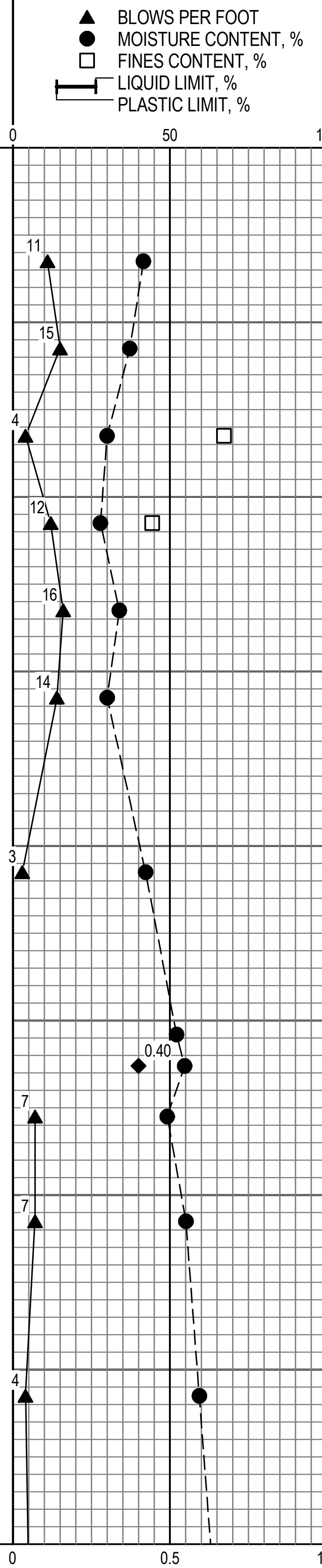
BORING B-5

AUG. 2018 JOB NO. 6138

Item #2.

DEPTH, FT	CLASSIFICATION OF MATERIAL	DEPTH, FT
	Surface Elevation: Not Available	
	Asphalt concrete PAVEMENT (3 in.) over crushed rock BASE COURSE (6 in.)	0.8
	SILT, some fine- to coarse-grained sand, trace clay and subangular to angular gravel, brown, stiff (Fill)	
5	SILT, some fine-grained sand, trace clay, brown, very stiff to stiff (Missoula Flood Deposits)	5.0
	---soft to medium stiff at 7.5 ft, sandy below 7.5 ft	
10	---interbedded with 18-in.-thick layer of silty, fine-grained sand at 10 ft	
	---gray below 12.5 ft	
15	Silty CLAY, trace fine-grained sand, gray, stiff (Missoula Flood Deposits)	15.0
20	---soft at 20 ft, gray mottled rust below 20 ft	
25	---medium stiff below 25 ft	
30		
35	---soft to medium stiff at 35 ft	
40		

SAMPLE NO.	BLOW COUNT	BLOWS PER FOOT	COMMENTS AND ADDITIONAL TESTS
S-1	3 4 7	11	
S-2	6 7 8	15	
S-3	2 2 2	4	
S-4	2 5 7	12	
S-5	2 7 9	16	
S-6	4 7 7	14	
S-7	1 1 2	3	
S-8		0.40	Dry Density = 70 pcf
S-9	2 2 5	7	
S-10	4 4 3	7	
S-11	2 1 3	4	



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Logged By: C. Smerdon	**Drilled by:** Western States Soil Conservation, Inc.
Date Started: 7/31/18	**GPS Coordinates:** Not Available
Drilling Method: Mud Rotary **Equipment:** CME 75 HT Truck-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 73%
Note: See Legend for Explanation of Symbols	

GRI

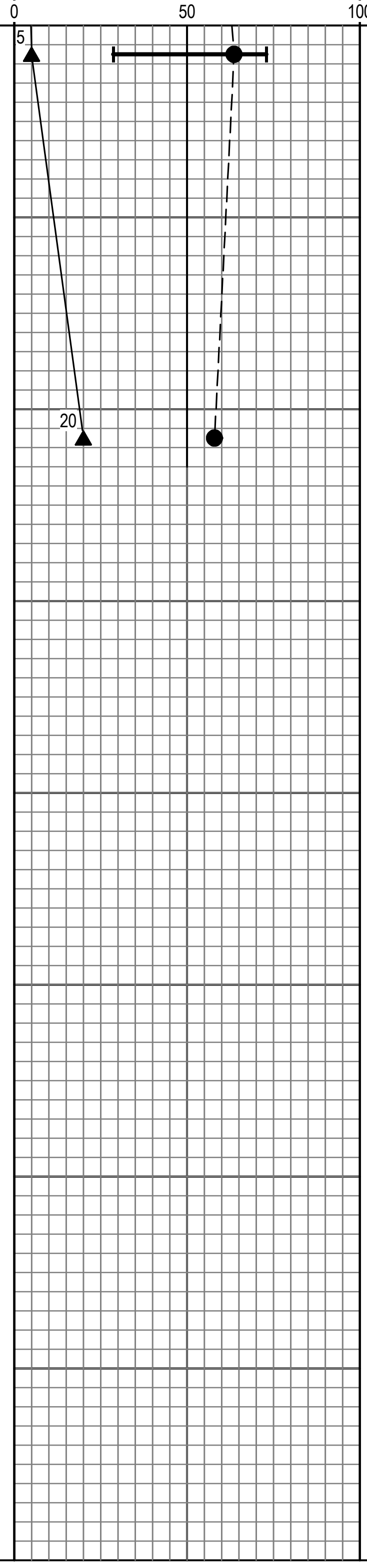
BORING B-6

AUG. 2018 JOB NO. 6138

GRI BORING LOG (GPS) - NO ELEV GRI DATA TEMPLATE.GDT 8/21/18

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT	COMMENTS AND ADDITIONAL TESTS
		Surface Elevation: Not Available						
		Silty CLAY, trace fine-grained sand, gray mottled rust, medium stiff (Missoula Flood Deposits)			S-12		1 1 4	
45								
50		---gray, very stiff at 50 ft			S-13		4 7 13	
		(7/31/2018)	51.5					
55								
60								
65								
70								
75								
80								

▲ BLOWS PER FOOT
● MOISTURE CONTENT, %
□ FINES CONTENT, %
LIQUID LIMIT, %
PLASTIC LIMIT, %



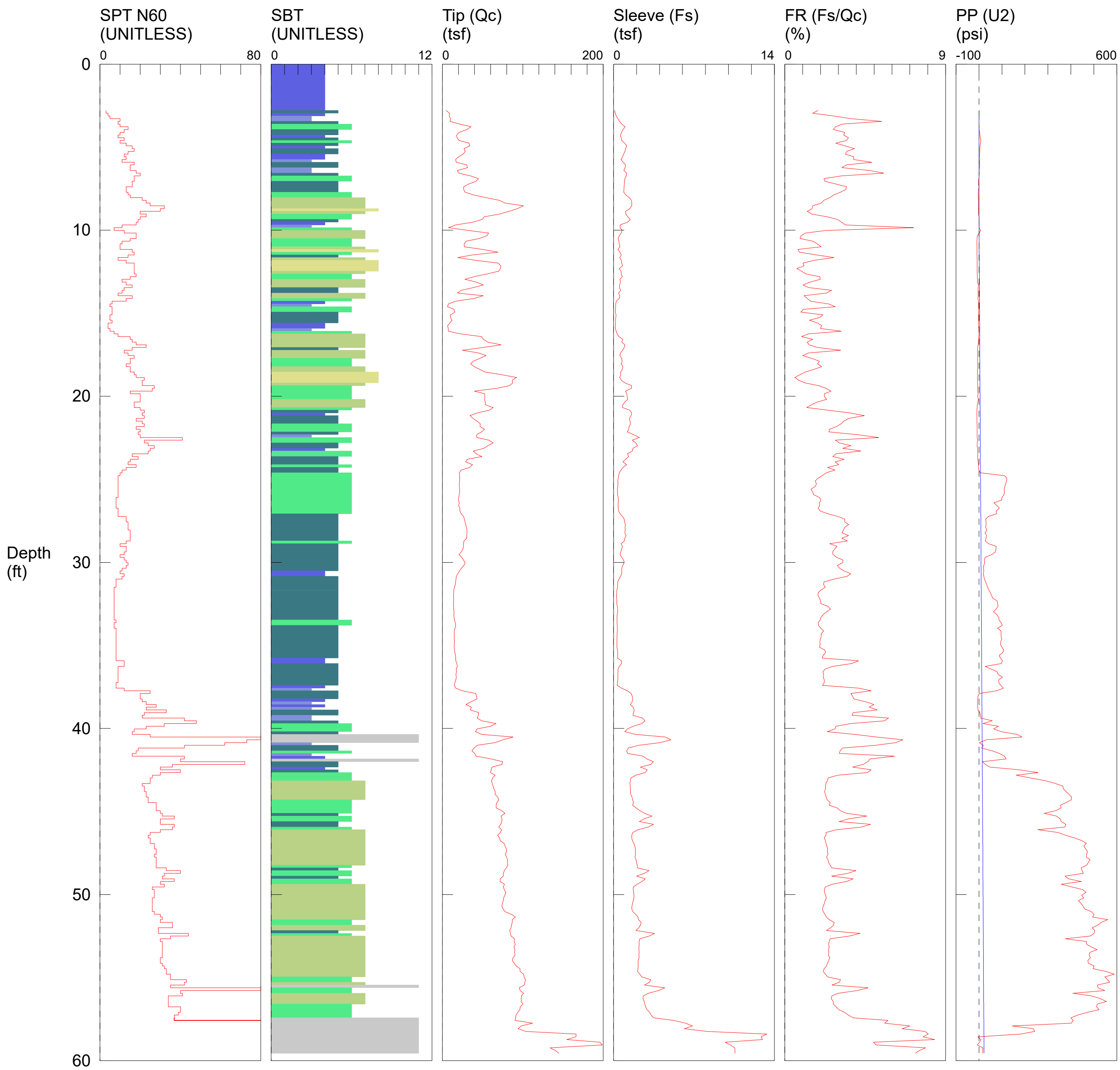
◆ TORVANE SHEAR STRENGTH, TSF
■ UNDRAINED SHEAR STRENGTH, TSF

GRI BORING LOG (GPS) - NO ELEV GRI DATA TEMPLATE.GDT 8/21/18

GRI

BORING B-6

AUG. 2018 JOB NO. 6138



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

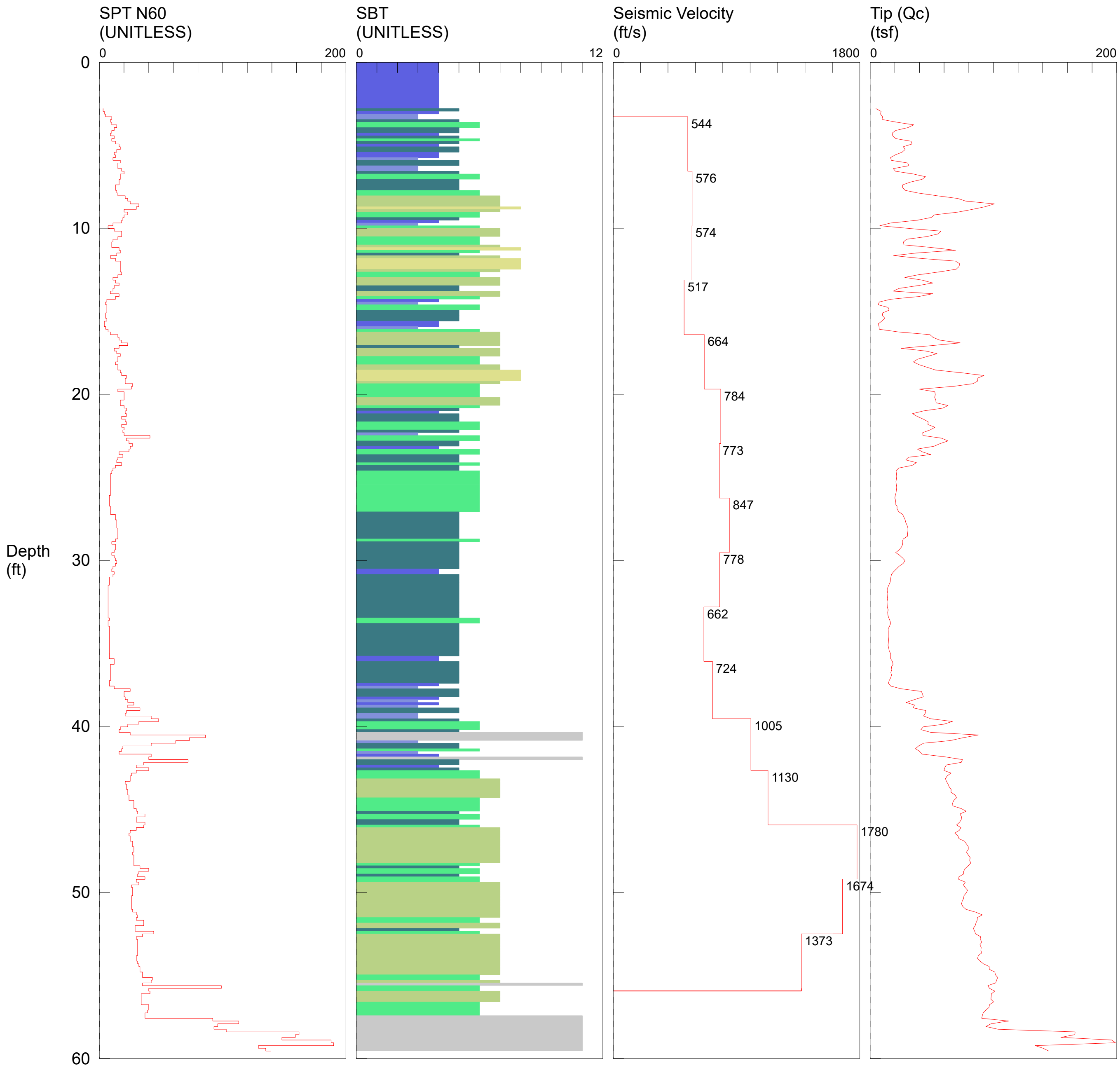
*SBT/SPT CORRELATION: UBC-1983

GRI

Observed By: C. Smerdon	**Advanced By:** Oregon Geotechnical Explorations, Inc.
Date Started: 07/24/18	**Ground Surface Elevation:** Not Available
Coordinates: Not Available	

CONE PENETRATION TEST CPT-1

AUG. 2018 JOB NO. 6138



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

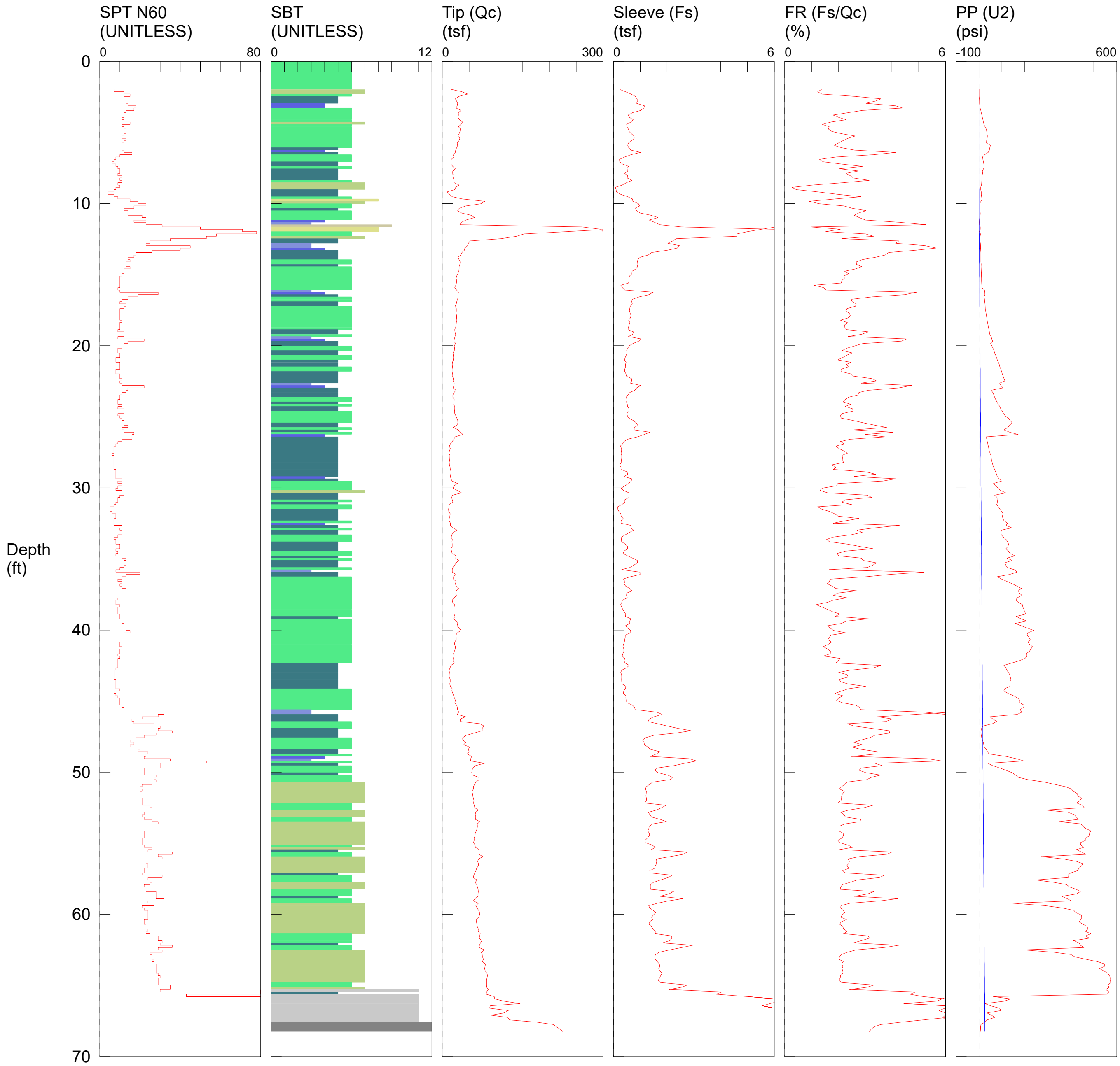
GRI

Observed By: C. Smerdon	**Advanced By:** Oregon Geotechnical Explorations, Inc.
Date Started: 07/24/18	**Ground Surface Elevation:** Not Available
Coordinates: Not Available	

CONE PENETRATION TEST CPT-1

(SEISMIC VELOCITY PROFILE)

AUG. 2018 JOB NO. 6138



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

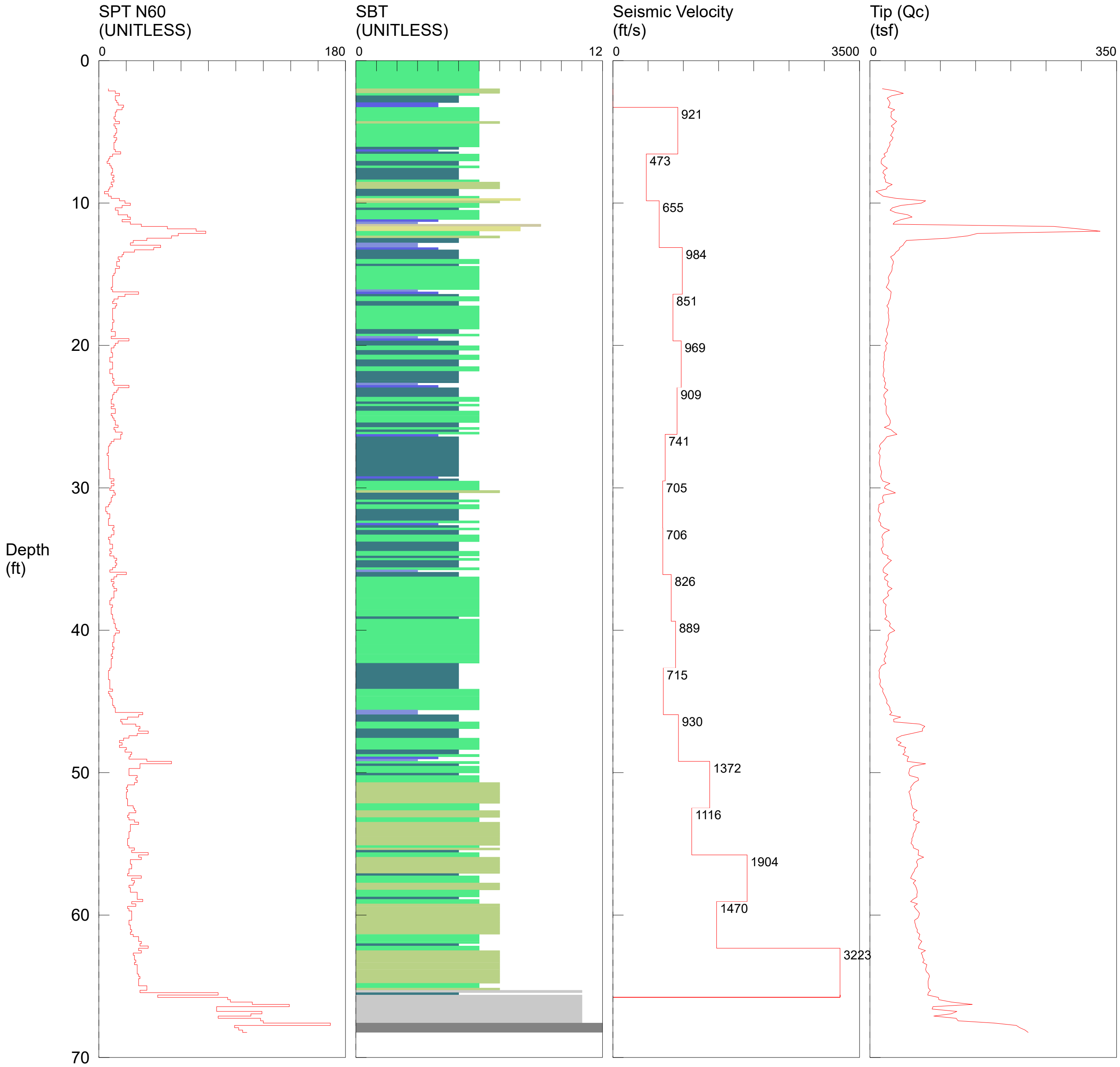
*SBT/SPT CORRELATION: UBC-1983

GRI

Observed By: C. Smerdon	**Advanced By:** Oregon Geotechnical Explorations, Inc.
Date Started: 07/17/18	**Ground Surface Elevation:** Not Available
Coordinates: Not Available	

CONE PENETRATION TEST CPT-2

AUG. 2018 JOB NO. 6138



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 (*)

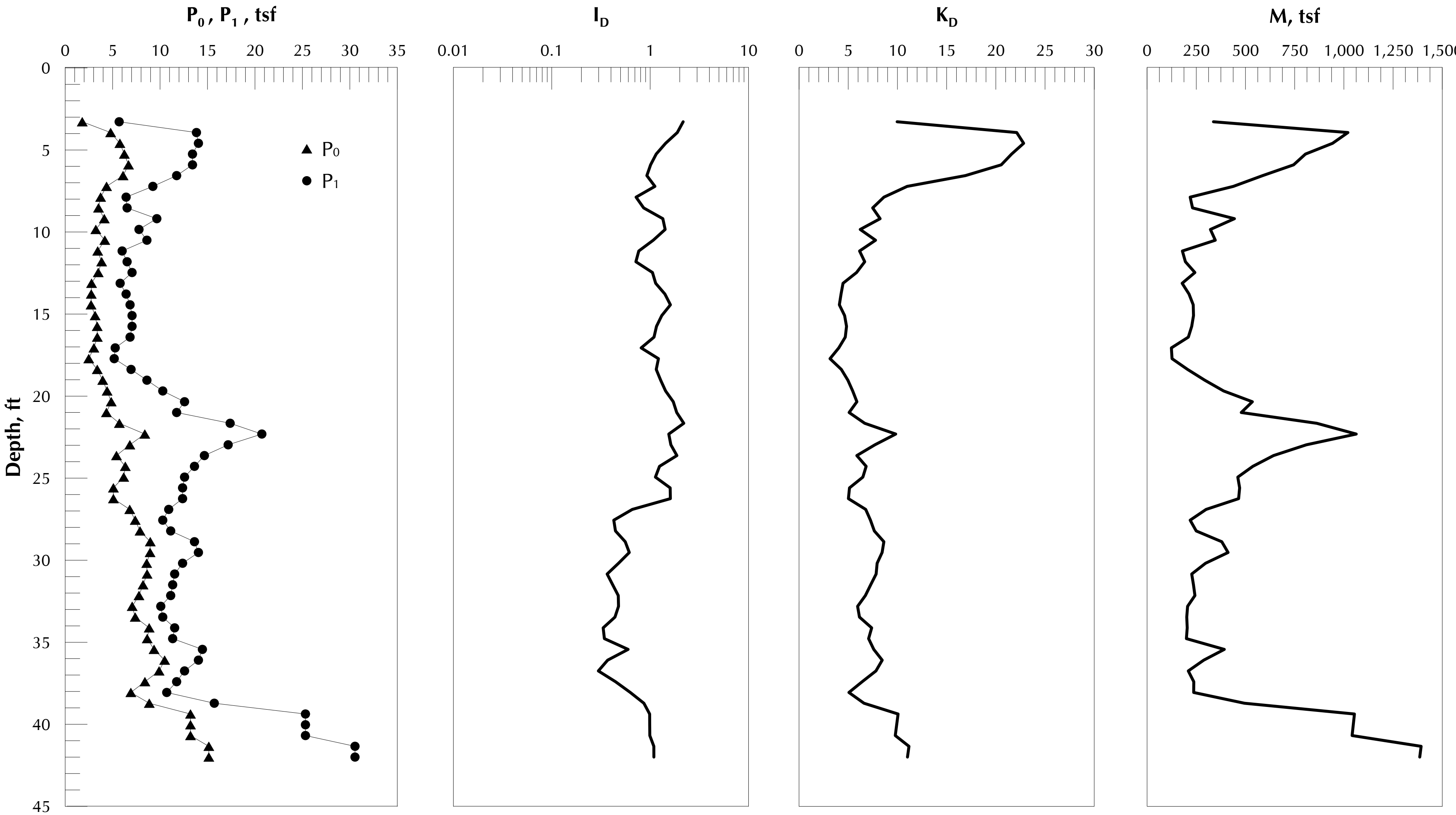
*SBT/SPT CORRELATION: UBC-1983

Observed By: C. Smerdon	**Advanced By:** Oregon Geotechnical Explorations, Inc.
Date Started: 07/17/18	**Ground Surface Elevation:** Not Available
Coordinates: Not Available	

GRI

CONE PENETRATION TEST CPT-2
(SEISMIC VELOCITY PROFILE)

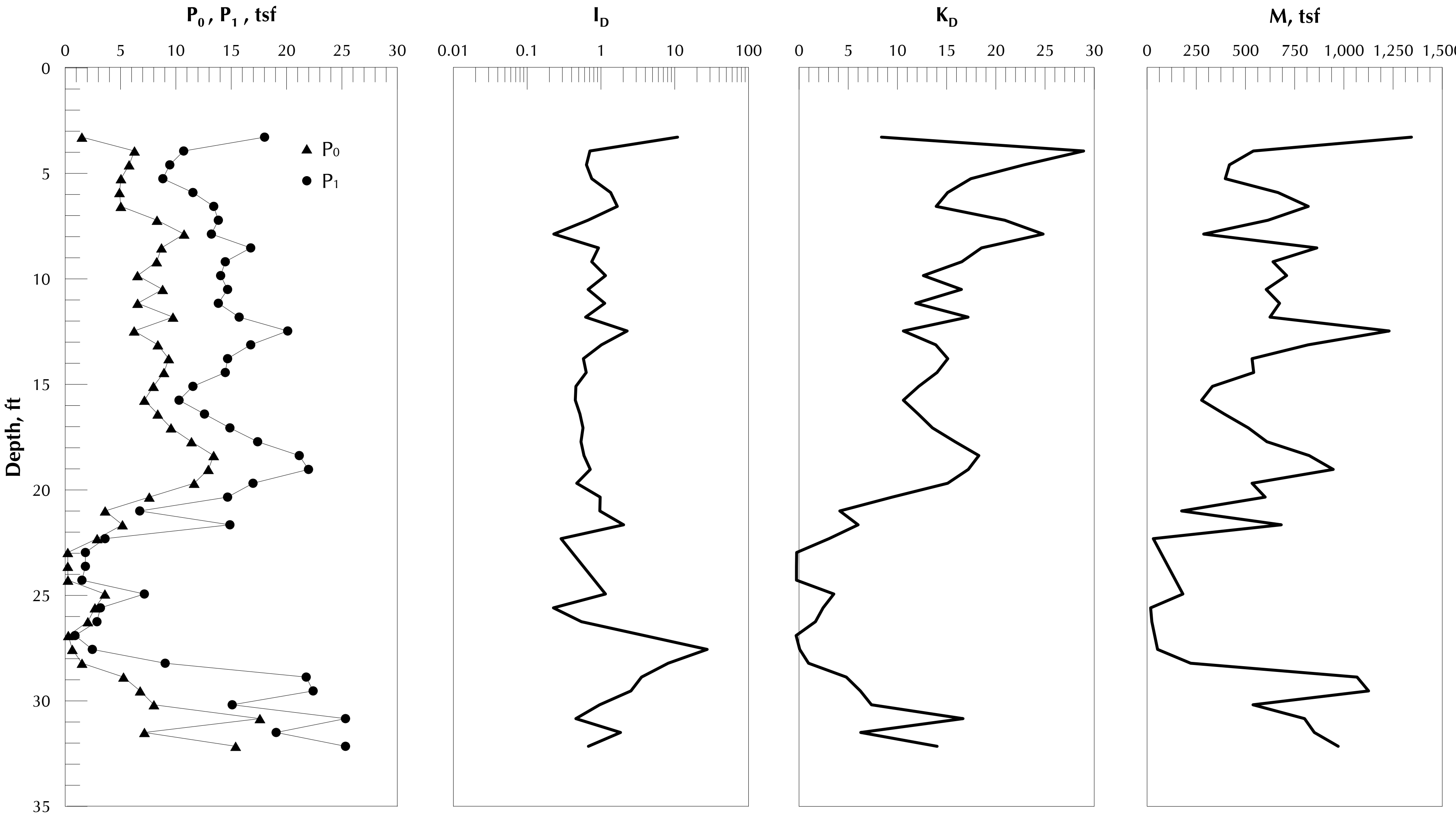
AUG. 2018 JOB NO. 6138



GRI

DILATOMETER SOUNDING
DMT-1

AUG. 2018 JOB NO. 6138



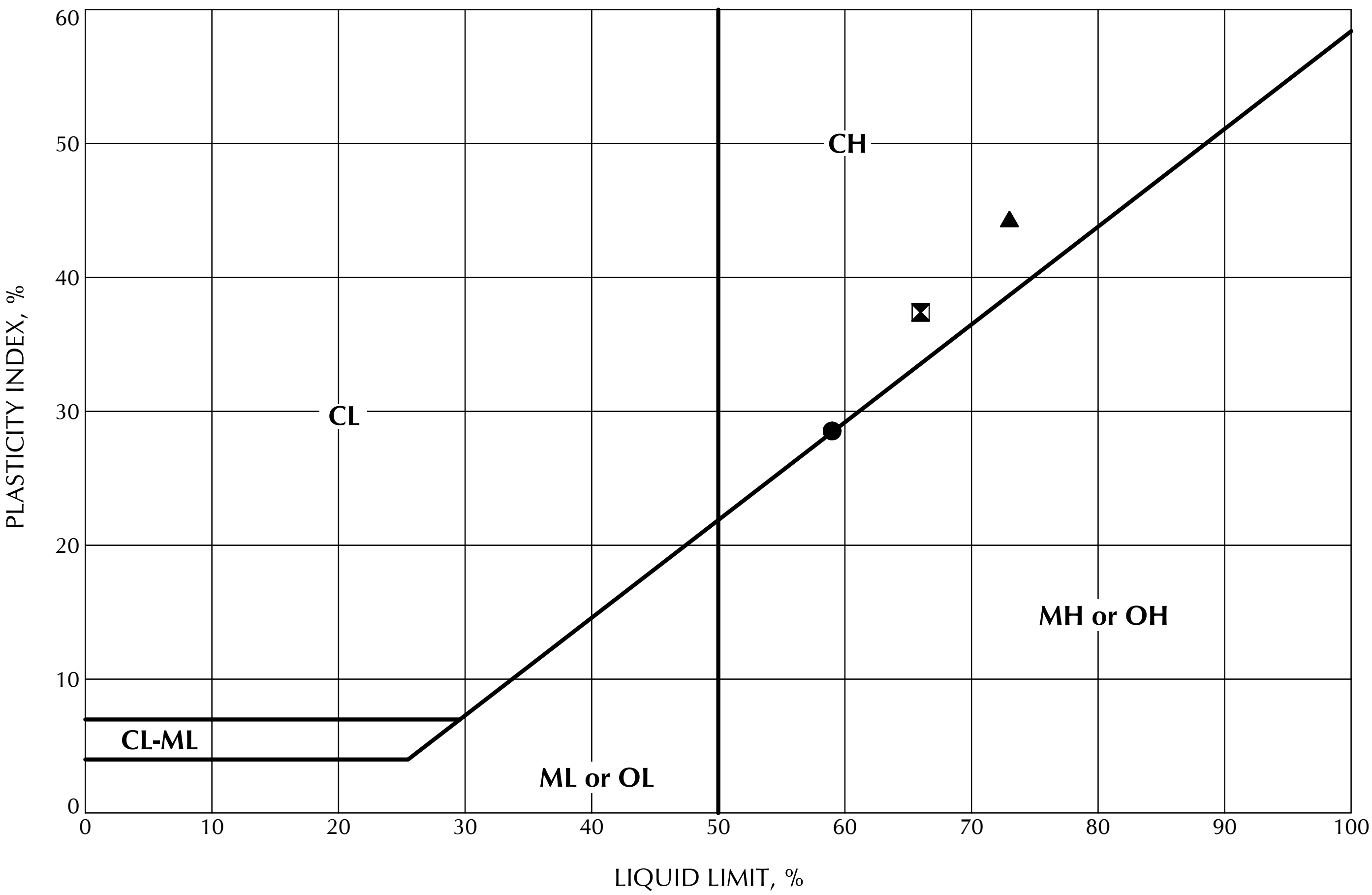
GRI

DILATOMETER SOUNDING
DMT-2

AUG. 2018 JOB NO. 6138 FIG. 12A

GROUP SYMBOL	UNIFIED SOIL CLASSIFICATION FINE-GRAINED SOIL GROUPS
OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
ML	INORGANIC CLAYEY SILTS TO VERY FINE SANDS OF SLIGHT PLASTICITY
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

GROUP SYMBOL	UNIFIED SOIL CLASSIFICATION FINE-GRAINED SOIL GROUPS
OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
MH	INORGANIC SILTS AND CLAYEY SILT
CH	INORGANIC CLAYS OF HIGH PLASTICITY



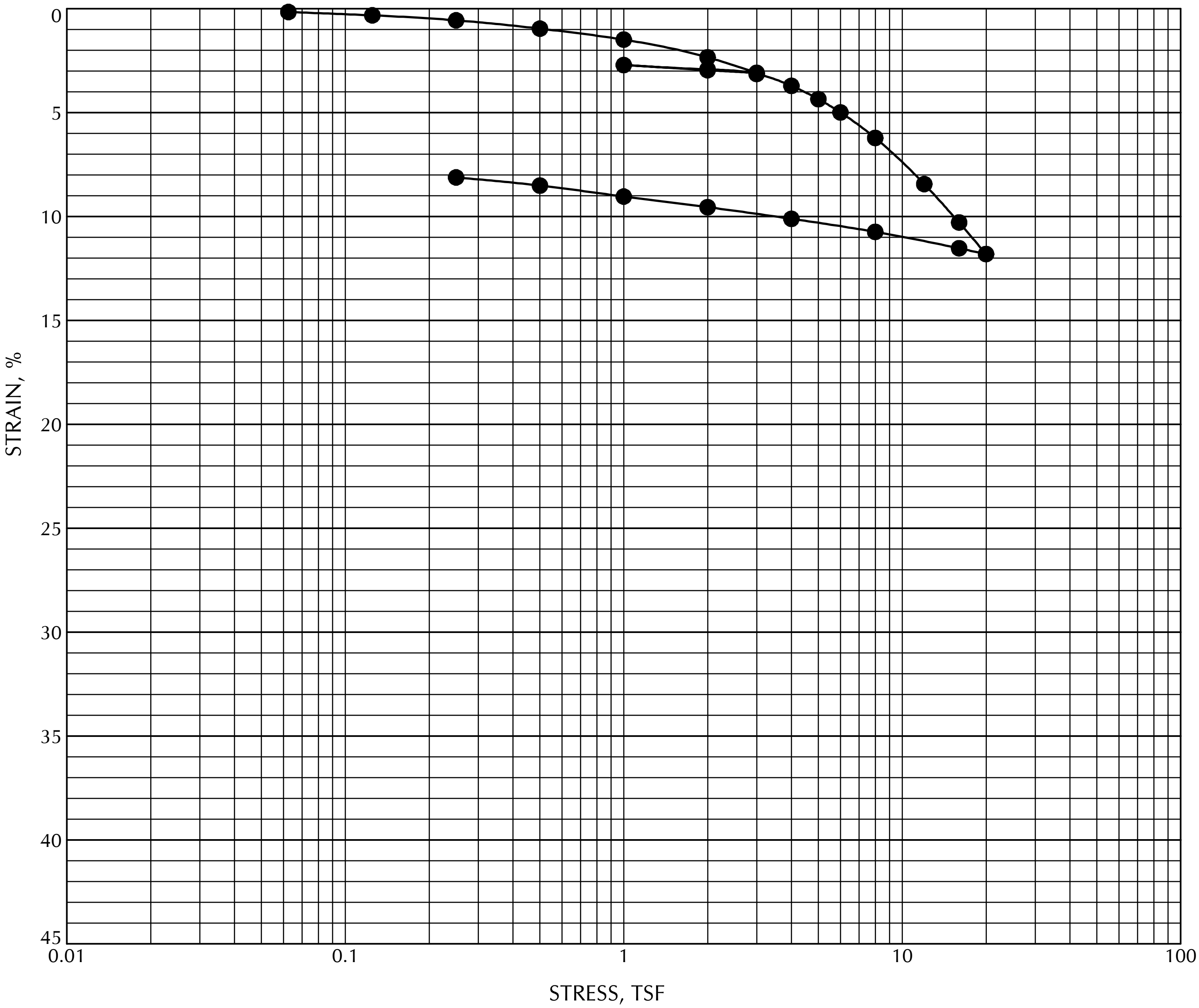
	Location	Sample	Depth, ft	Classification	LL	PL	PI	MC, %
●	B-1	S-7	20.0	Silty CLAY, trace fine-grained sand, gray mottled rust (Missoula Flood Deposits)	59	30	29	56
⧗	B-3	S-5	12.0	Silty CLAY, trace fine- to medium-grained sand, brown mottled rust (Missoula Flood Deposits)	66	29	37	34
▲	B-6	S-12	40.0	Silty CLAY, trace fine-grained sand, gray mottled rust (Missoula Flood Deposits)	73	29	44	64

ATTERBERG-PLASTICITY 3 PER PAGE GRI DATA TEMPLATE.GDT 8/15/18

GRI

PLASTICITY CHART

AUG. 2018 JOB NO. 6138

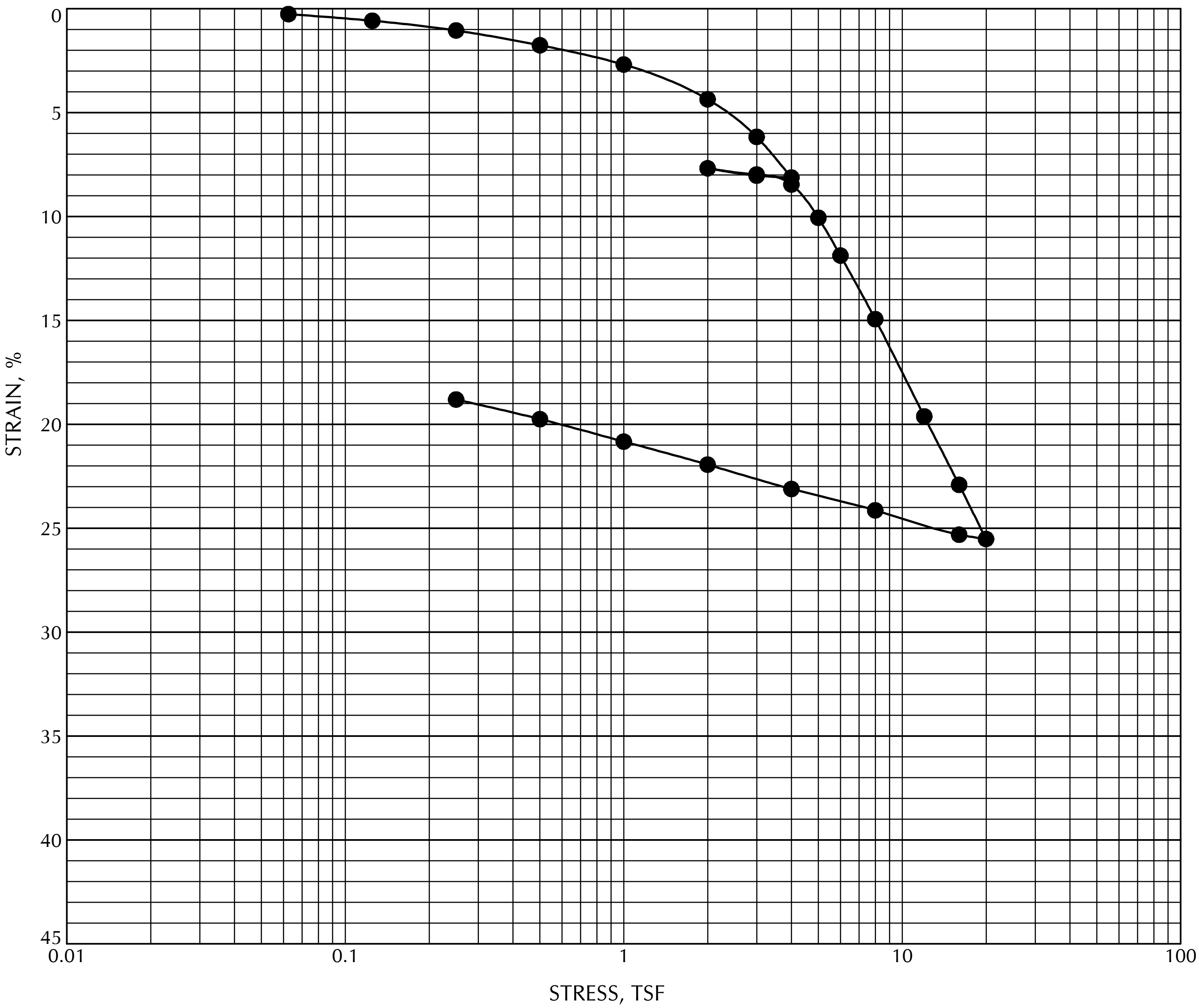


	Location	Sample	Depth, ft	Classification	Initial γ_d, pcf	Initial MC, %
●	B-3	S-4	11.0	SILT, some clay to clayey, trace fine- to medium-grained sand, brown (Missoula Flood Deposits)	96	33

GRI

CONSOLIDATION TEST

AUG. 2018 JOB NO. 6138



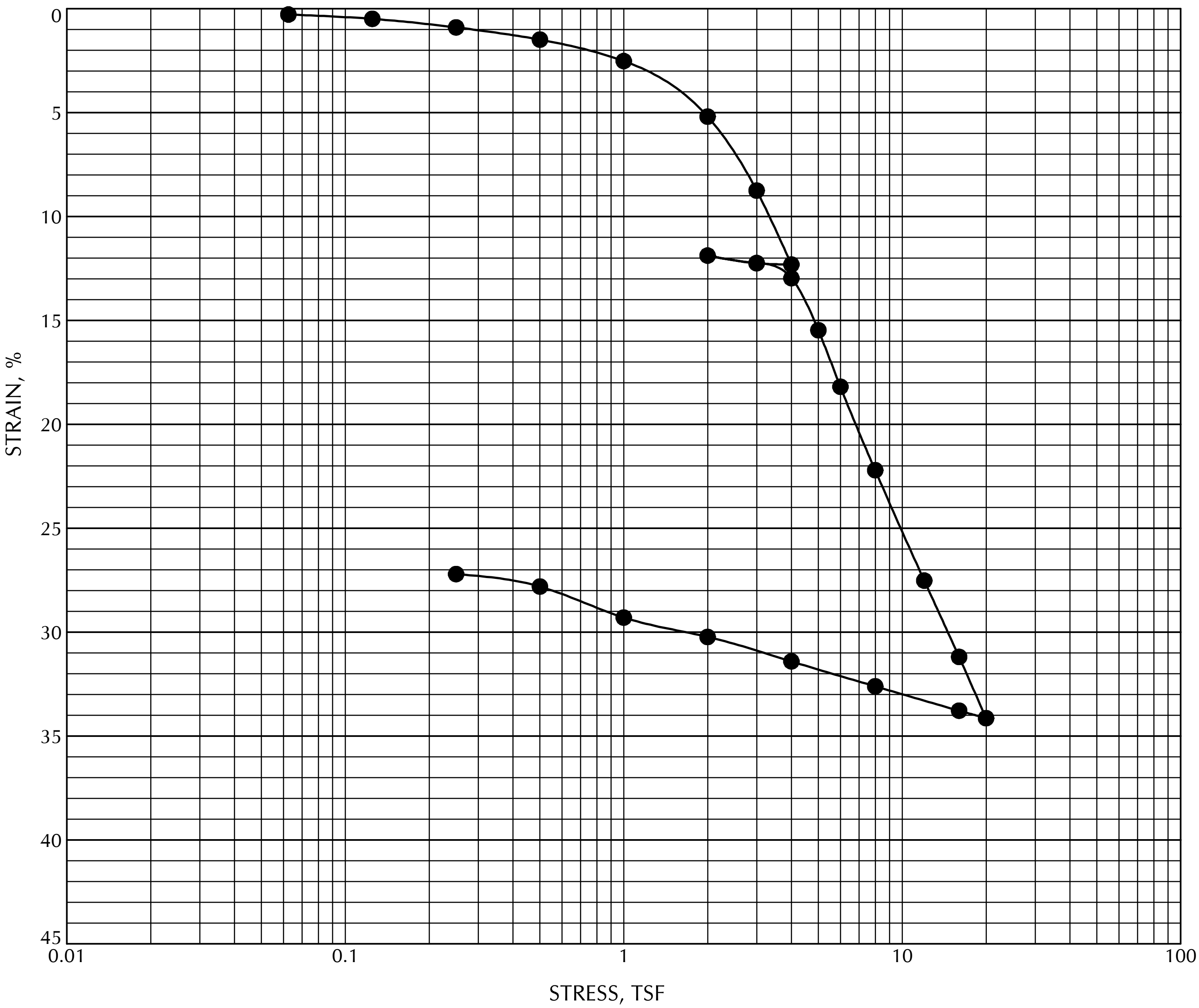
	Location	Sample	Depth, ft	Classification	Initial γ_d, pcf	Initial MC, %
●	B-3	S-7	21.7	Silty CLAY, trace fine-grained sand, gray mottled rust (Missoula Flood Deposits)	72	51

CONSOL STRAIN GRI - 0 TO 45-1PER PAGE GRI DATA TEMPLATE.GDT 8/15/18

GRI

CONSOLIDATION TEST

AUG. 2018 JOB NO. 6138



	Location	Sample	Depth, ft	Classification	Initial γ_d, pcf	Initial MC, %
●	B-5	S-11	36.2	Silty CLAY, trace fine-grained sand, gray mottled rust (Missoula Flood Deposits)	62	67

GRI

CONSOLIDATION TEST

AUG. 2018 JOB NO. 6138

APPENDIX B

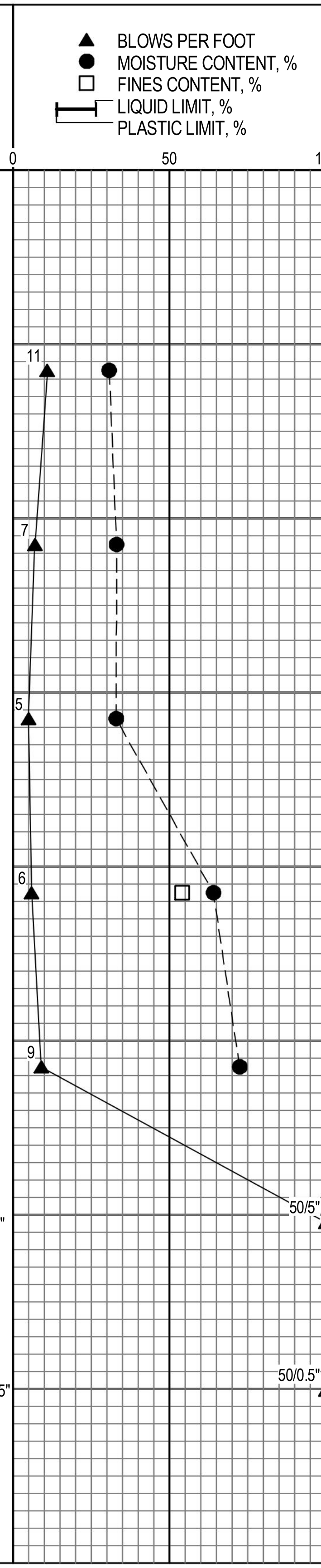
Relevant Borings from Previous Investigations Completed by GRI in the Project Area

GRI BORING LOG (LAT/LONG) - NO ELEV GRI DATA TEMPLATE.GDT 5/4/17

Surface Elevation: Not Available

DEPTH, FT	CLASSIFICATION OF MATERIAL	DEPTH, FT
0–15	SILT, trace clay and fine-grained sand, brown, stiff, contains some organics, 6-in.-thick heavily rooted zone at ground surface (Fill)	
	---trace to some clay, trace subangular gravel, medium stiff below 10 ft	
15–20	SILT, trace to some clay, trace fine-grained sand, brown, medium stiff	15.0
20–28	Sandy SILT, trace clay, brown mottled black, orange, and rust, medium stiff, fine-grained sand (Residual Soil)	20.0
	---stiff below 25 ft	
28–40	BASALT, gray, predominantly decomposed to decomposed, extremely soft to soft (R0 to R2), joints and fractures are stained rust and filled with black secondary mineralization (Boring Lava)	28.0

SAMPLE NO.	BLOW COUNT	BLOWS PER FOOT
S-1	3 5 6	11
S-2	1 3 4	7
S-3	2 3 2	5
S-4	2 2 4	6
S-5	2 5 4	9
S-6	50/5"	50/5"
S-7	50/0.5"	50/0.5"



COMMENTS AND ADDITIONAL TESTS

(CONTINUED NEXT PAGE)

◆ TORVANE SHEAR STRENGTH, TSF
■ UNDRAINED SHEAR STRENGTH, TSF

Logged By: T. Meskele	**Drilled by:** Western States Soil Conservation, Inc.
Date Started: 4/10/17	**Coordinates:** Not Available
Drilling Method: Mud Rotary **Equipment:** CME 850 Track-Mounted Drill Rig **Hole Diameter:** 5 in.	**Hammer Type:** Auto Hammer **Weight:** 140 lb **Drop:** 30 in. **Energy Ratio:** 0.8
Note: See Legend for Explanation of Symbols	

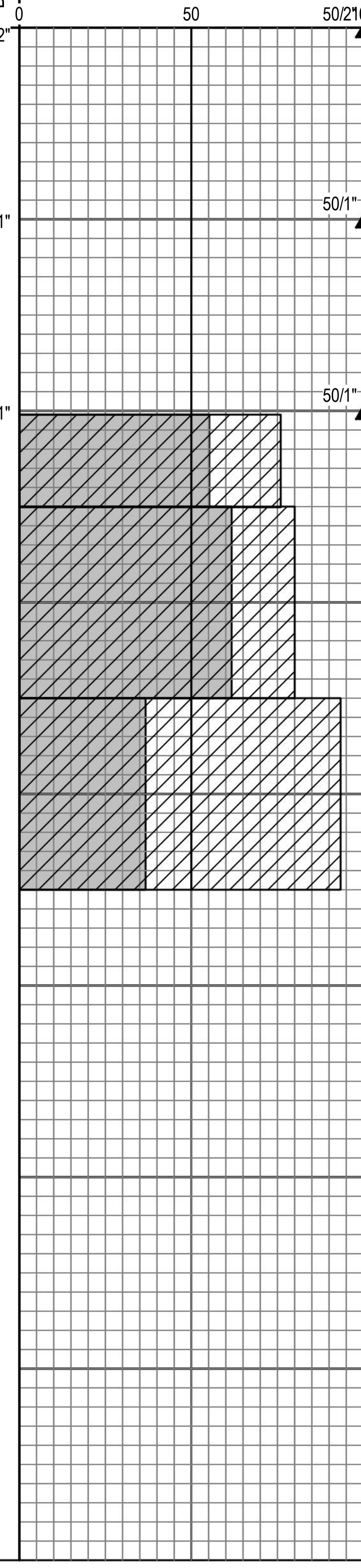
GRI

BORING B-1

MAY 2017 JOB NO. 5974

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL Surface Elevation: Not Available	DEPTH, FT	INSTALLATION	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT
	+++	BASALT, gray, moderately weathered to predominantly decomposed, very soft to medium hard (R1 to R3), joints and fractures are stained rust and filled with black secondary mineralization (Boring Lava)			S-8		50/2"
45	+++				S-9		50/1"
50	+++	---some vesicles, slightly weathered to fresh, medium hard to hard (R3 to R4), close randomly-oriented joints and fractures, joints are healed with clay on surfaces below 50 ft			S-10		50/1"
	+++				R-1		
55	+++				R-2		
	+++	---vesicular below 57 ft					
60	+++				R-3		
		(4/10/2017)	62.5				
65							
70							
75							
80							

▲ BLOWS PER FOOT
● MOISTURE CONTENT, %
□ FINES CONTENT, %
LIQUID LIMIT, %
PLASTIC LIMIT, %



◆ TORVANE SHEAR STRENGTH, TSF
■ UNDRAINED SHEAR STRENGTH, TSF

COMMENTS AND ADDITIONAL TESTS

GRI BORING LOG (LAT/LONG) - NO ELEV GRI DATA TEMPLATE.GDT 5/4/17

GRI

BORING B-1

MAY 2017 JOB NO. 5974

CLAC 62846

CLAC 6

Item #2.

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-0035)

(1) OWNER/PROJECT Hole Number #1

First Name Last Name
Company GRI (Owners Rep)
Address 9725 SW Beaverton-Hillsdale
City Portland State OR Zip 97005

(2) TYPE OF WORK [x] New [ ] Deepening [ ] Abandonment
[ ] Alteration (repair/recondition)

(3) CONSTRUCTION
[ ] Rotary Air [ ] Hand Auger [ ] Hollow stem auger
[x] Rotary Mud [ ] Cable [ ] Push Probe
[ ] Other

(4) TYPE OF HOLE:
( ) Uncased Temporary ( ) Cased Permanent
( ) Uncased Permanent (x) Slope Stablity
( ) Other
Other:

(5) USE OF HOLE

Geo-Tech & ~~Free Nom~~ Inclinomator

(6) BORE HOLE CONSTRUCTION Special Standard [ ] (Attach copy)
Depth of Completed Hole 90 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amt	sacks/ lbs
6	0	90	cement grout	90 ft	0	130 gal	

Backfill placed from ft. to ft. Material
Filter pack from ft. to ft. Material Size

(7) CASING/SCREEN

Casing	Screen	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
( )	( )		[ ]				( )	( )	[ ]	[ ]
(x)	( )	2.75	[ ]	90 ft	0	Sch 80	( )	(x)	[ ]	[x]
( )	( )		[ ]				( )	( )	[ ]	[ ]
(x)	( )	8"	[-]	1 ft	0 ft		(x)	( )	[ ]	[ ]
( )	( )		[ ]	Vault			( )	( )	[ ]	[ ]

(8) WELL TESTS
( ) Pump ( ) Bailer ( ) Air ( ) Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration(hr)

Temperature °F Lab analysis [ ] Yes By
Supervising Geologist/Engineer
Water quality concerns? [ ] Yes (describe below)

From	To	Description	Amount	Units

(9) LOCATION OF HOLE (legal description)
County Clackamas Twp 2S N/S Range 2E E/W WM
Sec 32 SW 1/4 of the NE 1/4 Tax Lot ROW
Tax Map Number Lot
Lat ° 0 ' " or 45.33741 DMS or DD
Long ° 0 ' " or -122.58442 DMS or DD
( ) Street address of hole (x) Nearest address
Trillium Park Drive + Davis Rd., Oregon City

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening				
Completed Well	9/21/06		-	18 ft

Flowing Artesian? [ ]
WATER BEARING ZONES Depth water was first found

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
9/21/06	38 ft	45 ft	N/A	N/A	-	18 ft

(11) SUBSURFACE LOG Ground Elevation

Material	From	To
asphalt & Rock base	0	1
Brown Clay Silty	1	6
Tan Silty Clay soft	6	38 ft
Rock broken weathered	38 ft	45 ft
basalt blk fracture Hrd	45 ft	63 ft
Blue Gray Clay Sticky	63	80 ft
Gray Stiff Clay	80 ft	90 ft

Date Started 9/20/06 Completed 9/21/06

(12) ABANDONMENT LOG:

Material	From	To	Amt	sacks/ lbs

RECEIVED
OCT 04 2006
WATER RESOURCES DEPT
SALEM, OREGON

WATER RESOURCES DEPT
SALEM OREGON

Date Started Completed

Professional Certification (to be signed by an Oregon licensed water or monitoring well constructor, or Oregon registered geologist or civil engineer).

I accept responsibility for the construction, deepening, alteration, or abandonment work performed during the construction dates reported above. All work performed during this time is in compliance with Oregon geotechnical hole construction standards. This report is true to the best of my knowledge and belief.

License/Registration Number 1772 Date 9/21/06
First Name William Last Name Wright
Affiliation Western States Soil Conservation, Inc.

ORIGINAL - WATER RESOURCES DEPARTMENT
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

Form Versio

APPENDIX C

Site-Specific Seismic Hazard Evaluation

APPENDIX C

SITE-SPECIFIC SEISMIC HAZARD EVALUATION

GENERAL

GRI completed a site-specific seismic hazard evaluation for the proposed expansion of the Providence Willamette Falls Hospital campus in Oregon City, Oregon. The purpose of this evaluation was to evaluate the potential seismic hazards associated with regional and local seismicity. We understand the hospital expansion is being designed in accordance with the new 2016 American Society of Civil Engineers (ASCE) 7-16 document, titled Minimum Design Loads and Associated Criteria for Buildings and Other Structures, which will be a reference standard in the 2018 International Building Code (2018 IBC). Like its predecessor, ASCE 7-10, ASCE 7-16 requires evaluation of seismic hazards based on the probabilistic Risk-Targeted Maximum Considered Earthquake (MCE_R), which is defined in Chapter 21 of ASCE 7-16 as the response spectrum expected to achieve a 1% probability of building collapse within a 50-year period.

Our site-specific seismic hazard evaluation was based on the potential for regional and local seismic activity, as described in the existing scientific literature, and the subsurface conditions at the site, as disclosed by the geotechnical explorations completed for the project. Specifically, our work included the following tasks:

1) A detailed review of available literature, including published papers, maps, open-file reports, seismic histories and catalogs, and other sources of information regarding the tectonic setting, regional and local geology, and historical seismic activity that might have a significant effect on the site.
2) Compilation, examination, and evaluation of existing subsurface data gathered at the site, including classification and laboratory analyses of soil samples and review of shear-wave velocity measurements. This information was used to prepare a generalized subsurface profile for the site.
3) Identification of potential seismic sources appropriate for the site and characterization of those sources in terms of magnitude, distance, and acceleration response spectra.
4) Office studies based on the generalized subsurface profile and controlling seismic sources resulting in conclusions and recommendations concerning:
    a. specific seismic events and characteristic earthquakes that might have a significant effect on the project site;
    b. the potential for seismic energy amplification and liquefaction or soil-strength loss at the site; and
    c. site-specific acceleration response spectra for design of structures at the site.

This appendix describes the work accomplished and summarizes our conclusions and recommendations.

GEOLOGIC SETTING

General

On a regional scale, the site lies at the northern end of the Willamette Valley, a broad, gently deformed, north-south-trending topographic feature separating the Coast Range to the west from the Cascade Mountains to the east. The site is located approximately 110 km inland from the rupture zone of the Cascadia Subduction Zone (CSZ), an active convergent plate boundary along which remnants of the Farallon Plate (the Gorda, Juan de Fuca, and Explorer plates) are being subducted beneath the western edge of the North American continent. The subduction zone is a broad, eastward-dipping zone of contact between the upper portion of the subducting slabs and the overriding North American Plate, as shown on Figure 1C.

On a local scale, the site lies in the southeastern portion of the Portland Basin, a large, well-defined, northwest-trending structure bounded by high-angle, northwest-trending, right-lateral, strike-slip faults generally considered to be seismogenic. The local geology in close proximity to the site is shown on the Local Geologic Map, Figure 2C. The distribution of nearby Quaternary faults is shown on the Local Fault Map, Figure 3C. Information regarding the continuity and potential activity of these faults is lacking due largely to the scale at which geologic mapping in the area has been conducted and the presence of thick, relatively young, basin-filling sediments that obscure underlying structural features. Other faults may be present within the basin, but clear stratigraphic and/or geophysical evidence regarding their location and extent is not presently available. Additional discussion regarding crustal faults is provided in the Local Crustal Event section below.

Because of the proximity of the site to the CSZ and its location in the Portland Basin, three seismic sources contribute to the potential for damaging earthquake motions at the site. Two of these sources are associated with tectonic activity related to the CSZ; the third is associated with movement on relatively shallow crustal faults.

Subsurface and Geologic Conditions

Published geologic mapping indicates the project area is mantled with Missoula flood deposits, locally referred to as the Willamette Silt Formation. In general, Willamette Silt consists of silt and fine sand deposited by late Pleistocene glacial-outburst floods (Gannet and Caldwell, 1998). The Willamette Silt is underlain by residual soils produced from the weathering of the underlying Boring Lava Basalt. These residual soils typically consist of very stiff to hard clay and silt soils with scattered boulders. With increased depth, the residual soil becomes more granular and progressively transitions to weathered basalt. The Boring Lava consists of Pliocene/Pleistocene-age basalts that are light gray and vary in thickness. They occur as blocky intracanyon flows, volcanic cones, and shield volcanoes, which are composed of thick basalt flows (Schlicker and Finlayson, 1979).

SEISMICITY

General

The available information indicates the potential seismic sources that may affect the site can be grouped into three independent categories: *subduction-zone events* related to sudden slip between the upper surface of the Juan de Fuca Plate and the lower surface of the North American Plate, *subcrustal events* related to deformation and volume changes within the subducted mass of the Juan de Fuca Plate, and *local* *crustal events* associated with movement on shallow, local faults within and adjacent to the Portland Basin. Each of these sources is considered capable of producing damaging earthquakes in the Pacific Northwest. However, there are no historical records of significant (i.e., moment magnitude (M_W) >6.0) subcrustal or intraslab earthquakes. Based on review of historical records and evaluation of U.S. Geological Survey (USGS) national seismic hazard maps, the two primary types of seismic sources at the site are the megathrust CSZ and local crustal faults.

Cascadia Subduction Zone (CSZ)

Written Japanese tsunami records suggest a great CSZ earthquake occurred in January 1700 (Atwater et al., 2015). Geological studies suggest great megathrust earthquakes have occurred repeatedly in the past 7,000 years (Atwater et al., 1995; Clague, 1997; Goldfinger et al., 2003; and Kelsey et al., 2005), and geodetic studies (Hyndman and Wang, 1995; and Savage et al., 2000) indicate rate of strain accumulation consistent with the assumption that the CSZ is locked beneath offshore northern California, Oregon, Washington, and southern British Columbia (Fluck et al., 1997; and Wang et al., 2001). Numerous geological and geophysical studies suggest the CSZ may be segmented (Hughes and Carr, 1980; Weaver and Michaelson, 1985; Guffanti and Weaver, 1988; Goldfinger, 1994; Kelsey and Bockheim, 1994; Mitchell et al., 1994; Personius, 1995; Nelson and Personius, 1996; and Witter, 1999), but the most recent studies suggest that for the last great earthquake in 1700, most of the subduction zone ruptured in a single M_W 9 earthquake (Satake et al., 1996; Atwater and Hemphill-Haley, 1997; and Clague et al., 2000). Published estimates of the probable maximum size of subduction-zone events range from M_W 8.3 to >M_W 9. Numerous detailed studies of coastal subsidence, tsunamis, and turbidites yield a wide range of recurrence intervals, but the most complete records (>4,000 years) indicate intervals of about 350 to 600 years between great earthquakes on the CSZ (Adams, 1990; Atwater and Hemphill-Haley, 1997; Witter, 1999; Clague et al., 2000; Kelsey et al., 2002; Kelsey et al., 2005; and Witter et al., 2003). Tsunami inundation in buried marshes along the Washington and Oregon coast and stratigraphic evidence from the Cascadia margin support these recurrence intervals (Kelsey et al., 2005; and Goldfinger et al., 2003). Goldfinger et al. (2003, 2012, 2016) evaluated turbidite evidence for 20 earthquakes that ruptured the entire CSZ over the past 10,000 years and about 20 M_W 8 earthquakes that only ruptured along the southern portion of the CSZ, and developed a model for recurrence of the CSZ M_W 8 to M_W 9 earthquakes.

The USGS probabilistic analysis assumes four potential locations (three alternative down-dip edge options and one up-dip edge option) for the eastern edge of the earthquake rupture zone for the CSZ, as shown on Figure 4C. As discussed in Petersen et al. (2014), the 2014 USGS mapping effort represents the 2014 CSZ source model with the full CSZ ruptures with moment magnitudes from M_W 8.6 to M_W 9.3, supplemented by partial ruptures with smaller magnitudes from M_W 8.0 to M_W 9.1. The partial ruptures were accounted for using a segmented model and unsegmented model. The magnitude-frequency distribution showing the contributions to the earthquake rates from each of the models and how the rates vary along the fault is presented on Figure 5C. In general, the earthquake rates along the CSZ are dominated by the full characteristic CSZ ruptures, with one event in 526 years (M_W 8.6 to M_W 9.3 earthquakes likely occur more often than the smaller segmented ruptures). Therefore, in our opinion, the CSZ event should be represented by an earthquake of M_W 9.0 at a focal depth of 30 km and a rupture distance of about 88 km.

Local Crustal Event

Sudden crustal movements along relatively shallow, local faults in the project area, although rare, have been responsible for local crustal earthquakes. The locations of and general information regarding quaternary faults (i.e., those that have experienced movement during the last 2.6 million years and are considered to be potentially active) are available through the USGS Earthquake Hazards Program. The precise relationship between specific earthquakes and individual faults is not well understood, since few of the faults in the area are expressed at the ground surface and the foci of the observed earthquakes have not been located with precision. The history of local seismic activity is commonly used as a basis for determining the size and frequency to be expected of local crustal events. Although the historical record of local earthquakes is relatively short (the earliest reported seismic event in the area occurred in 1920), it can serve as a guide for estimating the potential for seismic activity in the area.

Based on fault mapping conducted by the USGS (USGS, 2014), there are about three faults within 25 km of the project site that potentially contribute to the seismicity: the Bolton Fault at about 1.2 km from the site, Portland Hills Fault at about 3.6 km from the site, and Grant Butte Fault at about 13.8 km from the site. Based on our review of the faults, the Portland Hills Fault appears to be the controlling contributing crustal source to the local hazard. The Portland Hills Fault is considered to be a reverse-oblique fault that dips to the southwest beneath the eastern base of the Portland Hills with a total fault length of approximately 40 to 60 km and a characteristic earthquake magnitude of M_W 7.0. Based on our review of the USGS Quaternary Fault and Fold Database of the United States, it is our opinion the Portland Hills event should be represented by a source-to-site distance of approximately 3.6 km and a corresponding characteristic earthquake magnitude of M_W 7.

CODE BACKGROUND AND DESIGN RESPONSE SPECTRUM

General

The ASCE 7-16 seismic-hazard levels are based on a Risk-Targeted Maximum Considered Earthquake (MCE_R), with the intent of including the probability of structural collapse. Based on generalized building fragility curves, seismic design of a structure using the probabilistic MCE_R represents a targeted risk level of 1% in 50 years probability of collapse in the direction of maximum horizontal response. In general, these risk-targeted ground motions are developed by applying adjustment factors of directivity and risk coefficients to the 2% probability of exceedance in 50 years (2,475-year return period hazard level) ground motions developed from the recently updated 2014 U.S. Geological Survey (USGS) probabilistic seismic hazard maps. The risk-targeted probabilistic values are also subject to a deterministic check, which is computed from the models of earthquake sources and ground-motion propagation that form the basis of the 2014 USGS National Seismic Hazard Maps (NSHMs). ASCE 7-16 defines the site-specific deterministic MCE_R ground motions in terms of 84th-percentile, 5%-damped response spectral acceleration in the direction of maximum horizontal response. The MCE_R ground motions are taken as the lesser of the probabilistic and deterministic spectral accelerations.

Site Response

The ASCE 7-16 design methodology uses two spectral response acceleration parameters, S_S and S_1, corresponding to periods of about 0.2 and 1.0 second to develop the MCE_R response spectrum for Site Class B/C, or bedrock conditions. The S_S and S_1 parameters for the site located at the approximate latitude and longitude coordinates of 45.3561° N and 122.5871° W are 0.83 and 0.37 g, respectively. To establish the ground-surface MCE_R spectrum, these bedrock spectral parameters are adjusted for underlying soil conditions at the site using the short- and long-period site amplification coefficients, F_a and F_v. Based on the results of the explorations completed for this project, the soil profile at the site is representative of

Site Class D conditions. Site coefficients F_a and F_v of 1.17 and 1.93, respectively, were used to develop the Site Class D ground-surface MCE_R response spectra. However, Section 11.4.8 of ASCE 7-16 requires a ground motion hazard analysis be completed for structures on Site Class D sites to determine the F_v coefficient when the S_1 parameter is greater than or equal to 0.2 second. The code provides an exception that waives the ground motion hazard analysis if the seismic response coefficient, C_s, is determined in accordance with Equation 12.8-2 if the structure has a fundamental period of vibration less than about 0.9 second for this site. We anticipate the structures will have fundamental periods less than 0.9 second; therefore, the code-based, Site Class D, ground-surface MCE_R response spectrum is appropriate for design of the structures if C_s is determined in accordance with Equation 12.8-2. The design response spectrum in accordance with ASCE 7-16 is developed by taking two-thirds of the MCE_R response spectrum.

The MCE_R and design response spectral values are tabulated below.

RECOMMENDED MCE_R AND DESIGN RESPONSE SPECTRA, 5% DAMPING

Period, sec	MCE_R-Level Response Spectral Values, g	Design-Level Response Spectral Values, g
0.01	0.39	0.26
0.15	0.97	0.65
0.74	0.97	0.65
1.00	0.71	0.47
2.00	0.36	0.24
3.00	0.24	0.16
4.00	0.18	0.12

CONCLUSIONS

The ASCE 7-16 design methodology uses two mapped spectral acceleration parameters, S_S and S_1, corresponding to periods of 0.2 and 1.0 sec to develop the MCE_R earthquake. The S_S and S_1 parameters for the site located at the approximate latitude and longitude coordinates of 45.3561°N and 122.5871°W are 0.83 and 0.37 g, respectively. We recommend use of the Site Class D design spectrum for design of the proposed structure(s).

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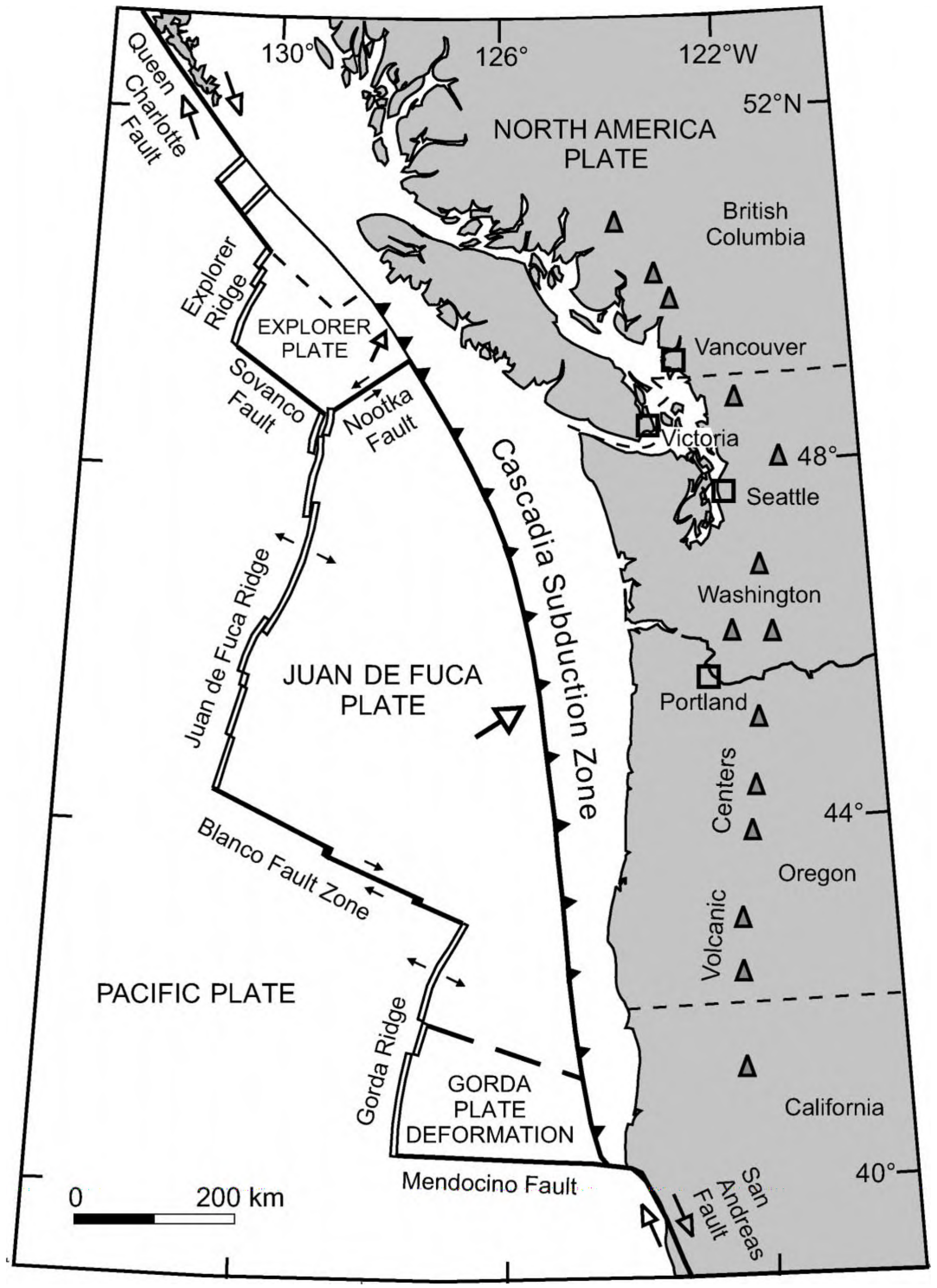
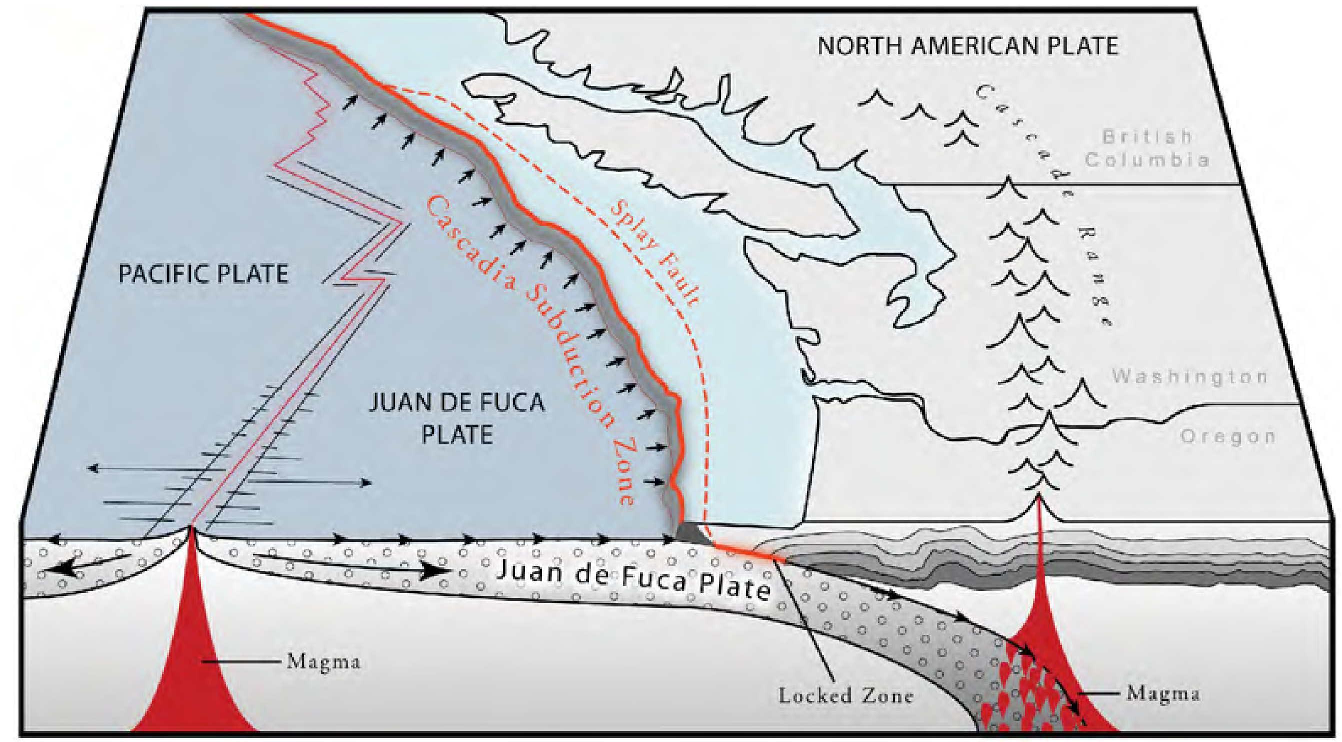


A) TECTONIC MAP OF PACIFIC NORTHWEST, SHOWING ORIENTATION AND EXTENT OF CASCADIA SUBDUCTION ZONE (MODIFIED FROM DRAGERT AND OTHERS, 1994)

Cascadia Subduction Zone Setting



CASCADIA SUBDUCTION ZONE SETTING, TSUNAMI INUNDATION MAPS, OREGON DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRY, 2013

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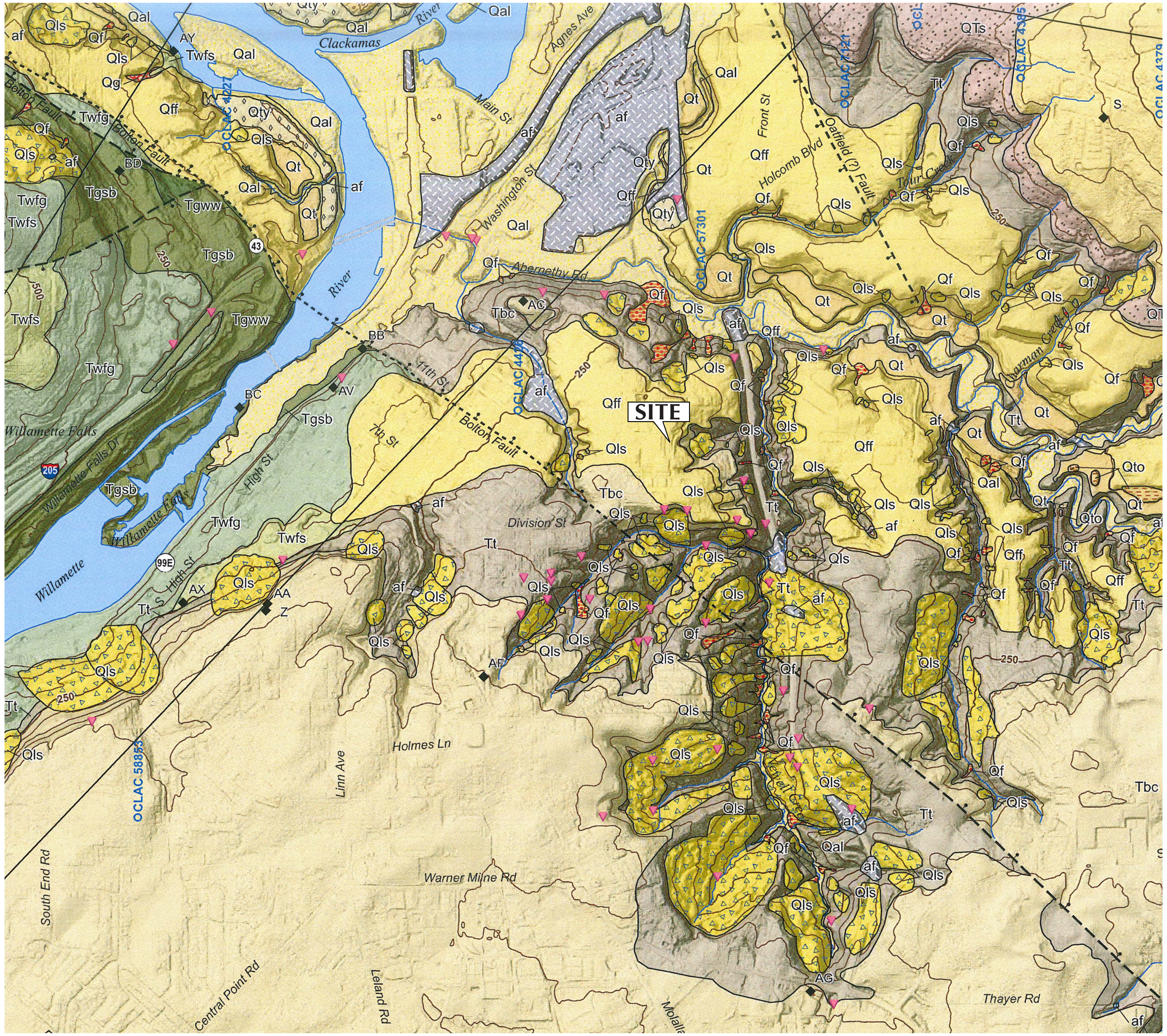
TECTONIC SETTING SUMMARY



MAP SYMBOLS

- Contact, approximately located
- Normal fault, approximate location
- Normal fault, concealed location
- Normal fault, inferred location
- A—A' Cross section line
- Water body
- Geochemical sample site, labeled with map code
- Location of water well used to construct cross section, labeled with Oregon Water Resources Department log identification number
- Location of minor debris flow from 1996-1997 storms (Hofmeister, 2000)
- Volcanic vent

EXPLANATION OF MAP UNITS

af	**Artificial fill** — Man-made deposits of mixed clay, silt, sand, gravel, and debris and rubble.

Quaternary Surficial Deposits

Qal	**Alluvial deposits (Quaternary)** — Gravel, sand, silt, and clay deposited in the active channels and floodplains of rivers and streams.
Qty	**Terrace deposits, younger (Quaternary)** — Lowest silt and sand (?) deposits capping strath terraces inset into Missoula Flood deposits along Abernethy Creek and the Willamette River near its confluence with the Clackamas River.
Qt	**Terrace deposits (Quaternary)** — Intermediate-elevation silt and sand (?) deposits capping strath terraces inset into Missoula Flood deposits along Abernethy Creek and the Willamette River near its confluence with the Clackamas River.
Qto	**Terrace deposits, older (Quaternary)** — Highest silt and sand (?) deposits capping strath terraces inset into Missoula Flood deposits along Abernethy Creek and the Willamette River near its confluence with the Clackamas River.
Qf	**Fan and flow deposits (Quaternary)** — Mixed sand, silt, clay, gravel, and soil deposited by earthflows or debris flows.
Qff	**Missoula (Bretz) flood deposits (Quaternary)** — Silt, sand, and minor gravel deposited by floods caused by the repeated failure of the glacial ice dam that impounded glacial Lake Missoula.
Qls	**Landslides (Quaternary)** — Chaotically mixed and deformed masses of rock, colluvium, and soil that have moved downslope in one or more events.

Pliocene-Pleistocene Boring volcanic field rocks

Qbo	**Basaltic andesite of Outlook (Pleistocene)** — Flow or flows of fine-grained grey diktytaxitic olivine basaltic andesite.
Qvo	**Outlook tephra (Pleistocene)** — Ash, scoria, bombs and breccia of basaltic andesite of Outlook composition deposited on and around vents.
Qbh	**Basaltic andesite of Hunsinger (Pleistocene)** — Flow or flows of grey fine-grained, diktytaxitic olivine basaltic andesite.
Tbc	**Basalt of Canemah (Pliocene)** — Flow or flows of grey medium-grained, diktytaxitic olivine basalt.
Tvc	**Canemah tephra (Pliocene)** — Ash to bomb size tephra with minor basalt flows inferred from water well logs.
Tbr	**Basaltic andesite of Root Creek (Pliocene)** — Flow or flows of fine-grained grey basaltic andesite.
Tvr	**Root Creek tephra (Pliocene)** — Ash, scoria, bombs and breccia of basaltic andesite of Root Creek composition.
Tbf	**Basaltic andesite of Fallsview (Pliocene)** — Flow or flows of grey to black, fine- to medium-grained, diktytaxitic olivine basaltic andesite.
Tvf	**Fallsview tephra (Pliocene)** — Ash, scoria, bombs, and breccia interbedded with the basaltic andesite of Fallsview.
Tbb	**Basaltic andesite of Beaver Creek (Pliocene)** — Flow or flows of grey fine-grained, weakly diktytaxitic olivine basaltic andesite.

Miocene-Pleistocene fluvial sedimentary rocks

Qg	**Conglomerate (Pleistocene?)** — Pebble to cobble conglomerate exposed in the walls of a small stream canyon in the extreme northwest corner of the map area.
QTs	**Springwater Formation conglomerate and sandstone (Pliocene-Pleistocene)** — Sandstone and conglomerate deposited by the ancestral Clackamas River.
Tt	**Troutdale Formation sandstone, siltstone and mudstone (Miocene-Pliocene)** — Mudstone, claystone, sandstone, and minor conglomerate and tuff.

Miocene Columbia River Basalt Group lavas

Twfs	**Wanapum Basalt, Frenchman Springs Member, basalt of Sand Hollow (Miocene)** — Black medium-grained basalt flows with sparse plagioclase phenocrysts, well developed columnar jointing.
Twfg	**Wanapum Basalt, Frenchman Springs Member, basalt of Gingko (Miocene)** — Black medium-grained basalt flows with abundant plagioclase phenocrysts, well developed columnar jointing.
Tgsb	**Grande Ronde Basalt, Sentinel Bluffs Member (Miocene)** — Sentinel Bluffs Member (middle Miocene) — black fine-grained basalt flows with sparse plagioclase phenocrysts, well developed columnar jointing.
Tgww	**Grande Ronde Formation, basalt of Winter Water (Miocene)** — Flow or flows of fine-grained basalt.
Tcu	**Columbia River Basalt, undifferentiated (Miocene)** (shown only in cross section)

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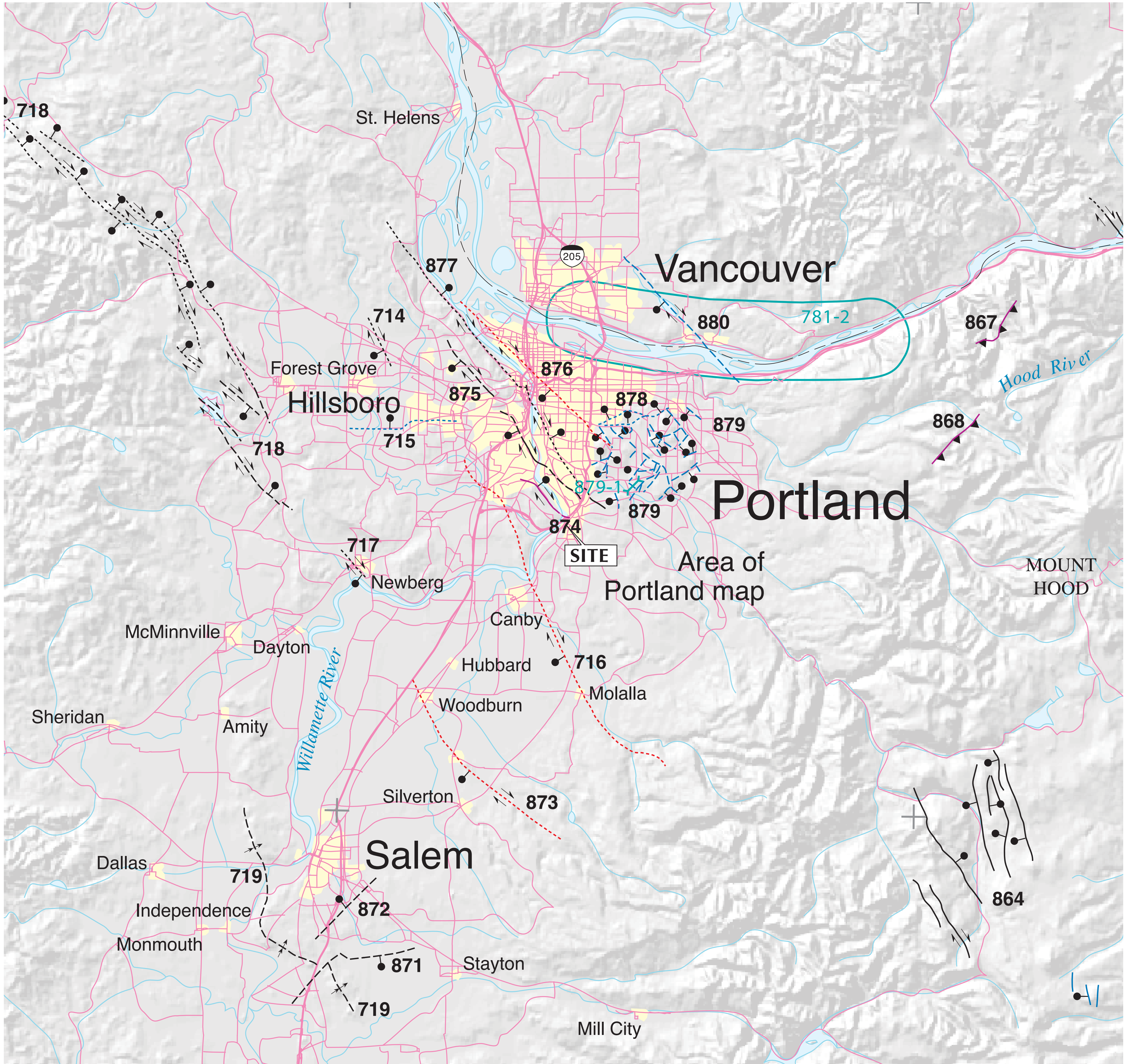
LOCAL GEOLOGIC MAP

AUG. 2018 JOB NO. 6138



MAP EXPLANATION

TIME OF MOST RECENT SURFACE RUPTURE

- Holocene (<10,000 years) or post last glaciation (<15,000 years; 15 ka); no historic ruptures in Oregon to date
- Late Quaternary (<130,000; post penultimate glaciation)
- Late and middle Quaternary (<750,000 years; 750 ka)
- Quaternary, undifferentiated (<1,600,000 years; <1.6 Ma)
- Class B structure (age or origin uncertain)

SLIP RATE

- >5 mm/year
- 1.0-5.0 mm/year
- 0.2-1.0 mm/year
- <0.2 mm/year

TRACE

- Mostly continuous at map scale
- Mostly discontinuous at map scale
- Inferred or concealed

STRUCTURE TYPE AND RELATED FEATURES

- Normal or high-angle reverse fault
- Strike-slip fault
- Thrust fault
- Anticlinal fold
- Synclinal fold
- Monoclinal fold
- Plunge direction of fold
- Fault section marker

DETAILED STUDY SITES

- 731-2 Trench site
- 781-2 Subduction zone study site

CULTURAL AND GEOGRAPHIC FEATURES

- Divided highway
- Primary or secondary road
- Permanent river or stream
- Intermittent river or stream
- Permanent or intermittent lake

FAULT NUMBER	NAME OF STRUCTURE
714	HELVETIA FAULT
715	BEAVERTON FAULT
716	CANBY-MOLALLA FAULT
717	NEWBERG FAULT
718	GALES CREEK FAULT ZONE
719	SALEM-EOLA HILLS HOMOCLINE
867	EAGLE CREEK THRUST FAULT
868	BULL RUN THRUST FAULT
871	MILL CREEK FAULT
872	WALDO HILLS FAULT
873	MOUNT ANGEL FAULT
874	BOLTON FAULT
875	OATFIELD FAULT
876	EAST BANK FAULT
877	PORTLAND HILLS FAULT
878	GRANT BUTTE FAULT
879	DAMASCUS-TICKLE CREEK FAULT ZONE
880	LACAMAS LAKE FAULT

FROM: PERSONIUS, S.F., AND OTHERS, 2003, MAP OF QUATERNARY FAULTS AND FOLDS IN OREGON, USGS OPEN FILE REPORT OFR-03-095.

North

0 20 40 MILES

0 20 40 KILOMETERS

GRI

LOCAL FAULT MAP

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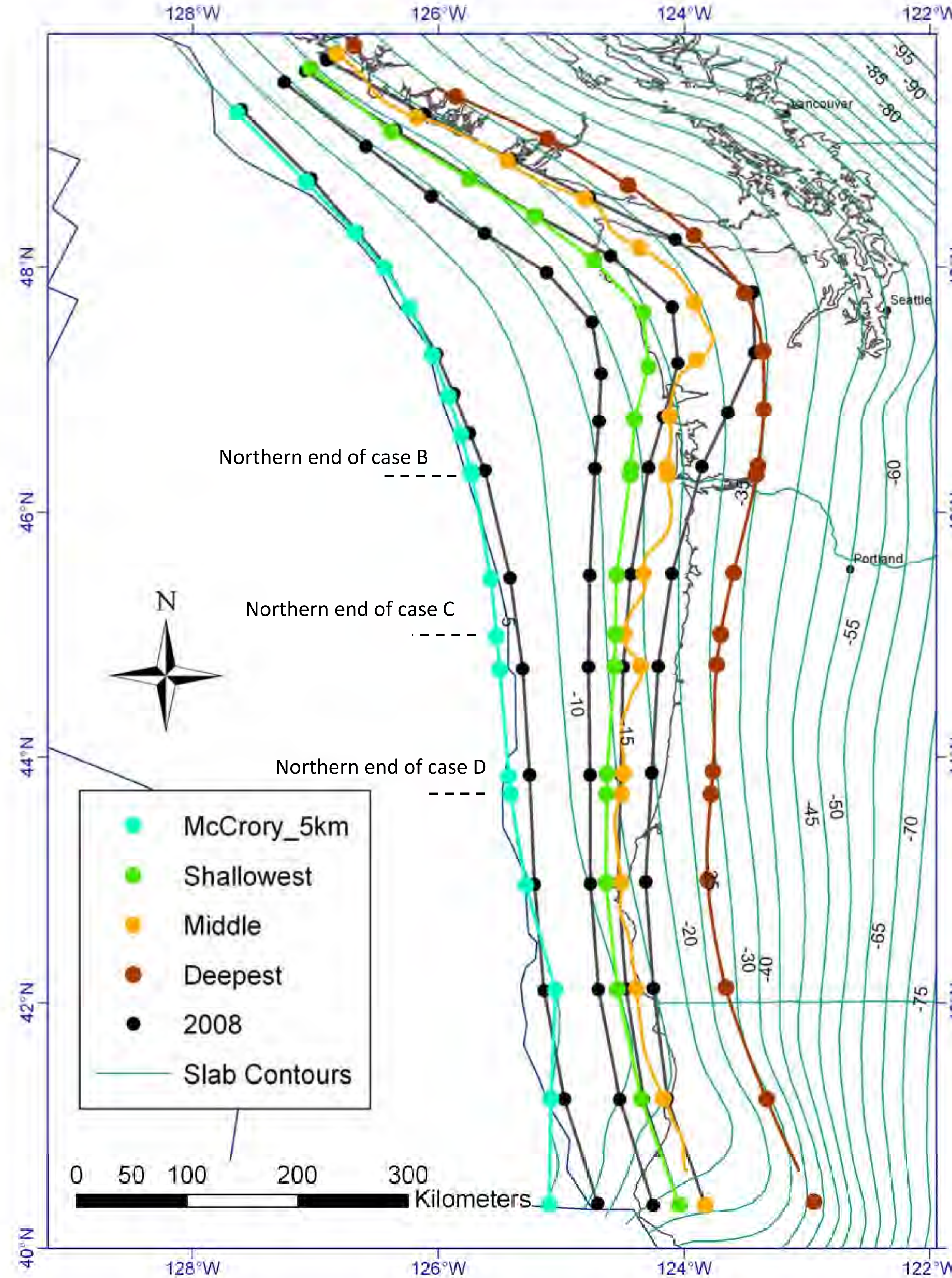

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LOCATION OF SURFACE TRACES FOR UP-DIP EDGE & THREE DOWN-DIP EDGE OPTIONS USED IN 2014 NSHMS

(CHEN ET. AL 2014)

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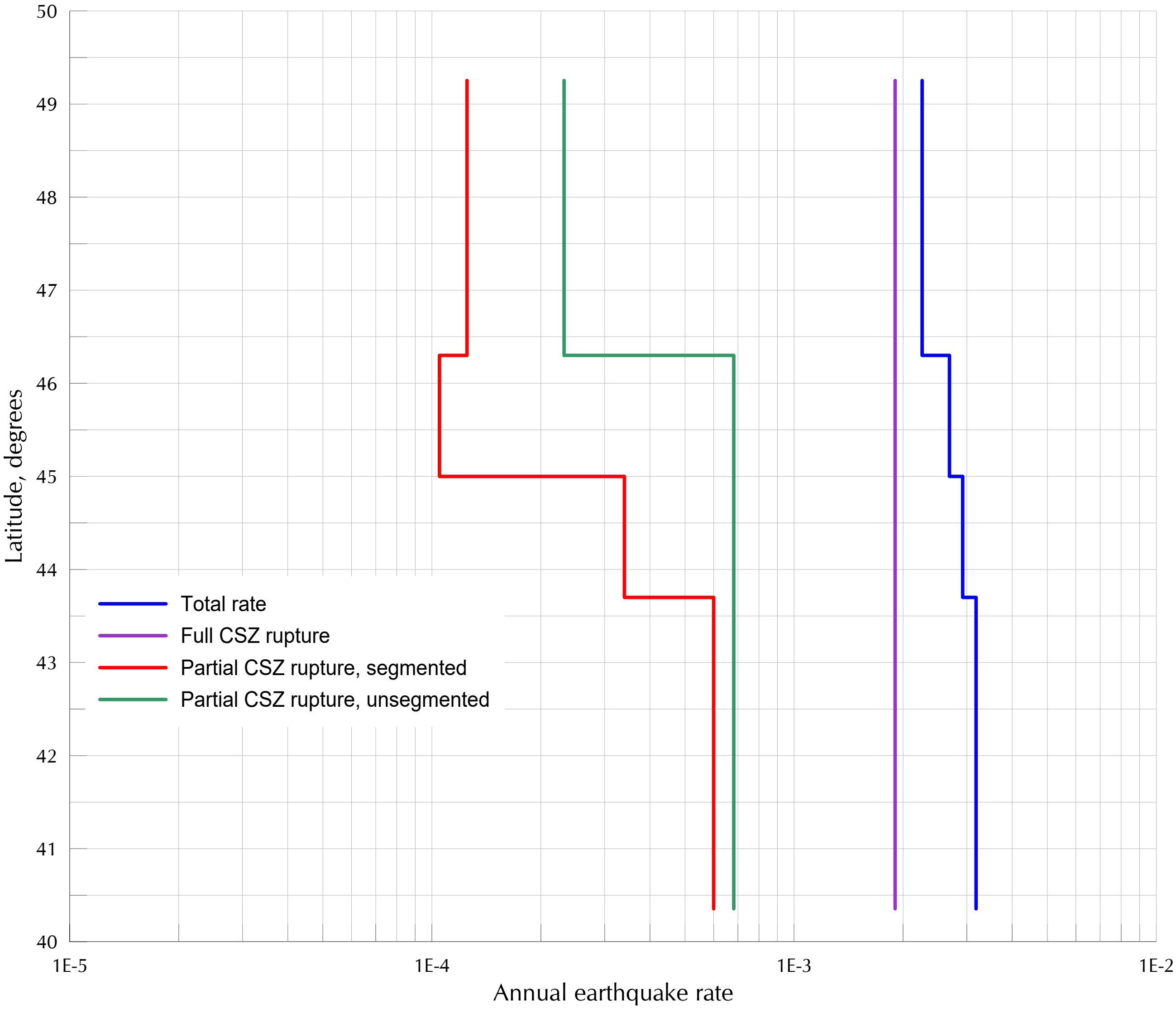

REFERENCE:
PETERSEN, M.D., MOSCHETTI, M.P., POWERS, P.M., MUELLER, C.S., HALLER, K.M., FRANKEL, A.D., ZENG, Y., REZAEIAN, S., HARMSEN, S.C., BOYD, O.S., FIELD, N., CHEN, R., RUKSTALES, K.S., NICO, L., WHEELER, R.L., WILLIAMS, R.A., AND OLSEN, A.H., 2014, DOCUMENTATION FOR THE 2014 UPDATE OF THE UNITED STATES NATIONAL SEISMIC HAZARD MAPS: U.S. GEOLOGICAL SURVEY OPEN-FILE REPORT 2014–1091, 243 P.

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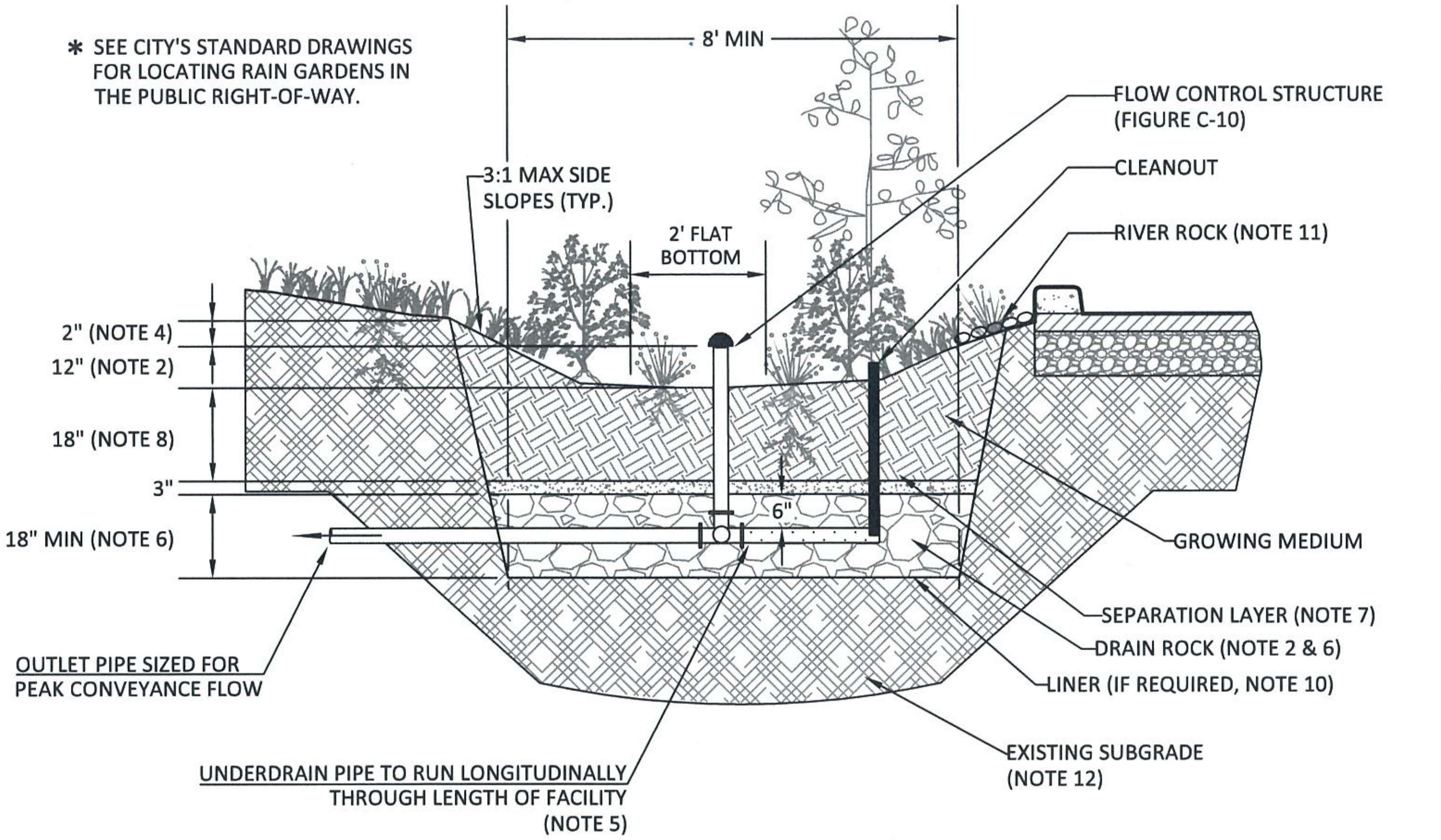
VARIATION OF EARTHQUAKE RATES
CASCADIA SUBDUCTION ZONE (CSZ)

AUG. 2018 JOB NO. 6138

STORMWATER FACILITIES
OPERATIONS AND MAINTENANCE CHECKLIST

Problem	Recommended / Required	Trigger	Preferred Condition
Sediment Accumulation in Treatment Area	Monthly from November through April / Annually Required	Sediment depth exceeds 3 inches	Sediment removed from vegetated treatment area: level side to side and drains freely toward outlet; no standing water within 24 hours of any major storm (1" in 24 hours)
Erosion Scouring	Monthly from November through April / Annually Required	Exposed earth or rutted soil	Repair ruts or bare areas by filling with topsoil during dry season; regrade and replant large bare areas
Standing Water	Monthly from November through April and after any major storm event (1 inch in 24 hours)	Standing water in the planter between storms that does not drain freely	Remove sediment or trash blockages; improve end to end grade so there is no standing water 24 hours after any major storm (1 inch in 24 hours)
Flow not Distributed Evenly	Monthly from November through April / Annually Required	Flows unevenly distributed through planter width due to uneven or clogged flow spreader	Level the spreader and clean so that flows spread evenly over entire planter width
Settlement/ Misalignment	Annually Required	Failure of planters has created safety, function, or design problem	Planter replaced or repaired to design standards
Constant Baseflow	Monthly from November through April / Annually Required	Small, continual flow of water through the planter even after weeks without rain; planter bottom has an eroded, muddy channel	Add a low-flow pea gravel drain the length of the planter or bypass the baseflow around the planter
Vegetation	Monthly from November through April / Annually Required	Vegetation blocking more than 10% of the inlet pipe opening	No vegetation blocking the inlet pipe opening
Poor Vegetation Coverage	Monthly / Annually Required	Grass or other vegetation is sparse, or bare in more than 10% of the planter area	Determine cause of poor growth and correct the condition; replant with plants (per Appendix A) as needed to meet facility standards
Invasive Vegetation	Monthly / Annually Required	No invasive vegetation is planted or permitted to remain	No invasive vegetation present; remove excessive weeds. Control if complete eradication is not feasible
Rodents	Monthly / Annually Required	Evidence of rodents or rodent damage	No rodents; functioning facility
Insects	Annually Required	Insects such as wasps and hornets that interfere with maintenance activities	Harmful Insects removed
Trash and Debris	Monthly and after any major storm event (1 inch in 24 hours) / Annually Required	Visual evidence of trash, debris or dumping	Trash and Debris removed from facility
Contamination and Pollution	Monthly from November through April / Annually Required	Any evidence of oil, gasoline, contamination or other pollutants	No contaminants or pollutants present; coordinate removal/cleanup with local water quality response agency
Obstructed Inlet/Outlet	Monthly and after any major storm event (1 inch in 24 hours) / Annually Required	Inlet/outlet areas clogged with sediment, vegetation or debris	Clear inlet and outlet; obstructions removed
Excessive Shading	Monthly from November through April / Annually Required	Vegetation growth is poor because sunlight does not reach planter	Trim over-hanging limbs and/or remove brushy vegetation as needed
Vegetation	Monthly from November through April / Annually Required	Specified or approved grass grows so tall that it competes with shrubs and/or becomes a fire danger	String trim non-wetland grasses to 4 to 6 inches and remove clippings; protect woody vegetation



GENERAL NOTES:

1. **PROVIDE PROTECTION** FROM ALL VEHICLE TRAFFIC, EQUIPMENT STAGING, AND FOOT TRAFFIC IN PROPOSED INFILTRATION AREAS PRIOR TO, DURING AND AFTER CONSTRUCTION. UNLESS REQUIRED BY SITE CONDITIONS, UNLINED RAIN GARDENS ARE PREFERRED TO MAXIMIZE ONSITE INFILTRATION.
2. **DIMENSIONS:**
   -DEPTH OF BASIN (FROM TOP OF GROWING MEDIUM TO OVERFLOW ELEVATION): 12"
   -FLAT BOTTOM WIDTH: 2' MINIMUM
   -SIDE SLOPES OF BASIN: 3:1 MAXIMUM
   -SLOPE OF RAIN GARDEN: 0.5% OR LESS
   -FACILITY AREA SHALL BE MEASURED AT THE DEEPEST SECTION (DRAIN ROCK) OF FACILITY
3. **SETBACKS:**
   -FILTRATION RAIN GARDEN MUST BE 10' FROM FOUNDATIONS AND 5' FROM PROPERTY LINES UNLESS APPROVED BY BUILDING OFFICIAL.
4. **OVERFLOW:**
   -INLET ELEVATION MUST ALLOW FOR 2" OF FREEBOARD, MINIMUM. PROTECT FROM DEBRIS AND SEDIMENT WITH STRAINER OR GRATE.
   -IDENTIFY EMERGENCY OVERFLOW ROUTE ON THE STORMWATER MANAGEMENT PLAN.
5. **PIPING:**
   -PERFORATED UNDERDRAIN PIPING: SHALL BE ABS SCH. 40, DUCTILE IRON, OR PVC SCH.40. MINIMUM DIAMETER IS 6". PIPING MUST HAVE 1% GRADE AND FOLLOW THE UNIFORM PLUMBING CODE. PVC NOT ALLOWED ABOVE GROUND.
   -OVERFLOW PIPING: SHALL BE ABS SCH. 40, DUCTILE IRON, OR PVC SCH. 40 AND SHALL NOT BE PERFORATED. MINIMUM DIAMETER IS 6". PIPING MUST HAVE 1% GRADE AND FOLLOW THE UNIFORM PLUMBING CODE. PVC NOT ALLOWED ABOVE GROUND.
6. **DRAIN ROCK:**
   -SIZE: 1 1/2" to 3/4"-0 WASHED
   -DEPTH: 18" MINIMUM
7. **SEPARATION** BETWEEN DRAIN ROCK AND GROWING MEDIUM: SHALL BE A 3" LAYER OF 3/4" - 1/4" OPEN GRADED AGGREGATE OR FILTER FABRIC WITH 3" OF ADDITIONAL DRAIN ROCK MAY BE UTILIZED IN LIEU OF OPEN GRATED AGGREGATE IF APPROVED BY CITY ENGINEER.
8. **GROWING MEDIUM:**
   -DEPTH: 18" MINIMUM
   -SEE APPENDIX A FOR SPECIFICATION OR USE SAND/LOAM/COMPOST 3-WAY MIX.
   -FACILITY SURFACE AREA MAY BE REDUCED BY 20% WHEN GROWING MEDIA DEPTH IS INCREASED TO 30" OR MORE.
9. **VEGETATION:** FOLLOW LANDSCAPE PLANS OR REFER TO PLANTING REQUIREMENTS IN APPENDIX A.
10. **WATERPROOF LINER (IF REQUIRED):** SHALL BE 30 MIL PVC OR EQUIVALENT.
11. **INSTALL RIVER ROCK** OR SPLASH PAD TO TRANSITION FROM INLETS TO GROWING MEDIUM. SIZE OF ROCK SHALL BE 1" - 3".
12. **SEASONAL HIGH GROUNDWATER SEPARATION:**
    -SEPARATION DISTANCE AS REQUIRED BY CITY.

Rain Garden - Filtration
Figure C-4

OREGON CITY
STORMWATER AND GRADING DESIGN STANDARDS

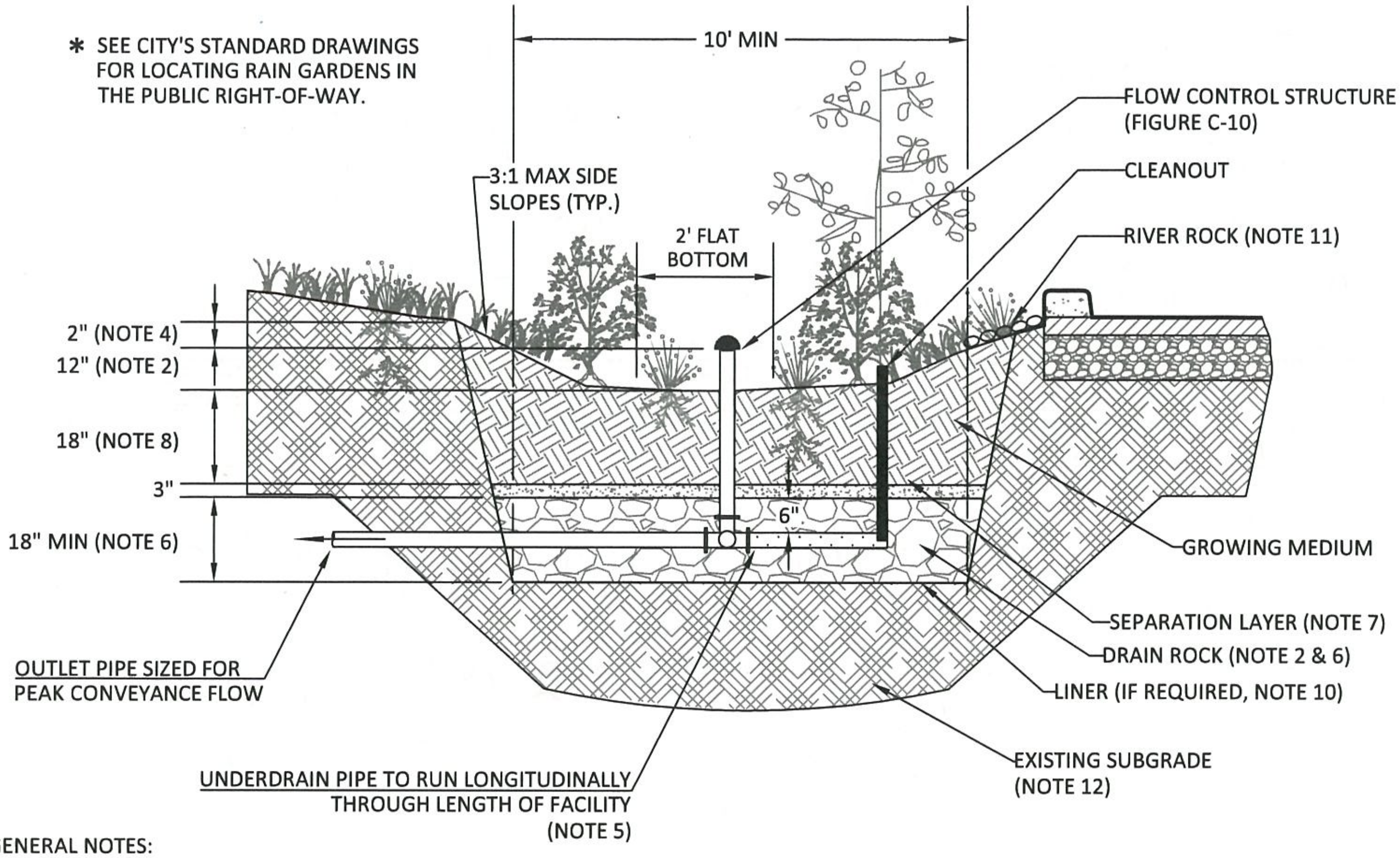
Rain Gardens
Operations & Maintenance Plan

What to Look For	What to Do
Structural Components, including inlets and outlets/overflows, shall freely convey stormwater.	
Clogged inlets or outlets	-Remove sediment and debris from catch basins, trench drains and curb inlets and pipes to maintain at least 50% conveyance capacity at all times.
Cracked Drain Pipes	-Repair/seal cracks. Replace when repair is insufficient.
Check Dams	-Maintain 4 to 10 inch deep rock check dams at design intervals.
Vegetation	
Dead or strained vegetation	-Replant per original planting plan, or substitute from Appendix A. -Irrigate as needed. Mulch banks annually. DO NOT apply fertilizers, herbicides, or pesticides.
Tall Grass and Vegetation	-Cut back grass and prune overgrowth 1-2 times per year. Remove cuttings.
Weeds	-Manually remove weeds. Remove all plant debris.
Growing/Filter Medium, including soil and gravels, shall sustain healthy plant cover and infiltrate within 72 hours.	
Gullies	-Fill, lightly compact, and plant vegetation to disperse flow.
Erosion	-Replace splash blocks or inlet gravel/rock.
Slope Slippage	-Stabilize 3:1 slopes/banks with plantings from Appendix A.
Ponding	-Rake, till, or amend to restore infiltration rate.

Annual Maintenance Schedule:

Summer. Make any structural repairs. Improve filter medium as needed. Clear drain. Irrigate as needed.
Fall. Replant exposed soil and replace dead plants. Remove sediment and plant debris.
Winter. Monitor infiltration/flow-through rates. Clear inlets and outlets/overflows to maintain conveyance.
Spring. Remove sediment and plant debris. Replant exposed soil and replace dead plants. Mulch.
All seasons. Weed as necessary. Clean scuppers or curb cuts as needed.
Maintenance Records: Record date, description, and contractor (if applicable) for all structural repairs, landscape maintenance, and facility cleanout activities. Keep work orders and invoices on file and make available upon request of the inspector.
Access: Maintain ingress/egress to design standards.
Infiltration/Flow Control: All facilities shall drain within 72 hours. Record time/date, weather, and site conditions when ponding occurs.
Pollution Prevention: All sites shall implement best management practices to prevent hazardous or solid wastes or excessive oil and sediment from contaminating stormwater. Contact emergency response agencies for immediate assistance responding to spills. Record time/date, weather, and site conditions if site activities contaminate stormwater.
Vectors (Mosquitoes & Rodents): Stormwater facilities shall not harbor mosquito larvae or rats that pose a threat to public health or that undermine the facility structure. Monitor standing water for small wiggling sticks perpendicular to the water's surface. Note holes/burrows in and around facilities. Call Clackamas County Vector Control for immediate assistance to eradicate vectors. Record time/date, weather, and site conditions when vector activity observed.

Rain Garden - O&M Plan
Figure C-6



GENERAL NOTES:

1. **PROVIDE PROTECTION** FROM ALL VEHICLE TRAFFIC, EQUIPMENT STAGING, AND FOOT TRAFFIC IN PROPOSED INFILTRATION AREAS PRIOR TO, DURING AND AFTER CONSTRUCTION. UNLESS REQUIRED BY SITE CONDITIONS, UNLINED SWALES ARE PREFERRED TO ALLOW MAXIMUM INFILTRATION.
2. **DIMENSIONS:**
   -DEPTH OF SWALE (FROM TOP OF GROWING MEDIUM TO OVERFLOW ELEVATION): 12"
   -LONGITUDINAL SLOPE OF SWALE: 6.0% OR LESS
   -FLAT BOTTOM WIDTH: 2' MINIMUM
   -SIDE SLOPES OF SWALE: 3:1 MAXIMUM
   -FACILITY AREA SHALL BE MEASURED AT THE DEEPEST SECTION (DRAIN ROCK) OF FACILITY
3. **SETBACKS:**
   -FILTRATION SWALES MUST BE 10' FROM FOUNDATIONS AND 5' FROM PROPERTY LINES UNLESS APPROVED BY BUILDING OFFICIAL.
4. **OVERFLOW:**
   -INLET ELEVATION MUST ALLOW FOR 2" OF FREEBOARD, MINIMUM. PROTECT FROM DEBRIS AND SEDIMENT WITH STRAINER OR GRATE.
   -IDENTIFY EMERGENCY OVERFLOW ROUTE ON THE STORMWATER MANAGEMENT PLAN.
5. **PIPING:**
   -PERFORATED UNDERDRAIN PIPING: SHALL BE ABS SCH. 40, DUCTILE IRON, OR PVC SCH.40. MINIMUM DIAMETER IS 6". PIPING MUST HAVE 1% GRADE AND FOLLOW THE UNIFORM PLUMBING CODE. PVC NOT ALLOWED ABOVE GROUND.
   -OVERFLOW PIPING: SHALL BE ABS SCH. 40, DUCTILE IRON, OR PVC SCH. 40 AND SHALL NOT BE PERFORATED. MINIMUM DIAMETER IS 6". PIPING MUST HAVE 1% GRADE AND FOLLOW THE UNIFORM PLUMBING CODE. PVC NOT ALLOWED ABOVE GROUND.
6. **DRAIN ROCK:**
   -SIZE: 1 1/2" - 3/4" WASHED
   -DEPTH: 12"
7. **SEPARATION** BETWEEN DRAIN ROCK AND GROWING MEDIUM: SHALL BE A 3" LAYER OF 3/4" - 1/4" OPEN GRADED AGGREGATE.
8. **GROWING MEDIUM:**
   -18" MINIMUM
   -SEE APPENDIX A FOR SPECIFICATION OR USE SAND/LOAM/COMPOST 3-WAY MIX.
   -FACILITY SURFACE AREA MAY BE REDUCED BY 20% WHEN GROWING MEDIA DEPTH IS INCREASED TO 30" OR MORE.
9. **VEGETATION:** FOLLOW LANDSCAPE PLANS OR REFER TO PLANTING REQUIREMENTS IN APPENDIX A.
10. **WATERPROOF LINER (IF REQUIRED):** SHALL BE 30 MIL PVC OR EQUIVALENT.
11. **INSTALL RIVER ROCK** OR SPLASH PAD TO TRANSITION FROM INLETS TO GROWING MEDIUM. SIZE OF ROCK SHALL BE 1" TO 3".
12. **SEASONAL HIGH GROUNDWATER SEPARATION:**
   -SEPARATION DISTANCE AS REQUIRED BY CITY.
13. **CHECK DAMS:** SHALL BE PLACED ACCORDING TO FACILITY DESIGN.

Vegetated Swale - Filtration
Figure C-7

OREGON CITY
STORMWATER AND GRADING DESIGN STANDARDS

Vegetated Swales
Operations & Maintenance Plan

What to Look For	What to Do
Structural Components, including inlets and outlets/overflows, shall freely convey stormwater.	
Clogged inlets or outlets	-Remove sediment and debris from catch basins, trench drains, curb inlets and pipes to maintain at least 50% conveyance capacity at all times.
Cracked Drain Pipes	-Replace/seal cracks. Replace when repair is insufficient.
Check Dams	-Maintain 4 - 10 inch deep rock check dams at design intervals.
Vegetation	
Dead or strained vegetation	-Replant per original planting plan, or substitute from Appendix A. -Irrigate as needed. Mulch banks annually. DO NOT apply fertilizers, herbicides, or pesticides.
Tall Grass and Vegetation	-Cut back to 4-6 inches, 1-2 times per year. Remove cuttings.
Weeds	-Manually remove weeds. Remove all plant debris.
Growing/Filter Medium, including soil and gravels, shall sustain healthy plant cover and infiltrate within 72 hours.	
Gullies	-Fill, lightly compact, and plant vegetation to disperse flow.
Erosion	-Restore or create outfalls, check dams, or splash blocks where necessary.
Slope Slippage	-Stabilize slope.
Ponding	-Rake, till, or amend to restore infiltration rate.

Annual Maintenance Schedule:

Summer. Make any structural repairs. Improve filter medium as needed. Clear drain. Irrigate as needed.
Fall. Replant exposed soil and replace dead plants. Remove sediment and plant debris.
Winter. Monitor infiltration/flow-through rates. Clear inlets and outlets/overflows to maintain conveyance.
Spring. Remove sediment and plant debris. Replant exposed soil and replace dead plants. Mulch.
All seasons. Weed as necessary. Clean scuppers or curb cuts as needed.
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Contech® CMP Detention Inspection and Maintenance Guide

Item #2.

Underground stormwater detention and infiltration systems must be inspected and maintained at regular intervals for purposes of performance and longevity.

Inspection

Inspection is the key to effective maintenance of CMP detention systems and is easily performed. Contech recommends ongoing, annual inspections. Sites with high trash load or small outlet control orifices may need more frequent inspections. The rate at which the system collects pollutants will depend more on-site specific activities rather than the size or configuration of the system.

Inspections should be performed more often in equipment washdown areas, in climates where sanding and/or salting operations take place, and in other various instances in which one would expect higher accumulations of sediment or abrasive/corrosive conditions. A record of each inspection is to be maintained for the life of the system.

Maintenance

CMP detention systems should be cleaned when an inspection reveals accumulated sediment or trash is clogging the discharge orifice. Accumulated sediment and trash can typically be evacuated through the manhole over the outlet orifice. If maintenance is not performed as recommended, sediment and trash may accumulate in front of the outlet orifice. Manhole covers should be securely seated following cleaning activities. Contech suggests that all systems be designed with an access/inspection manhole situated at or near the inlet and the outlet orifice. Should it be necessary to get inside the system to perform maintenance activities, all appropriate precautions regarding confined space entry and OSHA regulations should be followed.

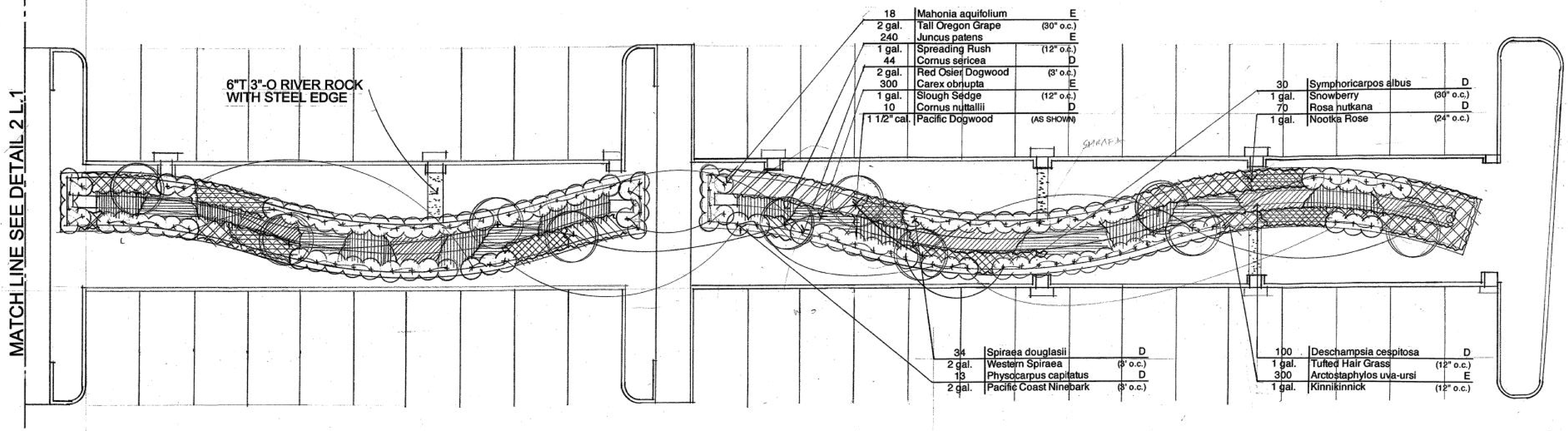
Annual inspections are best practice for all underground systems. During this inspection if evidence of salting/de-icing agents is observed within the system, it is best practice for the system to be rinsed, including above the spring line soon after the spring thaw as part of the maintenance program for the system.

Maintaining an underground detention or infiltration system is easiest when there is no flow entering the system. For this reason, it is a good idea to schedule the cleanout during dry weather.

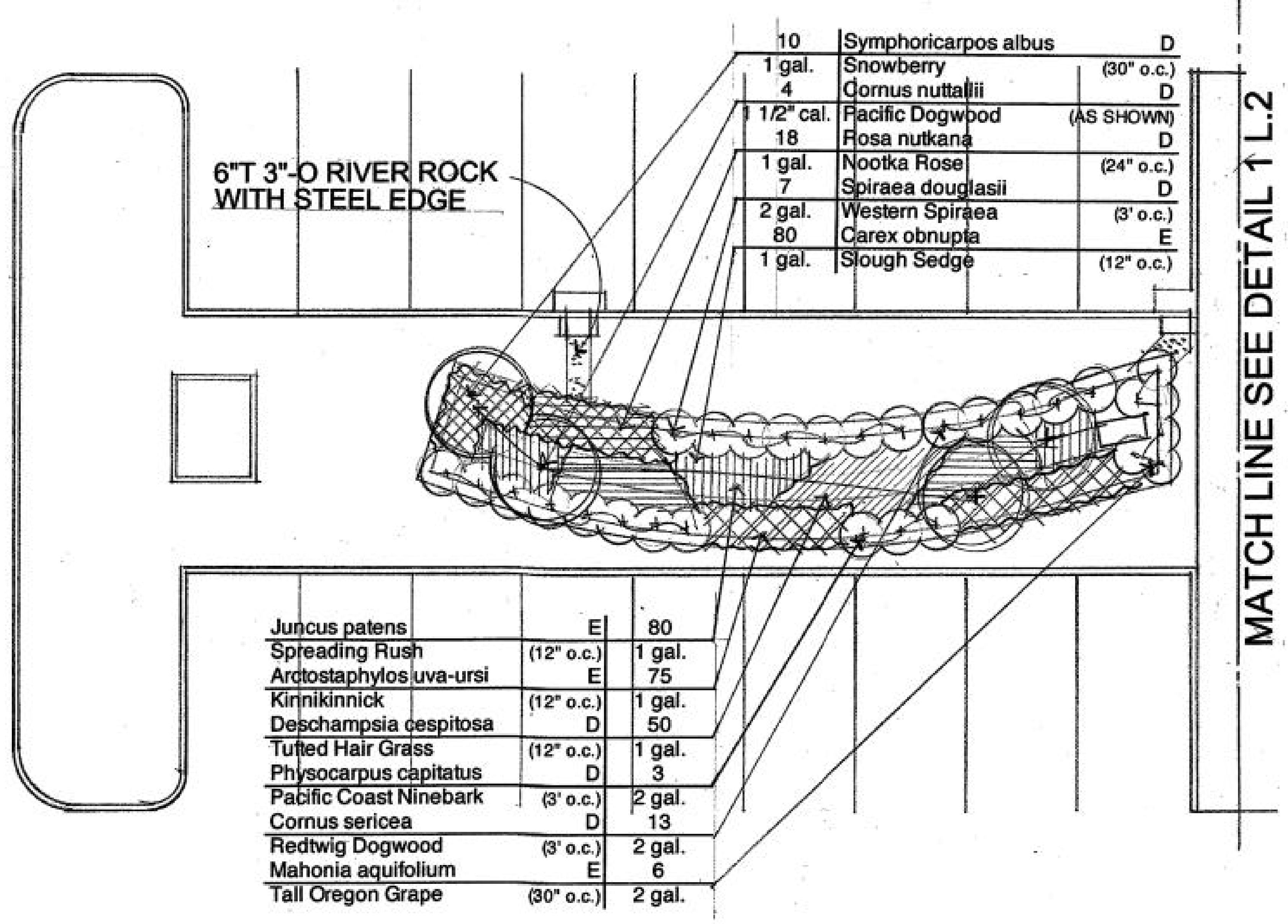
The foregoing inspection and maintenance efforts help ensure underground pipe systems used for stormwater storage continue to function as intended by identifying recommended regular inspection and maintenance practices. Inspection and maintenance related to the structural integrity of the pipe or the soundness of pipe joint connections is beyond the scope of this guide.

CONTECH® CMP DETENTION SYSTEMS

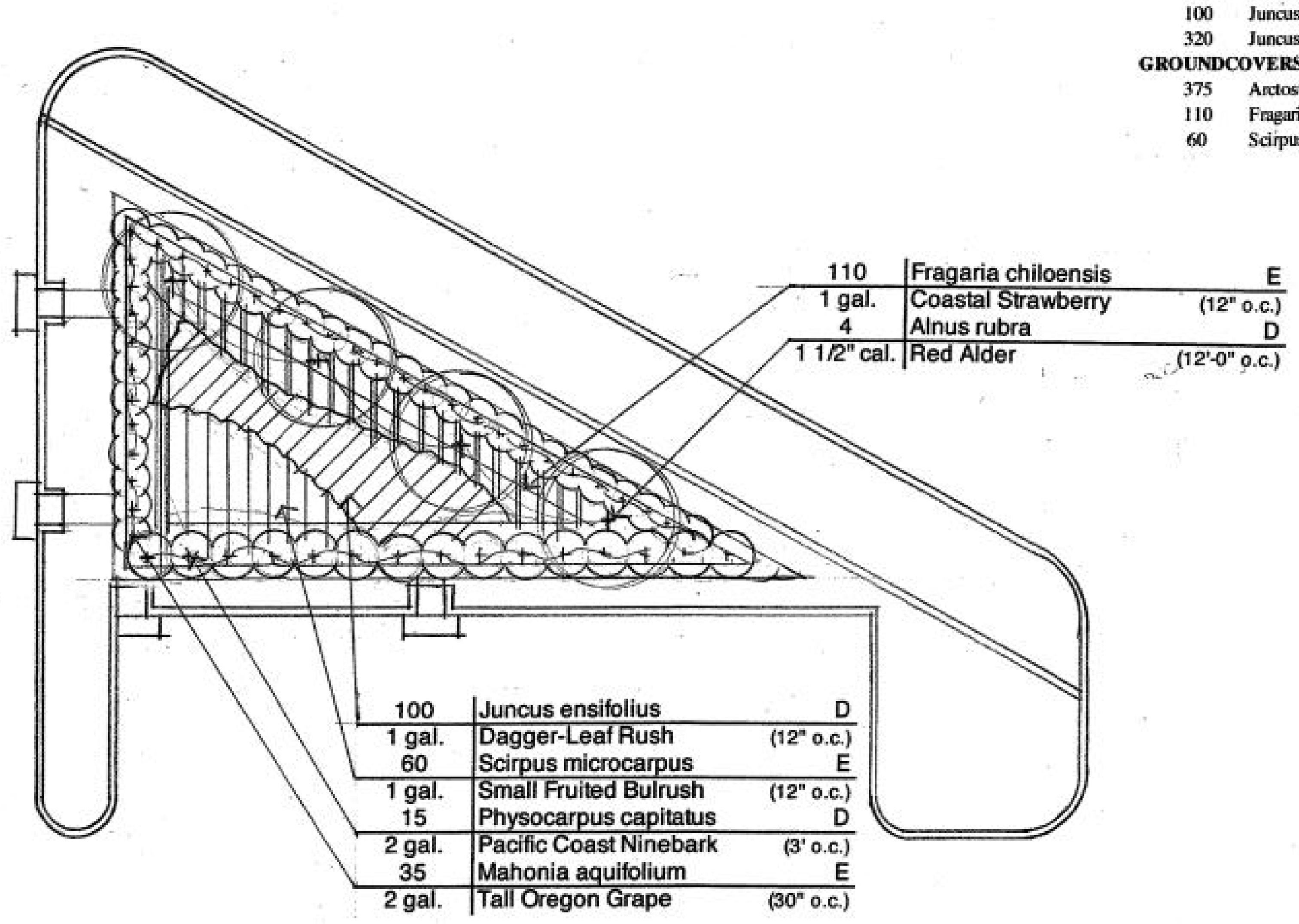
CONTECH® ENGINEERED SOLUTIONS



1 STORM WATER PLANTER 2
SCALE: 1" = 10' - 0"



2 STORM WATER PLANTER 2
SCALE: 1" = 10' – 0"



3 STORM WATER PLANTER 1
SCALE: 1" = 10' - 0"

PLANTING SCHEDULE - STORMWATER PLANTERS

QTY	SCIENTIFIC NAME	COMMON NAME	SIZE	O.C.	NATIVE	EVERGREEN	HEIGHT
TREES							
4	Alnus rubra	Red Alder	1 1/2" cal.	12'-0" o.c.	Native	Deciduous	
20	Cornus nuttallii	Pacific dogwood	1 1/2" cal.	As shown	Native	Deciduous	
4	Zelkova serrata	Japanese zelkova	2 1/2" cal.	As shown		Deciduous	
SHRUBS							
57	Cornus sericea	Red osier dogwood	2 gal.	3' o.c.	Native	Deciduous	6'
59	Mahonia aquifolium	Tall Oregon grape	2 gal.	30" o.c.	Native	Evergreen	5'
31	Physocarpus capitatus	Pacific coast ninebark	2 gal.	3' o.c.	Native	Deciduous	6'
88	Rosa nutkana	Nootka rose	1 gal.	24" o.c.	Native	Deciduous	8'
41	Spiraea douglasii	Western spiraea	2 gal.	3' o.c.	Native	Deciduous	7'
40	Symphoricarpos albus	Snowberry	1 gal.	30" o.c.	Native	Deciduous	3'
GRASSES							
380	Carex obnupta	Slough Sedge	1 gal.	12" oc.	Native	Evergreen	48"
150	Deschampsia cespitosa	Tufted hair grass	1 gal.	12"o.c.	Native	Deciduous	36"
100	Juncus ensifolius	Dagger-leaf Rush	1 gal.	12" o.c.	Native	Deciduous	10"
320	Juncus patens	Spreading Rush	1 gal.	12" oc.	Native	Evergreen	36"
GROUNDCOVERS							
375	Arctostaphylos uva-ursi	Kinnikinnick	1 gal.	12" oc.	Native	Evergreen	6"
110	Fragaria chiloensis	Coastal strawberry	1 gal.	12" o.c.	Native	Evergreen	6"
60	Scirpus microcarpus	Small Fruited Bulrush	1 gal.	12" o.c.	Native	Evergreen	24"

N

0 20
SCALE IN FEET

CITY OF OREGON CITY
APPROVED FOR CONSTRUCTION

☐ Approved as Submitted
☐ Approved as Noted in Red

Engineer: ______
Planning: ______
Public Works: ______

You shall be responsible for protecting all existing public and private utilities.

Date of Approval: ______

REGISTERED 352
BRIAN E. BAINNSON
OREGON
07/26/1996
LANDSCAPE ARCHITECT

Quatrefoil Inc.
Design • Landscape Architecture • Space Planning
415 NE 65th Ave. Portland, Oregon 97213
Tel: (503) 256-8955

PROVIDENCE WILLAMETTE FALLS EXPANSION
STORMWATER PLANTERS

REVISIONS

REV NO.	DATE	DESCRIPTION

OREGON CITY

CITY OF OREGON CITY
PUBLIC WORKS DEPARTMENT
APPROVAL FOR CONSTRUCTION

☐ APPROVED AS SUBMITTED
☐ APPROVED AS NOTED IN RED

SIGNATURE
NAME:
DATE:

DATE:03/31/2021
OC RECORD DRAWING#:

DRAWING NUMBER:
L.1

SITE ASSESSMENT AND PRELIMINARY DESIGN CHECKLIST

✓	Information needed	Attach supporting materials as needed
2.2.1 Site Information		
	Applicant contact information	Applicant name: Jeff Taylor Business name: Providence Contact address, phone number, and e-mail: 4400 NE Halsey St Jeffery.Taylor@providence.org Suite 190, Bldg 2 503-893-6750 Portland, OR 97213
	Project location	Site address: 1500 Division St Oregon City, OR 97045 Site description: T2S R2E 32AA/32AB/21AC - Tax Lot: 00400, 01201, 01900, 02000, 02100, 02200, 03900, 04000, 04100, 04200, 00101, 00201 Major drainage basin: John Adams Is the project site located with the NROD as defined in OCMC 17.49? N (Y/N) *Include a vicinity map of the site (including location of property in relation to adjacent properties, roads, and pedestrian/bike facilities).*
	Project type	Identify types of development planned for the site such as commercial, industrial, single-family residential, multi-family residential, or other (describe): Medical office Building
	Size of site	Size of site: 17.96 (acres) Number of existing/proposed tax lots: 12 Amount of new and replaced impervious area: 2.24 (SF)
2.2.2 Site Assessment *Note: Site assessment information may be available from the OCMaps online tool available through the City's website.*		
	Site Assessment Map	*Attach engineered scale Site Assessment Map, showing items below.*
	Topography Evaluate site and map slopes: *Flat: 0-10%* *Moderate: 10-25%* *Steep: 25% and greater*	*Surveyed or aerial-based mapping with 2-foot intervals for slopes 0-25% slope and 10-foot intervals for steeper.* Is the project site located within a *Geologic Hazard Areas*? Yes (Y/N) *Indicate Geologic Hazard Areas as defined by OCMC 17.04.510 and Geologic Hazards Overlay Zone as defined by OCMC 17.04.515.*
	Soils and Groundwater Research and map site soil hydrologic group & areas of high groundwater	NRCS Hydrologic Soil Type (show on map if more than one type present): *Attach seasonal groundwater depth evaluation if available or required (for site with floodplain and/or wetland). Groundwater depth information is available from* NRCS. D soils
	Infiltration Assessment Determine soil capacity for onsite infiltration	If an infiltration test is performed, attach the documentation. Report the test type (Basic/Professional) performed and results. See **Appendix D** for the approved infiltration testing methods. Test type: N/A N/A (inches/hour)

SITE ASSESSMENT AND PRELIMINARY DESIGN CHECKLIST		
	Hydrology – Conditions and Natural Features Map site floodplains, wetlands, streams, and location of outfalls	Clearly label on map all intermittent and perennial creeks/streams/rivers and wetlands, FEMA floodplains, and existing drainage systems (pipes, ditches, outfalls). Check here if present on site: N/A Sensitive area(s) N/A Floodplain N/A
	Downstream Conveyance	Indicate the proposed point of discharge on the site plan. *Prepare and attach a Downstream Analysis as required by* ***Chapter 5****.* Check here to verify that adequate downstream capacity is available: See report
	Existing Vegetation Map trees and vegetation	Using aerial photos or survey, map all trees and vegetation. Note all existing trees 6-inch caliper and greater (DBH) on map. Delineate and identify other areas and types of existing vegetation. The local planning authority may require a formal tree survey.
	Required Vegetated Buffers and Setbacks Assess and map buffers	Identify required vegetated buffer areas and other setback limits as defined by OCMC Title 17.
	Land Use and Zoning	Existing Land Use Zoning designation(s): MUE
	Access and Parking	Delineate proposed access points for all transportation modes on map. Indicate amount and area of required parking onsite if applicable, *attach documentation as needed.* See plans
	Utilities to Site and Surrounding Area	Map existing utilities including stormwater facilities, storm conveyance, sewer, water, electricity, phone/cable, gas, and any public storm system/facility downstream. See plans
2.2.3 Site Preliminary Design Objectives *(attach engineered scale Preliminary Site Plan)*		
	1. Preserve existing resources	**Required:** Show sensitive areas and buffers on site plan. Denote buffer areas that require enhancement. Show any proposed areas of encroachment and associated buffer mitigation areas.
	2. Minimize site disturbance	**Required:** Delineate protection areas on site plan for areas to remain undisturbed during construction.
	3. Minimize soil compaction	**Required:** Delineate and note temporary fencing on site plan for proposed infiltration facilities, vegetated stormwater management facilities, and re-vegetation areas.
	4. Minimize imperviousness	**Required:** Delineate proposed impervious areas and proposed impervious area reduction methods on the site plan. A. Total proposed new/replaced impervious area: 2.24 ac ~~(SF)~~ B. Area of proposed Green Roofs: 0 (SF) C. Area of proposed pervious pavements: 0 (SF) D. Describe type of pavers or pavement proposed: N/A E. Impervious area requiring management [A-(B+C)]: 2.24 ac ~~(SF)~~

SITE ASSESSMENT AND PRELIMINARY DESIGN CHECKLIST

2.2.4 Proposed Stormwater Management Strategy

Proposed Stormwater Management Strategy	**Level 1 – Onsite retention of the 10-year design storm** ______ Full onsite retention/infiltration using LID facilities where there are infiltration rates of 2.0 inches per hour or greater (choose one or more applicable strategies from the next section): **Level 2 – Onsite stormwater management using LID facilities** *(include documentation for the following applicable limiting condition(s) and choose one or more applicable strategies from the next section):* __X__ Low infiltration rates of less than 2.0 inches per hour ______ Location for stormwater management facilities limited to areas with fill __X__ Steep slopes __X__ High groundwater ______ Contaminated soils ______ Conflict with required Source Controls (**Chapter 6**) ______ **Level 3 - Offsite stormwater management facilities/regional facilities** ______ **Level 4 - Fee in Lieu, as determined by the City**
Preliminary Facility Selection	Check all that apply, *attach output from BMP Sizing Tool*, and show proposed Stormwater Management Facilities on Preliminary Site Plan. LID facilities: ______ Stormwater Planter (infiltration or filtration) __X__ Rain Garden (infiltration or filtration) ______ Vegetated Swale (infiltration or filtration) ______ Detention Pond (infiltration or filtration) ______ Other* Storm tech Chambers **Modifications must be approved by City per Section 1.6*
Minimum Facility Size	A. Level 1 - Required surface area of onsite surface infiltration facilities: As determined by BMP sizing tool or engineered method: ____________ (SF) OR storm facility which can infiltrate the full 10-year design storm: ____________ (SF) B. Level 2 - Calculate required surface area of onsite LID facilities: As determined by BMP sizing tool or engineered method: 3,515 (SF) *OR 10% of total impervious area (new and replaced): ____________ (SF) C. Level 3 - Calculate required surface area of offsite/regional facilities: As determined by BMP sizing tool or engineered method: ____________ (SF) D. Level 4 - Fee in Lieu, as determined by the City ____________ **10 % sizing factor only applicable for sites entirely within a Geologic Hazard Area (Section 2.2.4)*

SITE ASSESSMENT AND PRELIMINARY DESIGN CHECKLIST

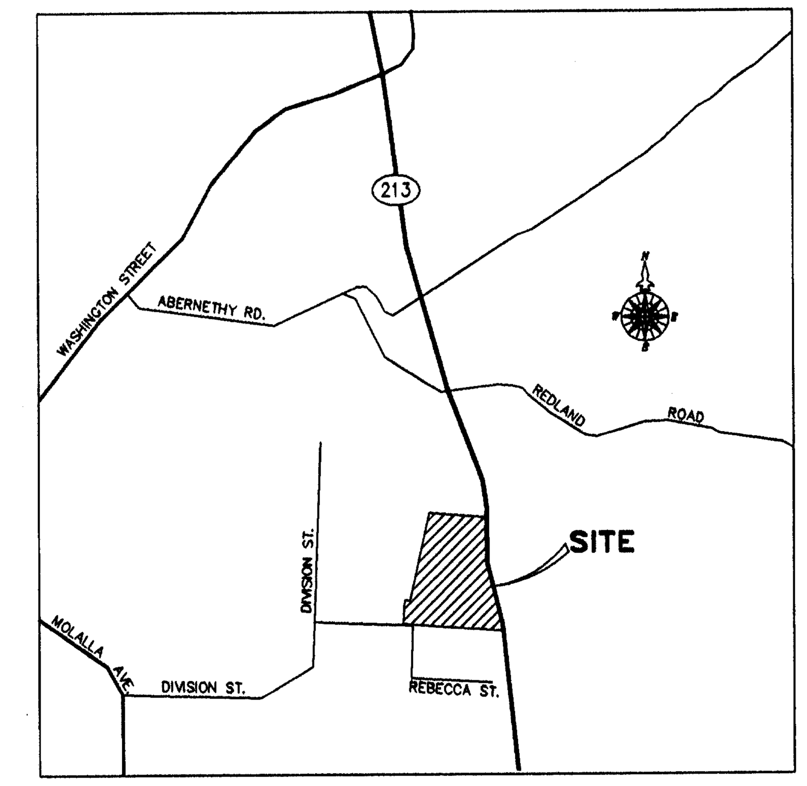
2.2.5 Other Project Requirements

	Grading Permit	A city-issued grading permit shall be required before the commencement of any of the following filling or grading activities (Review OCMC 15.48 for requirements): Grading activities in excess of ten cubic yards of earth. Y (Y/N) Grading activities divert existing drainage courses, (natural or man-made). Y (Y/N) Creation of impervious surfaces greater than two thousand square feet. Y (Y/N) Excavation beyond the limits of a basement or footing excavation, having an unsupported soil height greater than five feet after the completion of such a structure. N (Y/N) Grading activities involving the clearing or disturbance of one-half acre or more. Y (Y/N) *Fill and grading activities proposed to be undertaken in conjunction with a land use application, do not require a separate grading permit but are subject to the standards OCMC 15.48 and Chapter 3 of the Stormwater and Grading Design Standards. Approval of the construction plans submitted through the land use application process shall fulfill grading permit requirements.*
	Erosion Prevention and Sediment Control	Identify the required permits: X ESC Permit from the City *(sites that include 1,000+ SF new or replaced impervious area)* X 1200-C Permit from DEQ *(sites that disturb 1 acre or more land surface)*
	Source Control for High Use Sites	Identify whether the proposed development will include any of the following: ______ Fuel Dispensing Facilities and Surrounding Traffic Areas ______ Above-Ground Storage of Liquid Materials X Solid Waste Storage Areas, Containers, and Trash Compactors ______ Exterior Storage of Bulk Materials ______ Material Transfer Areas/Loading Docks ______ Equipment and/or Vehicle Washing Facilities ______ Development on Land With Suspected or Known Contamination ______ Covered Vehicle Parking Areas ______ Industrial and Commercial High Traffic Areas ______ Other land uses subject to the ODEQ 1200-Z Industrial Stormwater Permit
	Other Permits	Identify other natural resources related permits from local, state, or federal agencies that may be required as part of the proposed development activity. It is the responsibility of the applicant to identify and obtain required permits prior to project approval. List other anticipated permits: N/A

TRILLIUM PARK ESTATES

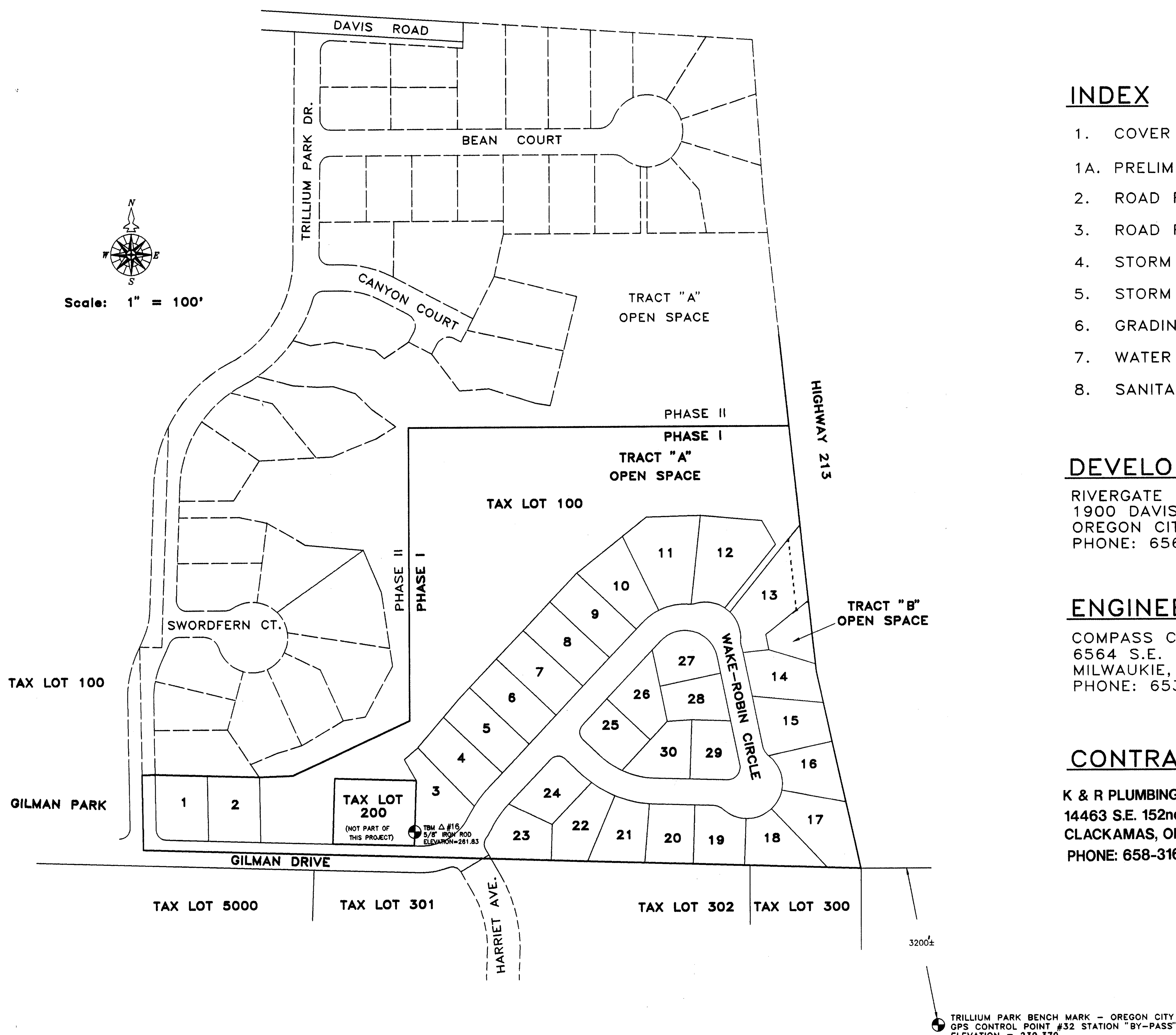
PHASE I

MAP 2S-2E-32 AA & 32AD, TL 100, 300, 301, 302, & 304
CITY OF OREGON CITY, CLACKAMAS COUNTY
CITY PLANNING FILE NO. PD93-01/TP94-11



VICINITY MAP

N. T. S.



INDEX

DEVELOPER

RIVERGATE DEVELOPMENT COMPANY
1900 DAVIS ROAD
OREGON CITY, OREGON 97045
PHONE: 656-1592

ENGINEER

COMPASS CORPORATION
6564 S.E. LAKE ROAD
MILWAUKIE, OREGON 97222
PHONE: 653-9093

CONTRACTOR

K & R PLUMBING CONSTRUCTION
14463 S.E. 152nd Dr.
CLACKAMAS, OREGON 97015
PHONE: 658-3161

NOTES

1. ALL WORK AND MATERIALS SHALL CONFORM TO 1990 EDITION OREGON CHAPTER A.P.W.A. STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION AS ADOPTED AND MODIFIED BY THE CITY OF OREGON CITY.
2. CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS PRIOR TO CONSTRUCTION AND SHALL ARRANGE FOR THE RELOCATION OF ANY IN CONFLICT WITH THE PROPOSED CONSTRUCTION.
3. CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS AND LICENSES BEFORE STARTING CONSTRUCTION. A CITY BUSINESS LICENSE IS REQUIRED.
4. EXISTING UTILITY LOCATIONS SHOWN ARE APPROXIMATE ONLY AND MUST BE VERIFIED BY THE CONTRACTOR. ADDITIONAL UNDERGROUND UTILITIES MAY EXIST.
5. CONTRACTOR SHALL NOTIFY THE PROJECT ENGINEER AND THE CITY OF OREGON CITY INSPECTOR 48 HOURS BEFORE STARTING CONSTRUCTION AND 24 HOURS BEFORE RESUMING WORK AFTER SHUTDOWNS, EXCEPT FOR NORMAL RESUMPTION OF WORK FOLLOWING SATURDAYS, SUNDAYS OR HOLIDAYS. CONTRACTOR SHALL NOTIFY THE PROJECT ENGINEER AND THE CITY OF OREGON CITY SO AS TO ELIMINATE UNNECESSARY INSPECTION TIME.
6. CONTRACTOR SHALL REMOVE AND DISPOSE OF TREES, STUMPS, BRUSH, ROOTS, TOPSOIL, AND OTHER MATERIAL IN THE RIGHT-OF-WAYS, EASEMENTS, AND WHERE INDICATED ON THE PLANS. MATERIAL SHALL BE DISPOSED OF IN SUCH A MANNER AS TO MEET LOCAL REGULATIONS.
7. CONSTRUCTION VEHICLES SHALL PARK ON THE CONSTRUCTION SITE. HOURS OF CONSTRUCTION SHALL BE 7:00 AM TO 6:00 PM, MONDAY THROUGH FRIDAY, AND 9:00 AM TO 6:00 PM ON SATURDAY. CONSTRUCTION PROHIBITED ON SUNDAY.
8. CONTRACTOR SHALL KEEP AND MAINTAIN A CURRENT SET OF DRAWINGS FOR THE PROJECT ENGINEER SHOWING AS-CONSTRUCTED DATA. THE PROJECT ENGINEER SHALL SUBMIT TWO SETS OF AS-BUILT/RECORD DRAWING MYLARS TO THE CITY OF OREGON CITY.
9. CONTRACTOR SHALL SUBMIT A MAINTENANCE BOND AS REQUIRED TO THE CITY OF OREGON CITY.
10. CONTRACTOR SHALL ERECT AND MAINTAIN TRAFFIC CONTROL PER THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", PART VI, CONSTRUCTION AND MAINTENANCE, AS ADOPTED AND MODIFIED BY ODOT. THE CONTRACTOR SHALL SUBMIT A PLAN FOR THE TRAFFIC CONTROL TO APPROPRIATE CITY, COUNTY, AND STATE PERSONNEL FOR APPROVAL.
11. CONTRACTOR SHALL PERFORM ALL WORK NECESSARY TO COMPLETE THIS PROJECT IN ACCORDANCE WITH THE PLANS INCLUDING SUCH INCIDENTALS AS MAY BE NECESSARY TO MEET APPLICABLE AGENCY REQUIREMENTS AND OTHERS AS NECESSARY TO PROVIDE A COMPLETE PROJECT.
12. CONTRACTOR SHALL KEEP AN APPROVED SET OF PLANS ON THE PROJECT SITE AT ALL TIMES.
13. ANY ALTERATION OR VARIANCE FROM THESE PLANS, EXCEPT MINOR FIELD ADJUSTMENTS NEEDED TO MEET EXISTING FIELD CONDITIONS, SHALL FIRST BE APPROVED BY THE APPLICABLE AGENCY REPRESENTATIVE. ANY ALTERATION OR VARIANCE FROM THESE PLANS SHALL BE DOCUMENTED ON CONSTRUCTION FIELD PRINTS AND TRANSMITTED TO THE PROJECT ENGINEER.
14. CONTRACTOR SHALL PROVIDE THE NECESSARY EROSION PROTECTION TO MINIMIZE EROSION AND IMPACT TO ADJACENT PROPERTY. SEE EROSION/SEDIMENTATION CONTROL NOTES AND PLAN.
15. OPEN TRENCHES SHALL BE STRICTLY LIMITED TO A MAXIMUM OF 100 FEET WITHIN STREET RIGHT-OF-WAYS UNLESS LIMITED TO A LESSER AMOUNT BY PERMIT. NO TRENCHES WILL BE ALLOWED TO REMAIN OPEN OVER NIGHT.
16. CONTRACTOR SHALL MAINTAIN AND COORDINATE ACCESS TO ALL EFFECTED PROPERTIES.
17. TRILLIUM PARK BENCH MARK – OREGON CITY GPS CONTROL POINT #32 STATION "BY-PASS" ELEV. = 239.379
18. THE ENGINEER HAS NOT BEEN RETAINED OR COMPENSATED TO PROVIDE DESIGN AND CONSTRUCTION REVIEW SERVICES RELATING TO THE CONTRACTOR'S SAFETY PRECAUTIONS OR TO MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES REQUIRED FOR THE CONTRACTOR TO PERFORM HIS WORK.
19. BOUND UNDER SEPARATE COVER ARE TECHNICAL SPECIFICATIONS AND DETAILS WHICH WERE ADOPTED BY THE CITY OF OREGON CITY FOR USE ON THIS PROJECT. THOSE TECHNICAL SPECIFICATIONS AND DETAILS HAVE PRECEDENT OVER THE TECHNICAL SPECIFICATIONS AND DETAILS SHOWN ON THESE PLANS.

LEGEND

- EXISITING CURB AND GUTTER
- PROPOSED CURB AND GUTTER
- SS — PROPOSED SANITARY SEWER
- STM — PROPOSED STORM SEWER
- W — EXISTING WATER
- W — PROPOSED WATER
- MAN HOLE
- CATCH BASIN
- EXISTING POWER POLE
- CENTERLINE MONUMENT BOX
- SIDEWALK
- WHEELCHAIR RAMP

APPROVALS

The data on this map is the
BEST INFORMATION AVAILABLE
from the records of the City of Oregon City
- errors and omissions may exist.

REGISTERED PROFESSIONAL ENGINEER 5679 OREGON July 8, 1986 THOMAS L. TYE
Ex. - 6-96

FEB. 1996	3	AS BUILT	DRAWN MMM	DESIGNED TLT	CHECKED	
4/26/95	2	PER CITY REVIEW	SCALE 1" = 100'		DATE JANUARY, 1995	
4/10/95	1	PER CITY REVIEW & GENERAL PLAN REVISION	PLAN 94-350.1-1725		COVER.DWG	
DATE	NO.	REVISION				

COMPASS CORPORATION
ENGINEERING SURVEYING PLANNING
6564 S.E. LAKE ROAD
MILWAUKIE, OREGON 97222
(503) 653-9093 PHONE
(503) 653-9095 FAX

RIVERGATE DEVELOPMENT COMPANY
1900 DAVIS ROAD
OREGON CITY, OREGON 97045 PHONE: 656-1592

10025.00 COVER SHEET

1/8

10025.00

C:\94\350.1\COVER Mon Apr 10 12:25:47 1995

1. ASPHALT CONCRETE PAVEMENT (2 LIFTS) 1 1/2" CLASS "C" ON 1 1/2" CLASS "B"
2. SECOND LIFT TO BE PLACED AFTER 90% OF HOUSES CONSTRUCTED OR NO LATER THAN ONE YEAR FROM FIRST LIFT. COMPACT PER ODOT SPEC.
3. AGGREGATE BASE, 2" OF 3/4" - 0 LEVELING COURSE OVER 8" OF 1"-0 BASE.
4. SUBGRADE AND BASE ROCK SHALL BE COMPACTED TO 95% RELATIVE DENSITY PER AASHTO T-180.
5. STANDARD AND CONSTRAINED SECTIONS SHALL BE SYMETRICAL ABOUT THE CENTER LINE.

CURB RETURN DATA

NOTE: CURB RETURNS ARE PROFILES IN A CLOCKWISE DIRECTION AT ALL INTERSECTIONS.

CURB RETURN NO. 6	
PC 7+56.28 WAKE-ROBIN CIRCLE	236.78 T.C.
1/4 PT.	235.37 T.C.
1/2 PT.	233.49 T.C.
1/4 PT.	231.84 T.C.
PT 16+50.15 WAKE-ROBIN CIRCLE	231.12 T.C.
CURB RETURN NO. 7	
PC 16+50.15 WAKE-ROBIN CIRCLE	231.12 T.C.
1/4 PT.	230.88 T.C.
1/2 PT.	229.81 T.C.
1/4 PT.	228.63 T.C.
PT 8+34.28 WAKE-ROBIN CIRCLE	227.46 T.C.
CURB RETURN NO. 23	
PC PC 5+38.73 GILMAN PARK DRIVE	260.85 T.C.
1/4 PT.	260.17 T.C.
1/2 PT.	259.03 T.C.
1/4 PT.	257.93 T.C.
PT 0+32.82 HARRIET AVENUE	257.38 T.C.
CURB RETURN NO. 24	
PC PC 0+32.82 HARRIET AVENUE	257.38 T.C.
1/4 PT.	257.47 T.C.
1/2 PT.	257.17 T.C.
1/4 PT.	256.48 T.C.
PT 5+98.62 WAKE-ROBIN CIRCLE	255.57 T.C.
CURB RETURN NO. 27	
PC PC 1+13.73 GILMAN PARK DRIVE	274.86 T.C.
1/4 PT.	275.12 T.C.
1/2 PT.	275.20 T.C.
1/4 PT.	275.09 T.C.
PT 0+37.28 TRILLIAM PARK DRIVE	274.93 T.C.

CURVE DATA

NO.	RADIUS	DELTA	LENGTH	LOCATION
1.	100.00'	64-56-44	113.35'	CENTERLINE
2.	86.00'	64-56-44	97.48'	FACE OF CURB
3.	194.00'	16-32-24	56.00'	FACE OF CURB
4.	180.00'	16-32-24	51.96'	CENTERLINE
5.	166.00'	16-32-24	47.92'	FACE OF CURB
6.	25.00'	90-00-03	39.27'	FACE OF CURB
7.	25.00'	89-59-57	39.27'	FACE OF CURB
8.	56.00'	124-49-08	122.00'	FACE OF CURB
9.	70.00'	124-49-08	152.49'	CENTERLINE
10.	84.00'	51-16-59	75.18'	FACE OF CURB
11.	31.00'	20-58-31	11.35'	FACE OF CURB
12.	48.00'	110-50-05	92.85'	FACE OF CURB
13.	31.00'	20-58-30	11.35'	FACE OF CURB
14.	84.00'	4-39-04	6.82'	FACE OF CURB
15.	25.00'	38-58-50	17.01'	FACE OF CURB
16.	45.00'	181-59-53	142.94'	FACE OF CURB
17.	25.00'	39-25-51	17.20'	FACE OF CURB
18.	25.00'	103-35-12	45.20'	FACE OF CURB
19.	136.00'	41-35-42	98.73'	FACE OF CURB
20.	150.00'	41-35-42	108.90'	CENTERLINE
21.	164.00'	41-35-42	119.06'	FACE OF CURB
22.	114.00'	22-11-34	44.16'	FACE OF CURB
23.	25.00'	72-50-41	31.78'	FACE OF CURB
24.	25.00'	72-50-41	31.78'	FACE OF CURB
25.	114.00'	8-26-31	16.80'	FACE OF CURB
26.	39.00'	103-35-12	70.51'	CENTERLINE
27.	25.00'	87-25-00	38.14'	FACE OF CURB

The data on this map is the BEST INFORMATION AVAILABLE from the records of the City of Oregon City - errors and omissions may exist.

APPROVALS

TRILLIUM PARK ESTATES
TP 94-11

REGISTERED PROFESSIONAL ENGINEER 5679 OREGON July 8, 1986 THOMAS L. TYE
EX. - 6-96

DATE	NO.	REVISION
FEB. 1996	3	AS BUILT
4/26/95	2	PER CITY REVIEW
4/10/94	1	REVISED PER CITY REVIEW & GENERAL PLAN REVISIONS

DRAWN WLH | DESIGNED TRK | CHECKED
SCALE 1" = 50' | DATE FEBRUARY 1995
PLAN 94-350.1-1725 | TRILROAD.DWG

COMPASS CORPORATION
ENGINEERING SURVEYING PLANNING
6564 S.E. LAKE ROAD
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1900 DAVIS ROAD
OREGON CITY, OREGON 97045
PHONE: 656-1592

ROAD PLAN

10025.01

2 / 8

10025.01

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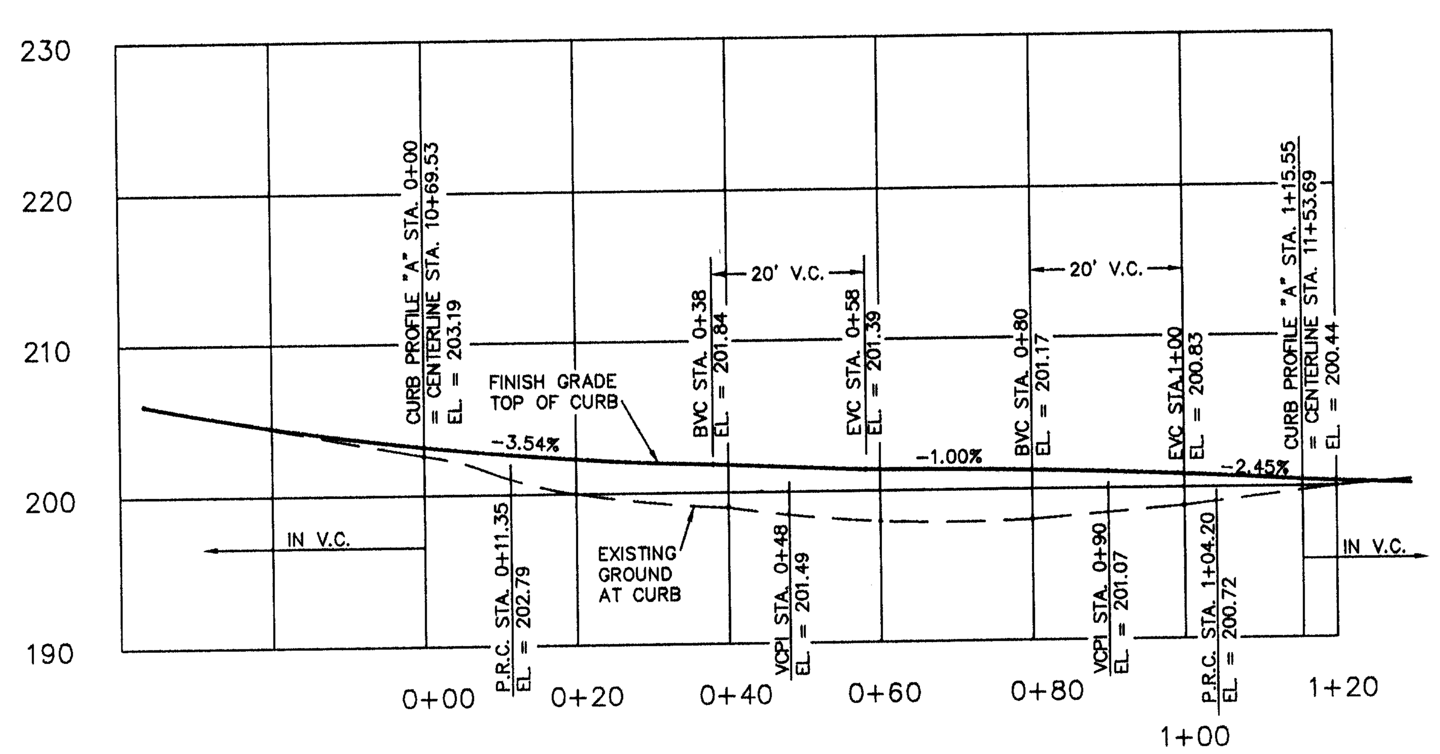
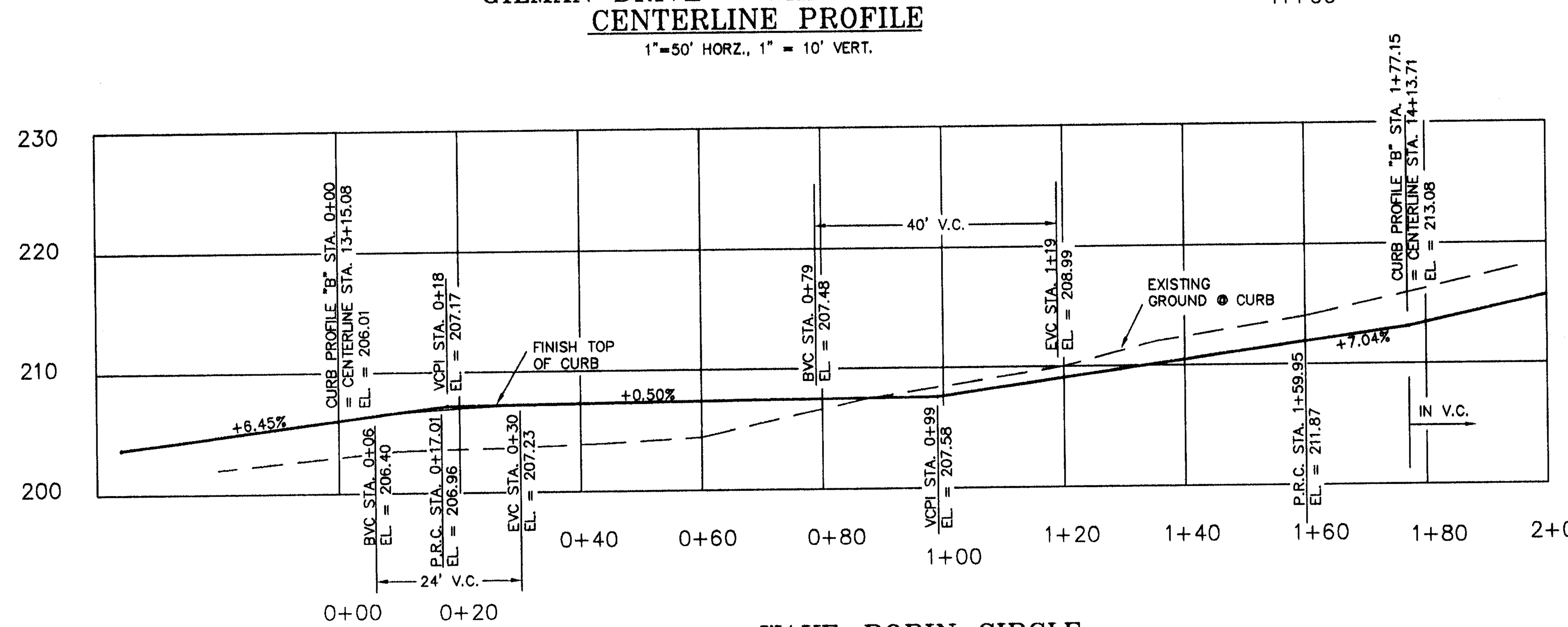
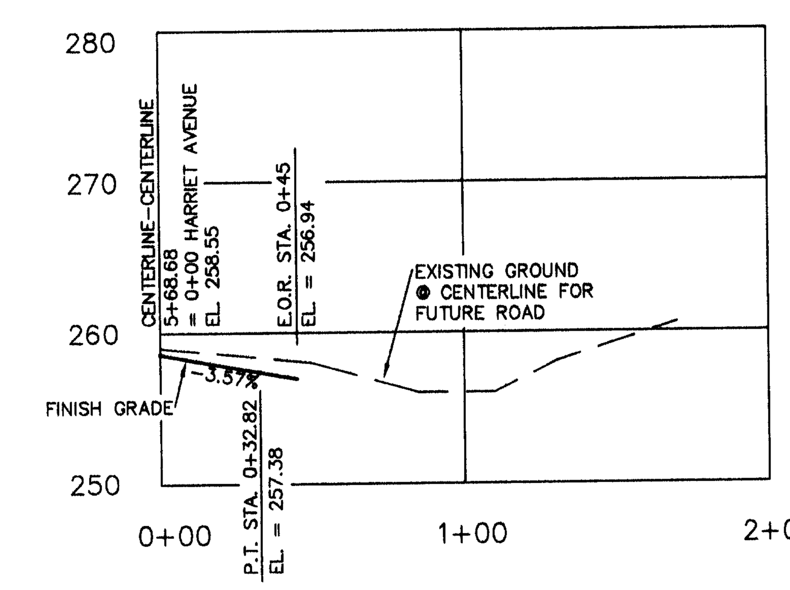
GILMAN DRIVE – WAKE–ROBIN CIRCLE
CENTERLINE PROFILE
1"=50' HORZ., 1" = 10' VERT.



WAKE–ROBIN CIRCLE
CURB PROFILE "A"
1" = 20' HORZ., 1" = 10' VERT.



WAKE–ROBIN CIRCLE
CURB PROFILE "B"
1"=20' HORZ., 1" = 10' VERT.



HARRIET AVENUE PROFILE
1"=50' HORZ., 1" = 10' VERT.

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APPROVALS

REGISTERED PROFESSIONAL ENGINEER 5679 OREGON July 8, 1986 THOMAS L. TYE
EX. - 6-96

TRILLIUM PARK ESTATES
TP94-11

10025.02

C:\94\350-1\ROAD-PRO Mon Apr 10 09:07:45 1995

DATE	NO.	REVISION
FEB. 1996	2	AS BUILT
4/10/95	1	PER CITY REVIEW

DRAWN WLH	DESIGNED TK	CHECKED
SCALE 1" = 50'	DATE	JAN 1995
PLAN 94-350.1-1725		ROAD-PRO.DWG

COMPASS CORPORATION
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10025.02

ROAD PROFILES

3 / 8

The data on this map is the
BEST INFORMATION AVAILABLE
from the records of the City of Oregon City
- errors and omissions may exist.

TRILLIUM PARK ESTATES
TP 94-11

REGISTERED PROFESSIONAL ENGINEER 5679 OREGON July 8, 1996 THOMAS L. TYE

EX. - 6-96

DATE	NO.	REVISION
FEB. 1996	3	AS BUILT
4/26/95	2	PER CITY REVIEW
4/6/95	1	PER CITY REVIEW & GENERAL PLAN REVISION

DRAWN WLH | DESIGNED TRK | CHECKED
SCALE 1" = 50' | DATE FEBRUARY 1995
PLAN 94-350.1-1725 | STORM.DWG

COMPASS CORPORATION
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PHONE: 656-1592

10025.03
STORM PLAN
4 / 8

C:\94\350-1\STORM Tue Apr 11 09:26:21 1995
10025.03

FEB. 1996	4	AS BUILT
5-10-95	3	Add ANCHOR WALLS -15 SPACE
4/26/95	2	PER CITY REVIEW
4/5/95	1	REVISED PER CITY REVIEW & GEN. PLAN REVISION
DATE	NO.	REVISION

DRAWN WLH | DESIGNED TRK | CHECKED
SCALE 1" = 50' | DATE JAN 1995
PLAN 94-350.1-1725 | STM-PRO.DWG

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RIVERGATE DEVELOPMENT COMPANY
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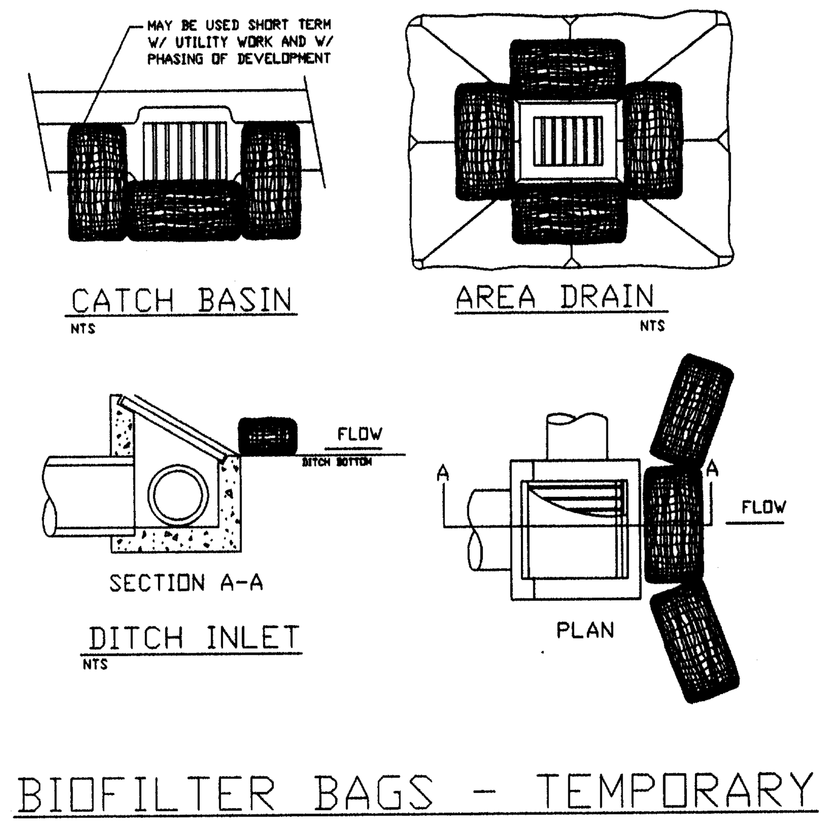
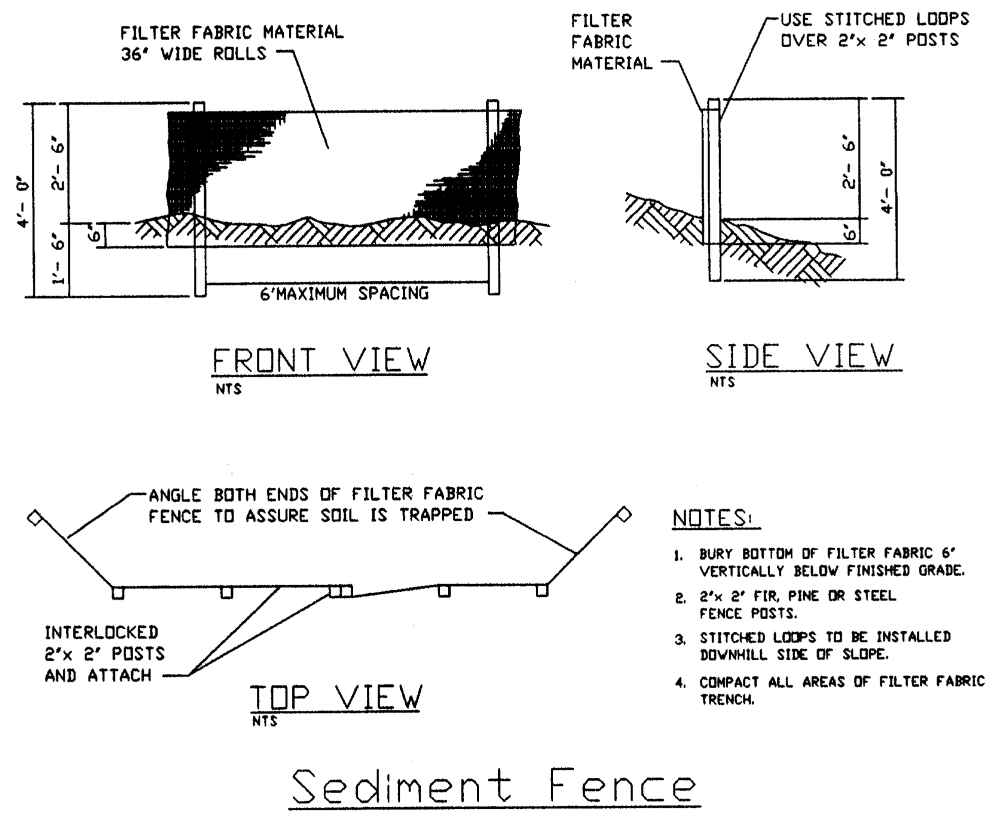
OREGON CITY, OREGON 97045 PHONE: 656-1592

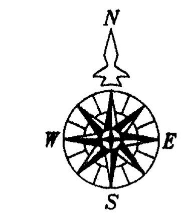
STORM PROFILES

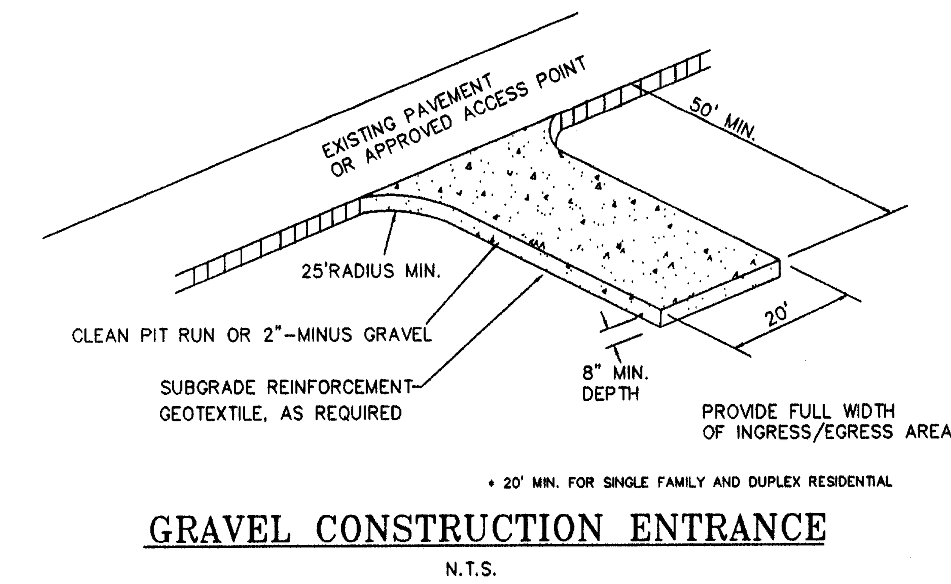
10025.04

5 / 8



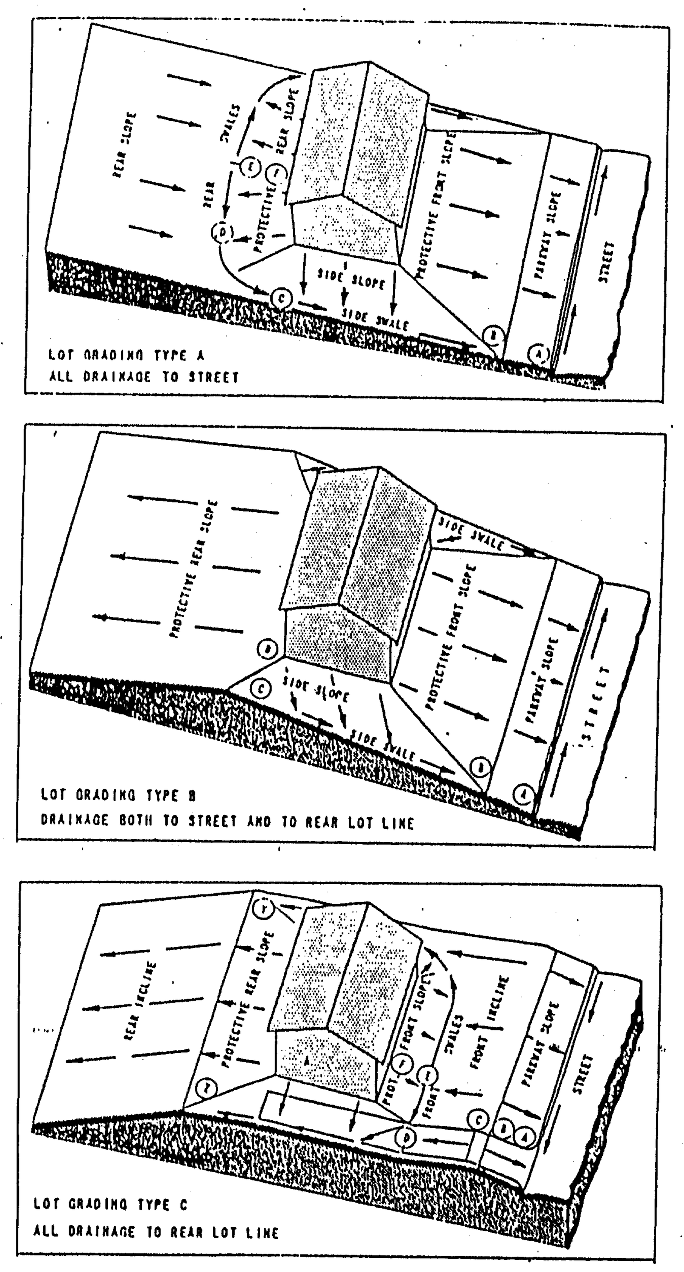


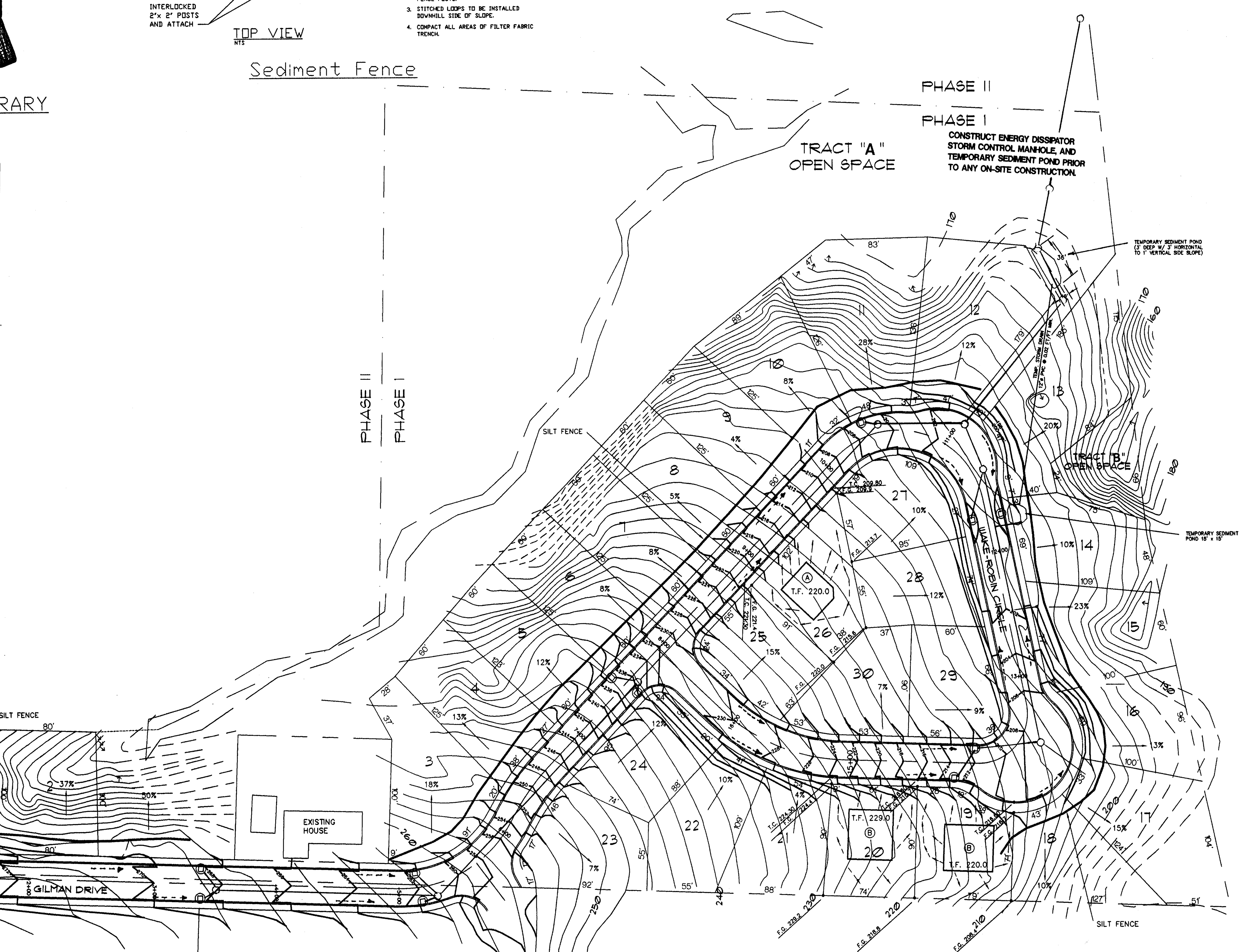




LEGEND

(dashed arrow)	DRAINAGE ARROW
8%	SLOPE ARROW
(rectangle)	BUILDING ENVELOPE
(B)	LOT GRADING TYPE
8	LOT NUMBER
F.G. 208.4	FINISH GRADE
T.F. 215.5	TOP OF FOUNDATION ELEVATION
T.C. 275.70	TOP OF CURB ELEVATION
(line)	EXISTING CONTOUR
(dashed line)	EXISTING CITY CONTOUR
(line)	FINISH GRADE CONTOUR
(line)	SILT FENCE
(circle)	INLET/CB PROTECTION



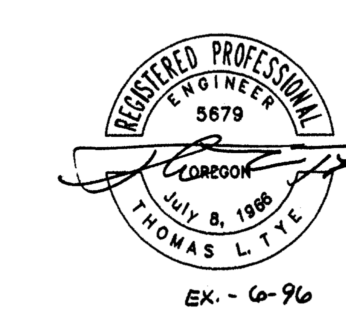


RESIDENTIAL LOT GRADING NOTES

1. GRADING OF RESIDENTIAL LOTS SHALL BE PER THE CITY'S DEVELOPMENT SERVICES DEPARTMENT POLICY NO. 21, "RESIDENTIAL LOT GRADING CRITERIA" UNLESS OTHERWISE APPROVED.
2. FINAL LOT GRADING IS THE RESPONSIBILITY OF THE INDIVIDUAL BUILDING PERMIT HOLDER/OWNER UNLESS OTHERWISE NOTED.
3. THE BUILDING ENVELOPES SHOWN ARE GENERIC, AND OTHER ENVELOPES ARE POSSIBLE PER THE CITY'S ZONING CODE.
4. THIS GRADING PLAN IS BASED ON THE CITY'S CRITERIA, AND MAYBE SUBMITTED FOR APPROVAL.
5. THE "LOT GRADING CONTROL LINE:" IS THE CRITICAL PATH TO DETERMINE THE TOP OF FOUNDATION ELEVATION BASED ON THE CITY'S "DESIGN CRITERIA TO DETERMINE GRADING CONTROL LINE".
6. THE "DESIGN CRITERIA TO DETERMINE GRADING CONTROL LINE" ARE:

   -PARKWAY SLOPE 2%
   -SWALE SLOPE 2% PREFERRED
   -SWALE SLOPE 1% MINIMUM
   -PROTECTIVE SLOPE MINIMUM 6 INCHES WITHIN FIRST TEN FEET OF BUILDING MINIMUM 8 INCHES ABOVE FINISHED GROUND ELEVATION
   -MAXIMUM DRIVEWAY SLOPE - 14%
   -MAXIMUM CHANGE IN DRIVEWAY - 12% FOR ANY TEN FOOT DISTANCE
7. LOTS THAT SHOW A TOP OF FOUNDATION 3.0 FEET HIGHER THAN THE AVERAGE TOP OF CURB ALONG THEIR FRONTAGE WILL EXCEED THE MAXIMUM DRIVEWAY SLOPE OF 14 PERCENT. THOSE LOTS SHOULD INDIVIDUALLY BE DESIGNED TO ACCOMMODATE THE HOUSE PLAN AND ELEVATIONS OF THAT LOT.

APPROVALS



The data on this map is the BEST INFORMATION AVAILABLE from the records of the City of Oregon City - errors and omissions may exist.

10025.05

TRILLIUM PARK ESTATES
TP 94-11

DATE	NO.	REVISION
FEB. 1996	4	AS BUILT
11-27-95	3	PER CITY REVIEW
4/26/95	2	PER CITY REVIEW
4/10/95	1	REVISION PER CITY REVIEW & GENERAL PLAN REVISION

DRAWN WLH | DESIGNED TRK | CHECKED
SCALE 1" = 50' | DATE FEBRUARY 1995
PLAN 94-350.1-1725 | GRADE.DWG

COMPASS CORPORATION
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MR. JIM BEAN
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GRADING & EROSION CONTROL PLAN

6 / 8

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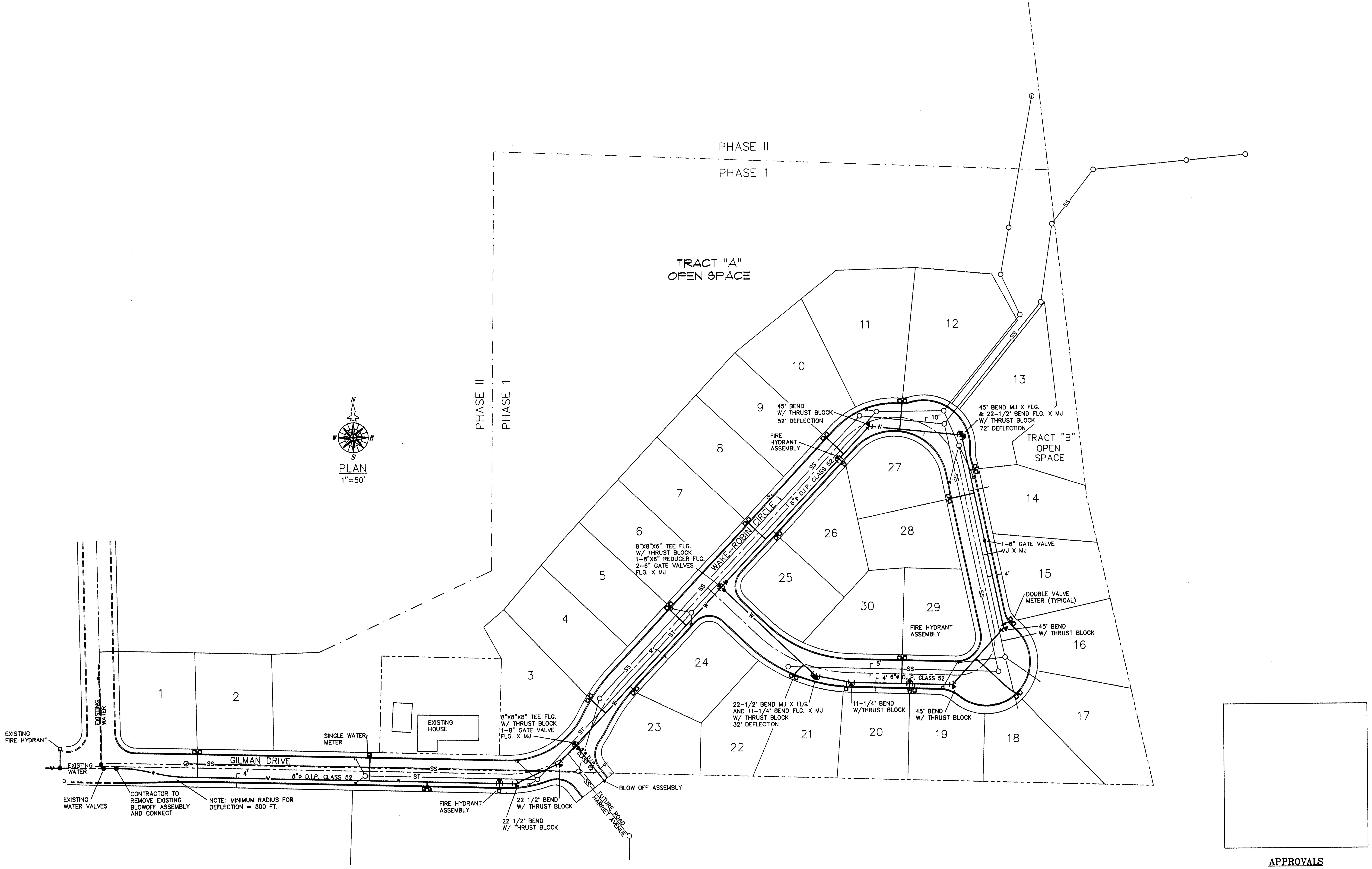
Item #2.



APPROVALS

The data on this map is the BEST INFORMATION AVAILABLE from the records of the City of Oregon City - errors and omissions may exist.

REGISTERED PROFESSIONAL ENGINEER 5879 OREGON July 8, 1986 THOMAS L. TYE
EX. 6-96

TRILLIUM PARK ESTATES
TP94-11

DATE	NO.	REVISION
FEB. 1996	3	AS BUILT
4/26/95	2	PER CITY REVIEW
4/6/95	1	PER CITY REVIEW & GENERAL PLAN REVISION

DRAWN WLH	DESIGNED TRK	CHECKED	
SCALE 1" = 50'	DATE JAN 1995		
PLAN 94-350.1-1725	WATER.DWG		

COMPASS CORPORATION
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1900 DAVIS ROAD
OREGON CITY, OREGON 97045 PHONE 656-1592

WATER PLAN
10025.06
7 / 8

10025.06
C:\94\350-1\WATER Mon Apr 10 15:21:23 1995

The data on this map is the
BEST INFORMATION AVAILABLE
from the records of the City of Oregon City
- errors and omissions may exist.

10025.07

TRILLIUM PARK ESTATES
TP94-11

REGISTERED PROFESSIONAL ENGINEER 5679 OREGON July 8, 1986 THOMAS L. LYTE
EX. - 6-96

DATE	NO.	REVISION
FEB. 1996	2	AS BUILT
4/10/95	1	PER CITY REVIEW & GENERAL PLAN REVISION

DRAWN WLH | DESIGNED TRK | CHECKED
SCALE 1" = 50' | DATE FEB 1995
PLAN 94-350.1-1725 | SAN-2.DWG

COMPASS CORPORATION
ENGINEERING SURVEYING PLANNING
6564 S.E. LAKE ROAD
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PHONE: 656-1592

SANITARY SEWER PLAN & PROFILE

8 / 8

10025.07

94350.1\SAN-2 Fri Feb 23 14:00:09 1996 KMT

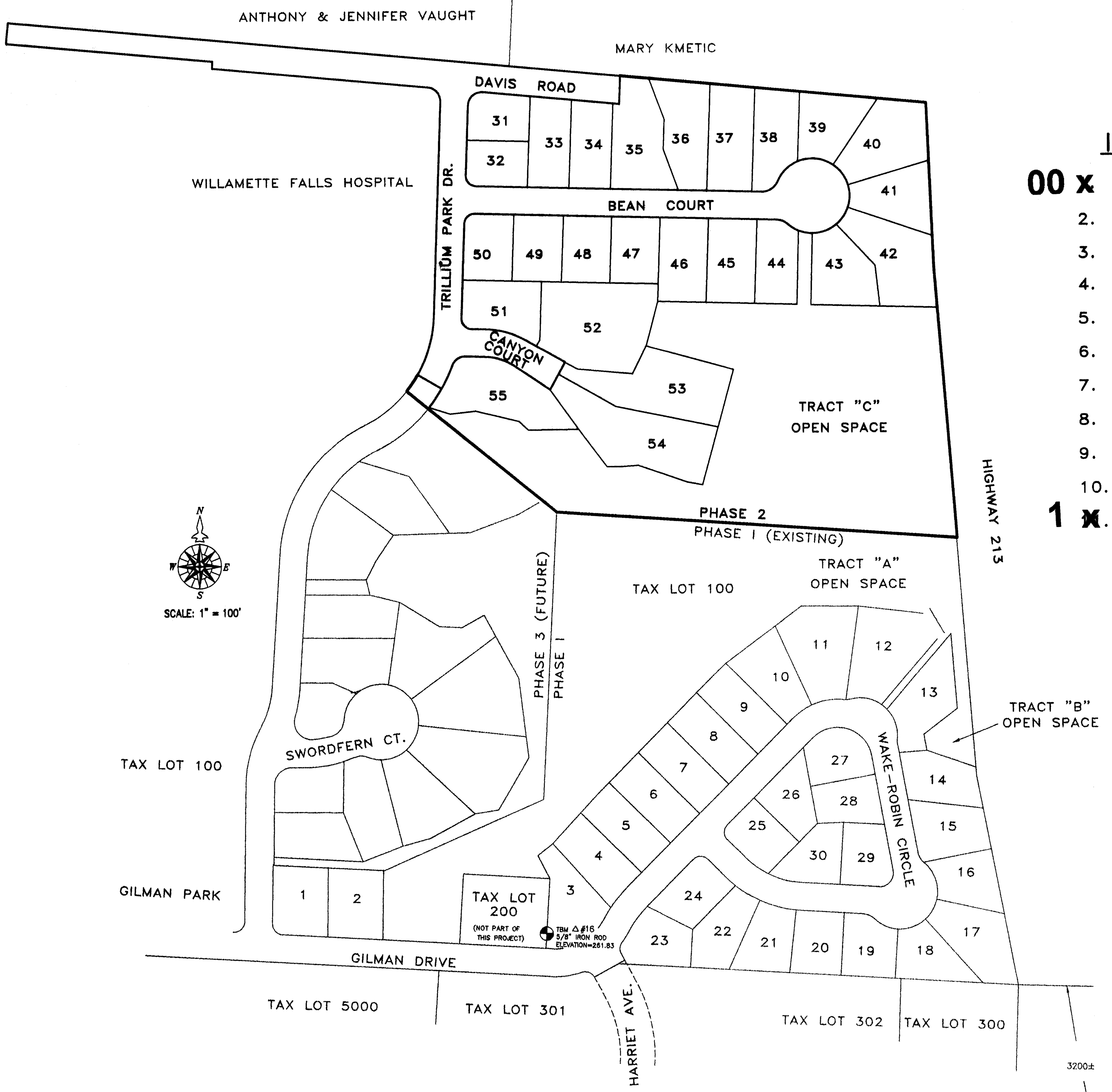
Item #2.

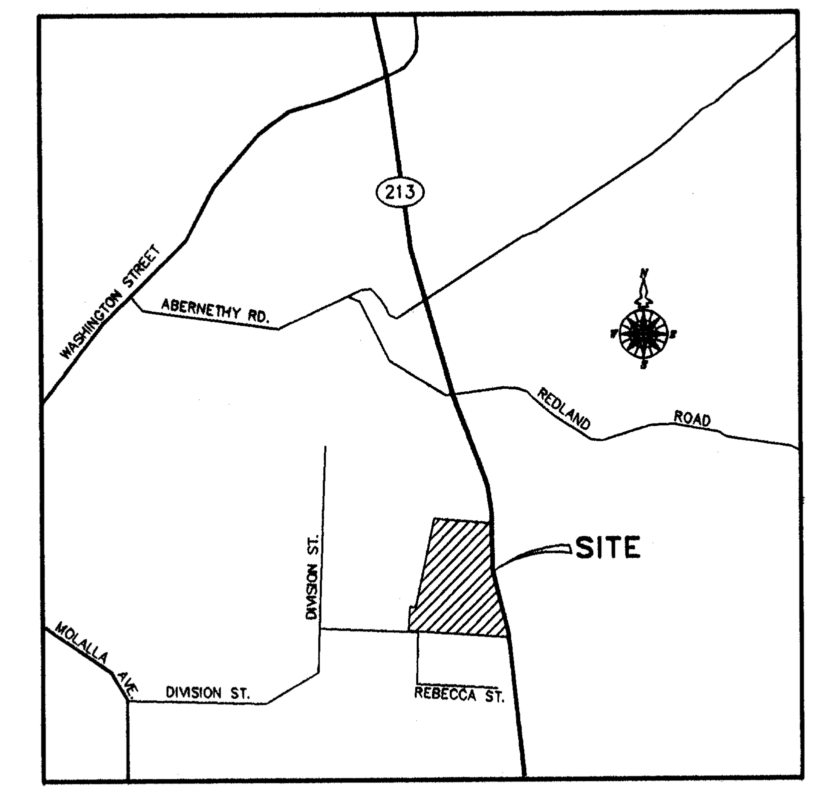
10090.00

TRILLIUM PARK ESTATES

PHASE 2

MAP 2S-2E-32 AA & 32AD, TL 100, 300, 301, 302, & 304
CITY OF OREGON CITY, CLACKAMAS COUNTY
CITY PLANNING FILE NO. PD93-01/TP94-11





VICINITY MAP

N. T. S.

INDEX

DEVELOPER

RIVERGATE DEVELOPMENT COMPANY
1900 DAVIS ROAD
OREGON CITY, OREGON 97045
PHONE: 656-1592

ENGINEER

COMPASS CORPORATION
6564 S.E. LAKE ROAD
MILWAUKIE, OREGON 97222
PHONE: 653-9093

NOTES

1. ALL WORK AND MATERIALS SHALL CONFORM TO 1990 EDITION OREGON CHAPTER A.P.W.A. STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION AS ADOPTED AND MODIFIED BY THE CITY OF OREGON CITY.
2. CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS PRIOR TO CONSTRUCTION AND SHALL ARRANGE FOR THE RELOCATION OF ANY IN CONFLICT WITH THE PROPOSED CONSTRUCTION.
3. CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS AND LICENSES BEFORE STARTING CONSTRUCTION. A CITY BUSINESS LICENSE IS REQUIRED.
4. EXISTING UTILITY LOCATIONS SHOWN ARE APPROXIMATE ONLY AND MUST BE VERIFIED BY THE CONTRACTOR. ADDITIONAL UNDERGROUND UTILITIES MAY EXIST.
5. CONTRACTOR SHALL NOTIFY THE PROJECT ENGINEER AND THE CITY OF OREGON CITY INSPECTOR 48 HOURS BEFORE STARTING CONSTRUCTION AND 24 HOURS BEFORE RESUMING WORK AFTER SHUTDOWNS, EXCEPT FOR NORMAL RESUMPTION OF WORK FOLLOWING SATURDAYS, SUNDAYS OR HOLIDAYS. CONTRACTOR SHALL NOTIFY THE PROJECT ENGINEER AND THE CITY OF OREGON CITY SO AS TO ELIMINATE UNNECESSARY INSPECTION TIME.
6. CONTRACTOR SHALL REMOVE AND DISPOSE OF TREES, STUMPS, BRUSH, ROOTS, TOPSOIL, AND OTHER MATERIAL IN THE RIGHT-OF-WAYS, EASEMENTS, AND WHERE INDICATED ON THE PLANS. MATERIAL SHALL BE DISPOSED OF IN SUCH A MANNER AS TO MEET LOCAL REGULATIONS.
7. CONSTRUCTION VEHICLES SHALL PARK ON THE CONSTRUCTION SITE. HOURS OF CONSTRUCTION SHALL BE 7:00 AM TO 6:00 PM, MONDAY THROUGH FRIDAY, AND 9:00 AM TO 6:00 PM ON SATURDAY. CONSTRUCTION PROHIBITED ON SUNDAY.
8. CONTRACTOR SHALL KEEP AND MAINTAIN A CURRENT SET OF DRAWINGS FOR THE PROJECT ENGINEER SHOWING AS CONSTRUCTED DATA. THE PROJECT ENGINEER SHALL SUBMIT TWO SETS OF AS-BUILT/RECORD DRAWING MYLARS TO THE CITY OF OREGON CITY.
9. CONTRACTOR SHALL SUBMIT A MAINTENANCE BOND AS REQUIRED TO THE CITY OF OREGON CITY.
10. CONTRACTOR SHALL ERECT AND MAINTAIN TRAFFIC CONTROL PER THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", PART VI, CONSTRUCTION AND MAINTENANCE, AS ADOPTED AND MODIFIED BY ODOT. THE CONTRACTOR SHALL SUBMIT A PLAN FOR THE TRAFFIC CONTROL TO APPROPRIATE CITY, COUNTY, AND STATE PERSONNEL FOR APPROVAL.
11. CONTRACTOR SHALL PERFORM ALL WORK NECESSARY TO COMPLETE THIS PROJECT IN ACCORDANCE WITH THE PLANS INCLUDING SUCH INCIDENTALS AS MAY BE NECESSARY TO MEET APPLICABLE AGENCY REQUIREMENTS AND OTHERS AS NECESSARY TO PROVIDE A COMPLETE PROJECT.
12. CONTRACTOR SHALL KEEP AN APPROVED SET OF PLANS ON THE PROJECT SITE AT ALL TIMES.
13. ANY ALTERATION OR VARIANCE FROM THESE PLANS, EXCEPT MINOR FIELD ADJUSTMENTS NEEDED TO MEET EXISTING FIELD CONDITIONS, SHALL FIRST BE APPROVED BY THE APPLICABLE AGENCY REPRESENTATIVE. ANY ALTERATION OR VARIANCE FROM THESE PLANS SHALL BE DOCUMENTED ON CONSTRUCTION FIELD PRINTS AND TRANSMITTED TO THE PROJECT ENGINEER.
14. CONTRACTOR SHALL PROVIDE THE NECESSARY EROSION PROTECTION TO MINIMIZE EROSION AND IMPACT TO ADJACENT PROPERTY. SEE EROSION/SEDIMENTATION CONTROL NOTES AND PLAN.
15. OPEN TRENCHES SHALL BE STRICTLY LIMITED TO A MAXIMUM OF 100 FEET WITHIN STREET RIGHT-OF-WAYS UNLESS LIMITED TO A LESSER AMOUNT BY PERMIT. NO TRENCHES WILL BE ALLOWED TO REMAIN OPEN OVER NIGHT.
16. CONTRACTOR SHALL MAINTAIN AND COORDINATE ACCESS TO ALL EFFECTED PROPERTIES.
17. TRILLIUM PARK BENCH MARK - OREGON CITY GPS CONTROL POINT #32 STATION "BY-PASS" ELEV. = 239.379.
18. THE ENGINEER HAS NOT BEEN RETAINED OR COMPENSATED TO PROVIDE DESIGN AND CONSTRUCTION REVIEW SERVICES RELATING TO THE CONTRACTOR'S SAFETY PRECAUTIONS OR TO MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES REQUIRED FOR THE CONTRACTOR TO PERFORM HIS WORK.
19. BOUND UNDER SEPARATE COVER ARE TECHNICAL SPECIFICATIONS AND DETAILS WHICH WERE ADOPTED BY THE CITY OF OREGON CITY FOR USE ON THIS PROJECT. THOSE TECHNICAL SPECIFICATIONS AND DETAILS HAVE PRECEDENT OVER THE TECHNICAL SPECIFICATIONS AND DETAILS SHOWN ON THESE PLANS.
20. ALL STORM SEWER AND SANITARY SEWER LINES SHALL BE VIDEO INSPECTED BY THE CONTRACTOR PER APWA STANDARD SPECIFICATIONS.
21. TEMPORARILY RESTORE ALL PAVEMENT CUTS SAME DAY OPENING WITH HOT OR COLD AC MIX. CONTRACTOR/APPLICANT SHALL MAINTAIN THESE CUTS UNTIL WORK IS COMPLETED.

LEGEND

- EXISTING CURB AND GUTTER
- PROPOSED CURB AND GUTTER
- SAN — PROPOSED SANITARY SEWER
- STM — PROPOSED STORM SEWER
- W — EXISTING WATER
- W — PROPOSED WATER
- NEW SANITARY MANHOLE
- NEW STORM MANHOLE
- CATCH BASIN
- EXISTING POWER POLE
- CENTERLINE MONUMENT BOX
- SIDEWALK BY HOME BUILDER
- SIDEWALK BY CONTRACTOR
- WHEELCHAIR RAMP

The data on this map is the BEST INFORMATION AVAILABLE from the records of the City of Oregon City - errors and omissions may exist.

AS-BUILT
DATE: 04/06/98

APPROVALS

REGISTERED PROFESSIONAL ENGINEER 7120 OREGON JULY 16, 1971 BRUCE D. GOLDSON
EXPIRES: 6/30/99
SIGNATURE DATE: 04/06/98

PD 93-01

COVER

DATE	NO.	REVISION
04/06/98	3	AS-BUILT
01/14/97	2	LOT ADJUSTMENT
10/18/96	1	PER CITY REVIEW

DRAWN BJS | DESIGNED TLT | CHECKED TLT
SCALE 1" = 100' | DATE AUG, 1996
PLAN 93-350.5-1725 | 350CIVIL .DWG

COMPASS CORPORATION
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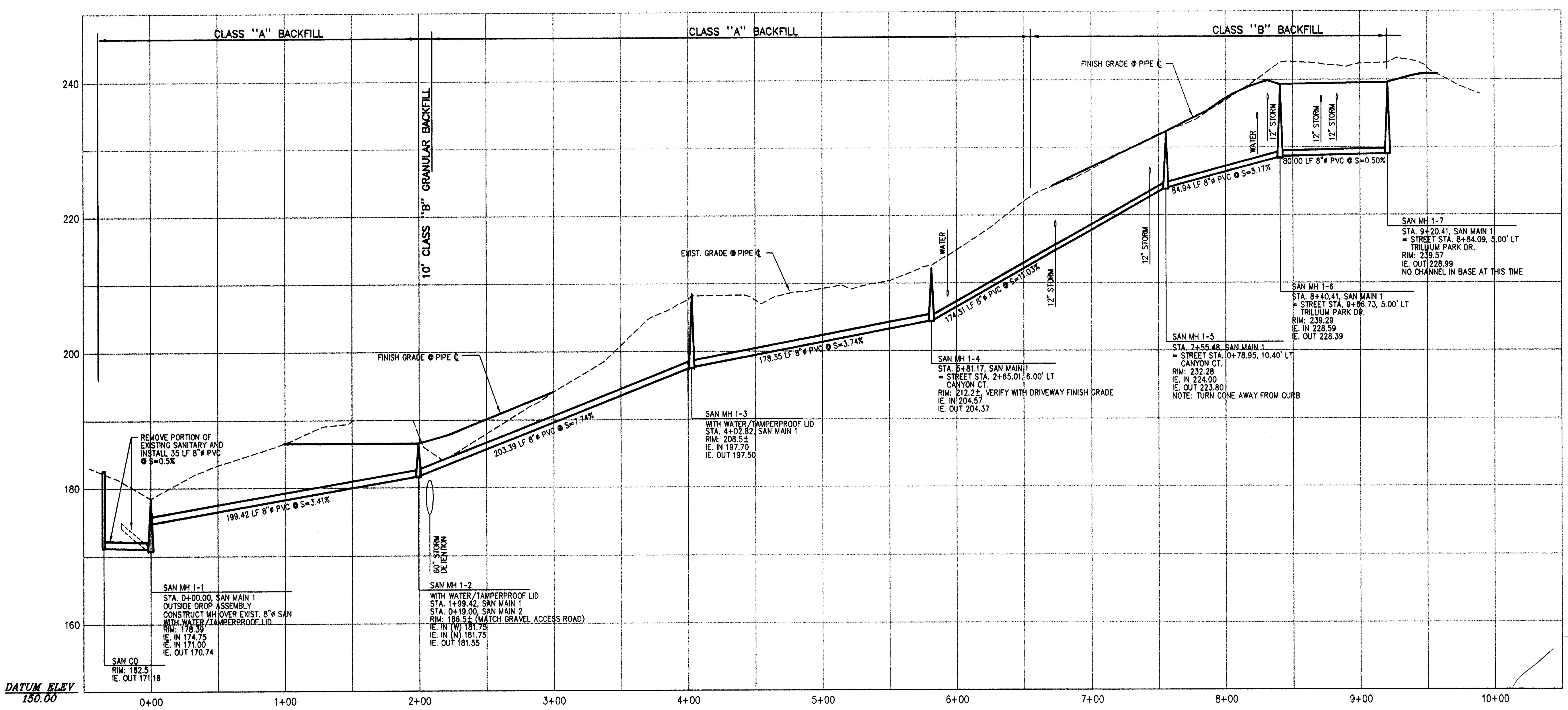
656-1592

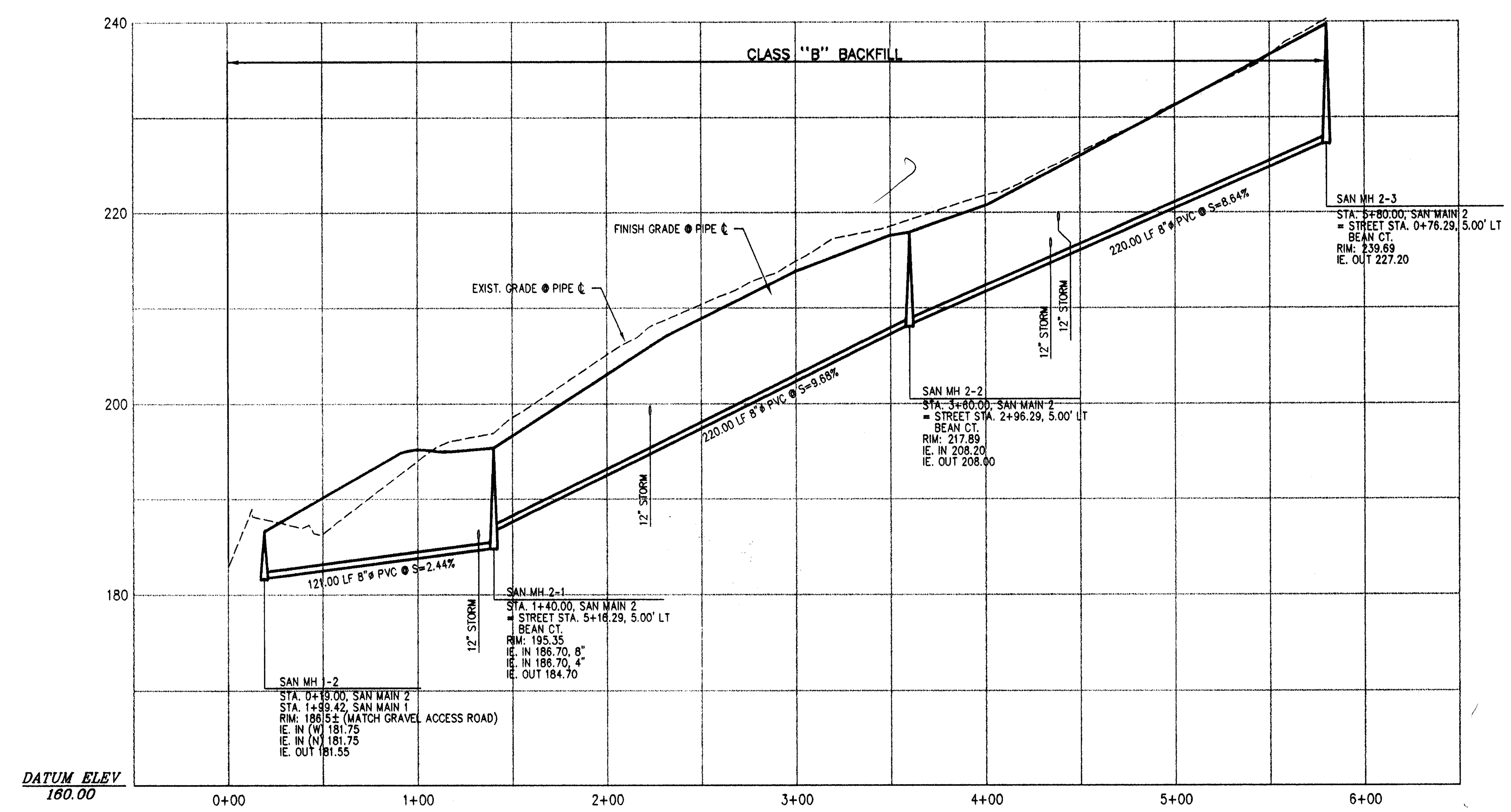
TRILLIUM PARK ESTATES - PHASE 2
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON
10090.00
01 / 11

C:\0350-2\350COVER Mon Apr 6 16:21:43 1998 BARBARA



SANITARY MAIN 1 PROFILE (1 / 11)

SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL



APPROVALS

The data on this map is the BEST INFORMATION AVAILABLE from the records of the City of Oregon City - errors and omissions may exist.

SANITARY MAIN 2 PROFILE (2 / 11)

SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL

REGISTERED PROFESSIONAL ENGINEER 7120 OREGON July 16, 1971 BRUCE D. GOLDSON

EXPIRES: 6/30/99
SIGNATURE DATE: 04/06/98

SANITARY PROFILES

DATE	NO.	REVISION
04/06/98	4	AS-BUILT
01/14/97	3	GENERAL REVISIONS
11/27/96	2	PER CITY REVIEW & GENERAL REVISIONS
10/21/96	1	PER CITY REVIEW

DRAWN BJS | DESIGNED TLT | CHECKED TLT
SCALE 1" = 50' | DATE AUG. 1996
PLAN 93-350.2-1725 | VIEW = PROF1 350PFSAN .DWG

COMPASS CORPORATION
ENGINEERING SURVEYING PLANNING
6564 S.E. LAKE ROAD MILWAUKIE, OREGON 97222
(503) 653-9093 PHONE
(503) 653-9095 FAX

RIVERGATE DEVELOPMENT COMPANY
1900 DAVIS ROAD
OREGON CITY, OREGON 97045
656-1592

TRILLIUM PARK ESTATES - PHASE 2
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON
10090.01

1 / 11

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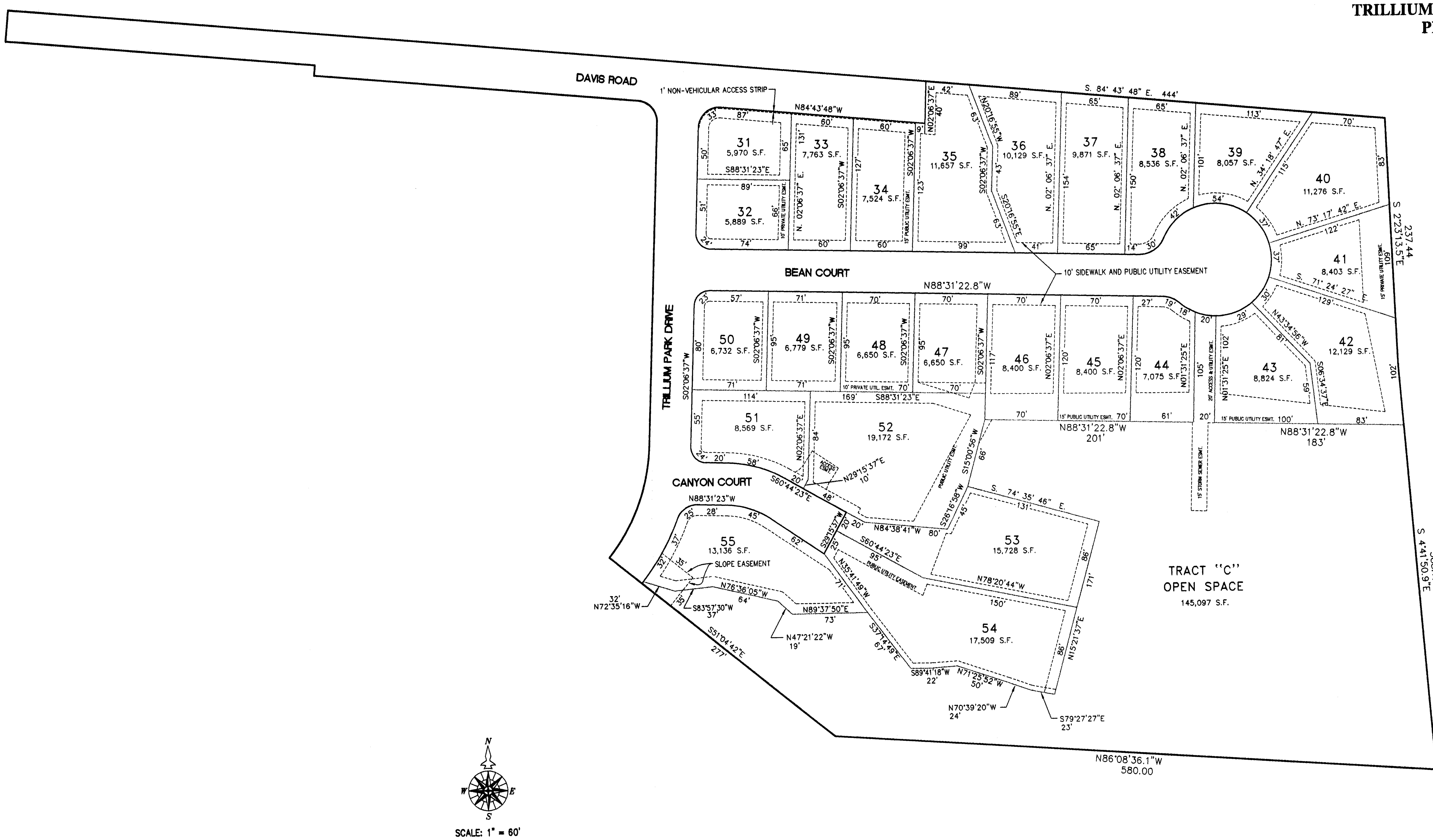
TRILLIUM PARK ESTATES
PHASE 2



NOTE:

THIS PLAT IS AN EXCERPT OF THE ANTICIPATED FINAL PLAT TO BE RECORDED. THE ACTUAL FINAL PLAT TAKES PRECEDENCE OVER THIS DRAWING.

The data on this map is the BEST INFORMATION AVAILABLE from the records of the City of Oregon City - errors and omissions may exist.

AS-BUILT
DATE: 04/06/98

PRELIMINARY PLAT

DATE	NO.	REVISION
04/06/98	4	AS-BUILT
01/14/97	3	PER CITY REVIEW - SLOPE ESMT. ON LOT 55
11/22/96	2	PER CITY REVIEW
10/18/96	1	PER CITY REVIEW

DRAWN BJS	DESIGNED TLT	CHECKED TLT
SCALE 1" = 60'	DATE AUG. 1996	
PLAN 93-350.2-1725	350PLAT2 .DWG	

COMPASS CORPORATION
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OREGON CITY, OREGON 97045
PHONE: 656-1592

TRILLIUM PARK ESTATES - PHASE 2
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON
10090.02

2/11

C:\0350-2\350PLAT2 Thu Apr 9 08:23:58 1998 BARBARA

CURVE DATE						
CURVE	RADIUS	LENGTH	TANGENT	CHORD	BEARING	DELTA
C1	100.00'	48.49'	24.73'	48.02'	S74° 37' 53"E	27° 47' 00"
C2	25.00'	31.11'	17.93'	29.14'	S55° 49' 24"W	71° 18' 26"
C3	25.00'	39.55'	25.28'	35.55'	N43° 12' 23"W	90° 38' 00"
C4	25.00'	38.99'	24.73'	35.16'	S46° 47' 37"W	89° 22' 00"
C5	25.00'	39.55'	25.28'	35.55'	N43° 12' 23"W	90° 38' 00"
C6	25.00'	40.65'	26.42'	36.32'	S48° 41' 25"W	93° 09' 35"
C7	25.00'	30.81'	17.70'	28.90'	S56° 10' 26"W	70° 36' 22"
C8	45.00'	227.09'	32.01'	52.17'	S14° 33' 30"E	289° 08' 29"
C9	25.00'	16.81'	8.74'	16.50'	N72° 22' 29"W	32° 17' 48"
C10	86.00'	48.48'	24.90'	47.84'	S70° 49' 29"E	35° 23' 48"
C12	25.00'	37.71'	24.45'	34.96'	N42° 15' 03"W	88° 43' 21"

REVISED 8/11/97 — CURB RETURN GRADES

C12 6+12.72, 14.00' RT DAVIS RD.	C6 13+03.84, 14.00' RT TRILLIM RD.	C2 9+34.03, 14.00' RT TRILLIUM RD.	C3 0+42.60, 14.00' LT CANYON CT.
START 232.55 TC.	START 231.50 TC.	START 238.96 TC.	START 236.98 TC.
1/4△ 232.21 TC.	1/4△ 230.90 TC.	1/4△ 239.00 TC.	1/4△ 237.99 TC.
1/2△ 231.53 TC.	1/2△ 230.74 TC.	1/2△ 238.78 TC.	1/2△ 239.16 TC.
1/4△ 231.08 TC.	1/4△ 230.64 TC.	1/4△ 238.47 TC.	1/4△ 240.23 TC.
END 231.38 TC.	END 230.44 TC.	END 238.00 TC.	END 240.98 TC.
13+05.56, 14.00' LT TRILLIUM RD.	6+91.56, 14.00' RT DAVIS RD.	0+29.96, 14.00' RT CANYON CT.	10+01.12, 14.00' RT TRILLIUM DR.

C4 11+27.83, 14.00' RT TRILLIUM RD.	C5 0+39.43, 14.00' LT BEAN CT.
START 243.82 TC.	START 241.92 TC.
1/4△ 243.51 TC.	1/4△ 241.98 TC.
1/2△ 242.90 TC.	1/2△ 241.76 TC.
1/4△ 242.28 TC.	1/4△ 241.27 TC.
END 241.94 TC.	END 240.62 TC.
0+38.57, 14.00' RT BEAN CT.	12+05.83, 14.00' RT TRILLIUM DR.

The data on this map is the
BEST INFORMATION AVAILABLE
from the records of the City of Oregon City
- errors and omissions may exist.

AS-BUILT
DATE: 04/06/98

APPROVALS

STREET PLAN

DATE	NO.	REVISION
04/06/98	4	AS-BUILTS
01/14/97	3	PER GENERAL REVISION - CURB RETURN 12 GRADES
11/27/96	2	PER CITY REVIEW
10/21/96	1	PER CITY REVIEW

DRAWN BJS | DESIGNED TLT | CHECKED TLT
SCALE 1" = 50' | DATE AUG, 1996
PLAN 93-350.2-1725 | VIEW = STORM 350CIVIL .DWG

COMPASS CORPORATION
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6564 S.E. LAKE ROAD
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RIVERGATE DEVELOPMENT COMPANY
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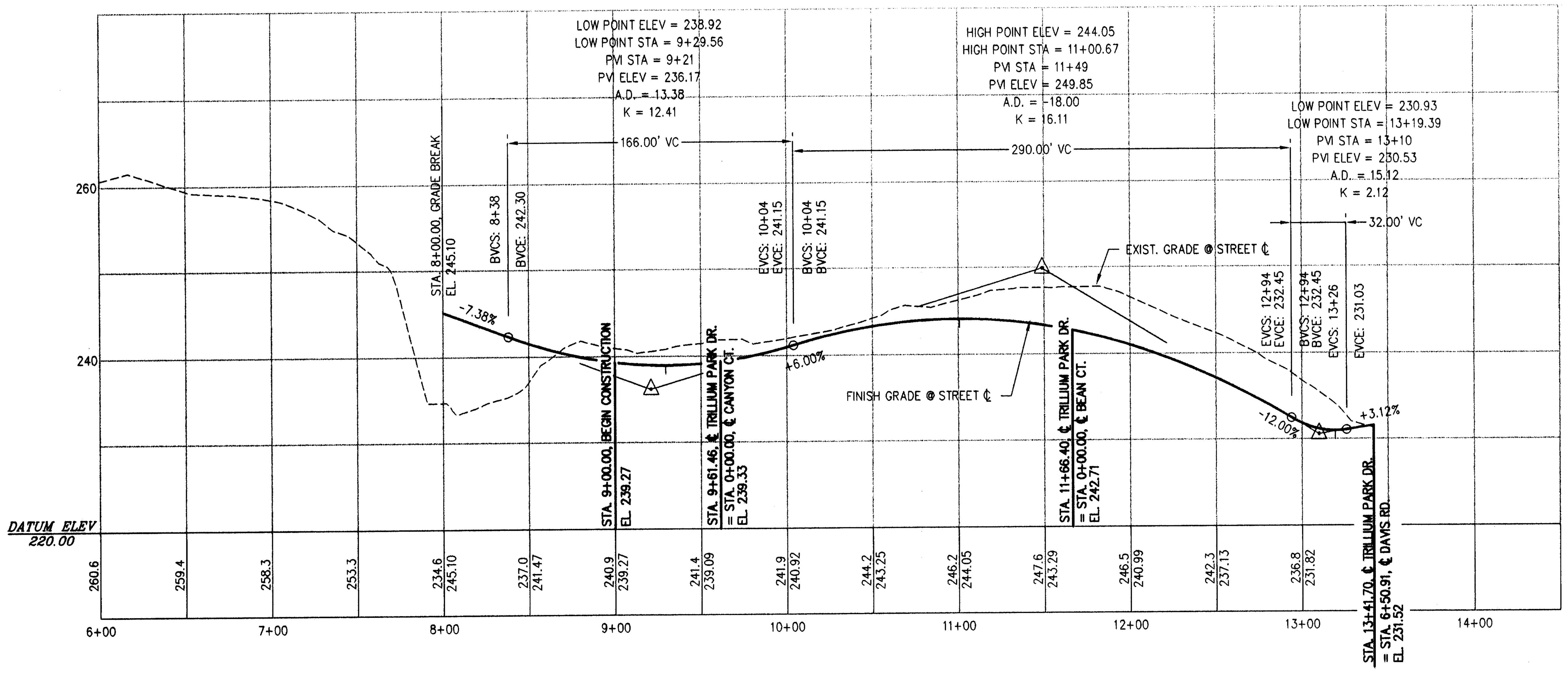
OREGON CITY, OREGON 97045
656-1592

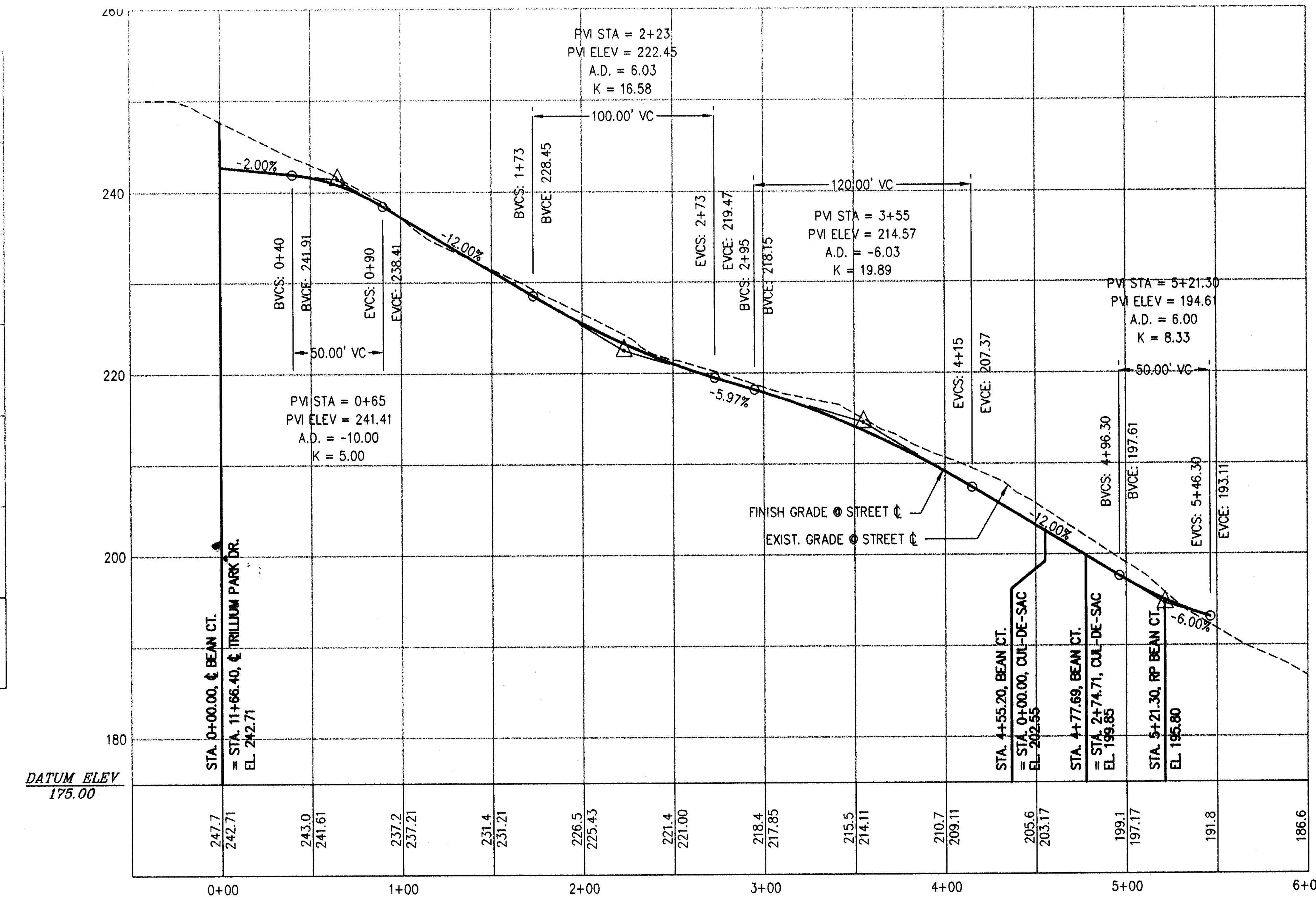
TRILLIUM PARK ESTATES - PHASE 2
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON **10090.03**

3/11

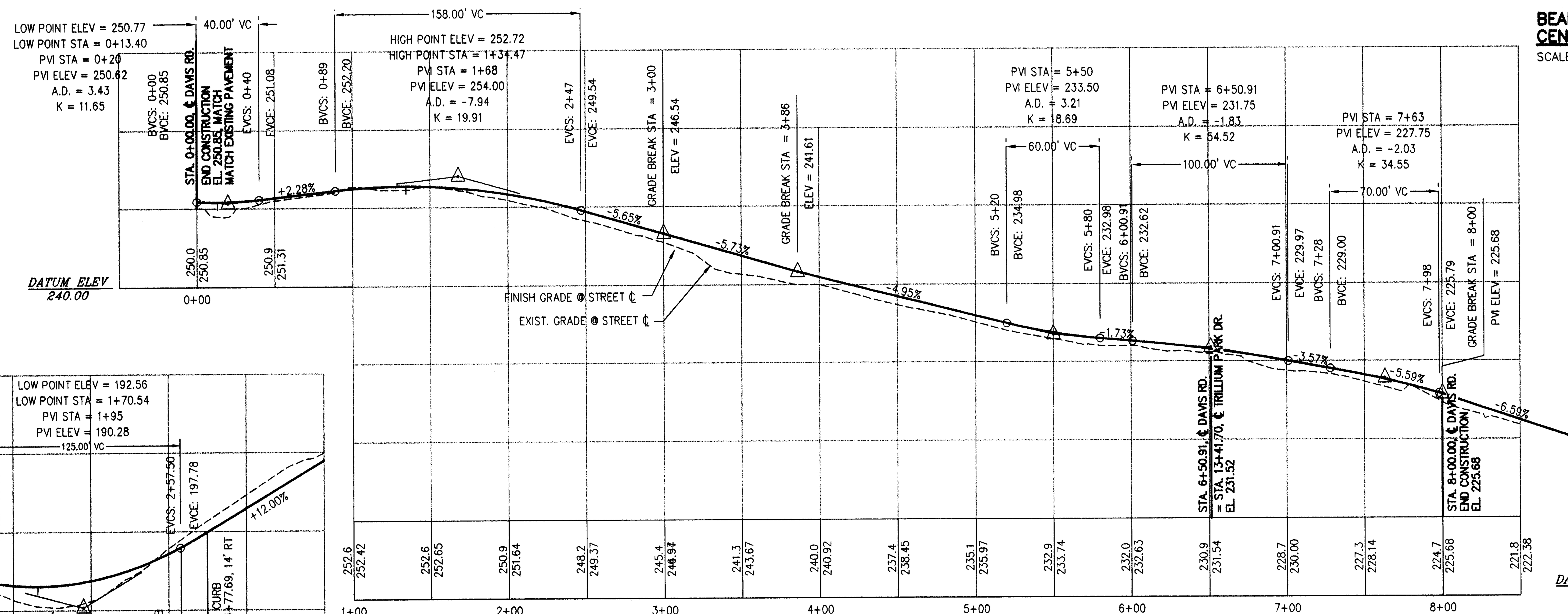
C:\0350-2\350CIVIL Mon Apr 6 15:16:45 1998 BARBARA

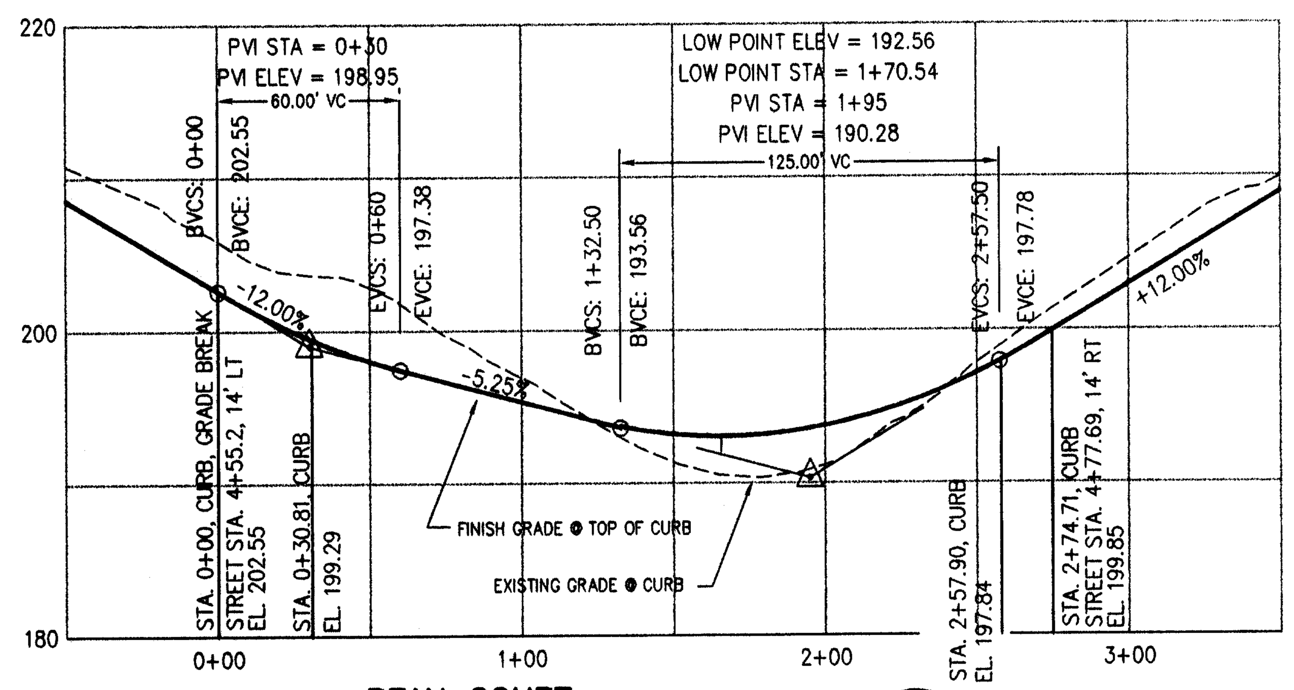


TRILLIUM PARK DRIVE CENTERLINE PROFILE 1/4
SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL



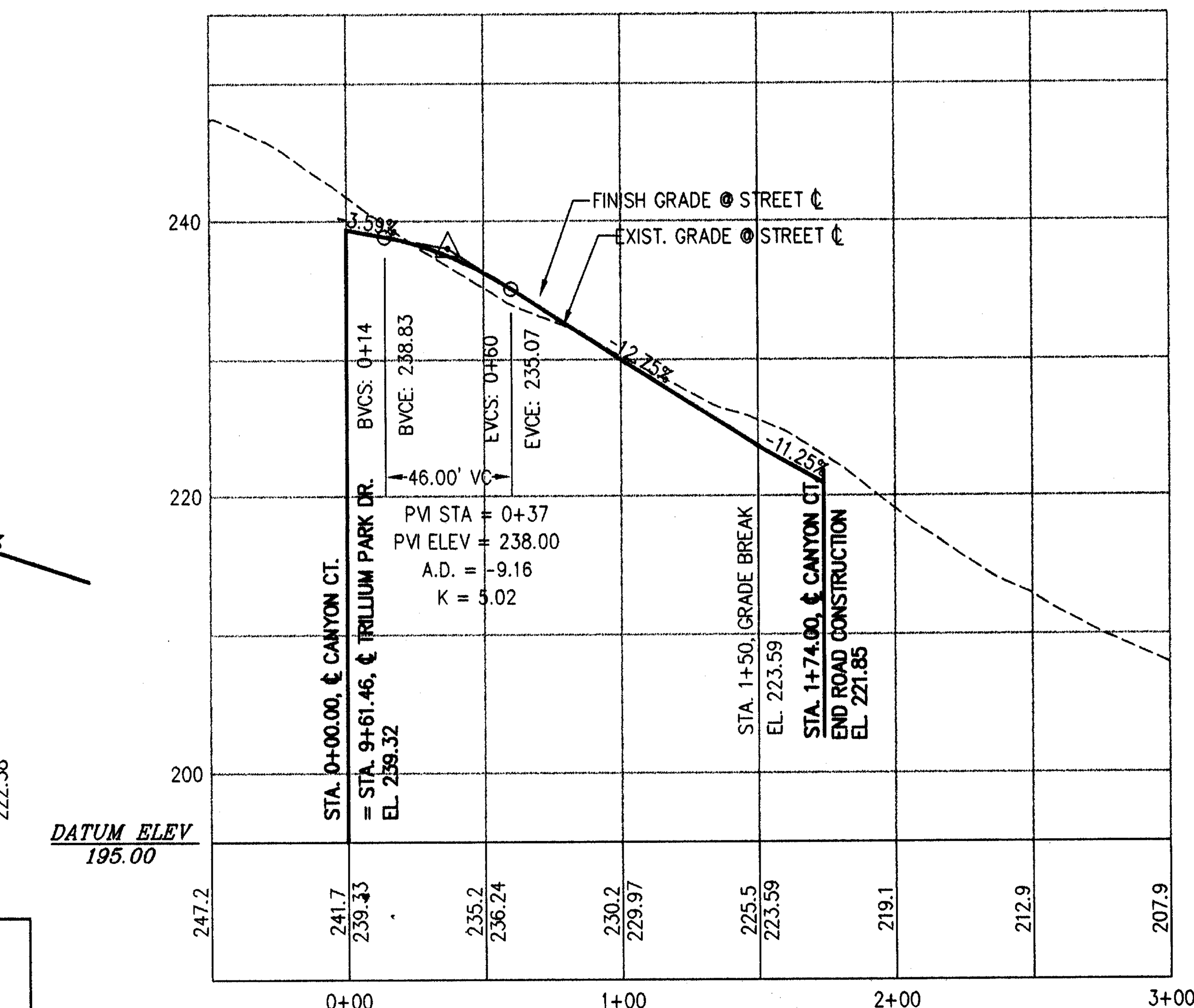
BEAN COURT CENTERLINE PROFILE 2/4
SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL





BEAN COURT CUL-DE-SAC PROFILE 1/2
SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL

DAVIS ROAD CENTERLINE PROFILE 3/4
SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL



CANYON COURT CENTERLINE PROFILE 4/4
SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL

The data on this map is the BEST INFORMATION AVAILABLE from the records of the City of Oregon City - errors and omissions may exist.

APPROVALS

AS-BUILT
DATE: 04/06/98

REGISTERED PROFESSIONAL ENGINEER — OREGON — July 16, 1971 — BRUCE D. GOLDSON
EXPIRES: 6/30/99
SIGNATURE DATE: 04/06/98

STREET PROFILES

DATE	NO.	REVISION
04/06/98	4	AS-BUILT
01/14/97	3	PER GENERAL REVISIONS - DAVIS ROAD
11/26/96	2	PER CITY REVIEW AND GENERAL REVISIONS
10/21/96	1	PER CITY REVIEW

DRAWN BJS | DESIGNED TLT | CHECKED TLT
SCALE 1" = 50' | DATE AUG. 1996
PLAN 93-350.2-1725 | VIEW = PROF1 350PFSTR.DWG

COMPASS CORPORATION
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6564 S.E. LAKE ROAD MILWAUKIE, OREGON 97222
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1900 DAVIS ROAD
OREGON CITY, OREGON 97045
656-1592

TRILLIUM PARK ESTATES - PHASE 2
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON **10090.04**

4/11

C:\0350-2\350PFSTR Thu Apr 9 08:25:26 1998 BARBARA

DATE	NO.	REVISION
04/06/98	4	AS-BUILTS
01/14/97	3	PER CITY REVIEW AND GEN. REVISIONS/STM MAIN 1 & 2
11/27/96	2	PER CITY REVIEW AND GENERAL REVISIONS
10/21/96	1	PER CITY REVIEW

DRAWN BJS | DESIGNED TLT | CHECKED TLT
SCALE 1" = 50' | DATE AUG. 1996
PLAN 93-350.2-1725 | VIEW = STORM 350CIVIL .DWG

COMPASS CORPORATION
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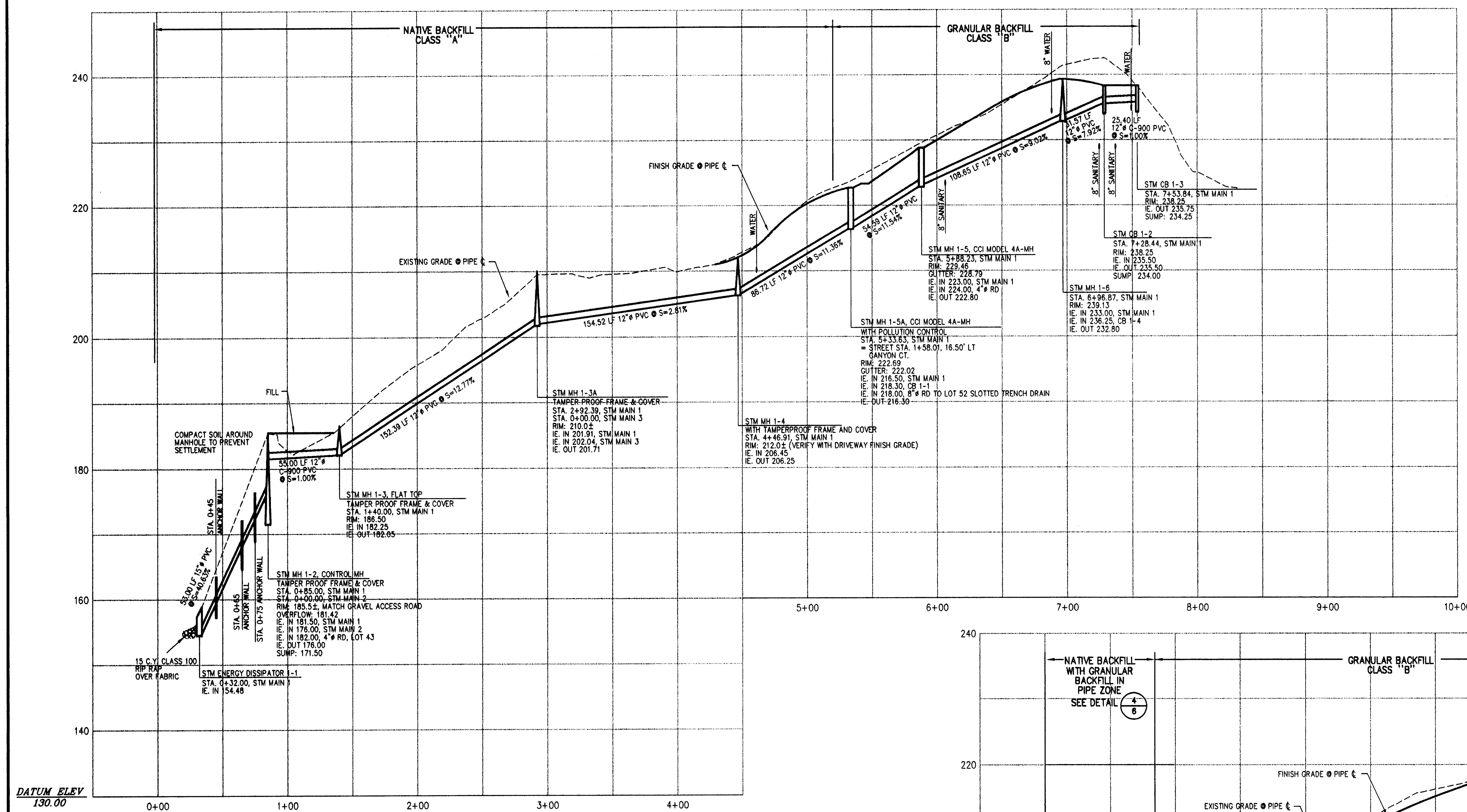
OREGON CITY, OREGON 97045
656-1592

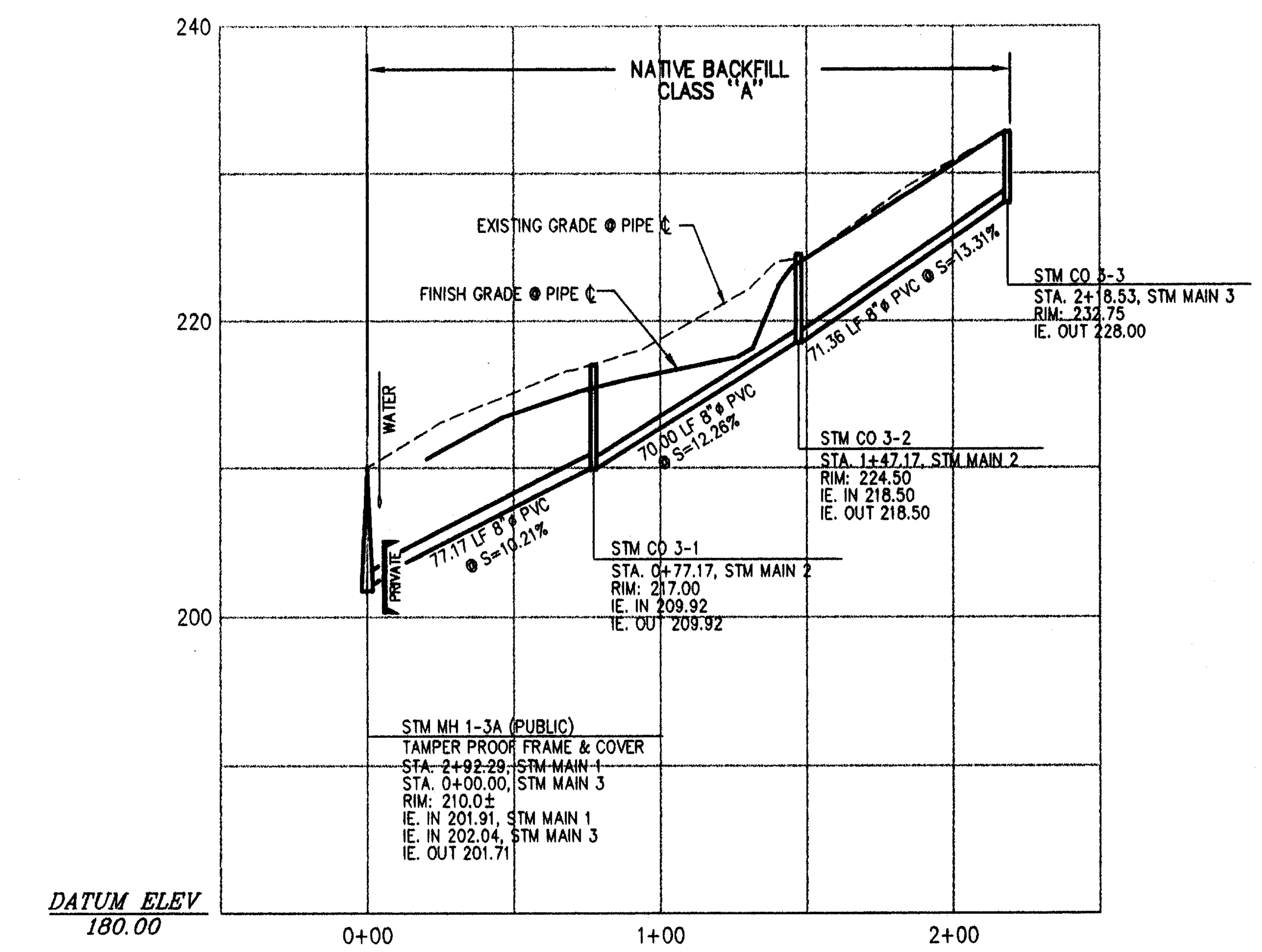
TRILLIUM PARK ESTATES - PHASE 2
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON
10090.05
5/11

C:\0350-2\350CIVIL Thu Apr 9 08:18:11 1998 BARBARA



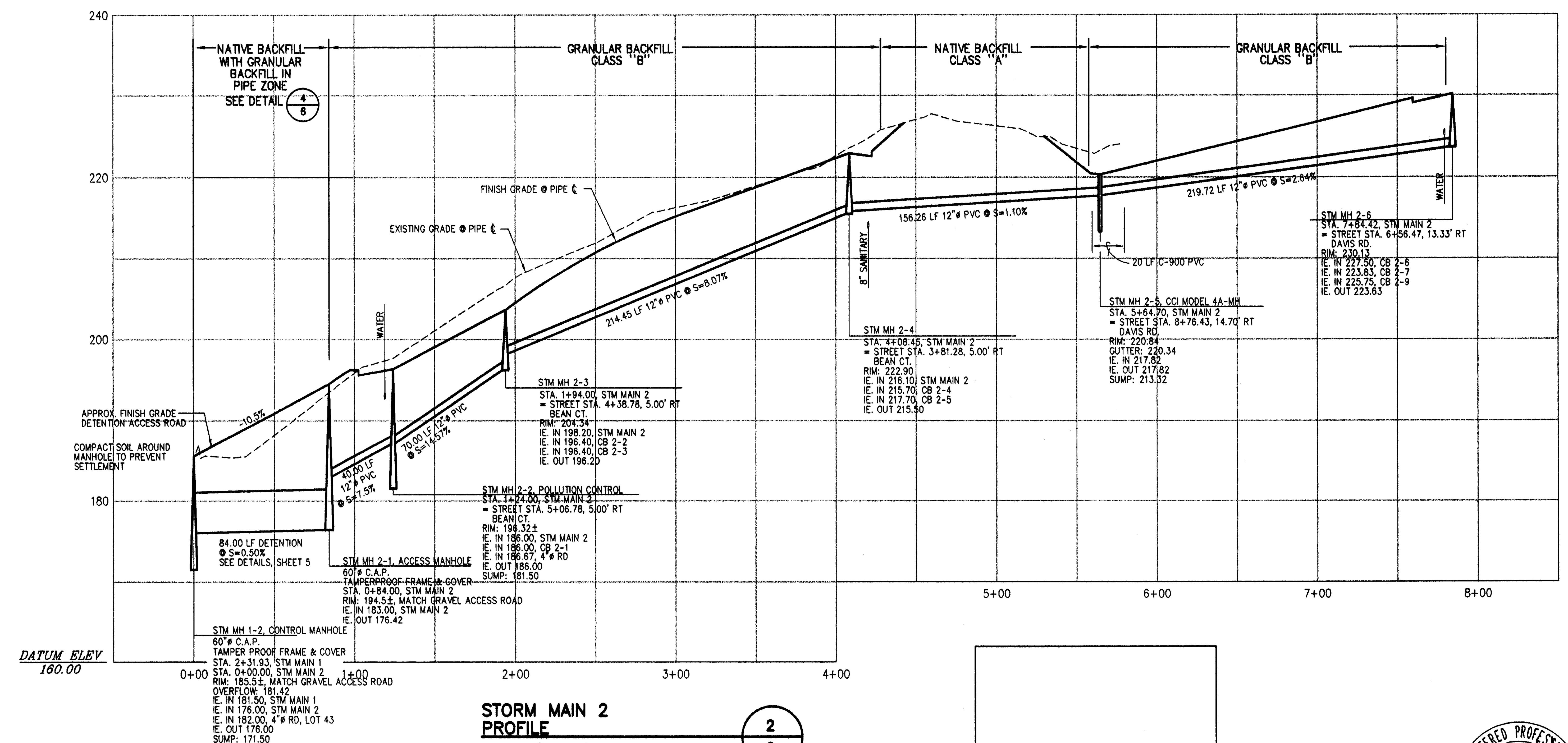
STORM MAIN 1 PROFILE (1/6)

SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL



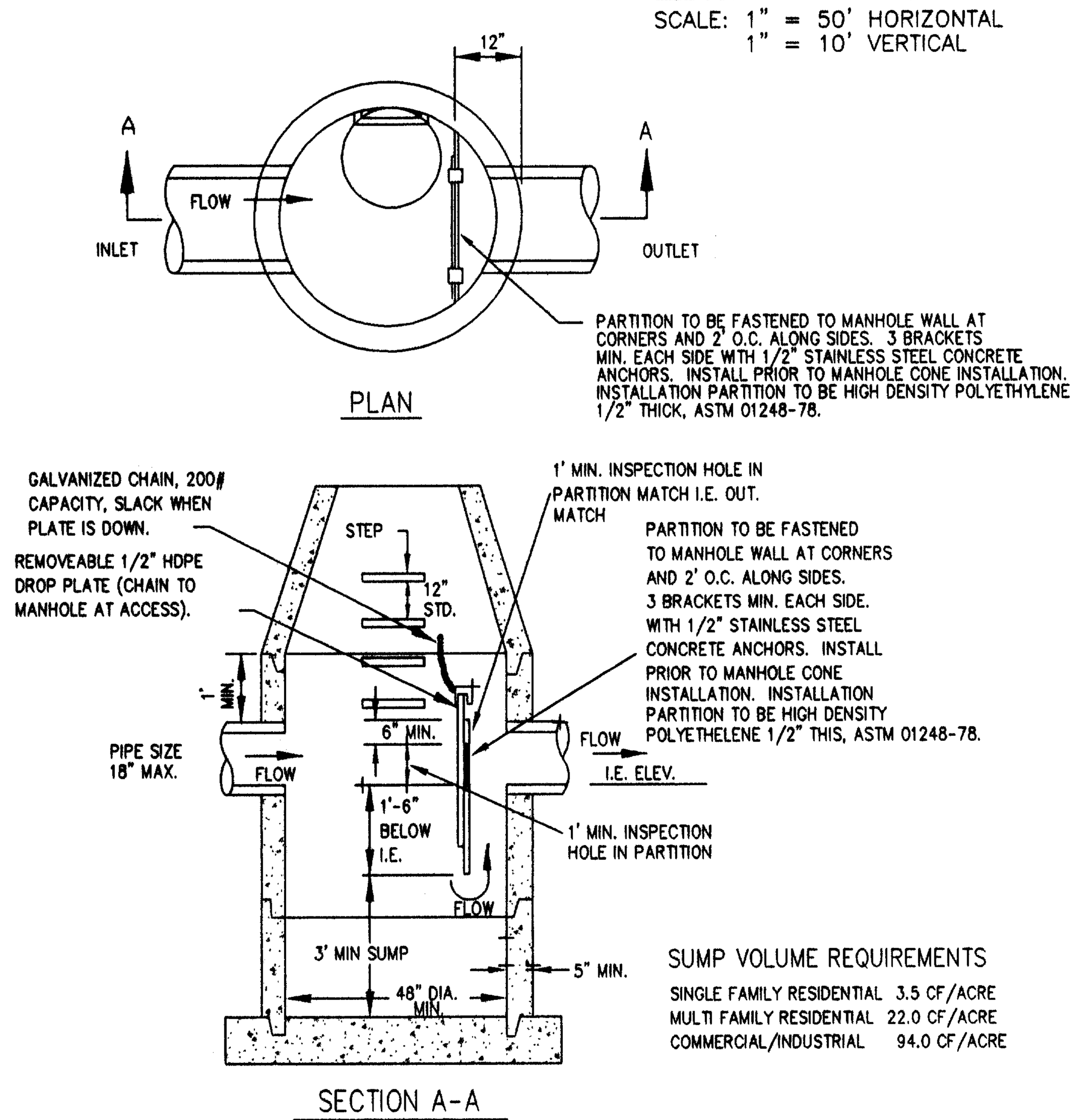
STORM MAIN 3 (PRIVATE) PROFILE (3/6)

SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL



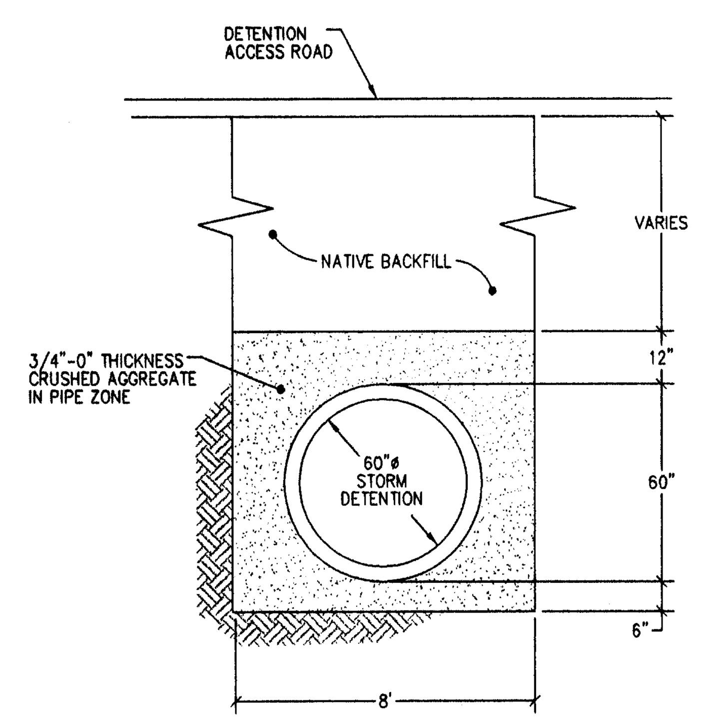
STORM MAIN 2 PROFILE (2/6)

SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL



POLLUTION CONTROL MANHOLE

SCALE: NTS



STORM DETENTION BACKFILL (4/6)

SCALE: NTS

The data on this map is the BEST INFORMATION AVAILABLE from the records of the City of Oregon City - errors and omissions may exist.

AS-BUILT
DATE: 04/06/98

APPROVALS

EXPIRES: 6/30/99
SIGNATURE DATE: 04/06/98

STORM PROFILES

DATE	NO.	REVISION
04/06/98	4	AS-BUILT
01/14/97	3	PER CITY REVIEW AND GENERAL REVISIONS
11/27/96	2	PER CITY REVIEW
10/21/96	1	REVISIONS BY CITY AND GENERAL PLAN REVISIONS

DRAWN BJS | DESIGNED TLT | CHECKED TLT
SCALE 1" = 50' | DATE AUG. 1996
PLAN 93-350.2-1725 | VIEW = PROF1 350PFSTM.DWG

COMPASS CORPORATION
ENGINEERING SURVEYING PLANNING
6564 S.E. LAKE ROAD MILWAUKIE, OREGON 97222
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1900 DAVIS ROAD
OREGON CITY, OREGON 97045
656-1592

TRILLIUM PARK ESTATES - PHASE 2
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON
10090.06

6/11

C:\0350-2\350PFSTM Mon Apr 6 15:40:09 1998 BARBARA

DAVIS ROAD IMPROVEMENTS

DATE	NO.	REVISION
04/06/98	4	AS-BUILTS
01/14/97	4	PER GENERAL REVISION - BLOCK SECTION
11/27/96	3	PER CITY REVIEW
10/18/96	2	PER CITY REVIEW
09/18/96	1	ADDITION OF POWER POLES, 0+00 TO 3+00

DRAWN BJS | DESIGNED TLT | CHECKED TLT
SCALE 1" = 20' | DATE AUG. 1996
PLAN 93-350.2-1725 | VIEW = DAVIS 350CIVIL .DWG

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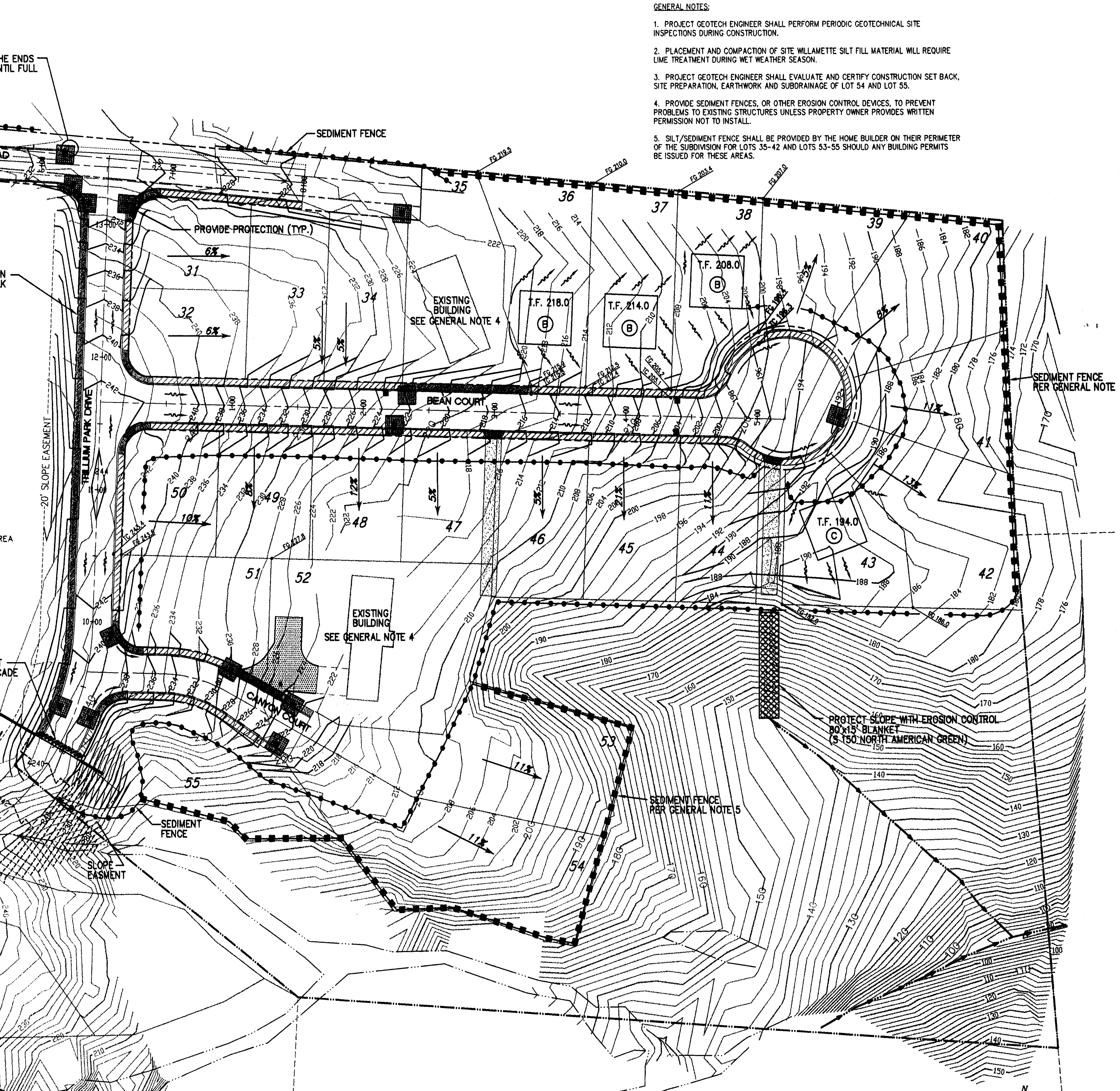
OREGON CITY, OREGON 97045
656-1592

TRILLIUM PARK ESTATES – PHASE 2
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON
10090.07

7/11

C:\0350-2\350CIVIL Mon Apr 6 15:16:32 1998 BARBARA



GENERAL NOTES:

1. PROJECT GEOTECH ENGINEER SHALL PERFORM PERIODIC GEOTECHNICAL SITE INSPECTIONS DURING CONSTRUCTION.

2. PLACEMENT AND COMPACTION OF SITE WILLAMETTE SILT FILL MATERIAL WILL REQUIRE LIME TREATMENT DURING WET WEATHER SEASON.

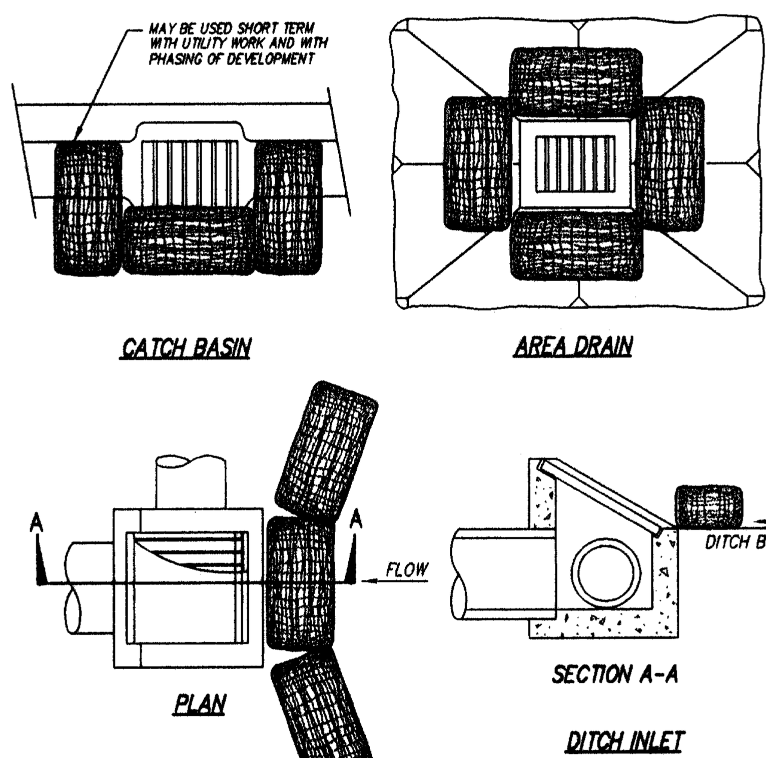
3. PROJECT GEOTECH ENGINEER SHALL EVALUATE AND CERTIFY CONSTRUCTION SET BACK, SITE PREPARATION, EARTHWORK AND SUBDRAINAGE OF LOT 54 AND LOT 55.

4. PROVIDE SEDIMENT FENCES, OR OTHER EROSION CONTROL DEVICES, TO PREVENT PROBLEMS TO EXISTING STRUCTURES UNLESS PROPERTY OWNER PROVIDES WRITTEN PERMISSION NOT TO INSTALL.

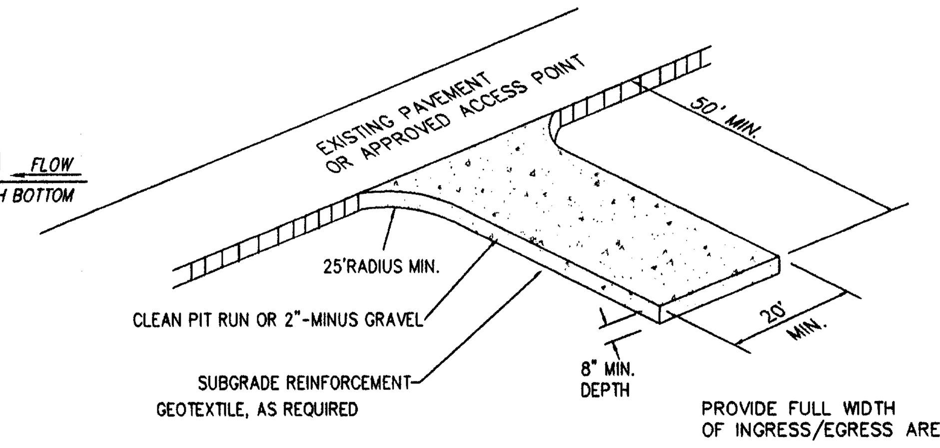
5. SILT/SEDIMENT FENCE SHALL BE PROVIDED BY THE HOME BUILDER ON THEIR PERIMETER OF THE SUBDIVISION FOR LOTS 35-42 AND LOTS 53-55 SHOULD ANY BUILDING PERMITS BE ISSUED FOR THESE AREAS.

LEGEND

	DRAINAGE ARROW
8%	SLOPE ARROW
	BUILDING ENVELOPE
(B)	LOT GRADING TYPE
34	LOT NUMBER
F.G. 208.4	FINISH GRADE
T.F. 215.5	TOP OF FOUNDATION ELEVATION
T.C. 275.70	TOP OF CURB ELEVATION
	EXISTING CONTOUR
	FINISH GRADE CONTOUR
	SEDIMENT FENCE
	INLET/CB PROTECTION



TEMPORARY BIOFILTER BAGS
SCALE: NTS



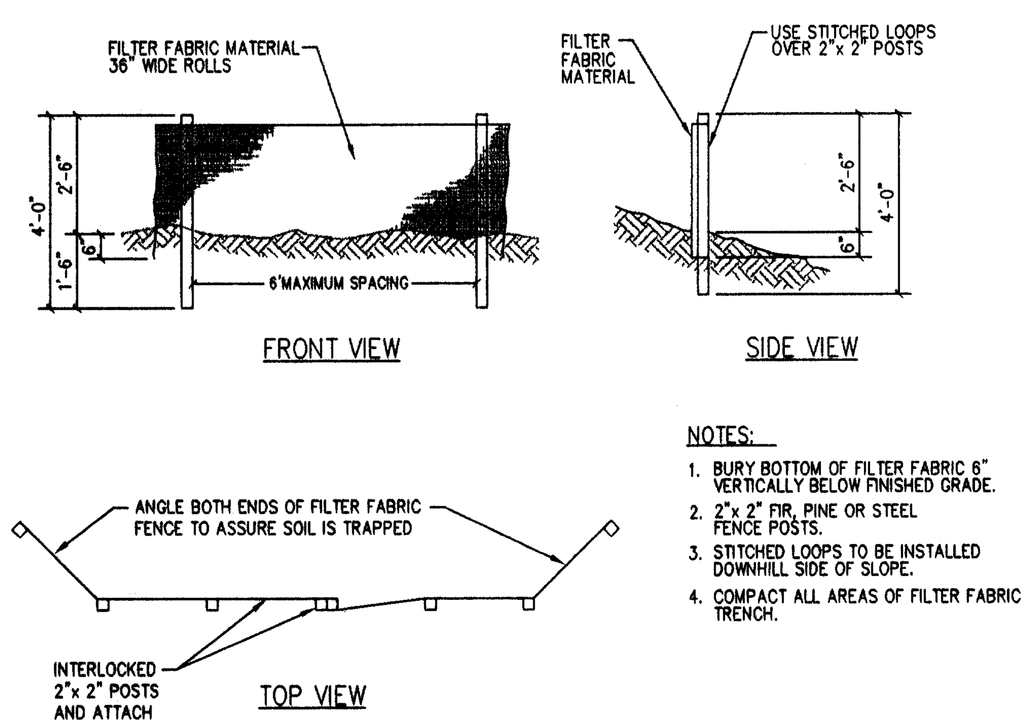
GRAVEL CONTRUCTION ENTRANCE
SCALE: NTS

RESIDENTIAL LOT GRADING NOTES

1. GRADING OF RESIDENTIAL LOTS SHALL BE PER THE CITY'S DEVELOPMENT SERVICES DEPARTMENT POLICY NO. 21, "RESIDENTIAL LOT GRADING CRITERIA" UNLESS OTHERWISE APPROVED.
2. FINAL LOT GRADING IS THE RESPONSIBILITY OF THE INDIVIDUAL BUILDING PERMIT HOLDER/OWNER UNLESS OTHERWISE NOTED.
3. THE BUILDING ENVELOPES SHOWN ARE GENERIC, AND OTHER ENVELOPES ARE POSSIBLE PER THE CITY'S ZONING CODE.
4. THIS GRADING PLAN IS BASED ON THE CITY'S CRITERIA, AND MAYBE SUBMITTED FOR APPROVAL.
5. THE "LOT GRADING CONTROL LINE:" IS THE CRITICAL PATH TO DETERMINE THE TOP OF FOUNDATION ELEVATION BASED ON THE CITY'S "DESIGN CRITERIA TO DETERMINE GRADING CONTROL LINE".
6. THE "DESIGN CRITERIA TO DETERMINE GRADING CONTROL LINE" ARE:

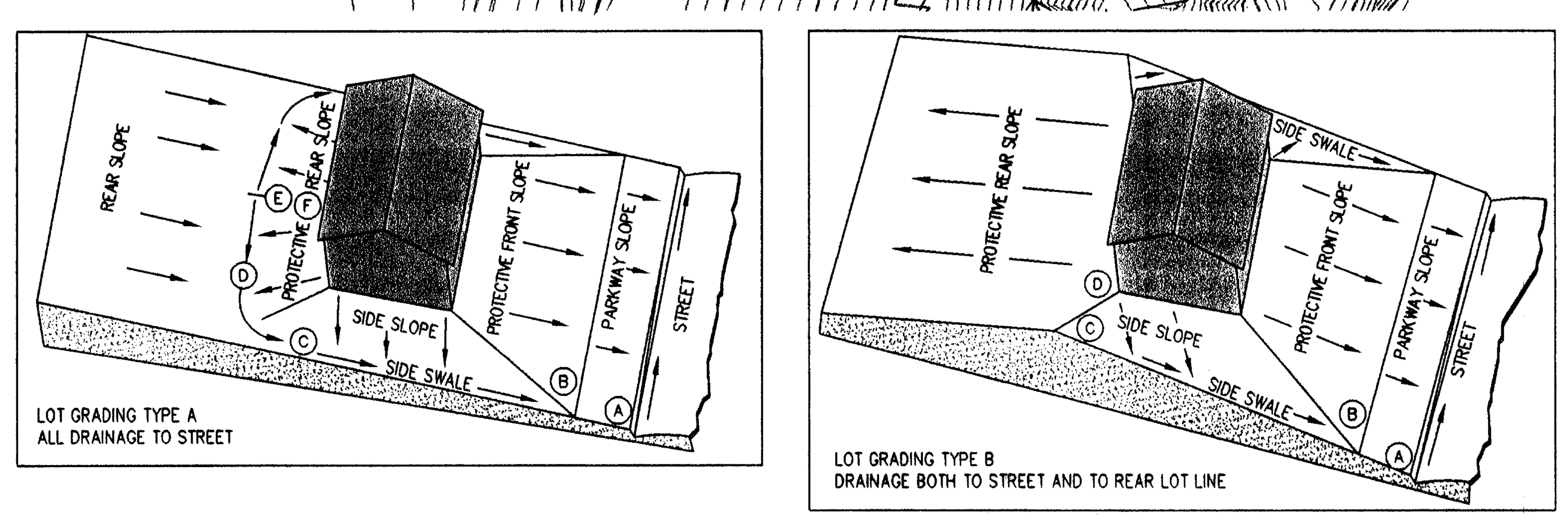
-PARKWAY SLOPE	2%
-SWALE SLOPE	2% PREFERRED
-SWALE SLOPE	1% MINIMUM
-PROTECTIVE SLOPE	MINIMUM 6 INCHES WITHIN FIRST TEN FEET OF BUILDING MINIMUM 8 INCHES ABOVE FINISHED ELEVATION
-MAXIMUM DRIVEWAY SLOPE	14%
-MAXIMUM CHANGE IN DRIVEWAY	12% FOR ANY TEN FOOT DISTANCE

7. LOTS THAT SHOW A TOP OF FOUNDATION 3.0 FEET HIGHER THAN THE AVERAGE TOP OF CURB ALONG THEIR FRONTAGE WILL EXCEED THE MAXIMUM DRIVEWAY SLOP OF 14 PERCENT. THOSE LOTS SHOULD INDIVIDUALLY BE DESIGNED TO ACCOMODATE THE HOUSE PLAN AND ELEVATIONS OF THAT LOT.



NOTES:
1. BURY BOTTOM OF FILTER FABRIC 6" VERTICALLY BELOW FINISHED GRADE.
2. 2"x 2" FIR, PINE OR STEEL FENCE POSTS.
3. STITCHED LOOPS TO BE INSTALLED DOWNHILL SIDE OF SLOPE.
4. COMPACT ALL AREAS OF FILTER FABRIC TRENCH.

SEDIMENT FENCE
SCALE: NTS



LOT GRADING TYPE A
ALL DRAINAGE TO STREET

LOT GRADING TYPE B
DRAINAGE BOTH TO STREET AND TO REAR LOT LINE

LOT GRADING TYPE C
ALL DRAINAGE TO REAR LOT LINE

SCALE: 1" = 50'

APPROVALS

REGISTERED PROFESSIONAL ENGINEER 7120 OREGON July 16, 1971 BRUCE D. GOLDSON
EXPIRES: 6/30/99
SIGNATURE DATE: 04/06/98

AS-BUILT
DATE: 04/06/98

GRADING AND EROSION CONTROL

DATE	NO.	REVISION
04/06/98	4	AS-BUILT
01/14/97	3	PER CITY REVIEW
11/26/96	2	PER CITY REVIEW
10/21/96	1	PER CITY REVIEW

DRAWN BJS | DESIGNED TLT | CHECKED TLT
SCALE 1" = 50' | DATE AUG, 1996
PLAN 93-350.2-1725 | VIEW = GRAD 350GRAD .DWG

COMPASS CORPORATION
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656-1592

TRILLIUM PARK ESTATES – PHASE 2
OREGON CITY, OREGON 10090.08

8/11

C:\0350-2\350GRAD Mon Apr 6 16:36:27 1998 BARBARA

NOTES:

1. PROVIDE ADEQUATE BLDG. #S. MINIMUM OF 4" AND EASILY READABLE FROM THE STREET. (UFC 10.301) CONTACT TRACI SOWELL AT CITY HALL FOR ADDRESSING INFORMATION.
2. HYDRANTS SHALL BE PAINTED WITH RODDA ALL PURPOSE EQUIPMENT ENAMEL (1625 SAFETY ORANGE PAINT) AND ALL CHAINS SHALL BE REMOVED FROM THE FIRE HYDRANT.
3. PROVIDE ADEQUATE FIRE HYDRANT SPACING AND FIRE FLOW. (APPENDIX IIIA-B) MINIMUM FIRE FLOW 1000 GPM; MINIMUM SPACING - A HYDRANT WITHIN 250 FT. OF EVERY PROPERTY.
4. PROVIDE ADEQUATE TURNING RADIUS [UFC 10.204(C)].
5. PROVIDE ADEQUATE WIDTH OF FIRE DEPT. ROADWAYS/TURNAROUNDS (UFC 10.103 & 10.204).
6. ANY DEADEND 150 FT. OR LONGER SHALL HAVE A FIRE DEPT. RUNAROUND [UFC 10.204(D)].
7. ALL HYDRANTS, ROADWAYS, AND STREET SIGNS TO BE COMPLETED, INSTALLED AND OPERATIONAL BEFORE FRAMING BEGINS.
8. NO PARKING ON PAVEMENT OF FIRE DEPT. TURNAROUND. FINANCES SHOULD BE SET ASIDE TO MAINTAIN SIGNAGE FOR DEVELOPMENT.
9. NO PARKING ON SIDES OF CANYON CT. AND BEAN CT. NO PARKING ON 1 SIDE OF TRILLIUM DRIVE.

AS-BUILT
DATE: 04/06/98

The data on this map is the BEST INFORMATION AVAILABLE from the records of the City of Oregon City - errors and omissions may exist.

APPROVALS

SCALE: 1" = 50'

REGISTERED PROFESSIONAL ENGINEER 7120 OREGON July 18, 1971 BRUCE D. GOLDSON

EXPIRES: 6/30/99
SIGNATURE DATE:

WATER PLAN

C:\0350-2\350CIVIL Mon Apr 6 15:16:19 1998 BARBARA

DATE	NO.	REVISION
04/06/98	4	AS-BUILTS
01/14/97	3	REALIGNMENT OF WATER
11/27/96	2	PER CITY REVIEW
10/21/96	1	PER CITY REVIEW

DRAWN BJS	DESIGNED TLT	CHECKED TLT
SCALE 1" = 50'	DATE AUG. 1996	
PLAN 93-350.2-1725	VIEW = WATER 350CIVIL .DWG	

COMPASS CORPORATION
ENGINEERING SURVEYING PLANNING
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MILWAUKIE, OREGON 97222
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RIVERGATE DEVELOPMENT COMPANY
1900 DAVIS ROAD
OREGON CITY, OREGON 97045
656-1592

TRILLIUM PARK ESTATES - PHASE 2
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON
10090.09

9/11

NOTES:

1. CONTRACTOR TO KEEP EXISTING SEPTIC SYSTEM IN SERVICE DURING CONSTRUCTION.
2. EXISTING SYSTEMS ARE SHOWN IN APPROXIMATE LOCATION.
3. EXISTING SEPTIC TANKS TO BE DECOMMISSIONED UPON SERVICE HOOKUP TO EXISTING HOMES. TANKS TO BE PUMPED AND BACKFILLED WITH SAND.

NOTE:

1. STORM AND SANITARY LATERALS SHALL BE COLOR CODED:

   SANITARY: GREEN
   STORM: WHITE

2. MINIMUM SLOPE ON LATERALS IS 2.00% AND HAVE A MINIMUM COVER OF 4 FEET AT PROPERTY LINE.

The data on this map is the BEST INFORMATION AVAILABLE from the records of the City of Oregon City - errors and omissions may exist.

AS-BUILT
DATE: 04/06/98

APPROVALS

SCALE: 1" = 50'

REGISTERED PROFESSIONAL ENGINEER 7120 OREGON July 16, 1971 BRUCE D. GOLDSON

EXPIRES: 6/30/99
SIGNATURE DATE:

SANITARY PLAN

DATE	NO.	REVISION
04/06/98	4	AS-BUILTS
01/14/97	3	PER GEN. REVISIONS/SAN MAIN 1
11/27/96	2	PER CITY REVIEW AND GENERAL REVISIONS
10/21/96	1	PER CITY REVIEW

DRAWN BJS | DESIGNED TLT | CHECKED TLT
SCALE 1" = 50' | DATE AUG. 1996
PLAN 93-350.2-1725 | VIEW = SANITARY 350CIVIL .DWG

COMPASS CORPORATION
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TRILLIUM PARK ESTATES – PHASE 2
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON
10090.10

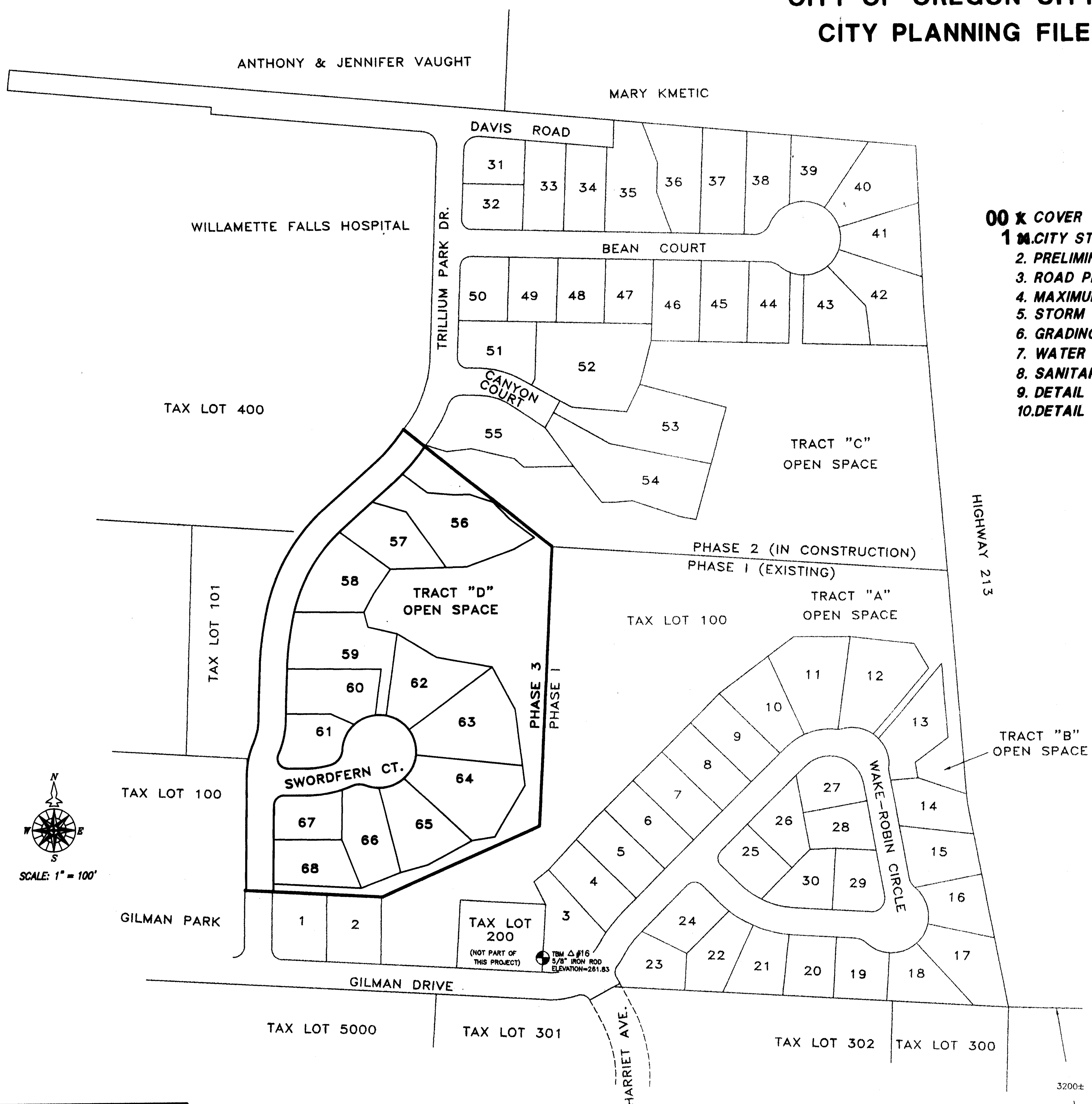
10 / 11

C:\0350-2\350CIVIL Thu Apr 9 08:12:45 1998 BARBARA

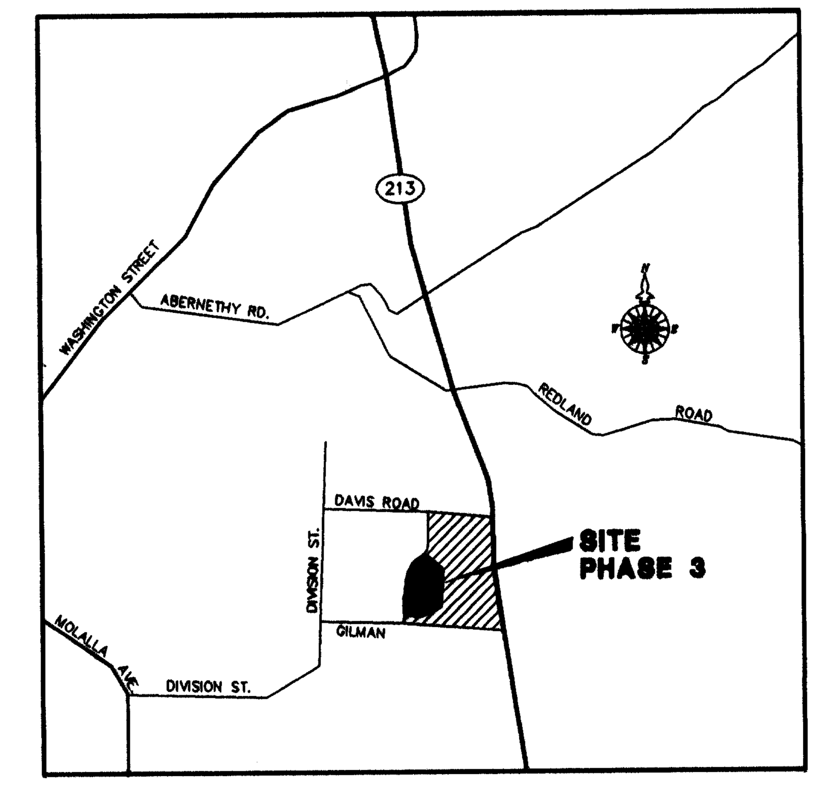
TRILLIUM PARK ESTATES

PHASE 3

MAP 2S-2E-32 AA & 32AD, TL 100, 300, 301, 302, & 304
CITY OF OREGON CITY, CLACKAMAS COUNTY
CITY PLANNING FILE NO. PD93-01/TP94-11



TRILLIUM PARK BENCH MARK – OREGON CITY GPS CONTROL POINT #32 STATION "BY-PASS" ELEVATION = 239.379



VICINITY MAP

N. T. S.

INDEX

DEVELOPER

RIVERGATE DEVELOPMENT COMPANY
1900 DAVIS ROAD
OREGON CITY, OREGON 97045
PHONE: 656-1592

ENGINEER

COMPASS CORPORATION
6564 S.E. LAKE ROAD
MILWAUKIE, OREGON 97222
PHONE: 653-9093

LEGEND

N. T. S.

- EXISITING CURB AND GUTTER
- PROPOSED CURB AND GUTTER
- PROPERTY BOUNDARY
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- EXISTING WATER
- PROPOSED WATER
- PROPOSED TYPICAL SINGLE HOUSE SERVICE
- PROPOSED TYPICAL DOUBLE HOUSE SERVICE
- PROPOSED FIRE HYDRANT ASSEMBLY
- PROPOSED THRUST BLOCK
- EXISTING SANITARY SEWER
- EXISTING SANITARY MANHOLE
- PROPOSED SANITARY SEWER
- PROPOSED SANITARY MANHOLE
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- PROPOSED STORM MANHOLE
- PROPOSED CATCH BASIN
- EXISTING GAS LINE
- EXISTING POWER POLE
- CONTRACTOR TO INSTALL CENTERLINE MONUMENT BOX AT LOCATION PER SURVEYOR
- SIDEWALK BY HOME BUILDER
- SIDEWALK BY CONTRACTOR
- ACCESS ROAD A.C.
- EXIST. PAVEMENT TO BE REMOVED
- GEOBLOCK WITH GRASS
- WHEELCHAIR RAMP
- SEDIMENT FENCE
- CATCH BASIN PROTECTION
- CENTERLINE
- DIAMETER

The data on this map is the BEST INFORMATION AVAILABLE from the records of the City of Oregon City - errors and omissions may exist.

ABBREVIATIONS

LF	LINEAR FEET	RCP	REINFORCED CULVERT PIPE
CO	CLEAN OUT	GALV.	GALVANIZED
YDS	YARDS	TBM	TEMPORARY BENCH MARK
CB	CATCH BASIN	FLG	FLANGE
LT	LEFT	N. T. S.	NOT TO SCALE
ESMT.	EASEMENT	LAT	LATERAL
CSP	CONCRETE SEWER PIPE	STM	STORM
S	SLOPE	SECT	SECTION
NO.	NUMBER	IE.	INVERT ELEVATION
MJ	MECHANICAL JOINT	RT	RIGHT
RD	ROOF DRAIN	DIP	DUCTILE IRON PIPE
MH	MANHOLE	EXIST.	EXISTING
SAN	SANITARY	PVC	POLYVINYL CHLORIDE
TL	TAX LOT	TYP	TYPICAL
STA	STATION	NTS	NOT TO SCALE
PUB.	PUBLIC		

NOTES

GENERAL NOTES:

1. ALL WORK AND MATERIALS SHALL CONFORM TO 1990 EDITION OREGON CHAPTER A.P.W.A. STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION AS ADOPTED AND MODIFIED BY THE CITY OF OREGON CITY.
2. CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS PRIOR TO CONSTRUCTION AND SHALL ARRANGE FOR THE RELOCATION OF ANY IN CONFLICT WITH THE PROPOSED CONSTRUCTION.
3. CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS AND LICENSES BEFORE STARTING CONSTRUCTION. A CITY BUSINESS LICENSE IS REQUIRED.
4. EXISTING UTILITY LOCATIONS SHOWN ARE APPROXIMATE ONLY AND MUST BE VERIFIED BY THE CONTRACTOR. ADDITIONAL UNDERGROUND UTILITIES MAY EXIST.
5. CONTRACTOR SHALL NOTIFY THE PROJECT ENGINEER AND THE CITY OF OREGON CITY INSPECTOR 48 HOURS BEFORE STARTING CONSTRUCTION AND 24 HOURS BEFORE RESUMING WORK AFTER SHUTDOWNS, EXCEPT FOR NORMAL RESUMPTION OF WORK FOLLOWING SATURDAYS, SUNDAYS OR HOLIDAYS. CONTRACTOR SHALL NOTIFY THE PROJECT ENGINEER AND THE CITY OF OREGON CITY SO AS TO ELIMINATE UNNECESSARY INSPECTION TIME.
6. CONTRACTOR SHALL REMOVE AND DISPOSE OF TREES, STUMPS, BRUSH, ROOTS, TOPSOIL, AND OTHER MATERIAL IN THE RIGHT-OF-WAYS, EASEMENTS, AND WHERE INDICATED ON THE PLANS. MATERIAL SHALL BE DISPOSED OF IN SUCH A MANNER AS TO MEET LOCAL REGULATIONS.
7. CONSTRUCTION VEHICLES SHALL PARK ON THE CONSTRUCTION SITE. HOURS OF CONSTRUCTION SHALL BE 7:00 AM TO 6:00 PM, MONDAY THROUGH FRIDAY, AND 9:00 AM TO 6:00 PM ON SATURDAY. CONSTRUCTION PROHIBITED ON SUNDAY.
8. CONTRACTOR SHALL KEEP AND MAINTAIN A CURRENT SET OF DRAWINGS FOR THE PROJECT ENGINEER SHOWING AS CONSTRUCTED DATA. THE PROJECT ENGINEER SHALL SUBMIT TWO SETS OF AS-BUILT/RECORD DRAWING MYLARS TO THE CITY OF OREGON CITY.
9. CONTRACTOR SHALL SUBMIT A MAINTENANCE BOND AS REQUIRED TO THE CITY OF OREGON CITY.
10. CONTRACTOR SHALL ERECT AND MAINTAIN TRAFFIC CONTROL PER THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", PART VI, CONSTRUCTION AND MAINTENANCE, AS ADOPTED AND MODIFIED BY ODOT. THE CONTRACTOR SHALL SUBMIT A PLAN FOR THE TRAFFIC CONTROL TO APPROPRIATE CITY, COUNTY, AND STATE PERSONNEL FOR APPROVAL.
11. CONTRACTOR SHALL PERFORM ALL WORK NECESSARY TO COMPLETE THIS PROJECT IN ACCORDANCE WITH THE PLANS INCLUDING SUCH INCIDENTALS AS MAY BE NECESSARY TO MEET APPLICABLE AGENCY REQUIREMENTS AND OTHERS AS NECESSARY TO PROVIDE A COMPLETE PROJECT.
12. CONTRACTOR SHALL KEEP AN APPROVED SET OF PLANS ON THE PROJECT SITE AT ALL TIMES.
13. ANY ALTERATION OR VARIANCE FROM THESE PLANS, EXCEPT MINOR FIELD ADJUSTMENTS NEEDED TO MEET EXISTING FIELD CONDITIONS, SHALL FIRST BE APPROVED BY THE APPLICABLE AGENCY REPRESENTATIVE. ANY ALTERATION OR VARIANCE FROM THESE PLANS SHALL BE DOCUMENTED ON CONSTRUCTION FIELD PRINTS AND TRANSMITTED TO THE PROJECT ENGINEER.
14. CONTRACTOR SHALL PROVIDE THE NECESSARY EROSION PROTECTION TO MINIMIZE EROSION AND IMPACT TO ADJACENT PROPERTY. SEE EROSION/SEDIMENTATION CONTROL NOTES AND PLAN.
15. OPEN TRENCHES SHALL BE STRICTLY LIMITED TO A MAXIMUM OF 100 FEET WITHIN STREET RIGHT-OF-WAYS UNLESS LIMITED TO A LESSER AMOUNT BY PERMIT. NO TRENCHES WILL BE ALLOWED TO REMAIN OPEN OVER NIGHT.
16. CONTRACTOR SHALL MAINTAIN AND COORDINATE ACCESS TO ALL EFFECTED PROPERTIES.
17. CHAR DIAZ ESTATES BENCH MARK - OREGON CITY GPS CONTROL POINT #40 "FIR RD." ELEV. = 439.80.
18. THE ENGINEER HAS NOT BEEN RETAINED OR COMPENSATED TO PROVIDE DESIGN AND CONSTRUCTION REVIEW SERVICES RELATING TO THE CONTRACTOR'S SAFETY PRECAUTIONS OR TO MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES REQUIRED FOR THE CONTRACTOR TO PERFORM HIS WORK.
19. ADDITIONAL TECHNICAL SPECIFICATIONS AND DETAILS WHICH WERE ADOPTED BY THE CITY OF OREGON CITY ARE UNDER SEPARATE COVER.
20. ALL STORM SEWER AND SANITARY SEWER LINES SHALL BE VIDEO INSPECTED BY THE CONTRACTOR PER APWA STANDARD SPECIFICATIONS.
21. TEMPORARILY RESTORE ALL PAVEMENT CUTS SAME DAY OPENING WITH HOT OR COLD AC MIX. CONTRACTOR/APPLICANT SHALL MAINTAIN THESE CUTS UNTIL WORK IS COMPLETED.
22. UTILITIES SHALL MAINTAIN A MINIMUM OF 18 INCHES CLEARANCE WHEN CROSSING OTHER UTILITIES. THE CLEARANCE MAY BE REDUCED TO 6 INCHES WHEN CONCRETE SUPPORT SADDLES ARE UTILIZED. HOWEVER, 6" IS THE MINIMUM SEPARATION BETWEEN UTILITIES.
23. DEVELOPER SHALL SUBMIT A MAINTENANCE BOND AS REQUIRED BY THE CITY

REGISTERED PROFESSIONAL ENGINEER 5679 OREGON July 8, 1966 THOMAS L. TYE

EXPIRES: 6/30/98
SIGNATURE DATE: ______

REGISTERED PROFESSIONAL ENGINEER 8120 OREGON July 16, 1971 BRUCE D. GOLDSON

EXPIRES: 6/30/99
SIGNATURE DATE: 11/04/98
AS-BUILT REVIEW ONLY

APPROVALS

10091.00 COVER

AS-BUILT
DATE: NOV. 11, 1998

10091.00

DATE	NO.	REVISION
11/11/98	3	AS-BUILT
08/21/97	2	PER CITY REVIEW
06/25/97	1	PER GENERAL PLAN REVISION

DRAWN BJS | DESIGNED TLT | CHECKED TLT
SCALE 1" = 100' | DATE FEB, 1997
PLAN 93-350.3-1725 | 350-3COV.DWG

COMPASS CORPORATION
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656-1592

TRILLIUM PARK ESTATES - PHASE 3
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON

0 X / 10

C:\0350-3\350-3cov.dwg Wed Nov 11 11:53:21 1998 BARBARA

EROSION CONTROL

1. APPROVAL OF THIS EROSION/SEDIMENTATION CONTROL (ESC) PLAN DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT ROAD OR DRAINAGE DESIGN (E.G., SIZE AND LOCATION OF ROADS, PIPES, RESTRICTORS, CHANNELS, RETENTION FACILITIES, UTILITIES, ETC.).
2. THE IMPLEMENTATION OF THESE ESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE ESC FACILITIES IS THE RESPONSIBILITY OF THE APPLICANT/CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED AND VEGETATION/LANDSCAPING IS ESTABLISHED.
3. THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THE GRADING PLAN SHALL BE CLEARLY FLAGGED IN THE FIELD PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE FLAGGED CLEARING LIMITS SHALL BE PERMITTED. THE FLAGGING SHALL BE MAINTAINED BY THE APPLICANT/CONTRACTOR FOR THE DURATION OF CONSTRUCTION.
4. THE ESC FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED PRIOR TO ALL CLEARING AND GRADING ACTIVITIES, AND MAINTAINED IN SUCH A MANNER AS TO ENSURE THAT SEDIMENT-LADEN WATER DOES NOT ENTER THE DRAINAGE SYSTEM OR VIOLATE APPLICABLE WATER STANDARDS.
5. THE ESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE ESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DO NOT LEAVE THE SITE.
6. THE ESC FACILITIES SHALL BE INSPECTED DAILY BY THE APPLICANT/CONTRACTOR AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTIONING.
7. THE ESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN THE 48 HOURS FOLLOWING A STORM EVENT.
8. AT NO TIME SHALL MORE THAN ONE FOOT (1') OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A TRAPPED CATCH BASIN. ALL CATCH BASINS AND CONVEYANCE LINES SHALL BE CLEANED PRIOR TO PAVING. THE CLEANING OPERATION SHALL NOT FLUSH SEDIMENT LADEN WATER INTO THE DOWNSTREAM SYSTEM.
9. STABILIZED CONSTRUCTION ENTRANCES SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES MAY BE REQUIRED TO INSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.

   ADDITIONAL GRAVEL MAY HAVE TO BE ADDED PERIODICALLY TO MAINTAIN PROPER FUNCTION OF THE PAD.

   IF THE GRAVEL PAD DOES NOT ADEQUATELY REMOVE DIRT AND MUD FROM VEHICLE WHEELS SUCH THAT MUD AND DIRT TRACKING IS EVIDENT OFF-SITE, ADDITIONAL MEASURES MUST BE TAKEN. SUCH MEASURES MAY INCLUDE HOSING OFF WHEELS BEFORE VEHICLES LEAVE THE SITE OR OTHER CONSTRUCTION TECHNIQUES/WORK OPERATION MODIFICATIONS. WHEEL WASHING SHOULD BE DONE ON THE GRAVEL PAD AND WASH WATER SHOULD DRAIN THROUGH A SILT-TRAPPING STRUCTURE PRIOR TO LEAVING THE CONSTRUCTION SITE.
10. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR PROTECTION OF ALL WORK ADJACENT PROPERTIES AND DOWNSTREAM FACILITIES FROM EROSION AND SILTATION DURING THE COURSE OF THE WORK. ANY DAMAGE RESULTING FROM SUCH EROSION AND SILTATION SHALL BE CORRECTED AT THE SOLE EXPENSE OF THE CONTRACTOR.
11. APPLICABLE RECOMMENDED EROSION CONTROL MEASURES FROM CHAPTER 3 OF CLACKAMAS COUNTY'S EROSION/SEDIMENTATION CONTROL PLANS TECHNICAL GUIDANCE HANDBOOK, DATED AUGUST 1991, SHALL BE REQUIRED. IN PARTICULAR, TABLE 3-2 EROSION CONTROL MATRIX, COMMERCIAL, SUBDIVISION AND LARGE SITE CONSTRUCTION COVERING BASE MEASURES, WET WEATHER MEASURES, AND POST CONSTRUCTION.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE HYDROSEEDED AREAS UNTIL VEGETATION UPON THEM IS ESTABLISHED. ANY ADDITIONAL HYDROSEEDING NECESSARY TO ESTABLISH THE VEGETATION SHALL BE DONE BY THE CONTRACTOR.
13. EROSION CONTROL MEASURES ARE A TEMPORARY MEASURE ONLY; THEY SHALL BE INSTALLED, REPAIRED, OR REPLACE AT THE DIRECTION OF THE PROJECT ENGINEER OR THE CITY INSPECTOR.

SEDIMENT FENCE/STRAW BALE SEDIMENT BARRIER NOTES:

1. THE FILTER FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID USE OF JOINTS. WHEN JOINTS ARE NECESSARY, FILTER CLOTH SHALL BE SPLICED TOGETHER ONLY AT A SUPPORT POST, WITH A MINIMUM SIX INCH (6") OVERLAP, AND BOTH ENDS SECURELY FASTENED TO THE POST.
2. THE FILTER FABRIC FENCE SHALL BE INSTALLED TO FOLLOW THE CONTOURS, WHERE FEASIBLE. THE FENCE POSTS SHALL BE SPACED A MAXIMUM OF SIX FEET (6') APART AND DRIVEN SECURELY INTO THE GROUND A MINIMUM OF 30 INCHES.
3. A TRENCH SHALL BE EXCAVATED, ROUGHLY 8 INCHES WIDE BY 12 INCHES DEEP (8" X 12"), UPSLOPE AND ADJACENT TO THE WOOD POST TO ALLOW THE FILTER FABRIC TO BE BURIED.
4. WHEN STANDARD STRENGTH FILTER FABRIC IS USED, A WIRE SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY-DUTY WIRE STAPLES AT LEAST ONE INCH (1") LONG, TIE WIRE OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF FOUR INCHES (4") AND SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE THE ORIGINAL GROUND SURFACE.
5. THE STANDARD STRENGTH FILTER FABRIC SHALL BE STAPLED OR WIRED TO THE FENCE, AND 20 INCHES OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE THE ORIGINAL GROUND SURFACE. FILTER FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
6. WHEN EXTRA-STRENGTH FILTER FABRIC AND CLOSER POST SPACING ARE USED, THE WIRE MESH SUPPORT FENCE MAY BE ELIMINATED. IN SUCH A CASE, THE FILTER FABRIC IS STAPLED OR WIRED DIRECTLY TO THE POSTS WITH ALL OTHER PROVISIONS OF THE ABOVE STANDARD NOTE FOR STANDARD STRENGTH FILTER FABRIC APPLYING.
7. SEDIMENT FENCES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFUL PURPOSE, BUT NOT BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED.
8. SEDIMENT FENCES SHALL BE INSPECTED BY THE APPLICANT/CONTRACTOR IMMEDIATELY AFTER EACH RAINFALL, AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.
9. AT NO TIME SHALL MORE THAN ONE FOOT (1') DEPTH OF SEDIMENT BE ALLOWED TO ACCUMULATE BEHIND A SEDIMENT FENCE OR STRAW BALE SEDIMENT BARRIER. SEDIMENT SHOULD BE REMOVED OR REGRADED INTO SLOPES AND THE SEDIMENT BARRIERS REPAIRED AND RE-ESTABLISHED AS NEEDED.
10. STRAW BALES SHALL BE STANDARD 40 TO 60 POUND RECTANGULAR BALES OF CEREAL GRAIN OR SEED STRAW.

SANITARY SEWER NOTES:

1. ALL TRENCH EXCAVATION SHALL CONFORM TO A.P.W.A. DIVISION III, SECTION 301.1.01, AND SHALL BE CLASSIFIED AS EITHER ROCK OR COMMON EXCAVATION. ALL EXCESS MATERIAL FROM THE TRENCH EXCAVATION SHALL BE DISPOSED OF ON AN APPROVED SITE.
2. PIPE BEDDING AND PIPE ZONE MATERIAL SHALL CONFORM WITH GRANULAR BEDDING AND BACKFILL REQUIREMENTS OF A.P.W.A. DIVISION III, SECTION 301.2.02 AND SHALL BE 3/4"-0" CRUSHED ROCK, CLASS "B". SAND MAY BE USED AS A SUBSTITUTE FOR 3/4"-0" IN TRENCHES THAT HAVE NO GROUNDWATER IN THE PIPE ZONE WITH THE APPROVAL OF THE CITY INSPECTOR.
3. TRENCH BACKFILL MAY BE CLASS "A", PER A.P.W.A. DIVISION III, SECTION 301.2.04, ON ALL SEWER LINES OUTSIDE PUBLIC STREETS OR OUTSIDE OF PAVED AREAS. TRENCH BACKFILL SHALL BE CLASS "B" PER A.P.W.A. DIVISION III, SECTION 301.2.04B IN ALL PUBLIC STREETS OR PAVED AREAS IN THE PROJECT. THE CLASS "B" BACKFILL SHALL EXTEND A MINIMUM OF TWO FEET (2') BEYOND THE EDGE OF STREET OR SURFACED AREAS.
4. TRENCH BACKFILL COMPACTION SHALL BE AS PER A.P.W.A. DIVISION III, SECTION 301.3.07. CONTRACTOR TO DETERMINE TYPE OF EQUIPMENT AND METHOD TO USE TO ACHIEVE THE REQUIRED COMPACTION. 95% COMPACTION, AASHTO T-99, IS REQUIRED IN PUBLIC STREET AND PAVED AREAS. 85% COMPACTION IS REQUIRED IN NON-BUILDABLE AREAS.
5. SUBSEQUENT SETTLEMENT OF THE FINISHED SURFACE WITHIN THE WARRANTY PERIOD SHALL BE CONSIDERED TO BE A RESULT OF IMPROPER COMPACTION AND SHALL BE PROMPTLY REPAIRED BY THE CONTRACTOR AT NO EXPENSE TO THE OWNER.
6. ALL SEWER LINES SHALL BE VIDEO INSPECTED BY THE CONTRACTOR PER A.P.W.A. DIVISION III, SECTION 303.3.11 AND A MANDRIL PASSED THROUGH ALL P.V.C. LINES TO CHECK DEFLECTION PER A.P.W.A. DIVISION III, SECTION 303.3.10.
7. ALL SEWER LINES SHALL BE AIR TESTED PER DIVISION III, SECTION 303.309C OF THE STANDARD SPECIFICATIONS. AS REQUIRED BY A.P.W.A., MANHOLES SHALL BE HYDROSTATICALLY TESTED IN ACCORDANCE WITH A.P.W.A. DIVISION III, SECTION 306.3.03, OR IN SUBSTITUTION OF HYDROSTATIC TESTING ALL MANHOLES MAY BE VACUUM TESTED IF APPROVED BY THE CITY ENGINEER.
8. PAVEMENT RESURFACING, WHERE REQUIRED, SHALL CONFORM TO A.P.W.A. DIVISION II, STREETS AND RELATED WORK, OF THE STANDARD SPECIFICATIONS.
9. PROJECT ENGINEER RESERVES THE RIGHT TO ADJUST GRADES OR ALIGNMENT TO ACCOMMODATE OTHER UTILITIES AS REQUIRED; SUCH ADJUSTMENTS OR REVISIONS SHALL BE REVIEWED BY THE CITY OF OREGON CITY ENGINEERING STAFF AND APPROVED PRIOR TO COMMENCING WORK.
10. ALL P.V.C. SEWER PIPE SHALL CONFORM TO ASTM D3034, SDR 35 SPECIFICATIONS AND SHALL BE CLEARLY MARKED AS SUCH.
11. ALL MANHOLES LOCATED IN UNIMPROVED EASEMENTS AND RIGHT-OF-WAYS SHALL BE PROVIDED WITH TAMPER-PROOF LIDS, AND SHALL BE FLUSH WITH EXISTING GRADE AND MARKED WITH A MARKER POST.
12. SANITARY SEWER LINES CROSSING LESS THAN 18-INCHES BELOW A STORM DRAIN (12-INCHES OR GREATER IN DIAMETER) SHALL BE CONSTRUCTED WITH DUCTILE IRON PIPE.

ROAD AND STORM SEWER NOTES:

1. CONCRETE CULVERT PIPE SHALL BE ASTM C14, "CLASS 3", NONREINFORCED CONCRETE PIPE UNLESS OTHERWISE NOTED. ALTERNATE STORM PIPE ALLOWED IS ADS, N-12 OR EQUIVALENT.
2. ALL TRENCH EXCAVATION SHALL CONFORM TO A.P.W.A. DIVISION III, SECTION 301.1.01, AND SHALL BE UNCLASSIFIED. ALL EXCESS MATERIAL FROM THE TRENCH EXCAVATION SHALL BE DISPOSED OF ON AN APPROVED SITE.
3. PIPE BEDDING AND PIPE ZONE MATERIAL SHALL CONFORM WITH GRANULAR BEDDING AND BACKFILL REQUIREMENTS OF A.P.W.A. DIVISION III, SECTION 301.2.02 AND SHALL BE 3/4"-0" CRUSHED ROCK, CLASS "B". SAND MAY BE APPROVED AS A SUBSTITUTE FOR 3/4"-0" IN TRENCHES THAT HAVE NO GROUNDWATER IN THE PIPE ZONE.
4. TRENCH BACKFILL MAY BE "CLASS A" PER A.P.W.A. DIVISION III, SECTION 301.2.04A, ON ALL STORM SEWER LINES OUTSIDE PUBLIC RIGHT-OF-WAYS OR OUTSIDE OF PAVED AREAS. TRENCH BACKFILL SHALL BE "CLASS B" PER A.P.W.A. DIVISION III, SECTION 301.2.04B IN ALL PUBLIC RIGHT-OF-WAYS OR PAVED AREAS IN THE PROJECT.
5. TRENCH COMPACTION SHALL BE PER A.P.W.A. DIVISION III, SECTION 301.3.07. CONTRACTOR TO DETERMINE TYPE OF EQUIPMENT AND METHOD TO USE TO ACHIEVE REQUIRED COMPACTION. EACH LIFT SHALL BE COMPACTED TO A MINIMUM OF 95 PERCENT OF THE MAXIMUM DENSITY AS DETERMINED BY AASHTO T99, METHOD D.
6. ENGINEERED FILL SHALL BE PLACED ON AREAS STRIPED OF ALL ORGANIC MATERIALS IN LIFTS NOT TO EXCEED 8-INCHES IN DEPTH AND EACH LAYER SHALL BE SEPARATELY AND THOROUGHLY COMPACTED. WITHIN THREE (3) FEET OF ESTABLISHED SUBGRADE ELEVATION, 95 PERCENT COMPACTION SHALL BE REQUIRED. FILL MATERIALS SHALL BE PLACED WITHIN 2% OF THE OPTIMUM MOISTURE AND COMPACTED ACCORDING TO A.P.W.A. DIVISION II, SECTION 204.3.09 AS DETERMINED BY AASHTO T180. CONTRACTOR SHALL SUBMIT TEST RESULTS TO THE ENGINEER.
7. MATERIAL IN SOFT SPOTS WITHIN THE ROADWAY SHALL BE REMOVED TO THE DEPTH REQUIRED TO PROVIDE A FIRM FOUNDATION AND SHALL BE REPLACED WITH 1 AND 1/2 INCH MINUS CRUSHED ROCK.
8. THE ENTIRE SUBGRADE SHALL BE THOROUGHLY COMPACTED AT THE LOWEST MOISTURE CONTENT AT WHICH A HANDFUL OF SOIL CAN BE MOLDED BY A FIRM CLOSING OF THE HAND. THE COMPACTION SHALL BE TO A MINIMUM OF 95 PERCENT OF THE MAXIMUM DENSITY AS DETERMINED BY AASHTO T99, CONFORMING TO A.P.W.A., DIVISION II, SECTION 204.3.09 AND SECTION 206.3.05. CONTRACTOR SHALL SUBMIT TEST RESULTS TO THE PROJECT ENGINEER.
9. CONTRACTOR SHALL NOTIFY THE PROJECT ENGINEER AND THE CITY INSPECTOR WHEN SUBGRADE IS COMPLETE AND 24 HOURS PRIOR TO PLACEMENT OF ROCK BASE MATERIAL AND 24 HOURS PRIOR TO FINAL INSPECTION OF THE WORK. FAILURE TO DO SO WILL MAKE ANY SUBGRADE FAILURE OR DRAINAGE PROBLEMS THE RESPONSIBILITY OF THE CONTRACTOR.
10. THE AGGREGATE ROAD BASE SHALL BE COMPACTED PER A.P.W.A. DIVISION II, SECTION 207.3.04. CONTRACTOR SHALL SUBMIT TEST RESULTS TO THE ENGINEER. MAXIMUM DENSITY REQUIRED IS 95 PERCENT AS DETERMINED BY OSHD TM 106.
11. ASPHALT CONCRETE PAVEMENT MIX SHALL BE DESIGNED FROM A MIX FORMULA APPROVED BY O.S.H.D. FOR MATERIAL USED. CONTRACTOR TO PROVIDE PROJECT ENGINEER WITH CERTIFICATE OF COMPLIANCE FROM ASPHALT PAVEMENT PLANT, UNLESS OTHERWISE INDICATED.
12. THE ASPHALT CONCRETE PAVEMENT MIX SHALL BE COMPACTED PER A.P.W.A., DIVISION II, SECTIONS 211.3.18B, AND 211.3.22B WITH THE FOLLOWING MODIFICATION: CHANGE LIFT THICKNESS REQUIREMENT FROM LESS THAN 1-1/2 INCHES TO LESS THAN OR EQUAL TO 1-1/2 INCHES. CONTRACTOR SHALL SUBMIT TEST RESULTS TO THE ENGINEER.
13. FOR SUBDIVISIONS THE ASPHALT SHALL BE PLACED IN TWO LIFTS. THE SECOND LIFT SHALL BE PLACED ONE YEAR AFTER THE FIRST OF AFTER 90 PERCENT OF THE LOTS HAVE BEEN DEVELOPED WHICH EVER OCCURS FIRST.
14. EXCESS EXCAVATION SHALL BE SPREAD AND COMPACTED EVENLY ON THE SITE PER THE SITE GRADING PLAN. VEGETATION AND TOPSOIL TO BE STRIPPED OF FILL AREAS PRIOR TO FILLING. 95 PERCENT COMPACTION, AASHTO T99 IS REQUIRED IN BUILDABLE AREAS, 85% COMPACTION REQUIRED IN NON-BUILDABLE AREAS.
15. ALL MANHOLE RIMS NOT IN PAVEMENT AREAS SHALL BE SET SIX INCHES (6") ABOVE FINISHED GRADE.

WATER SYSTEM NOTES:

1. ALL WORK AND MATERIALS SHALL COMPLY WITH THE CITY OF OREGON CITY PUBLIC WORKS STANDARDS; THE OREGON STATE HEALTH DIVISION ADMINISTRATIVE RULES, CHAPTER 333, A.W.W.A. AND A.P.W.A. STANDARDS.
2. WATERLINE SHALL BE DUCTILE IRON PIPE CEMENT-MORTAR LINED AND SEAL-COATED AND SHALL CONFORM WITH ASTM 536, AWWA C151, AWWA C104, AND AWWA C111. WATERLINES 10 INCHES AND ABOVE SHALL BE THICKNESS CLASS 50, 8 INCHES AND BELOW SHALL BE THICKNESS CLASS 52. PIPE SECTIONS SHALL BE 18 FEET IN LENGTH WITH PUSH-ON TYTON JOINT.
3. ALL PIPE SHALL HAVE A MINIMUM COVER OF 36-INCHES BELOW THE FUTURE FINISH GRADES IN EASEMENTS AND STREET RIGHT-OF-WAYS.
4. GATE VALVES SHALL BE DOUBLE DISK TYPE WITH RESILIENT SEATS PER AWWA C-509. BUTTERFLY VALUES SHALL CONFORM TO AWWA C-504.
5. COPPER TUBING SHALL BE TYPE "K" SOFT FOR 1" AND LESS SERVICES AND TYPE "L" RIGID FOR 1-1/2" AND 2" SERVICES.
6. ALL WATER METERS TO BE INSTALLED BY CITY OF OREGON CITY WATER DEPARTMENT.
7. FIRE HYDRANT ASSEMBLIES SHALL BE INSTALLED PER CITY STANDARD DRAWINGS. FIRE HYDRANTS SHALL BE CENTURION FIRE HYDRANTS AS PRODUCED BY MEULLER CO., WITH 5 1/4" VALVE OPENING, THREE PORT NOZZLES, TWO 2-1/2" HOSE NOZZLES AND ONE 4-1/2" THREADED PUMPER NOZZLE. ALTERNATE FIRE HYDRANT MANUFACTURERS AND MODELS ARE: CLOW VALVE COMPANY, MEDALLION MODEL NO. F-2545; M & H, MODEL NO. 129; AND WATEROUS, MODEL NO. WB6790. ALL FIRE HYDRANTS INSTALLED FOR A PARTICULAR PROJECT SHALL BE THE SAME MANUFACTURER AND MODEL.
8. ALL TEES, BENDS AND BLOW-OFF LOCATIONS SHALL, UNLESS OTHERWISE NOTED, HAVE A POURED-IN-PLACE CONCRETE THRUST BLOCK CONFORMING TO CITY STANDARD DRAWINGS.
9. PIPE BEDDING SHALL BE AS PER A.P.W.A. DIVISION III, SECTION 301.2.02 AND SHALL BE 3/4"-0" CRUSHED ROCK.
10. TRENCH BACKFILL SHALL BE "CLASS B" PER A.P.W.A. DIVISION III, SECTION 301.2.04B IN ALL PUBLIC RIGHT-OF-WAYS OR PAVED AREAS IN THE PROJECT.
11. ALL SANITARY SEWER LINES WITHIN 10' LATERALLY OR 18" VERTICALLY OF WATER MAIN SHALL BE ENCASED IN CONCRETE, OR BE CONSTRUCTED OF DUCTILE IRON WATER PIPE WITH WATERTIGHT JOINTS.
12. ANY CROSSING OF WATER MAIN BY SANITARY SEWER SHALL BE MADE AT APPROXIMATELY 90 DEGREES AND HAVE 18" OF VERTICAL CLEARANCE OR SANITARY SEWER SHALL BE CONSTRUCTED OF DUCTILE IRON WATER PIPE WITH WATERTIGHT JOINTS FOR A DISTANCE OF 9' FROM BOTH SIDES OF THE WATER LINE AND ENCASED IN CONCRETE.
13. JOINT DEFLECTION ALLOWED ONLY WITH THE APPROVAL OF THE PROJECT ENGINEER AND CITY INSPECTOR.
14. THE VALVE STEM FOR BUTTERFLY VALVE SHALL BE LOCATED ON THE STREET CENTERLINE SIDE OF THE WATERLINE UNLESS OTHERWISE NOTED ON THE PLANS OR DIRECTED BY THE CITY ENGINEER.
15. OREGON STATE HEALTH DIVISION BACTERIOLOGICAL TESTS SHALL BE TAKEN BY THE CITY OF OREGON CITY WATER DEPARTMENT PRIOR TO HYDROSTATIC TESTS.
16. HYDROSTATIC TESTS: THE TEST SHALL CONFORM WITH AWWA C600, SECTION 4 WITH THE FOLLOWING MODIFICATIONS: THE TEST PRESSURE SHALL BE 150 PSI AT THE HIGHEST POINT OF ELEVATION IN ANY SECTION. THE DURATION SHALL BE 60 MINUTES AND SHALL BE MONITORED BY THE CITY OF OREGON CITY WATER DEPARTMENT. DISINFECT THE LINE PRIOR TO PERFORMING HYDROSTATIC TESTING.
17. DISINFECTION: PIPELINES SHALL BE FLUSHED AND DISINFECTED BEFORE PLACING INTO SERVICE AND PRIOR TO PERFORMING HYDROSTATIC TESTING. DISINFECTION SHALL CONFORM WITH AWWA C651. DISCHARGING OF THE HIGHLY CHLORINATED WATER USED FOR DISINFECTION SHALL NOT BE DISCHARGED INTO SURFACE WATERS. APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS CONCERNING DISCHARGE SHALL BE FOLLOWED.

REGISTERED PROFESSIONAL ENGINEER
5679
OREGON
July 8, 1966
THOMAS L. TYE
EXPIRES: 6/30/98
SIGNATURE DATE: ________

REGISTERED PROFESSIONAL ENGINEER
7120
OREGON
July 16, 1971
BRUCE D. GOLDSON
EXPIRES: 6/30/99
SIGNATURE DATE: 11/11/98
AS-BUILT REVIEW ONLY

APPROVALS

The data on this map is the
BEST INFORMATION AVAILABLE
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- errors and omissions may exist.

CITY STANDARD CONSTRUCTION NOTES

AS-BUILT
DATE: NOV. 11, 1998

DATE	NO.	REVISION
11/11/98	4	AS-BUILT
09/11/97	3	PER CITY REVIEW
08/21/97	2	PER CITY REVIEW
06/25/97	1	PER GENERAL PLAN REVISION

DRAWN BJS	DESIGNED TLT	CHECKED TLT
SCALE NO SCALE	DATE FEB, 1997	
PLAN 93-350.3-1725	350-3NTS.DWG	

COMPASS CORPORATION
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RIVERGATE DEVELOPMENT COMPANY
1900 DAVIS ROAD
OREGON CITY, OREGON 97045
656-1592

TRILLIUM PARK ESTATES - PHASE 3
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON
10091.01

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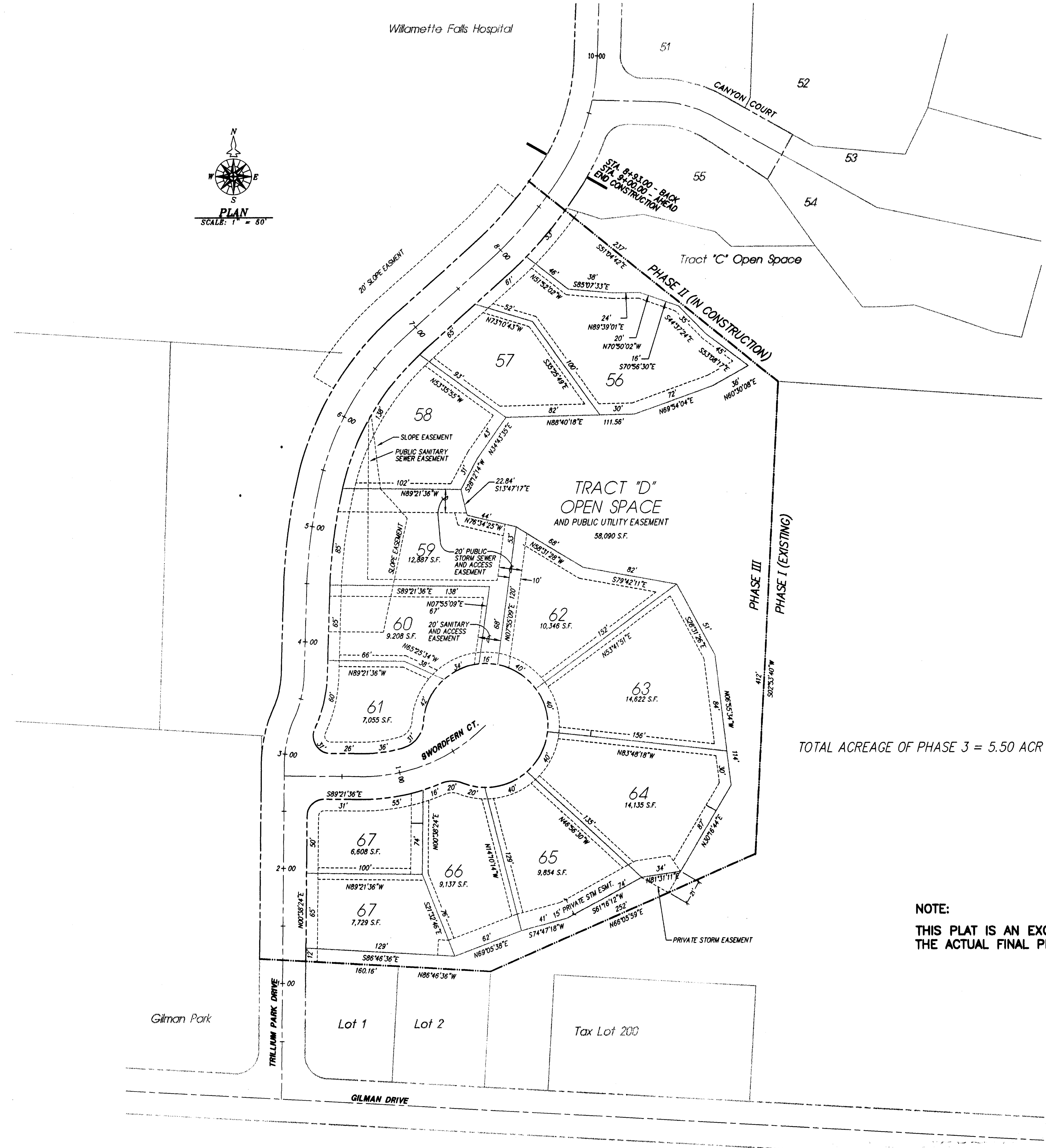

NOTE:

THIS PLAT IS AN EXCERPT OF THE FINAL RECORDED PLAT
THE ACTUAL FINAL PLAT TAKES PRECEDENCE OVER THIS DRAWING.

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AS-BUILT
DATE: NOV. 11, 1998

PRELIMINARY PLAT

DATE	NO.	REVISION
11/11/98	4	AS-BUILT
08/20/97	2	PER CITY REVIEW
06/25/97	1	PER CITY REVIEW

DRAWN BJS | DESIGNED TLT | CHECKED TLT
SCALE 1" = 50' | DATE FEB. 1997
PLAN 93-350.3-1725 | 350-3CIV .DWG

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TRILLIUM PARK ESTATES - PHASE 3
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON
10091.02

2/10

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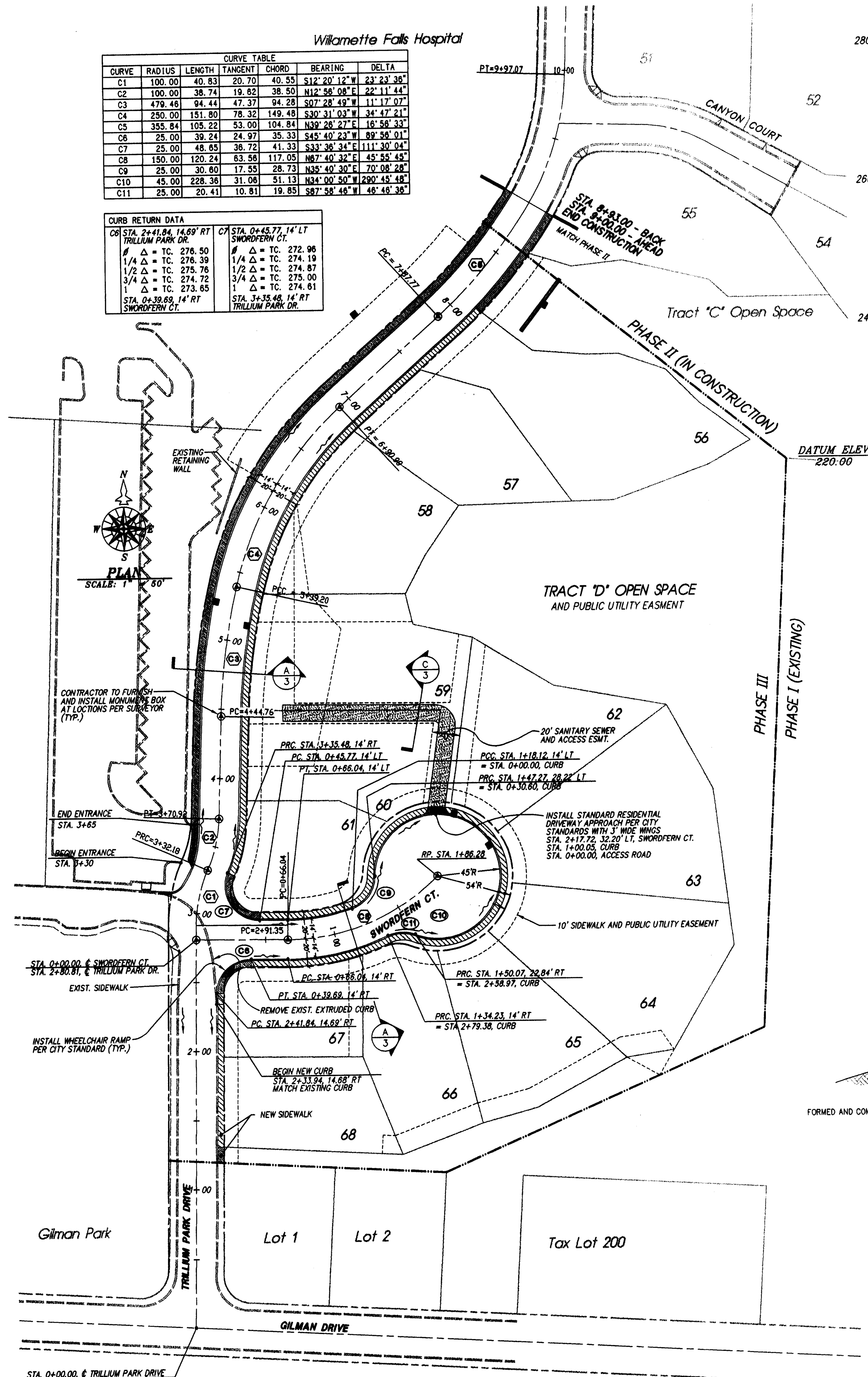
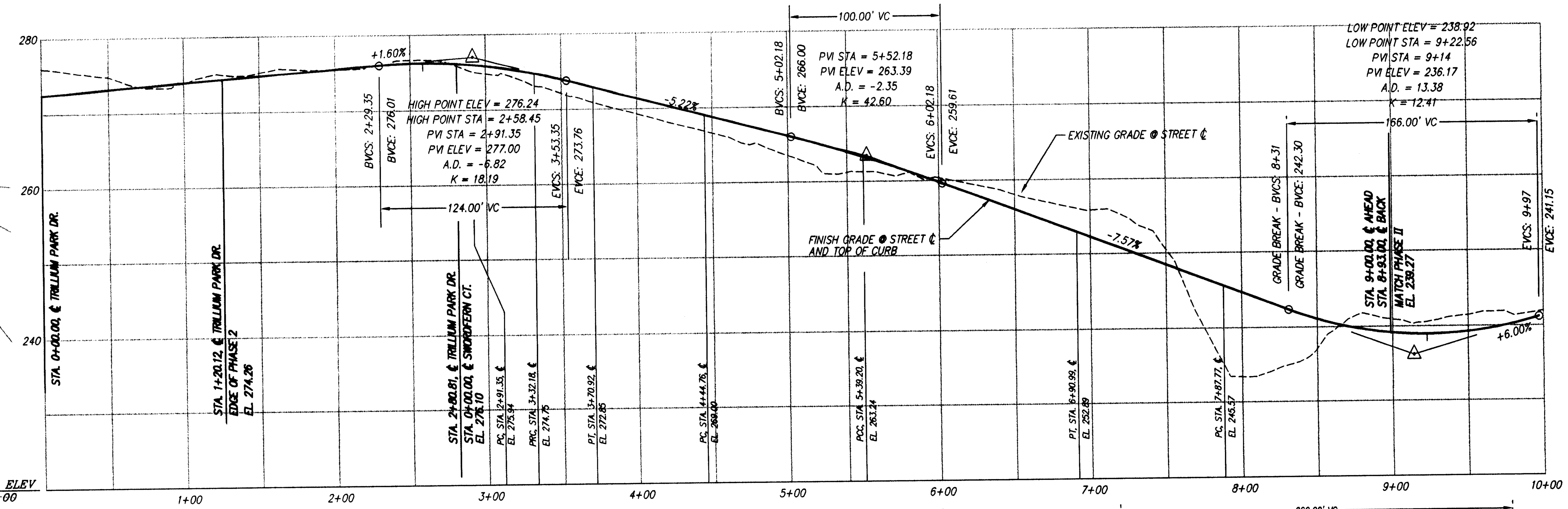


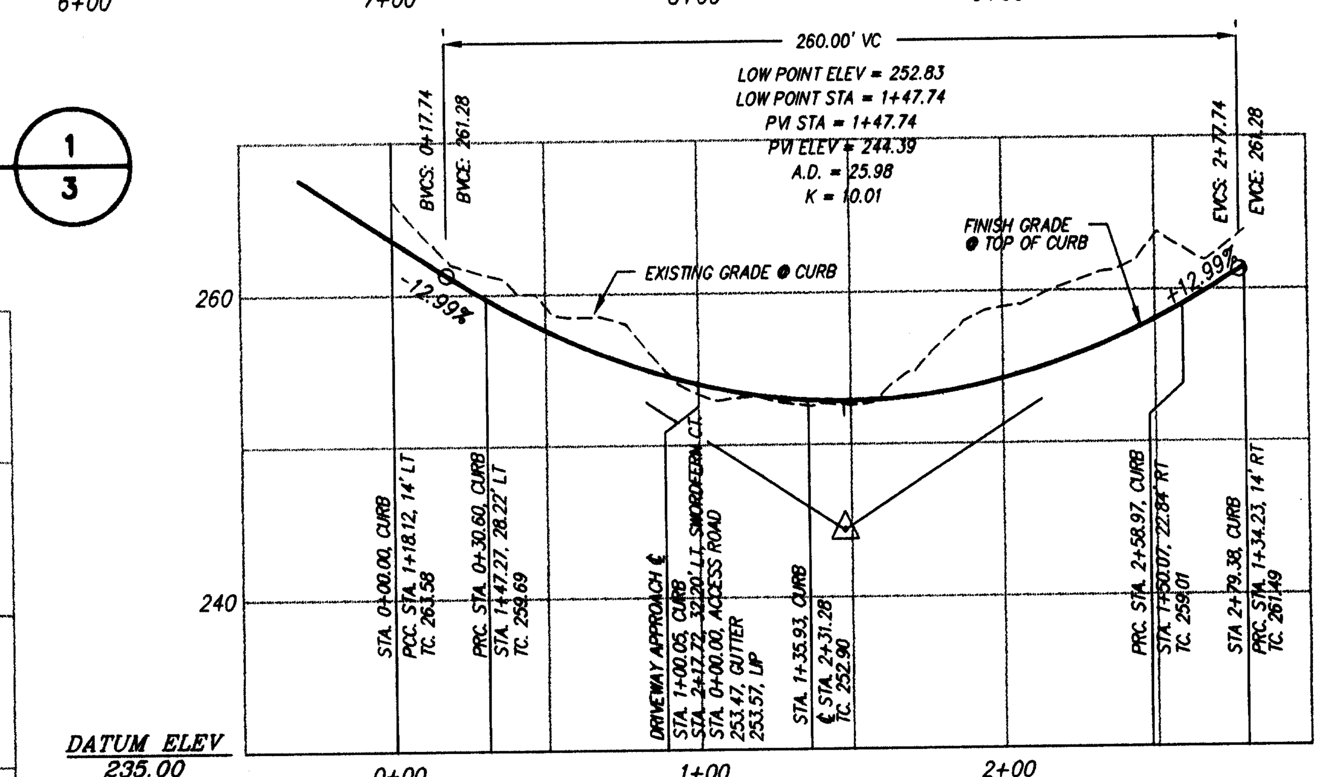
CURVE TABLE						
CURVE	RADIUS	LENGTH	TANGENT	CHORD	BEARING	DELTA
C1	100.00	40.83	20.70	40.55	S12°20'12"W	23°23'36"
C2	100.00	38.74	19.62	38.50	N12°56'08"E	22°11'44"
C3	479.46	94.44	47.37	94.28	S07°28'49"W	11°17'07"
C4	250.00	151.80	78.32	149.48	S30°31'03"W	34°47'21"
C5	355.84	105.22	53.00	104.84	N39°26'27"E	16°56'33"
C6	25.00	39.24	24.97	35.33	S45°40'23"W	89°56'01"
C7	25.00	48.65	36.72	41.33	S33°36'34"E	111°30'04"
C8	150.00	120.24	63.56	117.05	N67°40'32"E	45°55'45"
C9	25.00	30.60	17.55	28.73	N35°40'30"E	70°08'28"
C10	45.00	228.36	31.06	51.13	N34°00'50"W	290°45'48"
C11	25.00	20.41	10.81	19.85	S87°58'46"W	46°46'36"

CURB RETURN DATA			
C6	STA. 2+41.84, 14.69' RT TRILLIUM PARK DR. Ø Δ = TC. 276.50 1/4 Δ = TC. 276.39 1/2 Δ = TC. 275.76 3/4 Δ = TC. 274.72 1 Δ = TC. 273.65 STA. 0+39.69, 14' RT SWORDFERN CT.	C7	STA. 0+45.77, 14' LT SWORDFERN CT. Ø Δ = TC. 272.96 1/4 Δ = TC. 274.19 1/2 Δ = TC. 274.87 3/4 Δ = TC. 275.00 1 Δ = TC. 274.61 STA. 3+35.48, 14' RT TRILLIUM PARK DR.



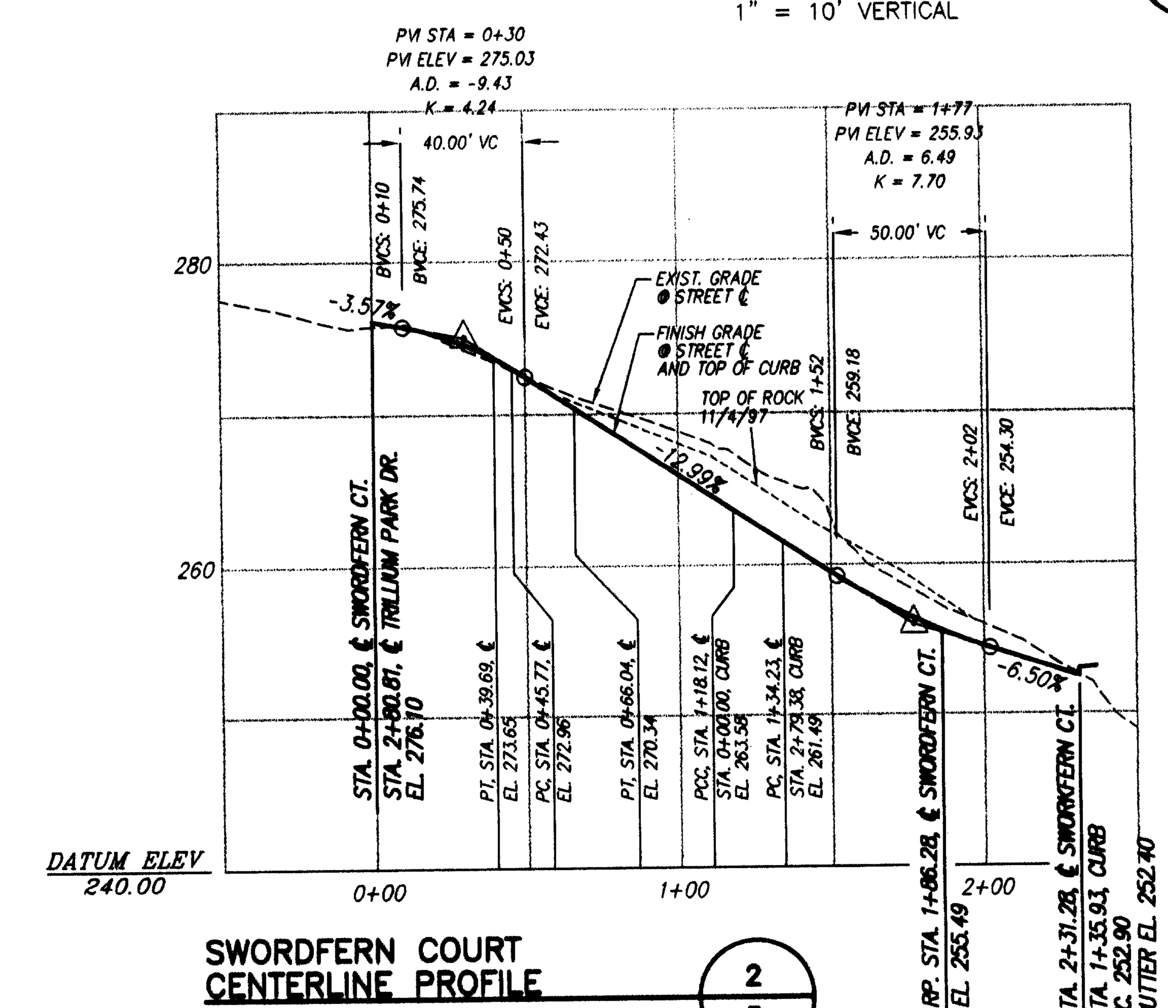
TRILLIUM PARK DRIVE CENTERLINE PROFILE (1/3)

SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL



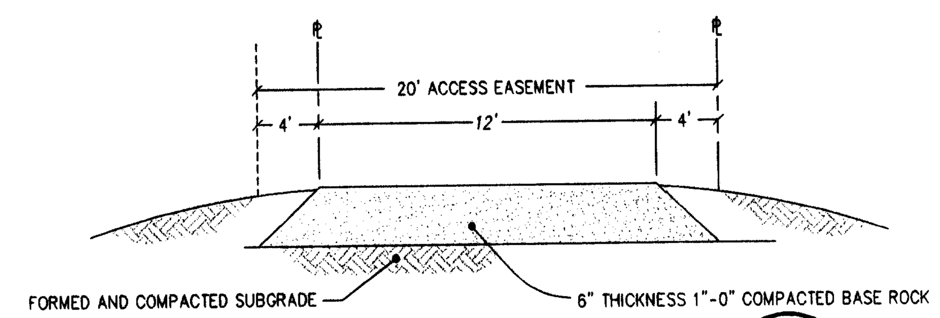
SWORDFERN CUL-DE-SACE CURB PROFILE (3/3)

SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL



SWORDFERN COURT CENTERLINE PROFILE (2/3)

SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL



ACCESS ROAD SECTION (C/3)

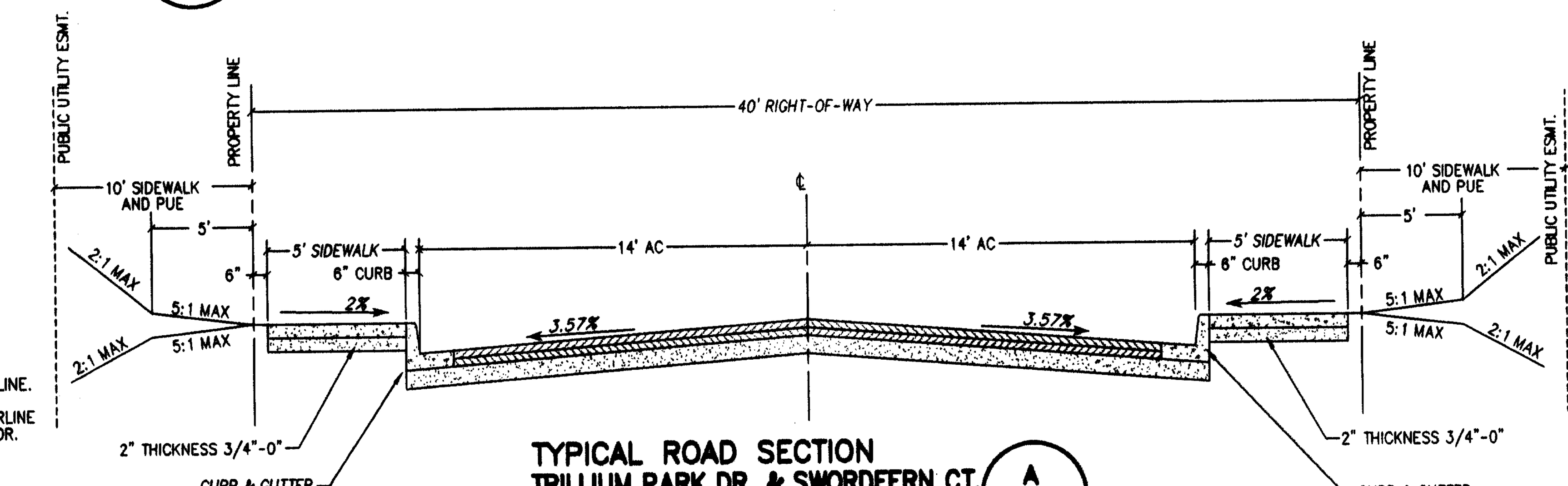
SCALE: NTS

NOTES:

1. ASPHALT CONCRETE PAVEMENT (2 LIFTS) 1 1/2" CLASS "C ON 1 1/2" CLASS "B".
2. SECOND LIFT TO BE PLACED AFTER 90% OF HOUSES CONSTRUCTED OR NO LATER THAN ONE YEAR FROM FIRST LIFT. COMPACT PER ODOT SPEC.
3. AGGREGATE BASE, 2" OF 3/4"-0" LEVELING COURSE OVER 8" OF 1"-0" BASE.
4. SUBGRADE AND BASE ROCK SHALL BE COMPACTED TO 95% RELATIVE DENSITY PER AASHTO T-180.
5. STANDARD AND CONSTRAINED SECTIONS SHALL BE SYMETRICAL ABOUT THE CENTER LINE.
6. CONTRACTOR TO FURNISH AND INSTALL CENTERLINE MONUMENTS BOXES AT LOCATION PER SURVEYOR.

NOTE:

CONTRACTOR TO STRAIGHT GRADE GUTTER AT 0.5% INTO INLET AT ALL SUMP VERTICAL CURVE LOCATIONS.



TYPICAL ROAD SECTION TRILLIUM PARK DR. & SWORDFERN CT. (A/3)

SCALE: NTS

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REGISTERED PROFESSIONAL ENGINEER 5679 OREGON July 8, 1996 THOMAS L. TYE
EXPIRES: 6/30/98
SIGNATURE DATE:

REGISTERED PROFESSIONAL ENGINEER 7120 OREGON July 16, 1971 BRUCE D. GOLDSON
EXPIRES: 6/30/99
SIGNATURE DATE: 11/04/98
AS-BUILT REVIEW ONLY

APPROVALS

ROAD PLAN & PROFILES

AS-BUILT
DATE: NOV. 11, 1998

SEE SHEET 1A FOR CITY OF OREGON CITY NOTES

DATE	NO.	REVISION
11/11/98	4	AS-BUILT
09/11/97	3	PER CITY REVIEW
08/20/97	2	PER CITY REVIEW
06/25/97	1	PER CITY REVIEW

DRAWN BJS	DESIGNED TLT	CHECKED TLT
SCALE 1" = 50'	DATE FEB. 1997	
PLAN 93-350.3-1725	350-3CIV .DWG	

COMPASS CORPORATION
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OREGON CITY, OREGON 97045
656-1592

TRILLIUM PARK ESTATES - PHASE 3
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON
10091.03

3/10

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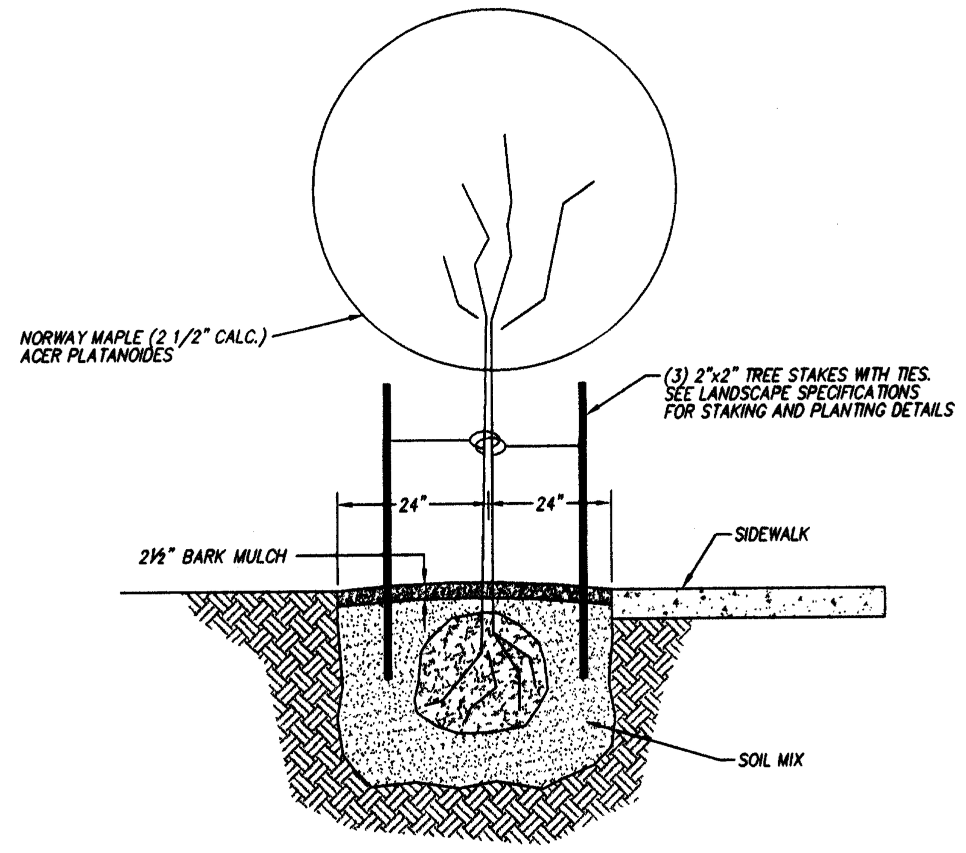
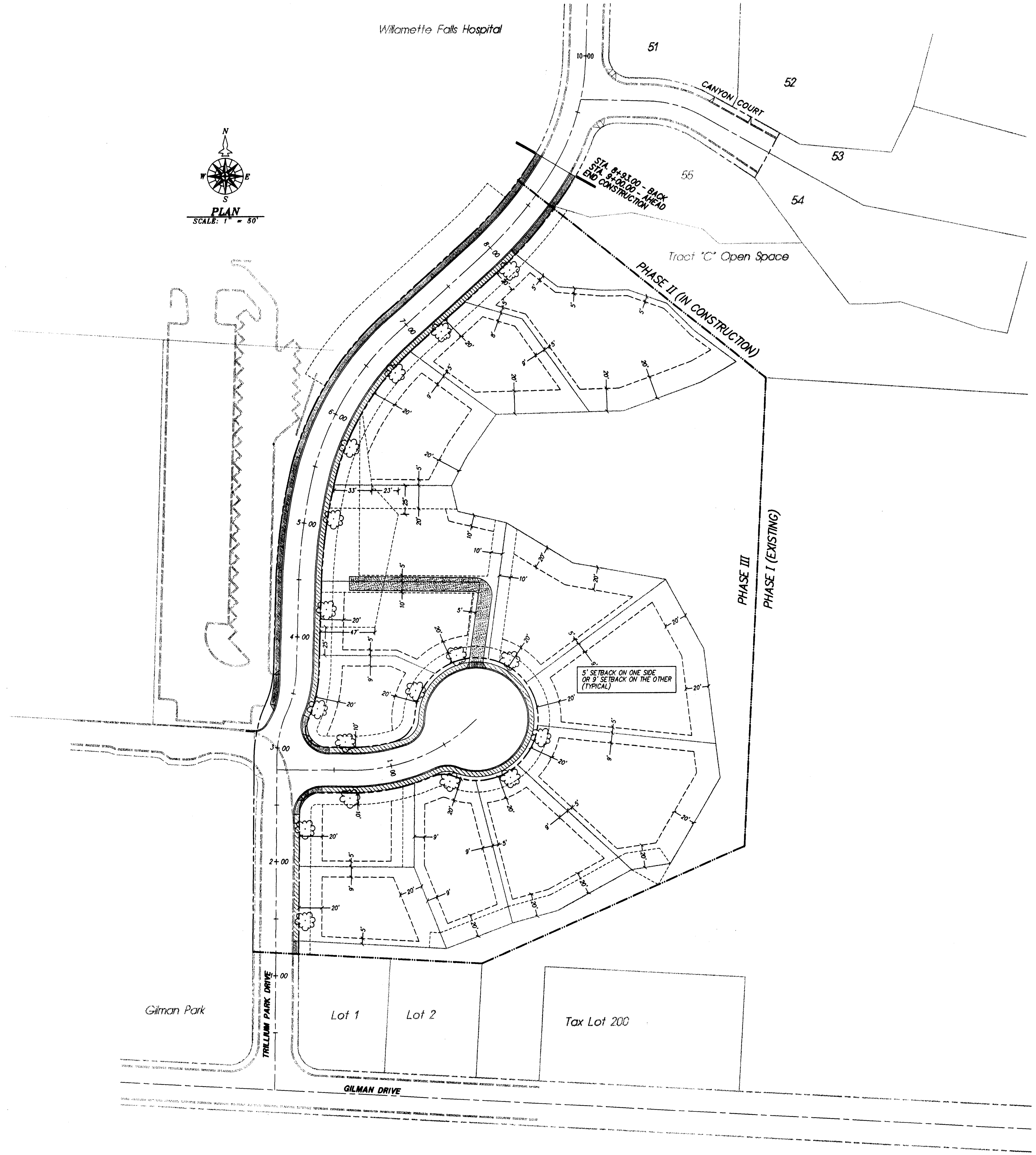


TYPICAL STREET TREE
SCALE: NTS



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AS-BUILT
DATE: NOV. 11, 1998

MAXIMUM BUILDING ENVELOPES AND TREE PLAN

DATE	NO.	REVISION
11/04/98	4	AS-BUILT
09/11/97	3	PER CITY REVIEW
08/20/97	2	PER CITY REVIEW
06/25/97	1	PER CITY REVIEW

DRAWN BJS | DESIGNED TLT | CHECKED TLT
SCALE 1" = 50' | DATE FEB, 1997
PLAN 93-350.3-1725 | 350-3CIV .DWG

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TRILLIUM PARK ESTATES - PHASE 3
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON
10091.04

4/10

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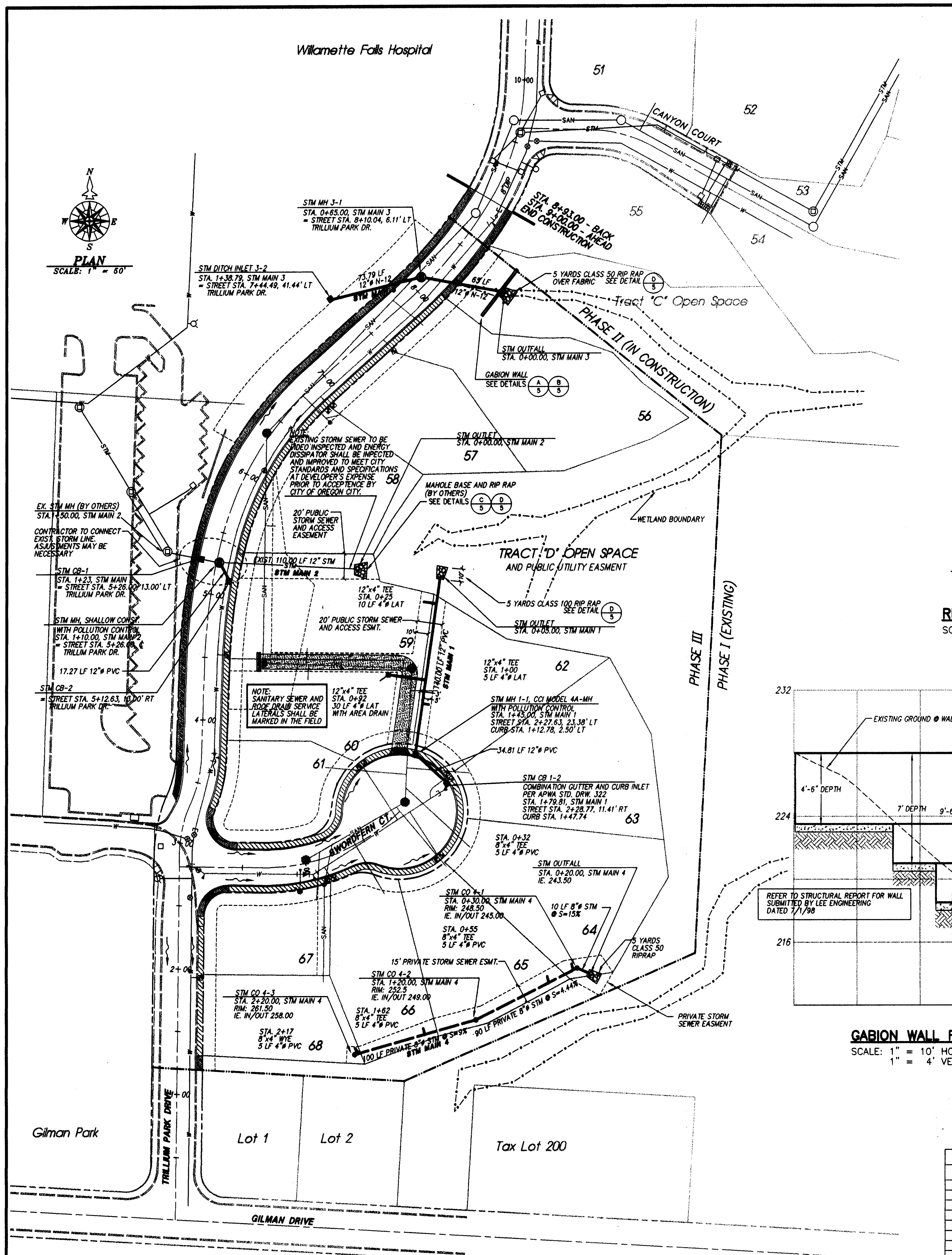
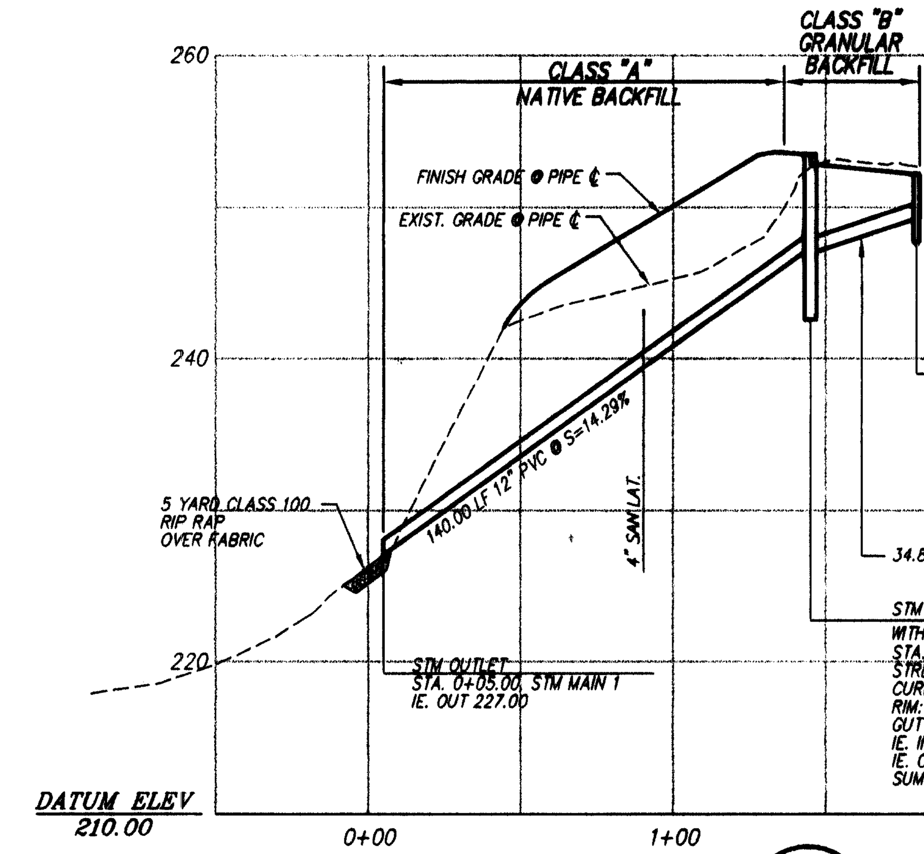
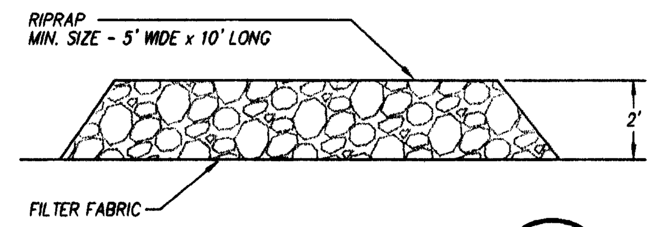


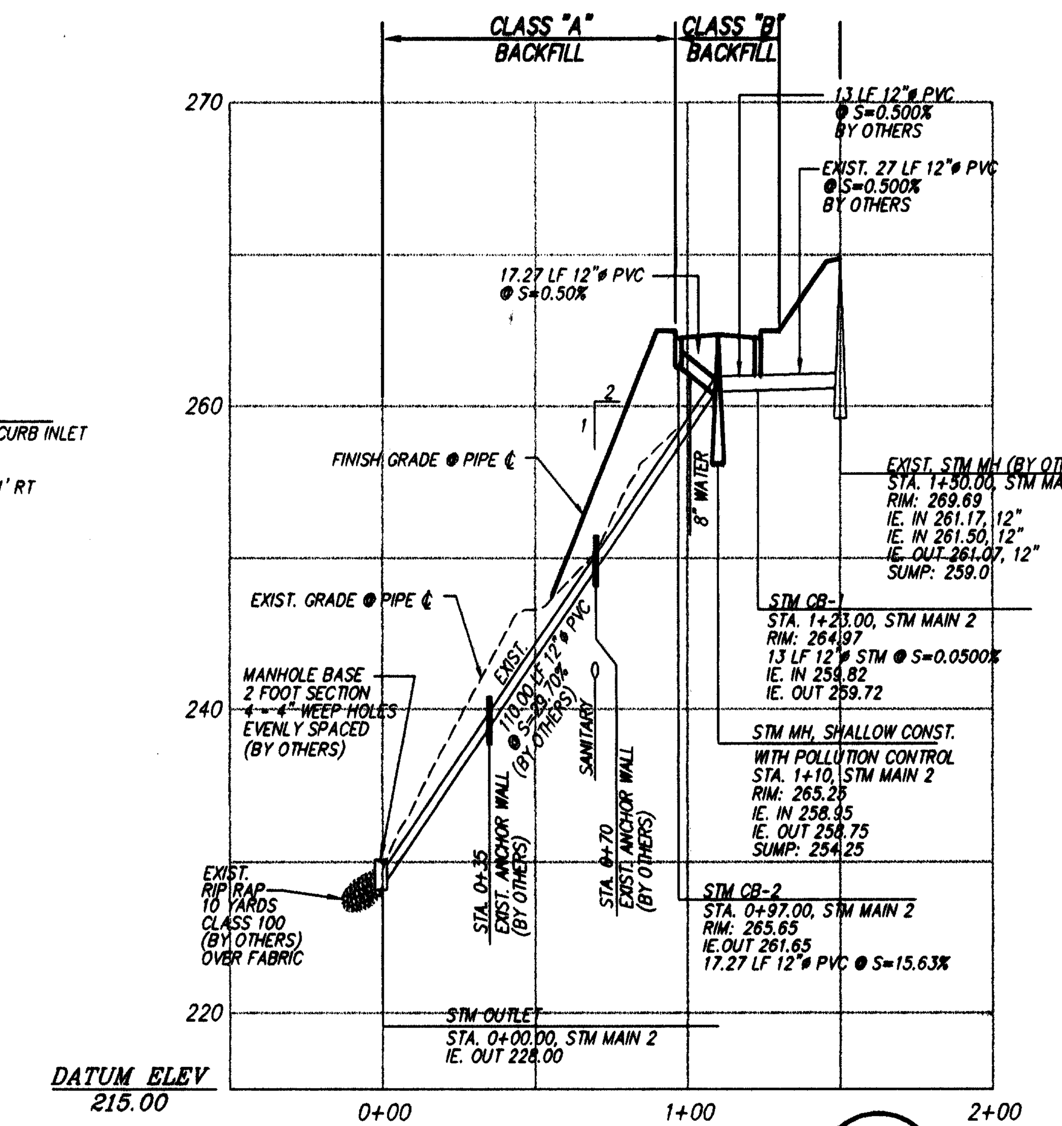
SEE SHEET 1A FOR CITY OF OREGON CITY NOTES



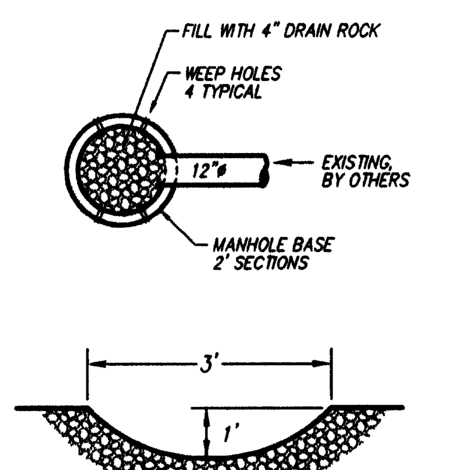
STORM MAIN 1 PROFILE (1/5)
SCALE: 1" = 50' HORIZONTAL
1" = 10 VERTICAL



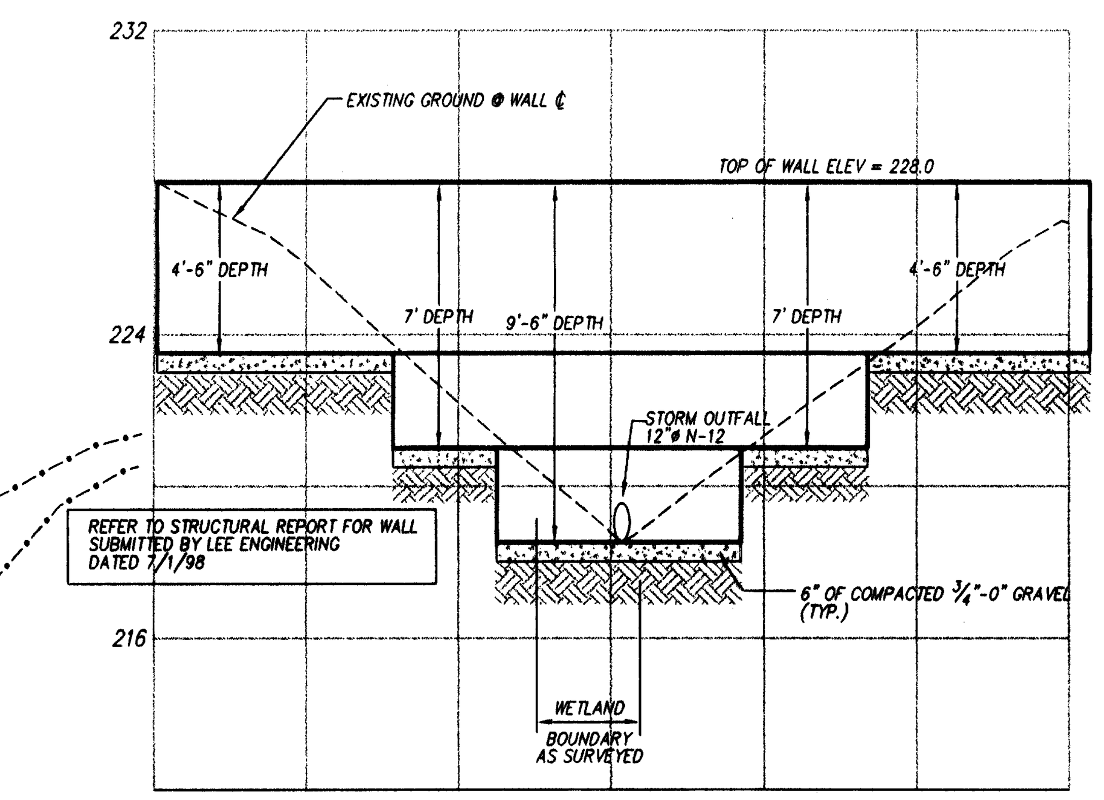
RIPRAP OVER FABRIC (D/5)
SCALE: NTS



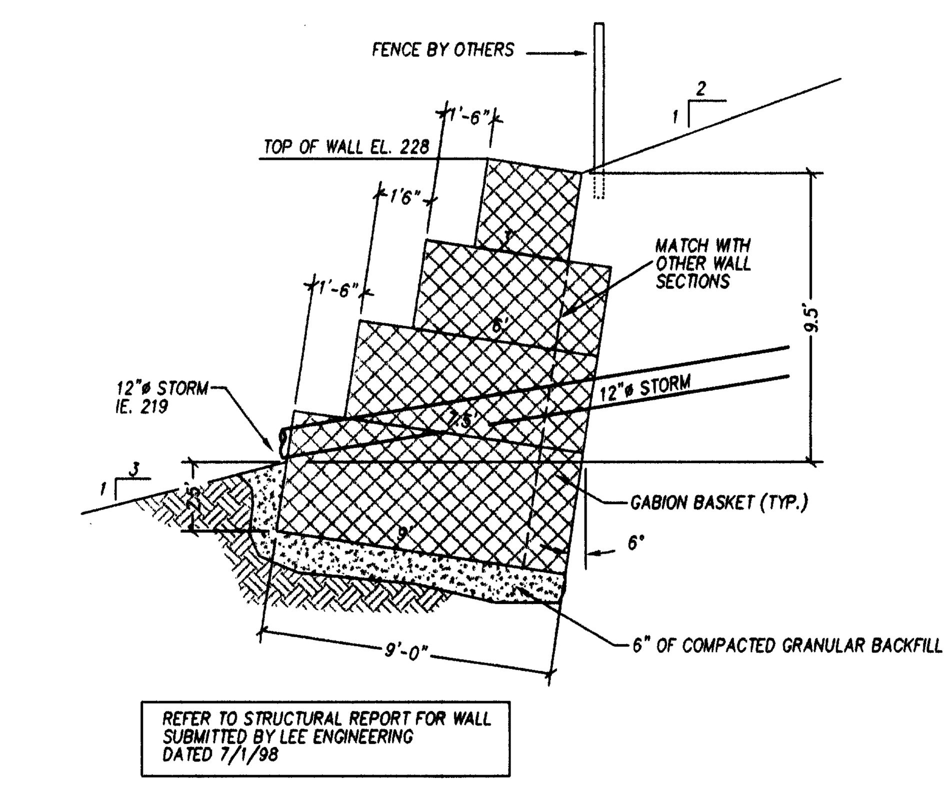
STORM MAIN 2 PROFILE (2/5)
SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL



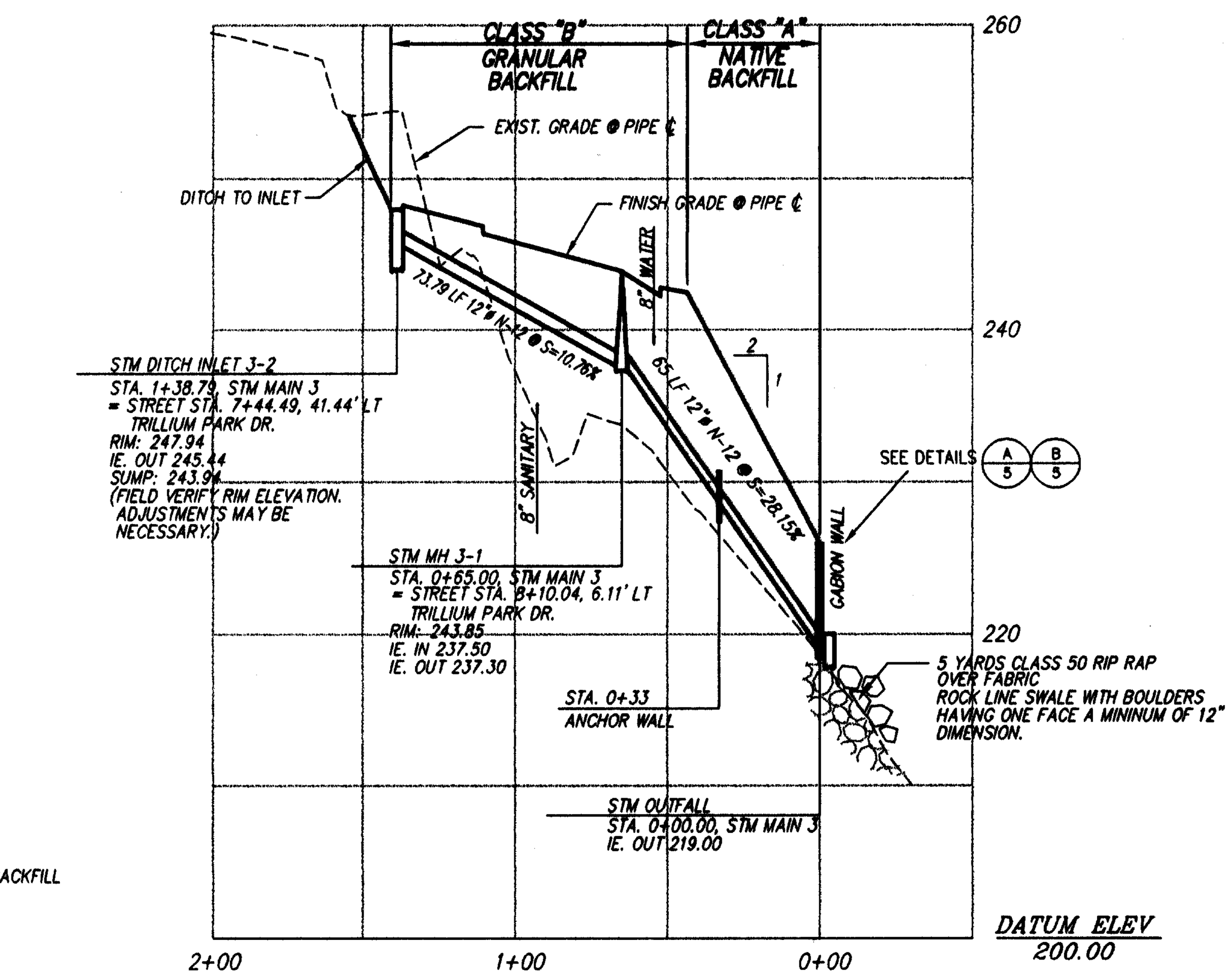
RIPRAP SECTION (C/5)
SCALE: NTS



GABION WALL FRONT SECTION (A/5)
SCALE: 1" = 10' HORIZONTAL
1" = 4' VERTICAL



GABION WALL SIDE SECTION (B/5)
SCALE: 1" = 10' HORIZONTAL
1" = 4' VERTICAL



STORM MAIN 3 PROFILE (3/5)
SCALE: 1" = 50' HORIZONTAL
1" = 10 VERTICAL

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STORM DRAINAGE TABLE		
LOT	ROOF DRAIN TO:	LAT. STA. @ TEE
56	OPEN SPACE	N/A
57	OPEN SPACE	N/A
58	OPEN SPACE	N/A
59	STM MAIN 1	STA. 0+20
60	STM MAIN 1	STA. 1+05
61	STREET	N/A
62	STM MAIN 1	STA. 1+00
63	OPEN SPACE	N/A
64	STREET/STM MAIN 4	STA. 0+32
65	STREET/STM MAIN 4	STA. 1+55
66	STREET/STM MAIN 4	STA. 1+62
67	STREET	N/A
68	STM MAIN 4	STA. 2+17

STORM DRAINAGE NOTES:

* ALL WORK AND MATERIALS SHALL COMPLY WITH THE CITY OF OREGON CITY STANDARDS AND THE A.P.W.A STANDARDS.
* CONTRACTOR SHALL NOTIFY UTILITIES BEFORE STARTING CONSTRUCTION AND SHALL COORDINATE WATERLINE CONSTRUCTION WITH OTHER FACILITIES AND UTILITIES.
* CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS PRIOR TO CONSTRUCTION AND SHALL CONSTRUCT THE WATER LINE TO AVOID CONFLICT WITH THE EXISTING UTILITIES.
* CONTRACTOR SHALL INSTALL PIPE LINE PER PLAN AND CONSTRUCTED PROPERTY TO WEST.
* EXCAVATION AND BACKFILL SHALL BE PER CITY STANDARD DETAIL.
* TRENCH SAFETY - CONTRACTOR TO DETERMINE SOIL TYPE AND PROVIDE FOR SAFETY MEASURES AS PER COUNTY, STATE AND FEDERAL LAWS.

NOTES:

1. ALL CATCH BASIN LEADS TO HAVE CLASS "B" GRANULAR BACKFILL.
2. STORM AND SANITARY LATERALS SHALL BE COLOR CODED:

   SANITARY - GREEN
   STORM - WHITE

3. MINIMUM SLOPE ON LATERALS IS 2.00% AND HAVE A MINIMUM COVER OF 4 FEET AT PROPERTY LINE.

REGISTERED PROFESSIONAL ENGINEER 5679 OREGON July 8, 1966 THOMAS L. TYE
EXPIRES: 6/30/98
SIGNATURE DATE: ________

REGISTERED PROFESSIONAL ENGINEER 7120 OREGON July 16, 1971 BRUCE D. GOLDSON
EXPIRES: 6/30/99
SIGNATURE DATE: 11/04/98
AS-BUILT REVIEW ONLY

APPROVALS

AS-BUILT
DATE: NOV. 11, 1998

DATE	NO.	REVISION
11/11/98	7	AS-BUILT
10/06/97	6	ENERGY DISSIPATOR, RIPRAP CLASS
09/26/97	5	WALL DETAILS NOTE ADDED
09/25/97	4	PER CITY REVIEW
09/11/97	3	PER CITY REVIEW
08/20/97	2	PER CITY REVIEW
06/25/97	1	PER CITY REVIEW

DRAWN BJS | DESIGNED TLT | CHECKED TLT
SCALE 1" = 50' | DATE FEB, 1997
PLAN 93-350.3-1725 | 350-3CIV .DWG

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STORM PLAN AND PROFILES

TRILLIUM PARK ESTATES - PHASE 3
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON 10091.05

5/10

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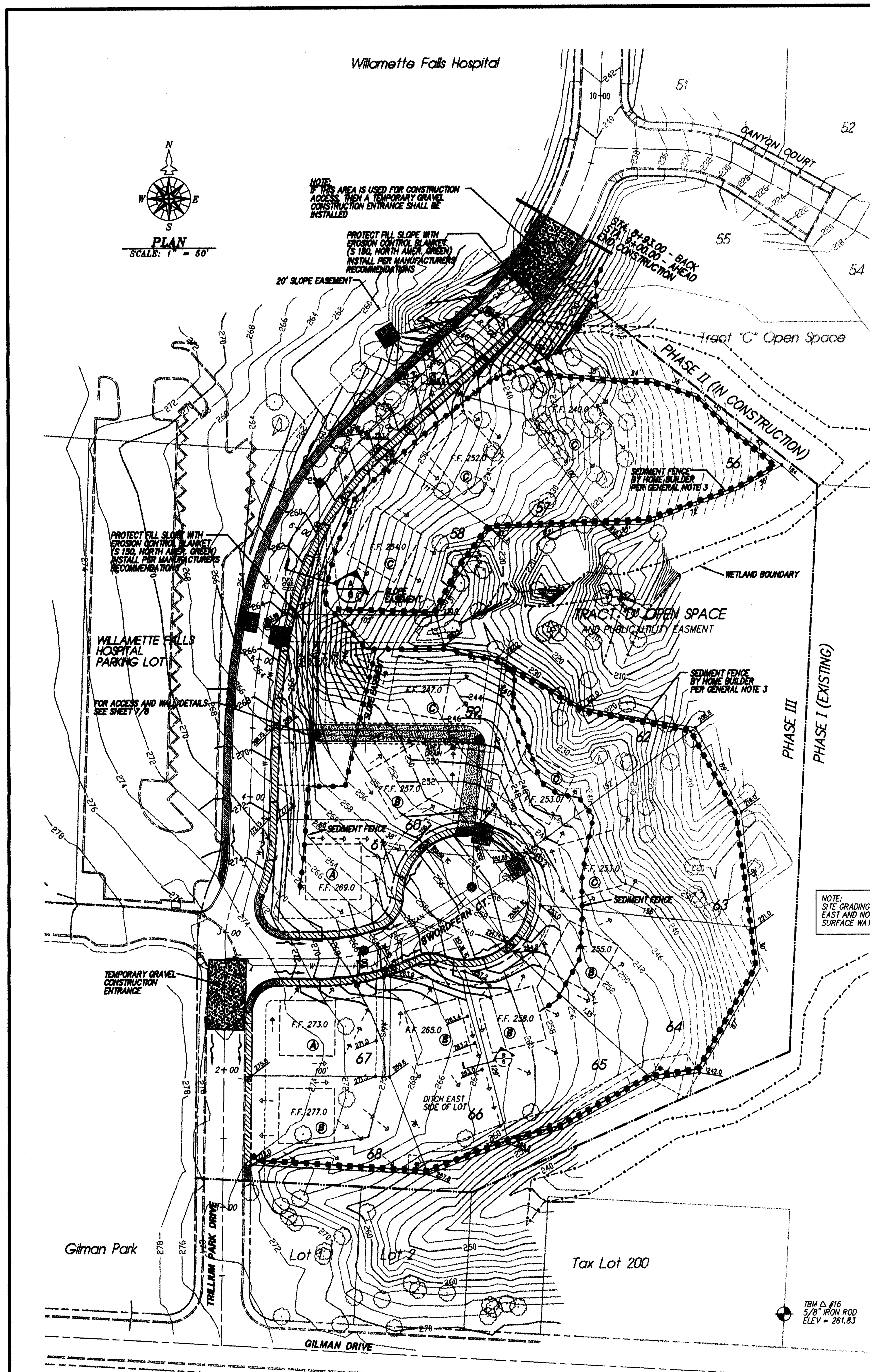
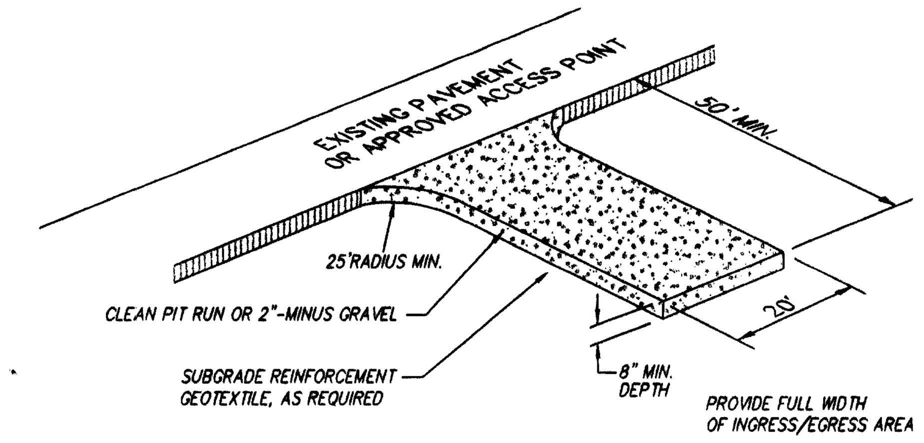
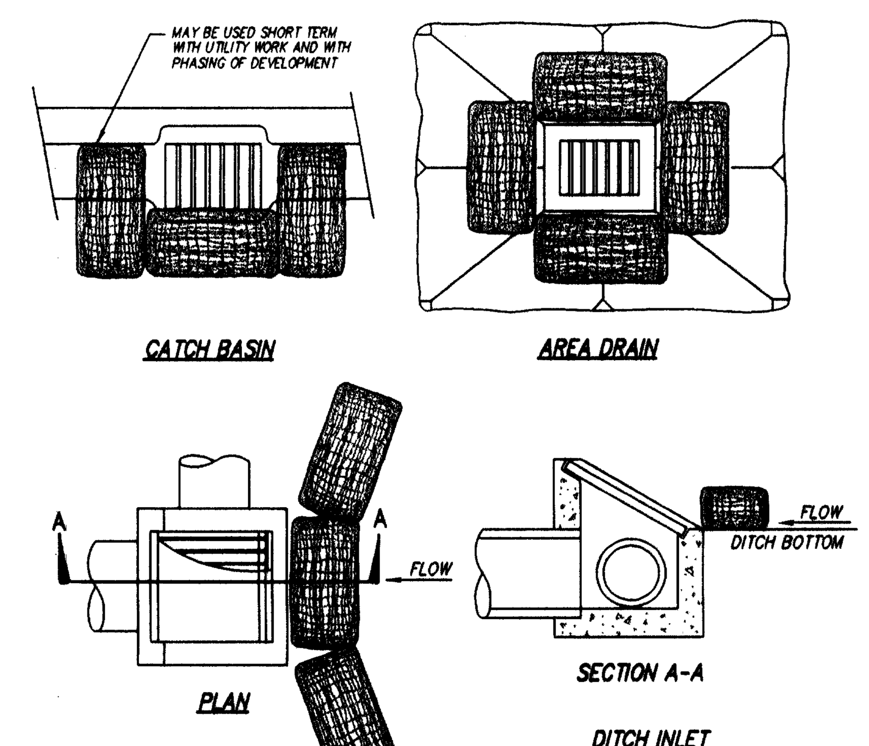


NOTE: LOTS 56, 57, 58, 59, 62, 63, 64 AND 65 MAY BE POLE FRAME CONSTRUCTION WHICH WOULD THEN REQUIRE NO GRADING.

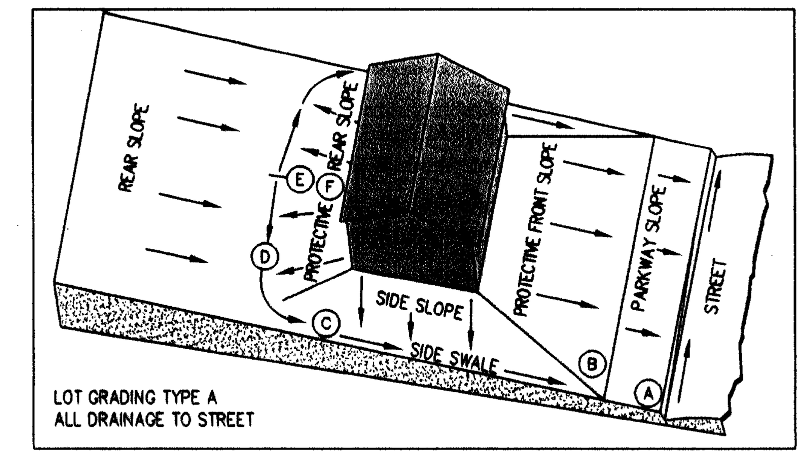
NOTE: SITE GRADING FOR LOT 66 TO HAVE SWALE ON EAST AND NORTH SIDE OF LOT TO CARRY SURFACE WATER TO AREA DRAIN.

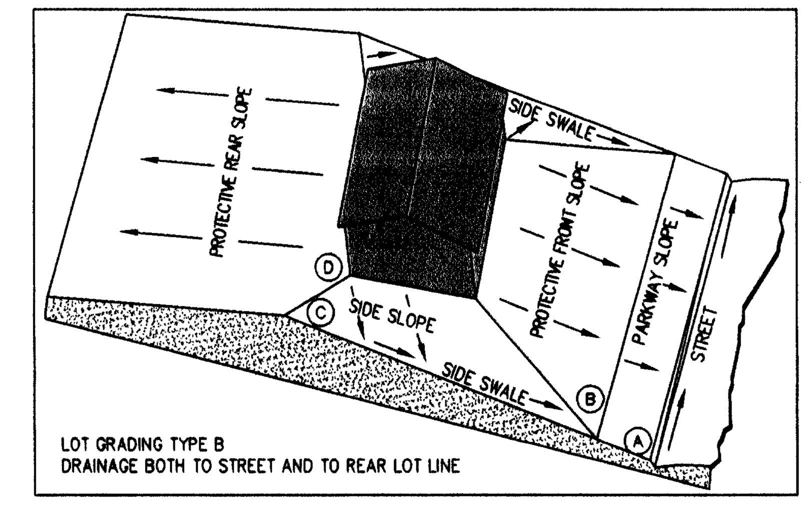


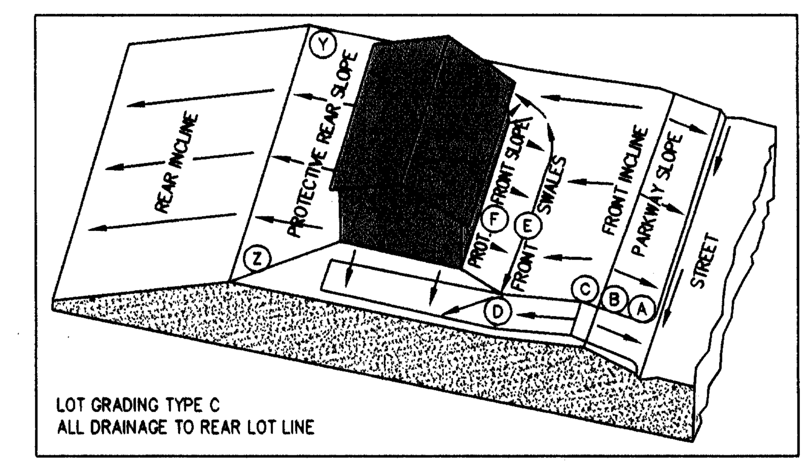
GRAVEL CONSTRUCTION ENTRANCE
SCALE: NTS



TEMPORARY BIOFILTER BAGS
SCALE: NTS







LEGEND

- DRAINAGE ARROW
- DIRECTION OF DRAINAGE
- EXISTING TREES
- APPROXIMATE BUILDING ENVELOPE
- Ⓑ LOT GRADING TYPE
- 34 LOT NUMBER
- 208.4 FINISH GRADE SPOT ELEVATIONS
- 208.4 TC FINISH GRADE TOP OF CURB
- F.F. 215.5 FINISH FLOOR ELEVATIONS
- EXISTING CONTOUR
- APPROX. EXISTING CONTOUR
- FINISH GRADE CONTOUR
- WETLAND BOUNDARY
- SEDIMENT FENCE BY CONTRACTOR
- SEDIMENT FENCE BY HOME BUILDER
- INLET/CB PROTECTION

GENERAL NOTES:

1. *PROJECT GEOTECT ENGINEER SHALL PERFORM PERIODIC GEOTECHNICAL SITE INSPECTIONS DURING CONSTRUCTION.*
2. *PLACEMENT AND COMPACTION OF SITE WILLAMETTE SILT FILL MATERIAL REQUIRE LIME TREATMENT DURING WET WEATHER SEASON.*
3. *SILT/SEDIMENT FENCE SHALL BE PROVIDED BY THE HOME BUILDER ON THEIR PERIMETER OF THE SUBDIVISION FOR LOTS 56-58 AND LOTS 62-68 SHOULD ANY BULDING PERMITS BE ISSUED FOR THESE AREAS.*
4. *THIS PLAN SHOWS MINIMUM REQUIREMENTS FOR EROSION CONTROL. ADDITIONAL MEASURES MAY BE NECESSARY.*

RESIDENTIAL LOT GRADING NOTES

1. GRADING OF RESIDENTIAL LOTS SHALL BE PER THE CITY'S DEVELOPMENT SERVICES DEPARTMENT POLICY NO. 21, "RESIDENTIAL LOT GRADING CRITERIA" UNLESS OTHERWISE APPROVED.
2. FINAL LOT GRADING IS THE RESPONSIBILITY OF THE INDIVIDUAL BUILDING PERMIT HOLDER/OWNER UNLESS OTHERWISE NOTED.
3. THE BUILDING ENVELOPES SHOWN ARE GENERIC, AND OTHER ENVELOPES ARE POSSIBLE PER THE CITY'S ZONING CODE.
4. THIS GRADING PLAN IS BASED ON THE CITY'S CRITERIA, AND MAY BE SUBMITTED FOR APPROVAL.
5. THE "LOT GRADING CONTROL LINE:" IS THE CRITICAL PATH TO DETERMINE THE TOP OF FOUNDATION ELEVATION BASED ON THE CITY'S "DESIGN CRITERIA TO DETERMINE GRADING CONTROL LINE".
6. THE "DESIGN CRITERIA TO DETERMINE GRADING CONTROL LINE" ARE:

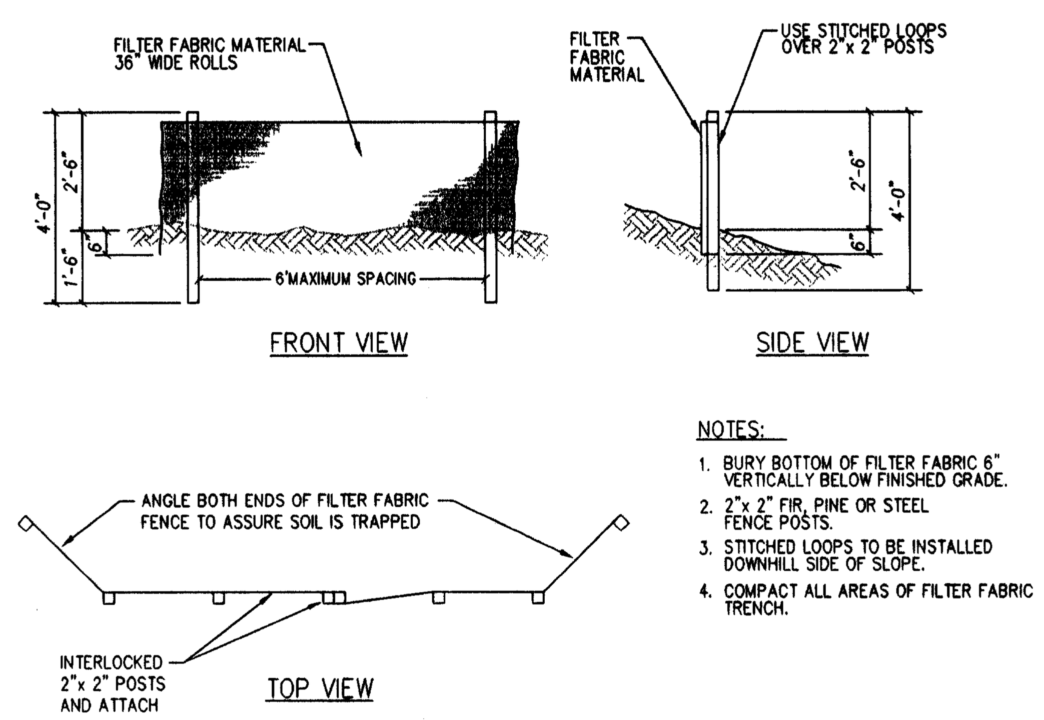
-PARKWAY SLOPE	2%
-SWALE SLOPE	2% PREFERRED
-SWALE SLOPE	1% MINIMUM
-PROTECTIVE SLOPE	MINIMUM 6 INCHES WITHIN FIRST TEN FEET OF BUILDING MINIMUM 8 INCHES ABOVE FINISHED ELEVATION
-MAXIMUM DRIVEWAY SLOPE	14%
-MAXIMUM CHANGE IN DRIVEWAY	12% FOR ANY TEN FOOT DISTANCE

7. LOTS THAT SHOW A TOP OF FOUNDATION 3.0 FEET HIGHER THAN THE AVERAGE TOP OF CURB ALONG THEIR FRONTAGE WILL EXCEED THE MAXIMUM DRIVEWAY SLOPE OF 14 PERCENT. THOSE LOTS SHOULD INDIVIDUALLY BE DESIGNED TO ACCOMODATE THE HOUSE PLAN AND ELEVATIONS OF THAT LOT.

NOTE:

THIS PLAN REPRESENTS A CONCEPT FOR INDIVIDUAL LOT BUILDING ELEVATIONS. HOME BUILDER TO DETERMINE FINAL FINSH FLOOR ELEVATION AND ADJUST GRADING ACCORDINGLY. SOME OF THESE HOMES MAY REQUIRE A POLE FOUNDATION.

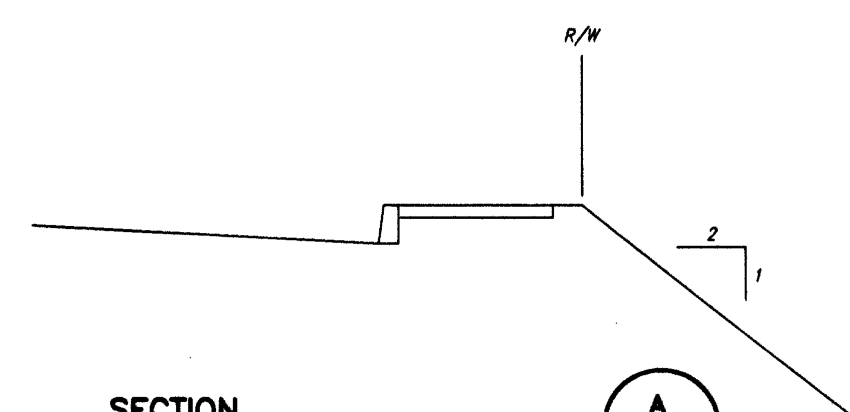
SEE SHEET 1A FOR CITY OF OREGON CITY NOTES



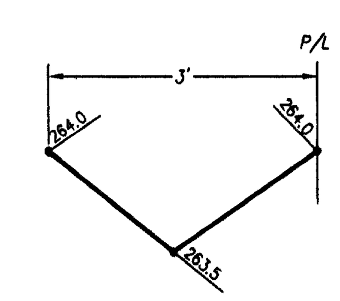
NOTES:

1. BURY BOTTOM OF FILTER FABRIC 6" VERTICALLY BELOW FINISHED GRADE.
2. 2" x 2" FIR, PINE OR STEEL FENCE POSTS.
3. STITCHED LOOPS TO BE INSTALLED DOWNHILL SIDE OF SLOPE.
4. COMPACT ALL AREAS OF FILTER FABRIC TRENCH.

SEDIMENT FENCE
SCALE: NTS



SECTION (A/6)
SCALE: NTS



DITCH SECTION (B/6)
SCALE: NTS

The data on this map is the
BEST INFORMATION AVAILABLE
from the records of the City of Oregon City
- errors and omissions may exist.

APPROVALS

REGISTERED PROFESSIONAL ENGINEER 5679 OREGON July 8, 1986 THOMAS L. TYE
EXPIRES: 6/30/98
SIGNATURE DATE:

REGISTERED PROFESSIONAL ENGINEER 7120 OREGON July 16, 1971 BRUCE D. GOLDSON
EXPIRES: 6/30/99
SIGNATURE DATE: 11/04/98
AS-BUILT REVIEW ONLY

AS-BUILT
DATE: NOV. 11, 1998

RESIDENTIAL LOT GRADING AND EROSION CONTROL PLAN

DATE	NO.	REVISION
11/11/98	5	AS-BUILT
09/25/97	4	PER CITY REVIEW
09/11/97	3	PER CITY REVIEW
08/20/97	2	PER CITY REVIEW
06/25/97	1	PER CITY REVIEW

DRAWN BJS	DESIGNED TLT	CHECKED TLT
SCALE 1" = 50'	DATE FEB. 1997	
PLAN 93-350.3-1725	350-3CIV .DWG	

COMPASS CORPORATION
ENGINEERING ★ SURVEYING ★ PLANNING
6564 S.E. LAKE ROAD
MILWAUKIE, OREGON 97222
(503) 653-9093 PHONE
(503) 653-9095 FAX

RIVERGATE DEVELOPMENT COMPANY
1900 DAVIS ROAD
OREGON CITY, OREGON 97045
656-1592

TRILLIUM PARK ESTATES - PHASE 3
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON
10091.06

6/10

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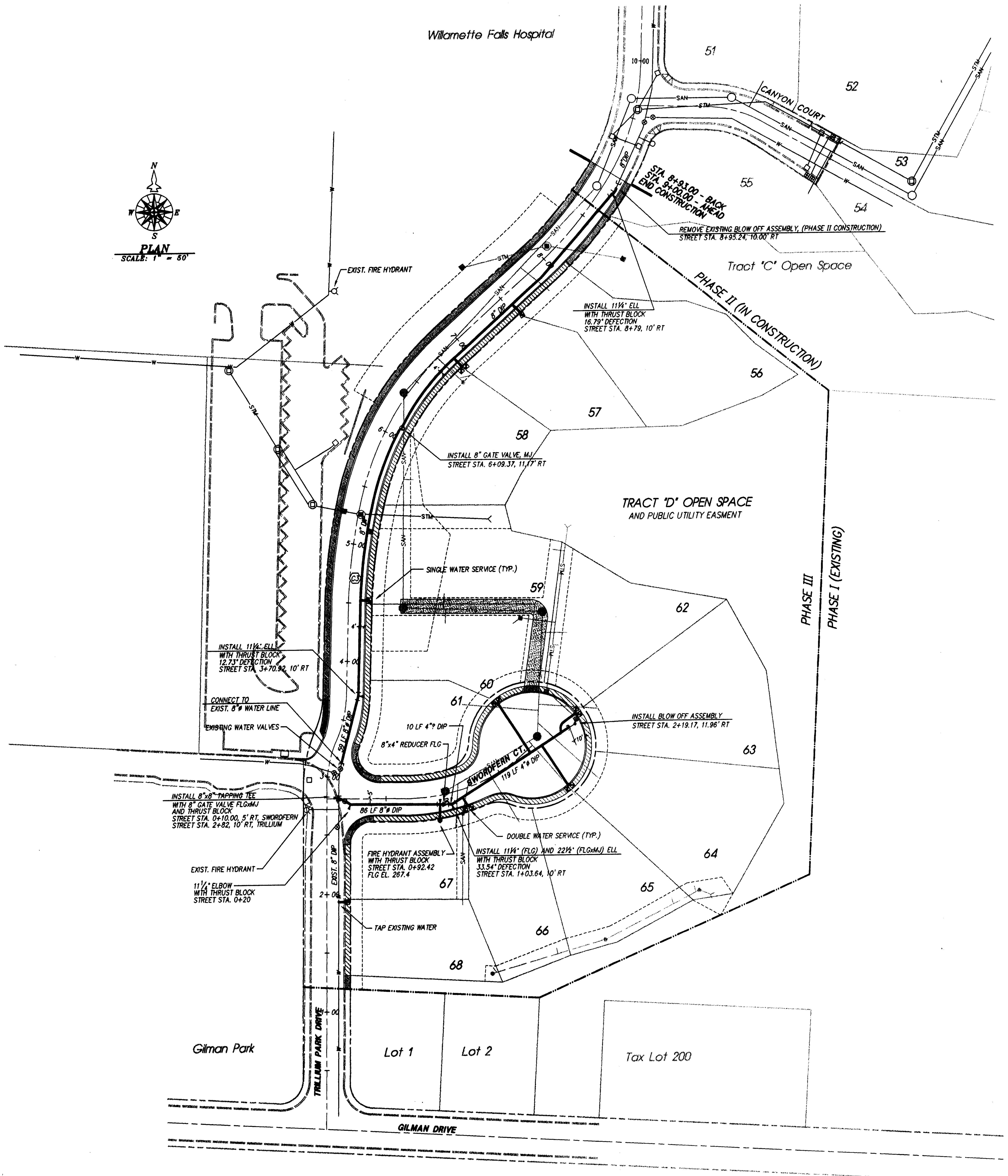
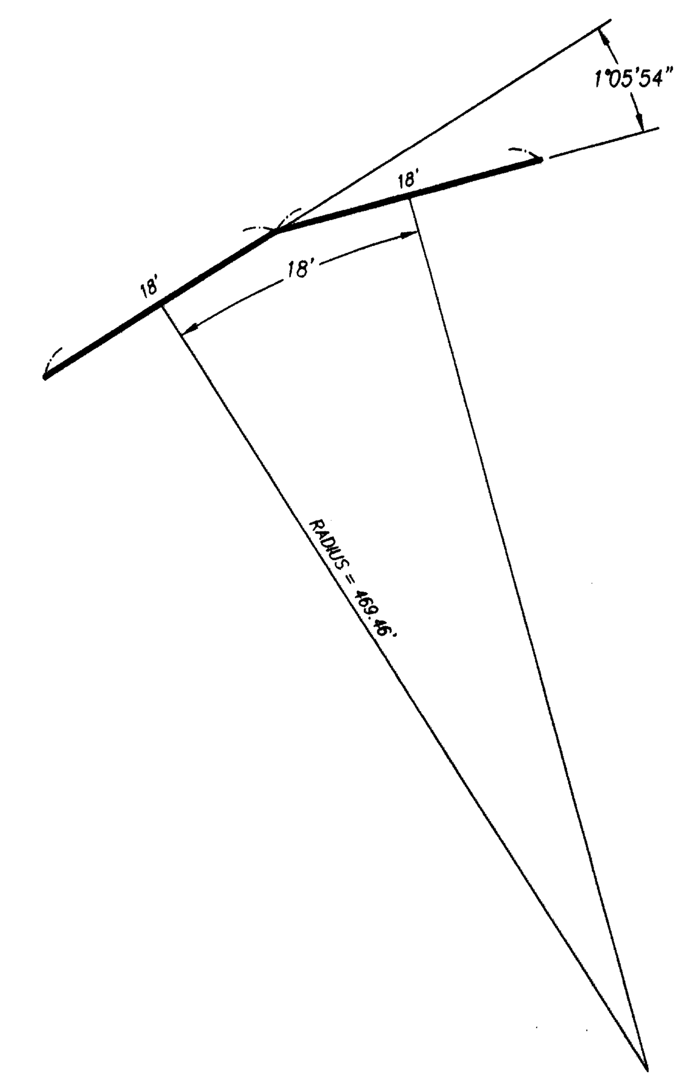


SEE SHEET 1A FOR CITY OF OREGON CITY NOTES



PIPE DEFLECTION DETAIL
CURVE NO. 3
SCALE: NTS

SCALE: 1" = 50'

NOTES:

- PROVIDE ADEQUATE BLDG. #S. MINIMUM OF 4" AND EASILY READABLE FROM THE STREET. (UFC 10.301) CONTACT TRACI SOWELL AT CITY HALL FOR ADDRESSING INFORMATION.
- HYDRANTS SHALL BE PAINTED WITH RODDA ALL PURPOSE EQUIPMENT ENAMEL (1625 SAFETY ORANGE PAINT) AND ALL CHAINS SHALL BE REMOVED FROM THE FIRE HYDRANT.
- PROVIDE ADEQUATE FIRE HYDRANT SPACING AND FIRE FLOW. (APPENDIX IIIA-B) MINIMUM FIRE FLOW 1000 GPM; MINIMUM SPACING - A HYDRANT WITHIN 250 FT. OF EVERY PROPERTY.
- PROVIDE ADEQUATE TURNING RADIUS [UFC 10.204(C)].
- PROVIDE ADEQUATE WIDTH OF FIRE DEPT. ROADWAYS/TURNAROUNDS (UFC 10.103 & 10.204).
- ANY DEADEND 150 FT. OR LONGER SHALL HAVE A FIRE DEPT. RUNAROUND [UFC 10.204(D)].
- ALL HYDRANTS, ROADWAYS, AND STREET SIGNS TO BE COMPLETED, INSTALLED AND OPERATIONAL BEFORE FRAMING BEGINS.
- NO PARKING ON PAVEMENT OF FIRE DEPT. TURNAROUND. FINANCES SHOULD BE SET ASIDE TO MAINTAIN SIGNAGE FOR DEVELOPMENT.
- NO PARKING ON 1 SIDE OF TRILLIUM DRIVE.

REGISTERED PROFESSIONAL ENGINEER 5679 OREGON July 6, 1966 THOMAS L. TYE
EXPIRES: 6/30/98
SIGNATURE DATE: ______

APPROVALS

REGISTERED PROFESSIONAL ENGINEER OREGON July 18, 1971 BRUCE D. GOLDSON
EXPIRES: 6/30/99
SIGNATURE DATE: 11/04/98
AS-BUILT REVIEW ONLY

The data on this map is the BEST INFORMATION AVAILABLE from the records of the City of Oregon City - errors and omissions may exist.

WATER PLAN

AS-BUILT
DATE: NOV. 11, 1998

DATE	NO.	REVISION
11/11/98	4	AS-BUILT
09/11/97	3	PER CITY REVIEW
08/20/97	2	PER CITY REVIEW
06/25/97	1	PER CITY REVIEW

DRAWN BJS | DESIGNED TLT | CHECKED TLT
SCALE 1" = 50' | DATE FEB, 1997
PLAN 93-350.3-1725 | 350-3CIV .DWG

COMPASS CORPORATION
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656-1592

TRILLIUM PARK ESTATES - PHASE 3
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON
10091.07

7/10

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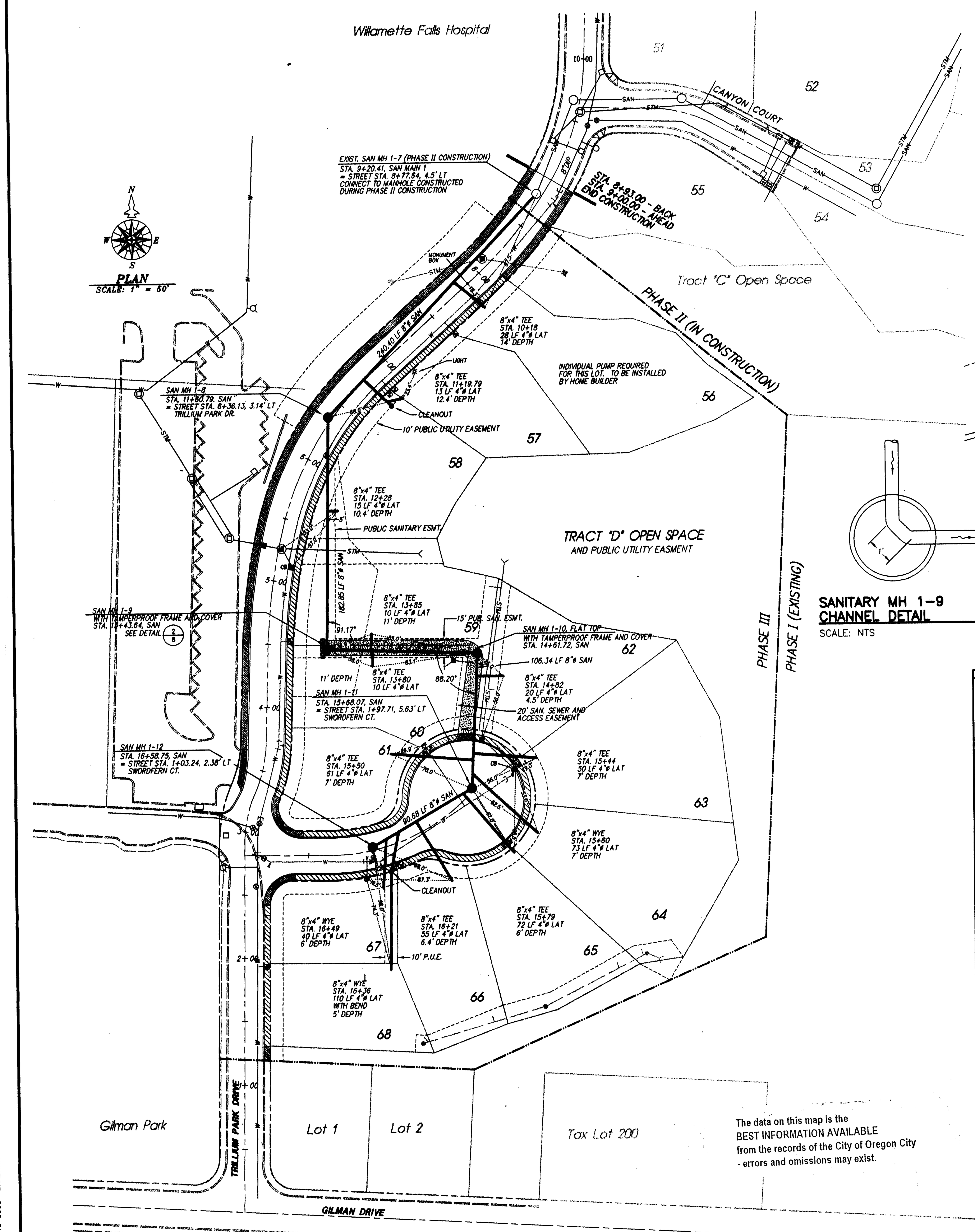
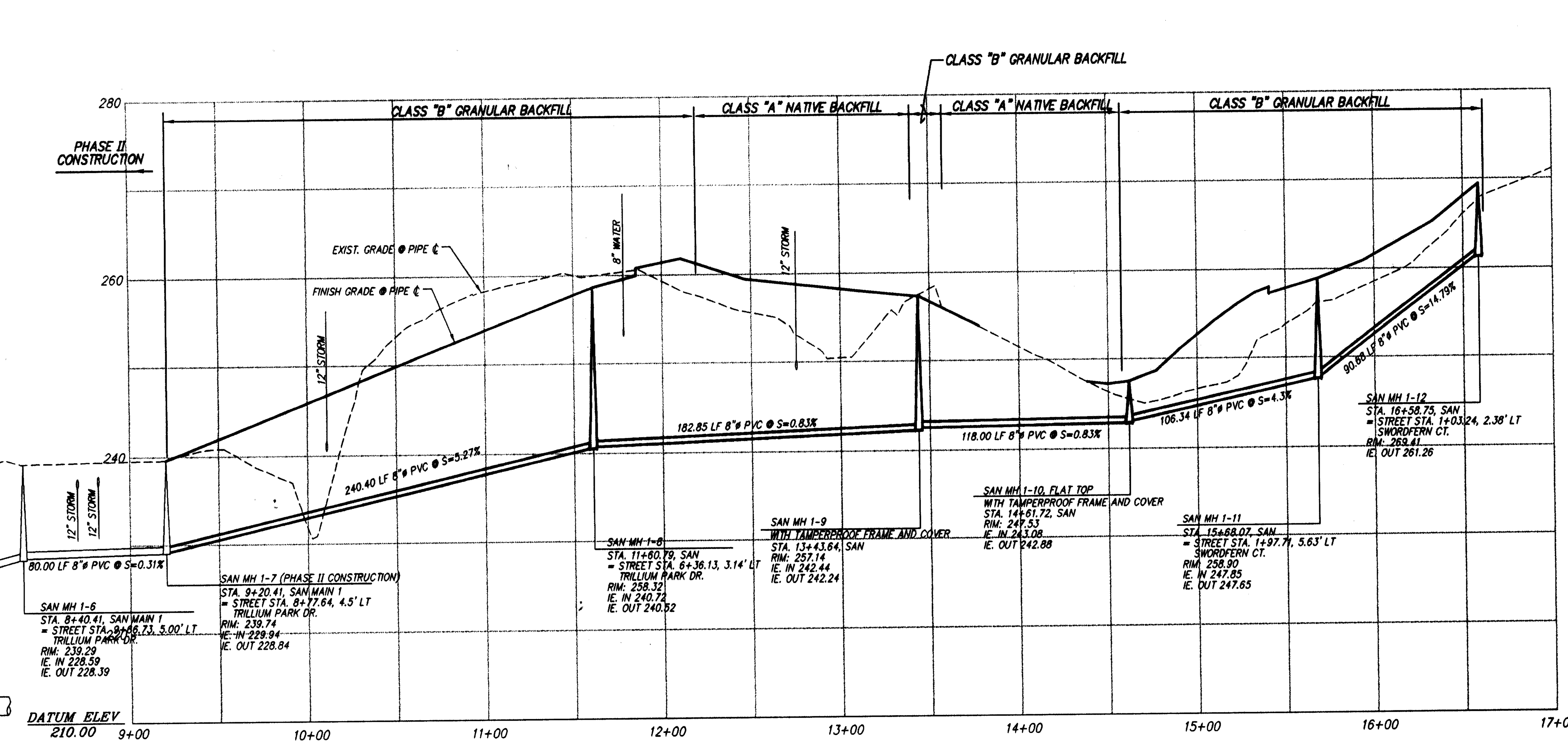
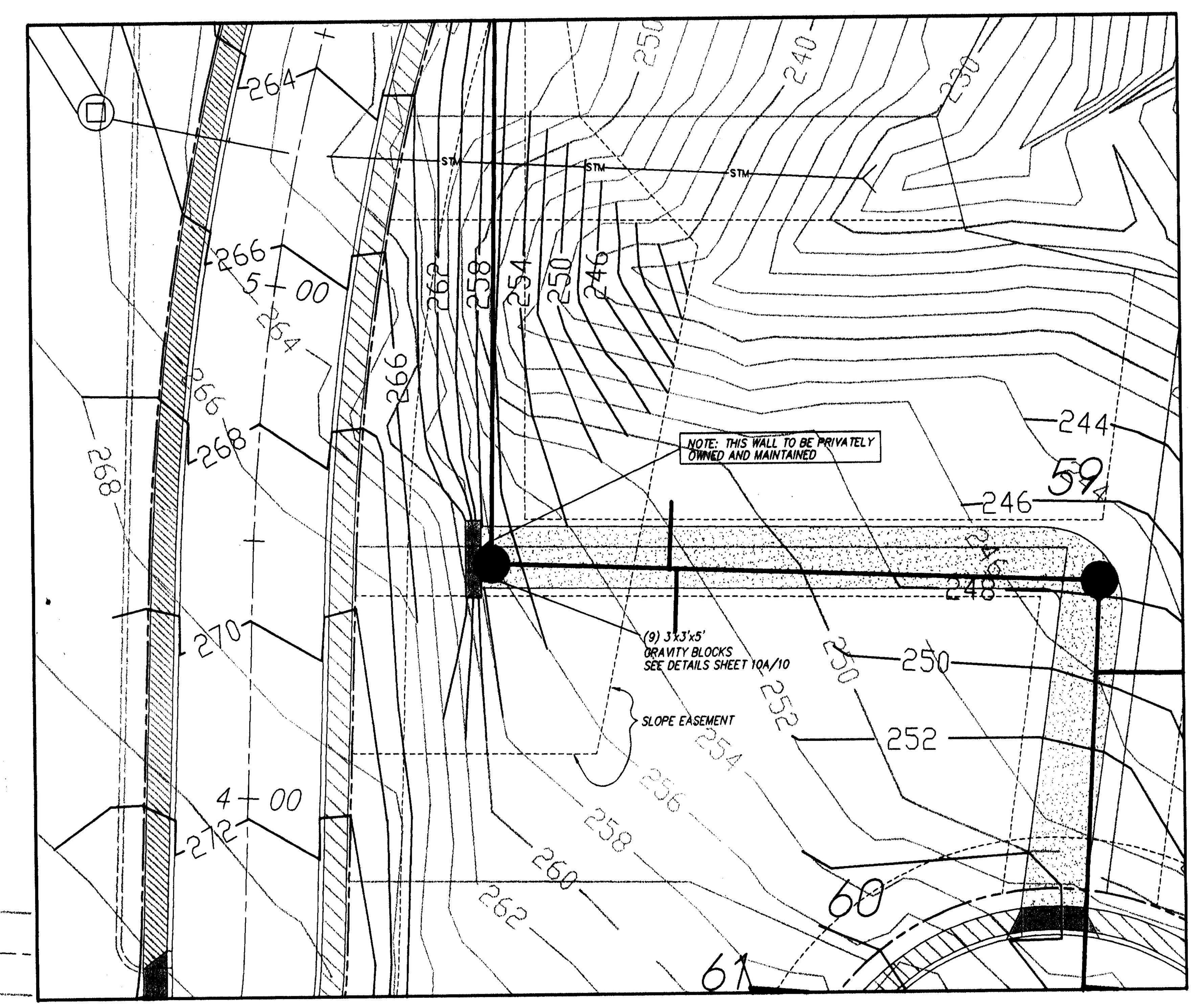


The data on this map is the BEST INFORMATION AVAILABLE from the records of the City of Oregon City - errors and omissions may exist.

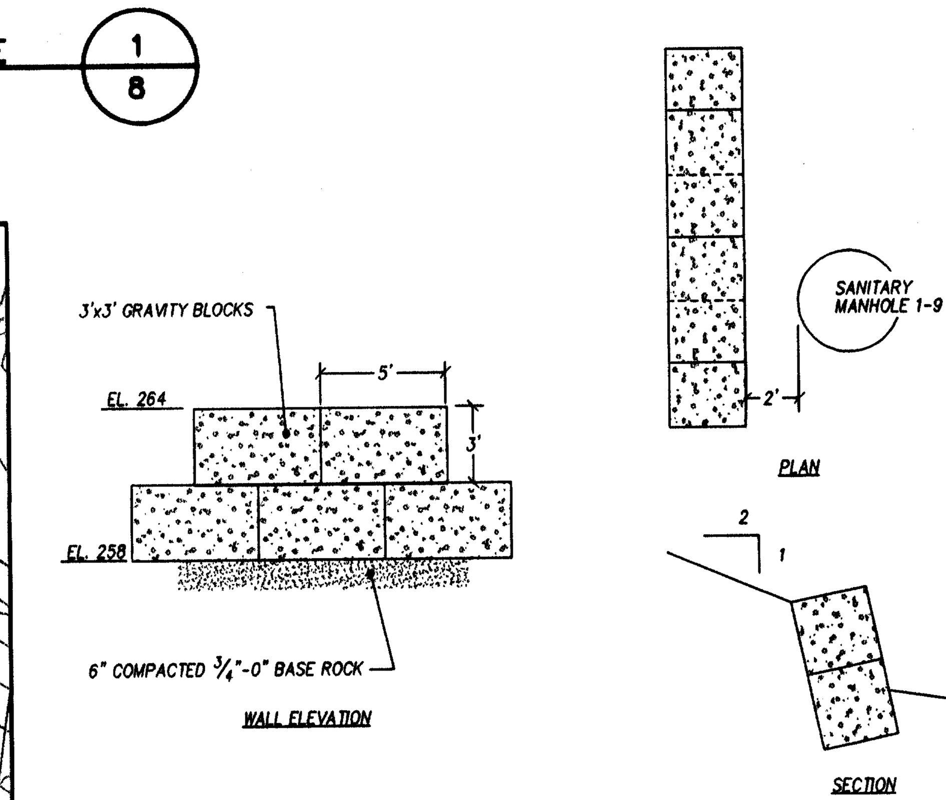
SANITARY MH 1-9 CHANNEL DETAIL (2/8)
SCALE: NTS



SANITARY SEWER PROFILE (1/8)
SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL



SANITARY MH 1-9 ACCESS PLAN (4/8)
SCALE: 1" = 20'



WALL DETAILS (3/8)
SCALE: NTS

REGISTERED PROFESSIONAL ENGINEER 5679 OREGON July 8, 1986 THOMAS L. TYE
EXPIRES: 6/30/98
SIGNATURE DATE:

REGISTERED PROFESSIONAL ENGINEER OREGON July 18, 1977 BRUCE D. GOLDSON
EXPIRES: 6/30/99
SIGNATURE DATE: 11/04/98
AS-BUILT REVIEW ONLY

APPROVALS

SEE SHEET 1A FOR CITY OF OREGON CITY NOTES

AS-BUILT
DATE: NOV. 11, 1998

SANITARY PLAN AND PROFILE

DATE	NO.	REVISION
11/11/98	4	AS-BUILT
09/11/97	3	PER CITY REVIEW
08/20/97	2	PER CITY REVIEW
06/25/97	1	PER CITY REVIEW

DRAWN BJS | DESIGNED TLT | CHECKED TLT
SCALE 1" = 50' | DATE FEB. 1997
PLAN 93-350.3-1725 | 350-3CIV .DWG

COMPASS CORPORATION
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656-1592

TRILLIUM PARK ESTATES - PHASE 3
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON
10091.08

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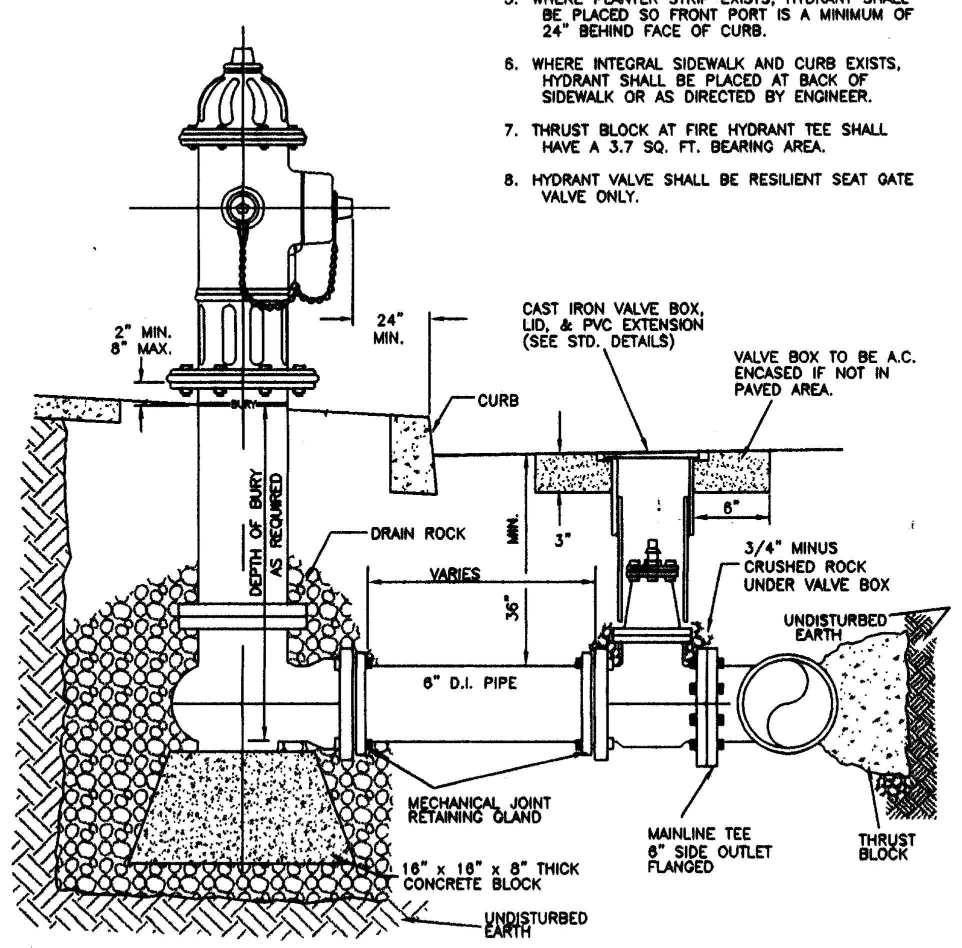
Item #2.

NOTES:

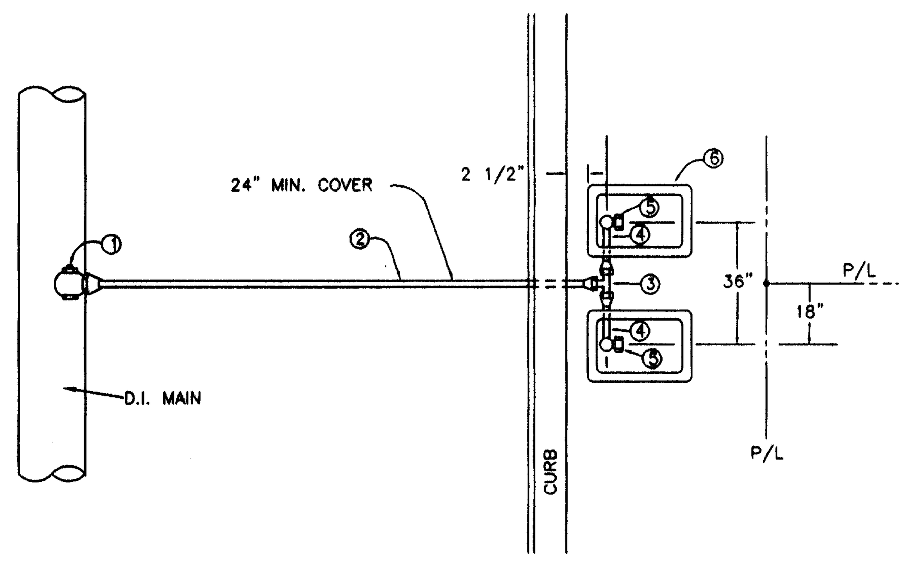
1. SEE WATER CONSTRUCTION NOTES FOR ACCEPTABLE FIRE HYDRANT MAKES AND MODELS.
2. TWO 3/4" GALVANIZED TIE RODS OR A HYDRANT HOLDING SPOOL MAY BE USED IN PLACE OF THE MECHANICAL JOINT RETAINING GLANDS FOR INSTALLATIONS LESS THAN 18" LONG.
3. ALL FITTINGS IN CONTACT WITH CONCRETE SHALL BE WRAPPED IN 10 MIL. PLASTIC. HYDRANT DRAIN HOLES TO REMAIN OPEN TO DRAIN ROCK AND OPERATIONAL.
4. 1 1/2"-3/4" CLEAN DRAIN ROCK SHALL BE PLACED A MINIMUM OF 6" ABOVE DRAIN OUTLET. COVER TOP DRAIN ROCK WITH PLASTIC.
5. WHERE PLANTER STRIP EXISTS, HYDRANT SHALL BE PLACED SO FRONT PORT IS A MINIMUM OF 24" BEHIND FACE OF CURB.
6. WHERE INTEGRAL SIDEWALK AND CURB EXISTS, HYDRANT SHALL BE PLACED AT BACK OF SIDEWALK OR AS DIRECTED BY ENGINEER.
7. THRUST BLOCK AT FIRE HYDRANT TEE SHALL HAVE A 3.7 SQ. FT. BEARING AREA.
8. HYDRANT VALVE SHALL BE RESILIENT SEAT GATE VALVE ONLY.



City of Oregon City
Public Works Standard Drawings
320 Warner Milne Rd. Oregon City, Oregon 97045

STANDARD FIRE HYDRANT INSTALLATION

DRAWN B.L.W. ENGR. J.W.H. SCALE N.T.S. DATE APRIL 1993 DWG. NO. 401



MATERIALS:

1. MUELLER CORPORATION STOP NO. H-15000, SET AT 45° DEG. ANGLE.
2. 1" SOFT TEMPER TYPE 'K' COPPER TUBING COMPLYING W/ASTM B-88.
3. MUELLER 3/4" X 3/4" X 1" "BULLHEAD" TEE NO. H-15380 ALL COP. FLARE.
4. 3/4" SOFT TEMPER TYPE 'K' COPPER TUBING COMPLYING W/ASTM B-88.
5. MUELLER ANGLE METER STOP NO. H-14255 OR FORD NO. KV23-332W.
6. BROOKS CONCRETE METER BOX, BODY NO. 37.

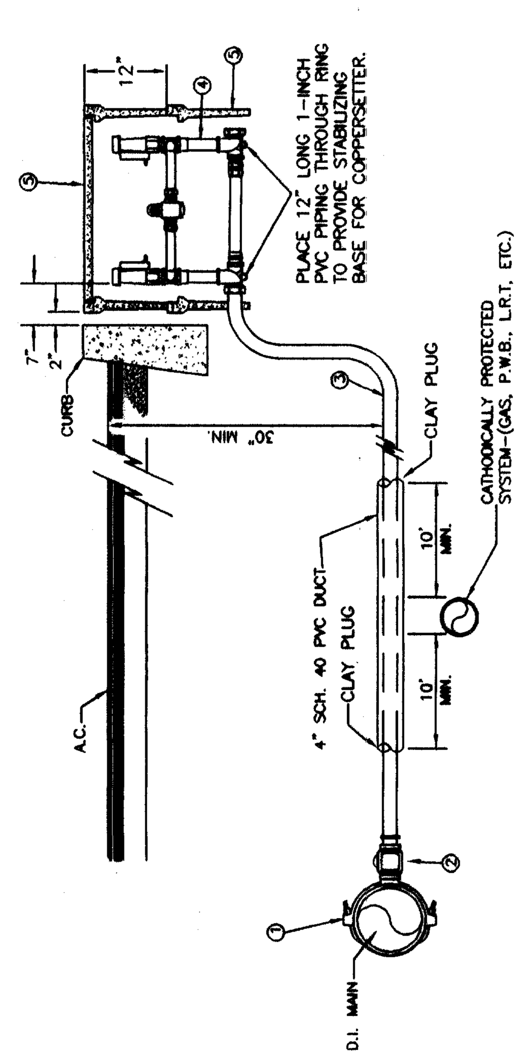
NOTES:

1. SUBSTITUTES FOR ANY MATERIALS SHOWN SHALL BE APPROVED BY THE CITY ENGINEER.
2. ALL PIPE AND STRUCTURE ZONES SHALL BE BACKFILLED USING 3/4" MINUS CRUSHED AGG. AND COMPACTED TO 95% MAX. DENSITY DETERMINED BY AASHTO T-180.
3. SET CENTERLINE METER NUT OF ANGLE METER STOP 10" BELOW TOP CURB.
4. SEE STANDARD DRAWING FOR STD. 3/4" & 1" WATER SERVICE ADDITIONAL DETAILS.
5. METER BOX SHALL BE CENTERED OVER THE COMPLETED METER ASSEMBLY.

City of Oregon City
Public Works Standard Drawings
320 Warner Milne Rd. Oregon City, Oregon 97045

STANDARD 1" DOUBLE SERVICE

DRAWN B.L.W. ENGR. J.W.H. SCALE N.T.S. DATE APRIL 1993 DWG. NO. 403



MATERIALS:

1. SERVICE SADDLE.
2. MUELLER H-9969 CORP. STOP
3. 2" ASTM B-88, ANNEALED COPPER.
4. MUELLER COPPER METER YOKE, #H-1423-2-99000, 24" RISER SIZED TO EQUAL SERVICE LINE.
5. BROOKS METER BOX, #65-H MBC FOR 1 1/2" AND #66-S MBC FOR 2" INSTALLATION.

NOTES:

1. SUBSTITUTES FOR ANY MATERIALS SHOWN SHALL BE APPROVED BY THE CITY ENGINEER.
2. ALL PIPE AND STRUCTURE ZONES SHALL BE BACKFILLED USING 3/4" MINUS CRUSHED AGG. AND COMPACTED TO 95% MAX. DENS. AS DETERMINED BY ASHTO T-180.
3. WHEN AN ACTIVE CATHODIC PROTECTED SYSTEM IS ENCOUNTERED, SCH. 40 PVC SHALL BE INSTALLED AS SHOWN WITH CLAY PLUG.
4. METER BOX SHALL BE CENTERED OVER THE COMPLETED METER AND FITTING ASSEMBLY.

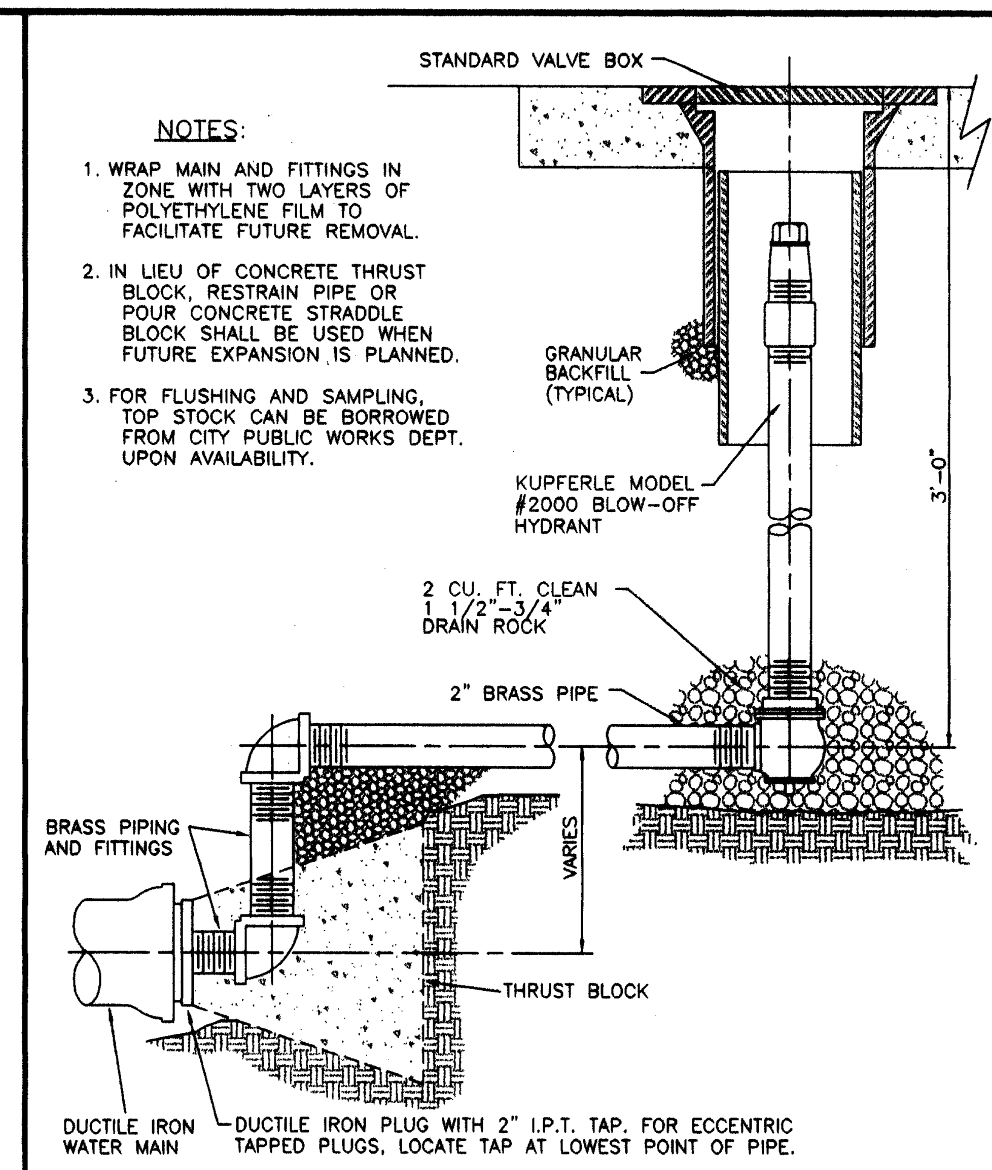
City of Oregon City
Public Works Standard Drawings
320 Warner Milne Rd. Oregon City, Oregon 97045

STANDARD 1 1/2"-2" SINGLE SERVICE

DRAWN B.L.W. ENGR. J.W.H. SCALE N.T.S. DATE JUNE 1993 DWG. NO. 404

NOTES:

1. WRAP MAIN AND FITTINGS IN ZONE WITH TWO LAYERS OF POLYETHYLENE FILM TO FACILITATE FUTURE REMOVAL.
2. IN LIEU OF CONCRETE THRUST BLOCK, RESTRAIN PIPE OR POUR CONCRETE STRADDLE BLOCK SHALL BE USED WHEN FUTURE EXPANSION IS PLANNED.
3. FOR FLUSHING AND SAMPLING, TOP STOCK CAN BE BORROWED FROM CITY PUBLIC WORKS DEPT. UPON AVAILABILITY.



City of Oregon City
Public Works Standard Drawings
320 Warner Milne Rd. Oregon City, Oregon 97045

STANDARD BLOW-OFF HYDRANT

DRAWN B.L.W. ENGR. J.W.H. SCALE N.T.S. DATE APRIL 1993 DWG. NO. 408

(HORIZONTAL) BEARING AREA OF THRUST BLOCKS IN SQUARE FEET									(VERTICAL) VOLUME OF THRUST BLOCK IN CUBIC YARDS			
FITTING SIZE	TEE, WYE, DEAD END AND HYDRANT	STRADDLE BLOCK	90° BEND PLUGGED CROSS	TEE PLUGGED ON RUN A-1	TEE PLUGGED ON RUN A-2	45° BEND	22-1/2° BEND	11-1/4° BEND	90° BEND	45° BEND	22-1/2° BEND	11-1/4° BEND
4	1.0	1.6	1.4	1.9	1.4	1.0	---	---	---	---	---	---
6	2.1	3.7	3.0	4.3	3.0	1.6	1.0	---	1.3	---	---	---
8	3.8	6.5	5.3	7.6	5.4	2.9	1.5	1.0	2.3	1.1	---	---
10	5.9	10.2	8.4	11.8	8.4	4.6	2.4	1.2	3.7	1.8	---	---
12	8.5	14.7	12.0	17.0	12.0	6.6	3.4	1.7	5.5	2.8	1.2	---
14	11.5	---	16.3	23.0	16.3	8.9	4.6	2.3	7.6	3.9	1.7	---
16	15.0	26.1	21.3	30.0	21.3	11.6	6.0	3.0	9.9	5.1	2.3	0.9
18	19.0	---	27.0	38.0	27.0	14.6	7.6	3.8	---	---	---	---
20	23.5	40.8	33.3	47.0	33.3	18.1	9.4	4.7	---	---	---	---
24	34.0	58.8	48.0	68.0	48.0	26.2	13.6	6.8	---	---	---	---

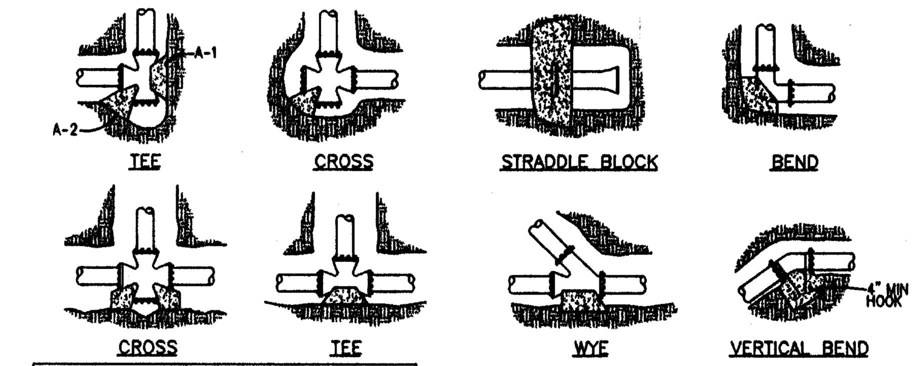
NOTES:

1. ABOVE BEARING AREAS BASED ON TEST PRESSURE OF 150 PSI AND AN ALLOWABLE SOIL BEARING STRESS OF 2000 POUNDS PER SQUARE FOOT. TO COMPUTE BEARING AREAS FOR DIFFERENT TEST PRESSURES AND SOIL BEARING STRESSES, USE THE FOLLOWING EQUATION:

   BEARING AREA = (TEST PRESSURE / 150) x (2000 / SOIL BEARING STRESS) x (TABLE VALUE)

2. ABOVE VOLUMES BASED ON TEST PRESSURE OF 150 PSI AND THE WEIGHT OF CONCRETE = 4050 POUNDS PER CUBIC YARD. TO COMPUTE FOR DIFFERENT TEST PRESSURES, USE THE FOLLOWING EQUATION:

   VOLUME = (TEST PRESSURE / 150) x (TABLE VALUE)



RODS FOR VERTICAL BENDS		
FITTING SIZE	ROD SIZE	EMBEDMENT
12" AND LESS	#6	30"
14"-16"	#8	36"

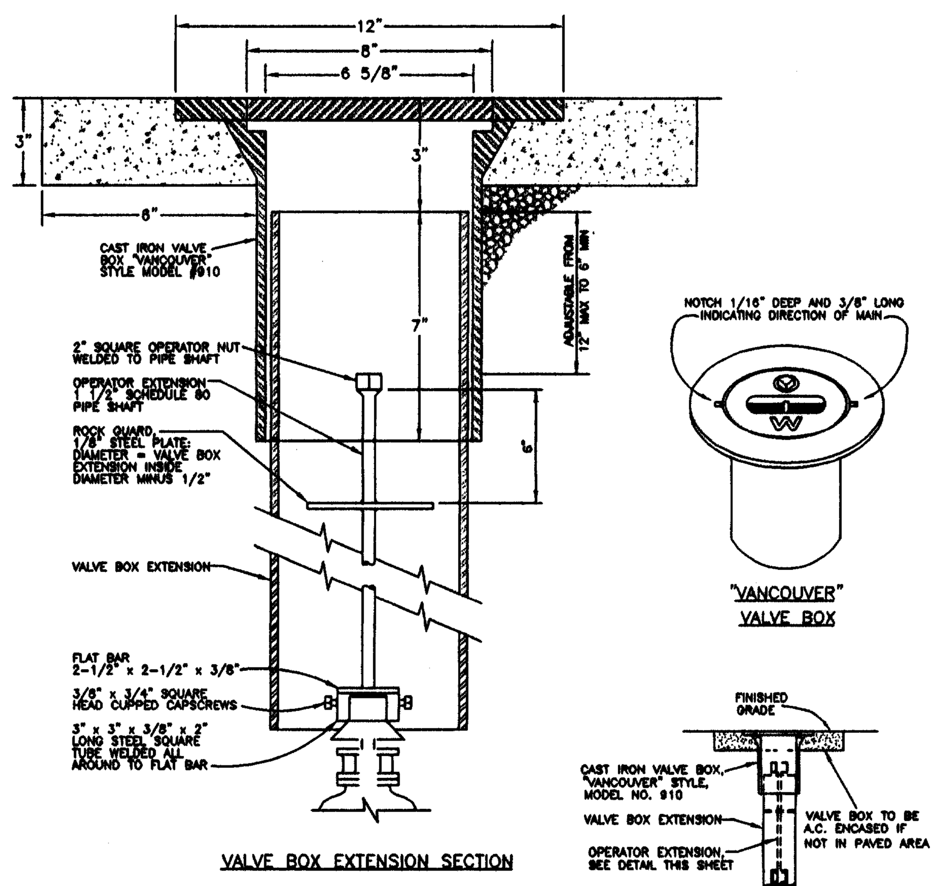
NOTES:

1. CONCRETE BLOCKING TO BE POURED AGAINST UNDISTURBED EARTH.
2. ALL CONCRETE TO BE CLASS 2400 MINIMUM.
3. INSTALL ISOLATION MATERIAL BETWEEN PIPE AND/OR FITTINGS BEFORE POURING CONCRETE BLOCKING.
4. CONCRETE SHALL BE KEPT CLEAR OF ALL JOINTS AND ACCESSORIES.
5. TIE RODS SHALL BE DEFORMED GALVANIZED COLD ROLLED STEEL, 40000 PSI TENSILE STRENGTH.

City of Oregon City
Public Works Standard Drawings
320 Warner Milne Rd. Oregon City, Oregon 97045

THRUST BLOCKING

DRAWN B.L.W. ENGR. J.W.H. SCALE N.T.S. DATE APRIL 1993 DWG. NO. 407



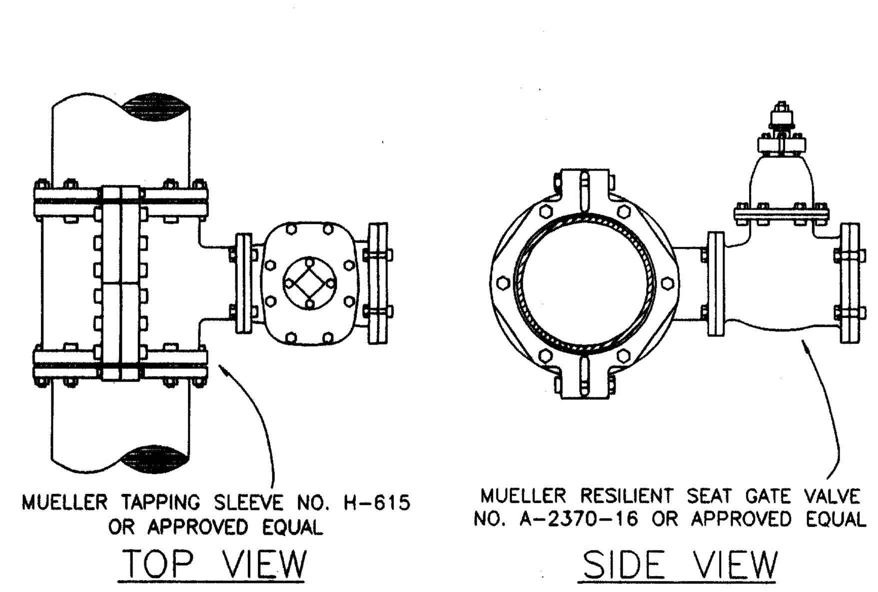
NOTES:

1. VALVE BOX NOT TO REST ON OPERATING ASSEMBLY.
2. OPERATOR EXTENSION REQUIRED WHEN VALVE NUT IS DEEPER THAN 4 FEET FROM FINISH GRADE.
3. CENTER VALVE BOX ON AXIS OF OPERATOR NUT.
4. VALVES 12" AND SMALLER SHALL BE PROVIDED WITH CLASS B BASE ON UNDISTURBED GROUND. VALVES GREATER THAN 12" SHALL BE INSTALLED ON PRECAST CONCRETE PIER BLOCK.
5. VALVE BOX EXTENSION SHALL BE PVC (ASTM D 3034).
6. VALVE BOX SHALL BE ADJUSTED TO MEET FINISHED SUBGRADE.

City of Oregon City
Public Works Standard Drawings
320 Warner Milne Rd. Oregon City, Oregon 97045

STANDARD VALVE BOX DETAIL

DRAWN B.L.W. ENGR. J.W.H. SCALE N.T.S. DATE APRIL 1993 DWG. NO. 410



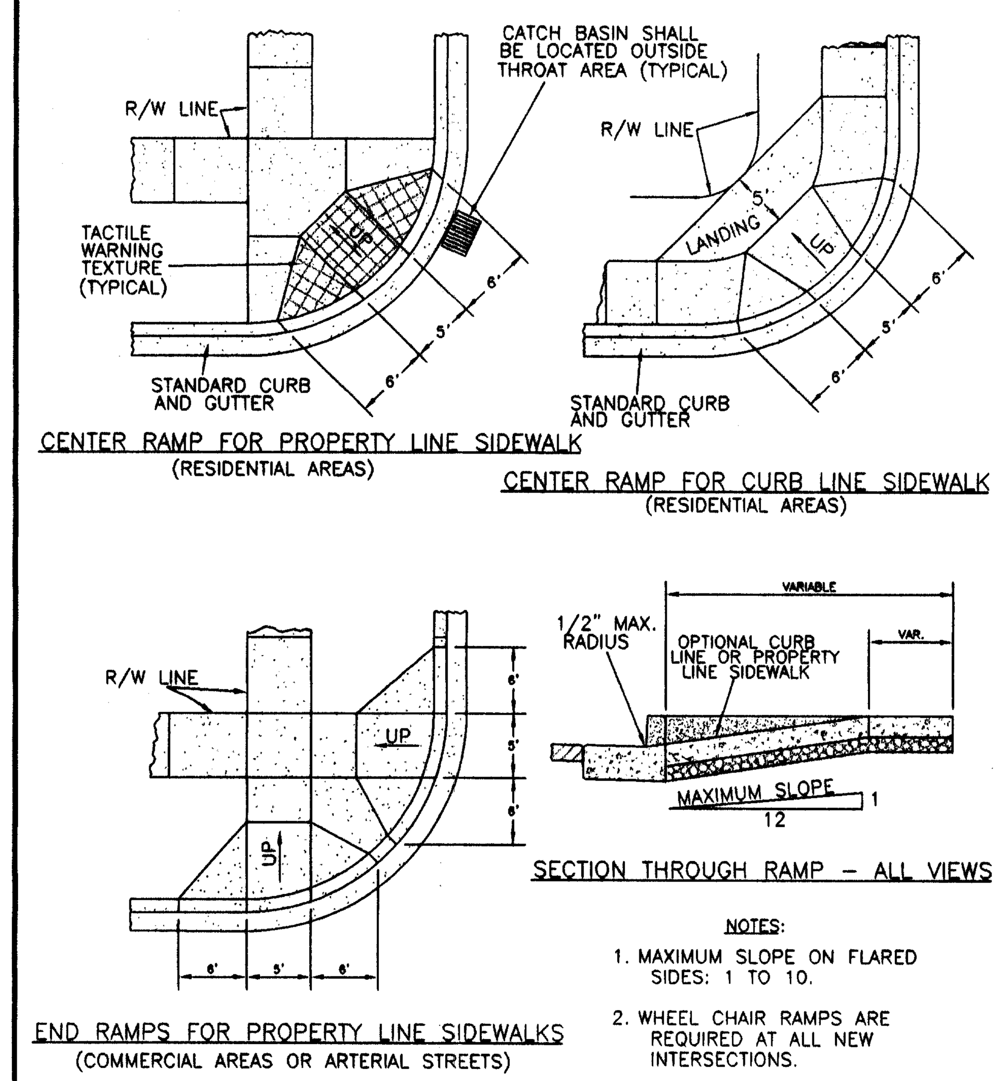
NOTES:

1. WATER MAIN SHALL BE CLEANED BEFORE ATTACHING SLEEVE.
2. SLEEVE AND VALVE SHALL BE PRESSURE TESTED BEFORE MAKING TAP.
3. PRESSURE TEST AND TAP SHALL BE MADE IN THE PRESENCE OF AN AUTHORIZED CITY REPRESENTATIVE.
4. PROPER TAPPING MACHINE SHALL BE USED TO MAKE TAP.
5. 3/4 INCH CRUSHED AGGREGATE SHALL BE PLACED AND COMPACTED TO 95% OF MAX. DENSITY AS DETERMINED BY AASHTO T-180.
6. THRUST BLOCKING REQUIREMENTS SHALL BE DETERMINED BY THE ENGINEER.
7. TAP SHALL BE MADE NO CLOSER THAN 18 INCHES FROM THE NEAREST JOINT.

City of Oregon City
Public Works Standard Drawings
320 Warner Milne Rd. Oregon City, Oregon 97045

STANDARD WET TAP DETAIL

DRAWN B.L.W. ENGR. J.W.H. SCALE N.T.S. DATE APRIL 1993 DWG. NO. 411



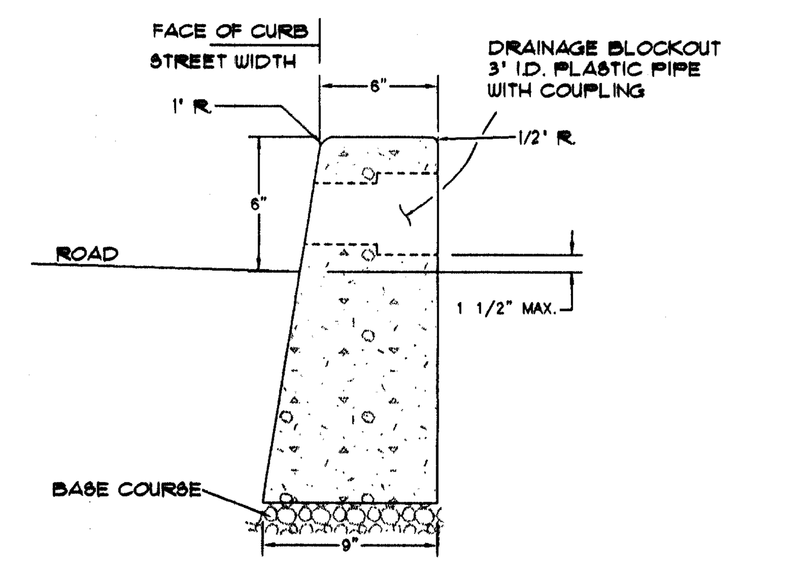
NOTES:

1. MAXIMUM SLOPE ON FLARED SIDES: 1 TO 10.
2. WHEEL CHAIR RAMPS ARE REQUIRED AT ALL NEW INTERSECTIONS.
3. SEE SIDEWALK DETAIL FOR ADDITIONAL NOTES.

City of Oregon City
Public Works Standard Drawings
320 Warner Milne Rd. Oregon City, Oregon 97045

WHEELCHAIR AND BICYCLE RAMPS

DRAWN B.L.W. ENGR. J.W.H. SCALE N.T.S. DATE JULY 1993 DWG. NO. 509

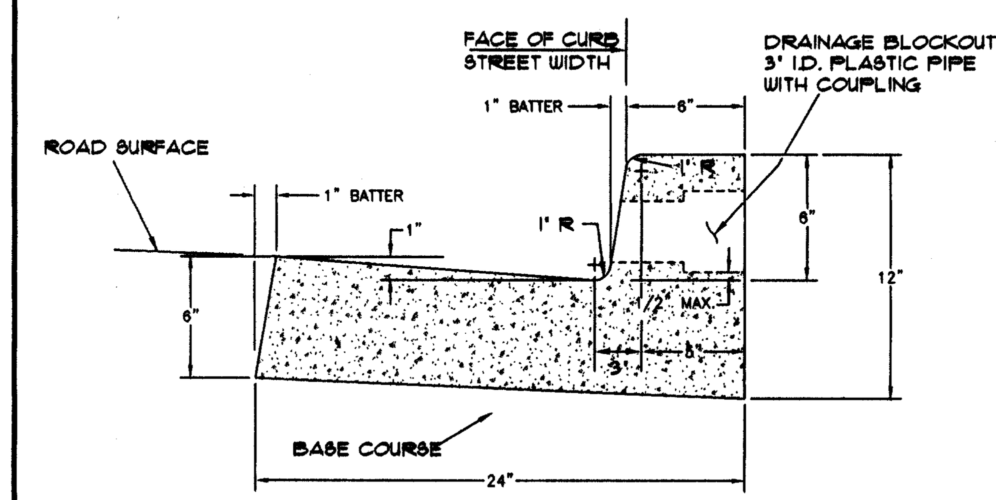


1. CONCRETE SHALL BE AIR-ENTRAINED AND HAVE A BREAKING STRENGTH OF 3300 PSI AFTER 28 DAYS.
2. EXPANSION JOINTS.
   A. TO BE PROVIDED:
      1) AT EACH COLD JOINT.
      2) AT EACH END OF DRIVEWAYS.
      3) AT EACH SIDE OF INLET STRUCTURES.
      4) AT EACH POINT OF TANGENCY OF THE CURB.
      5) AT LOCATIONS NECESSARY TO LIMIT SPACING TO 45 FEET.
   B. MATERIAL TO BE PRE-MOLDED, ASPHALT IMPREGNATED, NON-EXTRUDING WITH A THICKNESS OF 1/2 INCH.
3. CONTRACTION JOINTS.
   A. SPACING TO BE NOT MORE THAN 15 FEET.
   B. THE DEPTH OF THE JOINT SHALL BE AT LEAST 1-1/2 INCHES.
4. BASE ROCK TO BE 1"-0" OR 3/4"-0", 95% COMPACTION. BASE ROCK SHALL BE TO SUBGRADE OF STREET STRUCTURE OR 4" IN DEPTH, WHICHEVER IS GREATER.
5. DRAINAGE BLOCKOUT
   A. I.D. PLASTIC PIPE WITH COUPLING.
   B. DRAINAGE ACCESS THRU EXISTING CURBS SHALL BE CORE DRILLED OR CURB SAW CUT VERTICALLY 18" EACH SIDE OF DRAIN AND REPOURED TO FULL DEPTH OF CURB.
6. CURB EXPOSURE SHALL BE 8" AT CATCH INLETS/BASINS.

City of Oregon City
Public Works Standard Drawings
320 Warner Milne Rd. Oregon City, Oregon 97045

STANDARD CURB

DRAWN B.L.W. ENGR. J.W.H. SCALE N.T.S. DATE APRIL 1993 DWG. NO. 510



1. CONCRETE SHALL BE AIR-ENTRAINED AND HAVE A BREAKING STRENGTH OF 3300 PSI AFTER 28 DAYS.
2. EXPANSION JOINTS.
   A. TO BE PROVIDED:
      1) AT EACH COLD JOINT.
      2) AT EACH END OF DRIVEWAYS.
      3) AT EACH SIDE OF INLET STRUCTURES.
      4) AT EACH POINT OF TANGENCY OF THE CURB.
      5) AT LOCATIONS NECESSARY TO LIMIT SPACING TO 45 FEET.
   B. MATERIAL TO BE PRE-MOLDED, ASPHALT IMPREGNATED, NON-EXTRUDING WITH A THICKNESS OF 1/2 INCH.
3. CONTRACTION JOINTS.
   A. SPACING TO BE NOT MORE THAN 15 FEET.
   B. THE DEPTH OF THE JOINT SHALL BE AT LEAST 1-1/2 INCHES.
   C. PLACE JOINT OVER DRAINAGE BLOCKOUT.
4. BASE ROCK TO BE 1'-0' OR 3/4'-0', 95% COMPACTION. BASE ROCK SHALL BE TO SUBGRADE OF STREET STRUCTURE OR 4' IN DEPTH, WHICHEVER IS GREATER.
5. DRAINAGE BLOCKOUT
   A. I.D. PLASTIC PIPE WITH COUPLING.
   B. DRAINAGE ACCESS THRU EXISTING CURBS SHALL BE CORE DRILLED OR CURB SAW CUT VERTICALLY 18' EACH SIDE OF DRAIN AND REPOURED TO FULL DEPTH OF CURB.

City of Oregon City
Public Works Standard Drawings
320 Warner Milne Rd. Oregon City, Oregon 97045

MONOLITHIC CURB AND GUTTER

DRAWN B.L.W. ENGR. J.W.H. SCALE N.T.S. DATE JULY 1993 DWG. NO. 511

AS-BUILT
DATE: NOV. 4, 1998

The data on this map is the BEST INFORMATION AVAILABLE from the records of the City of Oregon City - errors and omissions may exist.

DETAIL SHEET 1

DATE	NO.	REVISION

DRAWN BJS | DESIGNED TLT | CHECKED TLT
SCALE NTS | DATE FEB, 1997
PLAN 93-350.3-1725 | 350-3DT1.DWG

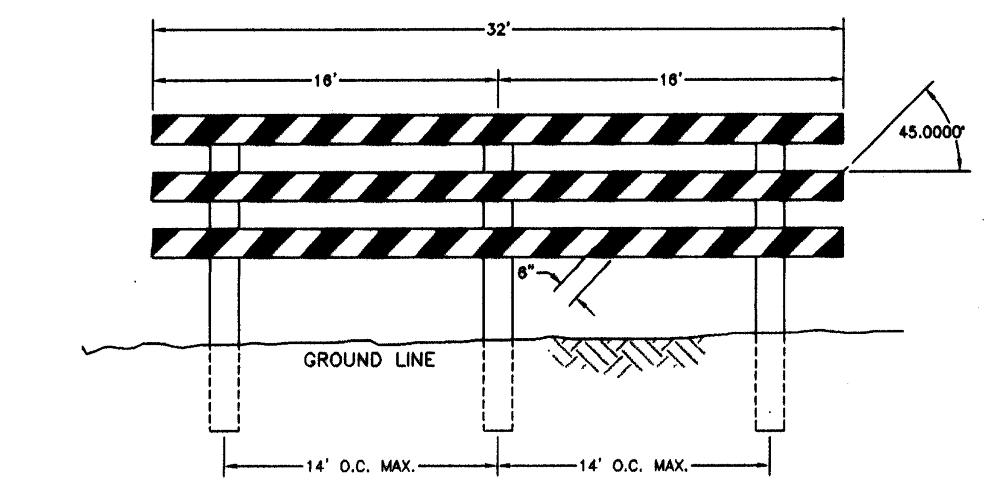
COMPASS CORPORATION
ENGINEERING ★ SURVEYING ★ PLANNING
6564 S.E. LAKE ROAD, MILWAUKIE, OREGON 97222
(503) 653-9093 PHONE, (503) 653-9095 FAX

RIVERGATE DEVELOPMENT COMPANY
1900 DAVIS ROAD
OREGON CITY, OREGON 97045
656-1592

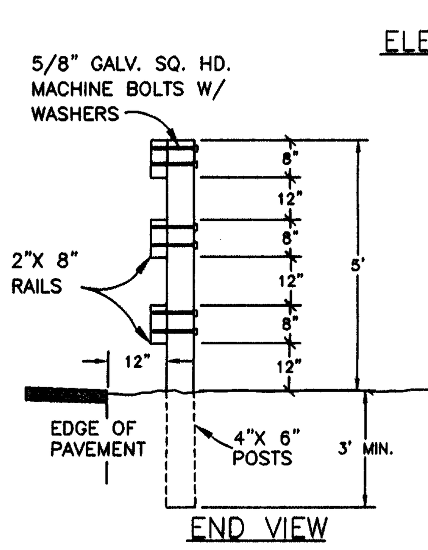
TRILLIUM PARK ESTATES - PHASE 3
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON
10091.09

9/10

C:\0350-3\350-3dt1.dwg Wed Nov 04 09:10:50 1998 BARBARA



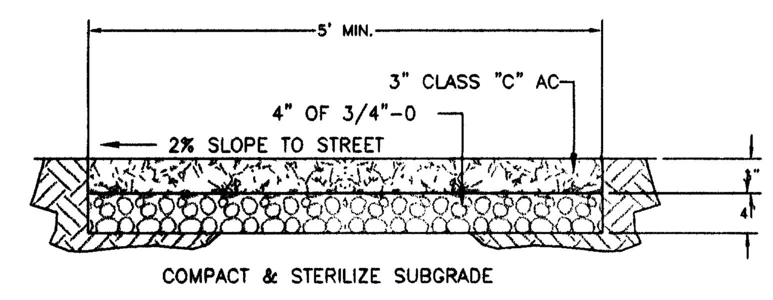
ELEVATION



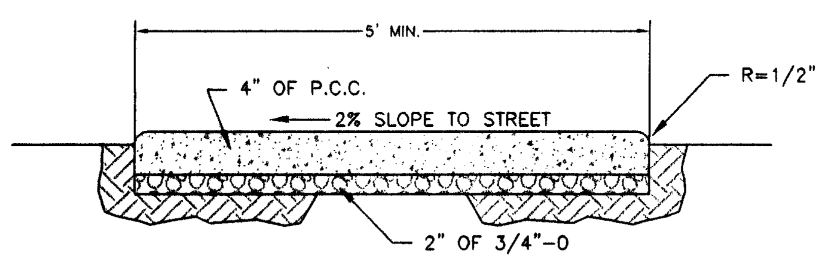
END VIEW

NOTES:
1. RAILS TO BE PAINTED BLACK WITH WHITE STRIPES. THE WHITE STRIPES SHALL BE REFLECTORIZED.
2. FOR WIDER APPLICATIONS, MULTIPLE SECTIONS AS SHOWN SHALL BE USED.
3. SEE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS AND THE OREGON SUPPLEMENT.
   3F-1 BARRICADES
   6C-8 BARRICADE DESIGN
   6C-9 BARRICADE APPLICATION
4. ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT STATE OF OREGON STANDARD SPECIFICATIONS FOR HWY.CONSTRUCTION.

City of Oregon City
Public Works Standard Drawings
320 Warner Milne Rd. Oregon City, Oregon 97045
SCALE N.T.S. DATE JULY 1993 DWG. NO. 312
STREET BARRICADE



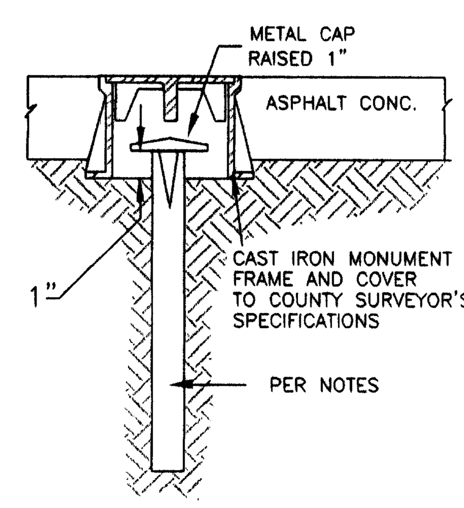
ASPHALTIC CONCRETE



PORTLAND CEMENT CONCRETE

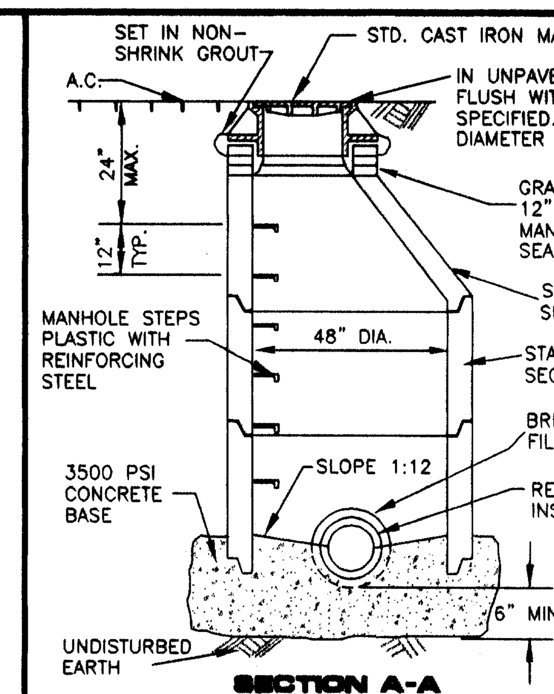
NOTES:
1. CONCRETE SHALL BE AIR ENTRAINED MINIMUM 4.5% AND HAVE A MINIMUM BREAKING STRENGTH OF 3300 PSI AT 28 DAYS.
2. SEE SIDEWALK DETAIL FOR ADDITIONAL NOTES ON CONCRETE CONSTRUCTION.
3. PROVIDE DRAINAGE PIPE AT LOW POINTS.
4. PROVIDE ONE FOOT SHOULDER ON CUT/FILL SLOPE EDGES.
5. MAXIMUM SLOPE OF CUT AND FILL EDGES, 3:1.

City of Oregon City
Public Works Standard Drawings
320 Warner Milne Rd. Oregon City, Oregon 97045
SCALE N.T.S. DATE JULY 1993 DWG. NO. 313
PEDESTRIAN PATH OR BIKEWAY



NOTES:
1. ALL MONUMENTS SHALL USE EITHER 5/8" DIA. x 30" LONG IRON ROD OR 3/4" DIA. x 30" LONG IRON PIPE.
2. ALL MONUMENTS SHALL BE IN ACCORDANCE WITH ORS 209.250 (4).

City of Oregon City
Public Works Standard Drawings
320 Warner Milne Rd. Oregon City, Oregon 97045
SCALE N.T.S. DATE MAY 1993 DWG. NO. 320
CENTERLINE SURVEY MONUMENTS



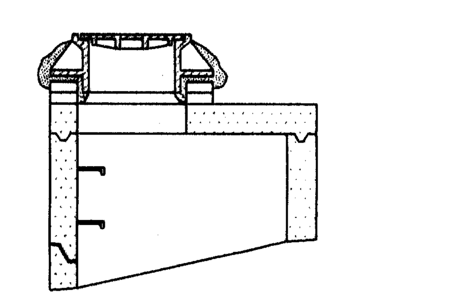
SECTION A-A

- STD. CAST IRON MANHOLE FRAME AND COVER
- IN UNPAVED AREAS MANHOLE TO BE FLUSH WITH GROUND UNLESS OTHERWISE SPECIFIED. IF IN GRAVEL ROAD PLACE SIX FOOT DIAMETER 3" A.C. OR CONCRETE AROUND MANHOLE.
- GRADE RINGS-VARIABLE, MAX. 3 LAYERS, 12" MAX., GROUTED IN PLACE. WHEN DIRECTED MANHOLE FRAME & GRADE RINGS SHALL BE SEALED WITH MASTIC.
- SLOPE OF PRECAST ECCENTRIC CONE SHALL FACE DOWN GRADE.
- STANDARD PRECAST MANHOLE SECTIONS. ASTM C478.
- BREAK-OUT 1" CLEAR (MIN.) FILL WITH GROUT.
- REMOVE UPPER HALF OF SEWER PIPE INSIDE OF MANHOLE.

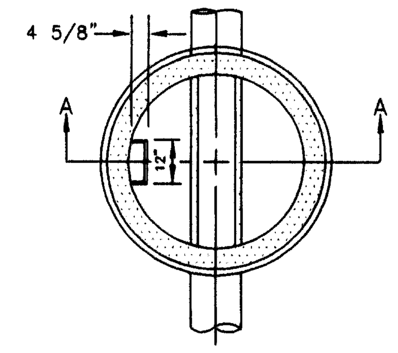
ALL JOINTS SHALL BE WATER TIGHT AND SEALED WITH PREFORMED RUBBERIZED OR PLASTIC MASTIC MATERIAL BEFORE SETTING RISERS AND TOP. ALL INSIDE JOINTS SHALL BE GROUTED.

ALL PRECAST SECTIONS AND POURED CONCRETE BASES SHALL CONFORM TO CITY STANDARD SPECIFICATIONS.

ALL MANHOLES SHALL HAVE A 12" MIN. 24" MAX. BOTTOM RISER, TO BE BEDDED IN THE CONCRETE AS THE BASE TAKES ITS INITIAL SET.

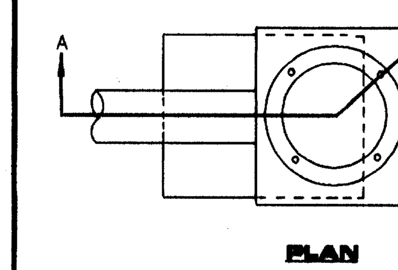


FLAT SLAB ALTERNATE
(SEE SHALLOW MANHOLE DETAIL)

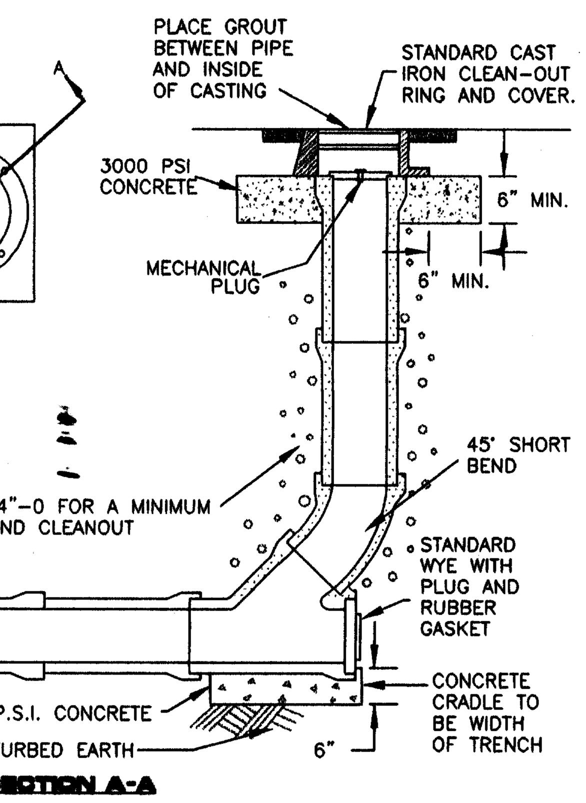


PLAN

City of Oregon City
Public Works Standard Drawings
320 Warner Milne Rd. Oregon City, Oregon 97045
SCALE N.T.S. DATE MAY 1993 DWG. NO. 304
STANDARD SAMPLING MANHOLE



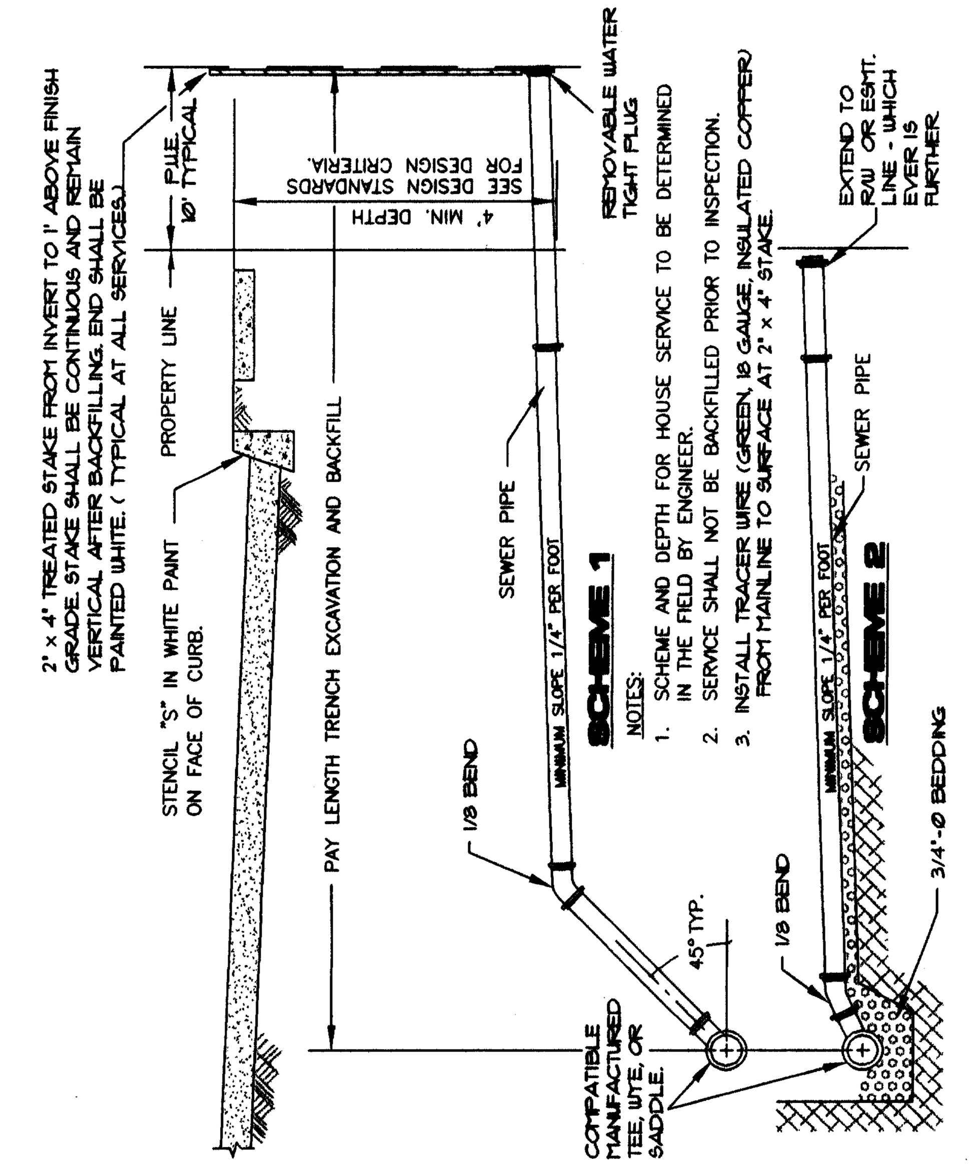
PLAN



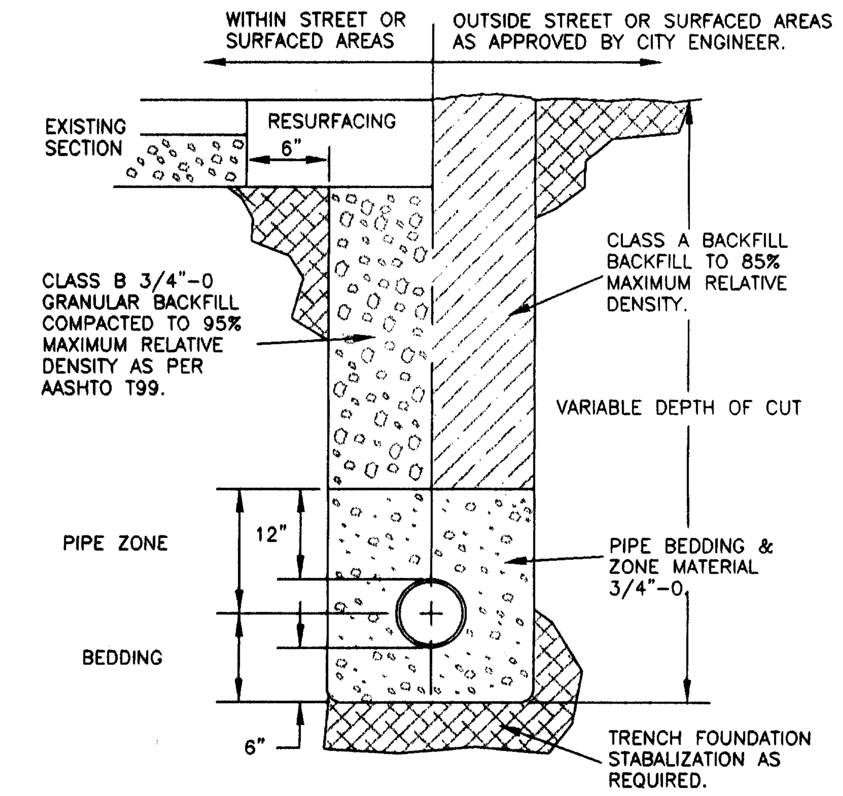
SECTION A-A

NOTES:
1. IF IN GRAVEL STREET PLACE 2" A/C PAVEMENT IN 4' DIAMETER CIRCLE AROUND CLEAN-OUT. SLOPE AWAY FROM CLEANOUT.
2. IF IN OPEN AREA & NOT SUBJECT TO STREET USE, USE LOCKING IRRIGATION BOX INSTEAD OF STANDARD CAST IRON CLEAN-OUT RING & COVER.
3. UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER CLEANOUTS ARE TO BE USED ONLY AS A TEMPORARY TERMINUS.
4. ALL CLEAN-OUT MATERIAL TO BE SAME AS SEWER MAIN PIPE.

City of Oregon City
Public Works Standard Drawings
320 Warner Milne Rd. Oregon City, Oregon 97045
SCALE N.T.S. DATE APRIL 1993 DWG. NO. 309
STANDARD CLEAN-OUT

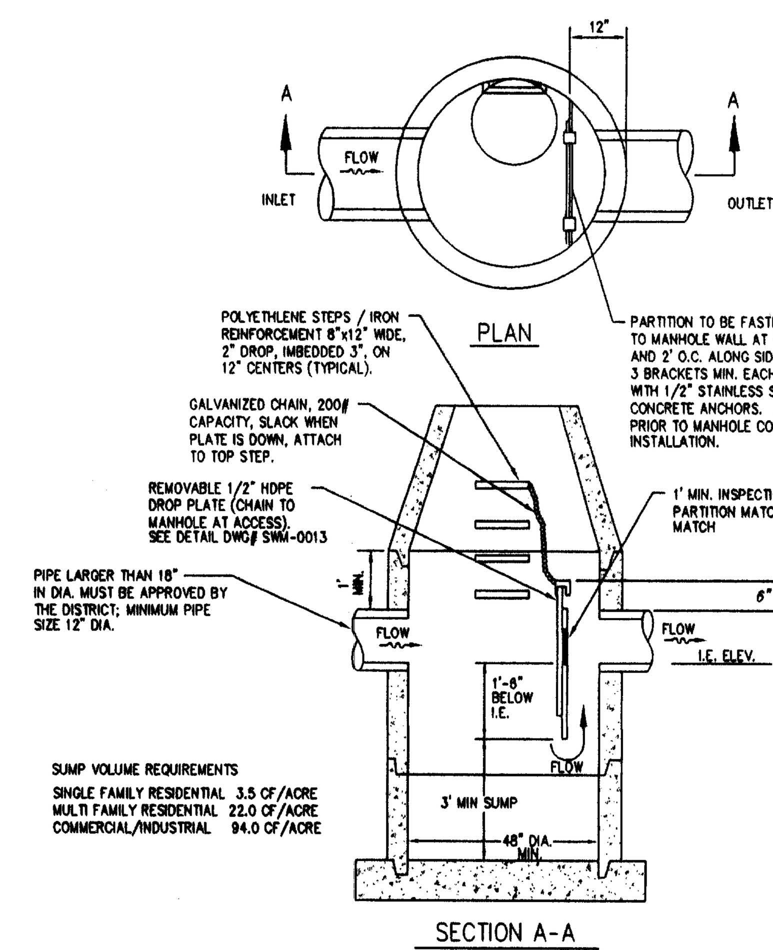


City of Oregon City
Public Works Standard Drawings
320 Warner Milne Rd. Oregon City, Oregon 97045
SCALE N.T.S. DATE APRIL 1993 DWG. NO. 310
STANDARD SEWER SERVICE

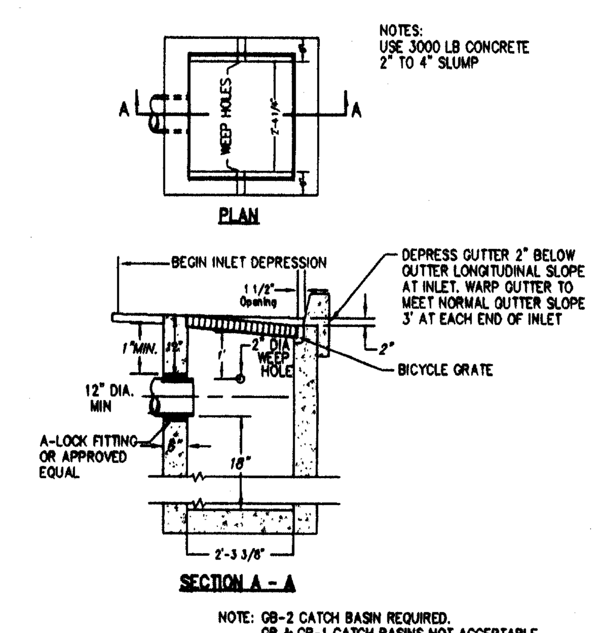


NOTES:
1. ALL CUTS IN PAVEMENT SHALL BE SAW CUT.
2. ALL CUT EDGES SHALL BE SAND SEALED.
3. RESURFACING TO BE MIN. 3" CLASS "C" ASPHALT OR MATCH EXISTING WHICHEVER IS GREATER.
4. THIS TRENCH BACKFILL REQUIREMENT APPLIES TO ALL UNDERGROUND CONDUITS.
5. CLASS "B" BACKFILL SHALL EXTEND 2 FT. BEYOND EDGE OF STREET OR SURFACED AREA.
6. BACKFILL SHALL BE PLACED AND COMPACTED IN A MAX. OF 18" LIFTS.

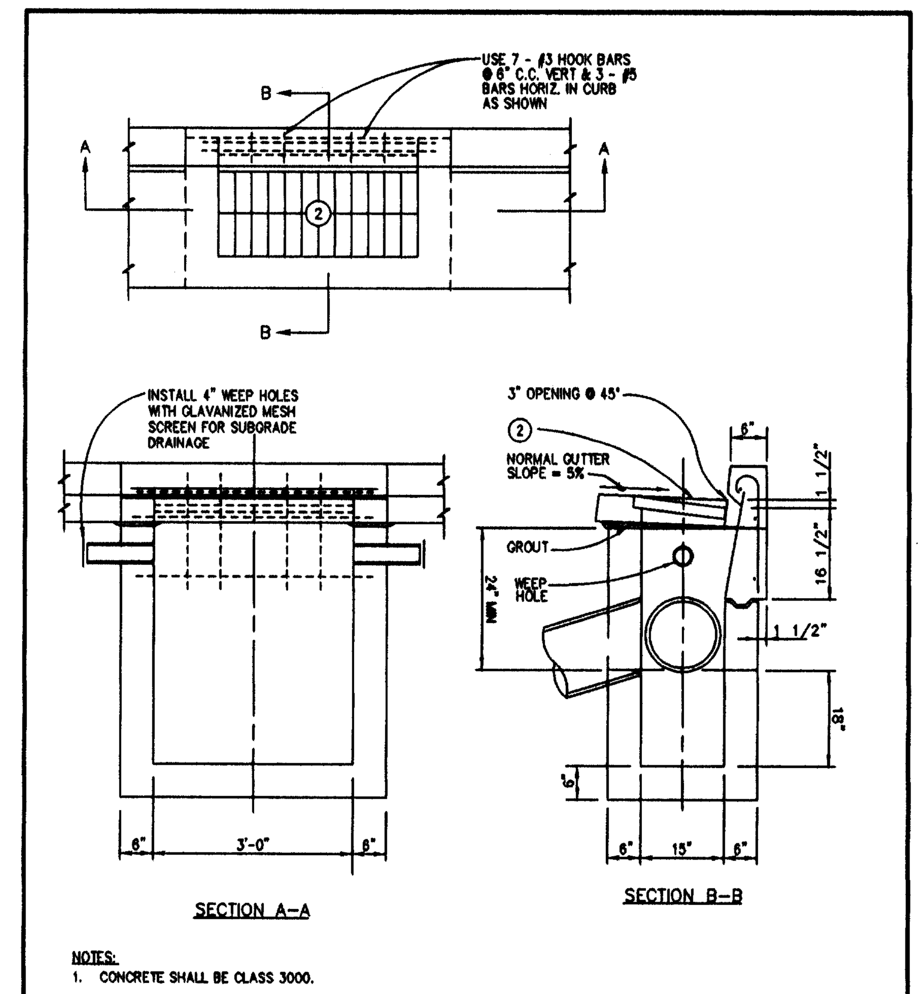
City of Oregon City
Public Works Standard Drawings
320 Warner Milne Rd. Oregon City, Oregon 97045
SCALE N.T.S. DATE APRIL 1993 DWG. NO. 313
PIPE BEDDING AND BACKFILL



CLACKAMAS CO. SWM-0012
POLLUTION CONTROL MANHOLE, BAFFLED
SCALE: NTS



CLACKAMAS CO. SWM-0001
CATCH BASIN
SCALE: NTS



APWA OREGON CHAPTER
COMBINATION GUTTER AND CURB INLET CATCH BASIN DETAILS
DATE MAY 1992 DRAWING NO. 322

AS-BUILT
DATE: NOV. 4, 1998

The data on this map is the BEST INFORMATION AVAILABLE from the records of the City of Oregon City - errors and omissions may exist.

DETAIL SHEET 2

DATE	NO.	REVISION
09/11/97	1	BY CITY REVIEW

DRAWN BJS | DESIGNED TLT | CHECKED TLT
SCALE NTS | DATE FEB. 1997
PLAN 93-350.3-1725 | 350-3DT2.DWG

COMPASS CORPORATION
ENGINEERING ★ SURVEYING ★ PLANNING
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(503) 653-9095 FAX

RIVERGATE DEVELOPMENT COMPANY
1900 DAVIS ROAD
OREGON CITY, OREGON 97045
656-1592

TRILLIUM PARK ESTATES - PHASE 3
CITY PLANNING FILE NO. TP94-11
OREGON CITY, OREGON
10091.10

10/10

C:\0350-3\350-3DT2.dwg Wed Nov 04 09:13:58 1998 BARBARA

kpff
Consulting Engineers

Final Storm Drainage Study

for

Providence Willamette Falls Medical Center
Division Street Parking Lot
Oregon City, Oregon

Oregon City Planning File No. PA-11-12

2/8/12

REGISTERED PROFESSIONAL ENGINEER
83295
OREGON
JULY 14, 2009
ADAM THEODORE ROTH
RENEWS: 12-31-12

KPFF Consulting Engineers
111 SW 5th Avenue, Suite 2500
Portland, OR 97204
(503) 227-3251

February 8, 2012

KPFF Project Number # 311119

Table of Contents

List of Tables

Appendices

I. Purpose of the Report

The purpose of this report is to document the design criteria, methodology and analysis for the stormwater facilities proposed for the Providence Willamette Falls Medical Center (PWFMC) Division Street Parking Lot project.

II. Project Location/Description

The Division Street Parking Lot project constitutes the first Phase of the PWFMC Master Plan Development. The project consists of redeveloping an existing asphalt-paved and gravel parking lot into a new, fully paved parking lot with 56 proposed stalls. The approximately 1.2 acre property is located in Oregon City, Oregon, and is bounded by Division Street to the west, Penn Lane to the north, private property to the east and Davis Road to the south. According to Figure 4-1 Drainage Basin Boundaries throughout the Oregon City Area from the City of Oregon City Stormwater and Grading Design Standards 1999, the property is located in the Abernethy drainage basin. The property consists of one legal tax lot (TL1201) and is the northern-most property included in the PWFMC Master Plan Development. Approximately 0.87 acres will be disturbed by the proposed parking improvements including right-of-way improvements on Davis Road and Division Street. Refer to Appendix A for a vicinity map. The disturbed area on private property studied for this drainage report equals 0.73 acres.

III. Existing Conditions

a. Land Use and Cover

The majority of the site is currently used as a parking lot by PWFMC. The southern half consists of an asphalt-paved parking area with 22 striped stalls while the northern half consists of a gravel area providing additional parking. In the northeast corner of the property, there is an existing single family residence separated from the gravel parking area by a wooded area. The residence will not be disturbed by this project. Refer to Table 1 for the breakdown of areas for the existing site.

b. Abutting Property Land Cover and Use

The site abuts property other than City-owned right-of-way only on its east side. These properties consist of single-family homes covered with various landscaping, vegetation and trees, as well as associated walkways and driveways.

c. Topography and Drainage Patterns

The on-site parking areas generally slope downward in a northeasterly direction at a grade of approximately 4 to 5 percent. At the northern edge of the property, the topography abruptly transitions to a 2:1 slope down to a grass and jute-lined swale adjacent to the Penn Lane right-of-way. The elevation change at the 2:1 slope varies from 0 to approximately 8-feet, increasing as it moves east down Penn Lane. The swale flows to the east following the longitudinal slope of

Penn Lane. The topography of the wooded area and residence in the northeast portion of the property also generally slope to the north and east with grades ranging from 5 to 20 percent.

Runoff from the majority of the existing asphalt-paved portion of the site flows to one catch basin at the north edge of the pavement. The flows are then conveyed to the south to storm drainage system in Davis Road and are ultimately routed to the existing detention pond on PWFMC property. Runoff from the rest of the property, except for the portion with the single-family residence, drains north to the swale adjacent to Penn Lane which conveys flows to a private catch basin at the northeast corner of the site. The flows collected in the catch basin are routed to the public 12-inch storm main in Penn Lane which outfalls to a drainage channel at the east end of improved right-of-way.

d. Offsite Drainage to Property

A small portion of the residential property to the east consisting of vegetated surfaces drains over the northeast corner of the site. This area is not affected by the proposed parking improvements. Also, the eastern half of Division Street between Penn Lane and Davis Road sheet flows across the gravel parking area beginning about mid-block at the end of the existing curb and gutter. This condition is addressed with the Division Street curb and gutter improvements and is discussed in more detail later in the report.

e. Sensitive Areas

The Oregon City Web Maps indicate that the northeast corner of the property and the east end of the improved Penn Lane right-of-way are located within a Title 13 Natural Resources Overlay District. Refer to Appendix B for a map of the Natural Resources Overlay District.

f. Soils

According to the USDA Natural Resources Conservation Service (NRCS) the soil on site consists of Woodburn silt and loam. According to Table 4.2 Hydrologic Soil Group of the Soils of Oregon City, Woodburn soils are categorized as Hydrologic Soil Group C (moderately high runoff potential). Refer to Appendix C for soils information.

g. Water Wells, Septic Tanks, etc.

In the northeast corner of the property there is a septic tank for the residential property. A pump and force main convey the sewage to the public sanitary sewer main in Penn Lane. This system will be not be disturbed by the proposed improvements. No known wells exist on site.

IV. Developed Site Drainage Conditions

a. Land Use and Cover

The land use of the developed site will remain unchanged. The existing parking areas will be improved to include additional asphalt pavement and increase the amount of parking stalls. The existing residence will not be disturbed.

b. Topography

The proposed improvements will closely match the existing topography in an effort to re-use as much of the existing base course and gravel as possible during the parking lot construction. The grades in the parking area will vary between approximately 3 and 6 percent. There are no accessible stalls proposed in the parking area. The northern edge of the pavement area terminates at the top of the existing slope down to the Penn Lane sidewalk. The swale south of the Penn Lane sidewalk will be lowered slightly to achieve a minimum depth of 10-inches below the sidewalk grade. The slope up to the parking area will be adjusted as necessary at no more than 2:1.

c. Drainage Patterns and Basins

In the developed condition, runoff from the proposed parking area will sheet flow to two new catch basins, one in the middle of the site roughly in the same location as the existing catch basin and one in the northeast corner of the paved area. Both of these catch basins will include CONTECH Stormwater Management Inc. StormFilter cartridges for water quality treatment. Stormwater collected in the catch basins will be routed to an underground tank detention system and flow control manhole, and will ultimately be conveyed to the existing catch basin at the northeast corner of the site. As mentioned above, this catch basin is connected to the 12-inch public storm drain main in Penn Lane with a 12-inch private storm sewer lateral.

As a result of the proposed drainage patterns, the public storm system in Davis Road and the existing detention facility on PWFMC property south of Davis Road will be relieved of runoff from the existing paved parking lot on site. This additional capacity in the existing detention pond will be utilized for future projects included in the PWFMC Master Plan development.

The roadway area in Division Street that currently sheet flows over the property will now be collected in a curb inlet catch basin just south of the proposed curb ramp at the north end of the improvements. Runoff collected in the curb inlet will be conveyed in a 12-inch pipe to a ditch inlet that discharges into the west end of the conveyance swale. As agreed with the City in a meeting on January 19, 2012, the City will own and maintain the proposed curb inlet in the right-of-way while PWFMC will own and maintain the 12-inch pipe from the curb inlet to the ditch inlet, the ditch inlet, and the conveyance swale. The City will not require an easement on PWFMC property.

Refer to Table 1 below for a comparison of land cover areas in the existing and developed conditions.

Table 1: On-site Drainage Basin Areas

Basin Id.	Description	Total Area (acre)	Impervious Area (acre)	Pervious Area (acre)
Existing	Asphalt pavement, gravel, vegetation	0.73	0.61*	0.12
Developed	Asphalt pavement, concrete sidewalk, vegetation	0.73	0.50	0.23

*Existing Impervious area includes 0.42 acres of gravel and 0.19 acres of asphalt pavement.

d. Hydrologic and Hydraulic Analysis

The SCS TR-55 hydrologic analysis method for Type 1A rainfall distribution is used to estimate peak flow rates and quantities. Autodesk Storm and Sanitary Analysis 2011 (formerly Boss International StormNet) is the software used to prepare the analysis. Curve Number (CN) values used for the evaluation are listed below and correspond with Table 4-3 of the City's Stormwater and Grading Design Standards:

- Impervious surfaces – CN = 98
- Gravel surfaces – CN = 89
- Pervious surfaces existing – CN = 81
- Pervious surfaces developed – CN = 86

The Rational Method is used to size the conveyance piping and swale.

e. Detention System Design

Below are the City's detention system requirements for sites within the Abernethy Drainage Basin:

- The 2-year, 24-hour peak discharge rate for the developed site cannot exceed 50% of the existing site's 2-year, 24-hour peak discharge rate.
- The 5-year, 24-hour peak discharge rate for the developed site cannot exceed the existing site's 5-year, 24-hour peak discharge rate.
- The 25-year, 24-hour peak discharge rate for the developed site cannot exceed the existing site's 10-year, 24-hour peak discharge rate.

In order to meet this requirement, runoff from the developed site is routed to 27-lineal feet of 96-inch diameter corrugated metal pipe (CMP). The flow out of the tank is controlled by a flow control outlet riser consisting of two orifices and an overflow in a 54-inch diameter manhole. The orifice information is provided in Table 2 below.

Table 2: Detention Tank Orifice Data

Orifice Size (in)	Orifice Elevation (ft)
1.63	248.70
3.5	256.30
12 (overflow)	257.20

The resulting developed peak discharge rates from the detention system are presented below compared to the required existing peak discharge rates.

Table 3: Existing and Developed Peak Discharge Rates

Storm Frequency	Peak Existing Discharge Rate (CFS)	Storm Frequency	Peak Developed Discharge Rate (CFS)
50% of the 2-year	0.15	2-year	0.14
5-year	0.39	5-year	0.17
10-year	0.47	25-year	0.38

The total volume stored at the 25-year peak discharge is 1,327 cubic feet. 1,357 cubic feet of storage is provided.

The Penn Lane Improvements Final Drainage Report indicates that the PWFMC Division Street Parking Lot project is required to over-detain its on-site flows to account for detention that was not provided for the Penn Lane project. Per the Master Plan General Development Plan submitted concurrently with the Detailed Development Plan for this project, the over-detention for Penn Lane will be implemented in a future phase of the Master Plan.

f. Stormwater Quality Facility Design

The City requires water quality facilities to be sized to treat the peak discharge rate equal to 1/3 of the SCS 2-year, 24-hour storm event. As mentioned above, two StormFilter Catch Basins will be used to meet the water quality requirements for the proposed parking area. The StormFilter cartridges will be sized using a specific flow rate of 2 gpm/sf and will contain pearlite media.

Impervious areas to each catch basin, the resulting water quality design storms and the StormFilter Catch Basin treatment capacities are listed below in Table 4.

Table 4: Water Quality Analysis

Structure No.	Impervious Tributary Area (ac)	Water Quality Design Storm (CFS)	StormFilter Cartridge Height/Capacity	StormFilter Cartridges Required	Treatment Capacity (CFS)
CBSF 1	0.17	0.03	18" / 0.033 CFS	1	0.033
CBSF 2	0.33	0.06	18" / 0.033 CFS	2	0.066

g. Conveyance and Inlet Capacity Analysis

The pipe and swale conveyance analysis is included in Appendix E for the 25-year storm event. All proposed storm drainage pipe is 12-inches in diameter with an assumed Manning's coefficient (n) of 0.013. The analysis shows that the pipes have excess capacity during the 25-year storm without surcharging. The 100-year storm event can also pass through the proposed drainage system without surcharging

The conveyance swale is designed to pass the 25-year storm event. The swale geometry consists of a triangular shape with a minimum longitudinal slope of 3% and 2:1 side slopes. Given the 25-year flow to the swale (0.53 CFS), the maximum depth is equal to 4-inches. Adding 6-inches of freeboard, the minimum required depth in the swale to pass the peak runoff from the 25-year storm event is 10-inches.

The capacity of the StormFilter Catch Basin inlet (inlet area of 3.553 SF, perimeter of 9.25-feet) assuming 4-inches of head is 5.8 CFS. The 100-year peak flows to the StormFilter Catch Basins equal 0.63 CFS and 1.23 CFS.

The 100-year peak flow to the Ex. CB (13) via surface runoff equals 0.66 CFS the capacity of the existing catch basins inlet equals 6.2 CFS.

Refer to Appendix E for the inlet capacity calculations.

h. Downstream Analysis

As mentioned above, the site drains to a newly installed 12-inch public storm main in Penn Lane. Per the Final Drainage Report for the Penn Lane Improvements dated October 6, 2010, prepared by HDJ Design Group, this line was sized based on a 100-year peak flow of 1.16 CFS which includes tributary area from the existing parking lot site and its resulting 100-year peak flow contribution of 0.49 CFS (using the SCS TR-20 method). The 12-inch line has a capacity of 9.64 CFS at the point of connection from this site per the Manning's equation calculations provided in Appendix E.

The 100-year peak flow from the developed parking lot, Division Street and conveyance swale is 2.52 CFS using the Rational Method. Although this calculation method is more conservative than the SCS TR-20 method, the resulting flow is still much less than the capacity of the 12-inch public main.

V. Operations and Maintenance Requirements

Operations and Maintenance guidelines for the stormwater management facilities have been provided in Appendix F of this report.

APPENDIX A
Vicinity Map and Oregon City Drainage Basin Boundaries

MAP FROM: GOOGLE ©

kpff Consulting Engineers 111 S.W. Fifth Avenue Suite 2400 Portland, Oregon 97204 (503) 227-3251 STRUCT. FAX (503) 227-7980 CIVL FAX (503) 274-4681	SCALE: NTS	TITLE: VICINITY MAP	SHEET NO.: Figure 1
	JOB NO.: 311119		
	DATE: 9/23/11	PROJECT: PWFMC - DIVISION STREET PARKING LOT OREGON CITY, OR	

DRAINAGE BASIN BOUNDARIES THROUGHOUT THE OREGON CITY AREA

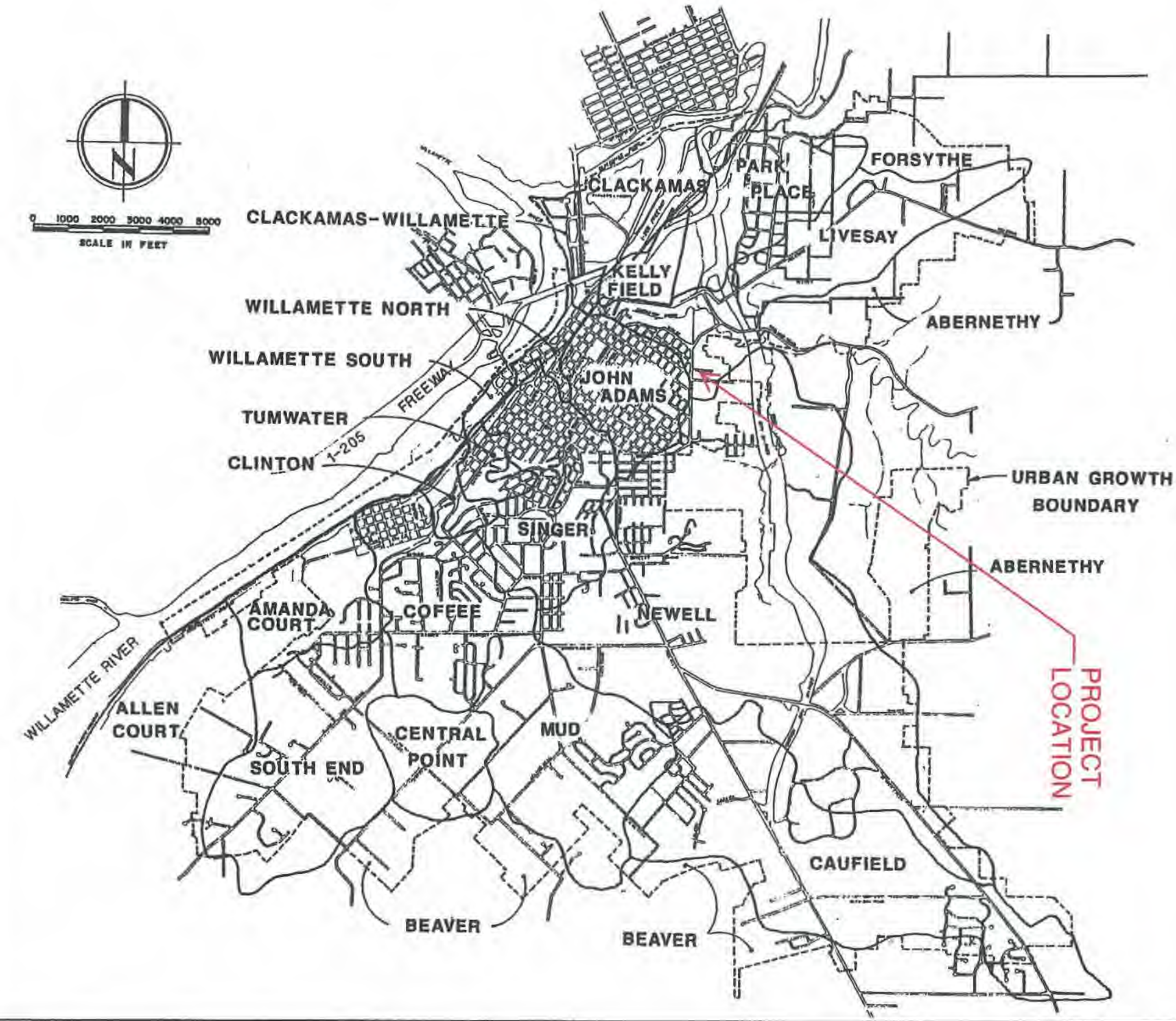


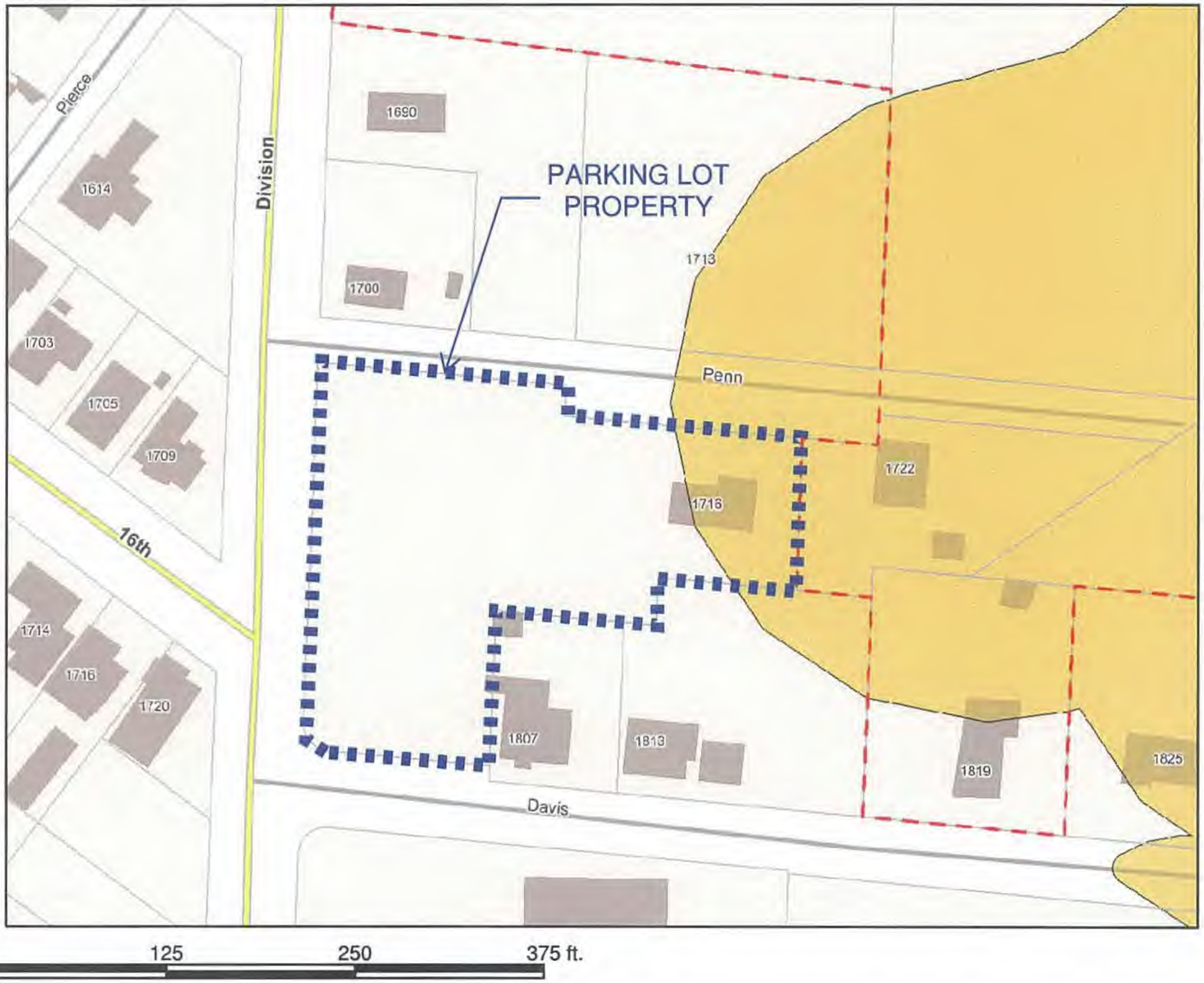
FIGURE 4-1

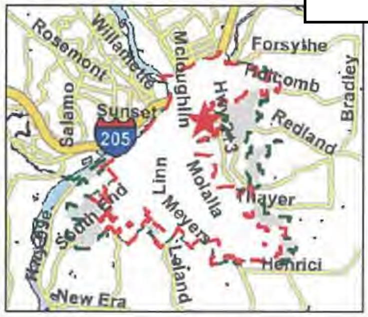
Print Date: 10/11/99 3:13 PM
File Name: H:\WRDFILES\BOB\STORMMAN\NEW\C1IAP4.DOC

APPENDIX B
Natural Resources Overlay District Map

City of Oregon City
P.O. Box 3040, 625 Center St
Oregon City, OR 97045
(503) 657-0891
www.ci.oregon-city.or.us

PWFMC - Division Street Parking Lot





Legend

- City Limits
- UGB
- Parcels
- Parks
- NROD
- Buildings
- Highways
- Major Streets
- Other Streets
- Rivers

Scale: 1:1,297

The City of Oregon City makes no representations, express or implied, as to the accuracy, completeness and timeliness of the information displayed. This map is not suitable for legal, engineering, surveying or navigation purposes. Notification of any errors is appreciated.

Notes: Natural Resource Overlay District Map

APPENDIX C
Soil Map and Information

Item #2.

Soil Map—Clackamas County Area, Oregon
(PWF - Division Street Parking Lot)

Map Scale: 1:468 if printed on A size (8.5" x 11") sheet.

N

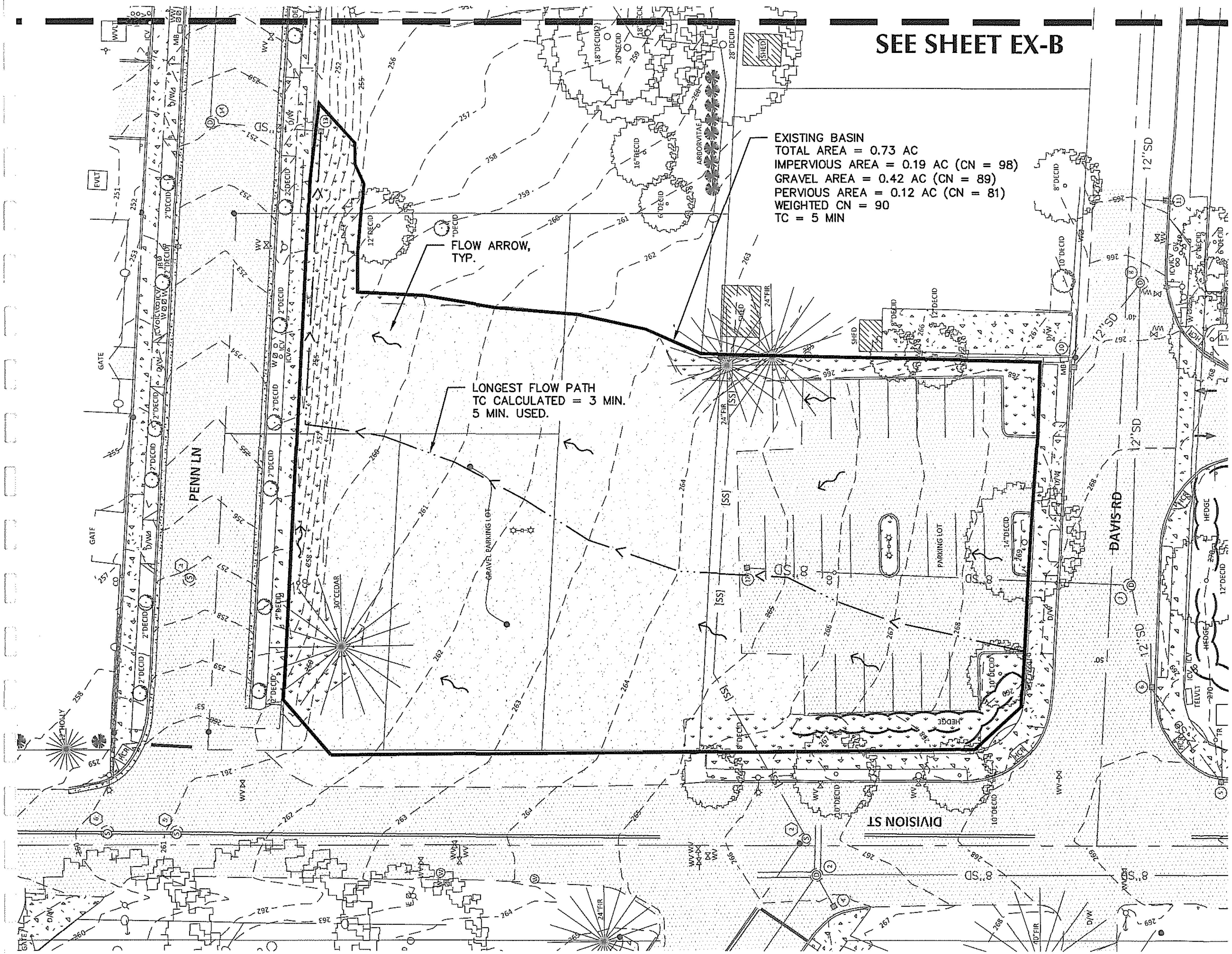
Meters: 0 4 8 16 24

Feet: 0 15 30 60 90

Map Unit Legend

Clackamas County Area, Oregon (OR610)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
91B	Woodburn silt loam, 3 to 8 percent slopes	1.1	100.0%
Totals for Area of Interest		**1.1**	**100.0%**

APPENDIX D
Drainage Basin Maps



SCALE
1 INCH = 30 FEET
30 0 30 60

LEGEND

IMPERVIOUS AREA

GRAVEL AREA

PERVIOUS AREA

PROVIDENCE Health & Services

PROVIDENCE WILLAMETTE FALLS MEDICAL CENTER
OREGON CITY, OR
DIVISION STEET PARKING LOT

Date: 2/8/12
Project Number: 110420
Sheet Number: EX-A

EXISTING BASIN DRAINAGE AREA MAP

PETERSEN KOLBERG & ASSOCIATES
ARCHITECTS/PLANNERS
6969 SW Hampton Street Portland, OR 97223
phone: 503-968-6800
fax: 503-968-6860
www.pkaarchitects.com

pka ARCHITECTS

STORM TABLE:

(1) STORM MANHOLE
RIM = 271.62'
IE 8" IN (S) SUBMERGED
IE 8" OUT (N) SUBMERGED
WATER LEVEL = 263.32

(2) STORM MANHOLE
RIM = 266.48'
IE 6" IN (E) = 262.19'
IE 10" IN (E) = 257.98'
IE 6" IN (SW) = 261.68'
IE 6" IN (N) = 260.68'
IE 8" IN (N) = 258.58'
IE 8" IN (S) = 258.09'
IE 10" OUT (NW) = 257.96'

(3) STORM MANHOLE
RIM = 262.01'
IE 8" IN (S) = 254.21'
IE 8" IN (N) = 254.21'
IE 10" IN (SE) = 253.73'
IE 10" OUT (NW) = 253.66'

(4) CATCH BASIN
RIM = 264.41'
IE 6" OUT (NE) = 264.41'

(5) CATCH BASIN
RIM = 269.24'
IE 8" IN (S) = 267.64'
IE 12" IN (E) = 266.53'
IE 12" OUT (NE) = 266.12'

(6) CATCH BASIN
RIM = 268.35'
IE 4" IN (W) = 266.65'
IE 4" IN (E) = 266.59'
IE 12" IN (SW) = 265.10'
IE 12" OUT (NE) = 263.72'

(7) STORM MANHOLE
RIM = 268.84'
IE 8" IN (N) = 261.54'
IE 12" IN (SW) = 261.56'
IE 12" OUT (E) = 261.38'

(8) STORM MANHOLE
RIM = 266.32'
IE 12" IN (NW) = 260.37'
IE 12" IN (W) = 260.29'
IE 12" OUT (E) = 260.22'

(9) STORM MANHOLE
RIM = 257.14'
IE 12" IN (W) = 252.57'
IE 12" OUT (S) = 252.44'

(10) CATCH BASIN
RIM = 266.83'
IE 4" IN (W) = 265.57'
IE 4" IN (E) = 265.45'
IE 12" OUT (SE) = 264.09'

(11) CATCH BASIN
RIM = 264.78'
IE 12" OUT (N) = 259.23'

(12) CATCH BASIN
RIM = 264.42'
IE 8" OUT (S) = 262.72'

(13) CATCH BASIN
RIM = 250.66'
IE 12" OUT (N) = 243.08'

(14) STORM MANHOLE
RIM = 250.92'
IE 12" IN (S) = 242.52'
IE 12' OUT (E) = 242.46'

(15) STORM MANHOLE
RIM = 237.97'
IE 12" IN (N) = 231.89'
IE 10" IN (S) = 231.79'
IE 12" IN (W) = 229.67'
IE 12" OUT (E) = 229.57'

(16) STORM MANHOLE
RIM = 237.29'
IE 8" IN (SW) = 232.19'
IE 8" IN (NW) = 231.99'
IE 12" IN (W) = 229.47'
IE 12" OUT (E) = 229.19'

(17) CATCH BASIN W/ FILTER
RIM = 237.32'
IE 8" OUT (SE) = 233.91'

(18) CATCH BASIN W/ FILTER
RIM = 237.40'
IE 8" OUT (NE) = 235.20'

SANITARY TABLE:

(1) SANITARY MANHOLE
RIM = 273.91'
IE 6" IN (E) = 260.45'
IE 8" IN (S) = 258.91'
IE 8" OUT (N) = 258.71'

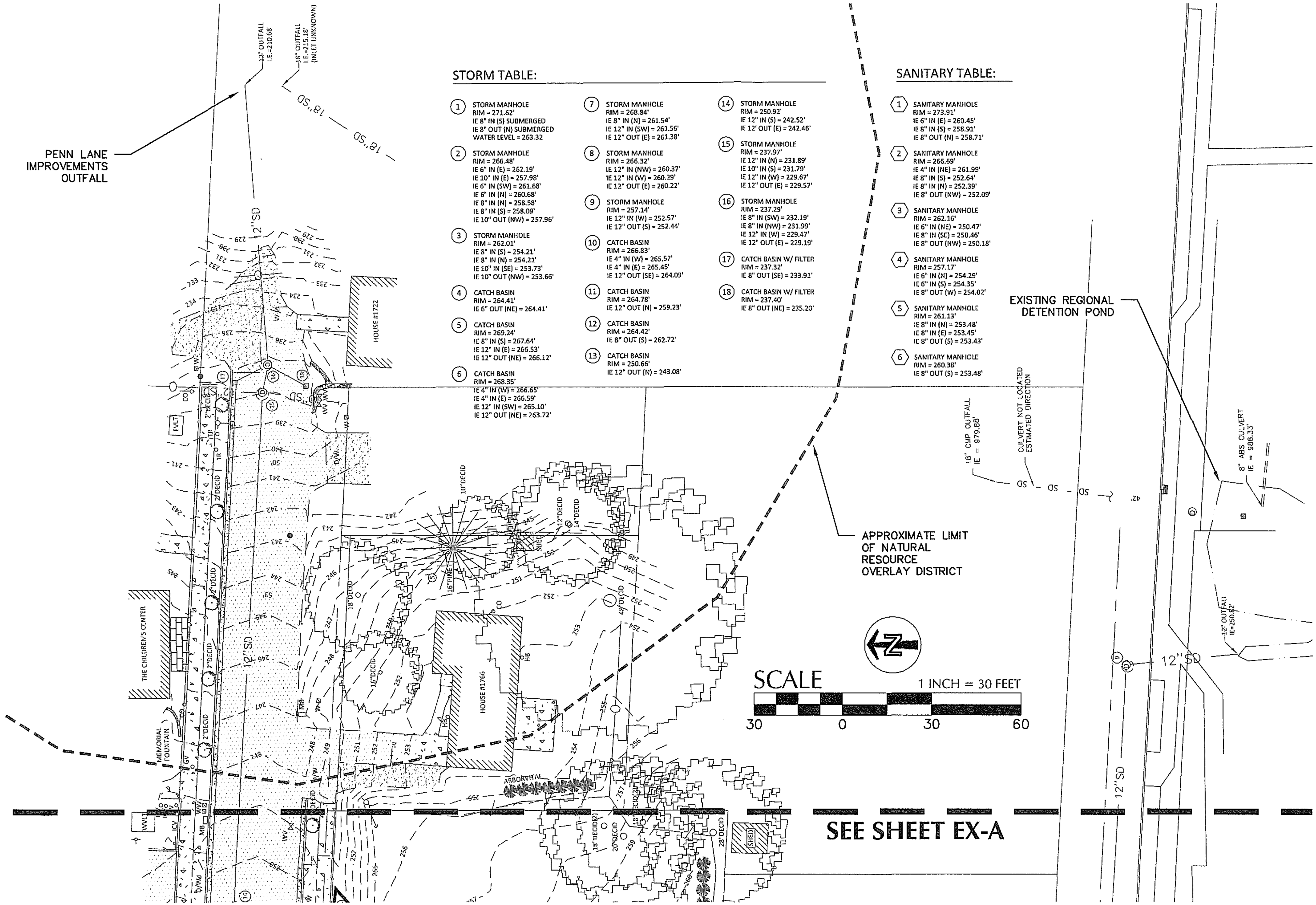
(2) SANITARY MANHOLE
RIM = 266.69'
IE 4" IN (NE) = 261.99'
IE 8" IN (S) = 252.64'
IE 8" IN (N) = 252.39'
IE 8" OUT (NW) = 252.09'

(3) SANITARY MANHOLE
RIM = 262.16'
IE 6" IN (NE) = 250.47'
IE 8" IN (SE) = 250.46'
IE 8" OUT (NW) = 250.18'

(4) SANITARY MANHOLE
RIM = 257.17'
IE 6" IN (N) = 254.29'
IE 6" IN (S) = 254.35'
IE 8" OUT (W) = 254.02'

(5) SANITARY MANHOLE
RIM = 261.13'
IE 8" IN (N) = 253.48'
IE 8" IN (E) = 253.45'
IE 8" OUT (S) = 253.43'

(6) SANITARY MANHOLE
RIM = 260.38'
IE 8" OUT (S) = 253.48'



SEE SHEET EX-A

PROVIDENCE Health & Services

Date: 2/8/12
Project Number: 110420
Sheet Number: EX-B

PROVIDENCE WILLAMETTE FALLS MEDICAL CENTER
OREGON CITY, OR
DIVISION STEET PARKING LOT

EXISTING BASIN DRAINAGE AREA MAP

PETERSEN KOLBERG & ASSOCIATES
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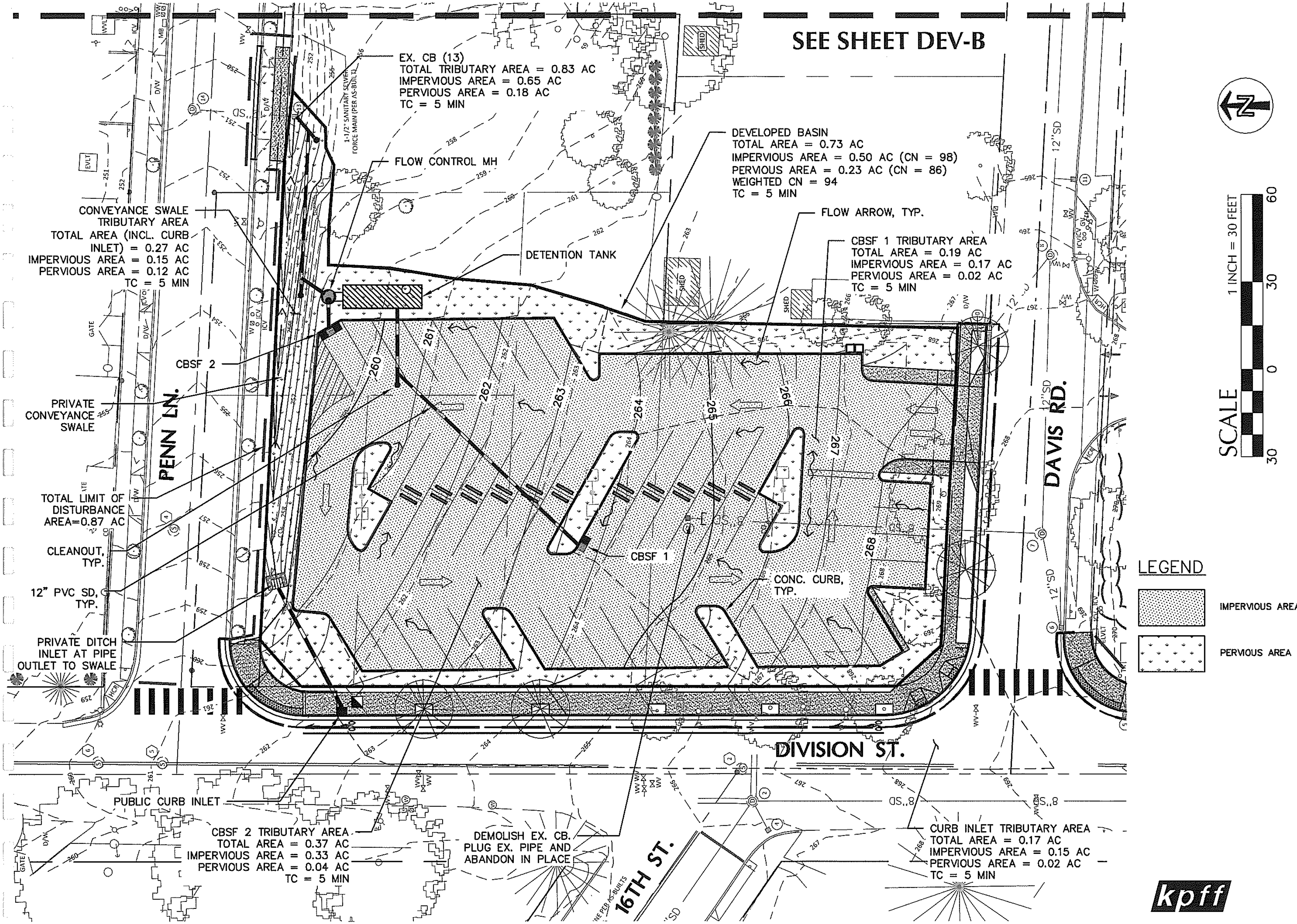
fax: 503-968-6860
www.pkaarchitects.com

pka ARCHITECTS



PROVIDENCE Health & Services

Date: 2/8/12
Project Number: 110420
Sheet Number: DEV-A

PROVIDENCE WILLAMETTE FALLS MEDICAL CENTER
OREGON CITY, OR
DIVISION STEET PARKING LOT

DEVELOPED BASIN AREA MAP

PETERSEN KOLBERG & ASSOCIATES
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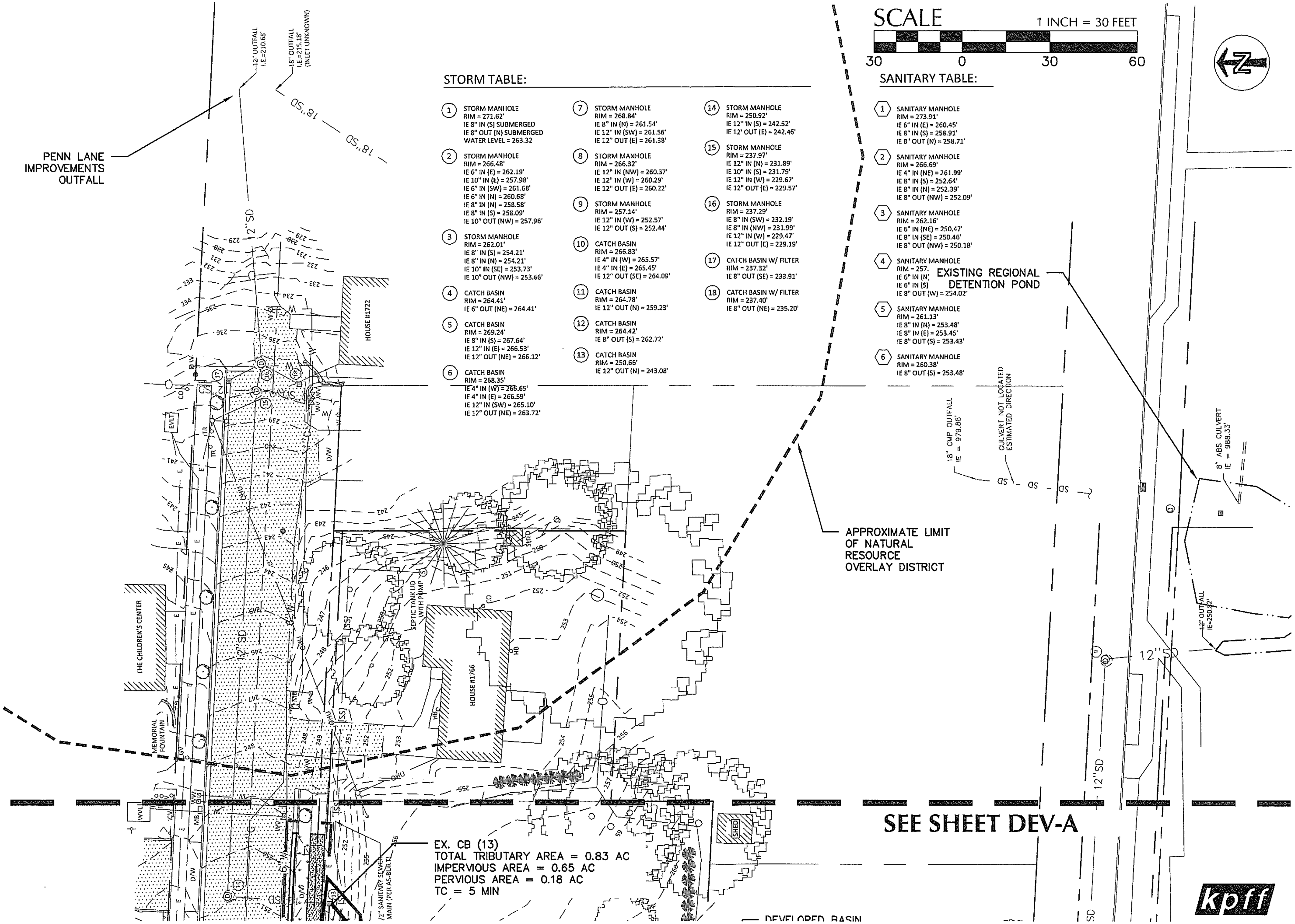
www.pkaarchitects.com

pka ARCHITECTS



STORM TABLE:

1. STORM MANHOLE
RIM = 271.62'
IE 8" IN (S) SUBMERGED
IE 8" OUT (N) SUBMERGED
WATER LEVEL = 263.32

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IE 6" IN (E) = 262.19'
IE 10" IN (E) = 257.98'
IE 6" IN (SW) = 261.68'
IE 6" IN (N) = 260.68'
IE 8" IN (N) = 258.58'
IE 8" IN (S) = 258.09'
IE 10" OUT (NW) = 257.96'

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IE 8" IN (N) = 254.21'
IE 10" IN (SE) = 253.73'
IE 10" OUT (NW) = 253.66'

4. CATCH BASIN
RIM = 264.41'
IE 6" OUT (NE) = 264.41'

5. CATCH BASIN
RIM = 269.24'
IE 8" IN (S) = 267.64'
IE 12" IN (E) = 266.53'
IE 12" OUT (NE) = 266.12'

6. CATCH BASIN
RIM = 268.35'
IE 4" IN (W) = 266.65'
IE 4" IN (E) = 266.59'
IE 12" IN (SW) = 265.10'
IE 12" OUT (NE) = 263.72'

7. STORM MANHOLE
RIM = 268.84'
IE 8" IN (N) = 261.54'
IE 12" IN (SW) = 261.56'
IE 12" OUT (E) = 261.38'

8. STORM MANHOLE
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IE 12" IN (NW) = 260.37'
IE 12" IN (W) = 260.29'
IE 12" OUT (E) = 260.22'

9. STORM MANHOLE
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IE 12" IN (W) = 252.57'
IE 12" OUT (S) = 252.44'

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IE 4" IN (W) = 265.57'
IE 4" IN (E) = 265.45'
IE 12" OUT (SE) = 264.09'

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RIM = 264.78'
IE 12" OUT (N) = 259.23'

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RIM = 264.42'
IE 8" OUT (S) = 262.72'

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IE 12' OUT (E) = 242.46'

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IE 10" IN (S) = 231.79'
IE 12" IN (W) = 229.67'
IE 12" OUT (E) = 229.57'

16. STORM MANHOLE
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IE 8" IN (NW) = 231.99'
IE 12" IN (W) = 229.47'
IE 12" OUT (E) = 229.19'

17. CATCH BASIN W/ FILTER
RIM = 237.32'
IE 8" OUT (SE) = 233.91'

18. CATCH BASIN W/ FILTER
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IE 8" OUT (NE) = 235.20'

SANITARY TABLE:

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IE 8" IN (S) = 252.64'
IE 8" IN (N) = 252.39'
IE 8" OUT (NW) = 252.09'

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IE 6" IN (NE) = 250.47'
IE 8" IN (SE) = 250.46'
IE 8" OUT (NW) = 250.18'

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IE 6" IN (N
IE 6" IN (S)
IE 8" OUT (W) = 254.02'

5. SANITARY MANHOLE
RIM = 261.13'
IE 8" IN (N) = 253.48'
IE 8" IN (E) = 253.45'
IE 8" OUT (S) = 253.43'

6. SANITARY MANHOLE
RIM = 260.38'
IE 8" OUT (S) = 253.48'

kpff

PROVIDENCE Health & Services

Date: 2/8/12
Project Number: 110420
Sheet Number: DEV-B

PROVIDENCE WILLAMETTE FALLS MEDICAL CENTER
OREGON CITY, OR
DIVISION STREET PARKING LOT

DEVELOPED BASIN AREA MAP

PETERSEN KOLBERG & ASSOCIATES
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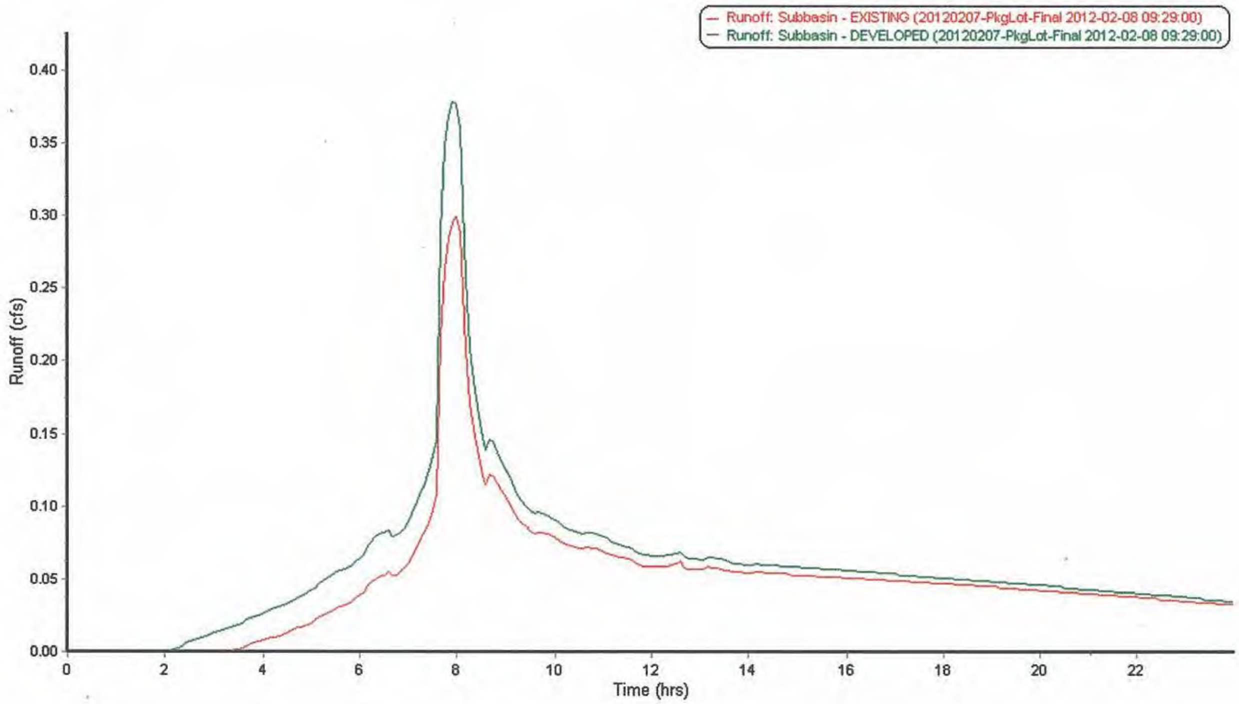
pka ARCHITECTS

APPENDIX E
Hydrologic/Hydraulic Analysis

2 YEAR STORM EVENT

BASIN: EXISTING AND DEVELOPED



Runoff Summary Table

Time period

From: 06/24/2011, 12:00:00 AM

To: 06/25/2011, 12:00:00 AM

Thresholds

Exceedance: 0

Deficit: 0

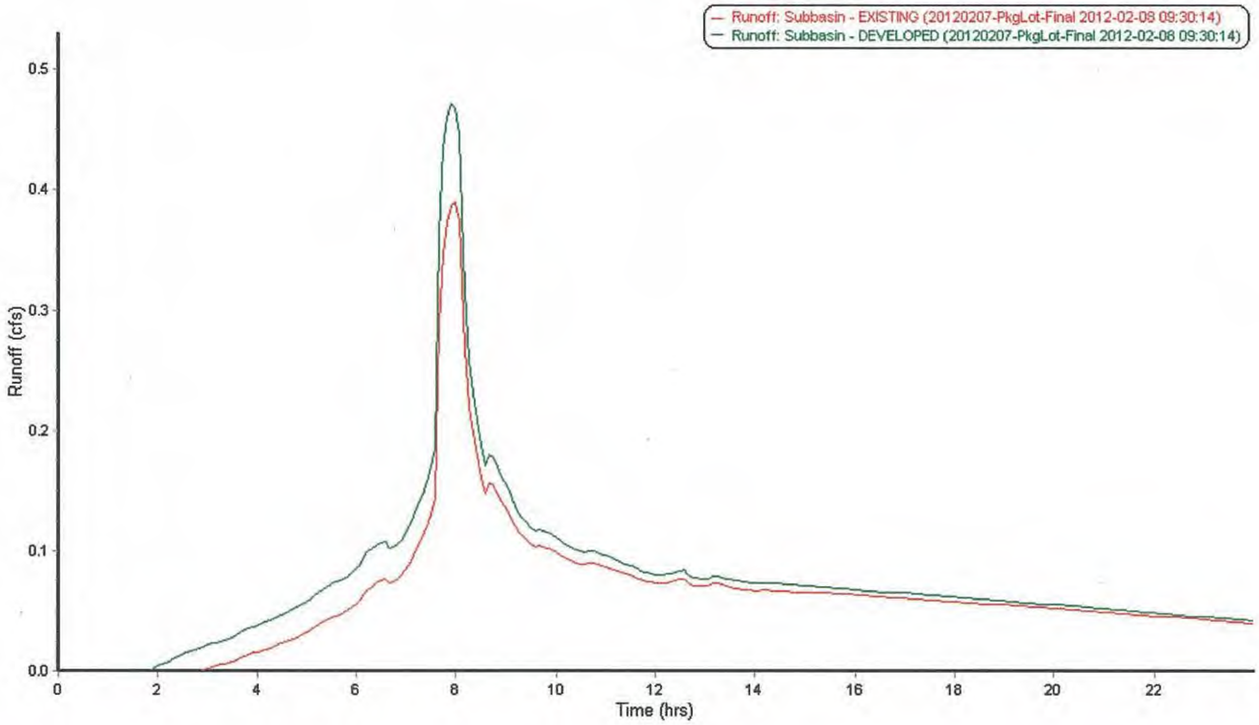
Detention storage

Max flow: 0

Element ID	EXISTING	DEVELOPED
Maximum Runoff (cfs)	0.30	0.38
Minimum Runoff (cfs)	0.00	0.00
Event Mean Runoff (cfs)	0.05	0.06
Duration of Exceedances (hrs)	N/A	N/A
Duration of Deficits (hrs)	N/A	N/A
Number of Exceedances	N/A	N/A
Number of Deficits	N/A	N/A
Volume of Exceedance (ft³)	N/A	N/A
Volume of Deficit (ft³)	N/A	N/A
Total Runoff (ft³)	4273.6	5231.39
Detention Storage (ft³)	N/A	N/A

5 YEAR STORM EVENT

BASIN: EXISTING AND DEVELOPED



Runoff Summary Table

Time period

From: 06/24/2011, 12:00:00 AM

To: 06/25/2011, 12:00:00 AM

Thresholds

Exceedance: 0

Deficit: 0

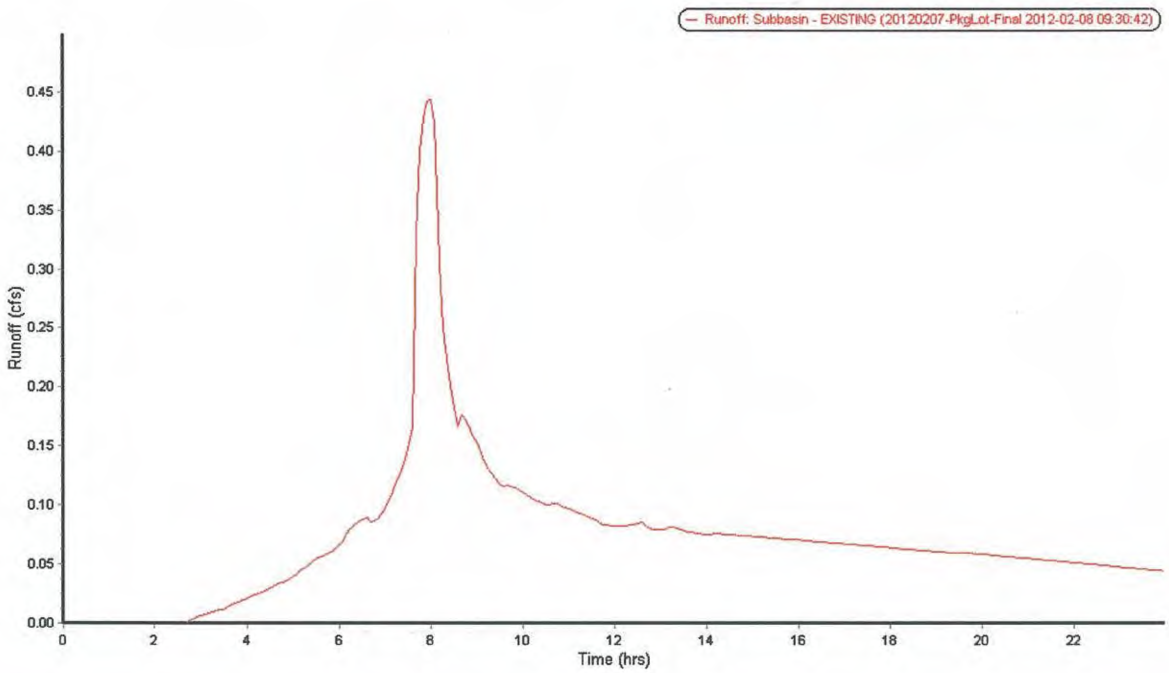
Detention storage

Max flow: 0

Element ID	EXISTING	DEVELOPED
Maximum Runoff (cfs)	0.39	0.47
Minimum Runoff (cfs)	0.00	0.00
Event Mean Runoff (cfs)	0.06	0.08
Duration of Exceedances (hrs)	N/A	N/A
Duration of Deficits (hrs)	N/A	N/A
Number of Exceedances	N/A	N/A
Number of Deficits	N/A	N/A
Volume of Exceedance (ft³)	N/A	N/A
Volume of Deficit (ft³)	N/A	N/A
Total Runoff (ft³)	5473.84	6504.72
Detention Storage (ft³)	N/A	N/A

10 YEAR STORM EVENT

BASIN: EXISTING



Runoff Summary Table

Time period

From:	06/24/2011, 12:00:00 AM
To:	06/25/2011, 12:00:00 AM

Thresholds

Exceedance:	0
Deficit:	0

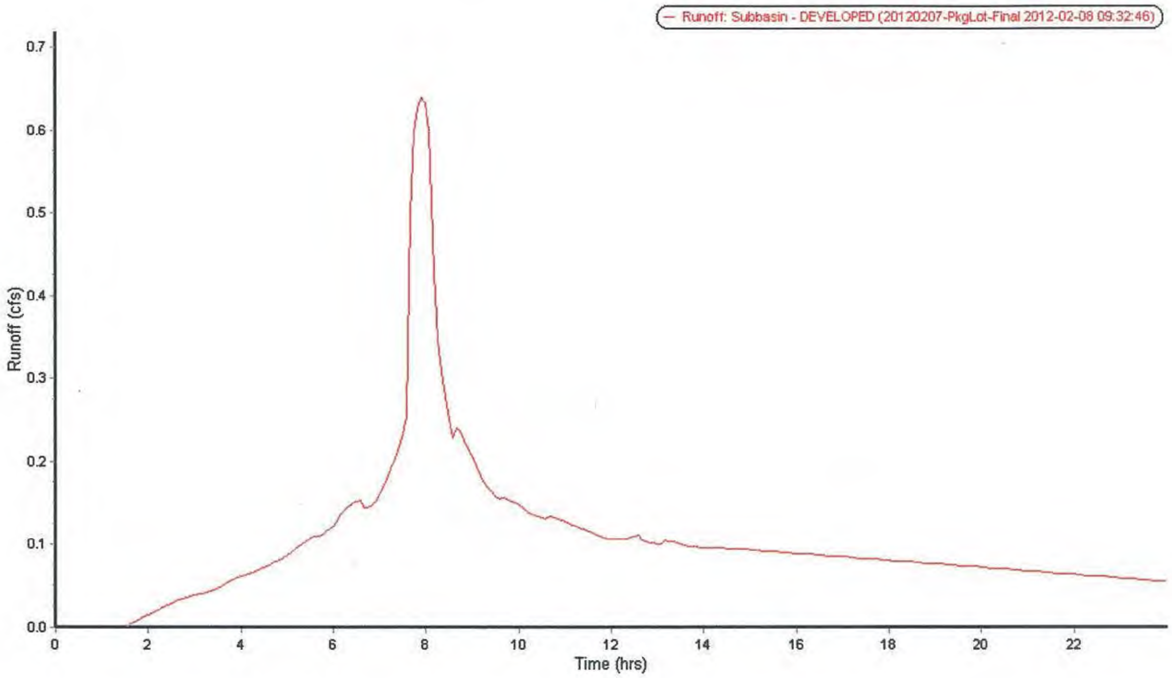
Detention storage

Max flow:	0

Element ID	EXISTING
Maximum Runoff (cfs)	0.44
Minimum Runoff (cfs)	0.00
Event Mean Runoff (cfs)	0.07
Duration of Exceedances (hrs)	N/A
Duration of Deficits (hrs)	N/A
Number of Exceedances	N/A
Number of Deficits	N/A
Volume of Exceedance (ft³)	N/A
Volume of Deficit (ft³)	N/A
Total Runoff (ft³)	6207.05
Detention Storage (ft³)	N/A

25 YEAR STORM EVENT

BASIN: DEVELOPED



Runoff Summary Table

Time period

From: 06/24/2011, 12:00:00 AM

To: 06/25/2011, 12:00:00 AM

Thresholds

Exceedance: 0

Deficit: 0

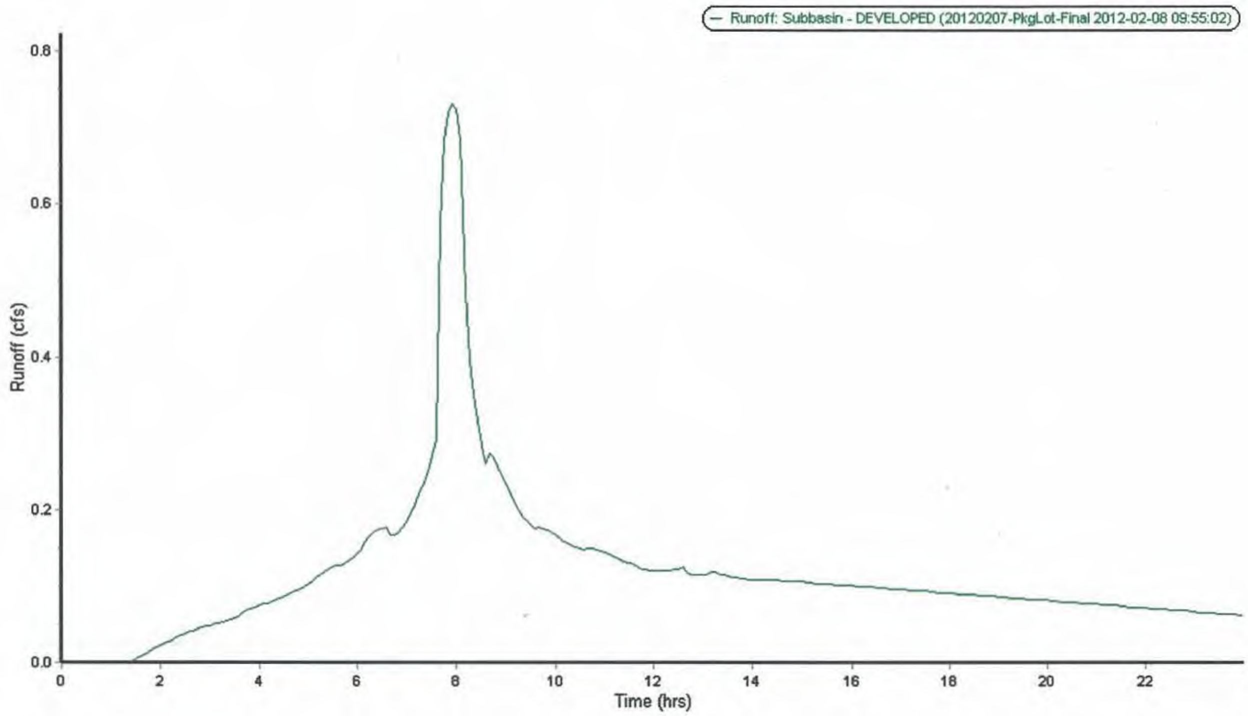
Detention storage

Max flow: 0

Element ID	DEVELOPED
Maximum Runoff (cfs)	0.64
Minimum Runoff (cfs)	0.00
Event Mean Runoff (cfs)	0.10
Duration of Exceedances (hrs)	N/A
Duration of Deficits (hrs)	N/A
Number of Exceedances	N/A
Number of Deficits	N/A
Volume of Exceedance (ft³)	N/A
Volume of Deficit (ft³)	N/A
Total Runoff (ft³)	8825.01
Detention Storage (ft³)	N/A

100 YEAR STORM EVENT

BASIN: DEVELOPED



Runoff Summary Table

Time period

From:	06/24/2011, 12:00:00 AM
To:	06/25/2011, 12:00:00 AM

Thresholds

Exceedance:	0
Deficit:	0

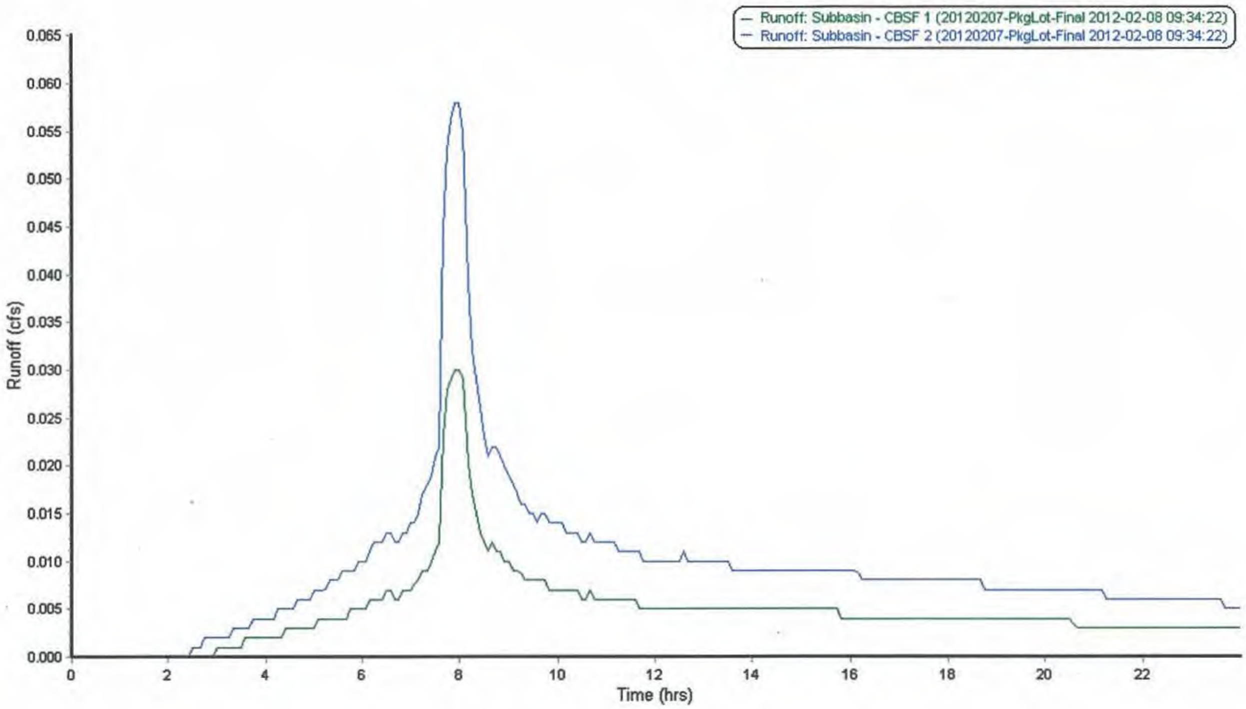
Detention storage

Max flow:	0

Element ID	DEVELOPED
Maximum Runoff (cfs)	0.73
Minimum Runoff (cfs)	0.00
Event Mean Runoff (cfs)	0.12
Duration of Exceedances (hrs)	N/A
Duration of Deficits (hrs)	N/A
Number of Exceedances	N/A
Number of Deficits	N/A
Volume of Exceedance (ft³)	N/A
Volume of Deficit (ft³)	N/A
Total Runoff (ft³)	10119.53
Detention Storage (ft³)	N/A

WQ STORM EVENT

BASIN: CBSF 1 AND CBSF 2



Runoff Summary Table

Time period

From: 06/24/2011, 12:00:00 AM

To: 06/25/2011, 12:00:00 AM

Thresholds

Exceedance: 0

Deficit: 0

Detention storage

Max flow: 0

Element ID	CBSF 1	CBSF 2
Maximum Runoff (cfs)	0.03	0.06
Minimum Runoff (cfs)	0.00	0.00
Event Mean Runoff (cfs)	0.00	0.01
Duration of Exceedances (hrs)	N/A	N/A
Duration of Deficits (hrs)	N/A	N/A
Number of Exceedances	N/A	N/A
Number of Deficits	N/A	N/A
Volume of Exceedance (ft³)	N/A	N/A
Volume of Deficit (ft³)	N/A	N/A
Total Runoff (ft³)	412.66	799.25
Detention Storage (ft³)	N/A	N/A

2-YEAR STORM EVENT ROUTED
THROUGH DETENTION TANK

Storage Nodes

Storage Node : Detention Tank

Input Data

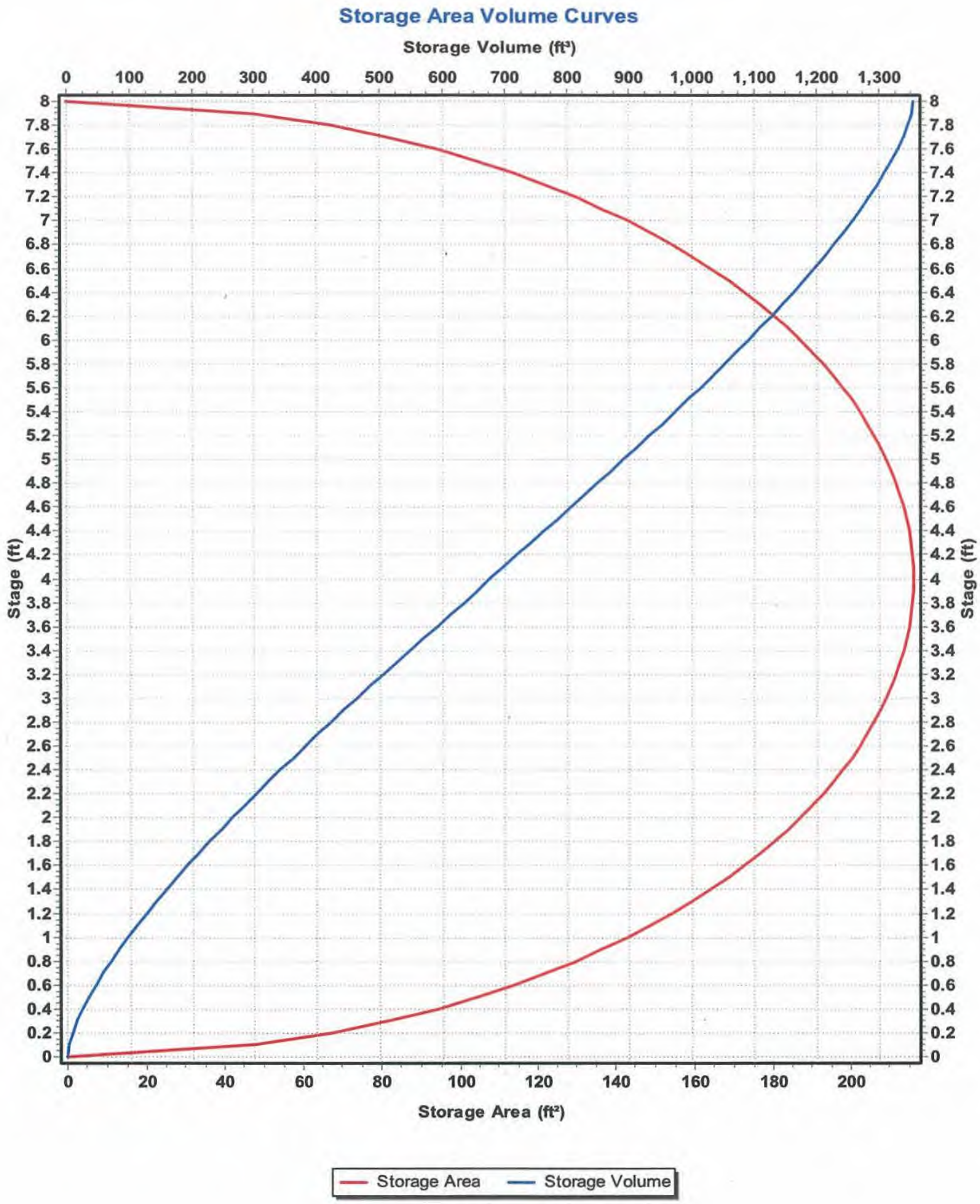
Invert Elevation (ft) 249.20
Max (Rim) Elevation (ft) 257.20
Max (Rim) Offset (ft) 8.00
Initial Water Elevation (ft) 0.00
Initial Water Depth (ft) .... -249.20
Ponded Area (ft^2) 0.00
Evaporation Loss 0.00

Storage Area Volume Curves

Storage Curve : CMP

Stage (ft)	Storage Area (ft^2)	Storage Volume (ft^3)
0	0.0000	0.000
0.1	47.9962	2.40
0.2	67.4460	8.17
0.3	82.0729	15.65
0.4	94.1522	24.46
0.5	104.5706	34.40
0.6	113.7851	45.32
0.7	122.0687	57.11
0.8	129.6000	69.69
0.9	136.5036	83.00
1	142.8706	96.97
1.1	148.7698	111.55
1.2	154.2549	126.70
1.3	159.3686	142.38
1.4	164.1458	158.56
1.5	168.6149	175.20
1.6	172.8000	192.27
1.7	176.7211	209.75
1.8	180.3956	227.61
1.9	183.8381	245.82
2	187.0615	264.36
2.1	190.0769	283.22
2.2	192.8942	302.37
2.3	195.5218	321.79
2.4	197.9673	341.46
2.5	200.2374	361.37
2.6	202.3379	381.50
2.7	204.2742	401.83
2.8	206.0509	422.35
2.9	207.6720	443.04
3	209.1411	463.88
3.1	210.4615	484.86
3.2	211.6359	505.96
3.3	212.6668	527.18
3.4	213.5562	548.49
3.5	214.3059	569.88
3.6	214.9173	591.34
3.7	215.3916	612.86
3.8	215.7298	634.42
3.9	215.9325	656.00
4	216.0000	677.60
4.1	215.9325	699.20
4.2	215.7298	720.78
4.3	215.3916	742.34
4.4	214.9173	763.86
4.5	214.3059	785.32
4.6	213.5562	806.71
4.7	212.6668	828.02
4.8	211.6359	849.24
4.9	210.4615	870.34
5	209.1411	891.32
5.1	207.6720	912.16
5.2	206.0509	932.85
5.3	204.2742	953.37
5.4	202.3379	973.70
5.5	200.2374	993.83
5.6	197.9673	1013.74
5.7	195.5218	1033.41
5.8	192.8942	1052.83
5.9	190.0769	1071.98
6	187.0615	1090.84
6.1	183.8381	1109.38
6.2	180.3956	1127.59
6.3	176.7211	1145.45
6.4	172.8000	1162.93

6.5	168.6149	1180.00
6.6	164.1458	1196.64
6.7	159.3686	1212.82
6.8	154.2549	1228.50
6.9	148.7698	1243.65
7	142.8706	1258.23
7.1	136.5036	1272.20
7.2	129.6000	1285.51
7.3	122.0687	1298.09
7.4	113.7851	1309.88
7.5	104.5706	1320.80
7.6	94.1522	1330.74
7.7	82.0729	1339.55
7.8	67.4460	1347.03
7.9	47.9962	1352.80
8	0.0000	1355.20


Storage Area Volume Curves
Storage Volume (ft³)
0 100 200 300 400 500 600 700 800 900 1,000 1,100 1,200 1,300
Stage (ft)
8 7.8 7.6 7.4 7.2 7 6.8 6.6 6.4 6.2 6 5.8 5.6 5.4 5.2 5 4.8 4.6 4.4 4.2 4 3.8 3.6 3.4 3.2 3 2.8 2.6 2.4 2.2 2 1.8 1.6 1.4 1.2 1 0.8 0.6 0.4 0.2 0
0 20 40 60 80 100 120 140 160 180 200
Storage Area (ft²)
Storage Area
Storage Volume

Storage Node : Detention Tank (continued)

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-09	Bottom	CIRCULAR	No	1.63			248.70	0.61
2	Orifice-10	Side	CIRCULAR	No	3.50			256.30	0.61
3	Orifice-11	Bottom	CIRCULAR	No	12.00			257.20	0.61

Output Summary Results

Peak Inflow (cfs) 0.38
Peak Lateral Inflow (cfs) 0.38
Peak Outflow (cfs) 0.14
Peak Exfiltration Flow Rate (cfm) 0.00
Max HGL Elevation Attained (ft) 253.25
Max HGL Depth Attained (ft) 4.05
Average HGL Elevation Attained (ft) 250.22
Average HGL Depth Attained (ft) 1.02
Time of Max HGL Occurrence (days hh:mm) 0 08:33
Total Exfiltration Volume (1000-ft³) 0.000
Total Flooded Volume (ac-in) 0
Total Time Flooded (min) 0
Total Retention Time (sec) 0.00

10-YEAR STORM EVENT ROUTED THROUGH DETENTION TANK

Storage Nodes

Storage Node : Detention Tank

Input Data

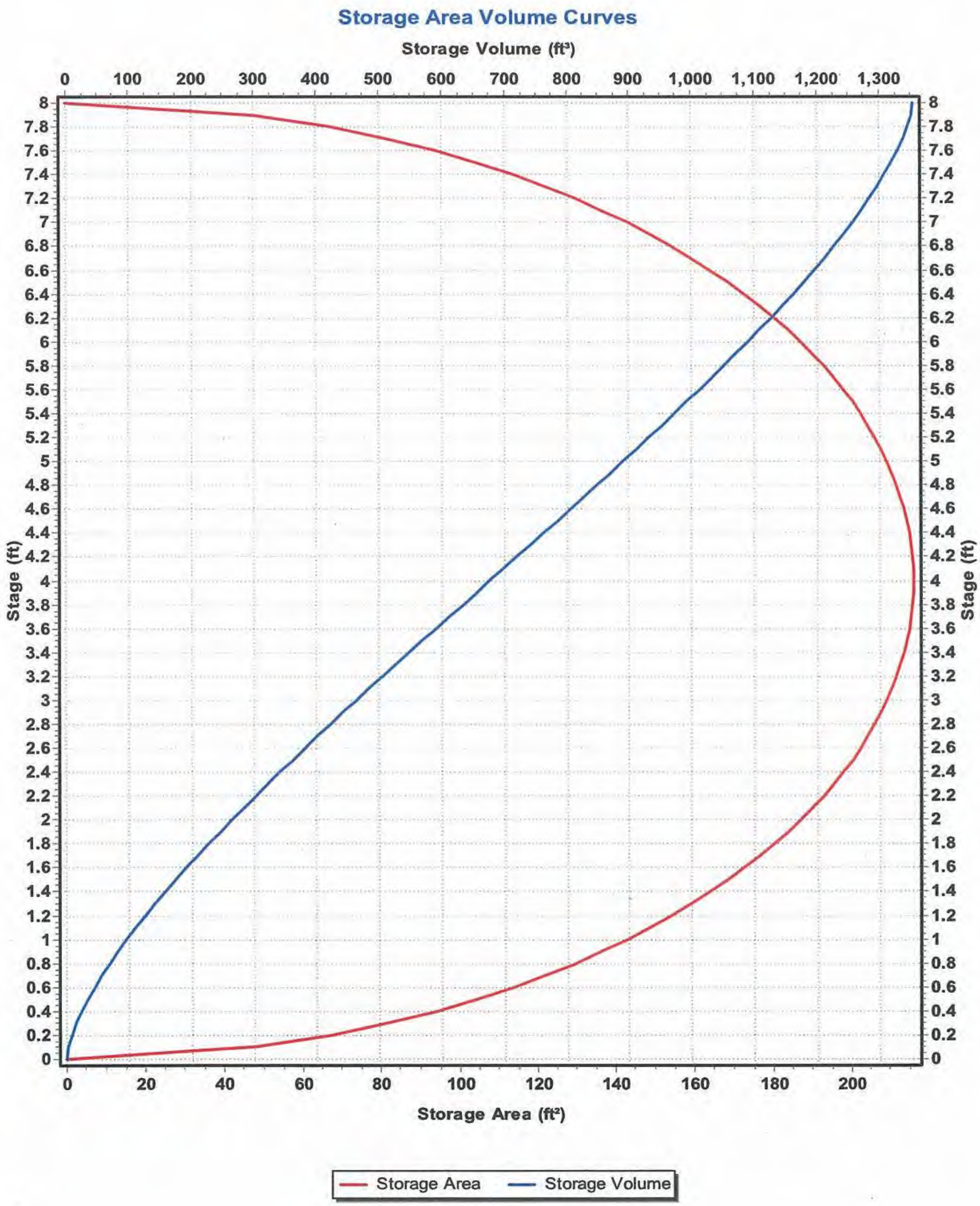
Invert Elevation (ft) 249.20
Max (Rim) Elevation (ft) 257.20
Max (Rim) Offset (ft) 8.00
Initial Water Elevation (ft) 0.00
Initial Water Depth (ft) .... -249.20
Ponded Area (ft²) 0.00
Evaporation Loss 0.00

Storage Area Volume Curves

Storage Curve : CMP

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	0.0000	0.000
0.1	47.9962	2.40
0.2	67.4460	8.17
0.3	82.0729	15.65
0.4	94.1522	24.46
0.5	104.5706	34.40
0.6	113.7851	45.32
0.7	122.0687	57.11
0.8	129.6000	69.69
0.9	136.5036	83.00
1	142.8706	96.97
1.1	148.7698	111.55
1.2	154.2549	126.70
1.3	159.3686	142.38
1.4	164.1458	158.56
1.5	168.6149	175.20
1.6	172.8000	192.27
1.7	176.7211	209.75
1.8	180.3956	227.61
1.9	183.8381	245.82
2	187.0615	264.36
2.1	190.0769	283.22
2.2	192.8942	302.37
2.3	195.5218	321.79
2.4	197.9673	341.46
2.5	200.2374	361.37
2.6	202.3379	381.50
2.7	204.2742	401.83
2.8	206.0509	422.35
2.9	207.6720	443.04
3	209.1411	463.88
3.1	210.4615	484.86
3.2	211.6359	505.96
3.3	212.6668	527.18
3.4	213.5562	548.49
3.5	214.3059	569.88
3.6	214.9173	591.34
3.7	215.3916	612.86
3.8	215.7298	634.42
3.9	215.9325	656.00
4	216.0000	677.60
4.1	215.9325	699.20
4.2	215.7298	720.78
4.3	215.3916	742.34
4.4	214.9173	763.86
4.5	214.3059	785.32
4.6	213.5562	806.71
4.7	212.6668	828.02
4.8	211.6359	849.24
4.9	210.4615	870.34
5	209.1411	891.32
5.1	207.6720	912.16
5.2	206.0509	932.85
5.3	204.2742	953.37
5.4	202.3379	973.70
5.5	200.2374	993.83
5.6	197.9673	1013.74
5.7	195.5218	1033.41
5.8	192.8942	1052.83
5.9	190.0769	1071.98
6	187.0615	1090.84
6.1	183.8381	1109.38
6.2	180.3956	1127.59
6.3	176.7211	1145.45
6.4	172.8000	1162.93

6.5	168.6149	1180.00
6.6	164.1458	1196.64
6.7	159.3686	1212.82
6.8	154.2549	1228.50
6.9	148.7698	1243.65
7	142.8706	1258.23
7.1	136.5036	1272.20
7.2	129.6000	1285.51
7.3	122.0687	1298.09
7.4	113.7851	1309.88
7.5	104.5706	1320.80
7.6	94.1522	1330.74
7.7	82.0729	1339.55
7.8	67.4460	1347.03
7.9	47.9962	1352.80
8	0.0000	1355.20


Storage Area Volume Curves
Storage Volume (ft³)
0 100 200 300 400 500 600 700 800 900 1,000 1,100 1,200 1,300
Stage (ft)
0 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2 2.2 2.4 2.6 2.8 3 3.2 3.4 3.6 3.8 4 4.2 4.4 4.6 4.8 5 5.2 5.4 5.6 5.8 6 6.2 6.4 6.6 6.8 7 7.2 7.4 7.6 7.8 8
Storage Area (ft²)
0 20 40 60 80 100 120 140 160 180 200
Storage Area
Storage Volume

Storage Node : Detention Tank (continued)

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-09	Bottom	CIRCULAR	No	1.63			248.70	0.61
2	Orifice-10	Side	CIRCULAR	No	3.50			256.30	0.61
3	Orifice-11	Bottom	CIRCULAR	No	12.00			257.20	0.61

Output Summary Results

Peak Inflow (cfs) 0.47
Peak Lateral Inflow (cfs) 0.47
Peak Outflow (cfs) 0.17
Peak Exfiltration Flow Rate (cfm) 0.00
Max HGL Elevation Attained (ft) 254.59
Max HGL Depth Attained (ft) 5.39
Average HGL Elevation Attained (ft) 250.72
Average HGL Depth Attained (ft) 1.52
Time of Max HGL Occurrence (days hh:mm) 0 08:52
Total Exfiltration Volume (1000-ft³) 0.000
Total Flooded Volume (ac-in) 0
Total Time Flooded (min) 0
Total Retention Time (sec) 0.00

Storage Nodes

Storage Node : Detention Tank

Input Data

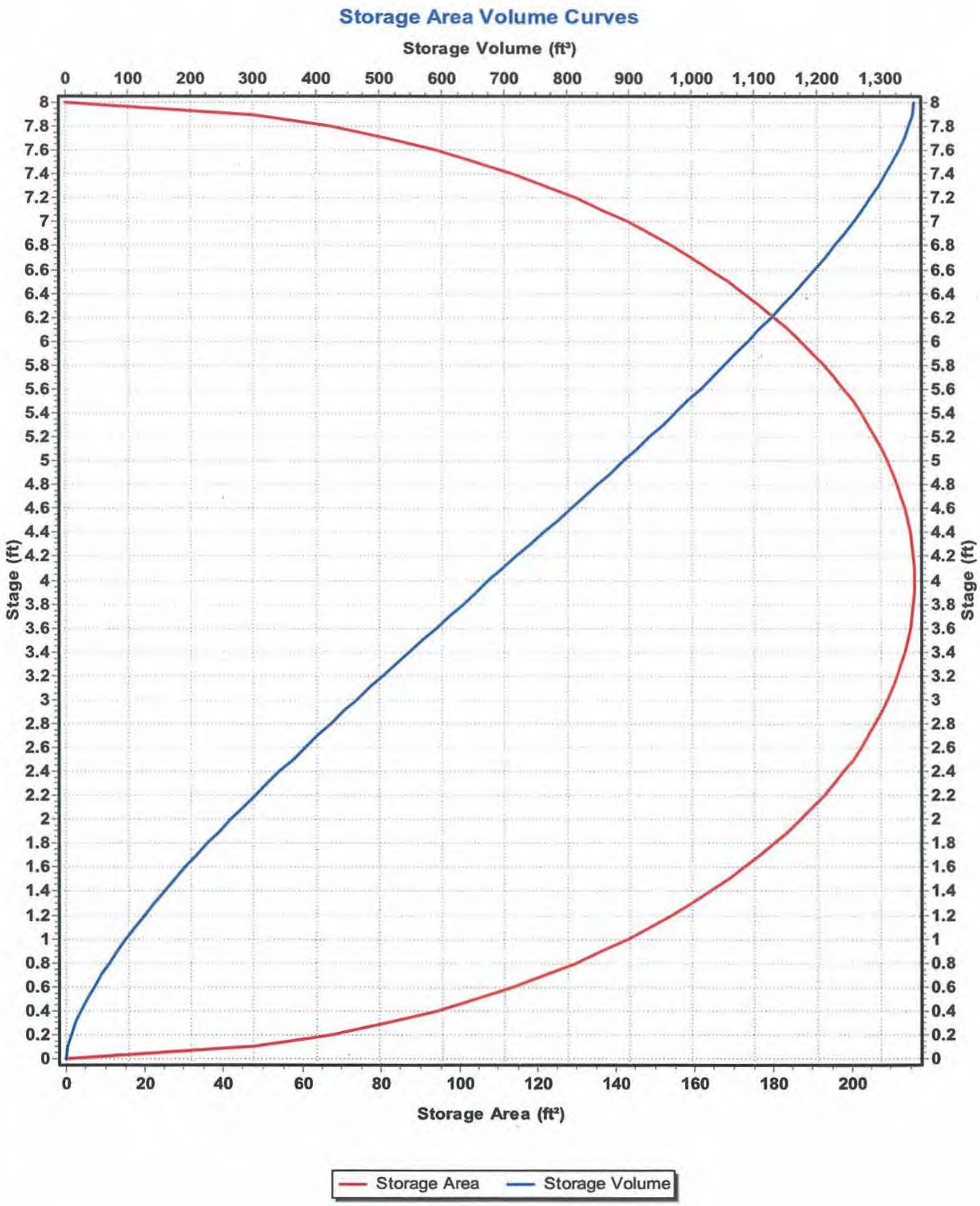
Invert Elevation (ft) 249.20
Max (Rim) Elevation (ft) 257.20
Max (Rim) Offset (ft) 8.00
Initial Water Elevation (ft) 0.00
Initial Water Depth (ft) .... -249.20
Ponded Area (ft²) 0.00
Evaporation Loss 0.00

Storage Area Volume Curves

Storage Curve : CMP

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	0.0000	0.000
0.1	47.9962	2.40
0.2	67.4460	8.17
0.3	82.0729	15.65
0.4	94.1522	24.46
0.5	104.5706	34.40
0.6	113.7851	45.32
0.7	122.0687	57.11
0.8	129.6000	69.69
0.9	136.5036	83.00
1	142.8706	96.97
1.1	148.7698	111.55
1.2	154.2549	126.70
1.3	159.3686	142.38
1.4	164.1458	158.56
1.5	168.6149	175.20
1.6	172.8000	192.27
1.7	176.7211	209.75
1.8	180.3956	227.61
1.9	183.8381	245.82
2	187.0615	264.36
2.1	190.0769	283.22
2.2	192.8942	302.37
2.3	195.5218	321.79
2.4	197.9673	341.46
2.5	200.2374	361.37
2.6	202.3379	381.50
2.7	204.2742	401.83
2.8	206.0509	422.35
2.9	207.6720	443.04
3	209.1411	463.88
3.1	210.4615	484.86
3.2	211.6359	505.96
3.3	212.6668	527.18
3.4	213.5562	548.49
3.5	214.3059	569.88
3.6	214.9173	591.34
3.7	215.3916	612.86
3.8	215.7298	634.42
3.9	215.9325	656.00
4	216.0000	677.60
4.1	215.9325	699.20
4.2	215.7298	720.78
4.3	215.3916	742.34
4.4	214.9173	763.86
4.5	214.3059	785.32
4.6	213.5562	806.71
4.7	212.6668	828.02
4.8	211.6359	849.24
4.9	210.4615	870.34
5	209.1411	891.32
5.1	207.6720	912.16
5.2	206.0509	932.85
5.3	204.2742	953.37
5.4	202.3379	973.70
5.5	200.2374	993.83
5.6	197.9673	1013.74
5.7	195.5218	1033.41
5.8	192.8942	1052.83
5.9	190.0769	1071.98
6	187.0615	1090.84
6.1	183.8381	1109.38
6.2	180.3956	1127.59
6.3	176.7211	1145.45
6.4	172.8000	1162.93

6.5	168.6149	1180.00
6.6	164.1458	1196.64
6.7	159.3686	1212.82
6.8	154.2549	1228.50
6.9	148.7698	1243.65
7	142.8706	1258.23
7.1	136.5036	1272.20
7.2	129.6000	1285.51
7.3	122.0687	1298.09
7.4	113.7851	1309.88
7.5	104.5706	1320.80
7.6	94.1522	1330.74
7.7	82.0729	1339.55
7.8	67.4460	1347.03
7.9	47.9962	1352.80
8	0.0000	1355.20


Storage Area Volume Curves
Storage Volume (ft³)
0
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
1,300
Stage (ft)
8
7.8
7.6
7.4
7.2
7
6.8
6.6
6.4
6.2
6
5.8
5.6
5.4
5.2
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
20
40
60
80
100
120
140
160
180
200
Storage Area (ft²)
Storage Area
Storage Volume

Storage Node : Detention Tank (continued)

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-09	Bottom	CIRCULAR	No	1.63			248.70	0.61
2	Orifice-10	Side	CIRCULAR	No	3.50			256.30	0.61
3	Orifice-11	Bottom	CIRCULAR	No	12.00			257.20	0.61

Output Summary Results

Peak Inflow (cfs) 0.64
Peak Lateral Inflow (cfs) 0.64
Peak Outflow (cfs) 0.38
Peak Exfiltration Flow Rate (cfm) 0.00
Max HGL Elevation Attained (ft) 256.76
Max HGL Depth Attained (ft) 7.56
Average HGL Elevation Attained (ft) 251.64
Average HGL Depth Attained (ft) 2.44
Time of Max HGL Occurrence (days hh:mm) 0 08:13
Total Exfiltration Volume (1000-ft³) 0.000
Total Flooded Volume (ac-in) 0
Total Time Flooded (min) 0
Total Retention Time (sec) 0.00

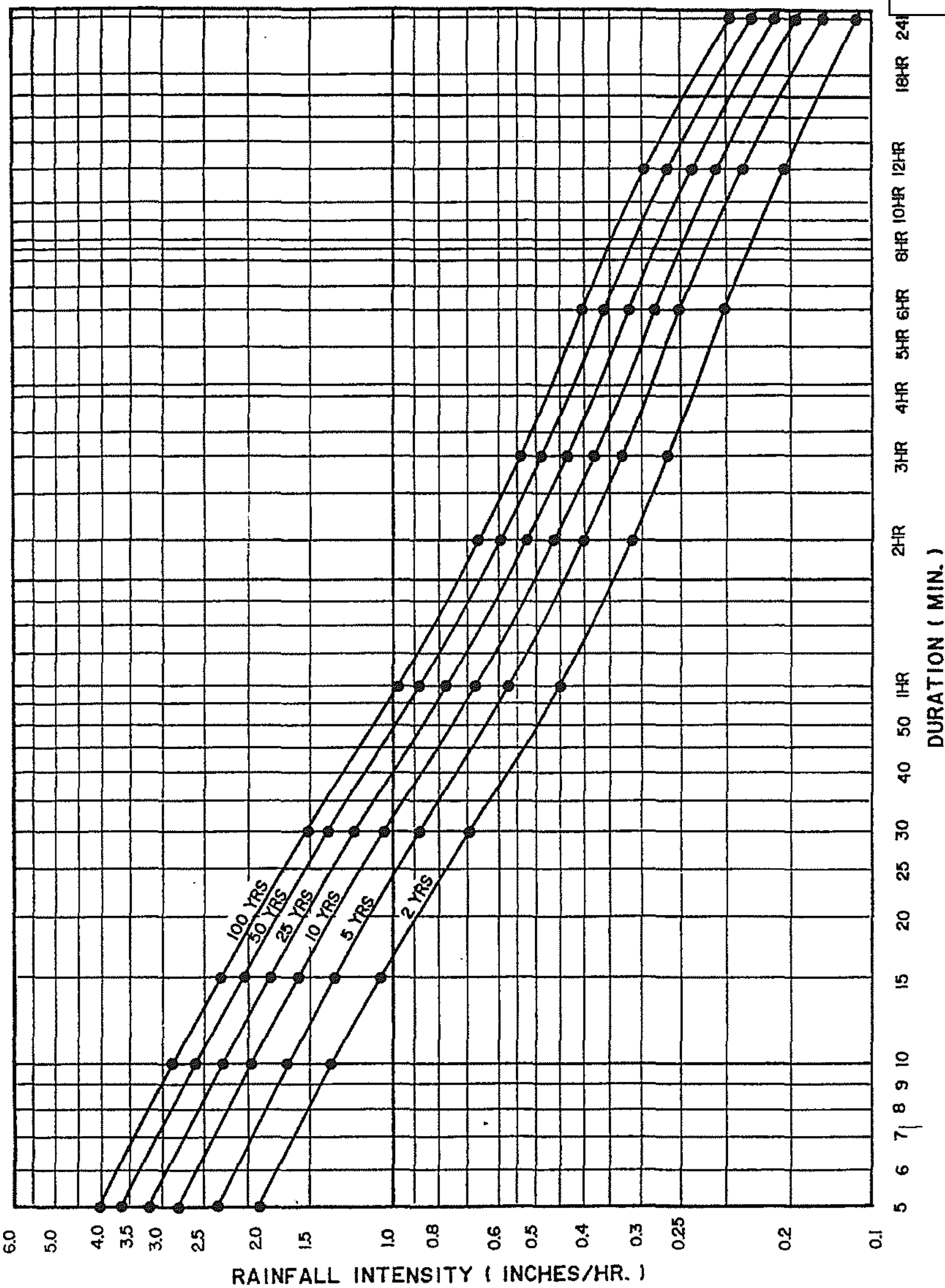


FIGURE 4.1

RAINFALL INTENSITY DURATION & FREQUENCY CURVES FOR OREGON CITY

otak incorporated

INC. ARCHITECTS, P.C.

17355 SW Boones Ferry Rd, Lake Oswego OR

101 E 8th Street, Vancouver WA 98660, (20

11058 Main Street #215, Bellevue WA 98004 (206) 455-5340

Rational Method Conveyance Analysis for 25-year storm event

Equation: Q=CIA

Constants:

Runoff Coefficient (C) = 0.90 for Pavements
Runoff Coefficient (C) = 0.25 for Landscaped Areas
Rainfall Intensity (I) = 3.2 in/hr

Notes:

1. The reach between the Ditch Inlet and Ex. CB (13) is the conveyance swale.
2. Although there is incremental C*A to Ex. CB (13), this has been included in the conveyance swale sizing so it was not included in the reach fron Ex. CB (13) to Ex. MH (14)

Structure From	Structure To	Initial Tc (min)	Total Tc (min)	A Imperv. (acre)	A Perv. (acre)	C Composite	C*A Incr. (acre)	C*A Total (acre)	Q (cfs)
CBSF 1	Detention Tank	5	5	0.17	0.02	0.83	0.16	0.16	0.51
CBSF 2	Detention Tank	5	5	0.33	0.04	0.83	0.31	0.31	0.98
Flow Control MH	Ex. CB	5	5	0.00	0.00	NA	NA	0.47	1.49
Public Curb Inlet	Ditch Inlet	5	5	0.15	0.02	0.82	0.14	0.14	0.14
Ditch Inlet	Ex. CB (13)	5	5	0.00	0.10	0.25	0.03	0.17	0.53
Ex. CB (13)	Ex. MH (14)	5	5	NA	NA	NA	NA	0.63	2.02
Ex. MH (14)	Ex. MH (15)	5	5	NA	NA	NA	NA	0.63	2.02

Rational Method Conveyance Analysis for 100-year storm event

Equation: Q=CIA

Constants:

Runoff Coefficient (C) =	0.90	for Pavements
Runoff Coefficient (C) =	0.25	for Landscaped Areas
Rainfall Intensity (I) =	4.0	in/hr

Notes:

1. The reach between the Ditch Inlet and Ex. CB (13) is the conveyance swale.
2. Although there is incremental C*A to Ex. CB (13), this has been included in the conveyance swale sizing so it was not included in the reach fron Ex. CB (13) to Ex. MH (14)

Structure From	Structure To	Initial Tc (min)	Total Tc (min)	A Imperv. (acre)	A Perv. (acre)	C Composite	C*A Incr. (acre)	C*A Total (acre)	Q (cfs)
CBSF 1	Detention Tank	5	5	0.17	0.02	0.83	0.16	0.16	0.63
CBSF 2	Detention Tank	5	5	0.33	0.04	0.83	0.31	0.31	1.23
Flow Control MH	Ex. CB	5	5	0.00	0.00	NA	NA	0.47	1.86
Public Curb Inlet	Ditch Inlet	5	5	0.15	0.02	0.82	0.14	0.14	0.14
Ditch Inlet	Ex. CB (13)	5	5	0.00	0.10	0.25	0.03	0.17	0.66
Ex. CB (13)	Ex. MH (14)	5	5	NA	NA	NA	NA	0.63	2.52
Ex. MH (14)	Ex. MH (15)	5	5	NA	NA	NA	NA	0.63	2.52

Manning's Equation for 25-year storm event

Manning's Equation: $Q=1.49/n*A*R^{2/3}*S^{1/2}$
Continuity Equation: $V=Q/A$

Constants:

n = 0.013 for pipes
n = 0.030 for swales

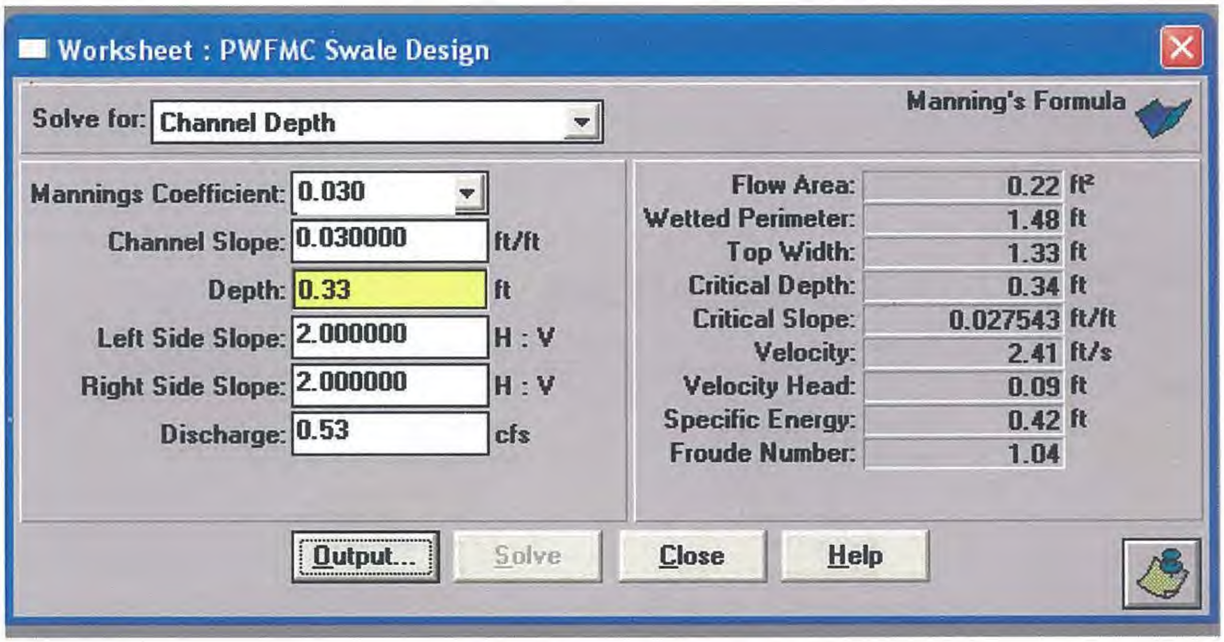
Notes:

1. Surcharge is when the Q pipe is smaller than the Q required. Q pipe-Q required=additional capacity available in pipe.
2. Minimum velocity equals 2.5 fps.

Structure From	Structure To	Pipe Size (inches)	Slope (ft/ft)	Q pipe (cfs)	Q required (cfs)	Velocity (fps)	Surcharge	Pipe Area
CBSF 1	Detention Tank	12	0.0375	6.89	0.51	8.77	NO	0.79
CBSF 2	Detention Tank	12	0.0500	7.95	0.98	10.12	NO	0.79
Flow Control MH	Ex. CB	12	0.0830	10.24	1.49	13.04	NO	0.79
Public Curb Inlet	Ditch Inlet	12	0.0604	8.74	0.14	11.13	NO	0.79
Ditch Inlet	Ex. CB (13)	Swale	0.0300	NA	0.17	See Triangular Channel Calculation		
Ex. CB (13)	Ex. MH (14)	12	0.0165	4.57	2.02	5.82	NO	0.79
Ex. MH (14)	Ex. MH (15)	12	0.0735	9.64	2.02	12.27	NO	0.79

SWALE DEPTH CALCULATION

25-YEAR STORM EVENT



MAX. 25-YEAR FLOW DEPTH = 0.33 FEET AT MIN. CHANNEL SLOPE EQUAL TO 3%. 6-INCHES OF FREEBOARD REQUIRED PER OC DESIGN STANDARDS.

SWALE MUST BE 10 INCHES BELOW BACK OF SIDEWALK IN ALL LOCATIONS.

STORMFILTER CATCH BASIN INLET CAPACITY

WEIR & ORIFICE CALCULATOR

The Weir and Orifice Calculator is used to determine the inlet capacity in sag (ponding) conditions by use of the Weir and Orifice equations. Knowing this information will allow you to select the proper grate type and size for your specific job or project.

Weir Flow Calculations

Weir Equation: $Q = 3.3P(h)^{1.5}$

- **Q** = Capacity in CFS
- **P** = Feet perimeter
- **h** = Head in feet
- Weir Information

Orifice Flow Calculations

Orifice Flow Equation: $Q = 0.6A\sqrt{2gh}$

- **Q** = Capacity in CFS
- **A** = Free open area of grate in sq. ft.
- **g** = 32.2 (feet per sec/sec)
- **h** = Head in feet
- Orifice Information

Instructions:

1. Select a catalog number (will automatically fill in Open Area and Perimeter) or enter your own values
2. Enter head value
3. Click "calculate"

The results will determine automatically if your situation falls into a Weir, Transitional or Orifice flow. Additionally, Neenah grates which fall within the parameters chosen will appear below the calculator.

Catalog Number and Grate Type:

Select Number and Grate

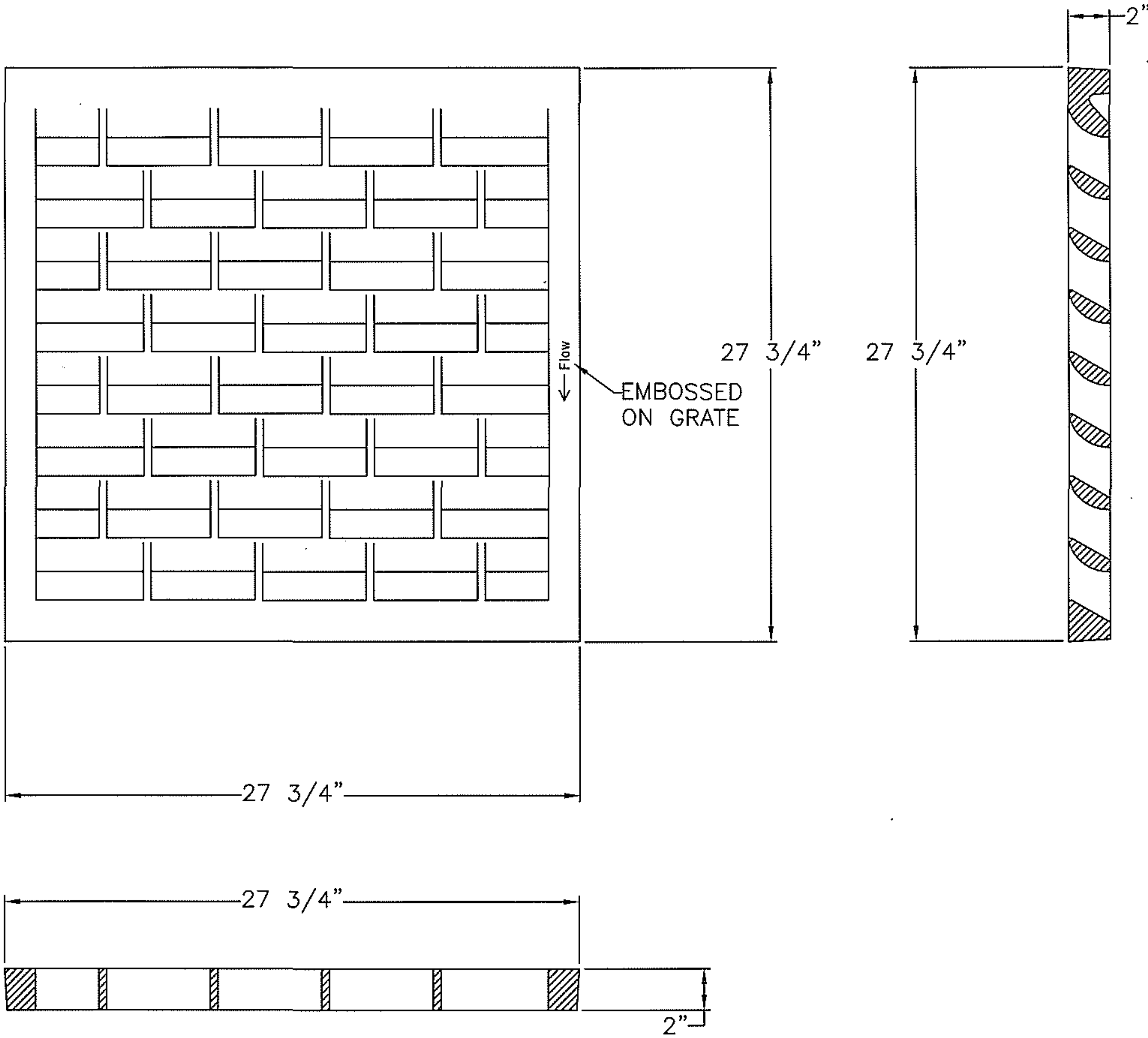
Feet perimeter (P):	Head in feet (h):	Free open area in sq. ft. (A):
9.25	.33	3.553

Calculate

Weir capacity in cfs:	Transitional flow in cfs:	Orifice capacity in cfs:
5.8		

For additional information regarding Neenah Inlet Grate Capacities, please contact Steven Akkala P.E., at (920) 729.3653 or email at sakkala@nfco.com.

STORMFILTER CATCH BASIN VANED GRATE



OPEN AREA = 3.553ft²

DUCTILE IRON TO CONFORM TO ASTM A-536 CLASS 80-55-06	I-1364 D&L MODEL # DRAWN BY: ADAM KROUPA D&L Foundry (Not to Scale) DATE: 1-2-08	D&L FOUNDRY & SUPPLY CALIFORNIA SALES: (800)- WASHINGTON SALES: (888) UTAH SALES: (800)-453-9802

G-2 INLET CAPACITY
EX. CB (13)

MUNICIPAL PRODUCT SEARCH

Enter a product number. Go

Downloadable Product Catalog

ENGINEERING TOOLS

- Modified Manning Calculators
- Weir and Orifice Calculator
  - Weir Flow
  - Orifice Flow
- Curb Opening Hydraulics Calculator
- R-4999 Vane Trench Grate Hydraulics
- Neenah Grate Information
- Engineering Literature & Videos

WEIR & ORIFICE CALCULATOR

The Weir and Orifice Calculator is used to determine the inlet capacity in sag (ponding) conditions by use of the Weir and Orifice e Knowing this information will allow you to select the proper grate type and size for your specific job or project.

Weir Flow Calculations

Weir Equation: $Q = 3.3P(h)^{1.5}$

- **Q** = Capacity in CFS
- **P** = Feet perimeter
- **h** = Head in feet
- Weir Information

Orifice Flow Calculations

Orifice Flow Equation: $Q = 0.6A\sqrt{2gh}$

- **Q** = Capacity in CFS
- **A** = Free open area of grate in sq. ft.
- **g** = 32.2 (feet per sec/sec)
- **h** = Head in feet
- Orifice Information

Instructions:

1. Select a catalog number (will automatically fill in Open Area and Perimeter) or enter your own values
2. Enter head value
3. Click "calculate"

The results will determine automatically if your situation falls into a Weir, Transitional or Orifice flow. Additionally, Neenah grates w within the parameters chosen will appear below the calculator.

Catalog Number and Grate Type:

Select Number and Grate

Feet perimeter (P):	Head in feet (h):	Free open area in sq. ft. (A):
9.84	0.33	3.86

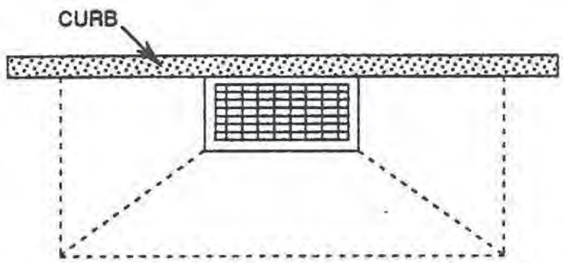
Calculate

Weir capacity in cfs:	Transitional flow in cfs:	Orifice capacity in cfs:
6.2		

For additional information regarding Neenah Inlet Grate Capacities, please contact Steven Akkala P.E., at (920) 729.3653 or email a sakkala@nfco.com

INLET DIMENSIONS & CRITERIA

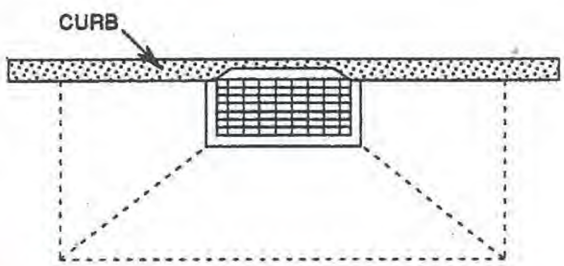
4-30 INLET
(ONE 4-39 GRATE)



GRATE LENGTH	2.67 feet
GRATE WIDTH	1.12 feet
GRATE OPEN AREA	1.93 sq. ft.
3 SIDE PERIMETER	4.92 feet
DEPRESSION WIDTH	4.00 feet
DEPRESSION AT CURB	0.167 feet
SPLASH-OVER VELOCITY, V_o	5.7 ft. per sec.
REDUCTION FOR CLOGGING	50%
MIN. LEAD DIA.	8 inches
MIN. LEAD SLOPE	2.00 percent

4-32-3 INLET
(ONE 4-39 GRATE W/ CURB OPENING)

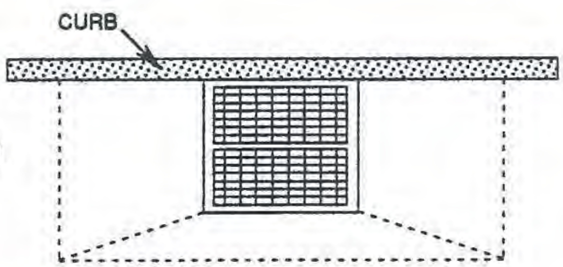
SIMILAR TO G-2 GRATE



GRATE LENGTH	2.67 feet
GRATE WIDTH	1.12 feet
GRATE OPEN AREA	1.93 sq. ft.
3 SIDE PERIMETER	4.92 feet
DEPRESSION WIDTH	4.00 feet
DEPRESSION AT CURB	0.167 feet
SPLASH-OVER VELOCITY, V_o	5.7 ft. per sec.
OPENING LENGTH	2.35 feet
OPENING HEIGHT	0.20 feet
OPENING AREA	0.47 sq. ft.
REDUCTION FOR CLOGGING	35%
MIN. LEAD DIA.	10 inches
MIN. LEAD SLOPE	2.00 percent

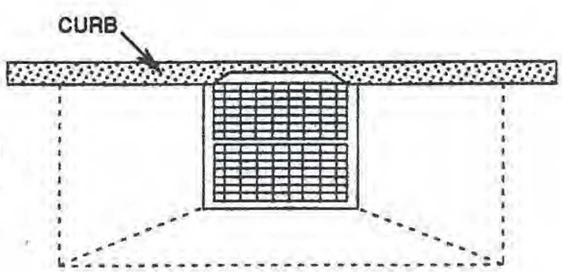
4-31-2 INLET & 4-31-3 CATCH BASIN
(TWO 4-39 GRATES)

4 SIDE PERIMETER = 9.84'



GRATE LENGTH	2.67 feet
GRATE WIDTH	2.25 feet
GRATE OPEN AREA	3.86 sq. ft.
3 SIDE PERIMETER	7.17 feet
DEPRESSION WIDTH	4.00 feet
DEPRESSION AT CURB	0.167 feet
SPLASH-OVER VELOCITY, V_o	5.7 ft. per sec.
REDUCTION FOR CLOGGING	50%
MIN. LEAD DIA.	10 inches
MIN. LEAD SLOPE	2.00 percent

4-32-4 INLET & 4-32-5 CATCH BASIN
(TWO 4-39 GRATES W/ CURB OPENING)



GRATE LENGTH	2.67 feet
GRATE WIDTH	2.25 feet
GRATE OPEN AREA	3.86 sq. ft.
3 SIDE PERIMETER	7.17 feet
DEPRESSION WIDTH	4.00 feet
DEPRESSION AT CURB	0.167 feet
SPLASH OVER VELOCITY, V_o	5.7 ft. per sec.
OPENING LENGTH	2.35 feet
OPENING HEIGHT	0.20 feet
OPENING AREA	0.47 sq. ft.
REDUCTION FOR CLOGGING	35%
MIN. LEAD DIA.	10 inches
MIN. LEAD SLOPE	2.00 %

APPENDIX F
Operations and Maintenance Manual

CONTECH STORMWATER SOLUTIONS

CMP DETENTION SYSTEM OPERATION AND MAINTENANCE

Maintenance

Underground storm water detention and retention systems should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size or configuration of the system.

Inspection

Inspection is the key to effective maintenance and is easily performed. CONTECH recommends ongoing quarterly inspections of the accumulated sediment. Sediment deposition and transport may vary from year to year and quarterly inspections will help insure that systems are cleaned out at the appropriate time. Inspections should be performed more often in the winter months in climates where sanding operations may lead to rapid accumulations, or in equipment washdown areas. It is very useful to keep a record of each inspection. A sample inspection log is included for your use.

Systems should be cleaned when inspection reveals that accumulated sediment or trash is clogging the discharge orifice. CONTECH suggests that all systems be designed with an access/inspection manhole situated at or near the inlet and the outlet orifice. Should it be necessary to get inside the system to perform maintenance activities, all appropriate precautions regarding confined space entry and OSHA regulations should be followed.

Cleaning

Maintaining an underground detention or retention system is easiest when there is no flow entering the system. For this reason, it is a good idea to schedule the cleanout during dry weather.

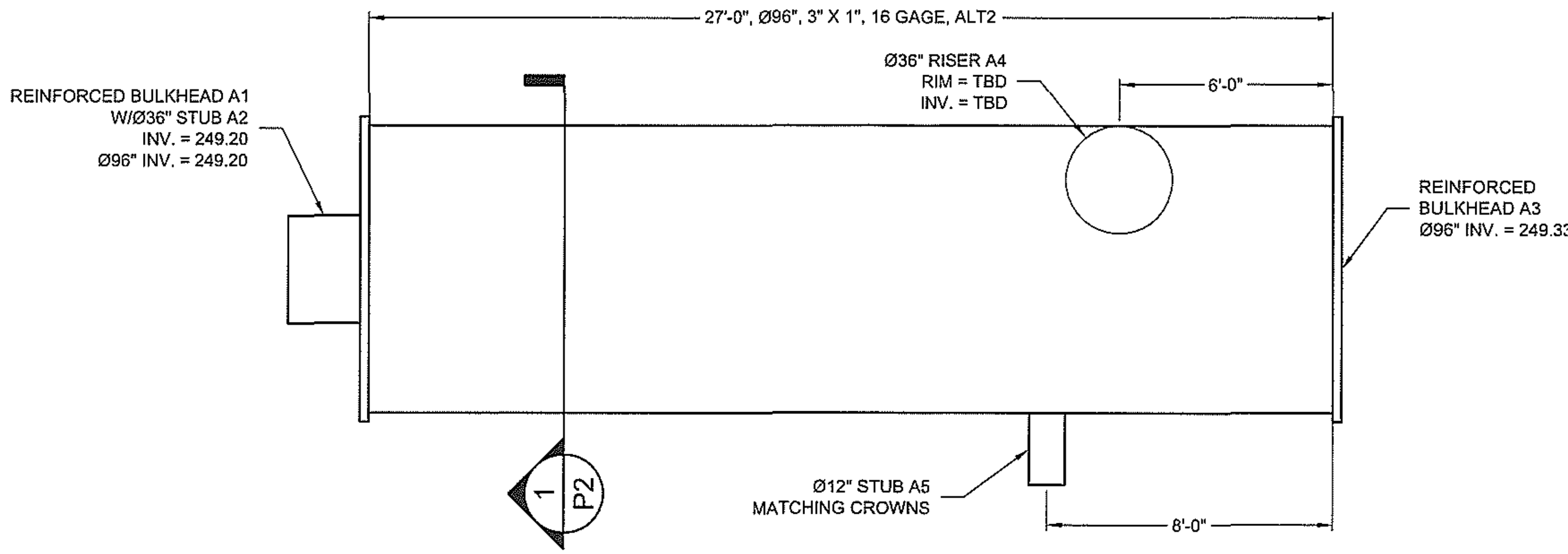
Accumulated sediment and trash can typically be evacuated through the manhole over the outlet orifice. If maintenance is not performed as recommended, sediment and trash may accumulate in front of the outlet orifice. Manhole covers should be securely seated following cleaning activities.

CONTECH® STORMWATER SOLUTIONS

Inspection & Maintenance Log

__" Diameter System			Location: Anywhere, USA		
Date	**Depth of Sediment**	**Accumulated Trash**	**Maintenance Performed**	**Maintenance Personnel**	**Comments**
12/01/99	2"	None	Removed Sediment	B. Johnson	Installed
03/01/00	1"	Some	Removed Sediment and Trash	B. Johnson	Swept parking lot
06/01/00	0"	None	None		
09/01/00	0"	Heavy	Removed Trash	S. Riley	
12/01/00	1"	None	Removed Sediment	S. Riley	
4/01/01	0"	None	None	S. Riley	
04/15/01	2"	Some	Removed Sediment and Trash	ACE Environmental Services	

SAMPLE



ASSEMBLY

SCALE:1" = 5'
VOLUME: 1,357 C.F.
LOADING: H20/H25
SYSTEM INV =TBD

THE UNDERSIGNED HEREBY APPROVES THE ATTACHED (3) PAGES.

CUSTOMER DATE

NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE.
- ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2⅔" x ½" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.

MARK	DATE	REVISION DESCRIPTION	BY

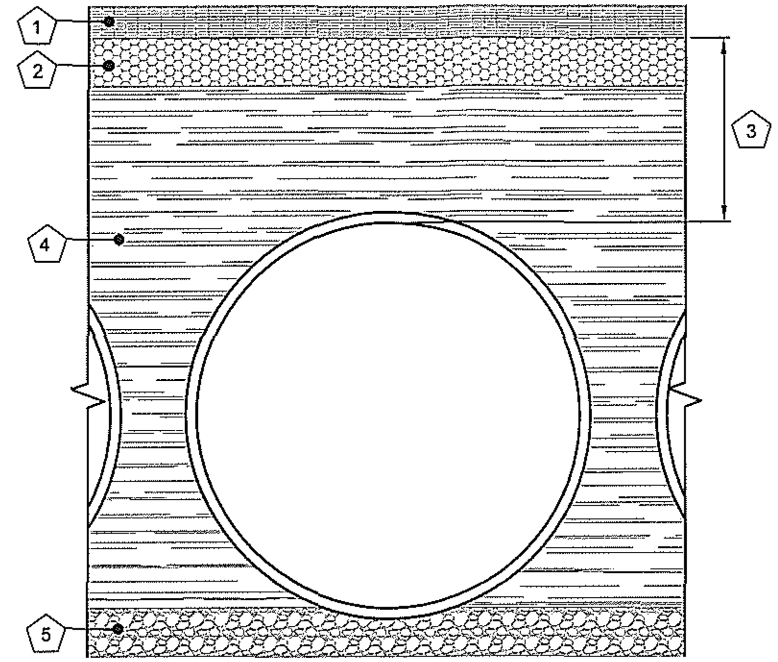
CONTECH CONSTRUCTION PRODUCTS INC.
www.contech-cpi.com
11835 NE Glenn Widing Drive, Portland, OR 97220
800-548-4667 503-240-3393 800-561-1271 FAX

CONTECH CMP DETENTION SYSTEMS

CONTECH PROPOSAL DRAWING

Ø96" UNDERGROUND DETENTION SYSTEM - 443961-003
PROVIDENCE WILLAMETTE FALLS
OREGON CITY, OR
SITE DESIGNATION: CMP DETENTION TANK

PROJECT No.: 443961	SEQ. No.: 003	DATE: 10/11/11
DESIGNED: AS	DRAWN: DLF	
CHECKED:	APPROVED:	
SHEET NO.: P1 OF		



KEY

1. RIGID OR FLEXIBLE PAVEMENT
2. GRANULAR ROAD BASE
3. 12" MIN. FOR DIAMETERS THROUGH 96"
   18" MIN. FOR DIAMETERS FROM 102"
   AND LARGER MEASURED TO TOP OF RIGID
   OR BOTTOM OF FLEXIBLE PAVEMENT.
4. SELECT GRANULAR FILL PER AASHTO M145
   A1, A2 OR A3, OR APPROVED EQUAL.
   PLACED IN 8" LIFTS (COMPACTED TO MIN.
   90% STANDARD DENSITY PER AASHTO T99.)
5. GRANULAR BEDDING, ROUGHLY SHAPED TO
   FIT THE BOTTOM OF PIPE, 4" TO 6" IN DEPTH

FOUNDATION/BEDDING PREPARATION

PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER. ONCE THE FOUNDATION PREPARATION IS COMPLETE, 4" - 6" OF A WELL-GRADED GRANULAR MATERIAL SHALL BE PLACED AS THE BEDDING.

BACKFILL

THE BACKFILL SHALL BE AN A1, A2 OR A3 GRANULAR FILL PER AASHTO M145, OR A WELL-GRADED GRANULAR FILL AS APPROVED BY THE SITE ENGINEER (SEE INSTALLATION GUIDELINES). THE MATERIAL SHALL BE PLACED IN 8" LOOSE LIFTS AND COMPACTED TO 90% AASHTO T99 STANDARD PROCTOR DENSITY. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO LIFT (16") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE DETENTION SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON THE PIPE.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.

1 / P2 BACKFILL DETAIL
SCALE: N.T.S.

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CONTECH®
CONSTRUCTION PRODUCTS INC.
www.contech-cpi.com
11835 NE Glenn Widing Drive, Portland, OR 97220
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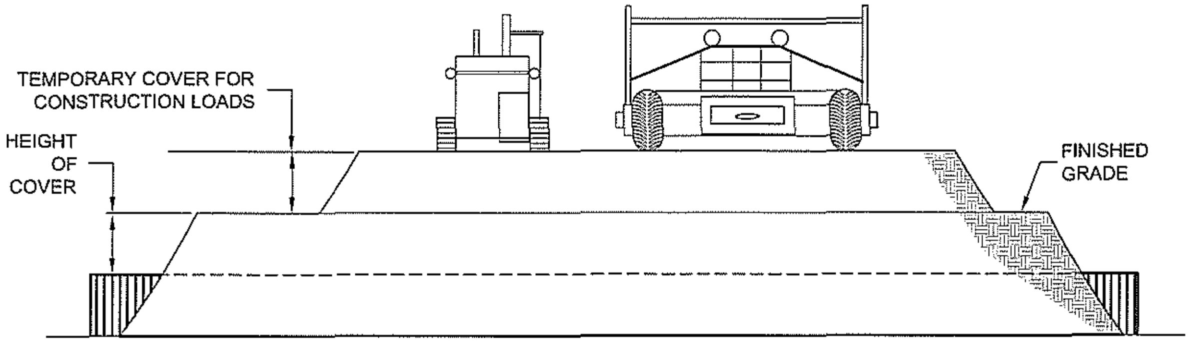
CONTECH®
CMP DETENTION SYSTEMS

CONTECH
PROPOSAL
DRAWING

Ø96" UNDERGROUND DETENTION SYSTEM - 443961-003
PROVIDENCE WILLAMETTE FALLS
OREGON CITY, OR
SITE DESIGNATION: CMP DETENTION TANK

PROJECT No.: 443961	SEQ. No.: 003	DATE: 10/11/11
DESIGNED: AS	DRAWN: DLF	
CHECKED:	APPROVED:	
SHEET NO.: P2 OF		



CONSTRUCTION LOADS

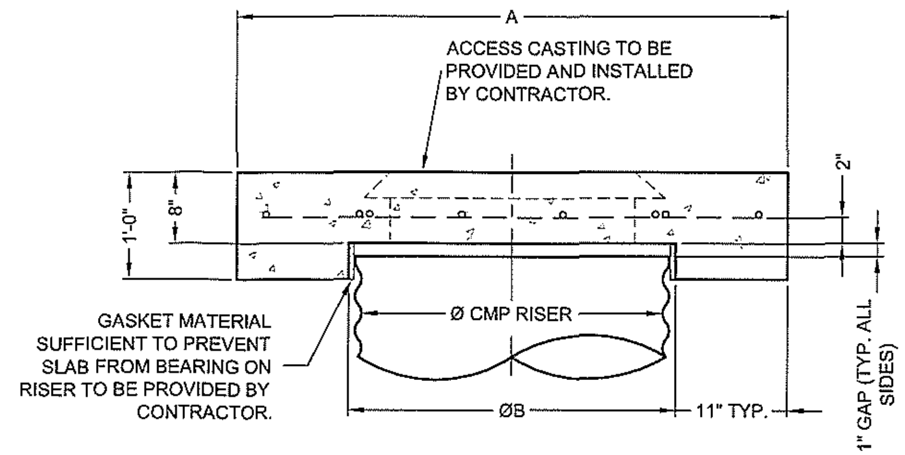
FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

2 / P3 CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

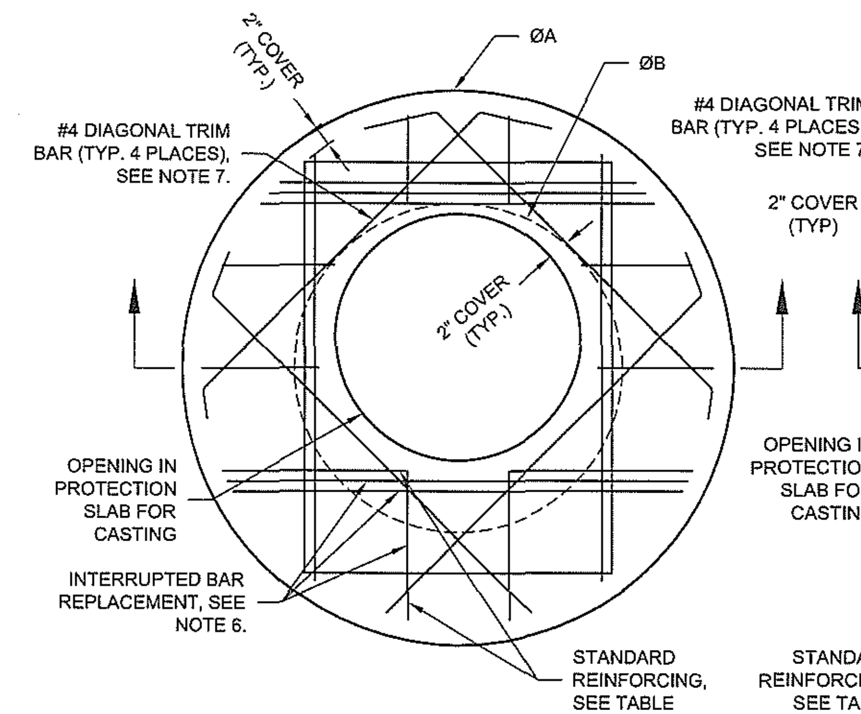


SECTION VIEW

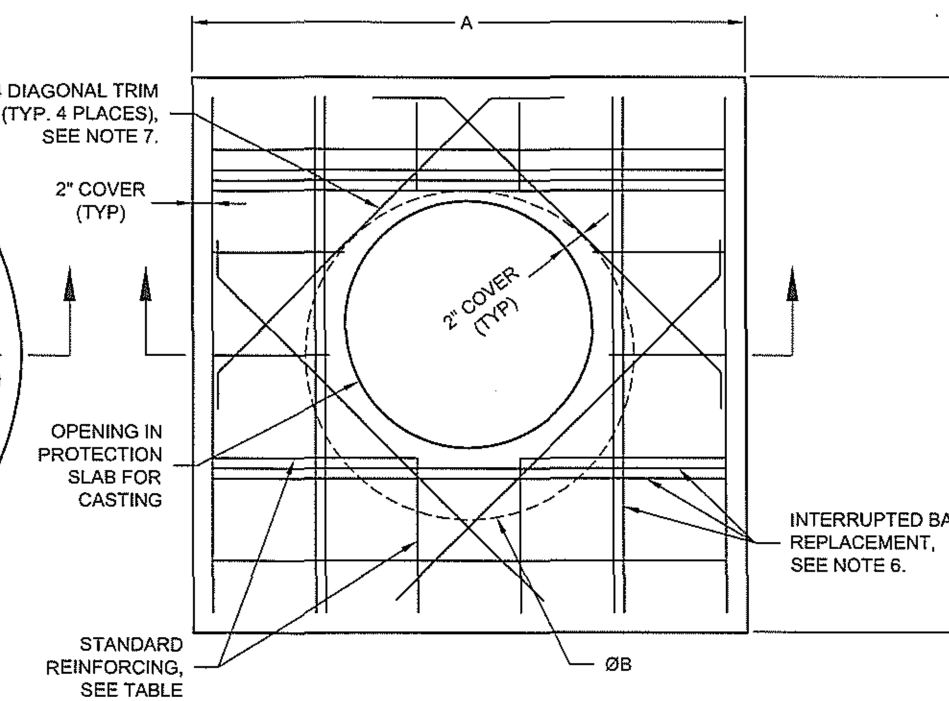
Ø CMP RISER	A	Ø B	REINFORCING	**BEARING PRESSURE (PSF)
24"	Ø 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	Ø 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	Ø 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	Ø 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	Ø 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

REINFORCING TABLE

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

3 / P3 MANHOLE CAP DETAIL

SCALE: N.T.S.

SPECIFICATION FOR CORRUGATED STEEL PIPE-ALUMINIZED TYPE 2 STEEL

SCOPE

THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE CORRUGATED STEEL PIPE (CSP) DETAILED IN THE PROJECT PLANS.

MATERIAL

THE ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M274 OR ASTM A929.

PIPE

THE CSP SHALL BE MANUFACTURED IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF AASHTO M36 OR ASTM A760. THE PIPE SIZES, GAGES AND CORRUGATIONS SHALL BE AS SHOWN ON THE PROJECT PLANS.

ALL FABRICATION OF THE PRODUCT SHALL OCCUR WITHIN THE UNITED STATES.

HANDLING AND ASSEMBLY

SHALL BE IN ACCORDANCE WITH RECOMMENDATIONS OF THE NATIONAL CORRUGATED STEEL PIPE ASSOCIATION (NCSPA)

INSTALLATION

SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II OR ASTM A798 AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

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CONTECH® CMP DETENTION SYSTEMS

CONTECH PROPOSAL DRAWING

Ø96" UNDERGROUND DETENTION SYSTEM - 443961-003
PROVIDENCE WILLAMETTE FALLS
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SITE DESIGNATION: CMP DETENTION TANK

PROJECT No.: 443961	SEQ. No.: 003	DATE: 10/11/11
DESIGNED: AS		DRAWN: DLF
CHECKED:		APPROVED:
SHEET NO.: P3 OF		

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CONTECH® STORMWATER SOLUTIONS INC.

Operation and Maintenance

CatchBasin StormFilter™

Important: These guidelines should be used as a part of your site stormwater plan.

Overview

The CatchBasin StormFilter™ (CBSF) consists of a multi-chamber steel, concrete, or plastic catch basin unit that can contain up to four StormFilter cartridges. The steel CBSF is offered both as a standard and as a deep unit.

The CBSF is installed flush with the finished grade and is applicable for both constrained lot and retrofit applications. It can also be fitted with an inlet pipe for roof leaders or similar applications.

The CBSF unit treats peak water quality design flows up to 0.13 cfs, coupled with an internal weir overflow capacity of 1.0 cfs for the standard unit, and 1.8 cfs for the deep steel and concrete units. Plastic units have an internal weir overflow capacity of 0.5 cfs.

Design Operation

The CBSF is installed as the primary receiver of runoff, similar to a standard, grated catch basin. The steel and concrete CBSF units have an H-20 rated, traffic-bearing lid that allows the filter to be installed in parking lots, and for all practical purposes, takes up no land area. Plastic units can be used in landscaped areas and for other non-traffic-bearing applications.

The CBSF consists of a sumped inlet chamber and a cartridge chamber(s). Runoff enters the sumped inlet chamber either by sheet flow from a paved surface or from an inlet pipe discharging directly to the unit vault. The inlet chamber is equipped with an internal baffle, which traps debris and floating oil and grease, and an overflow weir. While in the inlet chamber, heavier solids are allowed to settle into the deep sump, while lighter solids and soluble pollutants are directed under the baffle and into the cartridge chamber through a port between the baffle and the overflow weir. Once in the cartridge chamber, polluted water ponds and percolates horizontally through the media in the filter cartridges. Treated water collects in the cartridge's center tube from where it is directed by an under-drain manifold to the outlet pipe on the downstream side of the overflow weir and discharged.

When flows into the CBSF exceed the water quality design value, excess water spills over the overflow weir, bypassing the cartridge bay, and discharges to the outlet pipe.

Applications

The CBSF is particularly useful where small flows are being treated or for sites that are flat and have little available hydraulic head to spare. The unit is ideal for applications in which standard catch basins are to be used. Both water quality and catchment issues can be resolved with the use of the CBSF.

Retro-Fit

The retrofit market has many possible applications for the CBSF. The CBSF can be installed by replacing an existing catch basin without having to "chase the grade," thus reducing the high cost of re-piping the storm system.

Maintenance Guidelines

Maintenance procedures for typical catch basins can be applied to the CatchBasin StormFilter (CBSF). The filter cartridges contained in the CBSF are easily removed and replaced during maintenance activities according to the following guidelines.

1. Establish a safe working area as per typical catch basin service activity.
2. Remove steel grate and diamond plate cover (weight ≈ 100 lbs. each).
3. Turn cartridge(s) counter-clockwise to disconnect from pipe manifold.
4. Remove 4" center cap from cartridge and replace with lifting cap.
5. Remove cartridge(s) from catch basin by hand or with vactor truck boom.
6. Remove accumulated sediment via vactor truck (min. clearance 13" x 24").
7. Remove accumulated sediment from cartridge bay.
   (min. clearance 9.25" x 11")
8. Rinse interior of both bays and vactor remaining water and sediment.
9. Install fresh cartridge(s) threading clockwise to pipe manifold.
10. Replace cover and grate.
11. Return original cartridges to CONTECH Stormwater Solutions for cleaning and media disposal.

Media may be removed from the filter cartridges using the vactor truck before the cartridges are removed from the catch basin structure. Empty cartridges can be easily removed from the catch basin structure by hand. Empty cartridges should be reassembled and returned to CONTECH Stormwater Solutions, as appropriate.

Materials required include a lifting cap, vactor truck, and fresh filter cartridges. Contact CONTECH Stormwater Solutions for specifications and availability of the lifting cap. The vactor truck must be equipped with a hose capable of reaching areas of restricted clearance. The owner may refresh spent cartridges. Refreshed cartridges are also available from CONTECH Stormwater Solutions on an exchange basis. Contact the maintenance department of CONTECH Stormwater Solutions at (503) 240-3393 for more information.

Maintenance is estimated at 26 minutes of site time. For units with more than one cartridge, add approximately 5 minutes for each additional cartridge. Add travel time as required.

Mosquito Abatement

In certain areas of the United States, mosquito abatement is desirable to reduce the incidence of vectors.

In BMPs with standing water, which could provide mosquito breeding habitat, certain abatement measures can be taken.

1. Periodic observation of the standing water to determine if the facility is harboring mosquito larvae.
2. Regular catch basin maintenance
3. Use of larvicides containing *Bacillus thuringiensis israelensis* (BTI). BTI is a bacterium toxic to mosquito and black fly larvae.

In some cases, the presence of petroleum hydrocarbons may interrupt the mosquito growth cycle.

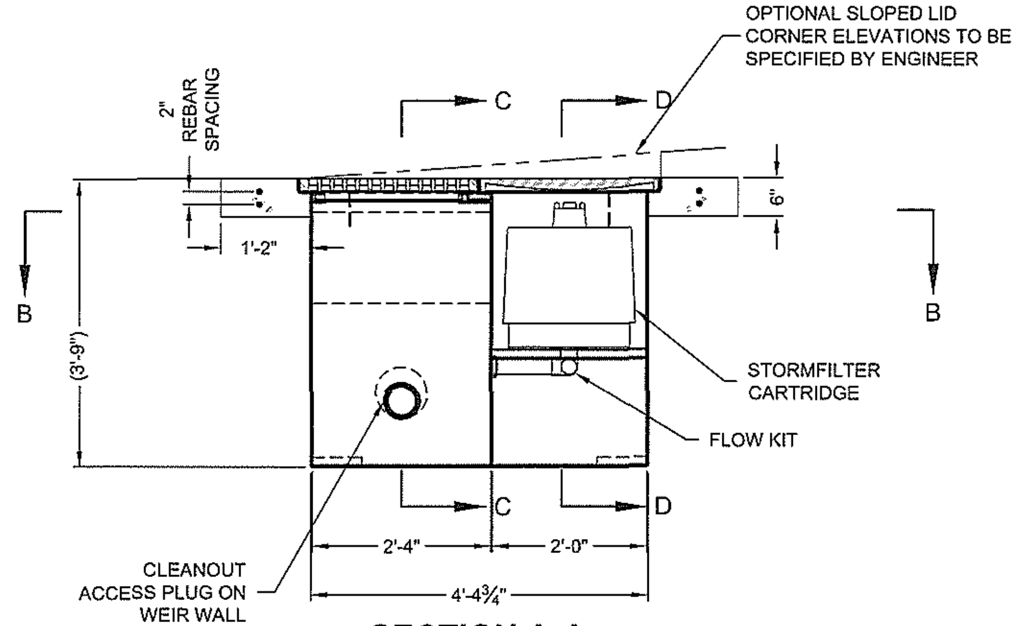
Using Larvicides in the CatchBasin StormFilter

Larvicides should be used according to manufacturer's recommendations.

Two widely available products are Mosquito Dunks and Summit B.t.i. Briquets. For more information, visit http://www.summitchemical.com/mos_ctrl/default.htm.

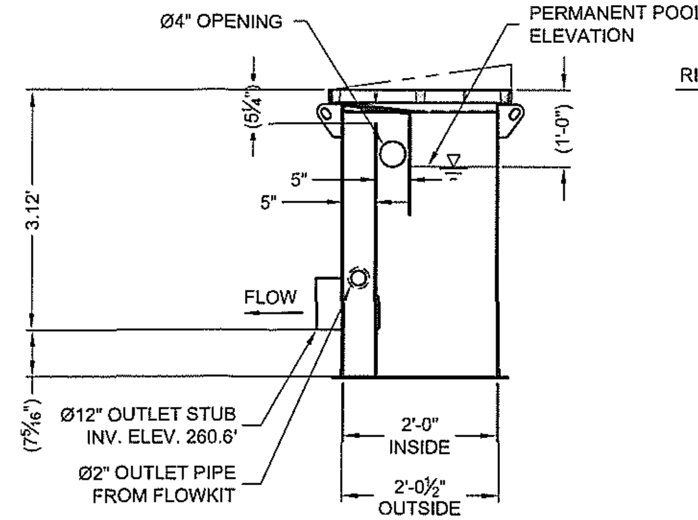
The larvicide must be in contact with the permanent pool. The larvicide should also be fastened to the CatchBasin StormFilter by string or wire to prevent displacement by high flows. A magnet can be used with a steel catch basin.

For more information on mosquito abatement in stormwater BMPs, refer to the following: http://www.ucmrp.ucdavis.edu/publications/managingmosquitoesstormwater8125.pdf

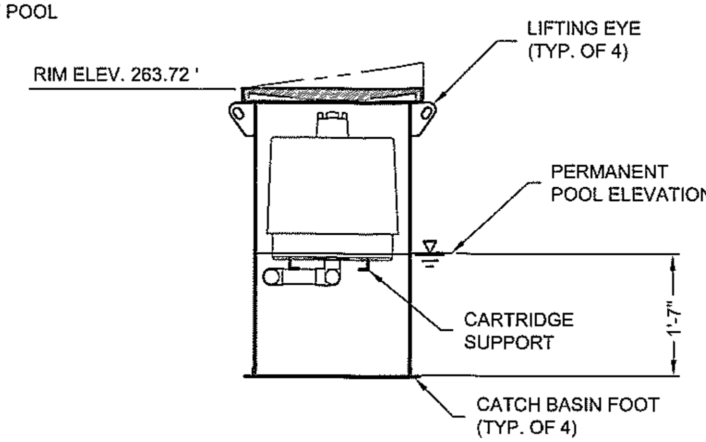


SECTION A-A

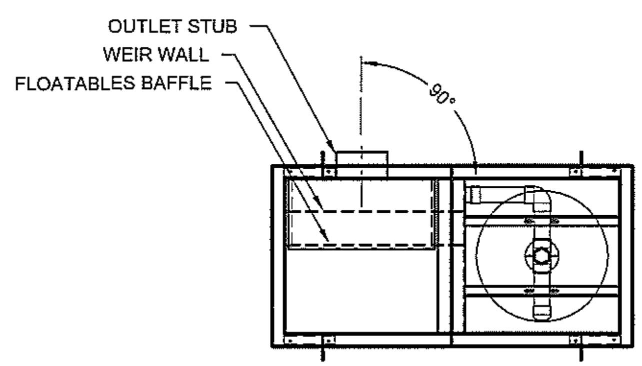
18" CARTRIDGES



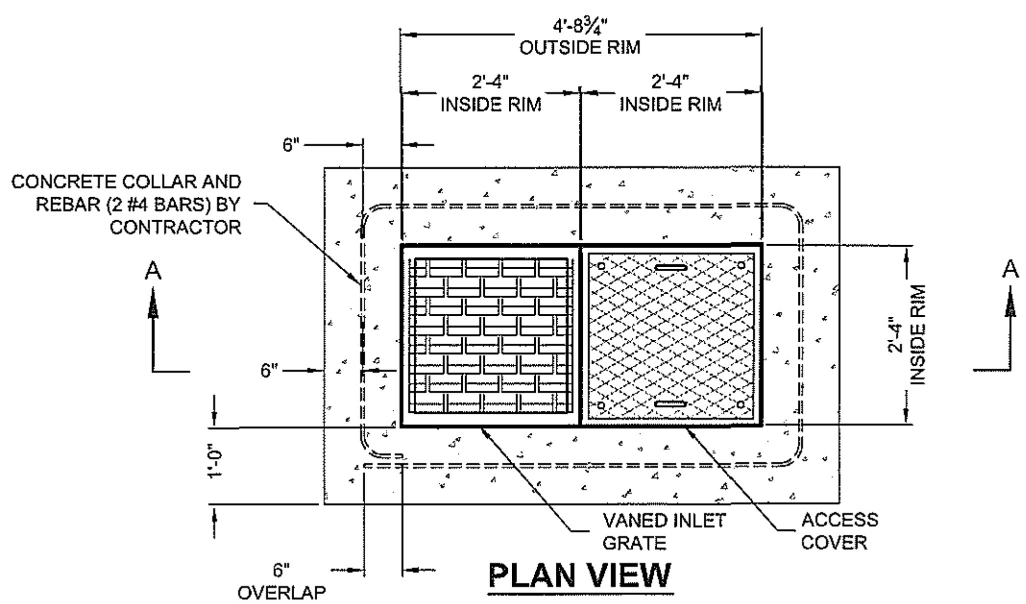
SECTION C-C



SECTION D-D



SECTION B-B



PLAN VIEW

MATERIAL LIST- PROVIDED BY CONTECH

COUNT	DESCRIPTION	INSTALLED BY
1	18", 15 GPM, PERLITE CARTRIDGE (BLK)	CONTECH
1	FLOW KIT	CONTECH
1	NON-POWDER COATED STEEL CATCH BASIN	CONTECH
1	28" x 28" VANED INLET COVER	CONTRACTOR
1	28" x 28" ACCESS COVER	CONTRACTOR

SITE DESIGN DATA

WATER QUALITY FLOW RATE	0.03 CFS
PEAK FLOW RATE	<1 CFS
RETURN PERIOD OF PEAK FLOW	25 YRS
FILTER MEDIA TYPE	PERLITE

PERFORMANCE SPECIFICATION

FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. **RADIAL MEDIA DEPTH SHALL BE 7-INCHES**. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST **37 SECONDS**.
SPECIFIC FLOW RATE SHALL BE 2 **GPM/SF (MAXIMUM)**. SPECIFIC FLOW RATE IS THE MEASURE OF THE FLOW (GPM) DIVIDED BY THE MEDIA SURFACE CONTACT AREA (SF). MEDIA VOLUMETRIC FLOW RATE SHALL BE **6 GPM/CF OF MEDIA (MAXIMUM)**.

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STEEL STRUCTURE TO BE MANUFACTURED OF 1/4 INCH STEEL PLATE. CASTINGS SHALL MEET AASHTO HS20 LOAD RATING. FOR HS20 LOAD RATING ON STRUCTURE, CONCRETE COLLAR IS REQUIRED AND TO BE PROVIDED BY CONTRACTOR.

INSTALLATION NOTES

1. ANY SUB-BASE, AND/OR BACKFILL DEPTH ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
2. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE.
3. CONTRACTOR TO SET BOTTOM OF STRUCTURE AT LEVEL.
4. CATCHBASIN STORMFILTER EQUIPPED WITH 4 INCH (APPROXIMATE) LONG STUBS FOR INLET (IF APPLICABLE) AND OUTLET PIPING. STANDARD OUTLET STUB IS 8 INCHES IN DIAMETER. MAXIMUM OUTLET STUB IS 15 INCHES IN DIAMETER. CONNECTION TO COLLECTION PIPING CAN BE MADE USING FLEXIBLE COUPLING BY CONTRACTOR.
5. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
6. FOR H20 LOAD RATING, CONTRACTOR TO PROVIDE CONCRETE COLLAR AS SHOWN WITH QUANTITY (2) #4 REBAR.

STRUCTURE WEIGHT

APPROXIMATE HEAVIEST PICK = 1,325 LBS

CONTECH
PROPOSAL
DRAWING

HILL

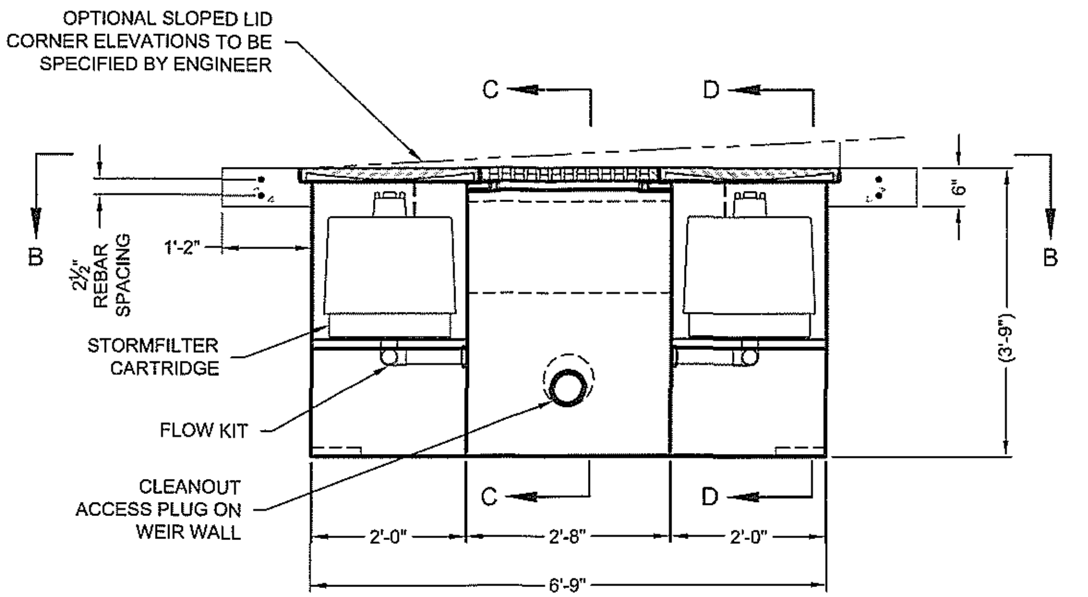
1 CARTRIDGE STEEL CATCHBASIN
443,961-001
PROVIDENCE WILLAMETTE FALLS -
NORTH PARKING LOT
OREGON CITY, OR
SITE DESIGNATION: XXX

MARK	DATE	REVISION DESCRIPTION	BY

CONTECH CONSTRUCTION PRODUCTS INC.
contech-cpi.com

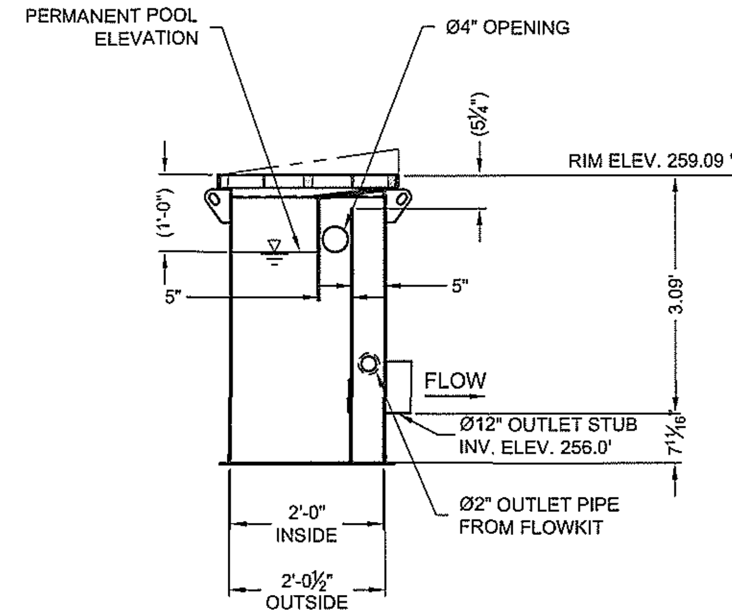
StormFilter®

DATE: 10/11/11	
DESIGNED: ALS	DRAWN: N/A
CHECKED:	APPROVED:
PROJECT No.: 443,961	SEQUENCE No.: 001
SHEET: 1	

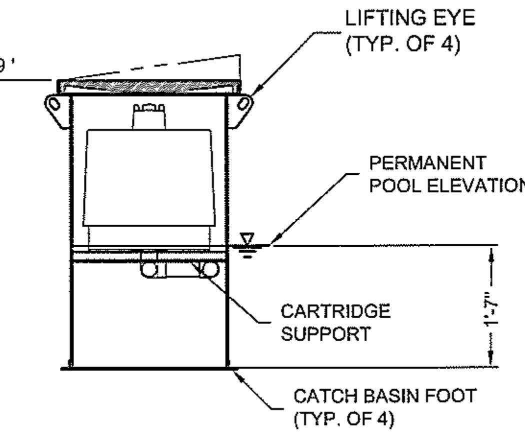


SECTION A-A

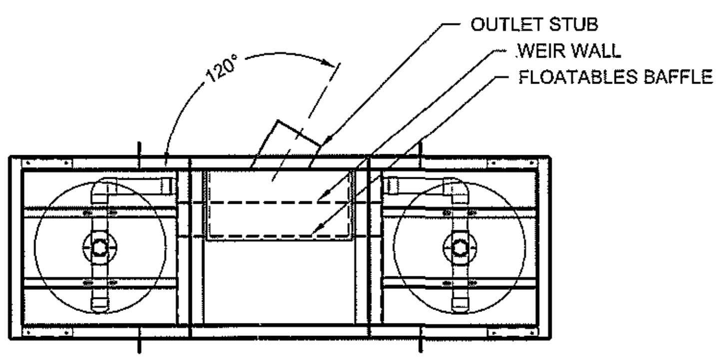
18" CARTRIDGES



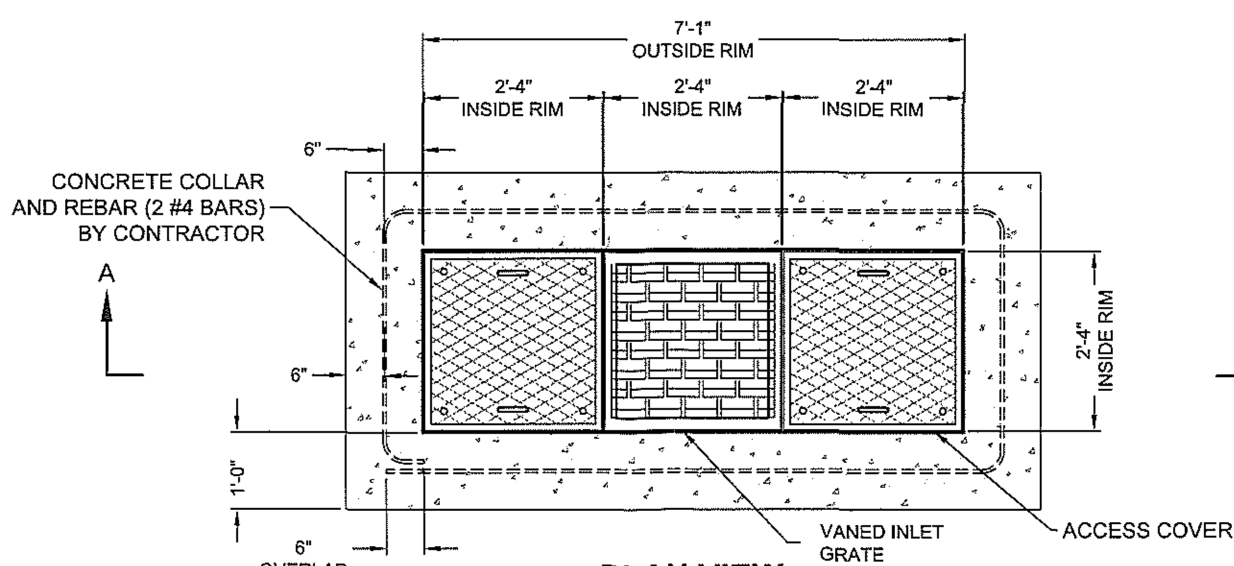
SECTION C-C



SECTION D-D



SECTION B-B



PLAN VIEW

MATERIAL LIST- PROVIDED BY CONTECH

COUNT	DESCRIPTION	INSTALLED BY
2	18", 15 GPM, PERLITE CARTRIDGE (BLK)	CONTECH
1	FLOW KIT	CONTECH
1	NON-POWDER COATED STEEL CATCH BASIN	CONTECH
1	28" x 28" VANED INLET COVER	CONTRACTOR
2	28" x 28" ACCESS COVER	CONTRACTOR

SITE DESIGN DATA

WATER QUALITY FLOW RATE	0.06 CFS
PEAK FLOW RATE	<1 CFS
RETURN PERIOD OF PEAK FLOW	25 YRS
FILTER MEDIA TYPE	PERLITE

PERFORMANCE SPECIFICATION

FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. **RADIAL MEDIA DEPTH SHALL BE 7-INCHES**. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST **37 SECONDS**. SPECIFIC FLOW RATE SHALL BE **2 GPM/SF (MAXIMUM)**. SPECIFIC FLOW RATE IS THE MEASURE OF THE FLOW (GPM) DIVIDED BY THE MEDIA SURFACE CONTACT AREA (SF). MEDIA VOLUMETRIC FLOW RATE SHALL BE **6 GPM/CF OF MEDIA (MAXIMUM)**.

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
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4. STEEL STRUCTURE TO BE MANUFACTURED OF 1/4 INCH STEEL PLATE. CASTINGS SHALL MEET AASHTO HS20 LOAD RATING. FOR HS20 LOAD RATING ON STRUCTURE, CONCRETE COLLAR IS REQUIRED AND TO BE PROVIDED BY CONTRACTOR.

INSTALLATION NOTES

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2. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE.
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5. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
6. FOR H20 LOAD RATING, CONTRACTOR TO PROVIDE CONCRETE COLLAR AS SHOWN WITH QUANTITY (2) #4 REBAR.

STRUCTURE WEIGHT

APPROXIMATE HEAVIEST PICK = 1,900 LBS

CONTECH
PROPOSAL
DRAWING

HILL

MARK	DATE	REVISION DESCRIPTION	BY

2 CARTRIDGE STEEL CATCHBASIN
443961-002
PROVIDENCE WILLAMETTE FALLS - NORTH PARKING LOT
OREGON CITY, OR
SITE DESIGNATION: XXX

CONTECH CONSTRUCTION PRODUCTS INC.
contech-cpi.com
StormFilter

DATE: 10/11/11	
DESIGNED: ALS	DRAWN: N/A
CHECKED:	APPROVED:
PROJECT No.: 443961	SEQUENCE No.: 002
SHEET: 1	

\\AD.CONTECH-CPI.COM\ROOT\MERLIN\PROJECT\ACTIVE\443900\443961\443961-2-STORMFILTER\DRAWINGS\443961-02 SFCB2-PRO.DWG 10/12/2011 2:24 PM

GRI
16520 SW Upper Boones Ferry Road, Suite 100
Tigard, OR 97224
p | 503-641-3478 f | 503-644-8034
www.gri.com

MEMORANDUM

To: Jeff Taylor, PE, PMP / Providence Health & Services

Date: May 12, 2022

GRI Project No.: 6652-A

From: Wesley Spang, PhD, PE, GE; Thomas O'Dell, PE; Melissa Preciado

Re: Proposed Helipad Evaluation
Providence Willamette Falls Hospital
1500 Division Street
Oregon City, Oregon

DRAFT

At your request, GRI is providing geotechnical evaluation services for the above-referenced project at the Providence Willamette Falls (PWF) Hospital in Oregon City, Oregon. As requested, this memorandum provides our recommendations for design and construction of the proposed Helipad near the southeast corner of the PWF campus in Oregon City. As you know, GRI previously completed a geotechnical investigation for design and construction of the adjacent expansion project. Subsurface conditions and explorations from the design report for the adjacent project (dated October 9, 2019) were reviewed as a part of this evaluation.

PROJECT DESCRIPTION

We understand a new helipad location is being considered approximately 100 feet southeast of the existing helipad near the southeast corner of the site. The helipad location is in close proximity to the slope that forms the eastern property boundary of the hospital campus. Based on our review of available topographic data, we estimate the adjacent slope has an inclination of about 3H:1V (Horizontal to Vertical) or shallower.

SITE DESCRIPTION

General

The existing hospital campus is bordered by Davis Road on the north, Trillium Park Drive on the east, an assisted-living facility and independent medical office buildings (MOBs) on the south, and Division Street on the west. The hospital campus is developed with the main hospital building, several MOBs, a parking garage, paved parking areas, and other associated improvements. The new helipad will be located east of the existing main hospital buildings near the top of the slope along the eastern property boundary.

Geology

Review of topographic information provided on the preliminary plans indicates the ground surface in the project area gently slopes from west to east towards the eastern property boundary and slopes down towards Trillium Park Drive at about 3H:1V or flatter. The eastern property boundary is located within an identified Oregon City Geologic Hazards area due to the slope inclination of 15% to 25%. Geologic units mapped in the vicinity of the hospital campus, from oldest to youngest, include Miocene Wanapum Basalt, Miocene/Pliocene Troutdale Formation, Pliocene Boring Lava basalt, Quaternary Missoula flood deposits, and Quaternary landslide deposits (Madin, 2009).

Published geologic mapping indicates the project area is mantled with Missoula flood deposits, locally referred to as the Willamette Silt Formation. In general, Willamette Silt consists of silt and fine sand deposited by late-Pleistocene glacial-outburst floods (Gannet and Caldwell, 1998). The Willamette Silt is underlain by residual soils produced from the weathering of the underlying Boring Lava basalt. These residual soils typically consist of very stiff to hard clay and silt soils with scattered boulders. With increased depth, the residual soil becomes more granular and progressively transitions to weathered basalt. The Boring Lavas are Pliocene/Pleistocene-age basalts that are light gray and vary in thickness. They occur as blocky, intracanyon flows, volcanic cones, and shield volcanoes composed of thick basalt flows (Schlicker and Finlayson, 1979).

Trillium Park Drive is situated on a fill constructed across a small drainage that flows eastward into the larger Newell Creek drainage. Trillium Park Drive and the surrounding area are prone to landslides and slope instability, with active landslide activity documented within the last five years. Published geologic mapping indicates the area within the active landslide mass to the east is underlain by Tertiary Sandy River Mudstone, a fine-grained sedimentary unit of the Troutdale Formation susceptible to landslides. The slope below the hospital campus is within a larger area mapped as "landslide topography" by the Oregon Department of Geology and Mineral Industries (DOGAMI) (Schlicker and Finlayson, 1979).

Soils

As noted above, GRI previously investigated the site as part of the hospital expansion project at the PWF Hospital campus. Several subsurface explorations were completed at the site during the geotechnical investigation. In addition, explorations B-4 and DMT-2 are located in the immediate vicinity of the proposed helipad. Based on our review of the previously completed explorations, subsurface conditions at the helipad location consist of silt fill underlain by Missoula flood deposits, residual basalt soils, and basalt rock with varying degrees of decomposition. In general, medium-stiff to stiff silt fill extending to depths of about 7.5 feet was encountered at the ground surface, underlain by medium-stiff to stiff silts and clays of the Missoula floods that extended to depths of about 15 feet. Below about 15 feet, hard sandy silt residual soil was encountered to depths of about 20 feet. Decomposed basalt was encountered at 20 feet, consisting of primarily gravel-sized basalt fragments to depths of about 30 feet, where extremely soft to soft basalt was encountered. The basalt extended to the maximum depth explored of about 50 feet. A 4-foot-thick layer of very stiff residual soil was encountered within the basalt unit at a depth of about 45 feet.

Groundwater

Based on our previous experience at the project site, we anticipate the regional groundwater level generally occurs deep within the underlying basalt; However, our work in the area indicates perched groundwater conditions can occur in the silt fill, Missoula flood deposits, or residual soils that mantle the site, particularly during the wet winter and spring months or during periods of heavy or prolonged precipitation. The groundwater-level readings indicate the phreatic surface at the site slopes toward the Newell Creek Drainage located immediately east of the hospital campus. A sloping phreatic surface is an indication groundwater movement through the decomposed basalt is likely occurring. We anticipate the perched groundwater level in the project area will typically occur at depths of 10 feet to 20 feet near the helipad area and 25 feet to 35 feet near the eastern property boundary; however, localized areas of perched groundwater may occur at shallower depths during the wet winter and spring months or during periods of heavy or prolonged precipitation.

LANDSLIDE MONITORING

In 2017, GRI installed a 60-foot-long inclinometer in boring B-1 (2017) to assess the potential impact of the off-site Trillium Park Drive landslide on the Emergency Generator/Oxygen Tank Area located along the eastern property boundary. Following installation, a benchmark reading was taken on April 17, 2017, with subsequent readings taken on May 3, 2017; February 7, 2018; and August 17, 2018. These readings were completed concurrently with observed landslide activity on Trillium Park Drive. Interpretation of inclinometer data indicates no measurable movement at the B-1 location related to the Trillium Park Drive landslide had occurred as of August 2018.

CONCLUSIONS AND RECOMMENDATIONS

Subsurface explorations reviewed for this evaluation and available geologic information for the project area indicate subsurface conditions vary significantly across the hospital campus. The southeastern portion near the proposed helipad location is mantled with fill soils likely associated with previous phases of development on campus. Missoula flood deposits are present below the fill and are underlain by residual soils produced by the weathering of the Boring Lava basalt that underlies the site at depth. We anticipate the perched groundwater level is typically at least 10 feet to 15 feet below the ground surface throughout the year; however, shallower perched groundwater can develop in the upper silt soils that mantle the site during periods of heavy or prolonged rainfall.

DRAFT

With respect to OCMC Chapter 17.44 requirements related to geologic hazards, provided the new addition is constructed immediately east of the existing main hospital building in accordance with the recommendations provided in this report, it is our opinion, from the standpoints of geotechnical engineering and engineering geology, the proposed helipad will not be impacted by the Trillium Park Drive landslide or reduce the current stability of the landslide.

The following sections of this report provide our conclusions and recommendations for use in the design and construction of the project.

Earthwork

General

The fine-grained soils that mantle the site are sensitive to moisture, and perched groundwater may approach the ground surface during the wet winter months. Therefore, it is our opinion earthwork can be completed most economically during the dry summer months, typically extending from June to mid-October. It has been our experience that the moisture content of the upper few feet of silty soils will decrease during extended warm, dry weather. However, below this depth, the moisture content of the soil tends to remain relatively unchanged and well above the optimum moisture content for compaction. As a result, the contractor must use construction equipment and procedures that prevent disturbance and softening of the subgrade soils. To minimize disturbance of the moisture-sensitive silt soils, site grading can be completed using track-mounted hydraulic excavators. The excavation should be finished using a smooth-edge bucket to produce a firm, undisturbed surface. If the subgrade is disturbed during construction, soft, disturbed soils should be overexcavated to firm soil and backfilled with structural fill.

If construction occurs during wet ground conditions, granular work pads will be required to protect the underlying silt subgrade and provide a firm working surface for construction activities. In our opinion, a 12- to 18-inch-thick granular work pad should be sufficient to prevent disturbance of the subgrade by lighter construction equipment and limited traffic by dump trucks. Haul roads and other high-density traffic areas will require a minimum of 18 inches to 24 inches of fragmental rock, up to 6-inch nominal size, to reduce the risk of subgrade deterioration. The use of geotextile fabric over the subgrade may reduce maintenance during construction. Haul roads can also be constructed by placing a thickened section of pavement base course and subsequently spreading and grading the excess crushed rock base after earthwork is complete.

Site Preparation

Demolition of the existing improvements within the limits of the helipad and associated improvements should include the removal of existing pavements, floor slabs, foundations, walls, and underground utilities (if present). The ground surface within all slabs and areas to receive structural fill should be stripped of existing vegetation, surface organics, and loose surface soils. We anticipate stripping up to a depth of about 4 inches to 6 inches will likely be required to construct the helipad in the proposed location; however, deeper grubbing may be required to remove brush and tree roots. All demolition debris, trees, brush, and surficial organic material should be removed from within the limits of the proposed improvements. Excavations required to remove existing improvements, brush, and trees should be backfilled with structural fill. Organic strippings should be disposed of off site or stockpiled on site for use in landscaped areas.

Following stripping or excavation to subgrade level, the exposed subgrade should be evaluated by a qualified member of GRI's geotechnical engineering staff or an engineering geologist. Proof rolling with a loaded dump truck may be part of this evaluation. Any soft areas or areas of unsuitable material disclosed by the evaluation should be overexcavated to firm material and backfilled with structural fill. Due to previous development at the site and the presence of fill soils, it should be anticipated some overexcavation of subgrade will be required.

Site Grading

Final grading across the project should provide for positive drainage of surface water away from exposed slopes to reduce the potential for erosion. Permanent cut and fill slopes should be no steeper than 2H:1V and protected with vegetation to reduce the risk of surface erosion due to rainfall.

Structural Fill

General

We anticipate less than 5 feet of structural fill will be required to construct the new helipad. In general, structural fills should consist of imported granular soil and extend a minimum horizontal distance of 2 feet beyond the edges of new improvements, such as the edges of new slabs and pavements.

Imported Granular Fill

Imported granular material would be most suitable for construction of the structural fills. Granular material, such as sand, sandy gravel, or fragmental rock, with a maximum size of up to 2 inches and less than 5% passing the No. 200 sieve (washed analysis), would be suitable structural-fill material. Granular fill should be placed in lifts and compacted with vibratory equipment to at least 95% of the maximum dry density determined in accordance with ASTM D698. Appropriate lift thicknesses will depend on the type of compaction equipment used. For example, if hand-operated vibratory plate equipment is used, lift thicknesses should be limited to 6 inches to 8 inches. If smooth-drum vibratory rollers are used, lift thicknesses up to 12 inches are appropriate, and if backhoe- or excavator-mounted vibratory plates are used, lift thicknesses of up to 2 feet may be acceptable.

DRAFT

Slope Stability Considerations

Slope-stability analyses were completed to evaluate the stability of the existing slopes adjacent to the proposed helipad footprint. The slope-stability modeling was completed with the aid of the computer software SLIDE 7.0 by Rocscience, Inc. Global slope-stability models were developed based on available topographic data for a selected east-west oriented cross section along the slopes adjacent to the proposed building location. Subsurface materials and conditions used in the models were based on the information obtained from the subsurface explorations and laboratory testing performed as part of this investigation. A horizontal pseudo-static coefficient (k_h) of 0.28, equal to about half the peak ground acceleration, was used to represent seismic loading for the 2,475-year design earthquake.

Factor of safety values against slope instability were computed for static and seismic conditions. The computed factor of safety against instability is defined as the ratio of the forces (or moments) tending to resist failure to the forces (or moments) tending to cause failure. Factor of safety values of less than 1.0 represents potentially unstable conditions. Factor of safety values of 1.5 and 1.1 are typically considered the minimum acceptable values for static and seismic conditions, respectively. Our analysis yielded factor of safety values of at least 1.5 against static slope instability affecting the proposed structure. A factor of safety value of at least 1.1 was computed for the 2,500-year design earthquake affecting the proposed structure.

Surficial sloughing and isolated locations of relatively shallow slope instability should be expected on permanent slopes that are steeper than about 1.5H:1V. As discussed above, permanent slopes with exposed soil on the slope face should be protected with a natural fiber mat and vegetated to reduce the risk of ongoing surficial failures and oversteepening.

Foundation Support

As currently planned, we anticipate the planned helipad will be constructed as a mat foundation. Based on our understanding of the project, we understand the helipad will have dimensions of roughly 40 feet by 40 feet and be 3 feet thick. We estimate the helipad will have a net average bearing pressure of less than about 250 pounds per square foot. In order to provide uniform support for the helipad, we recommend the mat foundation be underlain by a minimum of 12-inch thickness of compacted crushed rock. We estimate a mat foundation constructed in accordance with these recommendations will experience less than 1 inch of settlement. Differential settlements on the mat will be approximately half of the total settlement. Assuming a relatively uniform pressure distribution on the mat, the subgrade modulus for long-term loading of the mat is 10 pounds per cubic inch (pci). This value will vary, however, depending on mat load distribution. Short-term, transient point loads can be evaluated using a subgrade modulus of 125 pci. GRI should be contacted to review the mat foundation settlements as grading plans, mat loading, and building footprint are finalized.

DRAFT

Resistance to lateral loads can be provided by frictional forces developed between the base of the mat and the underlying material and by passive soil resistance against embedded portions of the footings. For footings formed directly on silt subgrade or granular structural fill, we recommend evaluating sliding resistance using coefficient of friction values of 0.30 and 0.40, respectively. For footings that are neat formed in excavations or backfilled using granular structural fill, passive earth pressure against embedded portions of the footings can be evaluated on the basis of a hydrostatic pressure using an equivalent fluid unit weight of 200 pcf or 250 pcf, respectively.

We recommend that all footings be established at a minimum depth of 18 inches below the lowest adjacent finished grade. All footing excavations should be completed using equipment equipped with smooth-edged cutting surfaces to reduce the risk of subgrade disturbance. All foundation subgrade should be evaluated by a GRI representative. Any soft or otherwise unsuitable subgrade soils should be removed and replaced with granular structural fill. In our opinion, granular fill should consist of sand, sandy gravel, or fragmental rock with a maximum size of about 1 1/2 inches and less than about 5% passing the No. 200 sieve (washed analysis). Granular structural fill should be placed in maximum 12-inch-thick (loose) lifts and compacted using appropriately sized vibratory equipment to at least 95% of the maximum dry density at a moisture content within about 3% of optimum as determined by ASTM D698. Backfill that is compacted by hand-operated equipment should be placed in maximum 6-inch-thick lifts.

LIMITATIONS

This memorandum has been prepared to aid the project team in the design of the helipad for the PWF Hospital in Oregon City, Oregon, and is subject to the limitations of our geotechnical report. The conclusions and recommendations submitted in this memorandum are based on the data obtained from the borings and DMT data shown in our October 9, 2019, geotechnical design report and other sources discussed above. In the performance of surface evaluations, specific information is obtained at specific locations at specific times. However, it is acknowledged that variations in soil conditions may exist between the boring locations. This memorandum does not reflect any variations that may occur between these locations. The nature and extent of variation may not become evident until construction. If, during construction, subsurface conditions differ from those encountered in the explorations, we should be advised at once so that we can observe and review these conditions and reconsider our recommendations where necessary. In the event that any changes in the project elements as outlined in this memorandum are planned, we should be given the opportunity to review the changes and modify or reaffirm the conclusions and recommendations of this memorandum in writing. Please contact the undersigned if you have any questions.

DRAFT

Submitted for GRI,

Wesley Spang, PhD, PE, GE
Principal

Thomas J. O'Dell, PE
Senior Engineer

This document has been submitted electronically.

6652-A PWF HELIPAD RELOCATION MEMORANDUM

Brad Kilby

From: Josh Kolberg <josh@pkaarchitects.com>
Sent: Tuesday, May 24, 2022 10:40 AM
To: Brad Kilby
Cc: Jim Knees
Subject: FW: Providence Willamette Falls Medical Center Helipad Relocation

[Email from external source]

Brad - FYI, see below.

jk

From: Boumann, Mike <mike.boumann@ClackamasFire.com>
Sent: Tuesday, May 24, 2022 10:07 AM
To: Jim Knees <Jim@pkaarchitects.com>
Cc: Josh Kolberg <josh@pkaarchitects.com>; Alberto Rinkevich <Alberto@pkaarchitects.com>
Subject: Re: Providence Willamette Falls Medical Center Helipad Relocation

Hello Jim,

Thank you for reaching out regarding the helipad. After review and consultation with our Operations Division, Clackamas Fire District is in approval of the proposed location.

Respectfully,

Mike Boumann
Captain Deputy Fire Marshal | Fire Prevention
direct: 503.742.2673

"Here for you"

CLACKAMAS FIRE DISTRICT #1
WWW.CLACKAMASFIRE.COM
503-742-2600

From: Jim Knees <Jim@pkaarchitects.com>
Sent: Thursday, May 19, 2022 4:40 PM
To: Boumann, Mike <mike.boumann@ClackamasFire.com>
Cc: Josh Kolberg <josh@pkaarchitects.com>; Alberto Rinkevich <Alberto@pkaarchitects.com>
Subject: RE: Providence Willamette Falls Medical Center Helipad Relocation

Mike,
Thanks. We also have a helipad consultant on board and will meet all the FAA guidelines.

Jim Knees

PKA ARCHITECTS P.C. AIA
Direct: 503.213.1061
Main: 503.968.6800

From: Boumann, Mike <mike.boumann@ClackamasFire.com>
Sent: Thursday, May 19, 2022 4:36 PM
To: Jim Knees <Jim@pkaarchitects.com>
Cc: Josh Kolberg <josh@pkaarchitects.com>; Alberto Rinkevich <Alberto@pkaarchitects.com>
Subject: Re: Providence Willamette Falls Medical Center Helipad Relocation

Hi Jim,

Thanks for asking, should be able to get back to you next week but I don't see any major issues. I'm assuming LifeFlight definitely reviews and is good with it?

Mike Boumann
Captain Deputy Fire Marshal | Fire Prevention
direct: 503.742.2673

"Here for you"

CLACKAMAS FIRE DISTRICT #1
WWW.CLACKAMASFIRE.COM
503-742-2600

From: Jim Knees <Jim@pkaarchitects.com>
Sent: Wednesday, May 18, 2022 6:51 AM
To: Boumann, Mike <mike.boumann@ClackamasFire.com>
Cc: Josh Kolberg <josh@pkaarchitects.com>; Alberto Rinkevich <Alberto@pkaarchitects.com>
Subject: Providence Willamette Falls Medical Center Helipad Relocation

Mike,
I am not sure if you are the person at the fire marshal's office to review this, but you helped us out on some other issues we had at Willamette Falls.
We are getting ready to submit a design review package to the city and would like Clackamas County Fire to review the new proposed location of the helipad and let us know if you have any concerns.
Thank you.

Jim Knees
PKA ARCHITECTS P.C. AIA
6969 Southwest Hampton Street
Portland, Oregon 97223
Direct: 503.213.1061
Main: 503.968.6800

AIRSAFE
13230 North Chiracahua Peak Drive
Oro Valley, AZ 85755
(360) 320-2131

May 13, 2022

Providence Willamette Falls Hospital – Helicopter/Heliport Technology

- Helicopters that would use the relocated helipad at Providence Willamette Falls Hospital would be the same as those using the existing helipad. The Airbus H-145 is the design helicopter for this project. The H-145 is a light-turbine, twin-engine, advanced technology helicopter that is used in several civilian roles. It is one of the most popular emergency medical service helicopters.

Airbus H-145

- The H-145 and similar, newer generation helicopters used in EMS service have reduced cool-down after landing time periods that reduce helicopter noise after landing. Cool down periods are used to allow dissimilar engine metals to cool evenly thereby reducing engine wear. An added benefit is reduced noise impacts as compared to older generation helicopters.

- Modern helicopters such as the H-145 have improved power-to-weight ratios that allow them to make more vertical approaches to and departures from helipads thus increasing safety and reducing noise impacts.

- As part of the helipad design scope of work, recommendations will be made to the hospital regarding agreements between the hospital and helicopter emergency medical service (HEMS) providers about flight procedures intended to reduce noise and light impacts on nearby land uses.

- HEMS pilots use night vision goggles that become nearly useless at brightly lighted heliports. Modern helipad design calls for light fixtures that produce barely noticeable light impacts beyond the helipad area. The design goal of using just enough of the right kind of light to provide pilots with a safe NVG operating environment has the added benefit of reduced light impacts on surrounding communities.

- Light fixtures at the helipad will consist of eight (8) embedded, flush-mounted, green LED perimeter lights and four (4) downward focused flood lights to provide a safe patient-transfer working environment. Floodlights will be on only during transfers of patients from gurneys to helicopters. A lighted wind indicator and a yet to be determined number of roof-mounted LED obstruction lights will be used.

- Operational lights at the helipad will only be on during helicopter operations.

- Depending on operator specific NVG policies and procedures helicopter pilots may use on-board landing lights as they approach and depart the helipad.

David Ketchum
AIRSAFE

MEMORANDUM

TO:	Josh Kolberg, PKA Architects
FROM	Erik Miller-Klein, Tenor Engineering
DATE:	May 14, 2022
PROJECT:	Providence Willamette Falls
SUBJECT:	Heliport Relocation

This memorandum is a summary of our noise impact analysis for the Heliport relocation for the Providence Willamette Falls in Oregon City, Oregon.

Noise Impact Criteria

The relocation of the heliport for the Providence Willamette Falls facility does not increase the "amount, frequency, or scale" the "number of helicopter flights" as outlined within the Oregon City Municipal Code, Chapter 17.65 – Master Plans and Planned Unit Developments, §17.65.80.B.3.

Though an evaluation of the changes and noise impacts from helicopters on the ground after landing and prior to take-off were assessed to the nearest residents compared to the original location and the current location during the new building addition.

> The noise from the helicopter flight path is not detailed in this assessment since that is detailed under the federal United States Code §40103. Sovereignty and use of airspace, which states the "the United States Government has exclusive sovereignty of airspace of the United States."

Measurement Results & Observations

The ambient daytime noise level on Trillium Park Drive was measured at 3:00 PM on May 10, 2022, to be 54 dBA / 72 dBC[1] from operations and construction at Providence Willamette Falls campus and traffic on Division Street.

Current Temporary Heliport

View toward Future Heliport Location

[1] Svantek 971 (SN: 91413, calibrated to 114.0 dB at 1 kHz), Type 1 precision

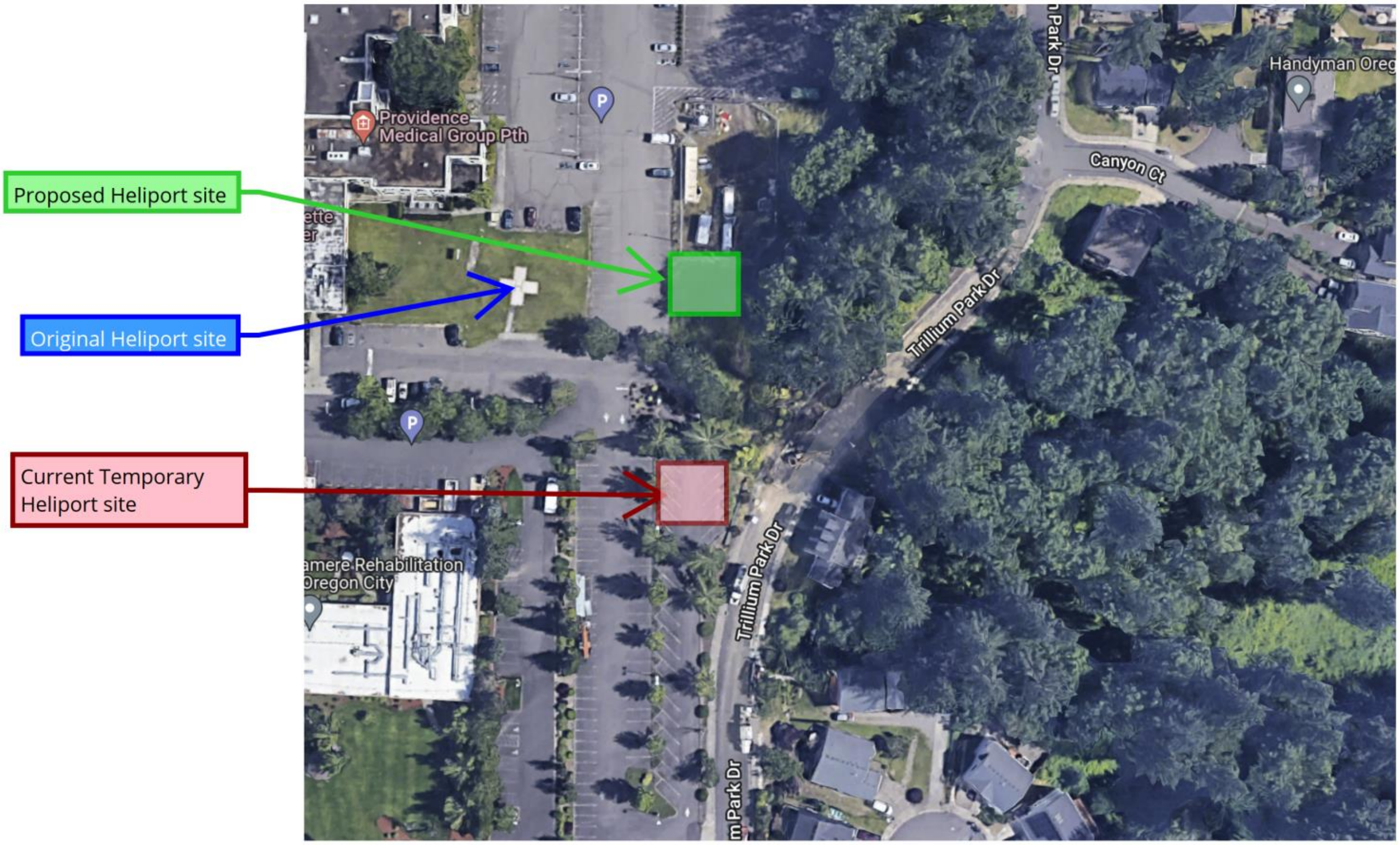


Figure 1: Heliport Relocation

The noise impact difference between the original location, the proposed location, and the current temporary location was analyzed using data from a Bell 407 helicopter landing and taking-off at 400-feet[2]. The comparison noise difference from the three location is noted in Table _. The original Heliport location (noted in blue) is approximately 285 feet from the center of the landing pad to the west property line of the nearest residence. The current temporary Heliport location that is being used during the addition construction (noted in red) is approximately 90 feet from the center of the landing pad to the west property line of the nearest residence. The proposed location of the Heliport (noted in green) is approximately 200 feet from the center of the landing pad to the west property line of the nearest residence and includes approximately 70-feet thick of vegetation.

Table 1: Measured Lmax, dBA

Type	Landing at 400-feet	Take-off at 400-feet
Bell 407 Helicopter	80.2 dBA	81.1 dBA

[2] Lmax sound pressure levels at 400-feet from the National Park Service (NPS) Report No. GRCA-07-05. The Bell 407 is a common medical airlift helicopter type.

Table 2: Predicted Noise Impact at nearest Residence from each of three locations

Heliport Location	Predicted Lmax from Landing/Take-off
Original Location (~285 feet)	84.0 dBA
Temporary Location (~90 feet)	99.0 dBA
Relocation (~200 feet)	85.6 dBA+

+ Includes Noise Reduction (NR) from foliage based on ISO 9613-2: Annex A.1

The permanent relocation for the Heliport will be barely noticeably different from the original location. A sound level difference of less than 3 dB is barely audible. This location will me more than 13 dB quieter than the current temporary location, which will be perceived to be 60% quieter at this residence. The number of flights are not expected to change with the relocation and it is our understanding that less than 10 flights happen in more calendar years.

Conclusions

The new heliport location is acoustically similar to the original heliport location and will be 60% quieter than the current temporary location being used during construction.

Please contact us with any questions or additional coordination.

All the best,

ERIK MILLER-KLEIN, PE, INCE BOARD CERTIFIED
PRINCIPAL OF ACOUSTICAL ENGINEERING

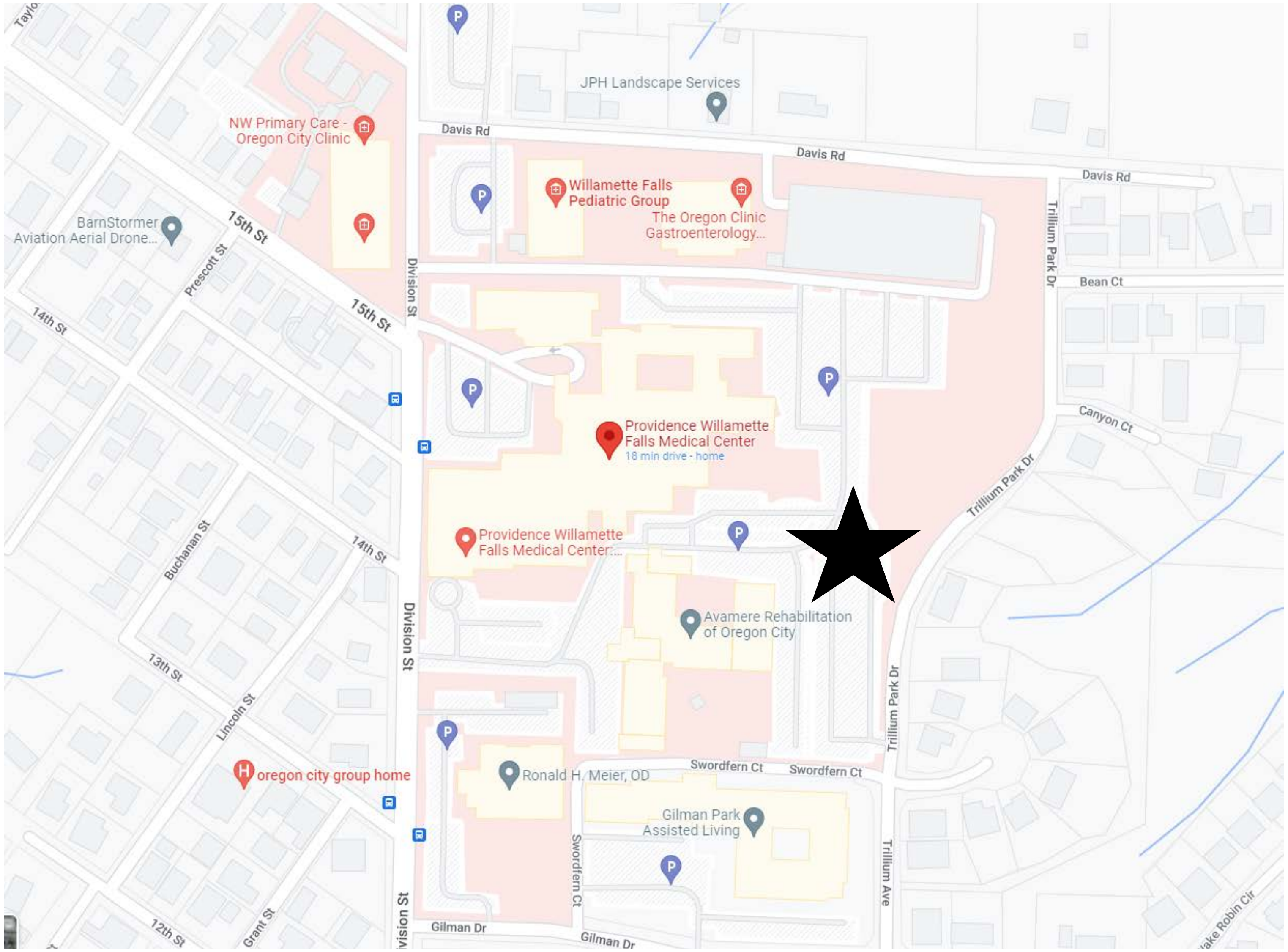
206.899.5450 / OFFICE
888.978.3667 / TOLL-FREE
ERIK.MK@TENOR-ENG.COM

Providence Willamette Falls Hospital Helipad Relocation Project

Neighborhood Meeting

Thursday, May 5th– 7:00pm

MCLOUGHLIN NEIGHBORHOOD ASSOCIATION



Project Team

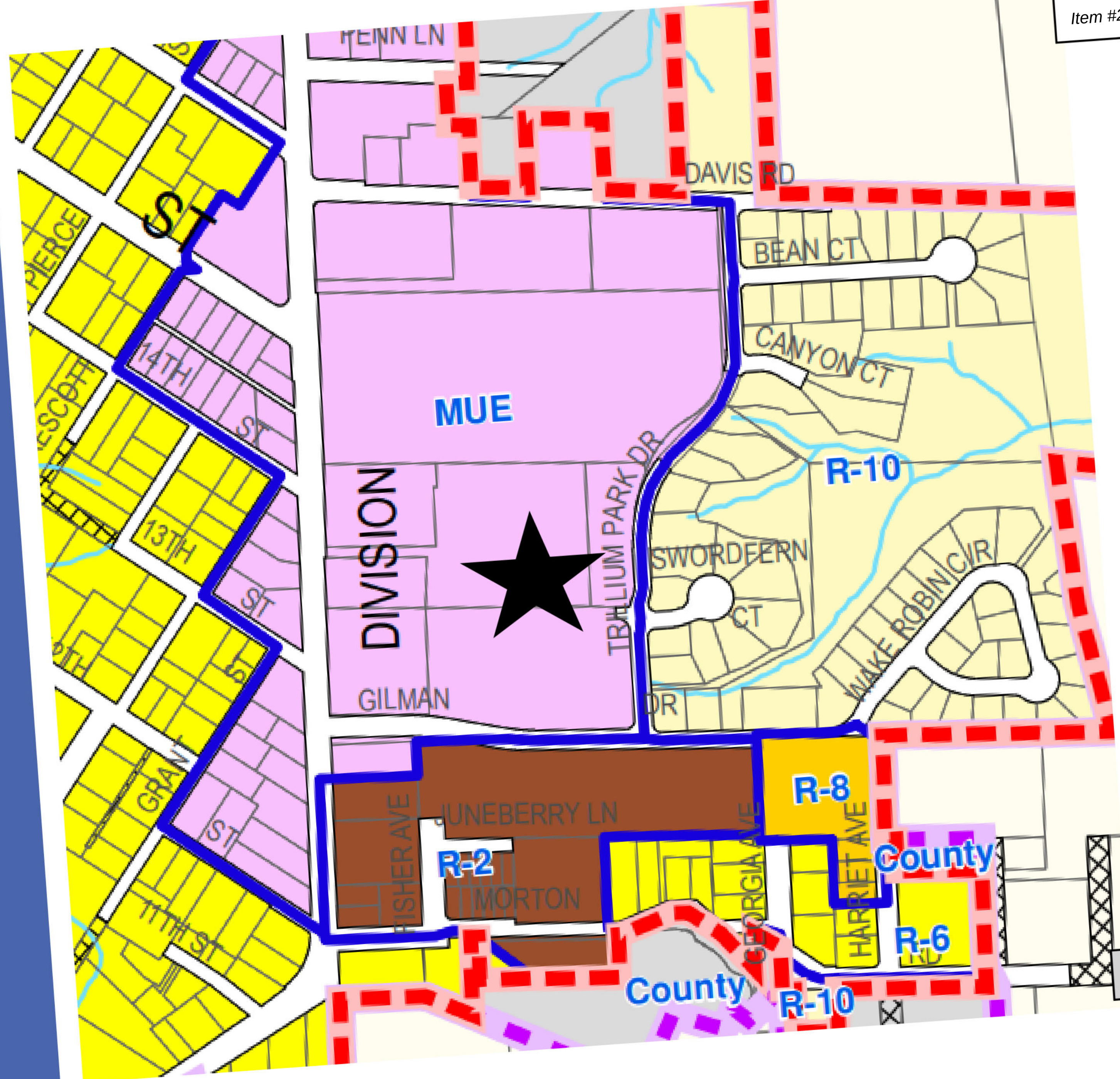
Item #2.

Client	Providence Willamette Falls Hospital Brad Henry and Renee King
Architect	PKA Architects Josh Kolberg, President
Land Use Planner	HHPR Inc. Brad Kilby, AICP

Location
West of Trillium Park Drive North of Swordfern Ct.

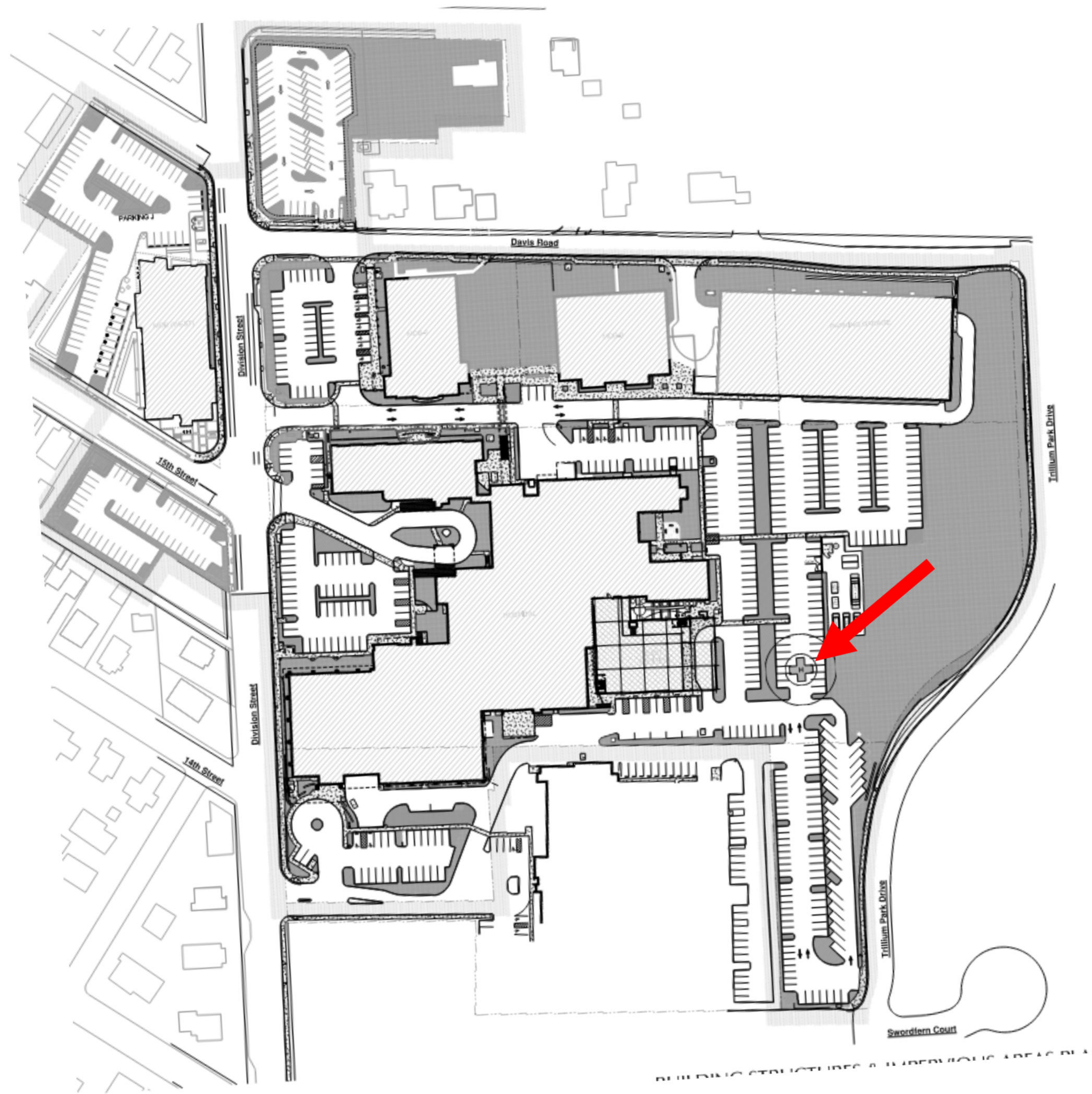
Zoning

- Mixed Use Employment District (MUE)
- Providence Willamette Falls Hospital and its accessory uses are outright permitted uses within the zone. Staff will review the helipad location as a Conditional Use and Site Plan review.

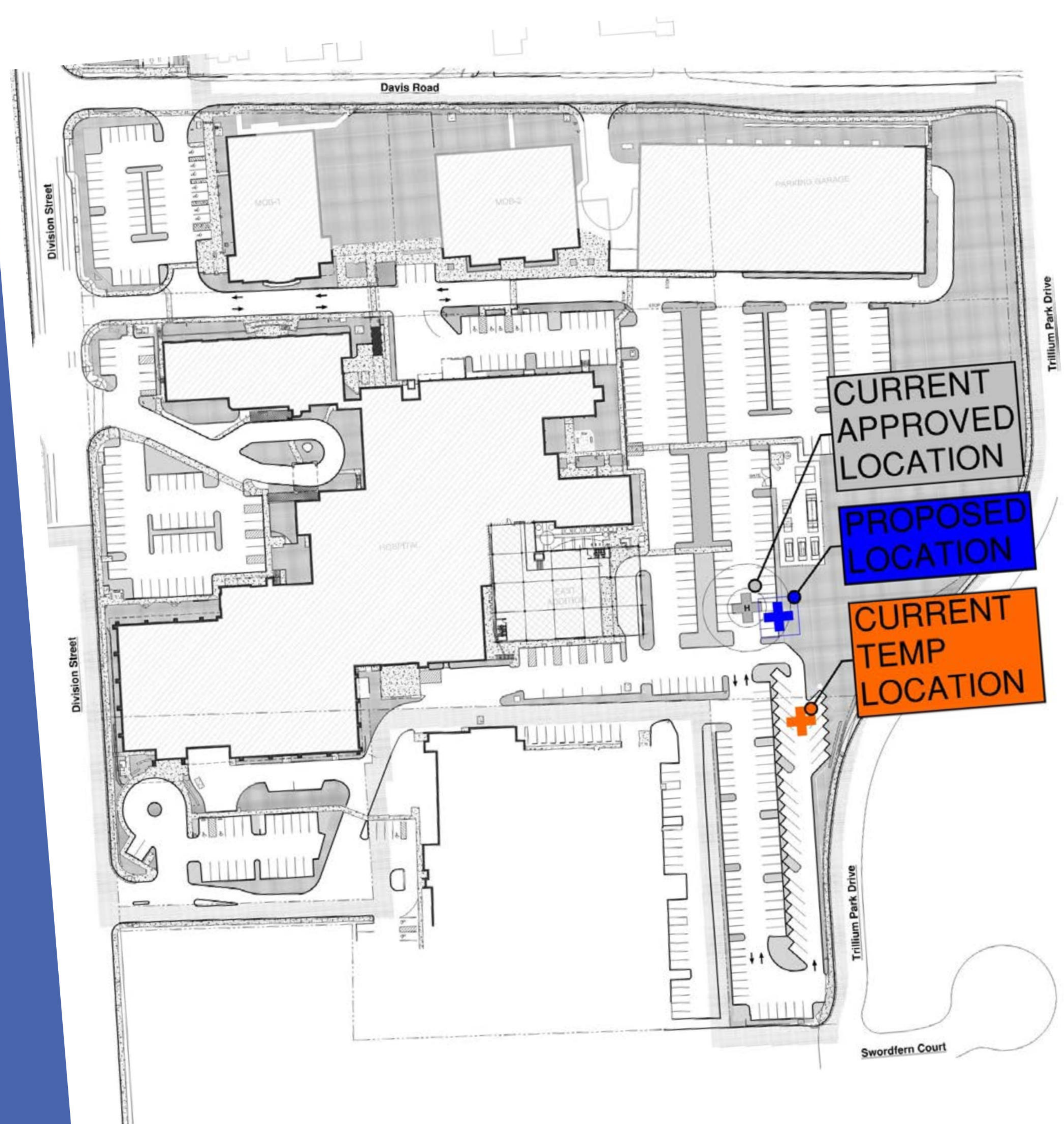


Current Approved Site Plan

- GLUA-20-00003 approved this site plan for the east expansion project.
- No formal helipad facility.
- Accommodations made in parking area



Current, Temporary, and Proposed Locations



Proposed Helipad Facility

- Multiple locations were considered.
- No NROD impacts
- No Geologic Hazard impacts
- Helipad will meet FAA requirements for safe flight operations
- No parking will be impacted by the flight operations (safer and more readily available to use in an emergency)
- Total campus parking still exceeds the minimum zoning requirements

Project Considerations

- Operations (6-7 life flights per year)
- Minimize Grading
- Resource Protection
- Safety and Security

Tentative Project Timeline

★ **WE ARE HERE**

Neighborhood Meeting

(May)

Application Submittal

(Late May)

Public Agency Review

(May-October)

Public Hearing

(September – October)

Construction (Winter/Spring)

OREGON CITY

Community Development – Planning

695 Warner Parrott Road | Oregon City OR 97045
Ph (503) 722-3789 | Fax (503) 722-3880

LAND USE APPLICATION TRANSMITTAL – RESPONSE FORM

Date: 7-13-22

Land Use Application File Number: GLUA-22-00016 CU-22-00001 NROD-22-00010

NAME: Wes Rogers

AGENCY: Oregon City SD

EMAIL ADDRESS: wes.rogers@orecity.k12.or.

The land use application material is referred to you for your information, study and official comments. Your recommendations and suggestions will be used to guide the Planning staff when reviewing this proposal. If you wish to have your comments considered and incorporated into the staff report, please return a copy of this form to facilitate the processing of this application and to ensure prompt consideration of your recommendations.

Please check the appropriate spaces below.

☑	The proposal does not conflict with our interests.
☐	The proposal conflicts with our interests for the reasons attached. (Please attach additional information)
☐	The proposal would not conflict our interests if the changes noted below or attached are addressed.

Please add any specific comments below or attach a separate document with more information.

This development falls outside the Clackamas River Water district boundary. The City of Oregon City will be the water purveyor.

CONTACT THE PLANNING DIVISION IF YOU HAVE ANY QUESTIONS ABOUT THIS APPLICATION

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OREGON CITY

Community Development

698 Warner Parrott Road | Oregon City OR 97045
Ph (503) 722-3789 | Fax (503) 722-3880

Natural Resource Overlay District (NROD)

Application for Exemption from NROD Review

Staff use:

File Number: NROD 22-00010 Reviewed By: C.Robertson-Gardiner Date: 7.29.22

Decision: x Approved __ Denied

See additional findings in GLUA-22-00016 CU-22-00001 NROD-22-00010

Site Address or Clackamas County Map and Tax Lot: 1500 Division Street, Oregon City

Applicant Name/Company: Josh Kolberg/PKA Architects Phone Number: 503-968-6800

Email Address: josh@pkaarchitects.com

The following uses are allowed within the NROD and do not require the issuance of an NROD permit. Indicate which exemption your project falls under:

___ Stream, wetland, riparian, and upland restoration or enhancement projects as authorized by the City.

___ Farming practices as defined in ORS 215.203 and farm uses, excluding buildings and structures, as defined in ORS 215.203.

___ Utility service using a single utility pole.

___ Boundary and topographic surveys leaving no cut scars greater than three inches in diameter on live parts of native plants listed in the Oregon City Native Plant List.

____ Soil tests, borings, test pits, monitor well installations, and other minor excavations necessary for geotechnical, geological or environmental investigation, provided that disturbed areas are restored to pre-existing conditions as approved by the Community Development Director.

____ Trails meeting all of the following:

1. Construction shall take place between May 1 and October 30 with hand held equipment;
2. Widths shall not exceed forty-eight inches and trail grade shall not exceed twenty percent;
3. Construction shall leave no scars greater than three inches in diameter on live parts of native plants;
4. Located no closer than twenty-five feet to a wetland or the top of banks of a perennial stream, or no closer than ten feet of an intermittent stream;
5. No impervious surfaces; and
6. No native trees greater than one-inch in diameter may be removed or cut, unless replaced with an equal number of native trees of at least two-inch diameter and planted within ten feet of the trail.

____ Land divisions provided they meet the following standards, and indicate the following on the final plat:

1. Lots shall have their building sites (or buildable areas) entirely located at least five feet from the NROD boundary shown on the City's adopted NROD map. For the purpose of this subparagraph, "building site" means an area of at least 3,500 square feet with minimum dimensions of forty feet wide by forty feet deep;
2. All public and private utilities (including water lines, sewer lines or drain fields, and stormwater disposal facilities) are located outside the NROD;
3. Impervious streets, driveways and parking areas shall be located at least ten feet from the NROD; and

4. The NROD portions of all lots are protected by:
   a. A conservation easement; or
   b. A lot or tract created and dedicated solely for unimproved open space or conservation purposes.

_X__ Site Plan and Design Review applications where all new construction is located outside of the NROD boundary shown on the City's adopted NROD map, and the NROD area is protected by a conservation easement approved in form by the City.

____ Routine repair and maintenance of existing structures, roadways, driveways and utilities.

____ Replacement, additions, alterations and rehabilitation of existing structures, roadways, utilities, etc., where the ground level impervious surface area is not increased.

____ Measures approved by the City of Oregon City to remove or abate nuisances or hazardous conditions.

____ Tree Removal. The Community Development Director may permit the removal of any tree determined to be a dead, hazardous, or diseased tree as defined in OCMC 17.04. Any tree that is removed in accordance with this Section (L) shall be replaced with a new tree of at least ½-inch caliper or at least six foot overall height. An exception to this requirement may be granted if the applicant demonstrates that a replacement tree has already been planted in anticipation of tree removal, or if the existing site conditions otherwise preclude tree replacement (due to existing dense canopy coverage or other ecological reasons).
The replacement tree(s) shall be located in the general vicinity of the removed tree(s), somewhere within NROD on the property. The replacement tree(s) shall be identified on the Oregon City Native Plant List or other locally adopted plant list (e.g. Metro or Portland). The property owner shall ensure that the replacement tree(s) survives at least two years beyond the date of its planting.

____ Planting of native vegetation and the removal of non-native, invasive vegetation (as identified on the Oregon City Native Plant List or other locally adopted plant list (e.g. Metro or Portland), or as recommended by an environmental professional with experience and academic credentials in one or more natural resource areas such as ecology, arboriculture, horticulture, wildlife biology, botany, hydrology or forestry), and removal of refuse and fill, provided that:
1. All work is done using hand-held equipment;
2. No existing native vegetation is disturbed or removed; and
3. All work occurs outside of wetlands and the top-of-bank of streams.

____ Activities in which no more than one hundred square feet of ground surface is disturbed outside of the bankfull stage of water bodies and where the disturbed area is restored to the pre-construction conditions, notwithstanding that disturbed areas that are predominantly covered with invasive species shall be required to remove the invasive species from the disturbance area and plant trees and native plants pursuant to this Chapter.

____ New fences meeting all of the following:
1. No taller than three and a half feet and of split rail or similar open design.;
2. Two feet width on both sides of fence shall be planted or seeded with native grasses, shrubs, herbs, or trees to cover any bare ground;
3. Six inches of clearance from ground level;
4. Fence posts shall be placed outside the top-of-bank of streams and outside of delineated wetlands.

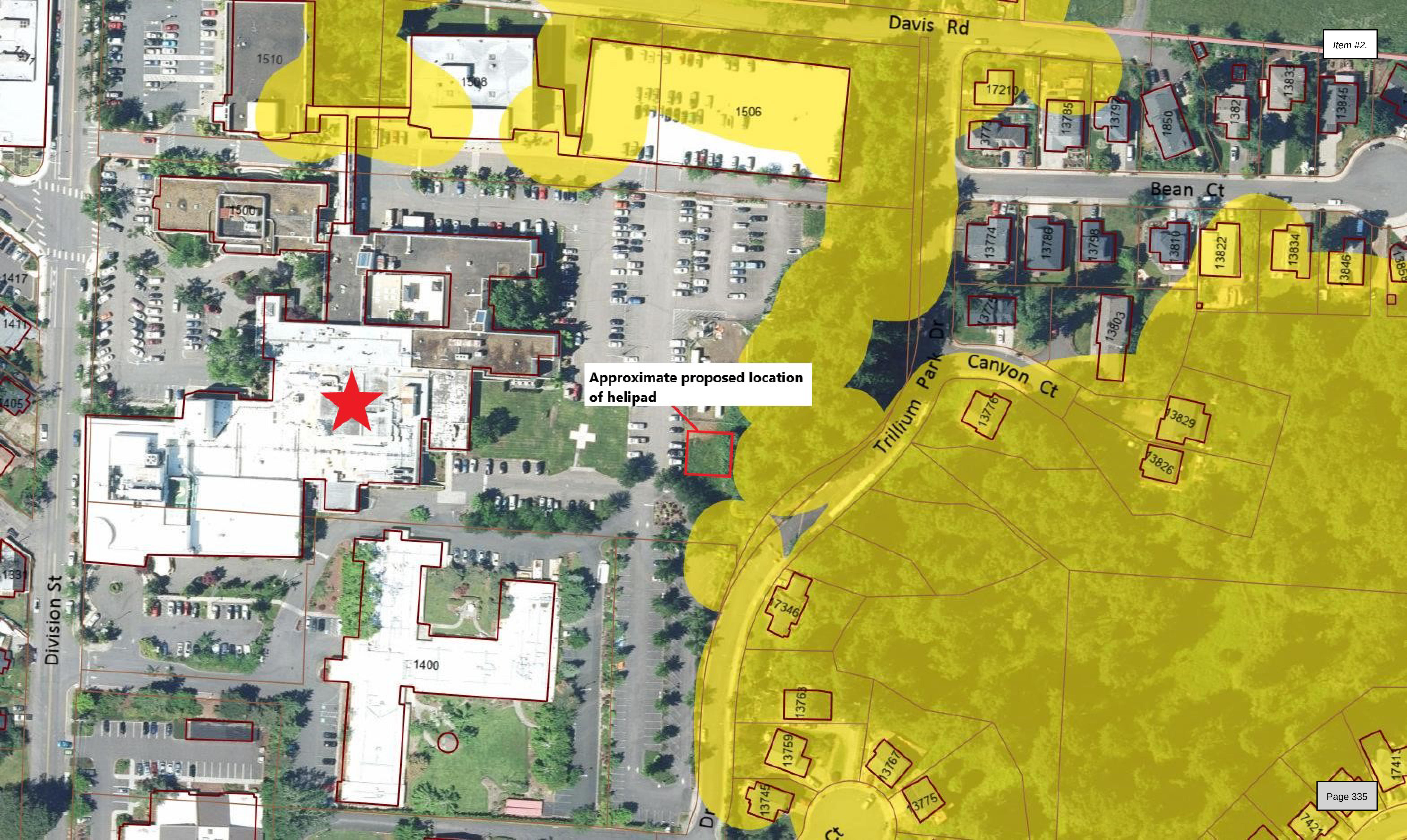
____ Gardens, fences and lawns within the NROD that existed prior to the time the overlay district was applied to a subject property are allowed to be maintained but cannot expand further into the overlay district.

Describe how your project meets one of the items in the list above.

This project proposes the relocation of a helipad from a temporary location to a permanent location. The proposed permanent location abuts, but is not within, a Natural Resource Overlay District and Geological Hazard area.

Attach a map showing the location of the proposed work.

Attach any other documentation, such as photos, plans, or reports needed to demonstrate compliance with the code.


Davis Rd
Bean Ct
Canyon Ct
Trillium Park Dr
Division St
Approximate proposed location of helipad
1510
1508
1506
1500
1400
1417
1411
1405
1531
17210
13785
13797
1850
13822
13834
13846
13774
13788
13798
13810
13803
13776
13829
13826
17346
13768
13759
13767
13775
13745

Providence Willamette Falls Medical Center Helipad

Neighborhood Meeting

Thursday, May 5th, 2022 – 7:00PM – Virtual Meeting

Attendee	**Organization**
Jesse Buss	Chair of NA
Wendy Marshall	NA
Ladonna Sullivan	NA
Nancy Shearer	NA
Denyse Mcgriff	NA
Denise Beasley	NA
Amy Wilson	NA
Curt Reesor	NA
Justin Young	OC Police
Shawn Dickerson	NA
Willemijn Ilcisin	NA
Gary Calderaz	NA
Steven Youkey and Neighbors	NA
Wendy Marshall	NA
Anne Bell-Fysh	NA
Chris Hamlin	NA
Jane and Dan 14th/Jackson	Variance applicants
Damon Mabee	NA
Jay Pearce	NA
Jesse Reade	NA
Jessica Murray	NA
Project Team	
Brad Kilby - Planner	HHPR
Brad Henry	Providence Willamette Falls Hospital
Josh Kolberg	PKA
Renee King	Providence Willamette Falls Hospital

Project Introduction

Brad Henry and Brad Kilby introduced the project to the attendees – See slide show

---

Q&A – *Questions* and responses may not be verbatim.

Questions

Jesse Buss - Are you moving the helipad to save parking spaces?

Josh Kolberg – We actually lose four spaces. This is an operational issue that allows the site to be utilized quickly without having to move any cars. Staff parking will be located nearby.

Jay Pearce – The new location appears to be a much more efficient location. Always wondered why it was in the location. How close are you to finishing the cancer center?

Brad Henry – Hoping to move in and take occupancy end of December early January. Building is framed. Floors are being poured. Indoor improvements are moving forward.

Damon Mabee – Has the FAA signed off on this new location?

Josh Kolberg – We have an FAA certified consultant working with us. The FAA does not actually approve the location. They Look at take-off angles, lighting etc. Consultant will help. 40X40 pad. The design will meet FAA recommendations for design.

Damon Mabee – Concerned about impacts to Trillium since downbeat of their propeller may be impacting the Trillium apartment and housing impacts. Concerned about the thumps. May want to meet separately with the Trillium HOA.

Jesse Buss and Damon Mabee – Discussed locations. Indicated that the Trillium neighborhood is part of the overall neighborhood Association.

Denyse McGriff – Apartments are not part of the Trillium HOA or subdivision.

Gary Calderaz – Is a member of the Trillium HOA and will let them know about the project.

Jesse Buss – Asked Gary if there he could speak to concerns related to helicopter noise?

Gary Calderaz – It's not really an issue for him.

Jesse- How far are you from the helipad?

Gary Calderaz– ¼ mile away. It's an interesting diversion. Isn't concerned about it because of the frequency of flights.

Jesse Buss – Would the helipad ever be used more frequently?

Brad Henry – Not really since ground transportation can actually move quicker because of the amount of time it takes to mobilize a helicopter crew. Only used in very critical emergencies. It should remain a very rare occurrence.

Josh Kolberg – Because the hospital is in the metro area, acute care patients will likely be directed to other locations.

Ladonna Sullivan – Thinks the cancer treatment center is a good thing for the community.

Gary Calderaz – Was at St. Joe's in Washington when a helicopter arrived and didn't think the noise was bad at all.

Denyse McGriff – Provided information about review criteria and standards for land use decisions in the City. Said that it is not about whether or not you like the use, but whether or not the project has met the review criteria.

Association moved on to the next item on their agenda.

GLUA-22-00016 CU-22-00001 NROD-22-00010 Willamette Falls Hospital Helipad Relocation Conditional Use

Planning Commission Hearing

August 8, 2022

OREGON CITY

Planning Commission Options

1. Approval with Conditions of GLUA-22-00016 CU-22-00001 NROD-22-00010
2. Denial of GLUA-22-00016 CU-22-00001 NROD-22-00010
3. Continue GLUA-22-00016 CU-22-00001 NROD-22-00010 to the September 12, 2022 Planning Commission Hearing

Staff’s Recommendations and Findings

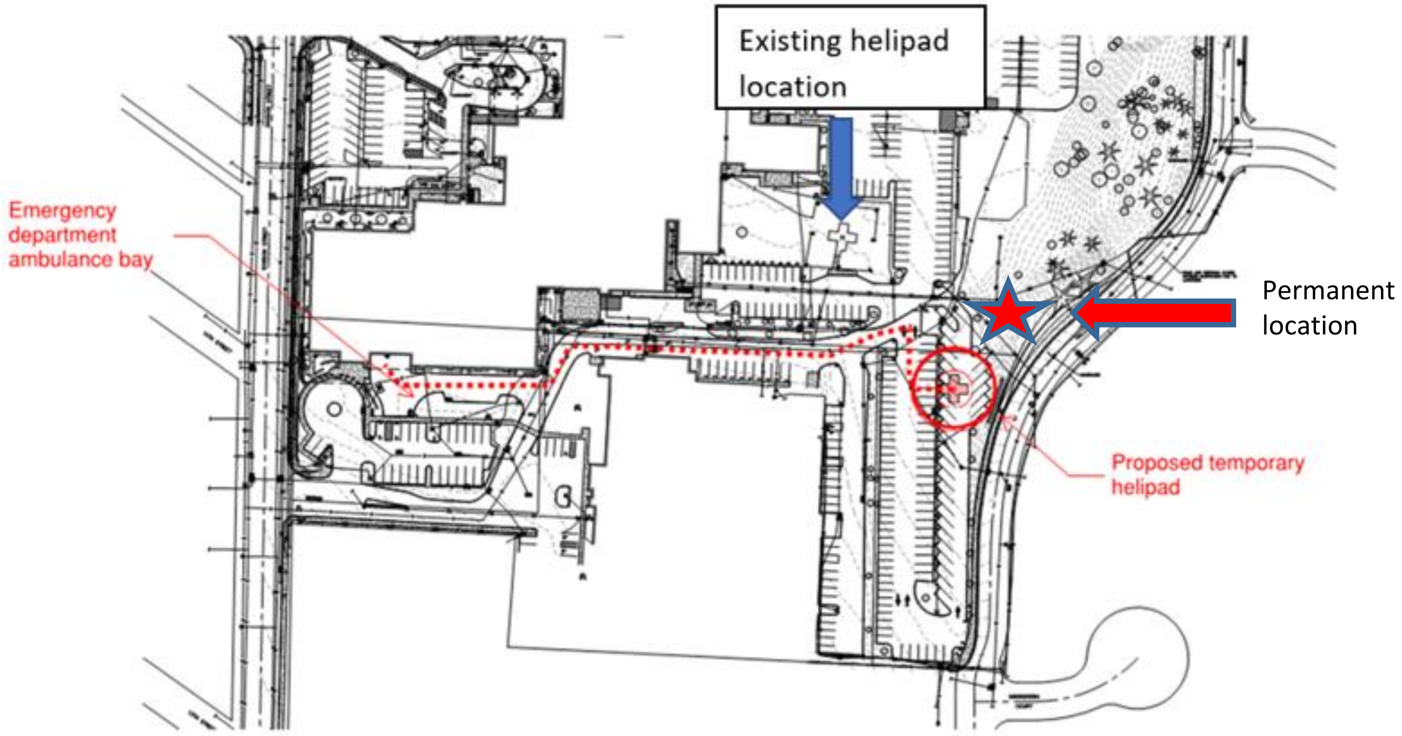
Approval with Conditions for the relocation of
the existing helipad at the Willamette Falls Hospital

- Low number of flights per year (6-7)
- In same general location as existing and 2021 temporary helipad (moving 100 feet the east)
- Applicant provided technical memos/reports on potential impacts
- Public hearings process- no substantive public comments to date
- Applicant provided additional mitigation above what is required by code (4 trees)
- Applicant provided sufficient findings for OCMC 17.56 Conditional Uses

OREGON CITY

Background

1. New hospital wing approved in 2020 in the location of existing helipad
2. Helipad temporality relocated to parking lot during construction of the hospital wing
3. Permanent relocation -Type III Conditional Use Review if the new location closer to abutting residential
4. The proposed permanent location is approximatly100 feet closer to residential development.



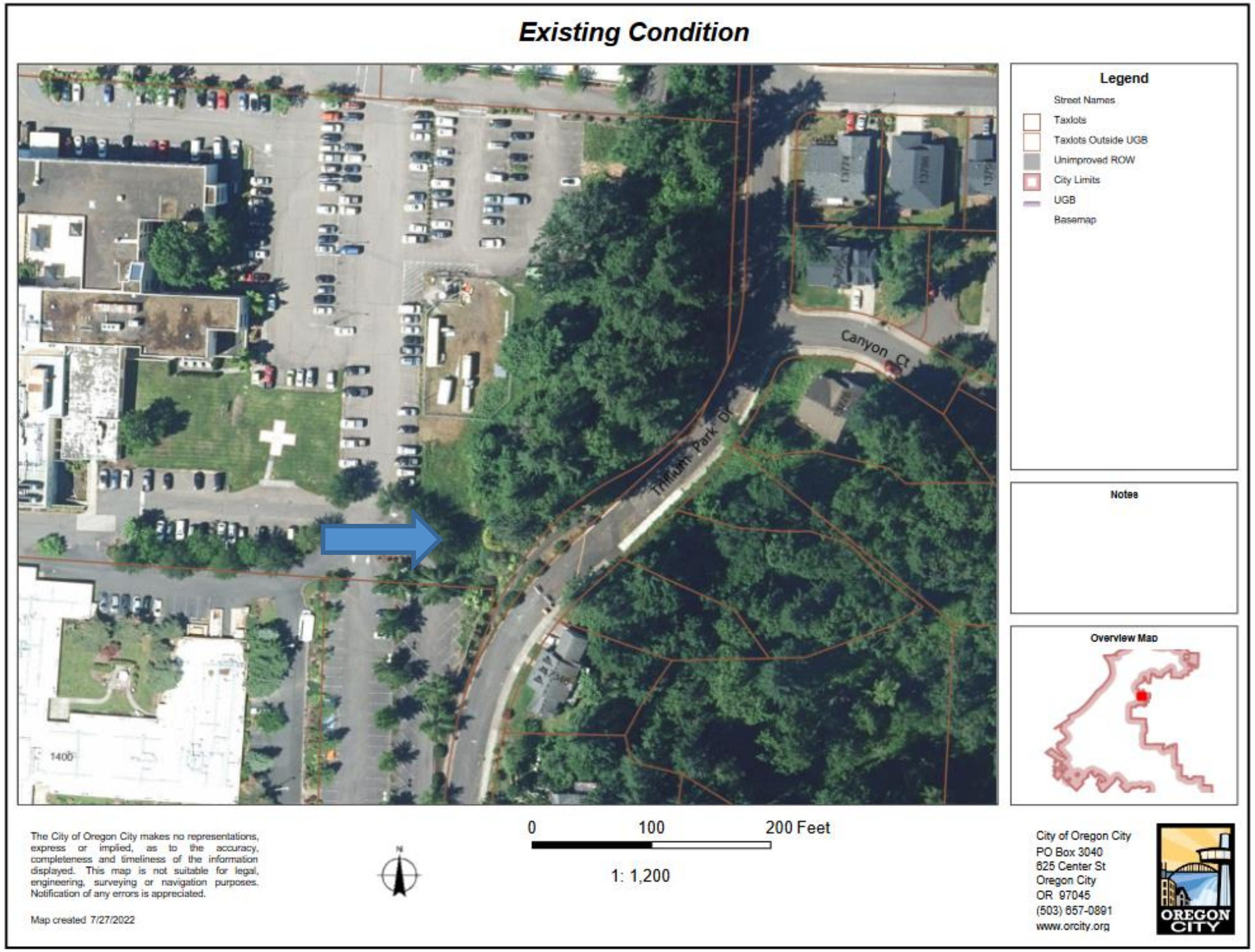
Background

This proposal requires approval of the following land use permits:

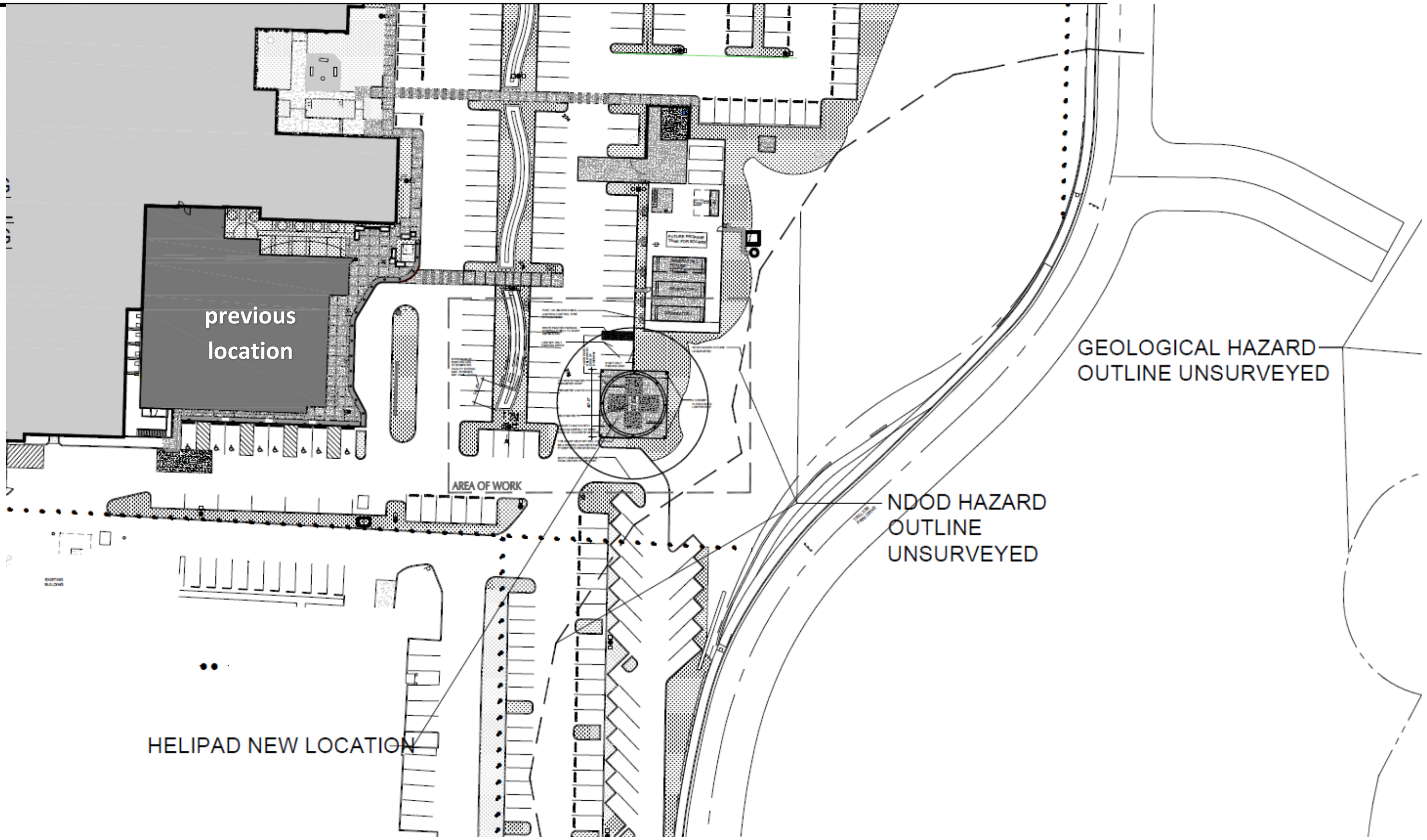
- Conditional Use Review for the Helipad
- NROD exemption (NROD 22-00010)

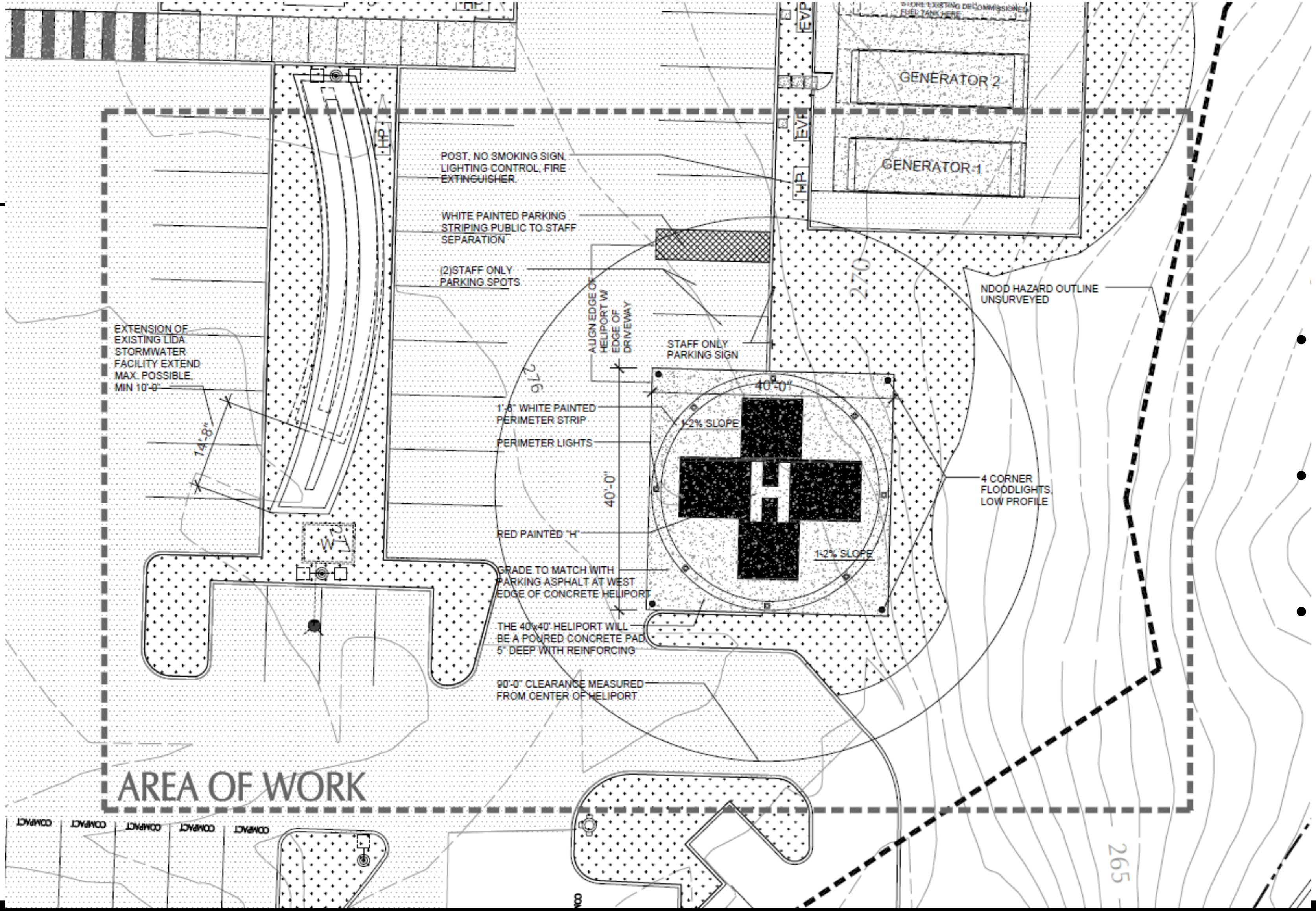
Upon approval of the Conditional Use

- Minor Type I Site Plan Review
- Development Services Grading Permits



Background

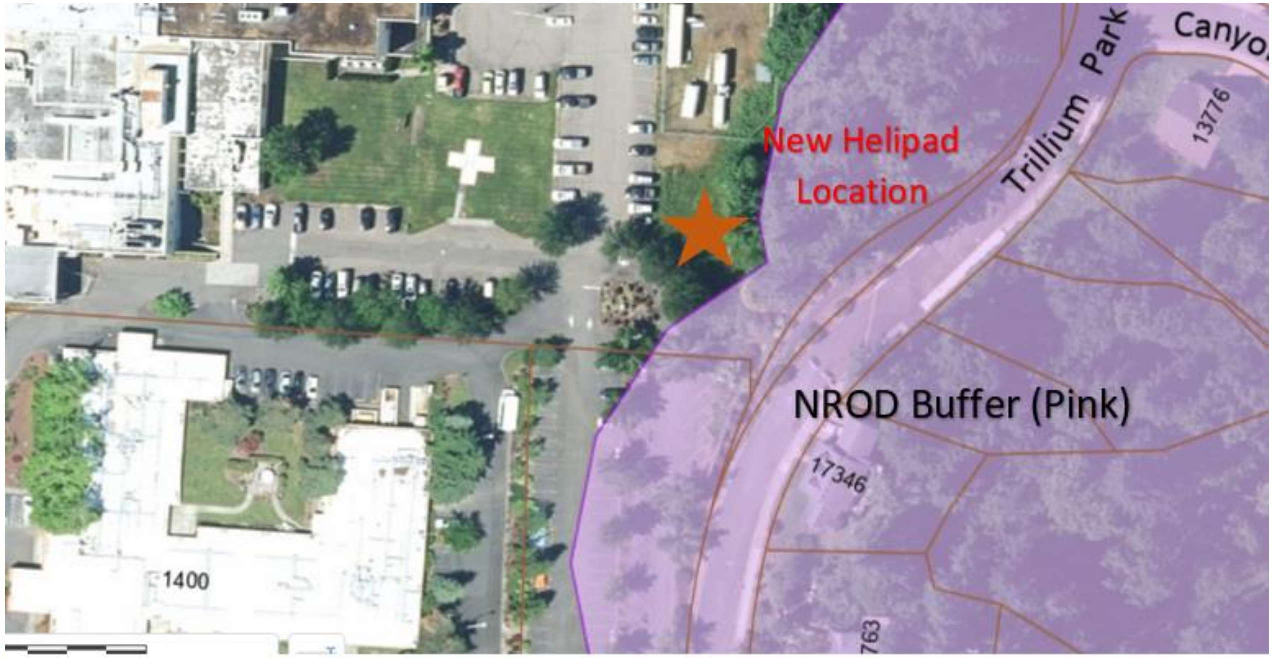

previous
location
AREA OF WORK
GEOLOGICAL HAZARD
OUTLINE UNSURVEYED
NDOD HAZARD
OUTLINE
UNSURVEYED
HELIPAD NEW LOCATION



- Relocating 4 trees in planter areas to other parts of the parking lot.
- Removal and replanting of 4 trees in adjacent forested area
- Replanting 4 additional trees as mitigation

GLUA-22-00016 CU-22-00001 NROD-22-00010

Geo Hazard and NROD Overlay Districts



OREGON CITY

GLUA-22-00016 CU-22-00001 NROD-22-00010

Conditions of Approval

1. The Applicant shall submit a revision to the existing stormwater and grading permit for the hospital east expansion approved under GLUA-20-00003/MAS-20-000001 for the helipad construction (DS)

2. Prior to approval of a grading permit or other required Development Services permits, the Applicant shall submit for and receive approval for a Type I Site Plan Review for the removal of the trees, additional . landscaping per plan sheet L.10, and construction of the helipad. (P)

3. The Applicant shall ensure that all proposed plantings, including mitigation trees, are planted onsite per the proposed landscape plan. (P)

Questions ?