



City of Sandy

Agenda

Planning Commission Meeting

Meeting Location: City Hall- Council Chambers, 39250 Pioneer Blvd., Sandy, Oregon 97055

Meeting Date: Tuesday, December 17, 2019

Meeting Time: 7:00 PM

Page

1. ROLL CALL

2. REQUESTS FROM THE FLOOR - CITIZEN COMMUNICATION ON NON- AGENDA ITEMS

3. OLD BUSINESS: NONE

4. NEW BUSINESS

4.1. 19-023 SUB VAR TREE Bailey Meadows Subdivision
[19-023 SUB VAR TREE Bailey Meadows Subdivision - Pdf](#)

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5. ITEMS FROM COMMISSION AND STAFF

6. ADJOURN



Staff Report

Meeting Date: December 17, 2019

From Emily Meharg, Associate Planner

SUBJECT: 19-023 SUB VAR TREE Bailey Meadows Subdivision

Background:

Allied Homes & Development submitted an application to subdivide 23.42 acres into a 100-lot residential subdivision. The subject property is located on Ponder Lane south of the Nicholas Glen subdivision and north of Highway 211. The 100 proposed lots vary in size from 7,500 to 9,706 square feet. The proposal also includes a 22,521 square foot stormwater detention tract. The proposed development includes removal of trees to accommodate the extension and/or construction of rights-of-way. There are no existing structures on the subject property. The application as submitted proposed to rely solely on using Melissa Avenue in the Nicolas Glen subdivision to access the 100 lots in this subdivision.

Recommendation:

Staff recommends the Planning Commission open a public hearing to receive public testimony. Once the hearing has been completed staff recommends the Planning Commission close the public hearing but leave the record open in accordance with state law, specifically ORS 197.763(6).

Given the upcoming holidays and the issues relating to the condition of approval for the additional access from Gunderson Road, the city attorney believes the best way to proceed is to have an initial open record period that would end on January 14, 2020. During this first open record period, any party would be able to submit any additional evidence or testimony that is relevant to the application. Then, a second open record period would begin that would run through January 28, 2020. During this second open record period, parties would be able to submit evidence and testimony that responds to issues raised during the first open record period, but parties would not be able to raise new issues. A final period of seven days would be reserved exclusively for the applicant to submit its final argument. This period would expire on February 4, 2020.

Staff would review the submissions and put together a summary of what was received, as well as a final recommendation to the planning commission. The planning commission would then reconvene in a public meeting to deliberate and make a decision on the application. Consistent with the poll staff recently sent to commissioners, the date of that meeting would be February 11, 2020. Based on discussions with the city attorney, staff understands that this proposed schedule is acceptable to the applicant and that the applicant would extend the 120-day

deadline for the amount of time between December 17 and the date the commission would reconvene to make a decision on February 11, 2020.

Code Analysis:

See attached staff report

Budgetary Impact:

Unknown

**PLANNING COMMISSION
STAFF REPORT
TYPE III LAND DIVISION**

DATE OF REPORT: December 10, 2019

HEARING DATE: December 17, 2019

FILE NO.: 19-023 SUB/VAR/TREE

PROJECT NAME: Bailey Meadows Subdivision

OWNER/APPLICANT: Allied Homes & Development

LEGAL DESCRIPTION: T2S R4E Section 23 Tax Lots 800, 801, 802, 803, 804

EXHIBITS:

Applicant's Submittals

A. Land Use Application Form

B. Narrative

C. Project Plan Set

- Sheet P1-01: Cover Sheet with Site & Vicinity Maps & Legend
- Sheet P1-02: Preliminary Existing Conditions Plan
- Sheet P1-03: Preliminary Existing Conditions Plan
- Sheet P1-04: Preliminary Subdivision Plat with Future Building Setbacks
- Sheet P1-05: Preliminary Grading & Erosion & Sediment Control Plan
- Sheet P1-06: Preliminary Grading & Erosion & Sediment Control Plan
- Sheet P1-07: Preliminary Composite Utility Plan
- Sheet P1-08: Preliminary Composite Utility Plan
- Sheet P1-09: Preliminary Street Plan
- Sheet P1-10: Preliminary Street Plan
- Sheet P1-11: Preliminary Street Cross Sections & Profiles
- Sheet P1-12: Preliminary Street Profiles
- Sheet P1-13: Preliminary Street Profiles
- Sheet P1-14: Preliminary Street Profiles
- Sheet P1-15: Conceptual Future Street Plan
- Sheet P1-16: Preliminary Tree Preservation & Removal Plan & Arborist Report
- Sheet P1-17: Preliminary Tree Preservation & Removal Plan & Arborist Report
- Sheet P1-18: Preliminary Tree Preservation & Removal Table & Arborist Report
- Sheet P1-19: Preliminary Tree Preservation & Removal Table & Arborist Report
- Sheet P1-20: Preliminary Demolition Plan
- Sheet P1-21: Preliminary Demolition Plan
- Sheet P1-22: Preliminary Street Tree and Stormwater Screening Planting Plan
- Sheet P1-23: Preliminary Landscape Notes and Details
- Sheet P1-24: Preliminary Parking Plan

- Sheet P1-25: Preliminary Emergency Vehicle Access Plan
- Sheet P1-26: Preliminary Emergency Vehicle Access Plan
- D. Conceptual Connectivity Plan
- E. Preliminary Numbered Parking Plan
- F. Traffic Impact Analysis
- G. Preliminary Stormwater Report
- H. Flood & Slope Hazard (FSH) Analysis
- I. Geotechnical Engineering Report
- J. Letter from Michael Robinson (July 2, 2019)
- K. Mailing Labels
- L. Applicant Submittal Checklist
- M. Warranty Deed
- N. Clackamas County Assessor's Map
- O. Documentation of Plat Name Reservation
- P. Letter from Michael Robinson with Exhibits (August 20, 2019)
- Q. 120 Day Extension Letter (October 15, 2019)
- R. Letter from Michael Robinson (November 21, 2019)
- S. Updated Sheet P1-04 (Plan Dated November 15, 2019)
- T. Updated Sheet P1-15 (Plan Dated November 21, 2019)
- U. Updated Narrative (November 21, 2019)
- V. Gunderson Extension Exhibit from Todd Mobley (November 22, 2019)
- W. Letter from Michael Robinson with Exhibits (November 25, 2019)
- X. Trip Distribution with Gunderson Road Email from Todd Mobley (December 5, 2019)

Agency Comments Received Prior to November 2019 Updated Submittal

- Y. City Engineer (September 27, 2019)
- Z. PGE (September 18, 2019)
- AA. ODOT (October 4, 2019)
- BB. Parks and Trails Advisory Board (October 9, 2019)
- CC. ODOT Design Speed Email (November 19, 2019)

Public Comments

- DD. Paul and Jolette Owen, 37189 Rachael Drive (September 14, 2019)
- EE. Paul Savage, 37506 Rachael Drive (September 26, 2019)
- FF. Sarah Bettey, 18195 Melissa Avenue (September 26, 2019)
- GG. Tiffany Harris, Rachael Drive (September 27, 2019)
- HH. Todd Cooper, 18190 Melissa Avenue (September 27, 2019)
- II. Tom Newell, 18007 Rachael Drive (September 27, 2019)
- JJ. Cary Mallon, corner of Melissa Avenue and Rachael Drive (September 28, 2019)
- KK. Lonnie McVey, No address provided (September 28, 2019)
- LL. John and Carol Dick, 18255 Grey Avenue (September 29, 2019)
- MM. Marilyn and Treena Siewell, No address provided (October 1, 2019)
- NN. Marguerite Wadkins, 18291 Myra Court (October 1, 2019)
- OO. Doris E. Rooney, 37214 Rachael Drive (October 1, 2019)
- PP. Susan Hebb, Reich Court and Dubarko Road (October 1, 2019)
- QQ. Dawn and Jordan Allen, Melissa Avenue (October 1, 2019)

RR. Dave Meeker, 18198 Grey Avenue (October 1, 2019)
 SS. Carol Hassebroek, 39400 SE Trubel Road (October 1, 2019)
 TT. Karen Higgins, 37487 Rachael Drive (October 2, 2019)
 UU. The Molcany Family, Wewer Avenue (October 2, 2019)
 VV. Esther Naomi Quick, 18214 Grey Avenue (October 2, 2019)
 WW. Edith Newton, 18246 Grey Avenue (October 2, 2019)
 XX. Lori Graham, 37322 Rachael Drive (October 3, 2019)
 YY. Jeff Conder, 36345 Dubarko Road (October 3, 2019)
 ZZ. Belus and Juanita Schonek, 18102 Wewer Avenue (October 3, 2019)
 AAA. Danielle and Oliver Mullon, Myra Court (October 3, 2019)
 BBB. Corri Baldwin, 37524 Rachael Drive (October 3, 2019)
 CCC. Mike Schell, 37524 Rachael Drive (October 3, 2019)
 DDD. Ashley Parrish, 37356 Rachael Drive (October 3, 2019)
 EEE. Guimar and James DeVaere, 18176 Rachael Drive (October 3, 2019)
 FFF. Erin Findlay, 37616 Rachael Drive (October 3, 2019)
 GGG. Krista and Gabriel Stone, 18111 Rachael Drive (October 4, 2019)
 HHH. Faith Egli, 37708 Rachael Drive (October 4, 2019)
 III. Tim Sellin, 18256 Melissa Avenue (October 4, 2019)
 JJJ. Nicole Sellin, 18256 Melissa Avenue (October 4, 2019)
 KKK. Barbara Coutts, 37265 Solso Drive (October 4, 2019)
 LLL. Roberta (Shelly) Evett, 18192 Rachael Drive (October 4, 2019)
 MMM. Laura Kvamme, 37438 Rachael Drive (October 11, 2019)
 NNN. Kelli Acord, 36366 Industrial Way Ste B (October 18, 2019)
 OOO. Elizabeth A. (Libby) Burke, 37412 Rachael Drive (October 20, 2019)
 PPP. Brad Robison, 37412 Rachael Drive (October 20, 2019)
 QQQ. Laurie Gilbert, 18392 SE 370th Avenue (November 4, 2019)

BACKGROUND AND SIGNIFICANT ISSUES

1. Allied Homes & Development submitted an application to subdivide 23.42 acres into a 100-lot residential subdivision. The subject property is located on Ponder Lane south of the Nicholas Glen subdivision and north of Highway 211. The 100 proposed lots vary in size from 7,500 to 9,706 square feet. The proposal also includes a 22,521 square foot stormwater detention tract. The proposed development includes removal of trees to accommodate the extension and/or construction of rights-of-way. There are no existing structures on the subject property. The application as submitted proposed to rely solely on using Melissa Avenue in the Nicolas Glen subdivision to access the 100 lots in this subdivision.
2. The city received the application on July 5, 2019, and notified the applicant that it was incomplete. The applicant responded with a letter and additional submittal items that the city received on August 22, 2019. Under state law, the application was deemed complete on August 22, 2019 because the applicant provided some information in response to the incompleteness notice and stated that it would provide no additional information.
3. The subject site consists of five lots with a total area of approximately 23.42 acres. The site is located north of Highway 211, south of Rachael Drive, and west of Ponder Lane. The parcel has

a Plan Map designation of Low Density Residential and Zoning Map designation of SFR, Single Family Residential.

4. According to the applicant, the 100 proposed lots will add approximately 944 vehicle trips each weekday to Melissa Avenue. In discussions with the applicant, both during the preapplication stage and after the application was submitted, staff expressed concerns about having one access into Bailey Meadows via Melissa Avenue.
5. One challenge in providing a second access into the proposed subdivision is the location of the subject property relative to the city's urban growth boundary ("UGB"). The city has a road identified in its transportation system plan ("TSP") that would serve as a second way to access Bailey Meadows. That road ("Gunderson Road") could connect the southern portion of the subdivision with Highway 211, as the TSP generally envisions. However, the connection from the subject property to 211 would occur outside of the city's UGB. State law would only allow Gunderson Road to be built if it were either: (a) in the city's UGB; or (b) Clackamas County approved an "exception" in accordance with state law that would allow the road to be built on rural land outside the UGB.
6. Initially, during the preapplication period, the applicant considered filing an exception application with Clackamas County to extend Gunderson. However, senior planning staff at the county were not supportive of an exception. The applicant discusses the exception in more detail on page 3 of its August 20, 2019 letter to city staff (Exhibit P). After concluding that an exception would not be approved, the applicant submitted the application and proposed relying solely on Melissa Avenue for access to the subdivision. As discussed further in Exhibit P, the applicant asserts that state law prohibits the city from denying the application for only proposing one access point from Melissa Avenue. The city attorney will address these assertions at the hearing on December 17.
7. After the application was deemed complete, the applicant chose to hold a neighborhood meeting regarding the proposed subdivision, which occurred on September 18, 2019 at the Sandy library. Subsequent to that meeting, on September 26, the applicant, its representatives and its attorney met with city staff and the city attorney to discuss issues related to the application. The parties discussed the impacts to Melissa Avenue and the residents of Nicolas Glen if a second access was not provided. At the conclusion of that meeting, the applicant agreed to explore a UGB expansion that would, if approved, permit the construction of Gunderson Road and provide a second access into and out of the proposed subdivision.
8. Ideally, a UGB expansion and the specifics of how Gunderson Road could be built and financed would occur prior to considering the subdivision application. However, this approach does not work for the applicant for reasons it can discuss at the December 17 hearing. Instead, the applicant is proposing that the city impose a condition of approval on its subdivision application that would require the applicant to seek, in a subsequent application process, an expansion of the UGB to allow the applicant to construct Gunderson Road, subject to certain contingencies. The applicant summarizes this proposal in a November 25, 2019 letter to the city (Exhibit W).

9. The specific details of the second access intersecting with HWY 211 are still being defined by the City of Sandy, the Oregon Department of Transportation (“ODOT”), and the applicant. The city, the county, the Oregon Department of Land Conservation and Development (“DLCD”) and ODOT have discussed the concept of a possible UGB expansion to accommodate a Gunderson Road connection. While the county had some procedural questions, these agencies have not expressed opposition to the concept and DLCD understood the justification for it. The land to be added to the UGB, and upon which Gunderson Road would be built, is under the control of the applicant. The amount of land added to the UGB would essentially be limited to the right-of-way necessary to accommodate constructing Gunderson Road from the subdivision to HWY 211 in accordance with the city’s right-of-way standards for a minor arterial road. The basis for adding the land to the UGB would be to satisfy an unmet need for a transportation facility and it would not justify any other type of development (e.g. additional housing or commercial development). The applicant currently intends to seek a UGB expansion in early January 2020. The city would need to hold at least two hearings on the proposed expansion – one before the planning commission and one before the city council. If approved, the county would also need to hold a hearing to amend its comprehensive plan map to account for the change to Sandy’s UGB.
10. Although there are significant details to address, staff is encouraged that the applicant is seeking a solution to provide a second access to the subdivision. As of the date of this report, a draft condition of approval is being considered that the city could ultimately impose on the subdivision, which we intend to discuss at the hearing on December 17.

PUBLIC COMMENTS

11. Neighbors in the vicinity of the proposed subdivision and other members of the public have expressed significant interest in and concern regarding the proposed subdivision, particularly regarding the impacts it may have on city infrastructure and services. As of the date of this report, the city has received approximately 40 written comments from the public. These comments are contained in the record in Exhibits DD through QQQ. The vast majority of the public comments express concern with traffic and access issues, particularly the effect of adding 100 new homes if a second access is not provided to the subdivision. As discussed above, city staff shares this concern.

PROCEDURAL ISSUES

12. The Planning Commission hearing was originally scheduled to be held on October 28, 2019. The applicant agreed to postpone the original hearing to a later date to consider a second access into the proposed subdivision. The original 120-day deadline was December 20, 2019. On October 15, 2019 the City of Sandy received a notice from the applicant’s attorney granting an extension of the 120-day clock to February 8, 2020 (Exhibit Q).
13. Notification of the proposal was originally mailed to property owners within 500 feet of the subject property and to affected agencies on September 12, 2019 regarding the October 28, 2019 public hearing. On October 16, 2019 a notice was mailed to property owners within 500 feet of the subject property stating that the October 28, 2019 meeting was cancelled. On November 27, 2019 notification of the revised proposal was mailed to property owners within 500 feet of the subject property and a legal notice was published in the Sandy Post on December 4, 2019 regarding the rescheduled public hearing on December 17, 2019.

14. Agency comments were initially received from the City Engineer, PGE, the Parks and Trails Advisory Board, and ODOT. On November 21, 2019, the applicant submitted updated materials to city staff (Exhibits R-U). On November 25, 2019, the applicant through its legal counsel clarified its intention to seek a UGB expansion to allow a Gunderson Road connection, subject to certain conditions (Exhibit W). On December 5, 2019, the applicant's traffic consultant submitted a memo (Exhibit X) that outlines anticipated changes in trip distributions from the subdivision if Gunderson Road were built and connected to HWY 211. As of the date of this report, the city has not received comments from other agencies or outside consultants to the city relative to the applicant's November 21 revised submittals or the December 5 memo from the applicant's traffic consultant. Staff would like to have these comments to guide the planning commission's review of the application. In particular, staff would like to have the city's traffic consultant review the applicant's December 5 submittal regarding anticipated trip redistribution if Gunderson Road were constructed. As of the date of this report, the city is also anticipating construction cost estimates for the Gunderson Road connection. These estimates are important for the city to consider in order to adequately respond to certain conditions that accompany the applicant's willingness to accept the condition of approval described above.
15. In light of the Thanksgiving holiday, planning staff schedules, staff workloads (exacerbated by the departure of one of the city's associate planners) and details that remain to be considered relative to a Gunderson Road connection, a number of code sections are still being evaluated by staff. Staff anticipates continuing to work on a customary staff report for the planning commission's consideration.
16. Staff understands from talking with the city attorney that the applicant anticipates there will be a desire and a need to allow the planning commission to consider additional evidence and testimony after the December 17 hearing, prior to the planning commission making a decision on the application. Staff concurs with this and an approach that the applicant's attorney and the city attorney have discussed for the planning commission's consideration is discussed below.

RECOMMENDATION

Staff recommends the Planning Commission open a public hearing to receive public testimony. Once the hearing has been completed staff recommends the Planning Commission close the public hearing but leave the record open in accordance with state law, specifically ORS 197.763(6).

Given the upcoming holidays and the issues relating to the condition of approval for the additional access from Gunderson Road, the city attorney believes the best way to proceed is to have an initial open record period that would end on January 14, 2020. During this first open record period, any party would be able to submit any additional evidence or testimony that is relevant to the application. Then, a second open record period would begin that would run through January 28, 2020. During this second open record period, parties would be able to submit evidence and testimony that responds to issues raised during the first open record period, but parties would not be able to raise new issues. A final period of seven days would be reserved exclusively for the applicant to submit its final argument. This period would expire on February 4, 2020.

Staff would review the submissions and put together a summary of what was received, as well as a final recommendation to the planning commission. The planning commission would then reconvene in a public meeting to deliberate and make a decision on the application. Consistent with the poll staff recently sent to commissioners, the date of that meeting would be February 11, 2020. Based on discussions with the city attorney, staff understands that this proposed schedule is acceptable to the applicant and that the applicant would extend the 120-day deadline for the amount of time between December 17 and the date the commission would reconvene to make a decision on February 11, 2020.

EXHIBIT A



LAND USE APPLICATION FORM

(Please print or type the information below)

Planning Department
39250 Pioneer Blvd.
Sandy OR 97055
503-668-4886

Name of Project Bailey Meadows Subdivision

Location or Address SE Ponder Lane (Current access from Ponder Lane and Hwy 211)

Map & Tax Lot Number T 25, R 4E, Section 23; Tax Lot(s) 800, 801, 802, 803, and 804

Plan Designation LDR Zoning Designation SFR Acres ± 23.42

Request:

Please see attached letter for project description.	Applicant's Consultant: AKS Engineering & Forestry, LLC 12965 SW Herman Rd., Suite 100 Tualatin, OR 97062 Contact: Chris Goodell Phone: 503-563-6151 Email: chriscg@aks-eng.com
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I am the (check one) owner lessee of the property listed above and the statements and information contained herein are in all respects true, complete and correct to the best of my knowledge and belief.

Applicant Allied Homes & Development	Owner Grant E. & Myrtle J. Sturm
Address 12042 SE Sunnyside Rd Ste 706	Address 647 E Historic Columbia River Hwy
City/State/Zip Clackamas, OR 97015	City/State/Zip Troutdale, OR 97060
Phone Please contact Applicant's consultant	Phone Please contact Applicant's consultant
Email Please contact Applicant's consultant	Email Please contact Applicant's consultant
Signature <small>DocuSigned by:</small> <small>765307736025457</small>	Signature

If signed by Agent, owner's written authorization must be attached.

File No.	Date	Rec. No.	Fee \$
Type of Review (circle one): Type I Type II Type III Type IV			

Bailey Meadows Subdivision

Date: July 2019

Submitted to: City of Sandy
39250 Pioneer Boulevard
Sandy, OR 97055

Applicant: Allied Homes & Development
12042 SE Sunnyside Road, Suite 706
Clackamas, OR 97015

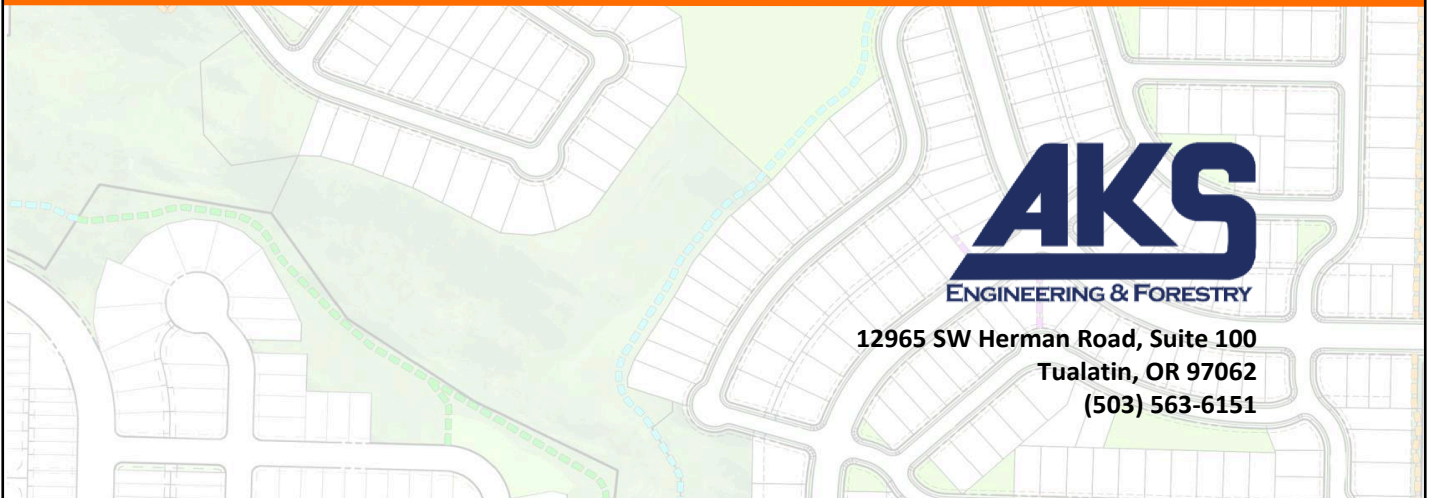


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Exhibits

- Exhibit A:** Preliminary Plans
- Exhibit B:** City of Sandy Land Use Application Forms and Checklists
- Exhibit C:** Property Ownership Information
- Exhibit D:** Clackamas County Assessor’s Map
- Exhibit E:** Public Notification
- Exhibit F:** Traffic Impact Analysis
- Exhibit G:** Preliminary Stormwater Report
- Exhibit H:** Flood & Slope Hazard (FSH) Analysis
- Exhibit I:** Documentation of Plat Name Reservation
- Exhibit J:** Geotechnical Engineering Report

Also Included with This Application

- Cover Letter from Applicant’s Legal Counsel
-

Bailey Meadows Subdivision

Submitted to:	City of Sandy Planning Department 39250 Pioneer Boulevard Sandy, OR 97055
Applicant:	Allied Homes and Development 12402 SE Sunnyside Road, Suite 706 Clackamas, OR 97015
Property Owner:	Myrtle J. Sturm and Grant E. Sturm, Trustees of the Sturm Family Trust 647 E Historic Columbia River Highway Troutdale, OR 97060
Applicant's Consultant:	AKS Engineering & Forestry, LLC 12965 SW Herman Road, Suite 100 Tualatin, OR 97062 Contact(s): Chris Goodell, AICP, LEED ^{AP} Email: chrisg@aks-eng.com Phone: (503) 563-6151
Applicant's Legal Counsel:	Schwabe, Williamson & Wyatt Pacwest Center 1211 SW 5th Avenue, Suite 190 Portland, OR 97204 Contact(s): Michael Robinson Email: mrobinson@schwabe.com Phone: (503) 796-3756
Applicant's Transportation Engineer:	Lancaster Engineering 321 SW 4 th Avenue, Suite 400 Portland, OR 97204 Contact(s): Todd Mobley Email: todd@lancasterengineering.com Phone: (503) 248-0313
Applicant's Geotechnical Engineer:	GeoPacific Engineering, Inc. 14835 SW 72 nd Avenue Tigard, OR 97224 Contact(s): Jim Imbrie Email: jimbrie@geopacificeng.com Phone: (503) 598-8445
Clackamas County Assessor's Map:	24E 23 Tax Lots 800, 801, 802, 803, and 804



Site Size:

One subdivision affecting five lots at ±23.42 total acres:

±2.40 acres (Lot 800)

±4.74 acres (Lot 801)

±4.74 acres (Lot 802)

±9.17 acres (Lot 803)

±2.37 acres (Lot 804)

Land Use District:

Single-Family Residential (SFR)



I. Executive Summary

To address the City of Sandy's identified need for urban land for housing under statewide planning goal 10, "housing," the City of Sandy (City) in 2017 expanded its Urban Growth Boundary (UGB) south to include the subject site. In June 2017, the property was annexed to the City of Sandy. The UGB expansion is final and acknowledged by the state.

This application for the Bailey Meadows Subdivision (the "Subdivision") is part of the planned progression of land use planning for the area and involves the creation of "Needed Housing" under ORS 197-303(1) and 197.307(4) on residential land properly zoned for the proposed use within the incorporated limits of the City of Sandy. The Applicant is submitting this application to the City of Sandy for a Single-Family Residential Subdivision on the ±23.42-acre site, designated with Single Family Residential (SFR) zoning. Planned project site features include:

- 100 lots for single-family detached housing
- Interconnected system of sidewalks and local public streets
- On-street parking
- Three planned phases with concurrent infrastructure improvements
- Full range of underground utilities including sanitary sewer, water, and franchise utilities
- Fee-in-lieu payment for parkland dedication
- Fee-in-lieu payment for improvements to SE Ponder Lane

This application package includes the City of Sandy application forms, written materials, and Preliminary Plans necessary for City staff to review and determine compliance with the applicable approval criteria. The evidence is substantial and supports the City's approval of this Subdivision.

This application is a "Needed Housing" application under ORS 197.303(1)(a) as it provides housing within an acknowledged urban growth boundary. ORS 197.307(4) states that a local government may apply only clear and objective standards, conditions, and procedures regulating the creation of Needed Housing, and such standards, conditions, and procedures cannot have the effect, either in themselves or cumulatively, of discouraging Needed Housing through unreasonable cost or delay.

Oregon Courts and the Land Use Board of Appeals (LUBA) have held that an approval standard is not clear and objective if it imposes on an applicant "subjective, value-laden analyses that are designed to balance or mitigate impacts of the development." *Rogue Valley Association of Realtors v. City of Ashland*, 35 Or LUBA 139, 158 (1998) *aff'd*, 158 Or App 1 (1999). ORS 197.831 places the burden on local governments to demonstrate that the standards and conditions placed on Needed Housing applications can be imposed only in a clear and objective manner. While this application addresses all standards and conditions, the Applicant reserves the right to object to the application of standards or conditions that are not clear and objective and does not waive its right to assert that the Needed Housing statutes apply to this application. The exceptions in ORS 197.307(4)(a) and 197.307(5) do not apply to this application. ORS 197.307(7)(a) is controlled by ORS 197.307(4). The City has not taken an exception for Needed Housing under 197.303(3).

II. Site Description and Setting

The subject property is approximately ±23.42 acres and is comprised of five separate tax lots generally located directly south of the Nicolas Glen No. 2 Subdivision. The site is designated "SFR" with no existing structures on the site. The site is primarily used for agricultural purposes with a few trees along the southern border of Tax Lots 800 and 803.

Surrounding Land Uses

North: The site abuts 14 residential lots within the southern portion of the Nicolas Glen No. 2 Subdivision. These properties have a general lot size of ±0.12 acres and are zoned Medium Density Residential (MDR) and are in the City. The planned access for Bailey Meadows Subdivision is via the existing right-of-way street stub terminus at Melissa Avenue, directly north of the project boundary.

East: The property to the east is within both the City's UGB and unincorporated Clackamas County and is zoned Rural Residential Farm Forest 5-Acre (RRFF-5). It is currently improved with a single-family dwelling which accesses off Ponder Lane.

South/West: The properties south and west of the site are undeveloped and located outside of the City's UGB and are zoned Exclusive Farm Use District (EFU) by Clackamas County.

III. Applicable Review Criteria

CITY OF SANDY MUNICIPAL CODE

Title 17 – DEVELOPMENT CODE

CHAPTER 17.18 - PROCESSING APPLICATIONS

17.18.00 PROCEDURES FOR PROCESSING LAND USE APPLICATIONS

An application shall be processed under a Type I, II, III or IV procedure. The differences between the procedures are generally associated with the different nature of the decisions as described in Chapter 17.12.

When an application and proposed development is submitted, the Director shall determine the type of procedure the Code specifies for its processing and the potentially affected agencies.

If a development proposal requires an applicant to file a land use application with the city (e.g. a design review application) and if there is a question as to the appropriate procedure to guide review of the application (e.g. a Type II versus a Type III design review process), the question will be resolved in favor of the lower type number.

If a development proposal requires an applicant to file more than one land use application with the city (e.g. a design review application and a variance) and if the development code provides that the applications are to be reviewed under separate types of procedures (e.g. a Type II design review and a Type III variance):

- the Director will generally elevate all of the required applications to the highest number procedure for review (e.g. the Type II design review application would be reviewed by the Planning Commission along with the Type III variance).

In situations where an applicant has attended a pre-application conference and has reviewed the application with the Director prior to submitting the applications, the Director may exercise his/her discretion to review the Type II application(s) at the staff level and only schedule a public hearing for the Type III portion(s) of the development proposal.

Response: The application requires a Type III Review Procedure, following conclusions of the November 20, 2018 pre-application conference (see response below).



17.18.20 PRE-APPLICATION CONFERENCE

A pre-application conference is required for all Type II, III, and IV applications unless the Director determines a conference is not needed. A request for a pre-application conference shall be made on the form provided by the city and will be scheduled following submittal of required materials and payment of fees. The purpose of the conference is to acquaint the applicant with the substantive and procedural requirements of the Code, provide for an exchange of information regarding applicable elements of the Comprehensive Plan and development requirements, arrange such technical and design assistance which will aid the applicant, and to otherwise identify policies and regulations that create opportunities or pose significant constraints for the proposed development. The Director will provide the applicant with notes from the conference within 10 days of the conference. These notes may include confirmation of the procedures to be used to process the application, a list of materials to be submitted, and the applicable code sections and criteria that may apply to the application. Any opinion expressed by the Director or City staff during a pre-application conference regarding substantive provisions of the City's code is advisory and is subject to change upon official review of the application.

Response: A pre-application conference was held with the City of Sandy on November 20, 2018. An additional meeting with City staff was held on January 29, 2019. This requirement is met.

17.18.30 LAND USE APPLICATION MATERIALS

Unless otherwise specified in this code, an application shall consist of the materials specified in this section, plus any other materials required by this Code.

- A. A completed application form and payment of fees.
- B. List and mailing labels of Affected Property Owners.
- C. An explanation of intent, stating the nature of the proposed development, reasons for the request, pertinent background information, information required by the Development Code and other material that may have a bearing in determining the action to be taken.
- D. Proof that the property affected by the application is in the exclusive ownership of the applicant, that the applicant has the consent of all parties in ownership of the affected property, or the applicant is the contractual owner.
- E. Legal description of the property affected by the application.
- F. Written narrative addressing applicable code chapters and approval criteria.
- G. Vicinity Map showing site in relation to local and collector streets, plus any other significant features in the nearby area.
- F. Site plan of proposed development
- G. Number of Copies to be Submitted:
 1. One copy of items A through D listed above;(...)

4. Type III: 15 copies of site plan and other materials required by the Code

The Director may vary the quantity of materials to be submitted as deemed necessary.

Response: The application submittal materials include the items listed above. The list and mailing labels are applicable to property owners within 500 feet of the subject properties. The remainder of the Code Section discusses the processing requirements to be completed by the City. For purposes of brevity, those Sections are not included in this narrative. This requirement is met.

CHAPTER 17.30 - ZONING DISTRICTS

17.30.20 RESIDENTIAL DENSITY CALCULATION PROCEDURE

The number of dwelling units permitted on a parcel of land is calculated after the determination of the net site area and the acreage of any restricted development areas (as defined by Chapter 17.60). Limited density transfers are permitted from restricted development areas to unrestricted areas consistent with the provisions of the Flood and Slope Hazard Area Overlay District, Chapter 17.60.

Calculation of Net Site Area (NSA): Net site area should be calculated in acres based upon a survey of the property boundaries excluding areas dedicated for public use.

- A. Minimum and Maximum Dwelling Units for Sites with No Restricted Areas. The allowable range of housing units on a piece of property is calculated by multiplying the net site area (NSA) in acres by the minimum and maximum number of dwelling units allowed in that zone.

For example: A site (NSA) containing 10 acres in the Single-Family Residential Zoning District requires a minimum of 30 units and allows a maximum of 58 units. (NSA x 3 units/acre = 30 units minimum) (NSA x 5.8 units/acre = 58 units maximum)

Response: The subject site is zoned Single Family Residential (SFR). The planned subdivision includes a total of 100 units on a total net site area of ±18.21 acres resulting in a net residential density of ±5.49 units per acre. This planned density falls within the minimum number of dwelling units required of 3 and the maximum of 5.8 units per acre. The tables below provide the details of the density calculations. Note that the gross site area excludes existing SE Ponder Lane right-of-way. The criteria are met.

Gross Area (AC)	ROW (AC)	NSA (AC)= GROSS-ROW		Units Per Acre	Density	Total Density
23.42	5.21	18.21	MIN	3	54.63	55
			MAX	5.8	105.62	106

- B. Minimum and Maximum Dwelling Units for Sites with Restricted Areas

-
1. Unrestricted Site Area: To calculate unrestricted site area (USA): subtract all restricted development areas (RDA) as defined by Section 17.60.20(A) from the net site area (NSA), if applicable.

$$\text{NSA} - \text{RDA} = \text{USA}$$

2. Minimum Required Dwelling Units: The minimum number of dwelling units required for the site is calculated using the following formula:

$$\text{USA (in acres)} \times \text{Minimum Density (Units per Acre) of Zoning District} = \text{Minimum Number of Dwelling Units Required.}$$

3. Maximum Allowed Dwelling Units: The maximum number of dwelling units allowed on a site is the lesser of the results of these two formulas:

- a. $\text{NSA (in acres)} \times \text{Maximum Density of Zoning District (units/acre)}$

- b. $\text{USA (in acres)} \times \text{Maximum Density of Zoning District (units/acre)} \times 1.5$ (maximum allowable density transfer based on Chapter 17.60)

For example: suppose a site in a zone with a maximum density of eight (8) units per acre has 6 acres of unrestricted site area (USA= 6) and two acres of restricted development area (RDA=2), for a total net site area of 8 acres (NSA= 8). Then NSA (8) x 8 units/acre = 64 and USA (6) x 8 units/acre x 1.5 = 72, so the maximum permitted number of dwelling units is 64 (the lesser of the two results).

Response: The project site does not contain any restricted areas. See Exhibit H for Flood and Slope Hazard Analysis. The criteria do not apply.

- C. Lot Sizes: Lot sizes shall comply with any minimum lot size standards of the underlying zoning district.

- D. Rounding: A dwelling unit figure is rounded down to the nearest whole number for all total maximum or minimum figures less than four dwelling units. For dwelling unit figures greater than four dwellings units, a partial figure of one-half or greater is rounded up to the next whole number.

For example: A calculation of 3.7 units is rounded down to 3 units. A calculation of 4.2 units is rounded down to 4 units and a calculation of 4.5 units is rounded up to 5 units.

Response: The application involves subdividing the subject site into 100 lots suitable for future single-family detached dwellings, all complying with the minimum lot size of 7,500 square feet. The subdivision also includes one tract for stormwater management infrastructure. Rounding as stated above is demonstrated in the density calculation. The criterion is met.

CHAPTER 17.34 - SINGLE-FAMILY RESIDENTIAL (SFR)

17.34.10 PERMITTED USES

- A. Primary Uses Permitted Outright:



1. Single detached dwelling subject to design standards in Chapter 17.90;

Response: The Applicant plans on building model homes with this subdivision. To the extent this cannot be done, the Applicant will work with the City and build a new single-family home on each of the lots of record prior to plat recordation, similar to a model home scenario.

2. Single detached manufactured dwelling subject to design standards in Chapter 17.90;

17.34.30 DEVELOPMENT STANDARDS

Type	Standard
A. Minimum Lot Area – Single detached dwelling	7,500 square ft.
B. Minimum Average Lot Width – Single detached dwelling	60 ft.
C. Minimum Lot Frontage	20 ft, except as allowed by Section 17.100.160
D. Minimum Average Lot Depth	No minimum
E. Setbacks (Main Building) Front Yard Rear Yard Side Yard (interior) Corner Lot	10 ft. minimum 20 ft. minimum 7.5 ft. minimum 10 ft. minimum on side abutting the street ¹
F. Setbacks (Garage/Carport)	22 ft. minimum for front vehicle access 15 ft. minimum if entrance is perpendicular to street (subject to Section 17.90.220) 5 ft. minimum for alley or rear access

Response: This application proposes lots for the permitted use of “single detached dwelling” listed above. The minimum standards for newly created lots in the SFR district are included in the table above. As planned, each of the lots meets the 20-foot minimum lot frontage to the street and the 60-foot average lot width for a single detached dwelling. The Preliminary Subdivision Plat, included in Exhibit A, demonstrates that future homes can meet the minimum setback requirements at the time of future building permit submittal. As shown, each lot meets the 7,500 square-foot minimum lot size requirement. The criteria are met.

17.34.40 MINIMUM REQUIREMENTS

- A. Must connect to municipal water.
- B. Must connect to municipal sewer if service is currently within 200 feet of the site. Sites more than 200 feet from municipal sewer, may be approved to connect to an alternative disposal system provided all of the following are satisfied:
 1. A county septic permit is secured and a copy is provided to the city;
 2. The property owner executes a waiver of remonstrance to a local improvement district and/or signs a deed restriction agreeing to complete improvements, including but not limited, to curbs, sidewalks, sanitary sewer, water, storm sewer or other improvements which directly benefit the property;

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- 3. The minimum size of the property is one acre or is a pre-existing buildable lot, as determined by the city;
 - 4. Site consists of a buildable parcel(s) created through dividing property in the city, which is less than five acres in size.
 - C. The location of any real improvements to the property must provide for a future street network to be developed.
 - D. Must have frontage or approved access to public streets.

Response: The Preliminary plans include information illustrating how the subdivision is planned to be serviced with municipal water, sanitary sewer, planned street network and improvements, and frontage on public streets. These criteria will be met.

17.34.50 ADDITIONAL REQUIREMENTS

- A. Design review as specified in Chapter 17.90 is required for all uses.

Response: This application involves a subdivision; design review for specific uses will be reviewed at the time of future permit submittal, if necessary. The standard is understood.

- B. Lots with 40 feet or less of street frontage shall be accessed by a rear alley or a shared private driveway.

Response: As illustrated by the Preliminary Plans, each lot is planned with at least 40 feet of street frontage. This criterion does not apply.

- C. Lots with alley access may be up to 10 percent smaller than the minimum lot size of the zone.

Response: Alleys are not included in this project. The criterion does not apply.

- D. **Zero Lot Line Dwellings:** Prior to building permit approval, the applicant shall submit a recorded easement between the subject property and the abutting lot next to the yard having the zero setback. This easement shall be sufficient to guarantee rights for maintenance purposes of structures and yard, but in no case shall it be less than 5 ft. in width.

Response: Building setback requirements will be reviewed at the time of future building permit submittal. This criterion is understood.

CHAPTER 17.60 - FLOOD & SLOPE HAZARD (FSH) OVERLAY DISTRICT

17.60.10 INTERPRETATION AND MAPPING

The Director has the ultimate responsibility for maintaining the FSH Overlay District on the City of Sandy Zoning Map, determining on-site measuring methods, and otherwise interpreting the provisions of this chapter. Technical terms used in this chapter are defined in Chapter 17.10, Definitions. This chapter does not regulate development on lots or parcels entirely outside the FSH Overlay District.

- A. **FSH Overlay District.** The only areas subject to the restrictions and prohibitions of the FSH overlay district are those indicated on the City of Sandy Zoning Map on file in the Planning Department and areas of special flood hazard identified by the Federal Insurance

Administration in a scientific and engineering report entitled, "Flood Insurance Study (FIS) for Clackamas County, Oregon and Incorporated Areas," dated January 18, 2019, with accompanying Flood Insurance Rate Maps (FIRMs). This chapter does not regulate lots or parcels entirely outside the FSH Overlay District.

1. The FIS and FIRMs are hereby adopted by reference and declared to be a part of Section 17.60 and are on file at the City of Sandy.

Response: According to the current Zoning Map, the site is located inside the City limits, within the UGB and is unaffected by the FSH Overlay. However, the project site was not included on the City's Goal 5 Inventory to determine whether wetlands, streams, or the FSH Overlay applies to the site because that inventory was created prior to the site's inclusion within the UGB and annexation to the City. A FSH Analysis (Exhibit H) is included in the application materials demonstrating that the FSH Overlay District does not apply to the project site.

B. **Development Approval Required.** No development shall occur within the FSH overlay district without first obtaining City approval under the provisions of this chapter. The Director shall notify the Oregon Division of State Lands whenever any inventoried wetland is proposed for development, in accordance with ORS 227.350. In riverine situations, the Director shall notify adjacent communities and the State Coordinating Office prior to any alteration or relocation of a watercourse, and submit copies of such notification to the administrator.

C. **Interpretation**

All provisions of the FSH overlay code shall be:

1. Considered as minimum requirements;
2. Liberally construed in favor of the governing body; and
3. Deemed neither to limit nor repeal any other powers granted under state statutes.

D. **Applicant Responsibilities.** The applicant for alteration or development within the FSH overlay district shall be responsible for preparing a survey of the entire site, based on site-specific field surveys or Corps of Engineers data that precisely maps and delineates the following areas:

1. The name, location and dimensions of affected streams or rivers, and the tops of their respective banks.
2. Area of Special Flood Hazard boundaries and elevations as determined by the January 18, 2019 FIS for Clackamas County and Incorporated Areas.

Response: According to Federal Emergency Management Area (FEMA) mapping, Special Flood Hazard Areas are not mapped within the project site.

3. The City of Sandy FSH overlay district boundary as depicted on the City of Sandy FSH Map.

Response: The subject site is not located within the City's FSH Overlay District.

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4. The water quality and slope setback area(s) as defined in Section 17.60.30.
 5. The size and location of locally significant wetlands shall be determined based on the City of Sandy Locally Significant Wetland Inventory (2002) unless modified by a wetland delineation approved by the Oregon Division of State Lands and submitted to the City. Wetland delineations that have formal concurrence from the Division of State Lands shall be valid for the period specified in that agency's administrative rules.

Response: The project site is located outside of the City of Sandy's Local Wetland Inventory.

6. Steep slope areas where the slope of the land is 25% or greater within the FSH overlay district boundary.
7. The area enclosed by a continuous line, measured 25 feet horizontally, parallel to and upland from the top of a steep slope area, where the top of the steep slope is within the FSH overlay district boundary.

Response: The FSH Analysis (Exhibit H) concludes that wetlands, waters, or slopes greater than 25% are not located on the subject site.

8. Existing public rights-of-way, structures, roads and utilities.
9. Natural vegetation, including trees or tree clusters and understory within the FSH Overlay District boundary.
10. Existing and proposed contours at 2-foot intervals.

Response: The FSH Analysis (Exhibit H) contains the applicable information as listed above. The criteria are met.

17.60.20 PERMITTED USES AND ACTIVITIES

This chapter lists permitted uses, or uses allowed under prescribed conditions, within the FSH overlay district. Where there are conflicts, this chapter supersedes the use provisions of the underlying district.

Response: The FSH Analysis (Exhibit H) documents that wetlands, waters, or slopes greater than 25% are not located on the subject site. Therefore, the FSH Overlay District does not apply to the project site and thus the criteria of Chapter 17.60 do not apply and have been omitted for brevity.

CHAPTER 17.84 - IMPROVEMENTS REQUIRED WITH DEVELOPMENT

17.84.20 TIMING OF IMPROVEMENTS

- A. All improvements required by the standards in this chapter shall be installed concurrently with development, as follows:
 1. Where a land division is proposed, each proposed lot shall have required public and franchise utility improvements installed or financially guaranteed in accordance with the provisions of Chapter 17 prior to approval of the final plat.

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2. Where a land division is not proposed, the site shall have required public and franchise utility improvements installed or financially guaranteed in accordance with the provisions of Chapter 17 prior to temporary or final occupancy of structures.

Response: As shown in the Preliminary Plans in Exhibit A, each lot is to be provided with utility, sanitary sewer, water, and stormwater infrastructure. The criterion is met.

- B. Where specific approval for a phasing plan has been granted for a planned development and/or subdivision, improvements may similarly be phased in accordance with that plan.

Response: As depicted in the Preliminary Plans, improvements are planned to be phased with the approved plans. See Exhibit A for detailed phasing logistics.

17.84.30 PEDESTRIAN AND BICYCLIST REQUIREMENTS

- A. Sidewalks shall be required along both sides of all arterial, collector, and local streets, as follows:

Response: As shown on the Preliminary Plans, sidewalks are planned to be provided on the streets within the subdivision and along the unimproved street stub section of Melissa Avenue.

1. Sidewalks shall be a minimum of 5 ft. wide on local streets. The sidewalks shall be separated from curbs by a tree planting area that provides separation between sidewalk and curb, unless modified in accordance with Subsection 3 below.

Response: As shown on the Preliminary Plans, sidewalks will be a minimum of 5 feet wide on the local street sections interior to the subdivision. See Exhibit A for detailed landscaping plans. The criterion is met.

2. Sidewalks along arterial and collector streets shall be separated from curbs with a planting area, except as necessary to continue an existing curb-tight sidewalk. The planting area shall be landscaped with trees and plant materials approved by the City. The sidewalks shall be a minimum of 6 ft. wide.

Response: The project site does not include proposed arterial or collector streets. The criterion does not apply.

3. Sidewalk improvements shall be made according to city standards, unless the city determines that the public benefit in the particular case does not warrant imposing a severe adverse impact to a natural or other significant feature such as requiring removal of a mature tree, requiring undue grading, or requiring modification to an existing building. Any exceptions to the standards shall generally be in the following order.

- a) Narrow landscape strips
- b) Narrow sidewalk or portion of sidewalk to no less than 4 feet in width

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- c) Eliminate landscape strips
 - d) Narrow on-street improvements by eliminating on-street parking
 - e) Eliminate sidewalks

Response: As shown on the Preliminary Plans, sidewalks are planned adjacent to the new streets within the subdivision. The criteria do not apply.

4. The timing of the installation of sidewalks shall be as follows:

- a) Sidewalks and planted areas along arterial and collector streets shall be installed with street improvements, or with development of the site if street improvements are deferred.

Response: The project site does not include proposed arterial or collector streets. The criterion does not apply.

- b) Sidewalks along local streets shall be installed in conjunction with development of the site, generally with building permits, except as noted in (c) below.

Response: Sidewalks are planned to be completed in conjunction with frontage improvements as phased with the approved plans. The criterion is met.

- c) Where sidewalks on local streets abut common areas, drainageways, or other publicly owned or semi-publicly owned areas, the sidewalks and planted areas shall be installed with street improvements.

Response: The project site does not abut drainageways, publicly owned areas, or common areas. The criterion does not apply.

B. Safe and convenient pedestrian and bicyclist facilities that strive to minimize travel distance to the extent practicable shall be provided in conjunction with new development within and between new subdivisions, planned developments, commercial developments, industrial areas, residential areas, public transit stops, school transit stops, and neighborhood activity centers such as schools and parks, as follows:

- 1. For the purposes of this section, “safe and convenient” means pedestrian and bicyclist facilities that: are reasonably free from hazards which would interfere with or discourage travel for short trips; provide a direct route of travel between destinations; and meet the travel needs of pedestrians and bicyclists considering destination and length of trip.

Response: Pedestrian routes as planned are safe, direct, and convenient and don’t deviate unnecessarily from a straight line, involve a significant amount of out-of-direction travel for likely users, or contain hazards. The criteria are met.

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2. To meet the intent of “B” above, right-of-ways connecting cul-de-sacs or passing through unusually long or oddly shaped blocks shall be a minimum of 15 ft. wide with 8 feet of pavement.

Response: The application does not include cul-de-sac improvements or unusual blocks; the criterion is met.

3. 12 feet wide pathways shall be provided in areas with high bicycle volumes or multiple use by bicyclists, pedestrians, and joggers.

Response: The application does not involve high volume pedestrian travel. The criterion does not apply.

4. Pathways and sidewalks shall be encouraged in new developments by clustering buildings or constructing convenient pedestrian ways. Pedestrian walkways shall be provided in accordance with the following standards:

- a) The pedestrian circulation system shall be at least five feet in width and shall connect the sidewalk on each abutting street to the main entrance of the primary structure on the site to minimize out of direction pedestrian travel.
- b) Walkways at least five feet in width shall be provided to connect the pedestrian circulation system with existing or planned pedestrian facilities which abut the site but are not adjacent to the streets abutting the site.
- c) Walkways shall be as direct as possible and avoid unnecessary meandering.
- d) Walkway/driveway crossings shall be minimized. Internal parking lot design shall maintain ease of access for pedestrians from abutting streets, pedestrian facilities, and transit stops.

Response: As shown on the Preliminary Plans, pedestrian walkways are intended to connect to the existing and planned pedestrian circulation system and future building entrances. Therefore, the applicable standards above are met.

- e) With the exception of walkway/driveway crossings, walkways shall be separated from vehicle parking or vehicle maneuvering areas by grade, different paving material, painted crosshatching or landscaping. They shall be constructed in accordance with the sidewalk standards adopted by the City. (This provision does not require a separated walkway system to collect drivers and passengers from cars that have parked on site unless an unusual parking lot hazard exists).

Response: The application does not involve common space walkways of this nature. Therefore, the criteria are not applicable.

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- f) Pedestrians amenities such as covered walk-ways, awnings, visual corridors and benches will be encouraged. For every two benches provided, the minimum parking requirements will be reduced by one, up to a maximum of four benches per site. Benches shall have direct access to the circulation system.

Response: The application does not include pedestrian amenities as described above. The criterion is not applicable.

- C. Where a development site is traversed by or adjacent to a future trail linkage identified within the Transportation System Plan, improvement of the trail linkage shall occur concurrent with development. Dedication of the trail to the City shall be provided in accordance with 17.84.80.

Response: According to the City of Sandy's Transportation System Plan (the "TSP"), there are no existing or planned trails adjacent to the project site which warrant a linkage. Therefore, the standard does not apply. However, this application is not subject to the TSP as explained above.

- D. To provide for orderly development of an effective pedestrian network, pedestrian facilities installed concurrent with development of a site shall be extended through the site to the edge of adjacent property(ies).

Response: As illustrated by the Preliminary Plans, a continuous pedestrian pathway system extending from the Nicolas Glen No. 2 Subdivision throughout the site is planned concurrently with each individual project phase. Sidewalks are planned to be completed prior to occupancy of the adjoining home, as indicated on the Preliminary Plans. Therefore, the standard is met.

- E. To ensure improved access between a development site and an existing developed facility such as a commercial center, school, park, or trail system, the Planning Commission or Director may require off-site pedestrian facility improvements concurrent with development.

Response: Existing adjacent trails, future phases, or public parks that warrant a connection are not included in the project. Therefore, the standard does not apply.

17.84.40 TRANSIT AND SCHOOL BUS TRANSIT REQUIREMENTS

- A. Development sites located along existing or planned transit routes shall, where appropriate, incorporate bus pull-outs and/or shelters into the site design. These improvements shall be installed in accordance with the guidelines and standards of the transit agency. School bus pull-outs and/or shelters may also be required, where appropriate, as a condition of approval for a residential development of greater than 50 dwelling units where a school bus pick-up point is anticipated to serve a large number of children.
- B. New developments at or near existing or planned transit or school bus transit stops shall design development sites to provide safe, convenient access to the transit system, as follows:

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1. Commercial and civic use developments shall provide a prominent entrance oriented towards arterial and collector streets, with front setbacks reduced as much as possible to provide access for pedestrians, bicycles, and transit.
 2. All developments shall provide safe, convenient pedestrian walkways between the buildings and the transit stop, in accordance with the provisions of 17.84.30 B.

Response: The project site is not located along any existing or planned transit or school bus transit stops. The criteria do not apply.

A. Traffic evaluations may be required of all development proposals in accordance with the following:

1. A proposal establishing the scope of the traffic evaluation shall be submitted for review to the City Engineer. The evaluation requirements shall reflect the magnitude of the project in accordance with accepted traffic engineering practices. Large projects should assess all nearby key intersections. Once the scope of the traffic evaluation has been approved, the applicant shall present the results with an overall site development proposal. If required by the City Engineer, such evaluations shall be signed by a Licensed Professional Civil Engineer or Licensed Professional Traffic Engineer licensed in the State of Oregon.

Response: The Traffic Impact Analysis (Exhibit F) assesses the traffic in accordance with planned site improvements and accepted traffic engineering practices. The standard is met.

2. If the traffic evaluation identifies level-of-service conditions less than the minimum standard established in the Transportation System Plan, improvements and funding strategies mitigating the problem shall be considered concurrent with a development proposal.

Response: The Traffic Impact Analysis (Exhibit F) reports conditions which meet the minimum standard established in the Transportation System Plan. The criterion does not apply.

B. Location of new arterial streets shall conform to the Transportation System Plan in accordance with the following:

1. Arterial streets should generally be spaced in one-mile intervals.
2. Traffic signals should generally not be spaced closer than 1500 ft. for reasonable traffic progression.

Response: This application does not include construction of new arterial streets. The criteria do not apply.

C. Local streets shall be designed to discourage through traffic. NOTE: for the purposes of this section, "through traffic" means the traffic traveling through an area that does not have a local origination or destination. To discourage through traffic and excessive vehicle speeds the following street design characteristics shall be considered, as well as other designs intended to discourage traffic:

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1. Straight segments of local streets should be kept to less than a quarter mile in length. As practical, local streets should include traffic calming features, and design features such as curves and “T” intersections while maintaining pedestrian connectivity.
 2. Local streets should typically intersect in “T” configurations rather than 4-way intersections to minimize conflicts and discourage through traffic. Adjacent “T” intersections shall maintain a minimum of 150 ft. between the nearest edges of the 2 rights-of-way.

Response: The Preliminary Plans include information on the local street pattern and intersections internal to the subdivision. The design incorporates curves, “T” intersections, straight segments less than a quarter mile in length, and maintains pedestrian connectivity. The traffic traveling through the area will be of local origin. The criteria are met.

3. Cul-de-sacs should generally not exceed 400 ft. in length nor serve more than 20 dwelling units, except in cases where existing topography, wetlands, or drainage systems or other existing features necessitate a longer cul-de-sac in order to provide adequate access to an area. Cul-de-sacs longer than 400 feet or developments with only one access point may be required to provide an alternative access for emergency vehicle use only, install fire prevention sprinklers, or provide other mitigating measures, determined by the City.

Response: The project site does not include cul-de-sacs. The standard does not apply.

- D. Development sites shall be provided with access from a public street improved to City standards in accordance with the following:
 1. Where a development site abuts an existing public street not improved to City standards, the abutting street shall be improved to City standards along the full frontage of the property concurrent with development.
 2. Half-street improvements are considered the minimum required improvement. Three-quarter-street or full-street improvements shall be required where traffic volumes generated by the development are such that a half-street improvement would cause safety and/or capacity problems. Such a determination shall be made by the City Engineer.
 3. To ensure improved access to a development site consistent with policies on orderly urbanization and extension of public facilities the Planning Commission or Director may require off-site improvements concurrent with development. Off-site improvement requirements upon the site developer shall be reasonably related to the anticipated impacts of the development.
 4. Reimbursement agreements for ¾ street improvements (i.e., curb face to curb face) may be requested by the developer per Chapter 12 of the SMC.

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5. A ½ street improvement includes curb and pavement 2 feet beyond the center line of the right-of-way. A ¾ street improvement includes curbs on both sides of the side and full pavement between curb faces.

Response: The Preliminary Plans show the project site is provided with access extending from Melissa Avenue, an existing public street right-of-way stubbed to the property. Per the Preliminary Plans, a fee-in-lieu of half-street improvements is planned on east SE Ponder Lane. Required frontage improvements on streets applicable to the project site will be completed as necessary. The criterion is met.

- E. As necessary to provide for orderly development of adjacent properties, public streets installed concurrent with development of a site shall be extended through the site to the edge of the adjacent property(ies) in accordance with the following:

1. Temporary dead-ends created by this requirement to extend street improvements to the edge of adjacent properties may be installed without turn-arounds, subject to the approval of the Fire Marshal.
2. In order to assure the eventual continuation or completion of the street, reserve strips may be required.

Response: The Preliminary Plans illustrate local street sections extending through the site to the edge of the property boundaries. Temporary dead-ends, as necessary, can be provided in the phase it is associated with, as indicated on the Preliminary Plans. The criteria can be met.

- F. Where required by the Planning Commission or Director, public street improvements may be required through a development site to provide for the logical extension of an existing street network or to connect a site with a nearby neighborhood activity center, such as a school or park. Where this creates a land division incidental to the development, a land partition shall be completed concurrent with the development.

Response: This application does not include an incidental land division as stated above. The standard does not apply.

- G. Except for extensions of existing streets, no street names shall be used that will duplicate or be confused with names of existing streets. Street names and numbers shall conform to the established pattern in the surrounding area and be subject to approval of the Director.

Response: Street names which conform to the surrounding area will be subjected to the approval of the Director. The criterion is met.

- H. Location, grades, alignment, and widths for all public streets shall be considered in relation to existing and planned streets, topographical conditions, public convenience and safety, and proposed land use. Where topographical conditions present special circumstances, exceptions to these standards may be granted by the City Engineer provided the safety and capacity of the street network is not adversely affected. The following standards shall apply:

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1. Location of streets in a development shall not preclude development of adjacent properties. Streets shall conform to planned street extensions identified in the Transportation Plan and/or provide for continuation of the existing street network in the surrounding area.
 2. Grades shall not exceed 6 percent on arterial streets, 10 percent on collector streets, and 15 percent on local streets.

Response: The planned locations of streets internal to the subdivision provide continuation of the existing street network stemming from the stub at Melissa Avenue, as identified in the Transportation Plan. Location of streets internal to the subdivision do not preclude development of adjacent properties. The grades on the planned local streets are not intended to exceed 15 percent; the project does not include arterial or collector streets. It is understood that if any special circumstances are identified, the standards of this Section will apply and be reviewed for compliance by the City Engineer. The criterion is met.

3. As far as practical, arterial streets and collector streets shall be extended in alignment with existing streets by continuation of the street centerline. When staggered street alignments resulting in “T” intersections are unavoidable, they shall leave a minimum of 150 ft. between the nearest edges of the two rights-of-way.

Response: The project site does not include the extension of arterial or collector streets. The standard does not apply.

4. Centerline radii of curves shall not be less than 500 ft. on arterial streets, 300 ft. on collector streets, and 100 ft. on local streets.

Response: The Preliminary Plans show the centerline radii of curves are not less than 100-foot on internal local streets. The standard is met.

5. Streets shall be designed to intersect at angles as near as practicable to right angles and shall comply with the following:
 - a) The intersection of an arterial or collector street with another arterial or collector street shall have a minimum of 100 ft. of straight (tangent) alignment perpendicular to the intersection.

Response: The project site does not include arterial or collector streets. The criterion does not apply.

- b) The intersection of a local street with another street shall have a minimum of 50 ft. of straight (tangent) alignment perpendicular to the intersection.
- c) Where right angle intersections are not possible, exceptions can be granted by the City Engineer provided that intersections not at right angles have a minimum corner radius of 20 ft. along the right-of-way lines of the acute angle.

-
- d) Intersections with arterial streets shall have a minimum curb corner radius of 20 ft. All other intersections shall have a minimum curb corner radius of 10 ft.

Response: The project site does not intersect with existing arterial streets. The criteria do not apply.

- 6. Right-of-way and improvement widths shall be as specified by the Transportation System Plan. Exceptions to those specifications may be approved by the City Engineer to deal with specific unique physical constraints of the site.

Response: As shown on the Preliminary Plans, right-of-way and improvement widths for streets within Bailey Meadows are being designed in accordance with City standards. The criterion is met.

- J. Private streets may be considered within a development site provided all the following conditions are met:

Response: This application includes public, local street infrastructure and thus the criteria for private streets do not apply and has been deleted for brevity.

17.84.60 PUBLIC FACILITY EXTENSIONS

- A. All development sites shall be provided with public water, sanitary sewer, broadband (fiber), and storm drainage.
- B. Where necessary to serve property as specified in "A" above, required public facility installations shall be constructed concurrent with development.
- C. Off-site public facility extensions necessary to fully serve a development site and adjacent properties shall be constructed concurrent with development.
- D. As necessary to provide for orderly development of adjacent properties, public facilities installed concurrent with development of a site shall be extended through the site to the edge of adjacent property(ies).
- E. All public facility installations required with development shall conform to the City's facilities master plans.

Response: The Preliminary Plans include information detailing the nature of public facility extensions to each lot, and to the edge of properties adjacent to the subdivision, where applicable. Installations are planned to be completed concurrent with the approved phasing of the subdivision and conform to the City's facilities master plans. The criteria are met.

- F. Private on-site sanitary sewer and storm drainage facilities may be considered provided all the following conditions exist:
 - 1. Extension of a public facility through the site is not necessary for the future orderly development of adjacent properties;
 - 2. The development site remains in one ownership and land division does not occur (with the exception of land divisions that may occur under the provisions of 17.84.50 F above);

-
3. The facilities are designed and constructed in accordance with the Uniform Plumbing Code and other applicable codes, and permits and/or authorization to proceed with construction is issued prior to commencement of work.

Response: The application does not include private facilities as described above. The criterion does not apply.

17.84.70 PUBLIC IMPROVEMENT PROCEDURES

It is in the best interests of the community to ensure public improvements installed in conjunction with development are constructed in accordance with all applicable City policies, standards, procedures, and ordinances. Therefore, prior to commencement of installation of public water, sanitary sewer, storm drainage, broadband (fiber), street, bicycle, or pedestrian improvements for any development site, developers shall contact the City Engineer to receive information regarding adopted procedures governing plan submittal, plan review and approval, permit requirements, inspection and testing requirements, progress of the work, and provision of easements, dedications, and as-built drawings for installation of public improvements. All work shall proceed in accordance with those adopted procedures, and all applicable City policies, standards, and ordinances.

Whenever any work is being done contrary to the provisions of this Code, the Director may order the work stopped by notice in writing served on the persons engaged in performing the work or causing the work to be performed. The work shall stop until authorized by the Director to proceed with the work or with corrective action to remedy substandard work already completed.

Response: Site work is planned to be completed in accordance with the public improvement procedures described above.

17.84.80 FRANCHISE UTILITY INSTALLATIONS

These standards are intended to supplement, not replace or supersede, requirements contained within individual franchise agreements the City has with providers of electrical power, telephone, cable television, and natural gas services (hereinafter referred to as "franchise utilities").

- A. Where a land division is proposed, the developer shall provide franchise utilities to the development site. Each lot created within a subdivision shall have an individual service available or financially guaranteed prior to approval of the final plat.
- B. Where necessary, in the judgment of the Director, to provide for orderly development of adjacent properties, franchise utilities shall be extended through the site to the edge of adjacent property(ies), whether or not the development involves a land division.
- C. The developer shall have the option of choosing whether or not to provide natural gas or cable television service to the development site, providing all of the following conditions exist:
 1. Extension of franchise utilities through the site is not necessary for the future orderly development of adjacent property(ies);

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2. The development site remains in one ownership and land division does not occur (with the exception of land divisions that may occur under the provisions of 17.84.50 F above); and
 3. The development is non-residential.

D. Where a land division is not proposed, the site shall have franchise utilities required by this section provided in accordance with the provisions of 17.84.70 prior to occupancy of structures.

E. All franchise utility distribution facilities installed to serve new development shall be placed underground except as provided below. The following facilities may be installed above-ground:

1. Poles for street lights and traffic signals, pedestals for police and fire system communications and alarms, pad mounted transformers, pedestals, pedestal mounted terminal boxes and meter cabinets, concealed ducts, substations, or facilities used to carry voltage higher than 35,000 volts;
2. Overhead utility distribution lines may be permitted upon approval of the City Engineer when unusual terrain, soil, or other conditions make underground installation impracticable. Location of such overhead utilities shall follow rear or side lot lines wherever feasible.

Response: The Preliminary Plans include information for franchise utility installations. The installation of franchise utilities will be in accordance with the provisions of this Section and arranged with franchise utility providers. The criteria are met.

F. The developer shall be responsible for making necessary arrangements with franchise utility providers for provision of plans, timing of installation, and payment for services installed. Plans for franchise utility installations shall be submitted concurrent with plan submittal for public improvements to facilitate review by the City Engineer.

Response: The Preliminary Plans include information for franchise utility installations. The standard is met.

G. The developer shall be responsible for installation of underground conduit for street lighting along all public streets improved in conjunction with the development in accordance with the following:

1. The developer shall coordinate with the City Engineer to determine the location of future street light poles. The street light plan shall be designed to provide illumination meeting standards set by the City Engineer.
2. The developer shall make arrangements with the serving electric utility for trenching prior to installation of underground conduit for street lighting.

Response: The installation of franchise utilities will be in accordance with the provisions of this Section and arranged with franchise utility providers. The criteria are met.

17.84.90 LAND FOR PUBLIC PURPOSES

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- A. Easements for public sanitary sewer, water, storm drain, pedestrian and bicycle facilities shall be provided whenever these facilities are located outside a public right-of-way in accordance with the following:
1. When located between adjacent lots, easements shall be provided on one side of a lot line.
 2. The minimum easement width for a single utility is 15 ft. The minimum easement width for two adjacent utilities is 20 ft. The easement width shall be centered on the utility to the greatest extent practicable. Wider easements may be required for unusually deep facilities.
- B. Public utility easements with a minimum width of 5 feet shall be provided adjacent to all street rights-of-way for franchise utility installations.

Response: The Preliminary Subdivision Plat in the Preliminary Plans depicts required dedications and easements. The criteria are met.

- C. Where a development site is traversed by a drainageway or water course, a drainage way dedication shall be provided to the City.

Response: The project site does not include water course or drainageway, as reported in the FSH Analysis (Exhibit H). This criterion does not apply.

- D. Where a development is traversed by, or adjacent to, a future trail linkage identified within the Transportation System Plan, dedications of suitable width to accommodate the trail linkage shall be provided. This width shall be determined by the City Engineer, considering the type of trail facility involved.

Response: The project site does not contain adjacent or future trails within the Transportation System Plan. This criterion does not apply.

- E. Where existing rights-of-way and/or easements within or adjacent to development sites are nonexistent or of insufficient width, dedications may be required. The need for and widths of those dedications shall be determined by the City Engineer.

Response: As shown on the Preliminary Plans, right-of-way and improvement widths for streets within Bailey Meadows are being designed in accordance with City standards. Dedications related to existing right-of-way on SE Ponder Lane, east adjacent to the subdivision, are detailed for review by the City Engineer. The criterion is met.

- F. Where easement or dedications are required in conjunction with land divisions, they shall be recorded on the plat. Where a development does not include a land division, easements and/or dedications shall be recorded on standard document forms provided by the City Engineer.

Response: The Preliminary Subdivision Plat in Exhibit A includes details of necessary easements and dedications to be recorded on the plat as required. The criteria are met.

- G. If the City has an interest in acquiring any portion of a proposed subdivision or planned development site for a public purpose, other

than for those purposes listed above, or if the City has been advised of such interest by a school district or other public agency, and there is a reasonable assurance that steps will be taken to acquire the land, the Planning Commission may require those portions of the land be reserved for public acquisition for a period not to exceed 1 year.

Response: Other than for necessary supporting public infrastructure, this application does not include land designated for a public purpose. The criteria do not apply.

H. Environmental assessments for all lands to be dedicated to the public or City may be required to be provided by the developer. An environmental assessment shall include information necessary for the City to evaluate potential liability for environmental hazards, contamination, or required waste cleanups related to the dedicated land. An environmental assessment shall be completed prior to the acceptance of dedicated lands in accordance with the following:

1. The initial environmental assessment shall detail the history of ownership and general use of the land by past owners. Upon review of the information provided by the grantor, as well as any site investigation by the City, the Director will determine if the risks of potential contamination warrant further investigation. When further site investigation is warranted, a Level I Environmental Assessment shall be provided by the grantor.

Response: Other than for necessary supporting public infrastructure, this application does not include land designated for a public purpose. The criteria do not apply.

17.84.100 MAIL DELIVERY FACILITIES

- A. In establishing placement of mail delivery facilities, locations of sidewalks, bikeways, intersections, existing or future driveways, existing or future utilities, right-of-way and street width, and vehicle, bicycle and pedestrian movements shall be considered. The final location of these facilities shall meet the approval of the City Engineer and the Post Office. Where mail delivery facilities are being installed in conjunction with a land division, placement shall be indicated on the plat and meet the approval of the City Engineer and the Post Office prior to final plat approval.
- B. Where mail delivery facilities are proposed to be installed in areas with an existing or future curb-tight sidewalk, a sidewalk transition shall be provided that maintains the required design width of the sidewalk around the mail delivery facility. If the right-of-way width will not accommodate the sidewalk transition, a sidewalk easement shall be provided adjacent to the right-of-way.
- C. Mail delivery facilities and the associated sidewalk transition (if necessary) around these facilities shall conform with the City's standard construction specifications. Actual mailbox units shall conform with the Post Office standards for mail delivery facilities.
- D. Installation of mail delivery facilities is the obligation of the developer. These facilities shall be installed concurrently with the public improvements. Where development of a site does not require public improvements, mail delivery facilities shall be installed concurrently with private site improvements.

Response: In conjunction with the final construction plans, locations for mail delivery facilities will be coordinated and established with the U.S. Post Office.

CHAPTER 17.86 - PARKLAND & OPEN SPACE

Parkland Dedication: New residential subdivisions, planned developments, multi-family or manufactured home park developments shall be required to provide parkland to serve existing and future residents of those developments. Multi-family developments which provide some "congregate" services and/or facilities, such as group transportation, dining halls, emergency monitoring systems, etc., but which have individual dwelling units rather than sleeping quarters only, are considered to be multi-family developments for the purpose of parkland dedication. Licensed adult congregate living facilities, nursing homes, and all other similar facilities which provide their clients with individual beds and sleeping quarters, but in which all other care and services are communal and provided by facility employees, are specifically exempt from parkland dedication and system development fee requirements.

1. The required parkland shall be dedicated as a condition of approval for the following:
 - a. Tentative plat for a subdivision or partition;
2. Calculation of Required Dedication: The required parkland acreage to be dedicated is based on a calculation of the following formula rounded to the nearest 1/100 (0.00) of an acre:

Required parkland dedication (acres) = (proposed units) x (persons/unit) x 0.0043 (per person park land dedication factor)

- a. Population Formula: The following table shall be used to determine the number of persons per unit to be used in calculating required parkland dedication:

Type of Unit	Total Persons Per Unit
Single-family residential	3.0

Persons per unit, age distribution, and local conditions change with time. The specific formula for the dedication of land will, therefore, be subject to periodic review and amendment.

- b. Per Person Parkland Dedication Factor: The total parkland dedication requirement shall be 0.0043 of an acre per person based on the adopted standard of 4.3 acres of land per one thousand of ultimate population per the Parks Master Plan

1. This standard represents the citywide land-to-population ratio for city parks, and may be adjusted periodically through amendments to the Parks Master Plan.

Response: The criteria above are satisfied by means of a fee in lieu of parkland dedication per the City standard 17.86.40. The remainder of Chapter 17 Section 86, which does not apply to the project, has been omitted for brevity.

17.86.40 CASH IN LIEU OF DEDICATION

At the city’s discretion only, the city may accept payment of a fee in lieu of land dedication. The city may require payment in lieu of land when the park land to be dedicated is less than 3 acres. A payment in lieu of land dedication is separate from Park Systems Development Charges, and is not eligible for a credit of Park Systems Development Charges. The amount of the fee in lieu of land dedication (in dollars per acre) shall be set by City Council Resolution, and it shall be based on the typical market value of developed property (finished lots) in Sandy net of related development costs.

1. The following factors shall be used in the choice of whether to accept land or cash in lieu:

Response: This application is a “Needed Housing” application pursuant to ORS 197.303(1) and ORS 197.307(4), therefore, only objective standards and procedures apply to the application review. The choice between dedication and payment is subjective, as is the procedure to make the recommendation on the choice.

- a. The topography, geology, access to, parcel size, and location of land in the development available for dedication;

Response: This criterion is subjective and cannot be applied to a “Needed Housing” application under ORS 197.307(4).

- b. Potential adverse/beneficial effects on environmentally sensitive areas;

Response: This application does not include any environmentally sensitive areas as reported in the FSH Analysis (Exhibit H). The criterion does not apply.

- c. Compatibility with the Parks Master Plan, Public Facilities element of the Comprehensive Plan, and the City of Sandy Capital Improvements Program in effect at the time of dedication;

Response: This application is a “Limited Land Use Decision” pursuant to ORS 197.195(1) and Plans may be approval criteria only if specific policies are incorporated into the City’s land use regulations. The City’s land use regulation’s approval criteria in SDC 17.100.60 do not incorporate the 1997 Parks Master Plan, nor the above Plans with the specificity required by ORS 197.195(1), so they are not mandatory approval criteria and do not apply to this application.

- d. Availability of previously acquired property; and
- e. The feasibility of dedication.

Response: The above criteria are subjective and cannot be applied to a “Needed Housing” application per ORS 197.307(4).

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2. Cash in lieu of parkland dedication shall be paid prior to approval of the final plat or as specified below:
 - a. 50 percent of the payment shall be paid prior to final plat approval, and
 - b. The remaining 50 percent of the payment pro-rated equally among the lots, plus an administrative surcharge as determined by the City Council through a resolution, will constitute a lien against the property payable at the time of sale.

Response: Cash in lieu of parkland dedication will be paid as determined and recorded in the resolution. The table below provides a preliminary cost estimate calculation. The criteria can be met.

CASH IN LIEU OF DEDICATION	
Proposed Units	100
Persons Per Unit	3
Per Person Parkland Dedication Factor	0.0043
Required Parkland (Acres)	1.29
Cash in Lieu Cost Estimate	\$310,890

CHAPTER 17.90 - DESIGN STANDARDS

17.90.10 APPLICABILITY

The provisions of this chapter apply to all zones and uses as follows except as specified in Sections 17.90.10(B), (C), (D), (E), and (F) below:

- C. **Residential Dwelling Exception:** Single family dwellings, duplexes, manufactured dwellings on individual lots of record, and manufactured dwellings in parks are exempt from all requirements of this chapter except for Section 17.90.150.

Response: This application involves a planned subdivision of lots suitable for future single-family detached dwellings. The Preliminary Dimensioned Subdivision Plan with Setbacks, included in Exhibit A, demonstrates that future homes can meet the minimum setback requirements of the Single-Family Residential zone. The residential design standards, which apply to the street-facing facades of all new single-family dwellings, will be assessed at time of future building permit submittal. The remainder of Section 17.90.150 has been omitted for brevity.

CHAPTER 17.92 - LANDSCAPING & SCREENING GENERAL STANDARDS - ALL ZONES

17.92.30 REQUIRED TREE PLANTINGS

Planting of trees is required for all parking lots with 4 or more parking spaces, public street frontages, and along private drives more than 150 feet long. Trees shall be planted outside the street right-of-way except where there is a designated planting strip or City adopted street tree plan.

The City maintains a list of appropriate trees for street tree and parking lot planting situations. Selection of species should be made from the city-approved list. Alternate selections may be approved by the Director following written request. The type of tree used shall determine frequency of trees in planting areas. Trees in parking areas shall be dispersed throughout the lot to provide a canopy for shade and visual relief.

Area/Type of Planting	Canopy	Spacing
Street Tree	Medium	30 ft. on center
Street Tree	Large	50 ft. on center

Trees may not be planted:

- Within 5 ft. of permanent hard surface paving or walkways, unless specific species, special
- planting techniques and specifications approved by the Director are used.
- Unless approved otherwise by the City Engineer:
 - Within 10 ft. of fire hydrants and utility poles
 - Within 20 ft. of street light standards
 - Within 5 ft. from an existing curb face
 - Within 10 ft. of a public sanitary sewer, storm drainage or water line
- Where the Director determines the trees may be a hazard to the public interest or general welfare.
- Trees shall be pruned to provide a minimum clearance of 8 ft. above sidewalks and 12 ft. above street and roadway surfaces.

Response: As shown on the Preliminary Street Tree and Stormwater Screening Planting Plan (included in Exhibit A), required street trees and planting strips are generally planned to be completed prior to occupancy of the adjoining lot. Street trees and planting strips that are located along the stormwater facility and at the site access are planned to be completed with the subdivision infrastructure as shown on the Preliminary Plans. Landscaping will be provided in accordance with the above criteria. Therefore, this standard is met.

17.92.40 IRRIGATION

Landscaping shall be irrigated, either with a manual or automatic system, to sustain viable plant life.

Response: This standard is understood. No additional response is necessary.

17.92.60 REVEGETATION IN UNLANDSCAPED OR NATURAL LANDSCAPED AREAS

- A. Areas where natural vegetation has been removed or damaged through grading or construction activity in areas not affected by the landscaping requirements and that are not to be occupied by structures or other improvements shall be replanted.

- B. Plant material shall be watered at intervals sufficient to assure survival and growth.
- C. The use of native plant materials or plants acclimatized to the Pacific Northwest is encouraged to reduce irrigation and maintenance demands.

Response: This standard is understood. No additional response is necessary.

17.98.20 OFF-STREET PARKING REQUIREMENTS

- A. Off Street Parking Requirements. Off street parking shall conform to the following standards:
 1. All square footage measurements are gross square feet of total floor area.
 2. 18 lineal inches of bench shall be considered 1 seat.
 3. Except as otherwise specified, parking for employees shall be provided based on 1 space per 2 employees for the largest shift in addition to required parking specified in Sections A6-A9 below.
 4. Where less than 5 parking spaces are required, then only one bicycle space shall be required except as otherwise modified in Sections 5-9 below.
 5. In addition to requirements for residential off street parking, new dwellings shall meet the on-street parking requirements in Section 17.98.200.

Residential Uses	Number of Parking Spaces	Number of Bicycle Spaces
Single Family Detached	2 per dwelling	0

Response: This application is for a residential subdivision suitable for single-family detached homes. As shown on the Preliminary Parking Plan in Exhibit A, future driveways provide for two off-street parking spaces per dwelling. Bicycle parking is not required or provided. As applicable, the criteria above are met.

17.98.200 RESIDENTIAL ON-STREET PARKING REQUIREMENTS

- A. Residential On-Street Parking Requirements. Residential on-street parking shall conform to the following standards:
 1. In addition to required off-street parking, all new residential planned developments, subdivisions and partitions shall provide one (1) on-street parking space within 200 feet of each dwelling except as provided in Section 17.98.200(A)(6) below.

Response: As shown on the Preliminary Parking Plan in Exhibit A, in addition to required off-street parking, the 100-lot subdivision is planned to provide 122 on-street parking spaces. The criterion is met.

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2. The location of residential on-street parking shall be reviewed for compliance with this section through submittal of a Residential Parking Analysis Plan as required in Section 17.98.10(M).

Response: The Preliminary Plans (Exhibit A) include a Preliminary Parking Plan sheet. The submittal requirements are met.

3. Residential on-street parking shall not obstruct required clear vision areas and shall not violate any local or state laws.
4. Parallel residential on-street parking spaces shall be 22 feet minimum in length.
5. Residential on-street parking shall be measured along the curb from the outside edge of a driveway wing or curb cut. Parking spaces must be set back a minimum of 15 feet from an intersection and may not be located within 10 feet of a fire hydrant.

Response: As shown on the Preliminary Parking Plan in Exhibit A, on-street parking is planned to not obstruct clear vision areas. Parallel on-street parking spaces meet the minimum length and setback requirements as detailed above. The criteria are met.

6. Portions of residential on-street parking required by this section may be provided in parking courts that are interspersed throughout a development when the following standards are met:
 - a. No more than eight (8) parking spaces shall be provided in a parking court;
 - b. Parking spaces within a parking court shall be nine (9) feet wide and 18 feet in depth;
 - c. Notwithstanding Section 17.98.70, vehicles parked in a parking court are permitted to back onto the public right-of-way from the parking court;
 - d. A parking court shall be located within 200 feet of the dwellings requiring parking in accordance with the requirements of Section 17.98.10(M);
 - e. No more than two (2) parking courts shall be provided within a block, with only one (1) parking court provided along a block face;
 - f. A parking court shall be paved in compliance with the standards of this chapter and the latest adopted grading and drainage standards; 17.98 - 13 Revised by Ordinance No. 2013-04 (effective 07/03/13)
 - g. If a parking court is adjacent to a public right-of-way, it shall be publicly owned and maintained;
 - h. If a parking court is adjacent to a private drive, it shall be privately owned and maintained. For each parking court there shall be a legal recorded document which includes:
 - i. A legal description of the parking court;

- ii. Ownership of the parking court;
 - iii. Use rights; and
 - iv. A maintenance agreement and the allocation and/or method of determining liability for maintenance of the parking court;
- i. A parking court shall be used solely for the parking of operable passenger vehicles.

Response: This application does not include parking courts. The criteria listed above are not applicable.

CHAPTER 17.100 - LAND DIVISION

17.100.20 LAND DIVISION CLASSIFICATION - TYPE I, II OR III PROCEDURES

E. Type III Land Division (Major Partition or Subdivision). A major partition or subdivision shall be a Type III procedure if unsatisfactory street conditions exist or the resulting parcels/lots do not comply with the standards of the zoning district and this chapter. The Director shall determine if unsatisfactory street conditions exist based on one of the following criteria:

1. The land division does not link streets that are stubbed to the boundaries of the property.

Response: This application links to and includes the continuation of the existing Melissa Avenue right-of-way street stub, north of the project site as shown on the Preliminary Plans in Exhibit A. Therefore, this criterion does not apply, and future street conditions will be satisfactory.

2. An existing street or a new proposed street will be extended beyond the boundaries of the land division to complete a street system or provide access to adjacent property.

Response: As shown on the Preliminary Plans, planned streets are not extended beyond the boundaries of the subdivision. Therefore, this criterion does not apply, and future street conditions will be satisfactory.

3. The proposed street layout is inconsistent with a street pattern adopted as part of the Comprehensive Plan or officially adopted City street plan.

Response: The Preliminary Plans include information illustrating how the infrastructure is planned to be consistent with City standards. Therefore, the criterion will be met, and future street conditions will be satisfactory.

17.100.60 SUBDIVISIONS

Approval of a subdivision is required for a land division of 4 or more parcels in a calendar year.

A two-step procedure is required for subdivision approval: (1) tentative plat review and approval; and (2) final plat review and approval.

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- A. Preapplication Conference. The applicant for a subdivision shall participate in a preapplication conference with city staff to discuss procedures for approval, applicable state and local requirements, objectives and policies of the Sandy Comprehensive Plan, and the availability of services. The preapplication conference provides the opportunity to discuss the conceptual development of the property in advance of formal submission of the tentative plan in order to save the applicant unnecessary delay and cost.

Response: A pre-application conference was held on November 20, 2018.

- B. Application Requirements for a Tentative Plat. Subdivision applications shall be made on forms provided by the planning department and shall be accompanied by:
1. 20 copies of the tentative plat;
 2. Required fee and technical service deposit;
 3. 20 copies of all other supplementary material as may be required to indicate the general program and objectives of the subdivision;
 4. Preliminary title search;
 5. List of affected property owners.

Response: Exhibit B contains the documents listed above. These submittal requirements are met.

- B. Format. The Tentative Plat shall be drawn on a sheet 18 x 24 inches in size and at a scale of one inch equals one hundred feet unless an alternative format is approved by the Director at the preapplication conference. The application shall include one copy of a scaled drawing of the proposed subdivision, on a sheet 8 1/2 x 11, suitable for reproduction.

Response: Exhibit A contains the Preliminary Subdivision Plat. This submittal requirement is met.

- D. Data Requirements for Tentative Plat.
1. Scale of drawing, north arrow, and date.
 2. Location of the subdivision by section, township and range, and a legal description sufficient to define the location and boundaries of the proposed tract.
 3. A vicinity map, showing adjacent property boundaries and how proposed streets may be extended to connect to existing streets.
 4. Names, addresses, and telephone numbers of the owner(s) of the property, the engineer or surveyor, and the date of the survey.
 5. Streets: location, names, paved widths, alleys, and right-of-way (existing and proposed) on and within 400 feet of the boundaries of the subdivision tract.
 6. Easements: location, widths, purpose of all easements (existing and proposed) on or serving the tract.

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7. Utilities: location of storm drainage, sanitary sewers and water lines (existing and proposed) on and abutting the tract. If utilities are not on or abutting the tract, indicate the direction and distance to the nearest locations.
 8. Ground elevations shown by contour lines at two-foot vertical intervals for ground slopes of less than 10 percent and at ten-foot vertical intervals for ground slopes exceeding 10 percent. Ground elevation shall be related to an established benchmark or other datum approved by the Director.
 9. Natural features such as marshes, rock outcroppings, watercourses on and abutting the property, location of wooded areas.
 10. Approximate location of areas subject to periodic inundation or storm sewer overflow, location of any floodplain or flood hazard district.
 11. Location, width, and direction of flow of all water courses.
 12. Identification of the top of bank and boundary of mandatory setback for any stream or water course.
 13. Identification of any associated wetland and boundary of mandatory setback.
 14. Identification of any wetland and boundary of mandatory setback.
 15. Location of at least one temporary bench mark within the tract boundaries.
 16. Existing uses of the property, including location and present use of all existing structures to remain on the property after platting.
 17. Lots and Blocks: approximate dimensions of all lots, minimum lot sizes, and proposed lot and block numbers.
 18. Existing zoning and proposed land use.
 19. Designation of land intended to be dedicated or reserved for public use, with the purpose, conditions, or limitations of such reservations clearly indicated.
 20. Proposed development phases, if applicable.
 21. Any other information determined necessary by the Director at the preapplication conference, such as a soil report or other engineering study, traffic analysis, floodplain or wetland delineation, etc.

Response: The Preliminary Plans and other documentation include the information listed above, as applicable. Therefore, these submittal requirements are met.

- E. Approval Criteria. The Director or Planning Commission shall review the tentative plat for the subdivision based on the classification procedure (Type II or III) set forth in Section 17.12 and the following approval criteria:



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1. The proposed subdivision is consistent with the density, setback and dimensional standards of the base zoning district, unless modified by a Planned Development approval.

Response: As shown on the Preliminary Subdivision Plat in Exhibit A and findings provided in the written document, the planned subdivision is consistent with the density, setback, and dimensional standards of the SFR zoning district. The project is not modified by Planned Development standards of approval. The criterion is met.

3. The proposed subdivision is consistent with the design standards set forth in this chapter.

Response: This subdivision application is consistent with the design standards set forth in SD 17.100.70 and in conformance with the applicable SFR zoning district. Therefore, the criterion is met.

4. The proposed street pattern is connected and consistent with the Comprehensive Plan or official street plan for the City of Sandy.

Response: As shown on the Preliminary Plans, the intended local street pattern internal to the subdivision is connected and consistent with the Comprehensive Plan. Access from the existing street stub, Melissa Avenue, provides a continuous network through and to the boundaries of the subdivision. Additionally, this standard may not be applied under ORS 197.307(4) because the phrase “connected and consistent” is subjective. Additionally, this standard may not be applied under ORS 197.307(4) because the phrase “City standards” is subjective. Additionally, this standard may not be applied under ORS 197.307(4) because the words “objective” and “necessary” are subjective.

5. Adequate public facilities are available or can be provided to serve the proposed subdivision.

Response: As shown in the Preliminary Plans, public facilities as available will be provided to serve the subdivision, including but not limited to stormwater management, sanitary sewer, municipal water, and franchise utilities. Infrastructure is planned to be completed concurrent with the build out of the associated phase. The criterion is met.

6. All proposed improvements meet City standards.

Response: Sandy Development Code requirements have been reviewed with the intent that all planned improvements meet applicable City standards.

6. The phasing plan, if requested, can be carried out in a manner that meets the objectives of the above criteria and provides necessary public improvements for each phase as it develops.

Response: As shown on the Preliminary Subdivision Plat in the Preliminary Plans, the subdivision is planned to be completed in three phases and provide necessary public improvements concurrently with each phase. The above requirements are satisfied and support the City’s approval of this Subdivision.

F. Conditions. The Director or Planning Commission may require dedication of land and easements and may specify such conditions or modifications of the tentative plat as deemed necessary.

Response: It is understood the Preliminary Subdivision Plat may have conditions or modifications required as necessary. The Applicant reserves the right to object to the application of standards or conditions other than those that are clear and objective and does not waive its right to assert that the needed housing statutes apply to this application.

G. Improvements. A detailed list of required improvements for the subdivisions shall be set forth in the approval and conditions for the tentative plat.

Response: This criterion is understood. No additional response is necessary.

H. Tentative Plat Expiration Date. The final plat shall be delivered to the Director for approval within one year following approval of the tentative plat, and shall incorporate any modification or condition required by approval of the tentative plat. The Director may, upon written request of the subdivider, grant an extension of the tentative plat approval for up to one additional year.

Response: This criterion is understood. No additional response is necessary.

17.100.70 LAND DIVISION DESIGN STANDARDS

All land divisions shall be in conformance with the requirements of the applicable base zoning district and this chapter, as well as with other applicable provisions of this Code. Modifications to these requirements may be accomplished through a Planned Development. The design standards in this section shall be used in conjunction with street design standards included in the City of Sandy Transportation System Plan and standards and construction specifications for public improvements as set forth in adopted Public Facilities Plans and the Sandy Municipal Code.

Response: This application contains the Preliminary Plans, reports, analysis, calculations, and applicable narrative information to validate conformance with the requirements of the Sandy Development Code. The land division design standards of City Code are satisfied.

17.100.80 CHARACTER OF THE LAND

Land which the Director or the Planning Commission finds to be unsuitable for development due to flooding, improper drainage, steep slopes, rock formations, adverse earth formations or topography, utility easements, or other features which will reasonably be harmful to the safety, health, and general welfare of the present or future inhabitants of the partition or subdivision and the surrounding areas, shall not be developed unless adequate methods are formulated by the subdivider and approved by the Director or the Planning Commission to solve the problems created by the unsuitable land conditions.

Response: As detailed in the Flood and Slope Hazard Analysis (Exhibit H) the project site does not exhibit or contain unsuitable land conditions. This criterion does not apply.

17.100.90 ACCESS CONTROL GUIDELINES AND COORDINATION

-
- A. Notice and coordination with ODOT required. The city will coordinate and notify ODOT regarding all proposals for new or modified public and private accesses on to Highways 26 and 211.
 - B. It is the city policy to, over time, reduce noncompliance with the Oregon Highway Plan Access Management Policy guidelines.
 - C. Reduction of compliance with the cited State standards means that all reasonable alternatives to reduce the number of accesses and avoid new non-complying accesses will be explored during the development review. The methods to be explored include, but are not limited to: closure, relocation, and consolidation of access; right-in/right-out driveways; crossover easements; and use of local streets, alleys, and frontage roads.

Response: The above criterion applies to City processes for noticing and coordinating with ODOT, as applicable. This standard is not applicable as the project does not access Highway 26 or 211 and does not require direct action of the Applicant. The criteria do not apply.

17.100.100 STREETS GENERALLY

No subdivision or partition shall be approved unless the development has frontage or approved access to an existing public street. In addition, all streets shall be graded and improved in conformance with the City's construction standards, approved by the City Engineer, in accordance with the construction plans.

- A. **Street Connectivity Principle.** The pattern of streets established through land divisions should be connected to: (a) provide safe and convenient options for cars, bikes and pedestrians; (b) create a logical, recognizable pattern of circulation; and (c) spread traffic over many streets so that key streets (particularly U.S. 26) are not overburdened.

Response: The Preliminary Plans illustrate the street network internal to the subdivision and establish safe, logical circulation throughout the site. The Street Connectivity Principle is met.

- B. **Transportation Impact Studies.** Transportation impact studies may be required by the city engineer to assist the city to evaluate the impact of development proposals, determine reasonable and prudent transportation facility improvements and justify modifications to the design standards. Such studies will be prepared in accordance with the following:
 - 1. A proposal established with the scope of the transportation impact study shall be coordinated with, and agreed to, by the city engineer. The study requirements shall reflect the magnitude of the project in accordance with accepted transportation planning and engineering practices. A professional civil or traffic engineer registered in the State of Oregon shall prepare such studies.
 - 2. If the study identifies level-of-service conditions less than the minimum standards established in the Sandy Transportation System Plan, improvements and funding strategies mitigating the problem shall be considered as part of the land use decision for the proposal.

Response: The Traffic Impact Analysis prepared by a registered professional traffic engineer (Exhibit F) is included in the application materials. The scope of the analysis was confirmed with the City's traffic engineer consultant. The requirements are met.

- C. Topography and Arrangement. All streets shall be properly related to special traffic generators such as industries, business districts, schools, and shopping centers and to the pattern of existing and proposed land uses.
- D. Street Spacing. Street layout shall generally use a rectangular grid pattern with modifications as appropriate to adapt to topography or natural conditions.

Response: The Preliminary Plans (Exhibit A) include information which meets the criteria above. The streets are arranged in accordance with existing residential activity and a rectangular grid pattern is generally used. The criteria are met.

- E. Future Street Plan. Future street plans are conceptual plans, street extensions and connections on acreage adjacent to land divisions. They assure access for future development and promote a logical, connected pattern of streets. It is in the interest of the city to promote a logical, connected pattern of streets. All applications for land divisions shall provide a future street plan that shows the pattern of existing and proposed future streets within the boundaries of the proposed land divisions, proposed connections to abutting properties, and extension of streets to adjacent parcels within a 400 foot radius of the study area where development may practically occur.

Response: The Preliminary Plans (Exhibit A) include a Conceptual Future Street Plan which meets the criteria above.

- F. Connections. Except as permitted under Exemptions, all streets, alleys and pedestrian walkways shall connect to other streets within the development and to existing and planned streets outside the development and to undeveloped properties which have no future street plan. Streets shall terminate at other streets or at parks, schools or other public land within a neighborhood.

Where practicable, local roads shall align and connect with other roads when crossing collectors and arterials.

Proposed streets or street extensions shall be located to provide direct access to existing or planned transit stops, and existing or planned neighborhood activity centers, such as schools, shopping areas and parks.

Response: The Preliminary Plans show local street and pedestrian walkway (sidewalk) connections internal to the subdivision. The local streets do not cross any collector or arterial roads and there are no exemptions necessary for the intended street network.

- G. Exemptions.
 - 1. A future street plan is not required for partitions of residentially zoned land when none of the parcels may be redivided under existing minimum density standards.

-
2. Standards for street connections do not apply to freeways and other highways with full access control.
 3. When street connection standards are inconsistent with an adopted street spacing standard for arterials or collectors, a right turn in/right turn out only design including median control may be approved. Where compliance with the standards would result in unacceptable sight distances, an accessway may be approved in place of a street connection.

Response: This application does not seek street design exemptions. The criteria do not apply.

17.100.110 STREET STANDARDS AND CLASSIFICATION

Street standards are illustrated in the figures included at the end of this chapter. Functional definitions of each street type are described in the Transportation System Plan as summarized below.

- A. Major arterials are designed to carry high volumes of through traffic, mixed with some unavoidable local traffic, through or around the city. Major arterials should generally be spaced at 1-mile intervals.
- B. Minor arterials are designed to collect and distribute traffic from major and minor arterials to neighborhood collectors and local streets, or directly to traffic destinations. Minor arterials should generally be spaced at 1-mile intervals.
- C. Residential minor arterials are a hybrid between minor arterial and collector type streets that allow for moderate to high traffic volumes on streets where over 90% of the fronting lots are residential.
- D. Collector streets are designed to collect and distribute traffic from higher type arterial streets to local streets or directly to traffic destinations. Collector streets should generally be spaced at 1/2-mile intervals.

Response: The project site does not include major or minor arterials, residential minor arterials, or collector streets. These standards do not apply.

- E. Local streets are designed to provide direct access to abutting property and connect to collector streets. A general spacing of 8-10 local streets per mile is recommended.

Response: The subdivision is accessed via Melissa Avenue, a local street section to the north of the property boundary, and a continuous network of local streets allow transportation throughout the site.

- F. Cul-de-sacs and dead end streets are discouraged. If deemed necessary, cul-de-sacs shall be as short as possible and shall not exceed 400 feet in length.
- G. Public access lanes are designed to provide primary access to a limited number of dwellings when the construction of a local street is unnecessary.
- H. Alleys are designed to provide access to multiple dwellings in areas where lot frontages are narrow and driveway spacing requirements cannot be met.

Response: The project site does not include cul-de-sacs, public access lanes, or alleys. These standards do not apply.

17.100.120 BLOCKS AND ACCESSWAYS

- A. **Blocks.** Blocks shall have sufficient width to provide for two tiers of lots at appropriate depths. However, exceptions to the block width shall be allowed for blocks that are adjacent to arterial streets or natural features.
- B. **Residential Blocks.** Blocks fronting local streets shall not exceed 400 feet in length, unless topographic, natural resource, or other similar physical conditions justify longer blocks. Blocks may exceed 400 feet if approved as part of a Planned Development, Specific Area Plan, adjustment or variance.

Response: As shown on the Preliminary Plans, the residential blocks provide two tiers of lots. Blocks front local streets and do not exceed 400 feet in length. There is no minimum average lot depth in the criteria of 17.34.30 Design Standards for newly created lots and the Preliminary Subdivision Plan with Setbacks demonstrates that future homes can meet the minimum setback requirements at the time of future building permit submittal. The standards are met.

- C. **Commercial Blocks.** Blocks located in commercial districts shall not exceed 400 feet in length.

Response: This application does not involve commercial districts; the criteria does not apply.

- D. **Pedestrian and Bicycle Access Way Requirements.** In any block in a residential or commercial district over 600 feet in length, a pedestrian and bicycle accessway with a minimum improved surface of 10 feet within a 15-foot right-of-way or tract shall be provided through the middle of the block. To enhance public convenience and mobility, such accessways may be required to connect to cul-de-sacs, or between streets and other public or semipublic lands or through greenway systems.

Response: As shown on the Preliminary Plans, this application does not include any blocks greater than 600 feet in length. The standard does not apply.

17.100.130 EASEMENTS

A minimum eight (8) foot public utility easement shall be required along property lines abutting a right-of-way for all lots within a partition or subdivision. Where a partition or subdivision is traversed by a watercourse, drainage way, channel or stream, the land division shall provide a stormwater easement or drainage right-of-way conforming substantially with the lines of such watercourse, and such further width as determined needed for water quality and quantity protection.

Response: As shown on the Preliminary Subdivision Plat, easements and dedications required along property lines abutting a right-of-way will be provided as required. The criterion is met.

17.100.140 PUBLIC ALLEYS

-
- A. Public alleys shall have a minimum width of 20 feet. Structural section and surfacing shall conform to standards set by the City Engineer.
 - B. Existing alleys may remain unimproved until redevelopment occurs. When development occurs, each abutting lot shall be responsible for completion of improvements to that portion of the alley abutting the property.
 - C. Parking within the alley right-of-way is prohibited except as provided in Section 17.100.140(D) below.
 - D. An alley with a minimum width of 28 feet may permit parallel parking on one side of the alley only.

Response: The application does not include public alleys. The criteria do not apply.

17.100.180 INTERSECTIONS

- A. Intersections. Streets shall be laid out so as to intersect as nearly as possible at right angles. A proposed intersection of two new streets at an angle of less than 75 degrees shall not be acceptable. No more than two streets shall intersect at any one point unless specifically approved by the City Engineer. The city engineer may require left turn lanes, signals, special crosswalks, curb extensions and other intersection design elements justified by a traffic study or necessary to comply with the Development Code.
- B. Curve Radius. All local and neighborhood collector streets shall have a minimum curve radius (at intersections of rights-of-way) of 20 feet, unless otherwise approved by the City Engineer. When a local or neighborhood collector enters on to a collector or arterial street, the curve radius shall be a minimum of 30 feet, unless otherwise approved by the City Engineer

Response: The Preliminary Plans include information illustrating how the local street system internal to the subdivision meets the design requirements. No more than two streets intersect at any one point and internal streets meet the minimum curve radius at intersections of rights-of-way, as applicable. The criteria are met.

17.100.190 STREET SIGNS

The subdivider shall pay the cost of street signs prior to the issuance of a Certificate of Substantial Completion. The City shall install all street signs and upon completion will bill the developer for costs associated with installation. In addition, the subdivider may be required to pay for any traffic safety devices related to the development. The City Engineer shall specify the type and location of the street signs and/or traffic safety devices.

Response: This statement is understood. No additional response is necessary.

17.100.200 STREET SURFACING

Public streets, including alleys, within the development shall be improved in accordance with the requirements of the City or the standards of the Oregon State Highway Department. An overlay of asphalt concrete, or material approved by the City Engineer, shall be placed on all streets within the development. Where required, speed humps shall be constructed in conformance with the City's standards and specifications.

Response: The statement is understood. No additional response is necessary.

17.100.210 STREET LIGHTING

A complete lighting system (including, but not limited to: conduits, wiring, bases, poles, arms, and fixtures) shall be the financial responsibility of the subdivider on all cul-de-sacs, local streets, and neighborhood collector streets. The subdivider will be responsible for providing the arterial street lighting system in those cases where the subdivider is required to improve an arterial street. Standards and specifications for street lighting shall be coordinated with the utility and any lighting district, as appropriate.

Response: Conceptual locations for street lighting are indicated in the Preliminary Plans. PGE will be contacted, and final lighting design elements will be confirmed during the final design process, as appropriate. The criterion is met.

17.100.220 LOT DESIGN

A. The lot arrangement shall be such that there will be no foreseeable difficulties, for reason of topography or other conditions, in securing building permits to build on all lots in compliance with the Development Code.

Response: The Preliminary Subdivision Plat with Setbacks, included in Exhibit A, demonstrates that all lots in the subdivision can accommodate future homes which meet the minimum setback requirements at the time of future building permit submittal. As shown, each lot meets the 7,500 square-foot minimum lot size requirement. The criteria are met.

B. The lot dimensions shall comply with the minimum standards of the Development Code. When lots are more than double the minimum lot size required for the zoning district, the subdivider may be required to arrange such lots to allow further subdivision and the opening of future streets to serve such potential lots.

Response: As shown on the Preliminary Plans, lot dimensions comply with the minimum dimensions and standards of the Development Code. Lots are not larger than twice the minimum lot size. The criterion is met.

C. The lot or parcel width at the front building line shall meet the requirements of the Development Code and shall abut a public street other than an alley for a width of at least 20 feet. A street frontage of not less than 15 feet is acceptable in the case of a flag lot division resulting from the division of an unusually deep land parcel which is of a size to warrant division into not more than two parcels.

Response: As shown on the Preliminary Plans, each lot complies with the minimum dimensions and standards of the Development Code and have proper frontage on a public street. The criterion is met.

D. Double frontage lots shall be avoided except where necessary to provide separation of residential developments from arterial streets or to overcome specific disadvantages of topography or orientation.

Response: As shown on the Preliminary Plans, the subdivision does not include double-frontage lots. The criteria do not apply.

-
- E. Lots shall avoid deriving access from major or minor arterials. When driveway access from major or minor arterials may be necessary for several adjoining lots, the Director or the Planning Commission may require that such lots be served by a common access drive in order to limit possible traffic hazards on such streets. Where possible, driveways should be designed and arranged to avoid requiring vehicles to back into traffic on minor or major arterials.

Response: As shown on the Preliminary Plans, the lot arrangement demonstrates compliance with the requirements of the Development Code. The project site does not contain or connect to major or minor arterial streets. The above criterion is met.

17.100.230 WATER FACILITIES

Water lines and fire hydrants serving the subdivision or partition, and connecting the development to City mains, shall be installed to provide adequate water pressure to serve present and future consumer demand. The materials, sizes, and locations of water mains, valves, service laterals, meter boxes and other required appurtenances shall be in accordance with the standards of the Fire District, the City, and the State.

If the city requires the subdivider to install water lines in excess of eight inches, the city may participate in the oversizing costs. Any oversizing agreements shall be approved by the city manager based upon council policy and dependent on budget constraints. If required water mains will directly serve property outside the subdivision, the city may enter into an agreement with the subdivider setting forth methods for reimbursement for the proportionate share of the cost.

Response: As shown on the Preliminary Plans, water infrastructure including conveyance mains, lines, and fire hydrants are designed in accordance with applicable standards. This criterion is met.

17.100.240 SANITARY SEWERS

Sanitary sewers shall be installed to serve the subdivision and to connect the subdivision to existing mains. Design of sanitary sewers shall take into account the capacity and grade to allow for desirable extension beyond the subdivision.

If required sewer facilities will directly serve property outside the subdivision, the city may enter into an agreement with the subdivider setting forth methods for reimbursement by nonparticipating landowners for the proportionate share of the cost of construction.

Response: The Preliminary Plans include information illustrating how the project is planned to be serviced with sanitary sewer. This infrastructure is planned in accordance with the standards of the applicable jurisdictions; therefore, the criterion is met.

17.100.250 SURFACE DRAINAGE AND STORM SEWER SYSTEM

- A. Drainage facilities shall be provided within the subdivision and to connect with off-site drainage ways or storm sewers. Capacity, grade and materials shall be by a design approved by the city engineer. Design of drainage within the subdivision shall take into account the location, capacity and grade necessary to maintain unrestricted flow

from areas draining through the subdivision and to allow extension of the system to serve such areas.

- B. In addition to normal drainage design and construction, provisions shall be taken to handle any drainage from preexisting subsurface drain tile. It shall be the design engineer's duty to investigate the location of drain tile and its relation to public improvements and building construction.
- C. The roof and site drainage from each lot shall be discharged to either curb face outlets (if minor quantity), to a public storm drain or to a natural acceptable drainage way if adjacent to the lot.

Response: The Preliminary Plans (Exhibit A) and Preliminary Stormwater Report (Exhibit G) include information illustrating how stormwater runoff is planned to be managed. The criteria are met.

17.100.260 UNDERGROUND UTILITIES

All subdivisions or major partitions shall be required to install underground utilities (including, but not limited to, electrical and telephone wiring). The utilities shall be installed pursuant to the requirements of the utility company.

Response: The Preliminary Plans include information illustrating how the project is planned to be provided with underground utilities. This infrastructure is planned in accordance with the standards of the applicable jurisdictions; therefore, the criterion is met.

17.100.270 SIDEWALKS

Sidewalks shall be installed on both sides of a public street and in any special pedestrian way within the subdivision.

Response: The Preliminary Plans show compliance with the local street typical sections in City Code. The standard is met.

17.100.280 BICYCLE ROUTES

If appropriate to the extension of a system of bicycle routes, existing or planned, the Director or the Planning Commission may require the installation of bicycle lanes within streets. Separate bicycle access ways may be required to reduce walking or cycling distance when no feasible street connection is available.

Response: The project site does not include any existing or planned bicycle routes. The criterion does not apply.

17.100.290 STREET TREES

Where planting strips are provided in the public right-of-way, a master street tree plan shall be submitted and approved by the Director. The street tree plan shall provide street trees approximately every 30' on center for all lots.

Response: As shown in the Preliminary Plans in Exhibit A, the appropriate number of trees are provided on the Street Tree Plan. The criterion is satisfied.

17.100.300 EROSION CONTROL



Grass seed planting shall take place prior to September 30th on all lots upon which a dwelling has not been started but the ground cover has been disturbed. The seeds shall be of an annual rye grass variety and shall be sown at not less than four pounds to each 1000 square feet of land area.

Response: The requirement is understood. No additional response is necessary.

17.100.310 REQUIRED IMPROVEMENTS

The following improvements shall be installed at no expense to the city, consistent with the design standards of Chapter 17.84, except as otherwise provided in relation to oversizing.

- A. Drainage facilities
- B. Lot, street and perimeter monumentation
- C. Mailbox delivery units
- D. Sanitary sewers
- E. Sidewalks
- F. Street lights
- G. Street name signs
- H. Street trees
- I. Streets
- J. Traffic signs
- K. Underground communication lines, including broadband (fiber), telephone, and cable. Franchise agreements will dictate whether telephone and cable lines are required.
- L. Underground power lines
- M. Water distribution lines and fire hydrants

Response: The above listed improvements are planned to be included in the project design as required. The criteria are met.

CHAPTER 17.102 - URBAN FORESTRY

17.102.20 APPLICABILITY

This chapter applies only to properties within the Sandy Urban Growth Boundary that are greater than one acre including contiguous parcels under the same ownership.

- A. General: No person shall cut, harvest, or remove trees 11 inches DBH or greater without first obtaining a permit and demonstrating compliance with this chapter.
 - 1. As a condition of permit issuance, the applicant shall agree to implement required provisions of this chapter and to allow all inspections to be conducted.
 - 2. Tree removal is subject to the provisions of Chapter 15.44, Erosion Control, Chapter 17.56, Hillside Development, and Chapter 17.60 Flood and Slope Hazard.



Response: As detailed in the Preliminary Plans, the application includes tree removal subject to the exception criteria below. Thus, the application is demonstrating compliance with this chapter. Tree removal is planned to comply with erosion control provisions of Chapter 15.44. As documented in the FSH Analysis (Exhibit H), the provisions of Chapters 17.56 and 17.60 are not relevant to the site and do not apply. The applicable criteria are understood.

B. **Exceptions:** The following tree removals are exempt from the requirements of this chapter.

1. Tree removal as required by the city or public utility for the installation or maintenance or repair of roads, utilities, or other structures.

Response: As detailed in the Preliminary Plans, the application includes tree removal for the installation of roads and utilities, including four off-site trees located in the existing public right-of-way for Melissa Avenue. Such tree removal is exempt from the requirements of this chapter as stated above. As shown on the Preliminary Plans, a tree in the existing public right-of-way could potentially be retained upon acceptance of fee-in-lieu for improvements to east SE Ponder Lane.

2. Tree removal to prevent an imminent threat to public health or safety, or prevent imminent threat to public or private property, or prevent an imminent threat of serious environmental degradation. In these circumstances, a Type I tree removal permit shall be applied for within seven days following the date of tree removal.

Response: The application does not involve tree removal subject to the exception criteria above.

IV. Conclusion

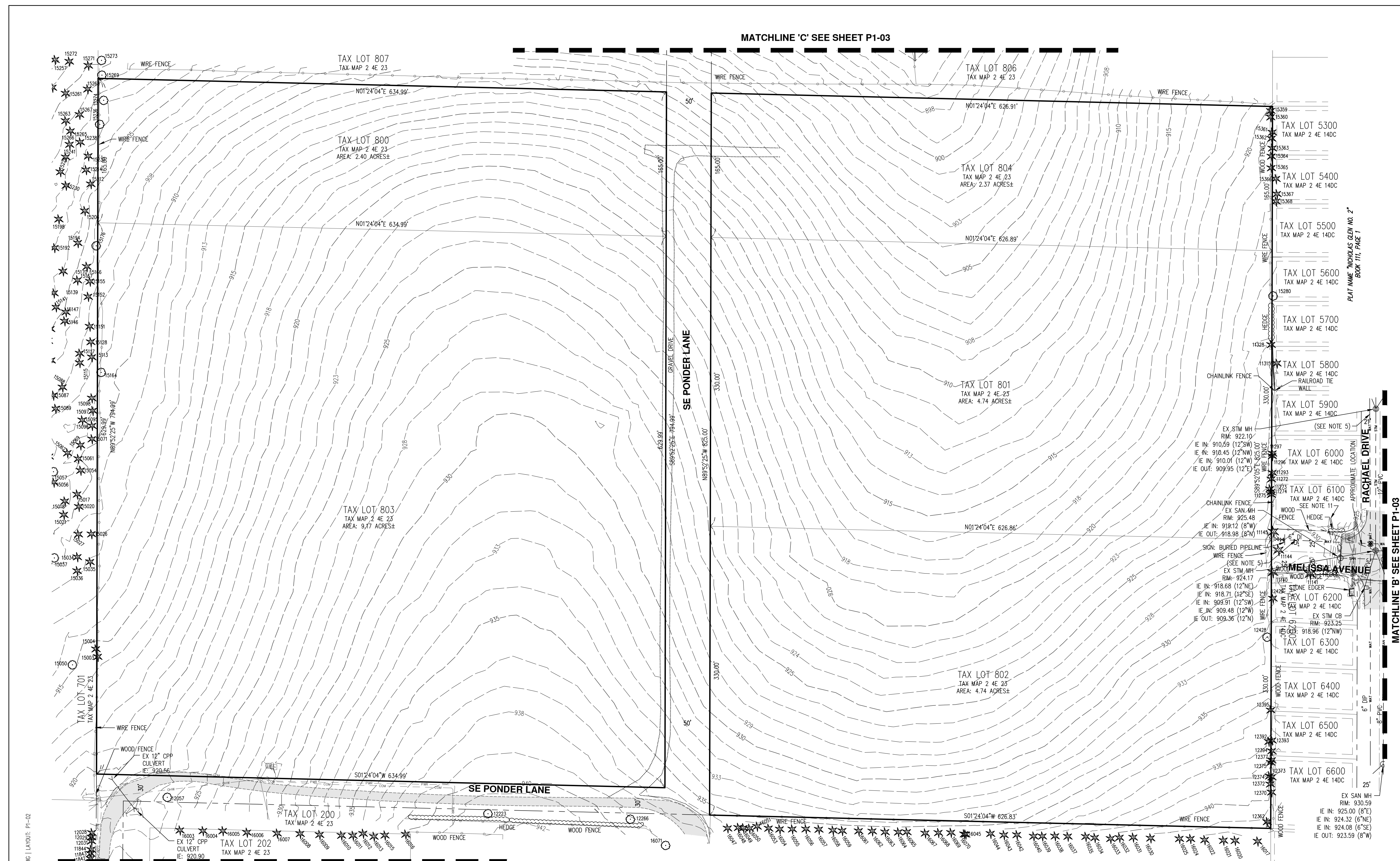
The required findings have been made and this written narrative and accompanying documentation demonstrate that the application is consistent with the applicable provisions of the City of Sandy Development Code. The evidence in the record is substantial and supports approval of the application.

**PRELIMINARY EXISTING
 CONDITIONS PLAN
 BAILEY MEADOWS
 SANDY, OREGON**

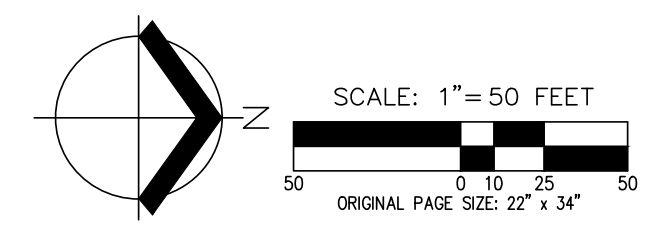
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PRELIMINARY
 NOT FOR CONSTRUCTION
 D. RETTIG
 80124LS
 RENEWS: 12/31/20

JOB NUMBER: 7107
 DATE: 07/03/2019
 DESIGNED BY: AJ
 DRAWN BY:
 CHECKED BY: BRH, MTB

P1-02



AKS DRAWING FILE: 7107 EXCOND.DWG | LAYOUT: P1-02



MATCHLINE 'A' SEE SHEET P1-03

NOTES:

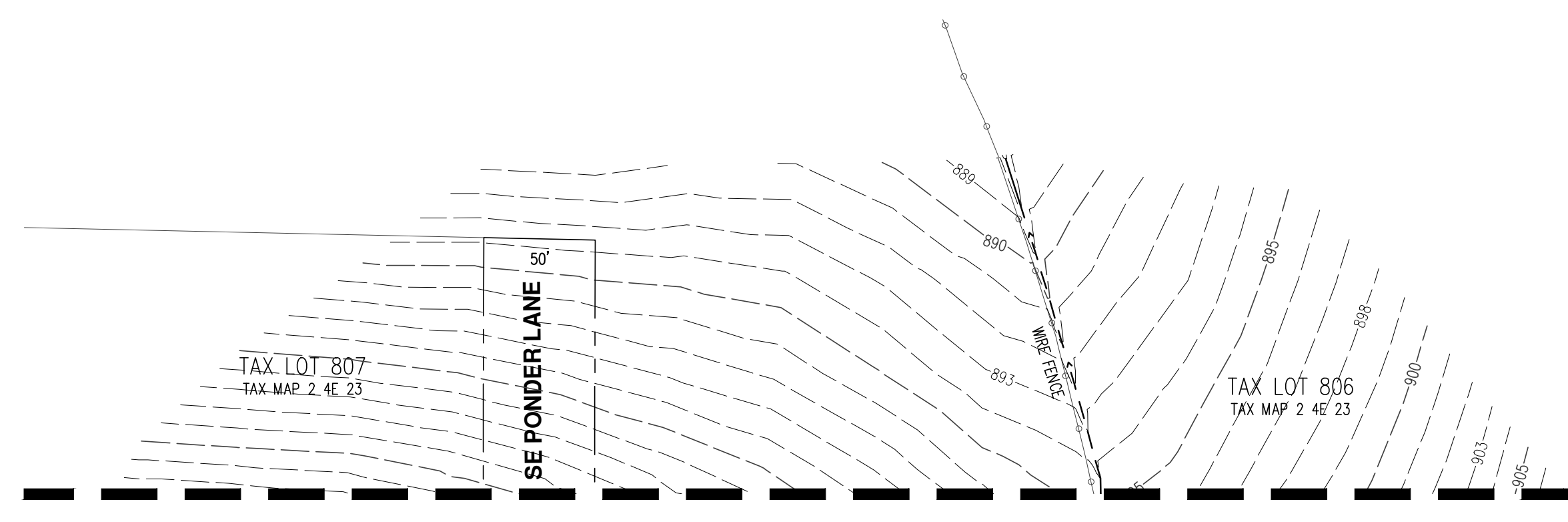
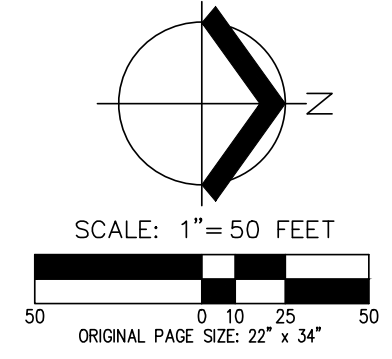
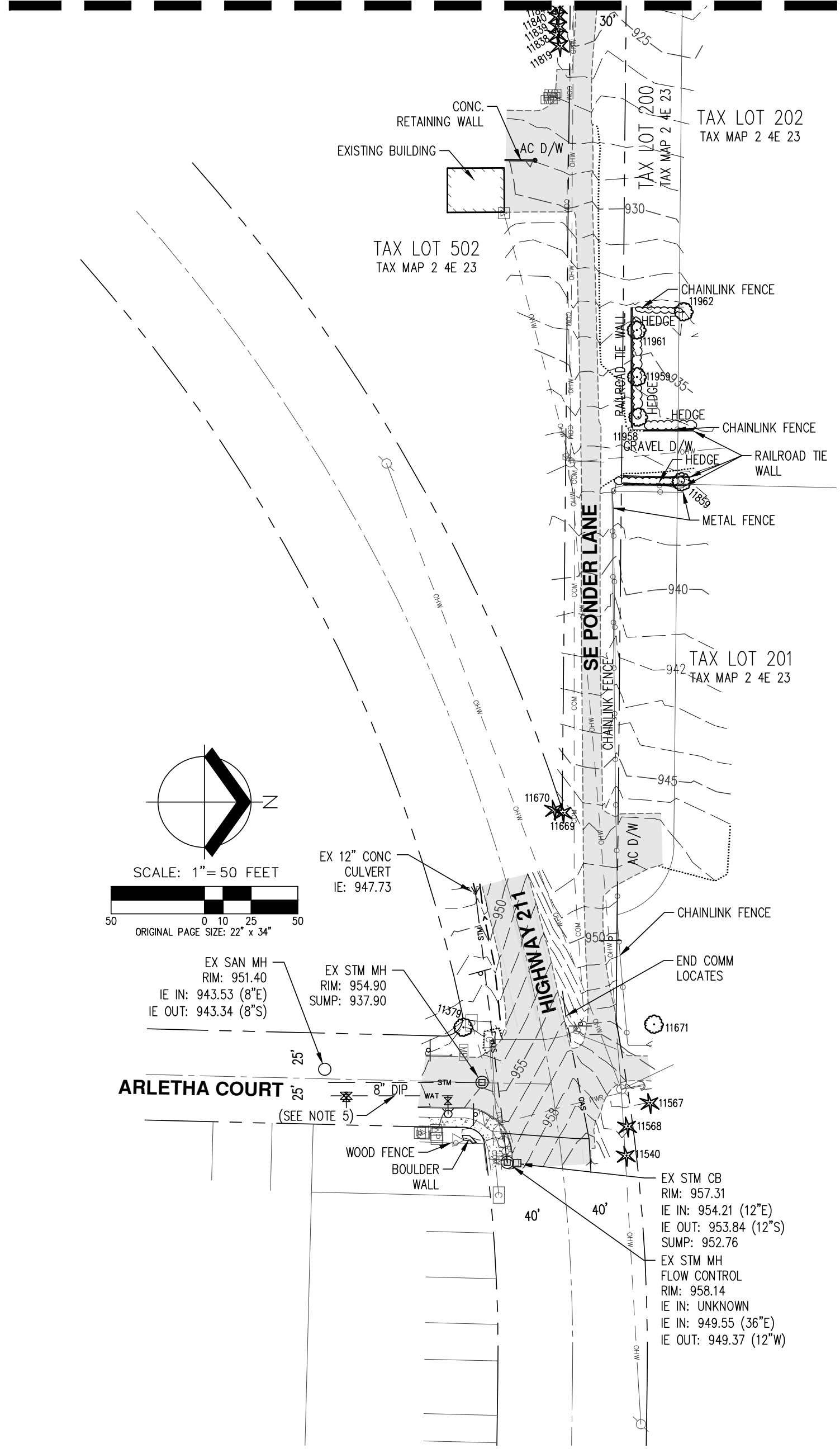
- UTILITIES SHOWN ARE BASED ON UNDERGROUND UTILITY LOCATE MARKINGS AS PROVIDED BY OTHERS, PROVIDED PER UTILITY LOCATE TICKET NUMBER 19105127, 19105129, 19105131, 19005117, & 19100525. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND LOCATES REPRESENT THE ONLY UTILITIES IN THE AREA. CONTRACTORS ARE RESPONSIBLE FOR VERIFYING ALL UTILITIES AND EXISTING CONDITIONS PRIOR TO BEGINNING CONSTRUCTION.
- FIELD WORK WAS CONDUCTED APRIL 29, JUNE 3 & 7, 2019.
- VERTICAL DATUM: ELEVATIONS ARE BASED ON NGS BENCHMARK NO. R00188, ELEVATION 990.05 FEET (NAVD88), LOCATED IN CONCRETE WALL 1' ABOVE SIDEWALK NEAR THE SOUTHWEST CORNER OF THE BUILDING AT 39131 PIONEER BOULEVARD, SANDY OREGON.
- THIS IS NOT A BOUNDARY SURVEY TO BE RECORDED WITH THE COUNTY. BOUNDARIES MAY BE PRELIMINARY AND SHOULD BE CONFIRMED WITH THE STAMPING SURVEYOR PRIOR TO RELYING ON FOR DETAILED DESIGN OR CONSTRUCTION.
- WATER LINE LOCATES WERE REQUESTED THROUGH OREGON UTILITY NOTIFICATION CENTER, BUT WERE NOT PROVIDED BY THE CITY. WATER LINES SHOWN ARE PER AS-BUILT DRAWINGS AND ARE APPROXIMATE ONLY. PLEASE CONTACT SURVEYOR FOR ANY QUESTIONS REGARDING ACCURACY.
- BUILDING FOOTPRINTS ARE MEASURED TO SIDING UNLESS NOTED OTHERWISE. CONTACT SURVEYOR WITH QUESTIONS REGARDING BUILDING TIES.
- CONTOUR INTERVAL IS 1 FOOT.
- TREES WITH DIAMETER OF 11" AND GREATER ARE SHOWN. TREE DIAMETERS WERE MEASURED UTILIZING A DIAMETER TAPE AT BREAST HEIGHT. TREE INFORMATION IS SUBJECT TO CHANGE UPON ARBORIST INSPECTION.
- THE PLATTED LOTS PER THE SUBDIVISION OF "NICOLAS GLEN NO. 2" (BOOK 111, PAGE 1), ARE SUBJECT TO A 5 FOOT WIDE PUBLIC UTILITY EASEMENT ON ALL FRONT, SIDE AND REAR LOT LINES.
- WATER LINE ADDED PER PLANS ENTITLED "STREET AND UTILITY IMPROVEMENTS FOR NICOLAS GLEN PHASE 2", SHEET 18, DATED 6-25-97.
- SANITARY SEWER LATERALS ARE SHOWN PER PLANS ENTITLED "NICOLAS GLEN PHASE 2 SANITARY SEWER PLAN", SHEET 10 OF 21, DATED 6-25-97.

FLAT NAME: "NICOLAS GLEN NO. 2"
 BOOK 111, PAGE 1

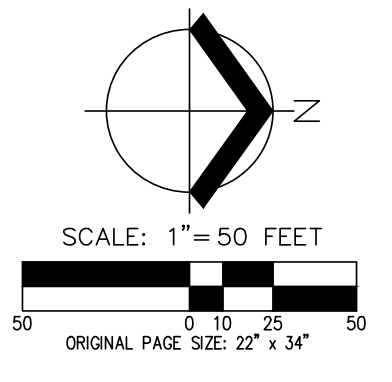
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MATCHLINE 'C' SEE SHEET P1-03

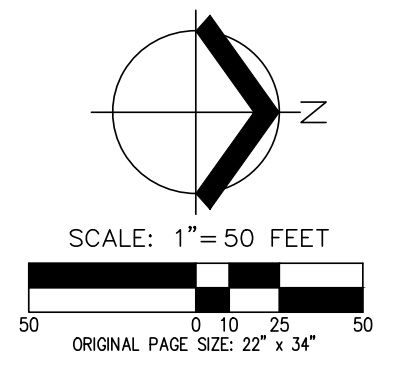
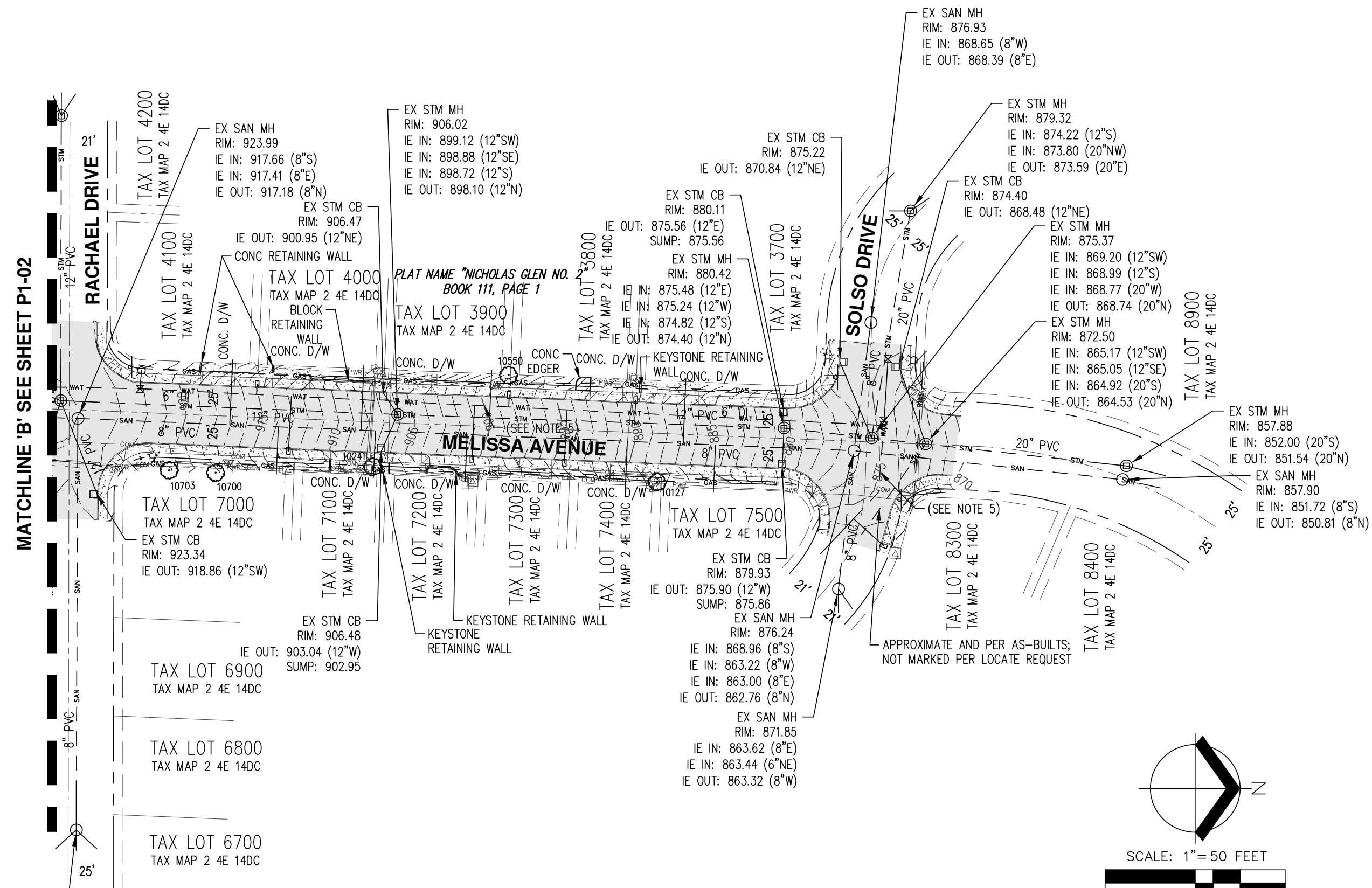
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MATCHLINE 'C' SEE SHEET P1-02



- NOTES:**
- UTILITIES SHOWN ARE BASED ON UNDERGROUND UTILITY LOCATE MARKINGS AS PROVIDED BY OTHERS, PROVIDED PER UTILITY LOCATE TICKET NUMBER 19105127, 19105129, 19105131, 19005117, & 19105125. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND LOCATES REPRESENT THE ONLY UTILITIES IN THE AREA. CONTRACTORS ARE RESPONSIBLE FOR VERIFYING ALL UTILITIES AND EXISTING CONDITIONS PRIOR TO BEGINNING CONSTRUCTION.
 - FIELD WORK WAS CONDUCTED APRIL 29, JUNE 3 & 7, 2019.
 - VERTICAL DATUM: ELEVATIONS ARE BASED ON NGS BENCHMARK NO. RD0188, ELEVATION 990.05 FEET (NAVD88). LOCATED IN CONCRETE WALL 1' ABOVE SIDEWALK NEAR THE SOUTHWEST CORNER OF THE BUILDING AT 39131 PIONEER BOULEVARD, SANDY OREGON.
 - THIS IS NOT A BOUNDARY SURVEY TO BE RECORDED WITH THE COUNTY. BOUNDARIES MAY BE PRELIMINARY AND SHOULD BE CONFIRMED WITH THE STAMPING SURVEYOR PRIOR TO RELYING ON FOR DETAILED DESIGN OR CONSTRUCTION.
 - WATER LINE LOCATES WERE REQUESTED THROUGH OREGON UTILITY NOTIFICATION CENTER, BUT WERE NOT PROVIDED BY THE CITY. WATER LINES SHOWN ARE PER AS-BUILT DRAWINGS AND ARE APPROXIMATE ONLY. PLEASE CONTACT SURVEYOR FOR ANY QUESTIONS REGARDING ACCURACY.
 - BUILDING FOOTPRINTS ARE MEASURED TO SIDING UNLESS NOTED OTHERWISE. CONTACT SURVEYOR WITH QUESTIONS REGARDING BUILDING TIES.
 - CONTOUR INTERVAL IS 1 FOOT.
 - TREES WITH DIAMETER OF 11" AND GREATER ARE SHOWN. TREE DIAMETERS WERE MEASURED UTILIZING A DIAMETER TAPE AT BREAST HEIGHT. TREE INFORMATION IS SUBJECT TO CHANGE UPON ARBORIST INSPECTION.
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 - SANITARY SEWER LATERALS ARE SHOWN PER PLANS ENTITLED "NICOLAS GLEN PHASE 2 SANITARY SEWER PLAN", SHEET 10 OF 21, DATED 6-25-97.



AKS
 AKS ENGINEERING & FORESTRY, LLC
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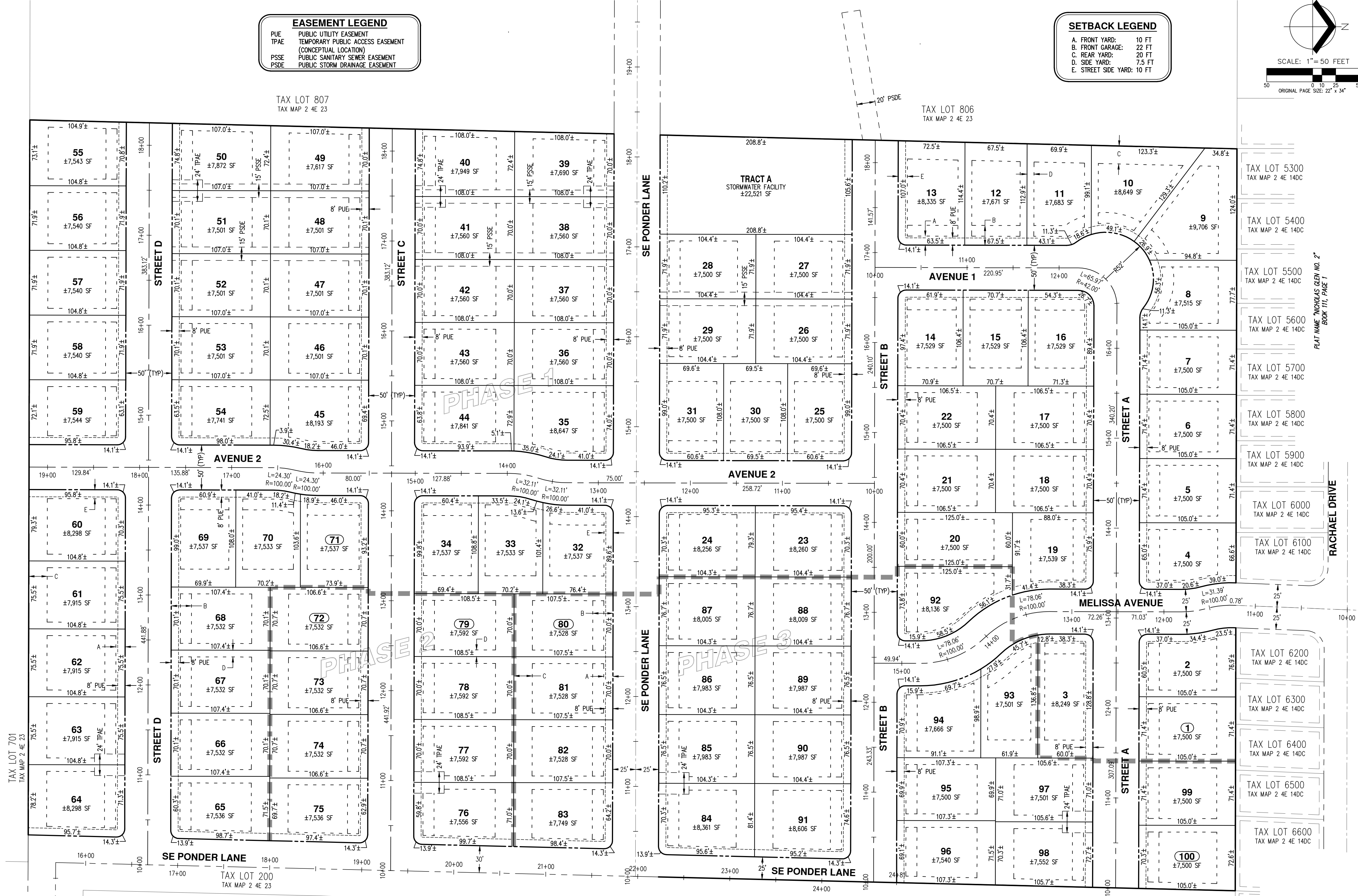
**PRELIMINARY EXISTING
 CONDITIONS PLAN
 BAILEY MEADOWS
 SANDY, OREGON**

REGISTERED PROFESSIONAL LAND SURVEYOR
PRELIMINARY
 NOT FOR CONSTRUCTION
 COURTNEY D. RITTS
 60124LS
 RENEWS: 12/31/20

JOB NUMBER: 7107
 DATE: 07/03/2019
 DESIGNED BY:
 DRAWN BY: AJ
 CHECKED BY: BRH, MTB

P1-03

AKS DRAWING FILE: 7107 DIM SUBDIV PLANNING | LAYOUT: P1-04

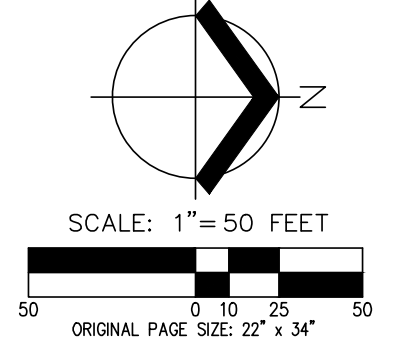


EASEMENT LEGEND

PUE	PUBLIC UTILITY EASEMENT
TPAE	TEMPORARY PUBLIC ACCESS EASEMENT (CONCEPTUAL LOCATION)
PSSE	PUBLIC SANITARY SEWER EASEMENT
PSDE	PUBLIC STORM DRAINAGE EASEMENT

SETBACK LEGEND

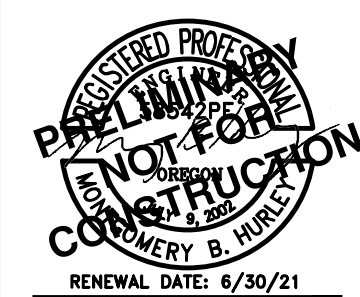
A.	FRONT YARD:	10 FT
B.	FRONT GARAGE:	22 FT
C.	REAR YARD:	20 FT
D.	SIDE YARD:	7.5 FT
E.	STREET SIDE YARD:	10 FT



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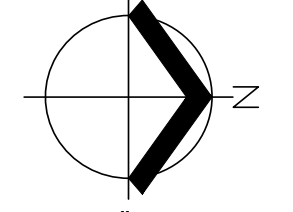
ENGINEERING - SURVEYING - NATURAL RESOURCES
FORESTRY - PLANNING - LANDSCAPE ARCHITECTURE

**PRELIMINARY SUBDIVISION PLAT
WITH FUTURE BUILDING SETBACKS
BAILEY MEADOWS
SANDY, OREGON**



RENEWAL DATE: 6/30/21
JOB NUMBER: 7107
DATE: 07/03/2019
DESIGNED BY: WN
DRAWN BY: CL
CHECKED BY: RSW

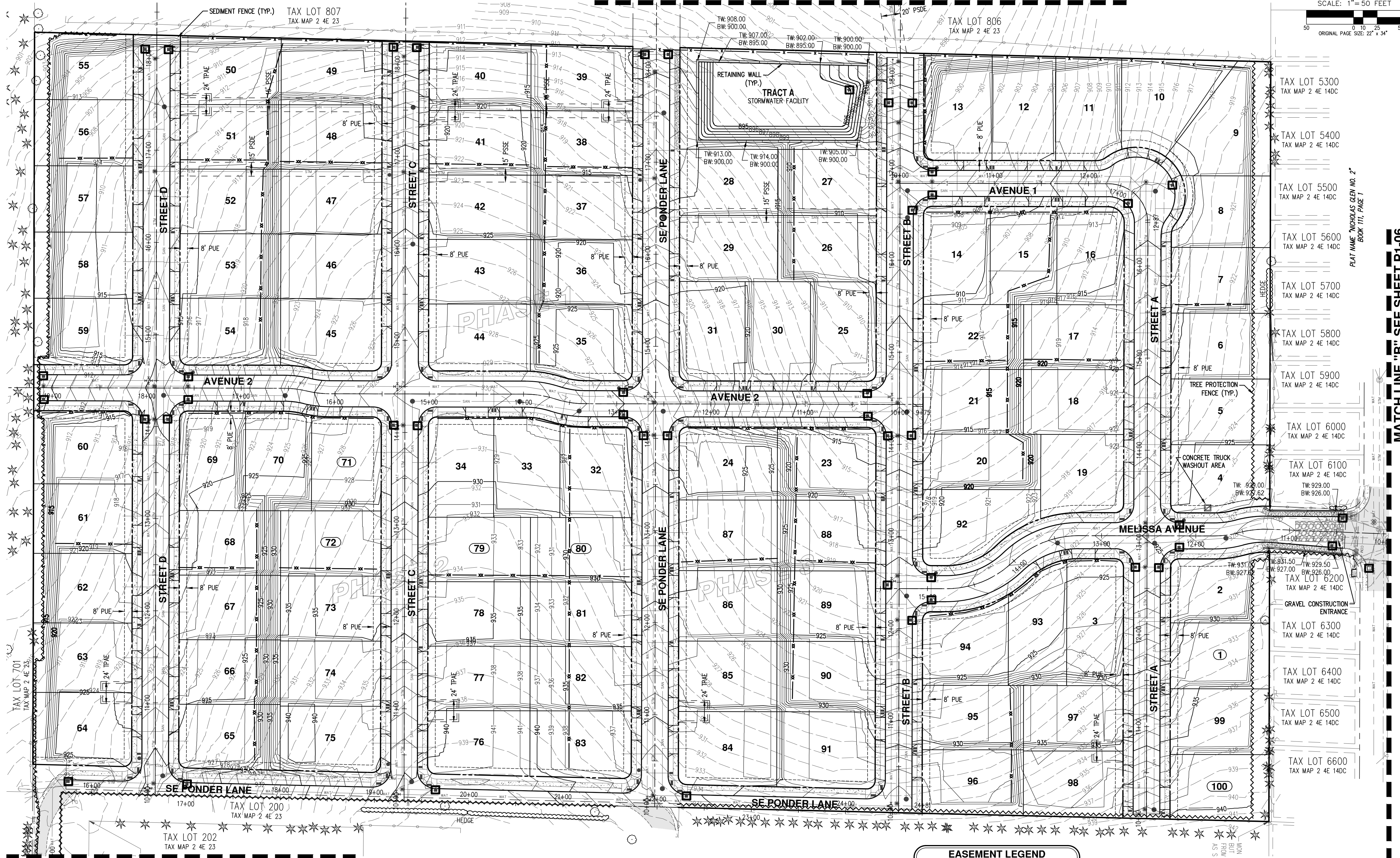
P1-04



SCALE: 1" = 50 FEET
ORIGINAL PAGE SIZE: 22" x 34"

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MATCH LINE "C" SEE SHEET P1-06



MATCH LINE "A" SEE SHEET P1-06

MATCH LINE "B" SEE SHEET P1-06

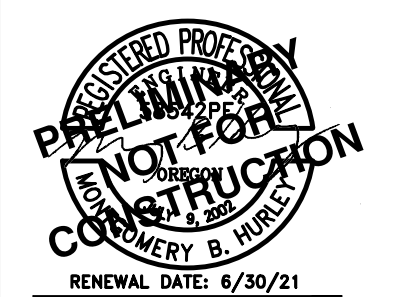
PLAT NAME: "WOODS GEN. NO. 2"
BOOK 111, PAGE 1

- TAX LOT 5300 TAX MAP 2 4E 14DC
- TAX LOT 5400 TAX MAP 2 4E 14DC
- TAX LOT 5500 TAX MAP 2 4E 14DC
- TAX LOT 5600 TAX MAP 2 4E 14DC
- TAX LOT 5700 TAX MAP 2 4E 14DC
- TAX LOT 5800 TAX MAP 2 4E 14DC
- TAX LOT 5900 TAX MAP 2 4E 14DC
- TAX LOT 6000 TAX MAP 2 4E 14DC
- TAX LOT 6100 TAX MAP 2 4E 14DC
TW: 929.00
BW: 926.00
- TAX LOT 6200 TAX MAP 2 4E 14DC
TW: 931.50
BW: 927.00
- TAX LOT 6300 TAX MAP 2 4E 14DC
- TAX LOT 6400 TAX MAP 2 4E 14DC
- TAX LOT 6500 TAX MAP 2 4E 14DC
- TAX LOT 6600 TAX MAP 2 4E 14DC

EASEMENT LEGEND

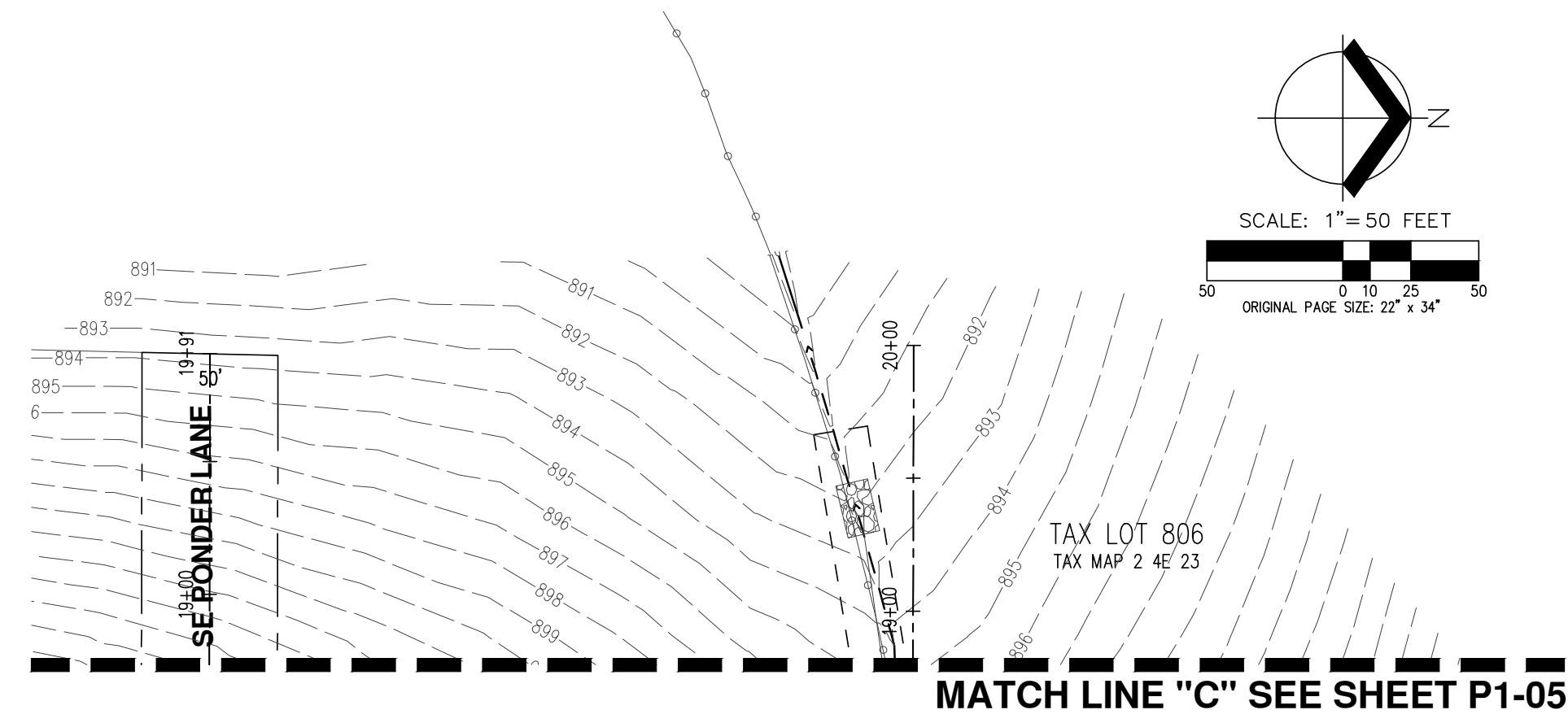
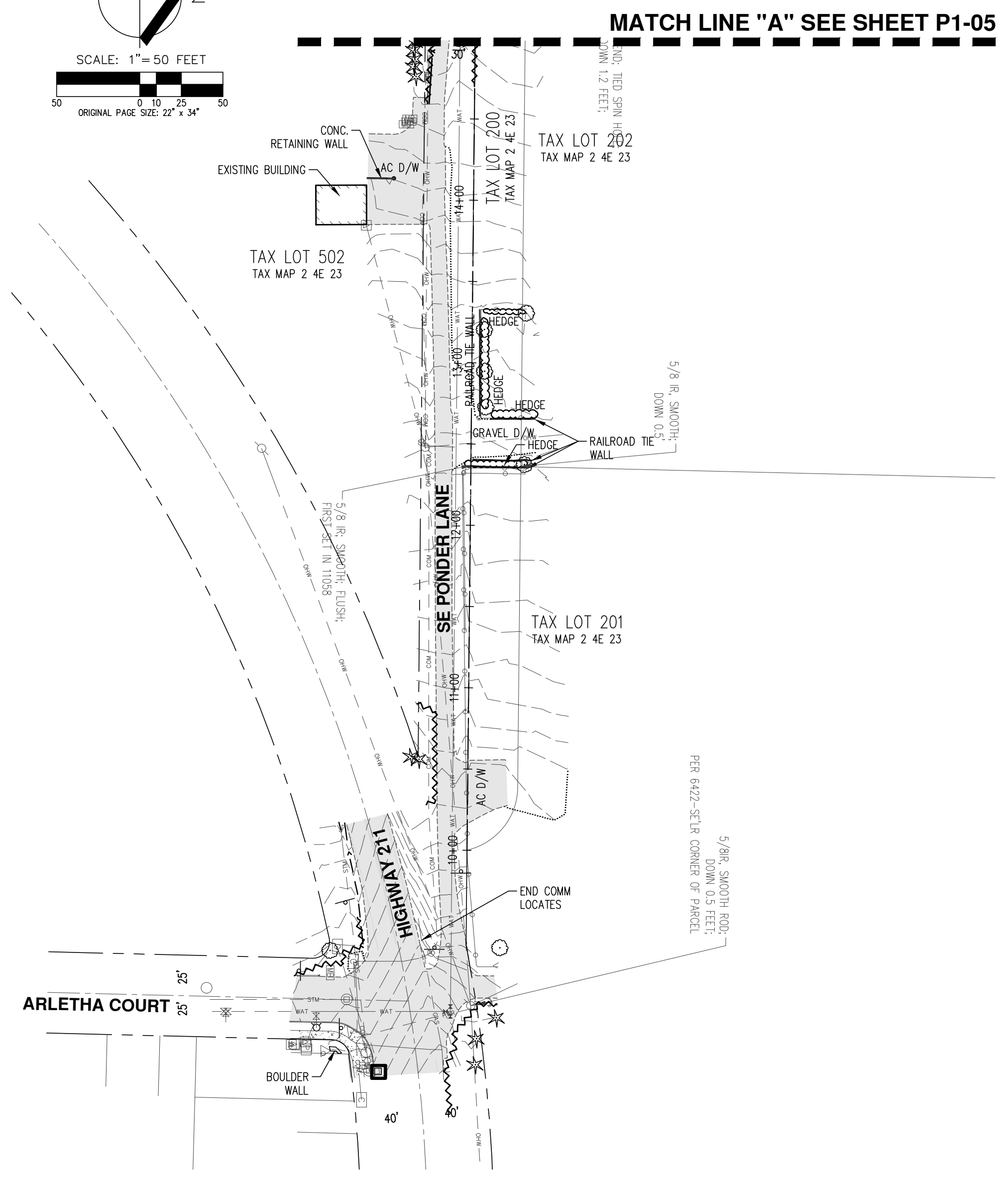
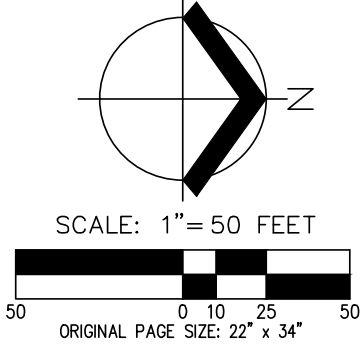
PUE	PUBLIC UTILITY EASEMENT
TPAE	TEMPORARY PUBLIC ACCESS EASEMENT (CONCEPTUAL LOCATION)
PSSE	PUBLIC SANITARY SEWER EASEMENT
PSDE	PUBLIC STORM DRAINAGE EASEMENT

PRELIMINARY GRADING & EROSION & SEDIMENT CONTROL PLAN BAILEY MEADOWS SANDY, OREGON

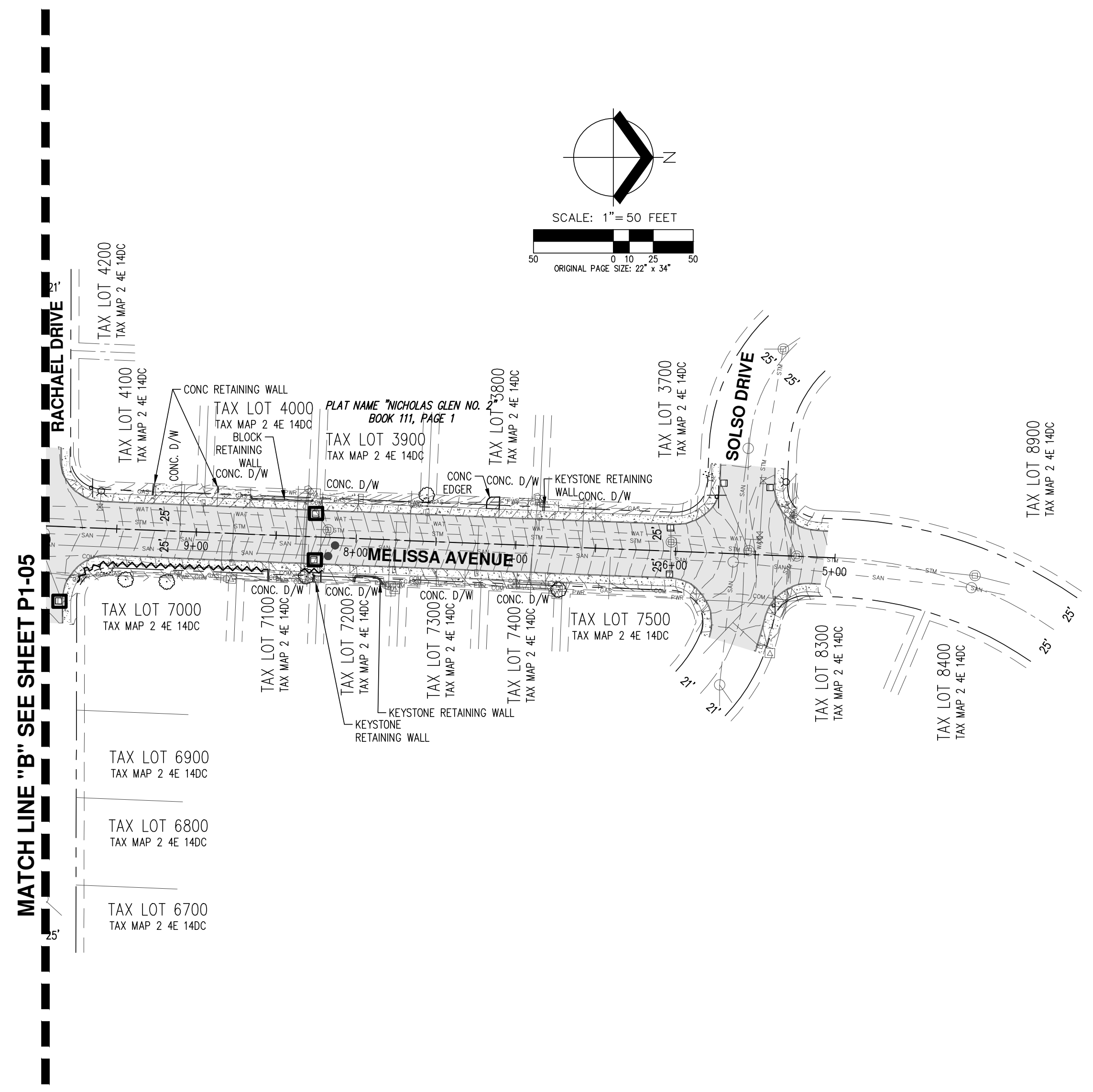
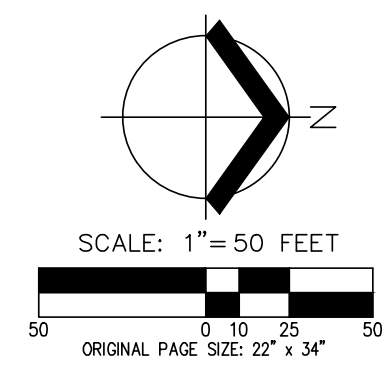


RENEWAL DATE: 6/30/21
JOB NUMBER: 7107
DATE: 07/03/2019
DESIGNED BY: VN
DRAWN BY: CL
CHECKED BY: RSW

P1-05



LEGEND	
EXISTING GROUND CONTOUR (1 FT)	
EXISTING GROUND CONTOUR (5 FT)	
FINISHED GRADE CONTOUR (1 FT)	
FINISHED GRADE CONTOUR (5 FT)	
SEDIMENT FENCE (TO BE INSTALLED PRIOR TO GRADING)	
SEDIMENT FENCE (TO BE INSTALLED AFTER GRADING)	
AREA DRAIN PROTECTION (TYP) PER CATCH BASIN INSERT BAG DETAIL	
CURB INLET PROTECTION (TYP) PER COMBINATION DETAIL	
DITCH INLET PROTECTION (TYP) PER DITCH INLET PROTECTION DETAIL	
CHECK DAM BIOFILTER BAG	
CONCRETE WASHOUT AREA	
DRAINAGE FLOW DIRECTION	
GRAVEL CONSTRUCTION ENTRANCE	
GRADING LIMITS	
TREE PROTECTION/CONSTRUCTION FENCE	

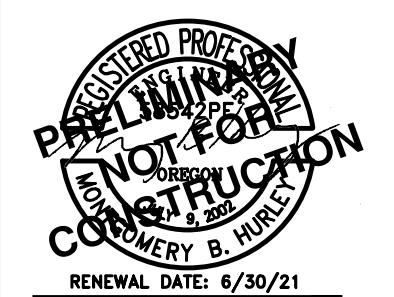


AKS DRAWING FILE: 7107 ESC PLANNING | LAYOUT: P1-06

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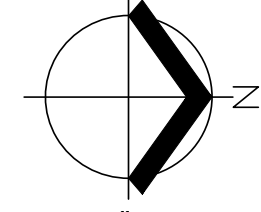
ENGINEERING - SURVEYING - NATURAL RESOURCES
 FORESTRY - PLANNING - LANDSCAPE ARCHITECTURE

**PRELIMINARY GRADING & EROSION
 & SEDIMENT CONTROL PLAN
 BAILEY MEADOWS
 SANDY, OREGON**



RENEWAL DATE: 6/30/21
 JOB NUMBER: 7107
 DATE: 07/03/2019
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P1-06



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ORIGINAL PAGE SIZE: 22" x 34"

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MATCH LINE "C" SEE SHEET P1-08

TAX LOT 807
TAX MAP 2 4E 23

TAX LOT 806
TAX MAP 2 4E 23

TAX LOT 5300
TAX MAP 2 4E 14DC

TAX LOT 5400
TAX MAP 2 4E 14DC

TAX LOT 5500
TAX MAP 2 4E 14DC

TAX LOT 5600
TAX MAP 2 4E 14DC

TAX LOT 5700
TAX MAP 2 4E 14DC

TAX LOT 5800
TAX MAP 2 4E 14DC

TAX LOT 5900
TAX MAP 2 4E 14DC

TAX LOT 6000
TAX MAP 2 4E 14DC

TAX LOT 6100
TAX MAP 2 4E 14DC

TAX LOT 6200
TAX MAP 2 4E 14DC

TAX LOT 6300
TAX MAP 2 4E 14DC

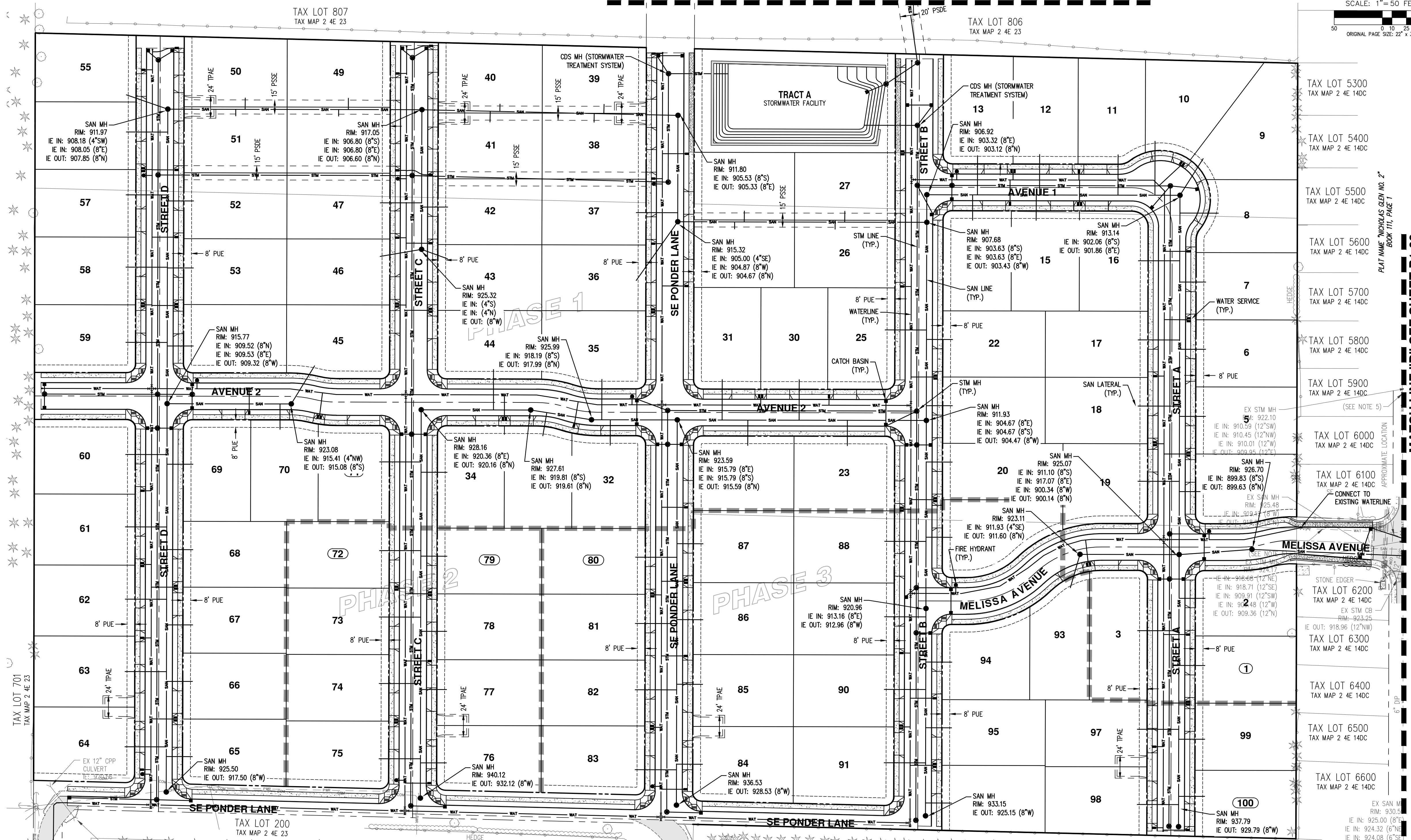
TAX LOT 6400
TAX MAP 2 4E 14DC

TAX LOT 6500
TAX MAP 2 4E 14DC

TAX LOT 6600
TAX MAP 2 4E 14DC

PLAT NAME: "MORIAS GLEN NO. 2"
BOOK 111, PAGE 1

MATCH LINE "B" SEE SHEET P1-08



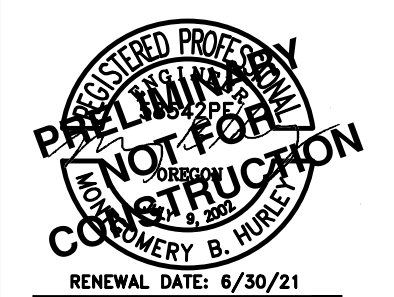
EASEMENT LEGEND

PUE	PUBLIC UTILITY EASEMENT
TPAE	TEMPORARY PUBLIC ACCESS EASEMENT (CONCEPTUAL LOCATION)
PSSE	PUBLIC SANITARY SEWER EASEMENT
PSDE	PUBLIC STORM DRAINAGE EASEMENT

NOTE:
CURB WEEPHOLES SHALL BE INSTALLED ON LOTS WITHOUT STORM DRAIN LATERALS.

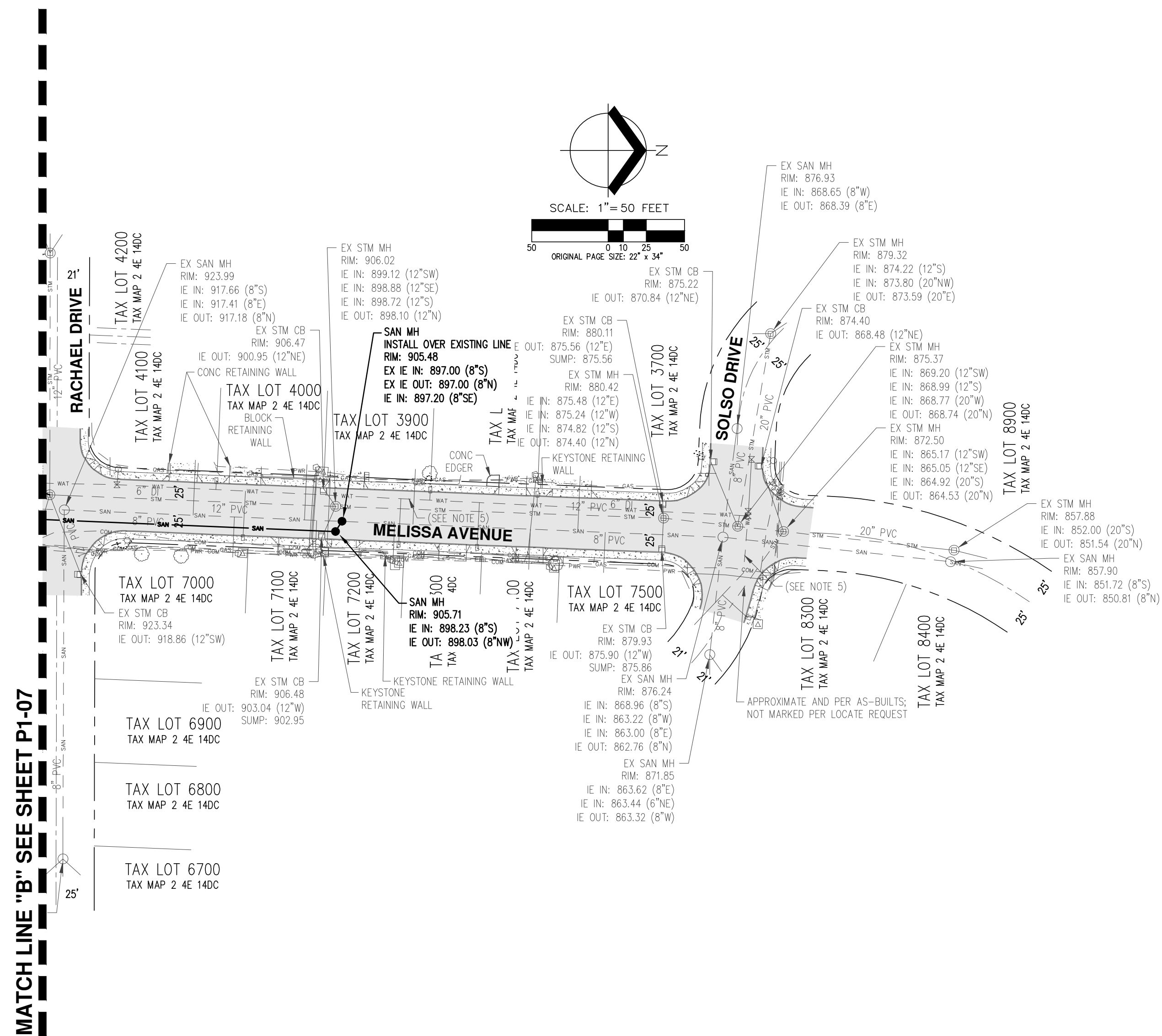
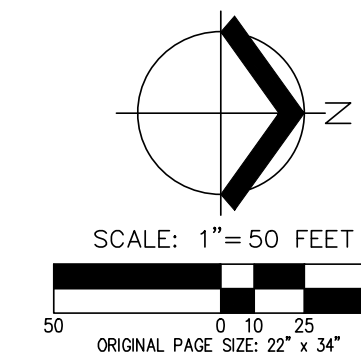
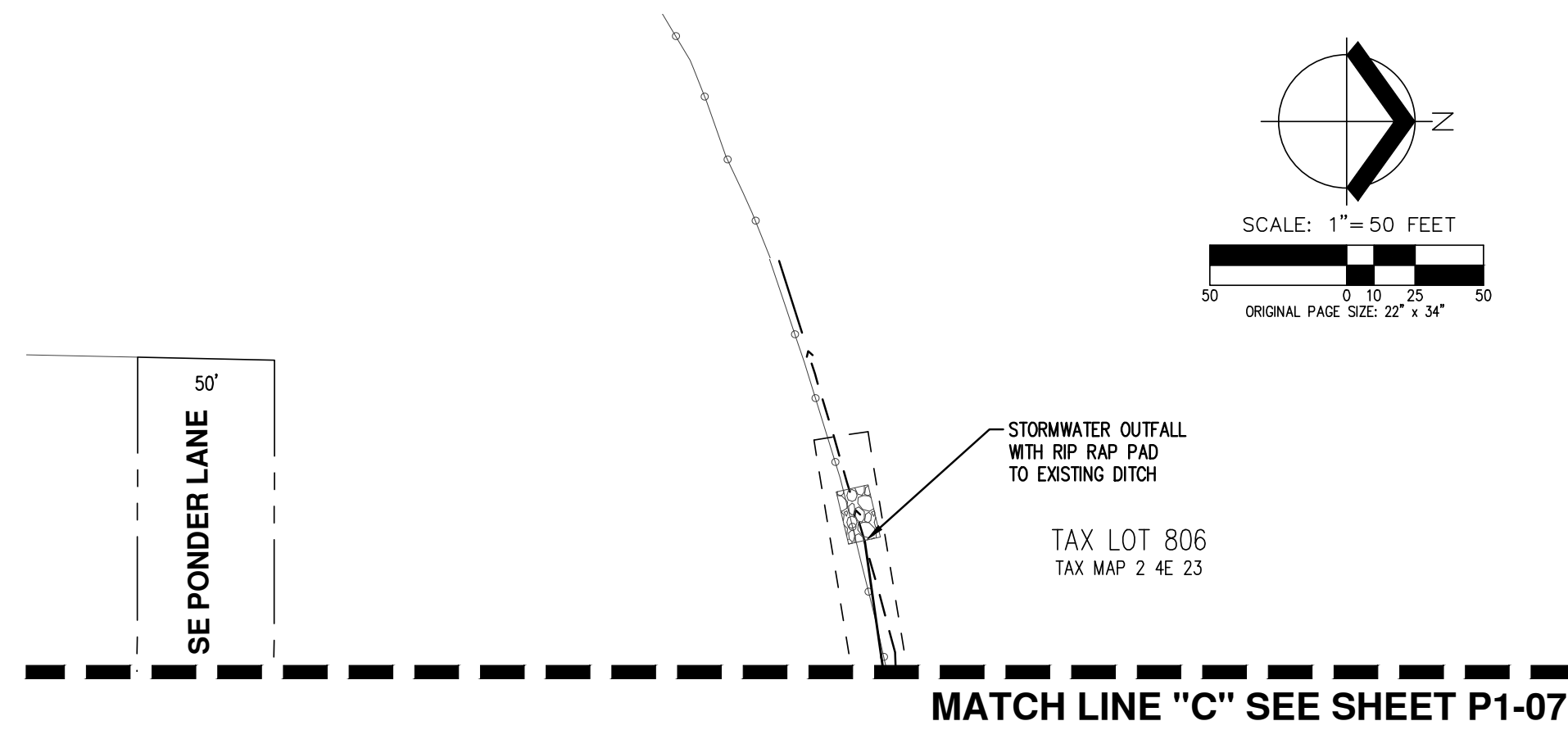
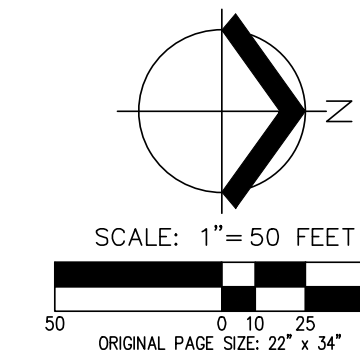
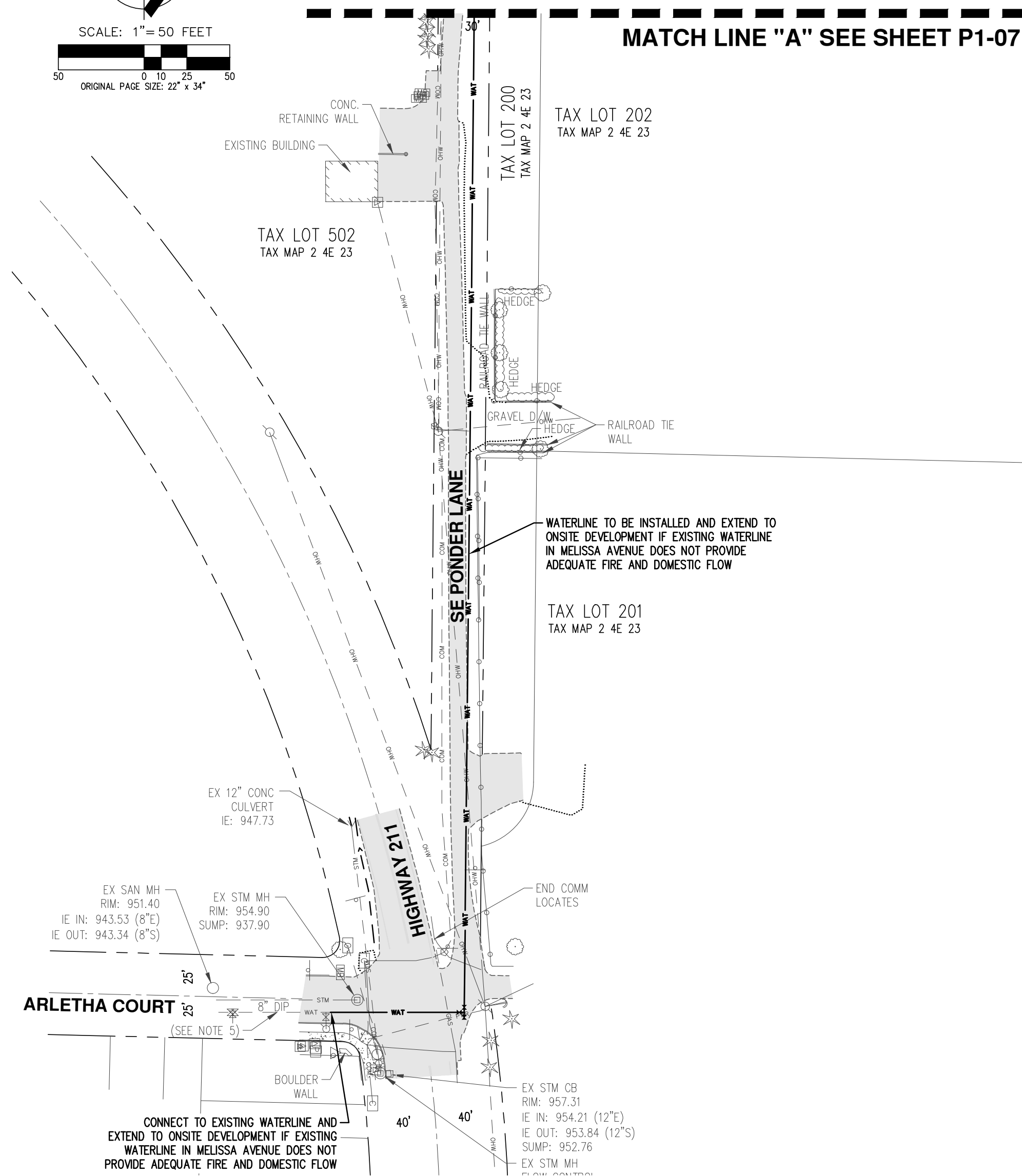
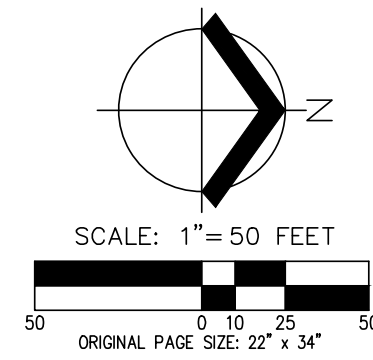
MATCH LINE "A" SEE SHEET P1-08

**PRELIMINARY COMPOSITE
UTILITY PLAN
BAILEY MEADOWS
SANDY, OREGON**



RENEWAL DATE: 6/30/21
JOB NUMBER: 7107
DATE: 07/03/2019
DESIGNED BY: VN
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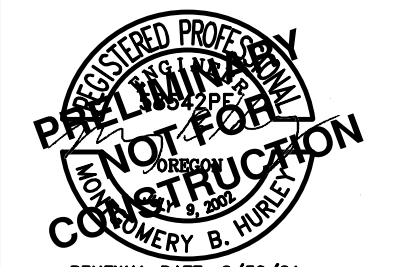
P1-07



AKS DRAWING FILE: 7107 COMP UTILITIES.DWG | LAYOUT: P1-08

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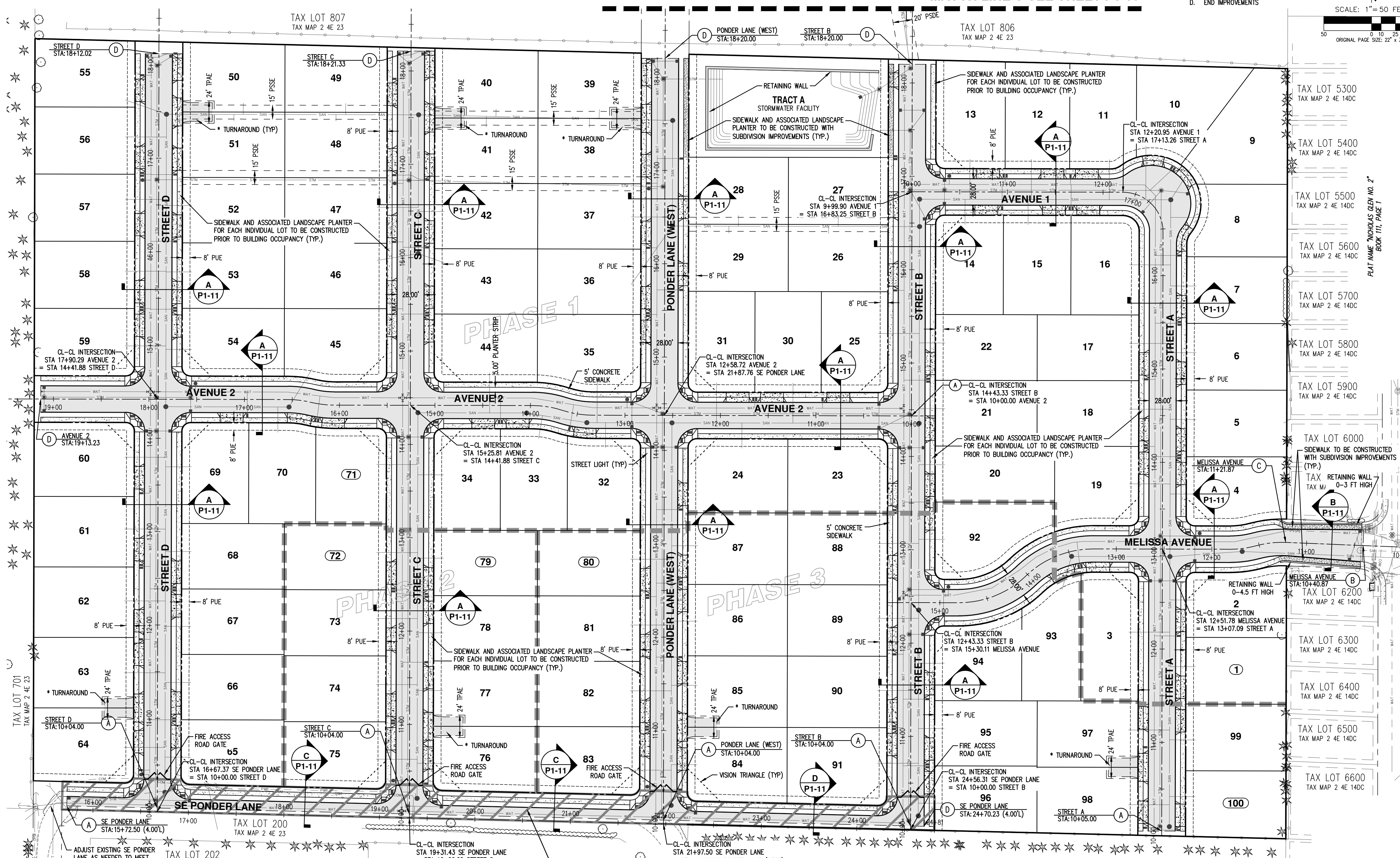
**PRELIMINARY COMPOSITE
 UTILITY PLAN
 BAILEY MEADOWS
 SANDY, OREGON**



RENEWAL DATE: 6/30/21
 JOB NUMBER: 7107
 DATE: 07/03/2019
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P1-08

AKS DRAWING FILE: 7107 STR PLANNING LAYOUT P1-09



MATCH LINE C SEE SHEET P1-10

MATCH LINE A SEE SHEET P1-10

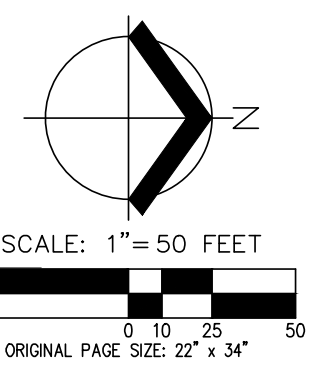
FEE-IN-LIEU OF STREET IMPROVEMENTS

EASEMENT LEGEND

PUE	PUBLIC UTILITY EASEMENT
TPAE	TEMPORARY PUBLIC ACCESS EASEMENT (CONCEPTUAL LOCATION)
PSSE	PUBLIC SANITARY SEWER EASEMENT
PSDE	PUBLIC STORM DRAINAGE EASEMENT

TEMPORARY EMERGENCY VEHICLE AND FRANCHISE WASTE HAULER TURNAROUND. LOCATIONS SHOWN ARE CONCEPTUAL AND TO BE DETERMINED DURING THE FINAL CONSTRUCTION PLAN REVIEW PROCESS.

- KEYED NOTES**
- A. BEGIN STREET IMPROVEMENTS
 - B. BEGIN IMPROVEMENTS / BEGIN TAPER
 - C. END TAPER
 - D. END IMPROVEMENTS



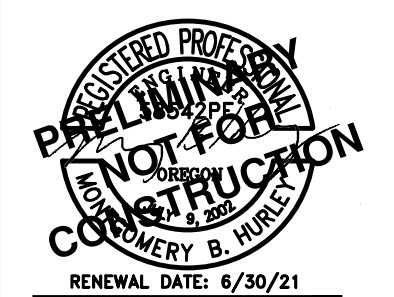
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MATCH LINE B SEE SHEET P1-10

PRELIMINARY STREET PLAN

BAILEY MEADOWS SANDY, OREGON



RENEWAL DATE: 6/30/21
JOB NUMBER: 7107
DATE: 07/03/2019
DESIGNED BY: VN
DRAWN BY: CL
CHECKED BY: RSW

P1-09

PLAT NAME: WOODS GEN. NO. 2 BOOK 111, PAGE 1

TAX LOT 5300 TAX MAP 2 4E 14DC

TAX LOT 5400 TAX MAP 2 4E 14DC

TAX LOT 5500 TAX MAP 2 4E 14DC

TAX LOT 5600 TAX MAP 2 4E 14DC

TAX LOT 5700 TAX MAP 2 4E 14DC

TAX LOT 5800 TAX MAP 2 4E 14DC

TAX LOT 5900 TAX MAP 2 4E 14DC

TAX LOT 6000 TAX MAP 2 4E 14DC

TAX LOT 6100 TAX MAP 2 4E 14DC

TAX LOT 6200 TAX MAP 2 4E 14DC

TAX LOT 6300 TAX MAP 2 4E 14DC

TAX LOT 6400 TAX MAP 2 4E 14DC

TAX LOT 6500 TAX MAP 2 4E 14DC

TAX LOT 6600 TAX MAP 2 4E 14DC

TAX LOT 807 TAX MAP 2 4E 23

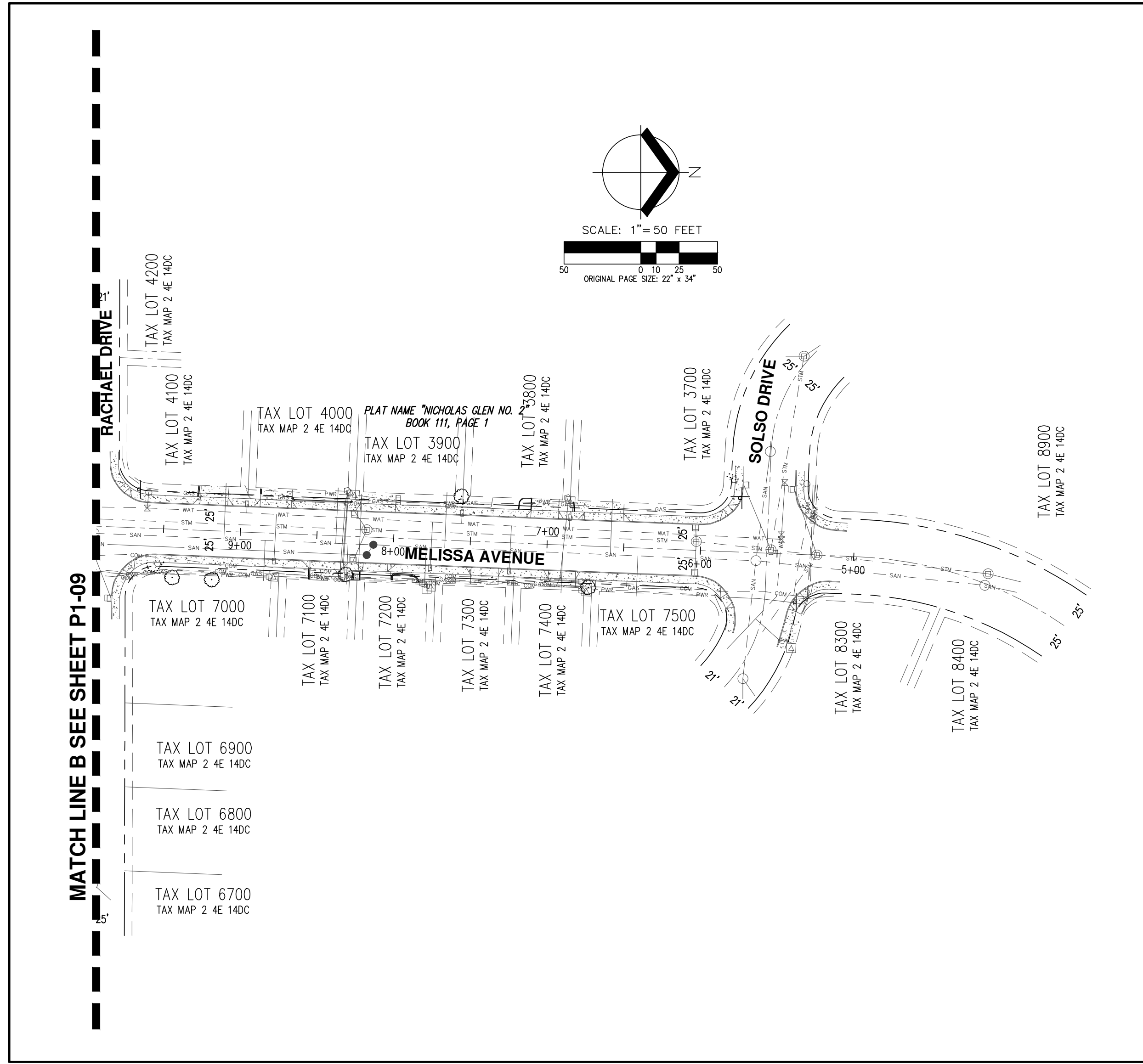
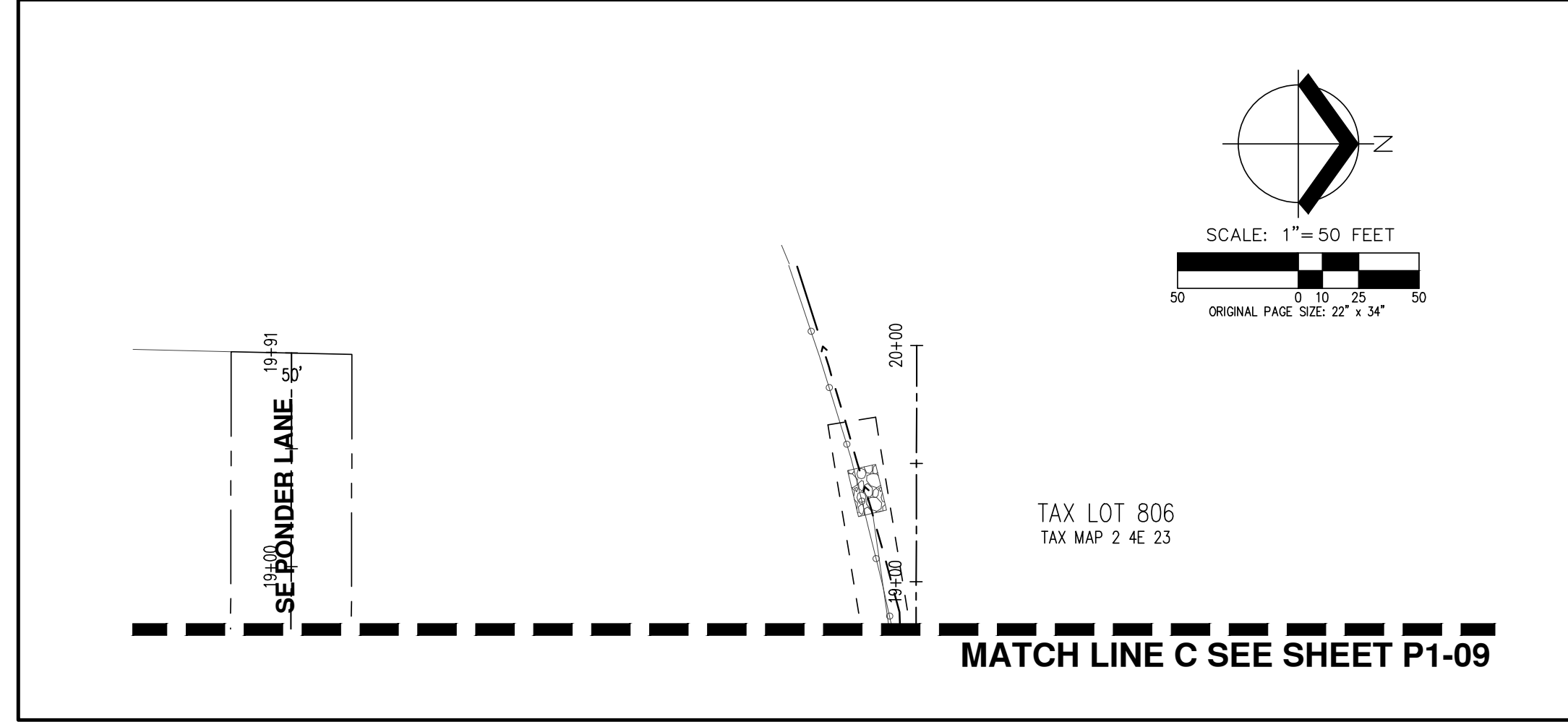
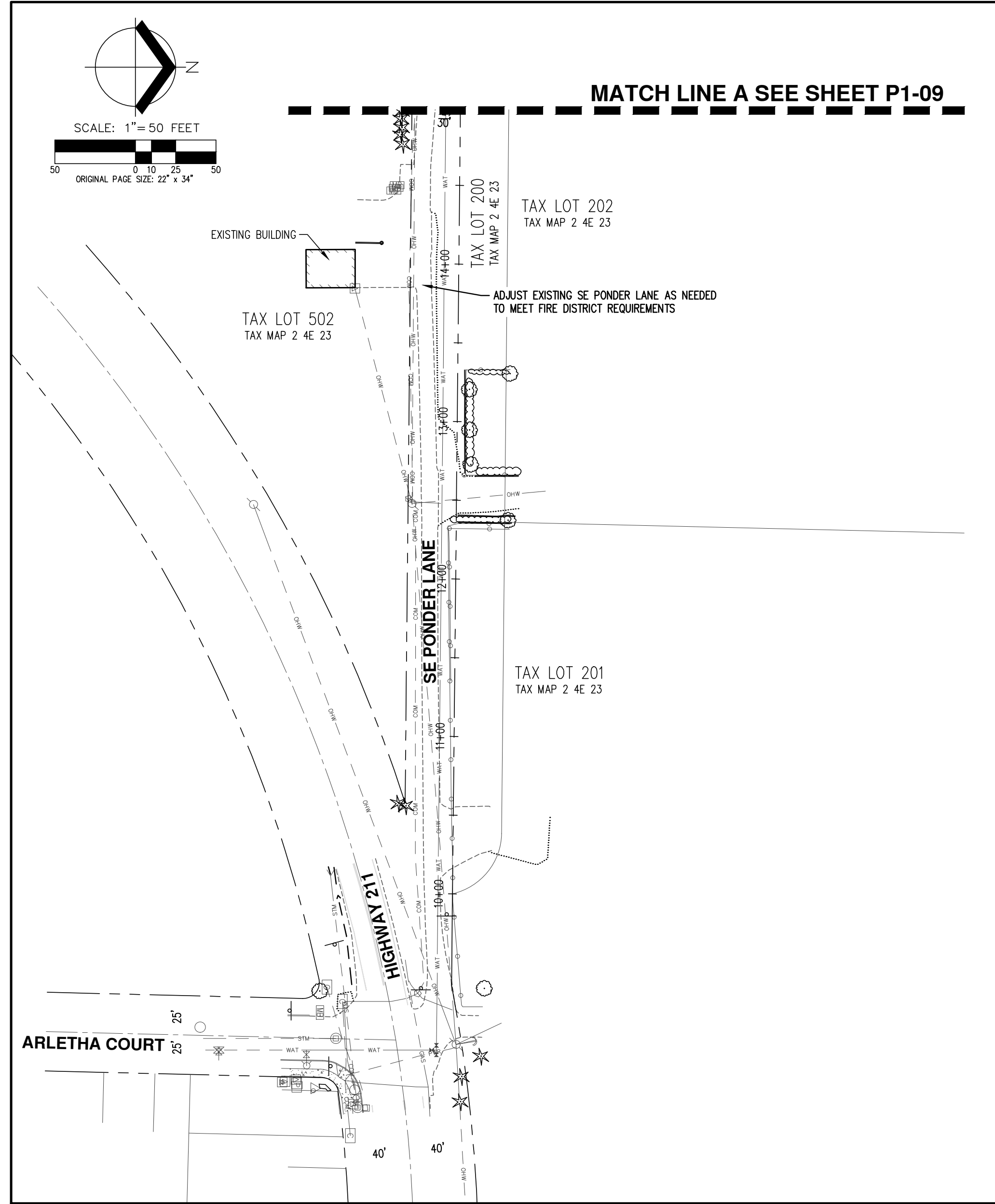
TAX LOT 806 TAX MAP 2 4E 23

TAX LOT 701 TAX MAP 2 4E 23

TAX LOT 200 TAX MAP 2 4E 23

TAX LOT 202 TAX MAP 2 4E 23

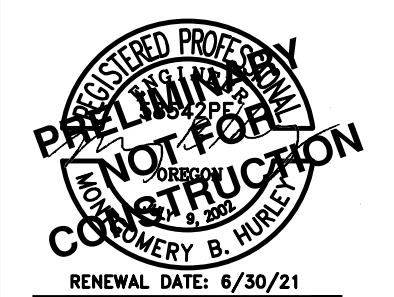
AKS DRAWING FILE: 7107 STR PLANNING | LAYOUT: P1-10



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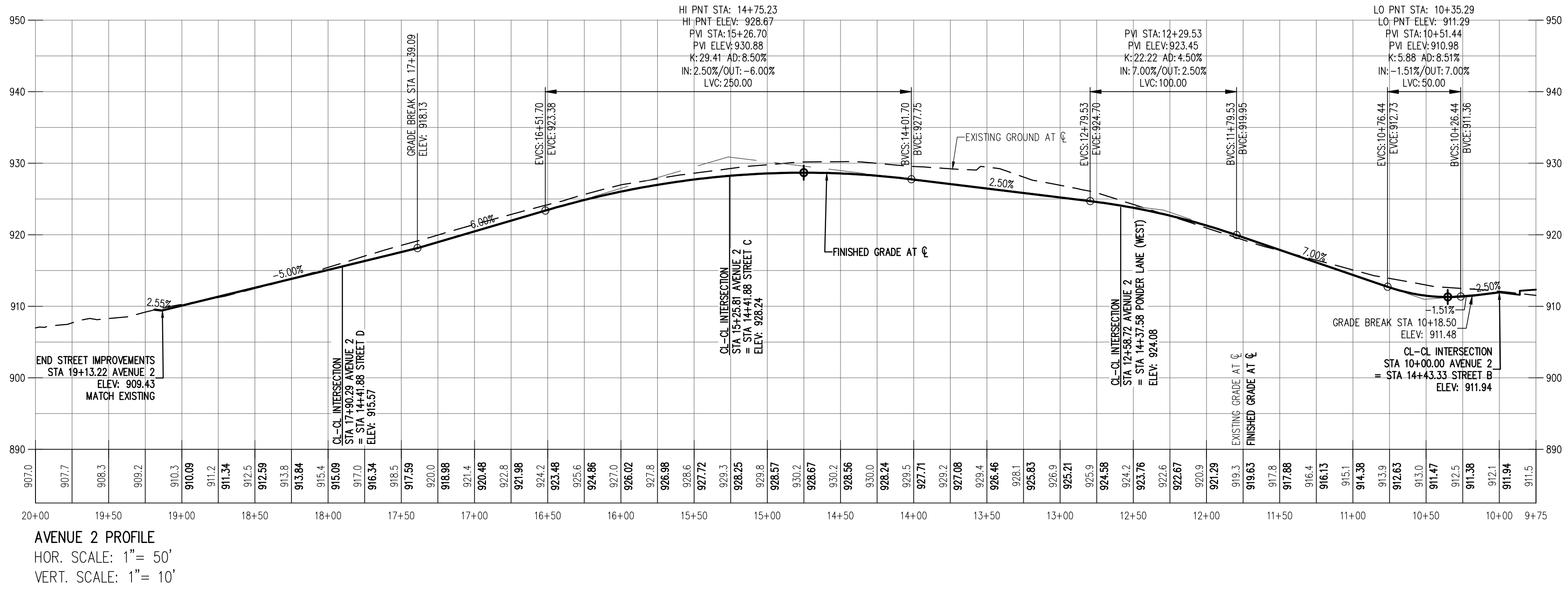
PRELIMINARY STREET PLAN
BAILEY MEADOWS
SANDY, OREGON



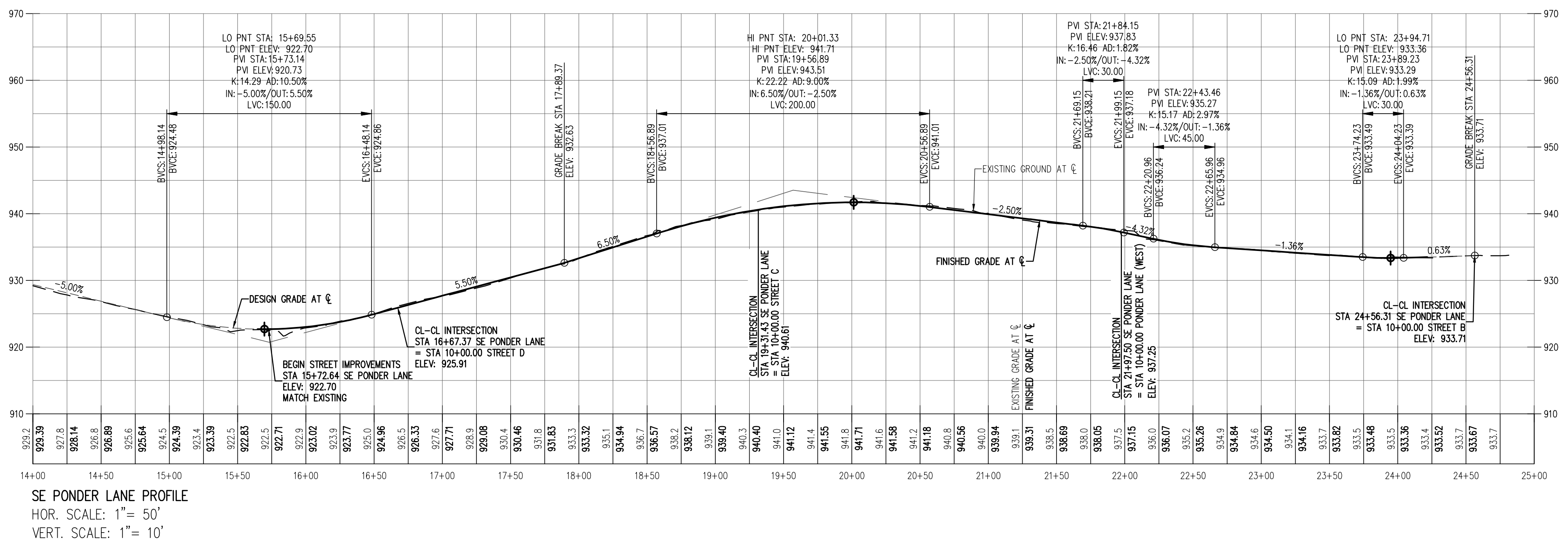
JOB NUMBER: 7107
DATE: 07/03/2019
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CHECKED BY: RSW

P1-10

AKS DRAWING FILE: 7107 STR PROFILES.DWG | LAYOUT: P1-12



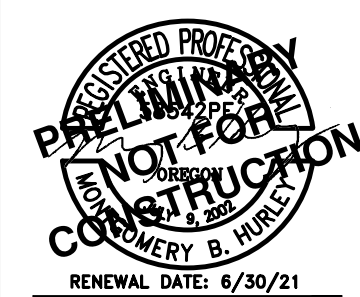
AVENUE 2 PROFILE
 HOR. SCALE: 1" = 50'
 VERT. SCALE: 1" = 10'



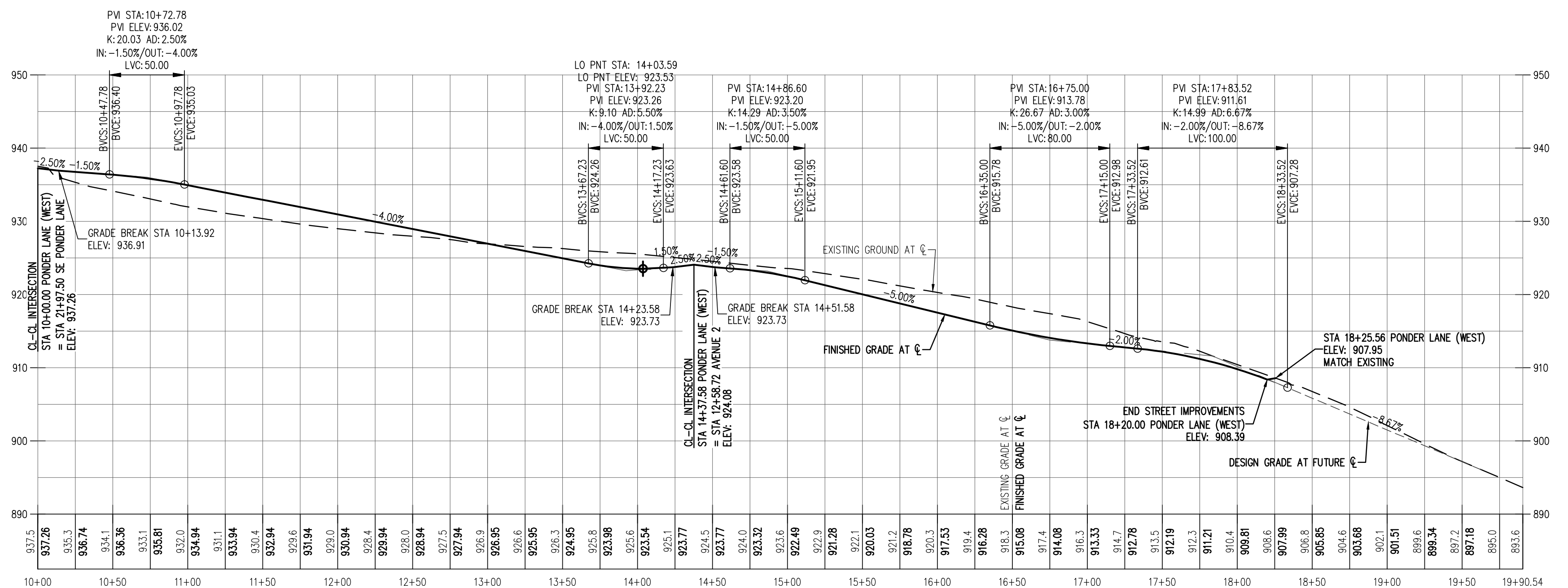
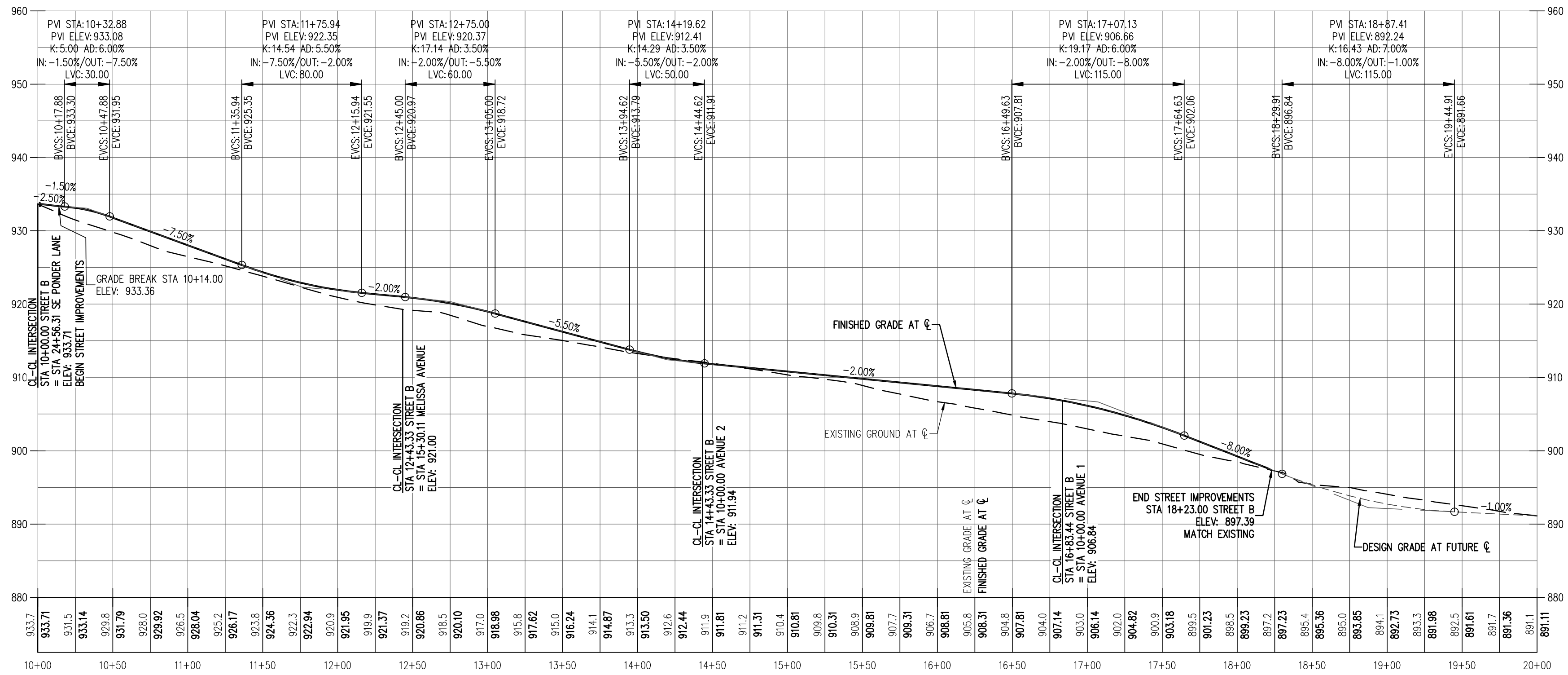
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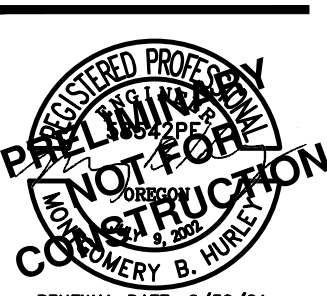
PRELIMINARY STREET PROFILES
**BAILEY MEADOWS
 SANDY, OREGON**



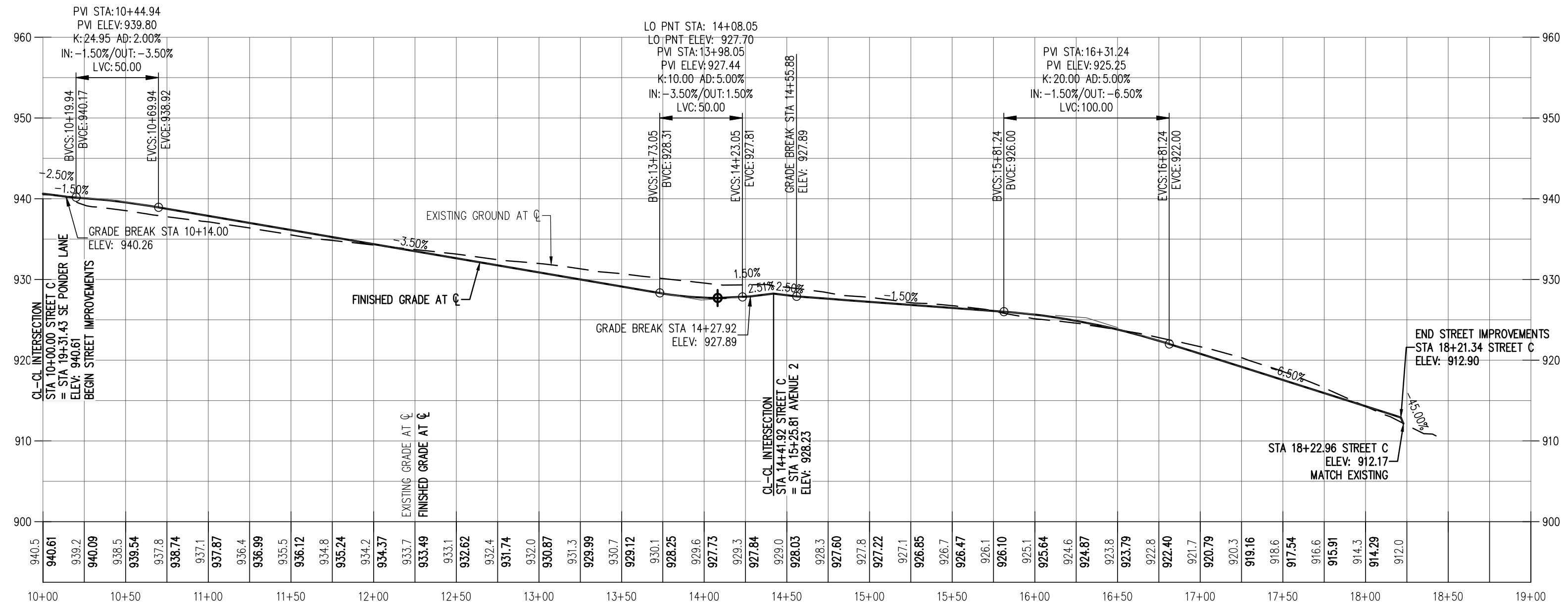
RENEWAL DATE: 6/30/21
 JOB NUMBER: 7107
 DATE: 07/03/2019
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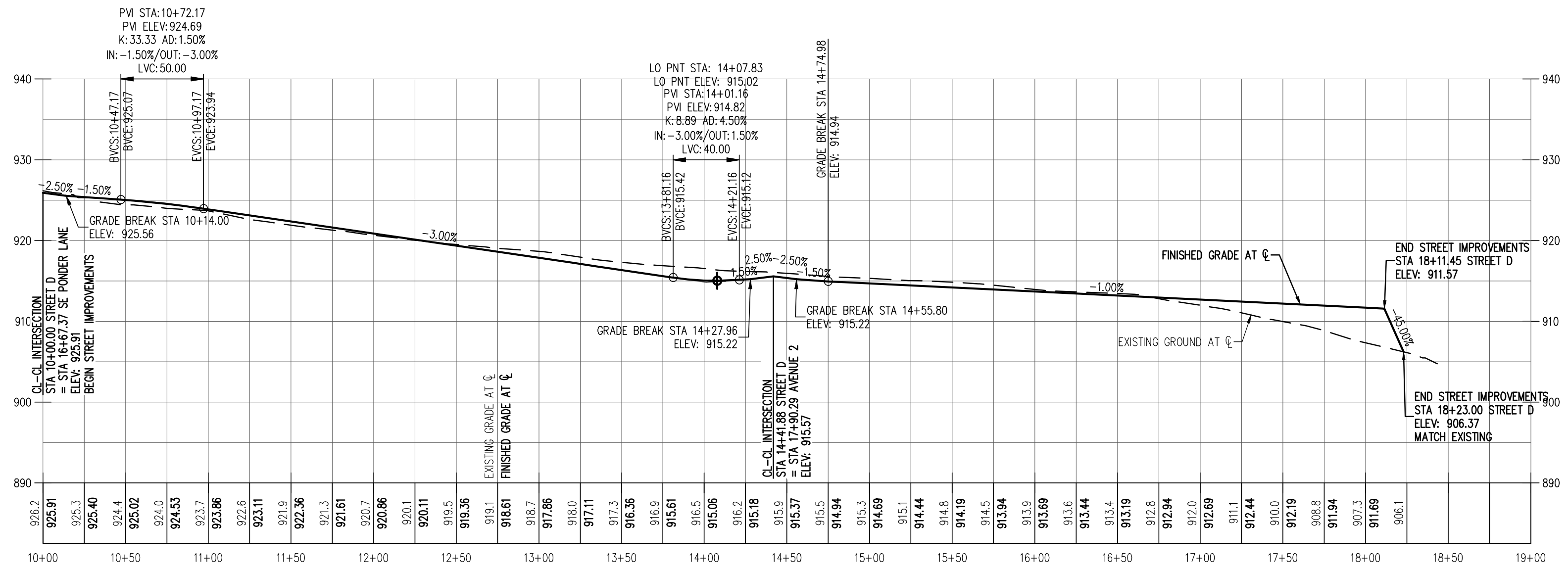
PRELIMINARY STREET PROFILES
BAILEY MEADOWS
SANDY, OREGON



RENEWAL DATE: 6/30/21
 JOB NUMBER: 7107
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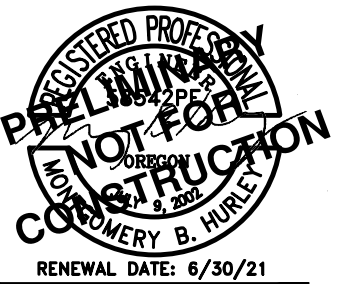
STREET C PROFILE
 HOR. SCALE: 1" = 50'
 VERT. SCALE: 1" = 10'



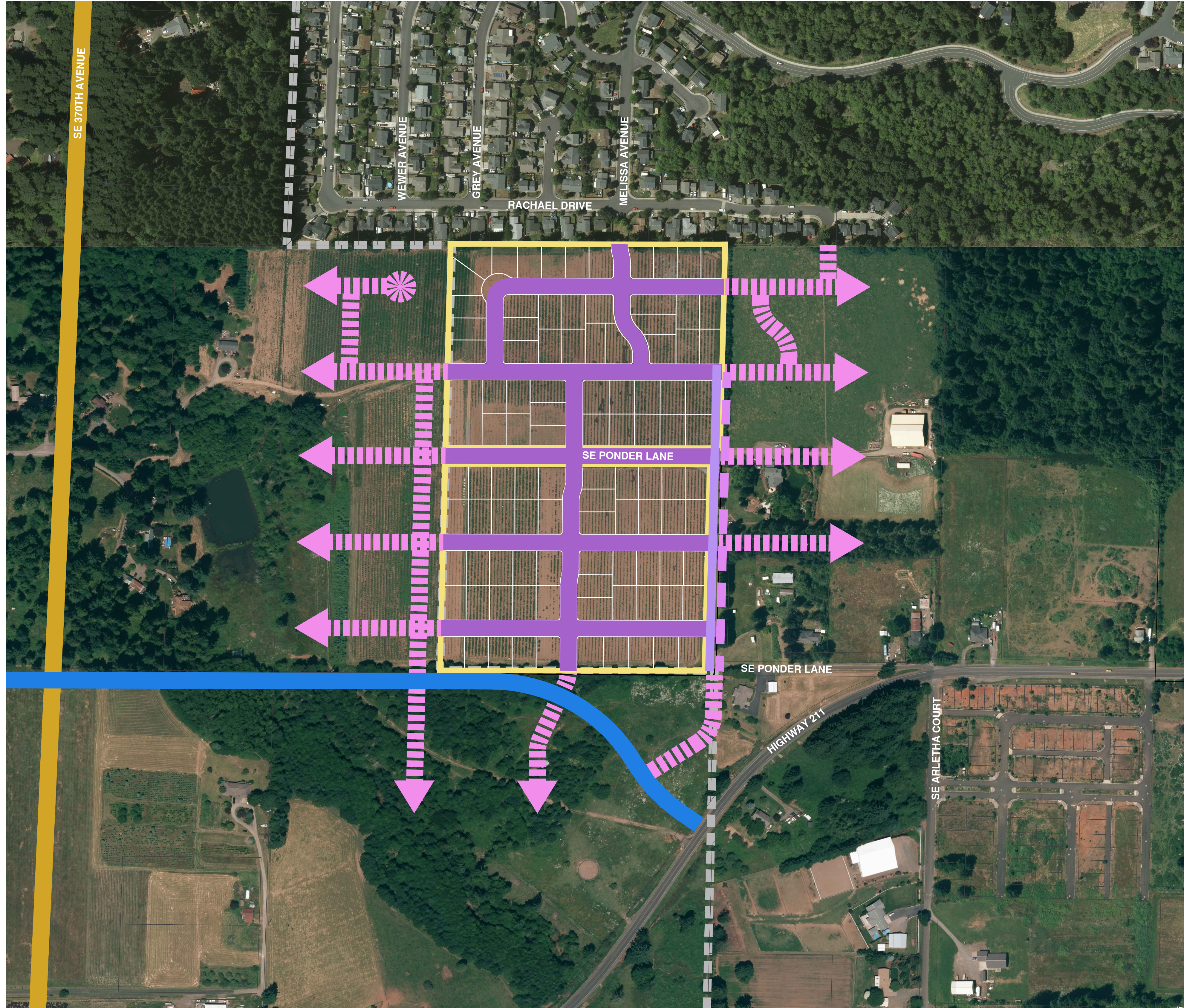
STREET D PROFILE
 HOR. SCALE: 1" = 50'
 VERT. SCALE: 1" = 10'

PRELIMINARY STREET PROFILES


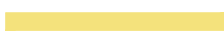






**BAILEY MEADOWS
 SANDY, OREGON**



RENEWAL DATE: 6/30/21
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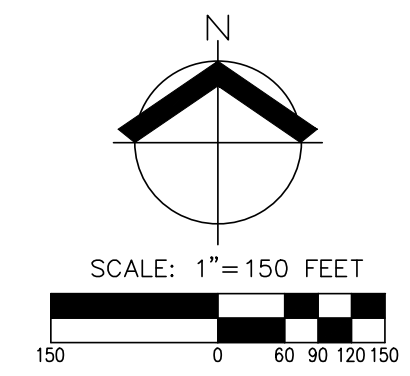


LEGEND

- URBAN GROWTH BOUNDARY 
- PROJECT SITE BOUNDARY 
- PLANNED LOCAL STREET 
- PLANNED LOCAL STREET (FEE-IN-LIEU FOR 1/2 STREET IMPROVEMENTS) 
- FUTURE MINOR ARTERIAL (ON TSP) 
- FUTURE COLLECTOR (ON TSP) 
- FUTURE LOCAL STREET 
- FUTURE LOCAL STREET (1/2 STREET IMPROVEMENTS) 

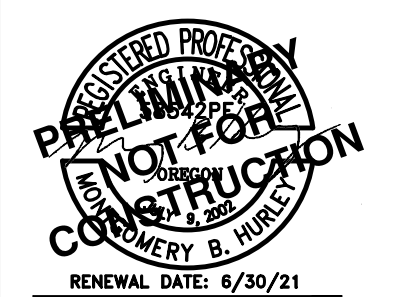
NOTES

1. THIS PLAN IS INCLUDED TO MEET THE SUBMITTAL REQUIREMENTS FOR THE CITY OF SANDY FOR THE BAILEY MEADOWS SUBDIVISION APPLICATION.
2. CONCEPTUAL FUTURE STREET LOCATIONS ARE SHOWN FOR ILLUSTRATIVE PURPOSES FOR THE LAND USE APPLICATION ONLY AND ARE NOT PROPOSED WITH THIS SUBDIVISION AND ARE NOT BINDING ON ANY OFFSITE PROPERTIES.



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**CONCEPTUAL FUTURE
 STREET PLAN
 BAILEY MEADOWS
 SANDY, OREGON**

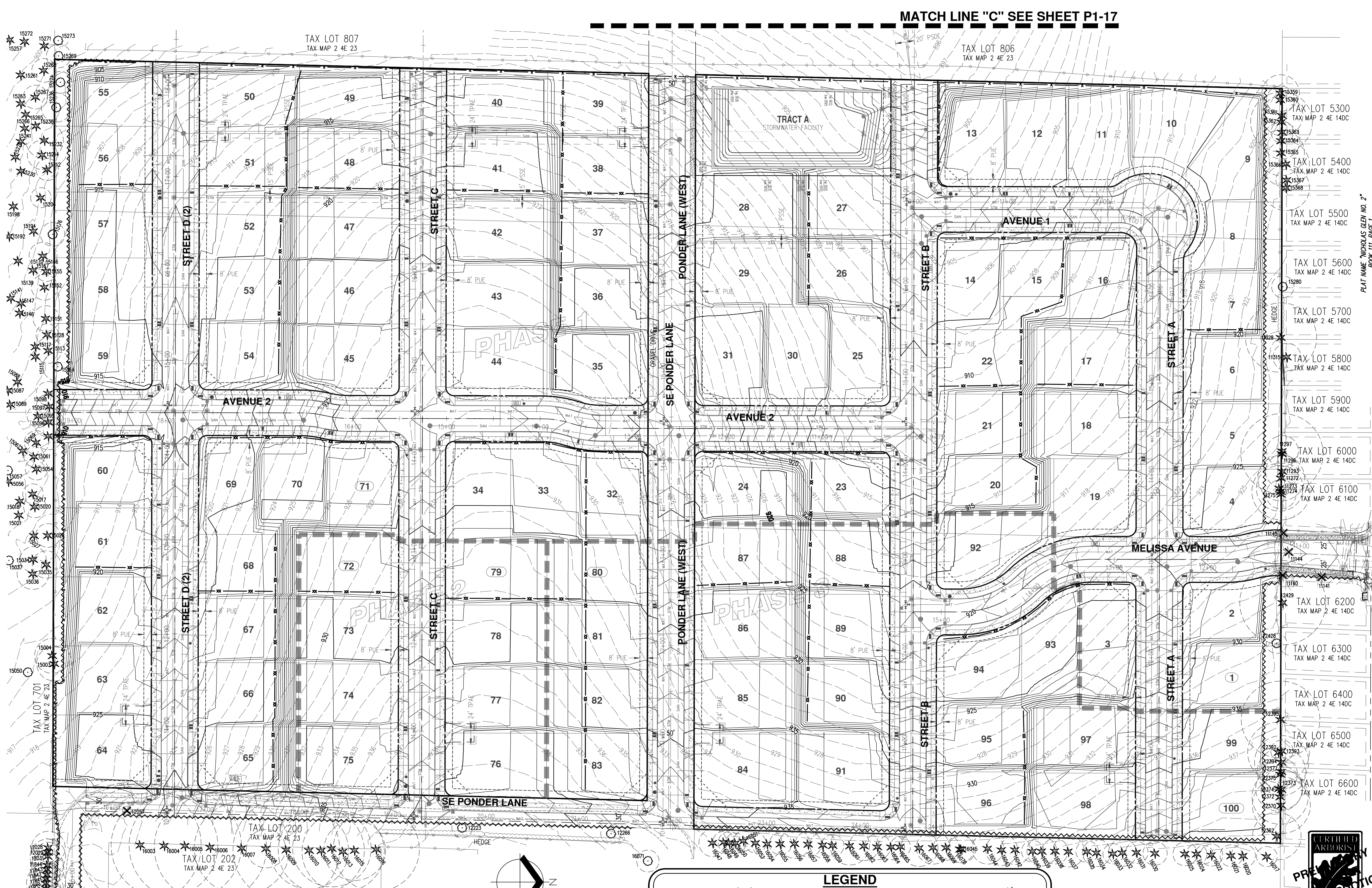


RENEWAL DATE: 6/30/21
 JOB NUMBER: 7107
 DATE: 07/03/2019
 DESIGNED BY: VN
 DRAWN BY: CL
 CHECKED BY: RSW

P1-15

**PRELIMINARY TREE PRESERVATION & REMOVAL PLAN & ARBORIST REPORT
 BAILEY MEADOWS
 SANDY, OREGON**

REGISTERED PROFESSIONAL ARBORIST
 PRELIMINARY NOT FOR CONSTRUCTION
 CONROY B. THURMANN
 RENEWAL DATE: 6/30/21
 JOB NUMBER: 7107
 DATE: 07/03/2019
 DESIGNED BY: VN
 DRAWN BY: CL
 CHECKED BY: RSW



MATCH LINE "A" SEE SHEET P1-17

MATCH LINE "C" SEE SHEET P1-17

MATCH LINE "B" SEE SHEET P1-17

LEGEND

EXISTING GROUND CONTOUR (1 FT)	149	EXISTING CONIFEROUS TREE	*
EXISTING GROUND CONTOUR (5 FT)	150	EXISTING DECIDUOUS TREE	o
FINISHED GRADE CONTOUR (1 FT)	149	TREE REMOVAL	x
FINISHED GRADE CONTOUR (5 FT)	150	TREE PROTECTION/CONSTRUCTION FENCE (TREE PROTECTION AREA)	~
OPTIMAL TREE ROOT ZONE (1-FT RADIUS PER 1-IN OF DBH)		SEDIMENT FENCE	- - -

NOTES:

- TREES WITH A DIAMETER OF 11" OR GREATER ARE SHOWN.
- SEE THE TREE PRESERVATION & REMOVAL TABLE FOR ADDITIONAL TREE RELATED INFORMATION.

SCALE: 1" = 50 FEET

ORIGINAL PAGE SIZE: 22" x 34"

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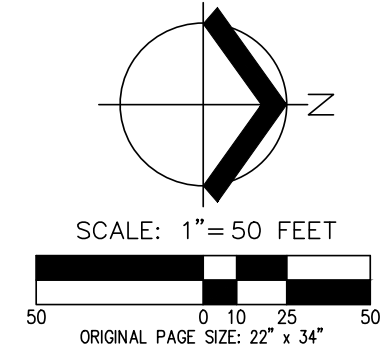
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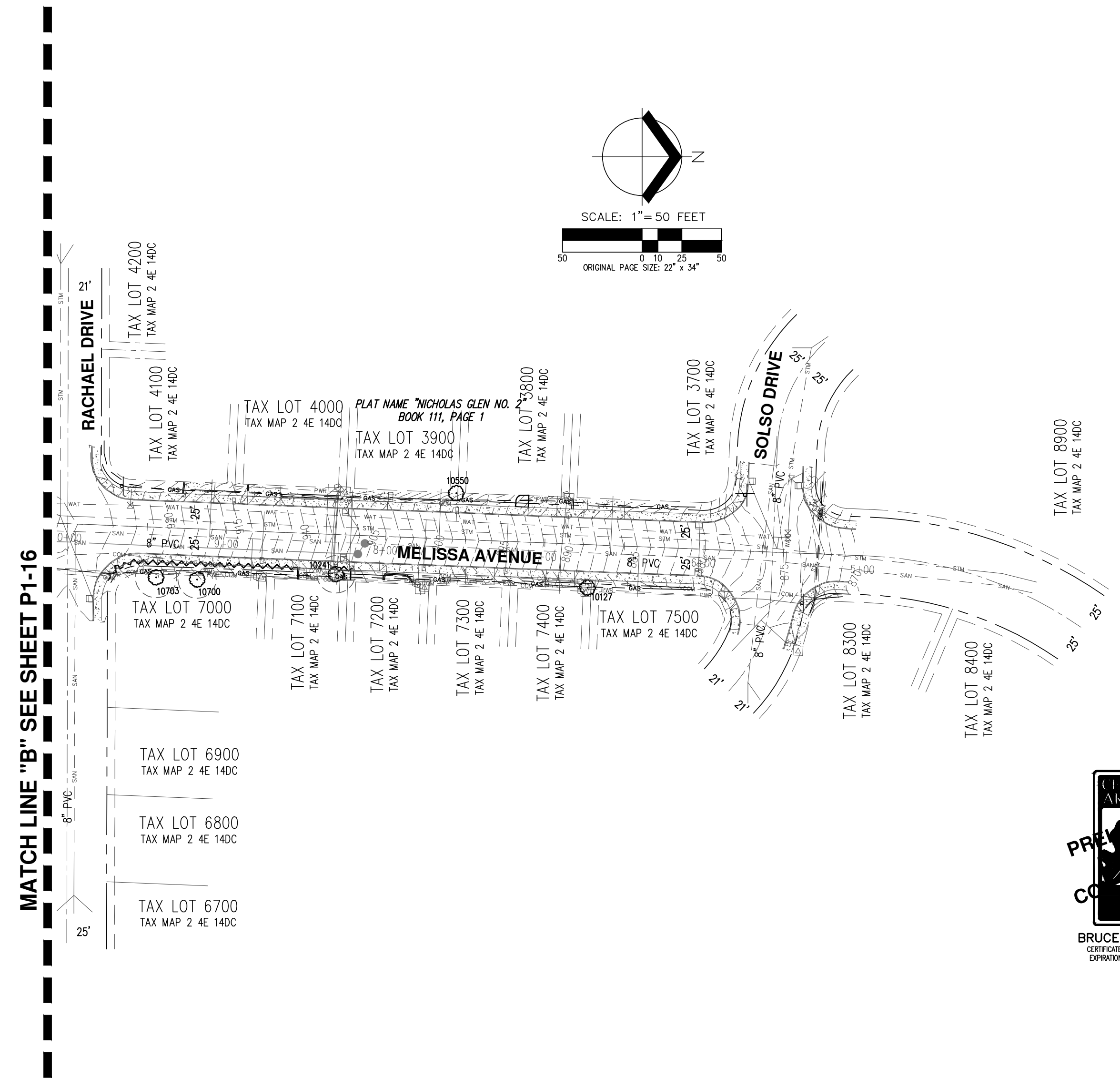
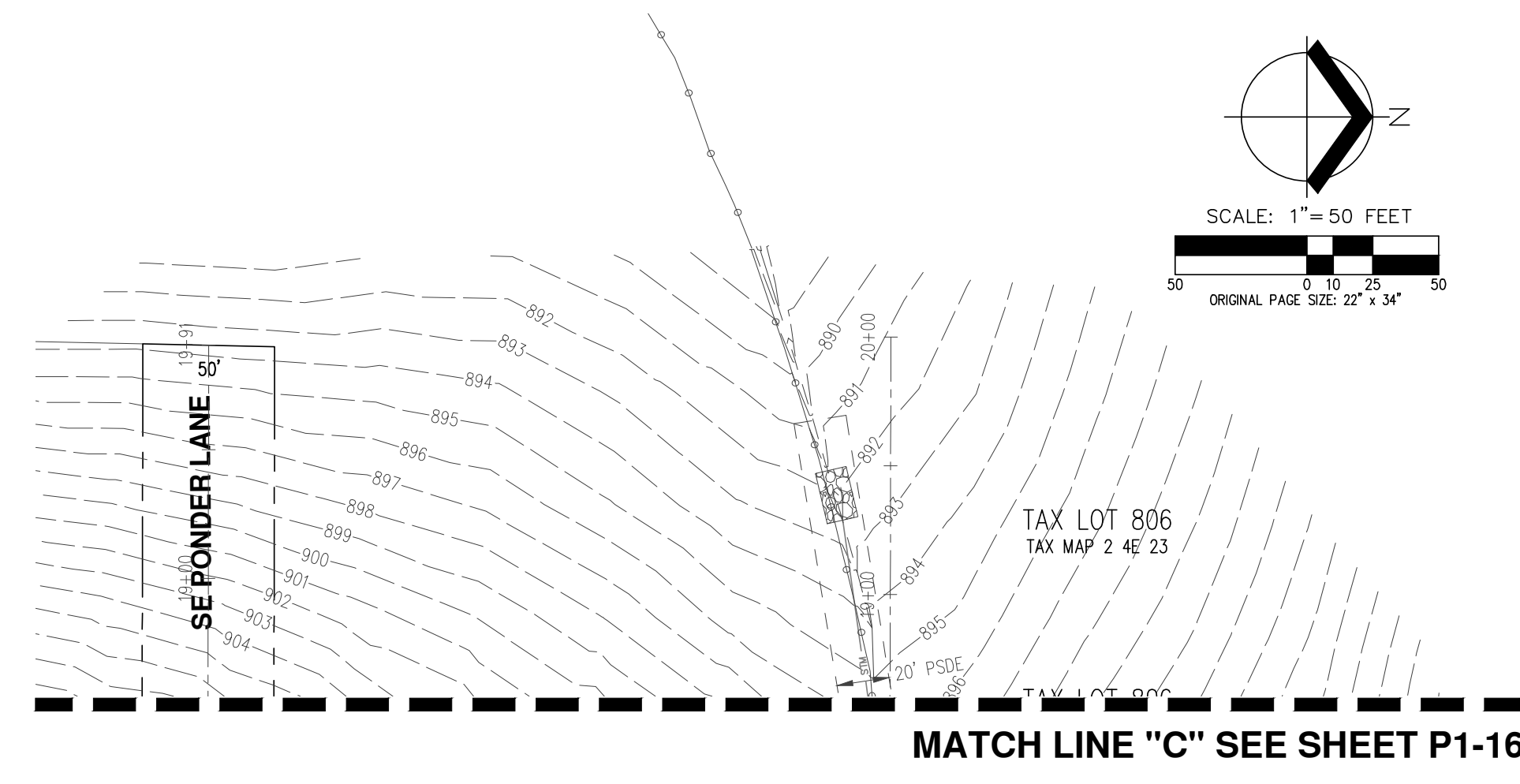
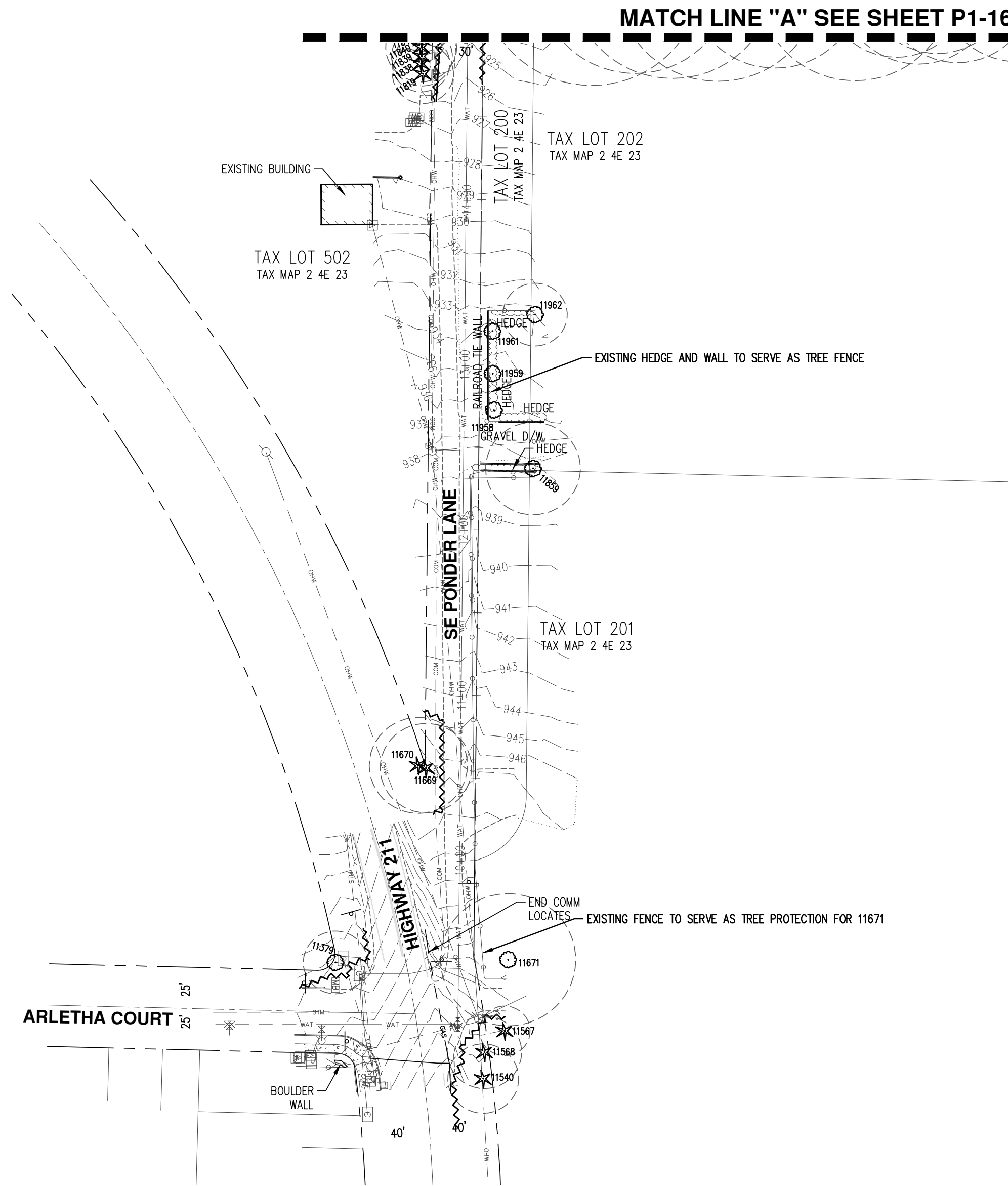
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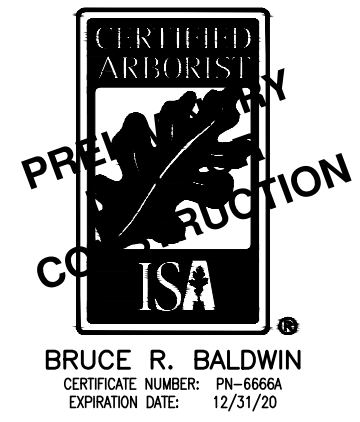
LEGEND			
EXISTING GROUND CONTOUR (1 FT)	---	149	EXISTING CONIFEROUS TREE
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FINISHED GRADE CONTOUR (5 FT)	---	150	TREE PROTECTION/CONSTRUCTION FENCE (TREE PROTECTION AREA)
OPTIMAL TREE ROOT ZONE (1-FT RADIUS PER 1-IN OF DBH)	○		SEDIMENT FENCE

- NOTES:**
- TREES WITH A DIAMETER OF 11" OR GREATER ARE SHOWN.
 - SEE THE TREE PRESERVATION & REMOVAL TABLE FOR ADDITIONAL TREE RELATED INFORMATION.



AKS
 AKS ENGINEERING & FORESTRY, LLC
 12905 SW HERMAN RD, STE. 100
 TUALATIN, OR 97062
 503.563.6151
 WWW.AKS-ENG.COM
 ENGINEERING - SURVEYING - NATURAL RESOURCES
 FORESTRY - PLANNING - LANDSCAPE ARCHITECTURE

**PRELIMINARY TREE PRESERVATION & REMOVAL PLAN & ARBORIST REPORT
 BAILEY MEADOWS
 SANDY, OREGON**



RENEWAL DATE:	6/30/21
JOB NUMBER:	7107
DATE:	07/03/2019
DESIGNED BY:	WN
DRAWN BY:	CL
CHECKED BY:	RSW

P1-17

Detailed Tree Inventory for Bailey Meadows

AKS Job No. 7107 - Evaluation Date: 5/30/2019

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (Scientific name)	Comments	Health Rating*	Structure Rating**	Reason for Removal***
10127	15	16	Red Alder (<i>Alnus rubra</i>)	OFFSITE; Codominant with included bark	1	2	Preserve
10241	12	16	Basswood (<i>Tilia americana</i>)	OFFSITE; Codominant with included bark	1	2	Preserve
10550	13	18	Red Alder (<i>Alnus rubra</i>)	OFFSITE	1	1	Preserve
10700	12	17	Sweetgum (<i>Liquidambar styraciflua</i>)	OFFSITE; Codominant 5' up with included bark	1	2	Preserve
10703	13	14	Sweetgum (<i>Liquidambar styraciflua</i>)	OFFSITE; Codominant 5' up with included bark	1	1	Preserve
11140	24	19	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE	1	1	Remove (A)
11141	15	14	Deodar Cedar (<i>Cedrus deodara</i>)	OFFSITE	1	1	Remove (A)
11144	18	17	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Sparse canopy	1	2	Remove (A)
11145	38	32	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Pruned branches; Dead branches; Codominant top; Broken 20' up with weakly attached branches; Decay	2	3	Remove (A)
11272	25	25	Douglas-fir (<i>Pseudotsuga menziesii</i>)		1	1	Preserve
11273	25	30	Douglas-fir (<i>Pseudotsuga menziesii</i>)	Lower branches pruned	1	1	Preserve
11274	31	30	Douglas-fir (<i>Pseudotsuga menziesii</i>)	Lower branches pruned	1	1	Preserve
11275	16	20	Douglas-fir (<i>Pseudotsuga menziesii</i>)	Some dead branches; Dead foliage	2	1	Preserve
11293	18	20	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence)	1	1	Preserve
11296	44	35	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence); Codominant 4' up with included bark	1	2	Preserve
11297	17	20	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence)	1	1	Preserve
11315	15	20	Deodar Cedar (<i>Cedrus deodara</i>)	OFFSITE; Evaluated from property line (behind fence); Some dead branches and dead foliage	2	1	Preserve
11328	38	33	Douglas-fir (<i>Pseudotsuga menziesii</i>)		1	1	Preserve
11379	19	20	Big Leaf Maple (<i>Acer macrophyllum</i>)	OFFSITE; Codominant 5' up with included bark	1	2	Preserve
11540	21	18	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; 70% ivy coverage; Topped for wires; Codominant top; Some broken and dead branches	2	2	Preserve
11567	15	16	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE	1	1	Preserve
11568	22	17	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Topped for wires; Codominant top; Some broken and dead branches	2	2	Preserve
11669	27	23	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Many pruned branches (N); Slight lean (N); Large broken branch 25' up	1	2	Preserve
11670	29	23	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE	1	1	Preserve
11671	40	32	Maple (<i>Acer sp.</i>)	OFFSITE; Evaluated from property line (behind fence); Codominant with included bark; Near wires	1	2	Preserve
11819	6, 8, 12, 12, 14, 15, 18	15	Western Red Cedar (<i>Thuja plicata</i>)	OFFSITE; Evaluated from property line; Pruned halfway up (N) for wires; Codominant base	1	2	Preserve
11838	13, 17	15	Western Red Cedar (<i>Thuja plicata</i>)	OFFSITE; Evaluated from property line; Pruned halfway up (N) for wires; Codominant base	1	2	Preserve
11839	18	15	Western Red Cedar (<i>Thuja plicata</i>)	OFFSITE; Evaluated from property line; Pruned halfway up (N) for wires	1	2	Preserve
11840	9, 21	15	Western Red Cedar (<i>Thuja plicata</i>)	OFFSITE; Evaluated from property line; Pruned halfway up (N) for wires; Codominant base	1	2	Preserve
11841	10, 12, 14	15	Western Red Cedar (<i>Thuja plicata</i>)	OFFSITE; Evaluated from property line; Pruned halfway up (N) for wires; Codominant base with included bark	1	2	Preserve
11842	14	15	Western Red Cedar (<i>Thuja plicata</i>)	OFFSITE; Evaluated from property line; Pruned halfway up (N) for wires	1	2	Preserve
11843	15, 17, 18	15	Western Red Cedar (<i>Thuja plicata</i>)	OFFSITE; Evaluated from property line; Pruned halfway up (N) for wires; Codominant base	1	2	Preserve
11844	17	15	Western Red Cedar (<i>Thuja plicata</i>)	OFFSITE; Evaluated from property line; Pruned halfway up (N) for wires	1	2	Preserve
11859	28	30	California Black Oak (<i>Quercus kelloggii</i>)	OFFSITE; Evaluated from property line; Abnormal dead branches; Codominant	2	2	Preserve
11958	17	0	European White Birch (<i>Betula pendula</i>)	OFFSITE; Evaluated from property line; Dead; Topped 8' up	3	3	Preserve
11959	17	0	European White Birch (<i>Betula pendula</i>)	OFFSITE; Evaluated from property line; Dead; Topped 8' up	3	3	Preserve
11961	13	0	European White Birch (<i>Betula pendula</i>)	OFFSITE; Evaluated from property line; Dead; Topped 8' up	3	3	Preserve
11962	19	23	Purple Leaf Plum (<i>Prunus cerasifera</i>)	OFFSITE; Evaluated from property line; Codominant with four stems 10' up	1	2	Preserve
12028	16, 18	15	Western Red Cedar (<i>Thuja plicata</i>)	OFFSITE; Evaluated from property line; Pruned halfway up (N) for wires; Codominant base with included bark	1	2	Preserve
12029	7, 11	15	Western Red Cedar (<i>Thuja plicata</i>)	OFFSITE; Evaluated from property line; Pruned halfway up (N) for wires; Codominant base with included bark	1	2	Preserve
12031	6, 19	15	Western Red Cedar (<i>Thuja plicata</i>)	OFFSITE; Evaluated from property line; Pruned halfway up (N) for wires; Codominant base with included bark	1	2	Preserve
12057	39	20	Black Cottonwood (<i>Populus trichocarpa</i>)	OFFSITE; Evaluated from property line; Some dead and broken limbs; Broken dead top; Epicormic sprouts; Near wires	2	2	Remove (B)
12223	11	13	Purple Leaf Plum (<i>Prunus cerasifera</i>)	OFFSITE; Evaluated from property line; Large dead stem; Codominant stems with included bark	2	2	Preserve
12266	10, 11	4	Purple Leaf Plum (<i>Prunus cerasifera</i>)	OFFSITE; Evaluated from property line; Some dead branches; Dead and pruned codominant stem with decay	2	2	Preserve
12362	26	27	Douglas-fir (<i>Pseudotsuga menziesii</i>)	Several codominant stems; Slight sweep	1	2	Preserve
12370	31	30	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE	1	1	Preserve
12372	30	30	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE	1	1	Preserve
12373	22	30	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE	1	1	Preserve
12374	25	30	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; 1-sided canopy (S)	1	2	Preserve
12375	9, 18	26	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Codominant; Sparse canopy	1	2	Preserve
12377	26	30	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE	1	1	Preserve
12392	33	26	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE	1	1	Preserve
12393	12	16	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence)	1	1	Preserve
12394	29	30	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence); Some pruned branches	1	1	Preserve
12395	42	35	Douglas-fir (<i>Pseudotsuga menziesii</i>)	Lean (SE); Codominant; Many dead branches	1	2	Preserve
12428	8, 9, 10, 11	30	Cascara Buckthorn (<i>Rhamnus purshiana</i>)	Bore holes; Dead foliage; Codominant	2	2	Preserve
12429	46	40	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence); Codominant stem ~15' up; Some broken branches	1	2	Preserve
15003	19	23	Western Red Cedar (<i>Thuja plicata</i>)		1	1	Preserve
15004	19	25	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Crooked top	1	2	Preserve
15017	11	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15018	14	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15020	12	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15021	14	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15026	13	18	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE	1	1	Preserve
15027	11	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15034	14	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15035	15	19	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE	1	1	Preserve
15036	17	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15037	8, 10, 11	-	Deciduous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15050	14	-	Deciduous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15054	12	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15056	16	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15057	9, 11	-	Deciduous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15061	11	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15062	12	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15069	13	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15071	15	20	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Broken top (~20'); Large broken codominant stem; Many pruned branches	2	3	Preserve
15087	11	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15088	13	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15089	12	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15095	12	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15096	16	20	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE	1	1	Preserve
15097	14	20	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE	1	1	Preserve
15098	13	18	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE	1	1	Preserve
15113	14	17	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE	1	1	Preserve

Detailed Tree Inventory for Bailey Meadows

AKS Job No. 7107 - Evaluation Date: 5/30/2019

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (Scientific name)	Comments	Health Rating*	Structure Rating**	Reason for Removal***
15115	12	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15117	15	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15128	12	20	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE	1	1	Preserve
15139	12	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15141	11	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15146	12	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15147	12	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15151	14	15	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Crooked; 1-sided canopy (N)	1	2	Preserve
15152	14	17	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE	1	1	Preserve
15155	11	15	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE	1	1	Preserve
15164	16, 13	23	Big Leaf Maple (<i>Acer macrophyllum</i>)	16" stem has codominance with included bark; 15" stem crooked	1	2	Preserve
15166	15	15	Grand Fir (<i>Abies grandis</i>)	OFFSITE	1	1	Preserve
15167	12	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15170	11	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15176	13	17	European White Birch (<i>Betula pendula</i>)	OFFSITE; Growing out of two dead decayed stumps; Sweep; Exposed roots	1	2	Preserve
15192	11	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15194	12	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15198	14	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15206	11	12	Grand Fir (<i>Abies grandis</i>)	OFFSITE	1	1	Preserve
15212	12	13	Grand Fir (<i>Abies grandis</i>)	OFFSITE; Being shaded out; Many dead branches	2	1	Preserve
15214	16	13	Grand Fir (<i>Abies grandis</i>)	OFFSITE	1	1	Preserve
15228	14	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15230	13	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15232	20	17	Grand Fir (<i>Abies grandis</i>)	OFFSITE	1	1	Preserve
15236	16	28	Big Leaf Maple (<i>Acer macrophyllum</i>)		1	1	Preserve
15238	14	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15241	14	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15251	12	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15257	11	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15261	14	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15263	13	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15265	12	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15266	11	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15267	13	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15268	13	12	Grand Fir (<i>Abies grandis</i>)	OFFSITE	1	1	Preserve
15269	13, 12, 8, 12, 9	27	Big Leaf Maple (<i>Acer macrophyllum</i>)	OFFSITE; One fully dead codominant stem; Other stems have dead branches	2	2	Preserve
15271	17	13	Grand Fir (<i>Abies grandis</i>)	OFFSITE	1	1	Preserve
15272	14	-	Coniferous	OFFSITE; Not evaluated by an Arborist	-	-	Preserve
15273	12, 7	16	Willow (<i>Salicaceae sp.</i>)	OFFSITE; Lean (W); Dead broken codominant stem at base; Some dead branches; Many codominant stems 8' up	2	2	Preserve
15274	12, 9	25	Big Leaf Maple (<i>Acer macrophyllum</i>)	Codominant with included bark	1	2	Preserve
15280	12	25	Green Ash (<i>Fraxinus pennsylvanica</i>)	OFFSITE; Evaluated from property line (behind fence); Codominant 6' up with included bark	1	2	Preserve
15359	20	30	Douglas-fir (<i>Pseudotsuga menziesii</i>)	Evaluated from behind fence	1	1	Preserve
15360	15	30	Douglas-fir (<i>Pseudotsuga menziesii</i>)	Evaluated from behind fence	1	1	Preserve
15361	22	30	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence); Some pruned branches	1	1	Preserve
15362	33	30	Douglas-fir (<i>Pseudotsuga menziesii</i>)	Evaluated from behind fence; Some pruned branches	1	1	Preserve
15363	12	15	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence); Some dead foliage	2	1	Preserve
15364	20	25	Douglas-fir (<i>Pseudotsuga menziesii</i>)	Evaluated from behind fence	1	1	Preserve
15365	25	25	Douglas-fir (<i>Pseudotsuga menziesii</i>)	Eval			

Detailed Tree Inventory for Bailey Meadows

AKS Job No. 7107 - Evaluation Date: 5/30/2019

Tree #	DBH (in.)	Avg. Crown Radius (ft)	Tree Species Common Name (Scientific name)	Comments	Health Rating*	Structure Rating**	Reason for Removal***
16055	12, 12	16	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence); Codominant top	1	2	Preserve
16056	16	15	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence)	1	1	Preserve
16057	14	17	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence)	1	1	Preserve
16058	14	15	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence)	1	1	Preserve
16059	12	12	Western Red Cedar (<i>Thuja plicata</i>)	OFFSITE; Evaluated from property line (behind fence)	1	1	Preserve
16061	21	15	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence)	1	1	Preserve
16062	16	18	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence)	1	1	Preserve
16063	14	13	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence)	1	1	Preserve
16064	14	15	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence)	1	1	Preserve
16065	11	12	Western Red Cedar (<i>Thuja plicata</i>)	OFFSITE; Evaluated from property line (behind fence)	1	1	Preserve
16067	20	18	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence)	1	1	Preserve
16068	17	18	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence)	1	1	Preserve
16069	14	18	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence)	1	1	Preserve
16070	15	21	Douglas-fir (<i>Pseudotsuga menziesii</i>)	OFFSITE; Evaluated from property line (behind fence)	1	1	Preserve
16071	12	15	Maple (<i>Acer</i> sp.)	OFFSITE; Evaluated from property line	1	1	Preserve
50003	9, 9, 10, 11, 8	22	Willow (<i>Salicaceae</i> sp.)	OFFSITE; Codominant; Dead branches; Lean (S); Crooked	2	2	Preserve

Total # of Existing Trees inventoried = 192

Total # of Existing Onsite Trees = 19

Total # of Existing Onsite Trees to be Preserved = 19

Total # of Existing Onsite Trees to be Removed = 0

Total # of Existing Offsite Trees = 173

Total # of Existing Offsite Trees to be Preserved = 168

Total # of Existing Offsite Trees to be Removed = 5

Total # of Existing Offsite Trees to be Removed that are Exempt from Urban Forestry Regulations = 5

***Health Rating:**

- 1 = Good Health - A tree that exhibits typical foliage, bark, and root characteristics, for its respective species, shows no signs of infection or infestation, and has a high level of vigor and vitality.
- 2 = Fair Health - A tree that exhibits some abnormal health characteristics and/or shows some signs of infection or infestation, but may be reversed or abated with supplemental treatment.
- 3 = Poor Health - A tree that is in significant decline, to the extent that supplemental treatment would not likely result in reversing or abating its decline.

****Structure Rating:**

- 1 = Good Structure - A tree that exhibits typical physical form characteristics, for its respective species, shows no signs of structural defects of the canopy, trunk, and/or root system.
- 2 = Fair Structure - A tree that exhibits some abnormal physical form characteristics and/or some signs of structural defects, which reduce the structural integrity of the tree, but are not indicative of imminent physical failure, and may be corrected using arboricultural abatement methods.
- 3 = Poor Structure - A tree that exhibits extensively abnormal physical form characteristics and/or significant structural defects that substantially reduces the structural viability of the tree, cannot feasibly be abated, and are indicative of imminent physical failure.

*****Reason for Removal:**

- (A) - This tree is proposed for removal to facilitate the installation of roads, utilities, grading, retaining walls, etc. for the Melissa Avenue extension. This tree is exempt from Chapter 17.102 - Urban Forestry per Sandy Development Code Chapter 17.102.20 B. 1.
- (B) - This tree is proposed for removal to facilitate the installation of roads, utilities, grading, etc. for the half street improvement of SE Ponder Lane. This tree is exempt from Chapter 17.102 - Urban Forestry per Sandy Development Code Chapter 17.102.20 B. 1.

Arborist Disclosure Statement:

Arborists are tree specialists who use their education, knowledge, training, and experience to examine trees, recommend measures to enhance the health of trees, and attempt to reduce the risk of living near trees. The Client and Jurisdiction may choose to accept or disregard the recommendations of the arborist, or seek additional advice. Arborists cannot detect every condition that could possibly lead to the structural failure of a tree. Trees are living organisms that fail in ways we do not fully understand. Conditions are often hidden within trees and below ground. Arborists cannot guarantee that a tree will be healthy or safe under all circumstances, or for a specified period of time. Likewise, remedial treatments, like medicine, cannot be guaranteed. Trees can be managed, but they cannot be controlled. To live near trees is to accept some degree of risk. The only way to eliminate all risk associated with trees is to eliminate all trees. Neither this author nor AKS Engineering & Forestry, LLC have assumed any responsibility for liability associated with the trees on or adjacent to this site.

At the completion of construction, all trees should once again be reviewed. Land clearing and removal of adjacent trees can expose previously unseen defects and otherwise healthy trees can be damaged during construction.



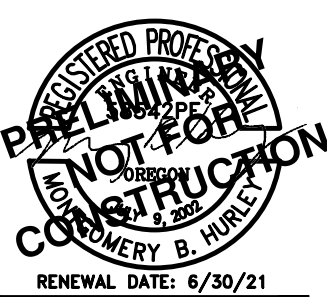
AKS ENGINEERING & FORESTRY, LLC
12905 SW HERMAN RD., STE. 100
TUALATIN, OR 97062
503.563.6151
WWW.AKS-ENG.COM

ENGINEERING - SURVEYING - NATURAL RESOURCES
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**PRELIMINARY TREE PRESERVATION & REMOVAL TABLE & ARBORIST REPORT
BAILEY MEADOWS
SANDY, OREGON**

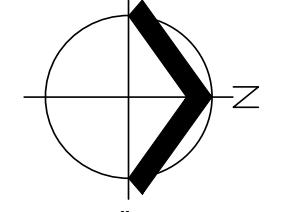


BRUCE R. BALDWIN
CITY OF OREGON LICENSE NUMBER: 774-0664
EXPIRATION DATE: 12/31/20



RENEWAL DATE: 6/30/21
JOB NUMBER: 7107
DATE: 07/03/2019
DESIGNED BY: WN
DRAWN BY: CL
CHECKED BY: RSW

P1-19



SCALE: 1"=50 FEET
ORIGINAL PAGE SIZE: 22" x 34"

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MATCH LINE "C" SEE SHEET P1-21

MATCH LINE "B" SEE SHEET P1-21

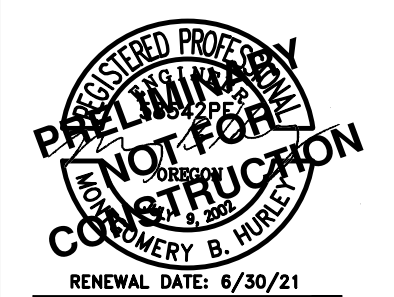


MATCH LINE "A" SEE SHEET P1-21

DEMOLITION KEYED NOTES:

- 1 REMOVE EXISTING FENCE.
- 2 PRESERVE EXISTING FENCE. PROTECT FROM DAMAGE.
- 3 REMOVE EXISTING GRAVEL DRIVEWAY.
- 4 REMOVE/RELOCATE EXISTING POWER POLE, GUY WIRES, AND OVERHEAD LINES, COORDINATE WITH POWER AND COMMUNICATION PROVIDERS.
- 5 REMOVE EXISTING BARRICADES
- 6 REMOVE/REPLACE EXISTING PAVEMENT
- 7 PROTECT EXISTING TREES (TYP). SEE TREE PRESERVATION AND REMOVAL PLAN.
- 8 REMOVE EXISTING TREES (TYP). SEE TREE PRESERVATION AND REMOVAL PLAN.

**PRELIMINARY
DEMOLITION PLAN
BAILEY MEADOWS
SANDY, OREGON**

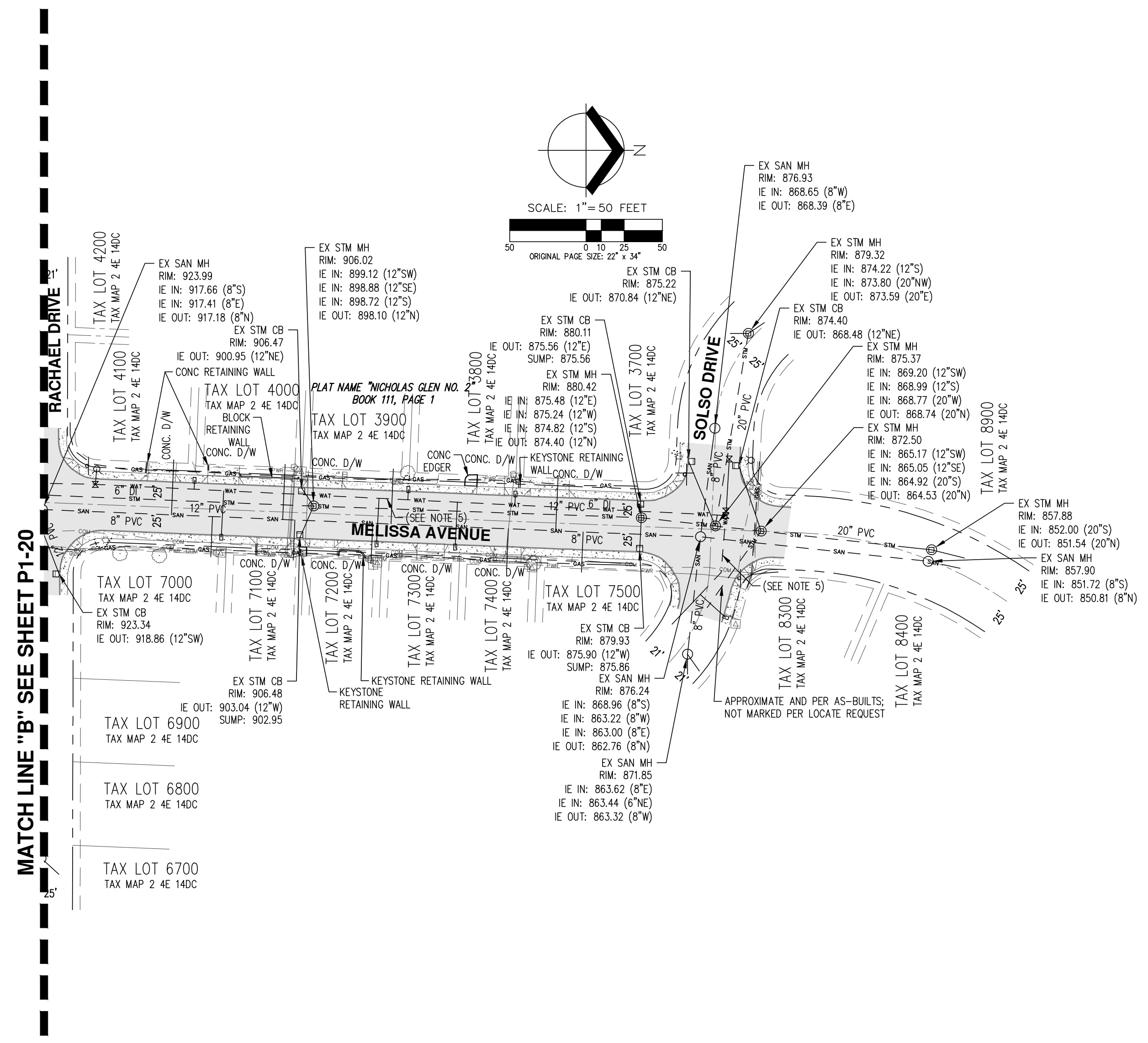
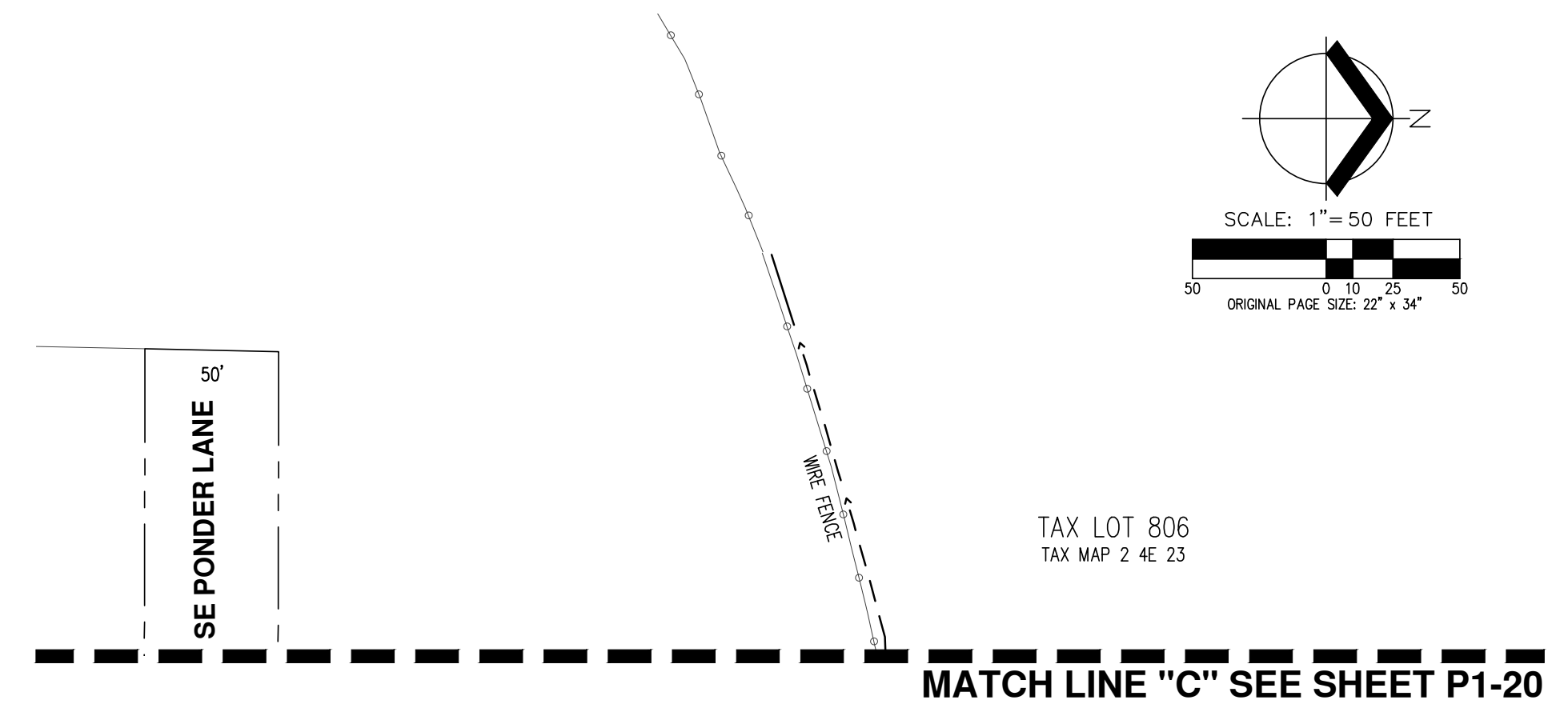
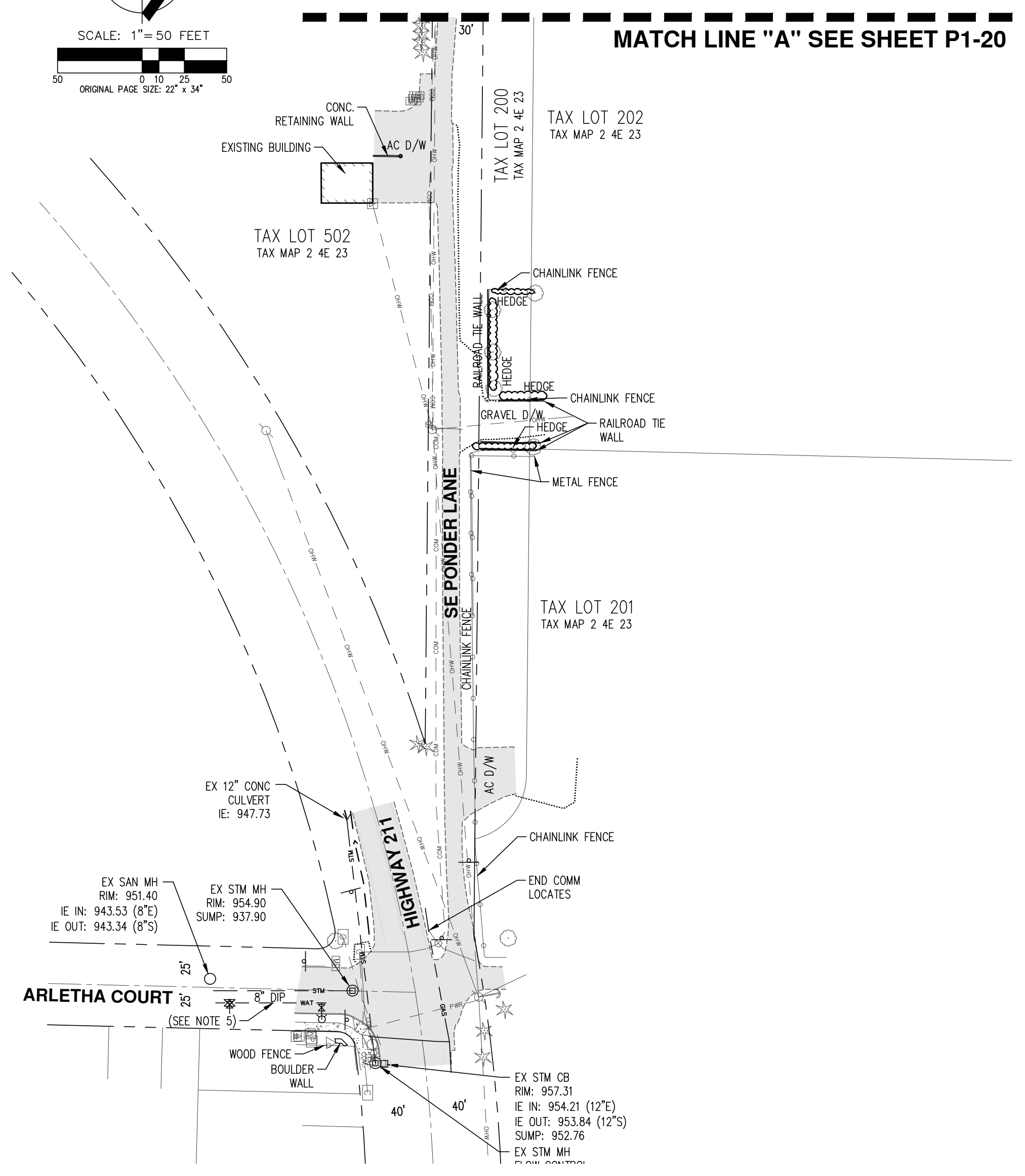
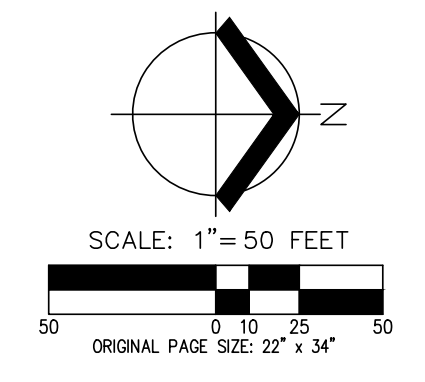


RENEWAL DATE: 6/30/21
JOB NUMBER: 7107
DATE: 07/03/2019
DESIGNED BY: VN
DRAWN BY: CL
CHECKED BY: RSW

P1-20

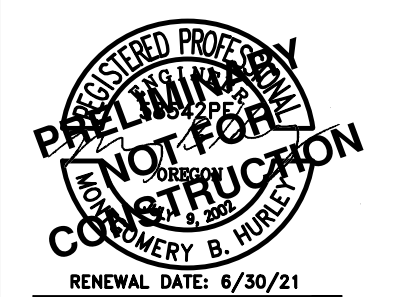
DEMOLITION KEYED NOTES:

- 1 REMOVE EXISTING FENCE.
- 2 PRESERVE EXISTING FENCE. PROTECT FROM DAMAGE.
- 3 REMOVE EXISTING GRAVEL DRIVEWAY.
- 4 REMOVE/RELOCATE EXISTING POWER POLE, GUY WIRES, AND OVERHEAD LINES. COORDINATE WITH POWER AND COMMUNICATION PROVIDERS.
- 5 REMOVE EXISTING BARRICADES
- 6 REMOVE/REPLACE EXISTING PAVEMENT
- 7 PROTECT EXISTING TREES (TYP). SEE TREE PRESERVATION AND REMOVAL PLAN.
- 8 REMOVE EXISTING TREES (TYP). SEE TREE PRESERVATION AND REMOVAL PLAN.



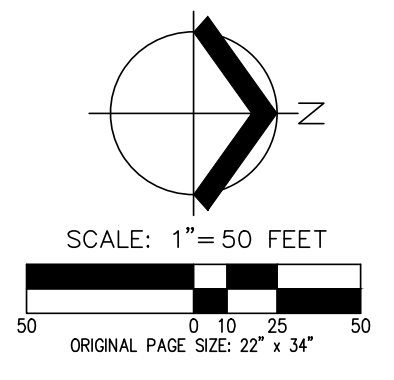
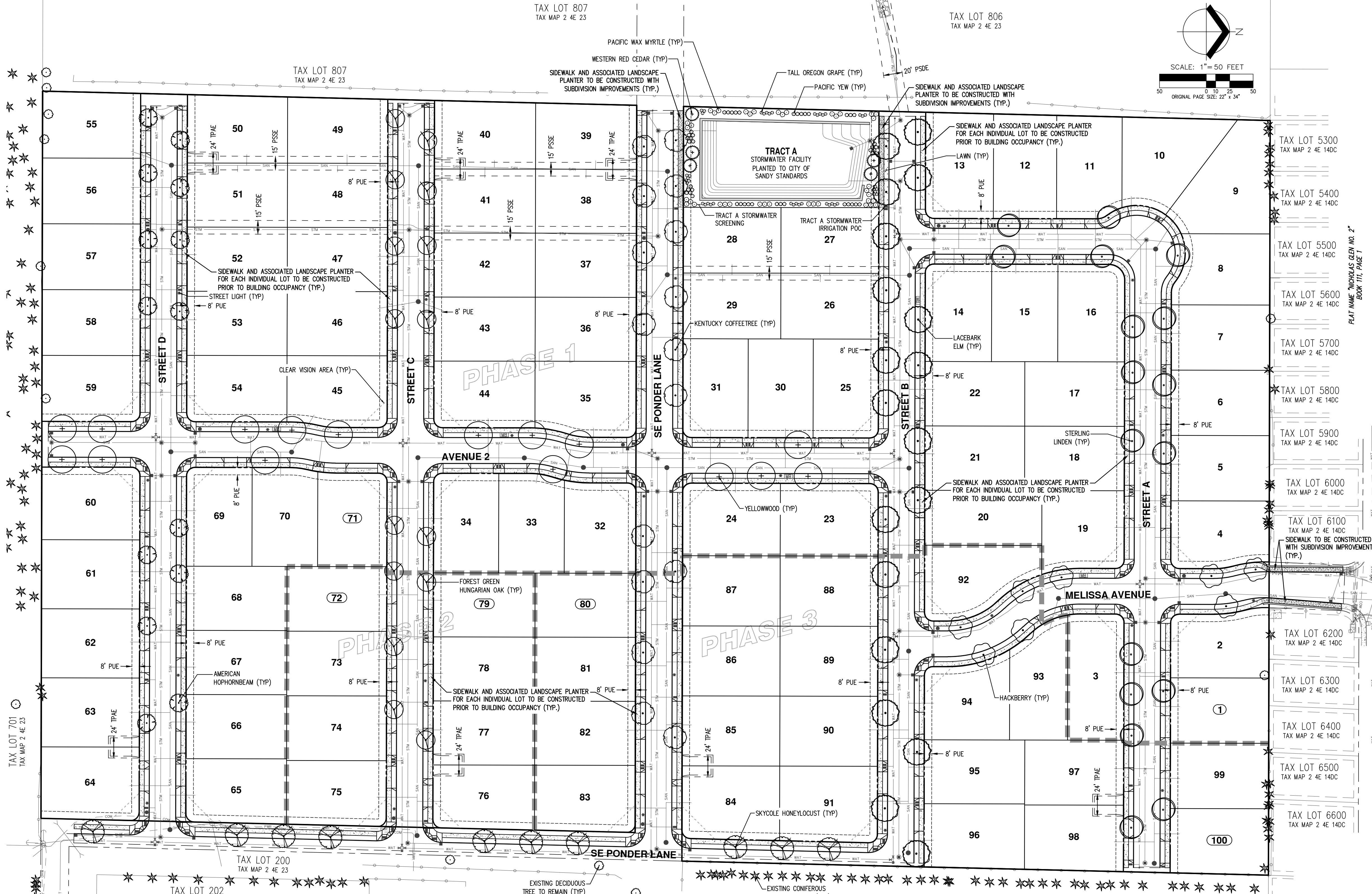
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**PRELIMINARY
 DEMOLITION PLAN
 BAILEY MEADOWS
 SANDY, OREGON**



RENEWAL DATE: 6/30/21
 JOB NUMBER: 7107
 DATE: 07/03/2019
 DESIGNED BY: VN
 DRAWN BY: CL
 CHECKED BY: RSW

P1-21



TAX LOT 807
TAX MAP 2 4E 23

TAX LOT 806
TAX MAP 2 4E 23

TAX LOT 807
TAX MAP 2 4E 23

TAX LOT 5300
TAX MAP 2 4E 14DC

TAX LOT 5400
TAX MAP 2 4E 14DC

TAX LOT 5500
TAX MAP 2 4E 14DC

TAX LOT 5600
TAX MAP 2 4E 14DC

TAX LOT 5700
TAX MAP 2 4E 14DC

TAX LOT 5800
TAX MAP 2 4E 14DC

TAX LOT 5900
TAX MAP 2 4E 14DC

TAX LOT 6000
TAX MAP 2 4E 14DC

TAX LOT 6100
TAX MAP 2 4E 14DC

TAX LOT 6200
TAX MAP 2 4E 14DC

TAX LOT 6300
TAX MAP 2 4E 14DC

TAX LOT 6400
TAX MAP 2 4E 14DC

TAX LOT 6500
TAX MAP 2 4E 14DC

TAX LOT 6600
TAX MAP 2 4E 14DC

TAX LOT 701
TAX MAP 2 4E 23

TAX LOT 200
TAX MAP 2 4E 23

TAX LOT 202
TAX MAP 2 4E 23

EXISTING DECIDUOUS
TREE TO REMAIN (TYP)

EXISTING CONIFEROUS
TREE TO REMAIN (TYP)

REFER TO SHEET P1-23 FOR PRELIMINARY
PLANT SCHEDULES, NOTES, AND DETAILS



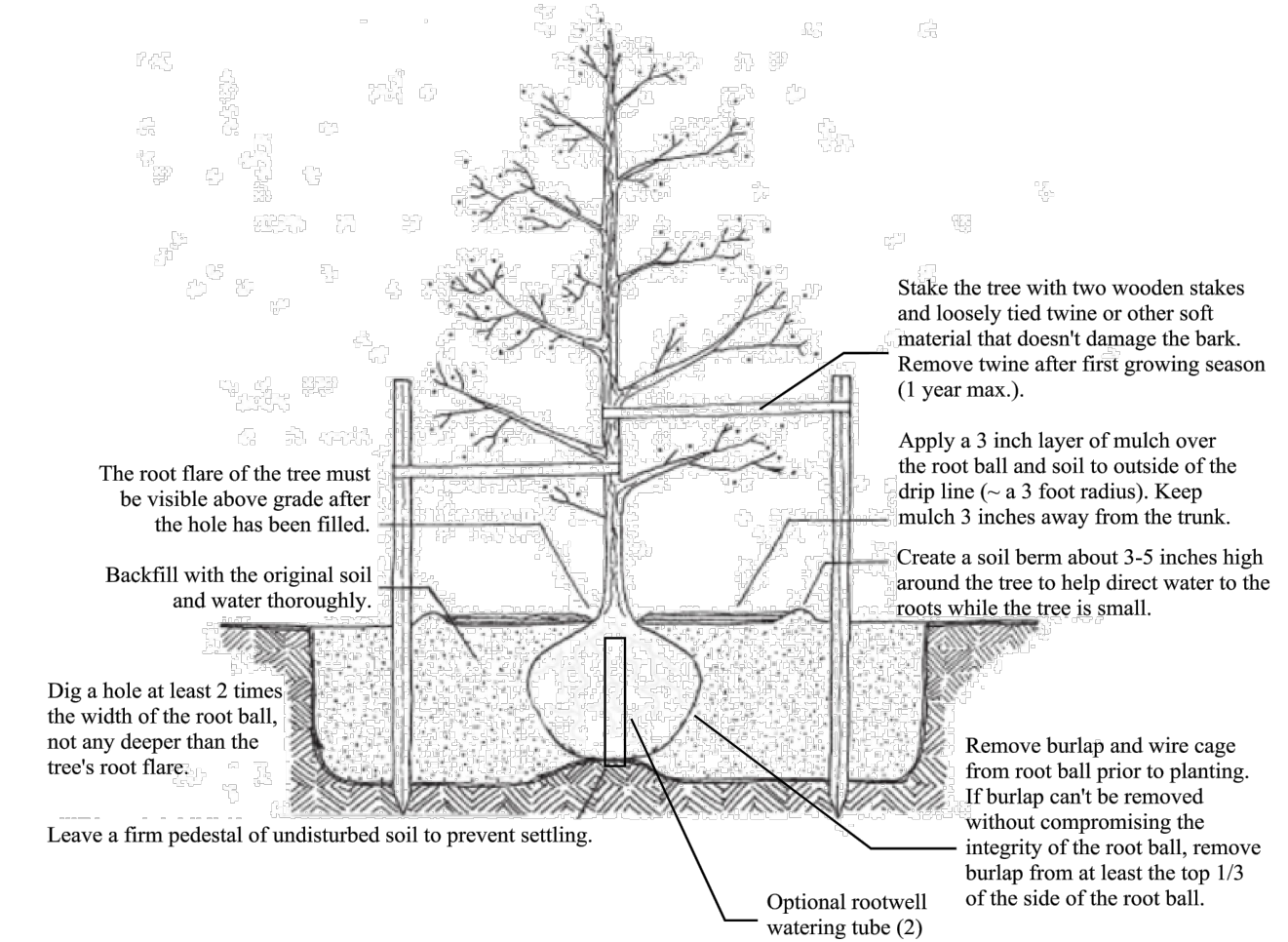
**PRELIMINARY STREET TREE AND
STORMWATER SCREENING PLANTING PLAN
BAILEY MEADOWS
SANDY, OREGON**



JOB NUMBER: 7107
DATE: 07/03/2019
DESIGNED BY: NKP
DRAWN BY: NKP
CHECKED BY: KAH

STREET TREE STANDARD PLANTING DETAIL

Profile of a newly planted street tree. Diagram not to scale.



- Please water your trees regularly for the first 2 to 3 years. During the summer dry season (roughly May to October), deep-root watering is recommended. Begin with 15 gallons of water per tree per week, and adjust as needed. During the remaining months of the year, monitor the root zone for dryness and water as needed. Good watering practices will promote vigorous growth, ensure well-formed root development, and help produce a beautiful tree for years to come.
- Make sure stakes are placed at the edge of the mulch pile and are pounded securely into the ground so they cannot be easily pulled out. Loosely tie the tree to the stakes with twine or another flexible material. The ties should be located no higher than 2/3 the height of the tree. The tree should be able to sway in the wind, which helps establish strong support roots and trunk. Check the twine periodically to make sure there is room for the tree to grow and the twine is not damaging the trunk. Remove the twine immediately if there are signs of damage on the trunk. Do not leave trees staked for more than one year or the tree may not develop its own proper support structure.
- Reapply mulch as necessary to maintain a 3 inch depth. Keep weeds and grass from growing in the mulch area to reduce competition for water and nutrients.
- Remove any twine, tape, or tags from the tree's trunk and branches prior to planting.

PRELIMINARY LANDSCAPE NOTES:

1. LANDSCAPE PLAN IS PRELIMINARY AND INTENDED TO SHOW DESIGN INTENT ONLY. PLANTING TYPES, LOCATIONS, QUANTITIES, AND DETAILS ARE CONCEPTUAL AND SUBJECT TO CHANGE PRIOR TO FINAL APPROVAL BASED ON SITE PLAN REFINEMENT. LANDSCAPING SHALL COMPLY WITH APPLICABLE CITY OF SANDY STANDARDS. SUBSTITUTIONS TO STREET TREES MUST BE APPROVED AND SELECTED FROM THE CITY'S APPROVED STREET TREE LIST.
2. STREET TREES SHALL COMPLY WITH CITY OF SANDY STANDARDS, INCLUDING APPROPRIATE MAINTENANCE AND WATERING. MEDIUM CANOPY TREES SHALL BE PLANTED 30' ON-CENTER, LARGE TREES SHALL BE PLANTED 50' ON-CENTER. PER CITY OF SANDY CODE 17.92.30, TREES MAY NOT BE PLANTED WITHIN 5' OF PERMANENT HARD SURFACE PAVING OR WALKWAYS, 10' OF FIRE HYDRANTS AND UTILITY POLES, 20' OF STREET LIGHT STANDARDS, 5' FROM AN EXISTING CURB FACE, 10' OF A PUBLIC SANITARY SEWER, STORM DRAINAGE, OR WATER LINE, AND 30' FROM INTERSECTIONS. TREES SHALL BE PRUNED TO PROVIDE A MINIMUM 8' CLEARANCE ABOVE SIDEWALKS AND 12' CLEARANCE ABOVE STREET AND ROADWAY SURFACES.
3. LANDSCAPE PLANT MATERIAL SHALL BE HEALTHY, FREE FROM DISEASE OR PESTS, SYMMETRICAL, AND TYPICAL FOR ITS SPECIES. PLANT MATERIAL, INCLUDING TREES, SHALL COMPLY WITH THE AMERICAN STANDARD FOR NURSERY STOCK (ANSI Z60.1). DOUBLE STAKE ALL TREES.
4. SOIL PREPARATION: ALL PLANTING AREAS SHALL HAVE SUFFICIENT SOIL DEPTH AND FERTILITY TO SUPPORT HEALTHY PLANT GROWTH. TOPSOIL MAY BE NON-COMPACTED, NATIVE EXISTING TOPSOIL, FROM CLEAN SOURCES STOCKPILED ON SITE, OR FROM IMPORTED SOURCES IF REQUIRED. TOPSOIL SHALL BE FREE OF ROOTS, WEEDS/WEED SEEDS, CLAY LUMPS, DEBRIS, ROCKS, LARGE WOODY MATERIAL, AND OTHER EXTRANEOUS, NON-ORGANIC MATERIAL HARMFUL TO PLANT GROWTH. ALL PLANTINGS IN PLANTING BEDS SHALL BE POCKET-PLANTED WITH AMENDED SOIL CONTAINING 2/3 NATIVE TOPSOIL, AND 1/3 ORGANIC COMPOST. FINISH GRADE OF NEW PLANTING AREAS SHALL SEAMLESSLY MEET GRADE OF SURROUNDING AREAS AND GRADES SHOWN ON GRADING PLANS.
5. MULCH: APPLY 3" DEEP BY MINIMUM 3' DIAMETER BARK MULCH RING AROUND STREET TREES. BARK MULCH SHALL BE DARK HEMLOCK, MEDIUM GRIND OR SHREDDED, OR SIMILAR AGED BARK MULCH. AVOID COVERING ROOT FLARES. ADJUST ROOT BALL DEPTH TO ACCOMMODATE MULCH APPLICATION.
6. IRRIGATION: LANDSCAPING SHALL BE IRRIGATED, EITHER WITH A MANUAL OR AUTOMATIC SYSTEM, TO SUSTAIN VIABLE PLANT LIFE. A WATER-EFFICIENT IRRIGATION SYSTEM IS RECOMMENDED FOR HEALTHY PLANT ESTABLISHMENT AND SURVIVABILITY. ALTERNATIVE METHODS OF IRRIGATION, SUCH AS HAND WATERING OR WATER BAGS, MAY BE APPROVED BY THE CITY OF SANDY. IF USED, IRRIGATION SYSTEMS SHALL BE DESIGN-BUILD BY THE LANDSCAPE CONTRACTOR AND REQUIRE ITS OWN SERVICE METER AND BACKFLOW PREVENTION DEVICE.

PRELIMINARY STREET TREE AND FRONTAGE PLANT SCHEDULE

TREES	QTY	BOTANICAL NAME	COMMON NAME	SIZE/CONTAINER	SPACING
	8	CELTIS OCCIDENTALIS LARGE TREE	HACKBERRY	1.5" MIN. CAL. B&B	50' O.C OR AS SHOWN
	16	CLADRASTIS KENTUKEA LARGE TREE	YELLOWWOOD	1.5" MIN. CAL. B&B	50' O.C OR AS SHOWN
	10	OLEDTISIA TRIACANTHOS INERMIS 'SKYCOLE' TM LARGE TREE	SKYCOLE HONEYLOCUST	1.5" MIN. CAL. B&B	50' O.C OR AS SHOWN
	16	GYMNOCCLADUS DIOICA 'ESPRESSO' LARGE TREE	KENTUCKY COFFEETREE	1.5" MIN. CAL. B&B	50' O.C OR AS SHOWN
	14	OSTRYA VIRGINIANA LARGE TREE	AMERICAN HOPHORNBEAM	1.5" MIN. CAL. B&B	50' O.C OR AS SHOWN
	15	QUERCUS FRAINETTO 'SCHMIDT' LARGE TREE	FOREST GREEN HUNGARIAN OAK	1.5" MIN. CAL. B&B	50' O.C OR AS SHOWN
	17	TILIA TOMENTOSA 'STERLING' LARGE TREE	STERLING LINDEN	1.5" MIN. CAL. B&B	50' O.C OR AS SHOWN
	19	ULMUS PARVIFOLIA LARGE TREE	LACEBARK ELM	1.5" MIN. CAL. B&B	50' O.C OR AS SHOWN
GROUND COVERS	QTY	DESCRIPTION			
	952 SF	LAWN			

PRELIMINARY STORMWATER FACILITY SCREENING PLANT SCHEDULE

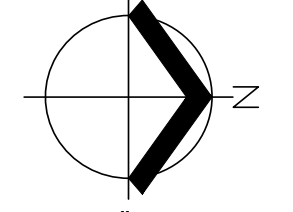
TREES	QTY	BOTANICAL NAME	COMMON NAME	SIZE/CONTAINER	SPACING
	5	THUJA PLICATA	WESTERN RED CEDAR	5' MIN. B&B	AS SHOWN
SHRUBS	QTY	BOTANICAL NAME	COMMON NAME	SIZE/CONTAINER	SPACING
	43	MAHONIA AQUIFOLIUM	TALL OREGON GRAPE	2 GAL. CONT.	36" o.c.
	39	MYRICA CALIFORNICA	PACIFIC WAX MYRTLE	2 GAL. CONT.	60" o.c.
	46	TAXUS BREVIFOLIA	PACIFIC YEW	2 GAL. CONT.	48" o.c.

PRELIMINARY LANDSCAPE NOTES AND DETAILS
BAILEY MEADOWS SANDY, OREGON



JOB NUMBER: 7107
 DATE: 07/03/2019
 DESIGNED BY: NKP
 DRAWN BY: NKP
 CHECKED BY: KAH

P1-23



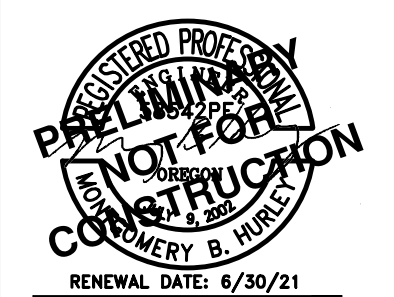
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 AKS ENGINEERING & FORESTRY, LLC
 12905 SW HERMAN RD, STE. 100
 TUALATIN, OR 97062
 503.563.6151
 WWW.AKS-ENG.COM
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 FORESTRY - PLANNING - LANDSCAPE ARCHITECTURE



- TAX LOT 5300 TAX MAP 2 4E 14DC
- TAX LOT 5400 TAX MAP 2 4E 14DC
- TAX LOT 5500 TAX MAP 2 4E 14DC
- TAX LOT 5600 TAX MAP 2 4E 14DC
- TAX LOT 5700 TAX MAP 2 4E 14DC
- TAX LOT 5800 TAX MAP 2 4E 14DC
- TAX LOT 5900 TAX MAP 2 4E 14DC
- TAX LOT 6000 TAX MAP 2 4E 14DC
- TAX LOT 6100 TAX MAP 2 4E 14DC
- TAX LOT 6200 TAX MAP 2 4E 14DC
- TAX LOT 6300 TAX MAP 2 4E 14DC
- TAX LOT 6400 TAX MAP 2 4E 14DC
- TAX LOT 6500 TAX MAP 2 4E 14DC
- TAX LOT 6600 TAX MAP 2 4E 14DC

PLAT NAME: "MELISSA AVENUE NO. 2"
 BOOK 111, PAGE 1

**PRELIMINARY
 PARKING PLAN
 BAILEY MEADOWS
 SANDY, OREGON**

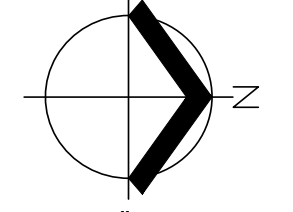


RENEWAL DATE: 6/30/21
 JOB NUMBER: 7107
 DATE: 07/03/2019
 DESIGNED BY: VN
 DRAWN BY: CL
 CHECKED BY: RSW

P1-24

NOTE:
 TOTAL ON-STREET PARKING SPACES: 122
 LOCATIONS FOR PARKINGS, DRIVEWAYS, STREET TREES, STREET LIGHTS, MAILBOXES, ETC. AS SHOWN ARE CONCEPTUAL AND TO BE DETERMINED DURING THE FINAL CONSTRUCTION PLAN REVIEW PROCESS.

AKS DRAWING FILE: 7107 PARKING PLANNING LAYOUT: P1-24



SCALE: 1" = 50 FEET
ORIGINAL PAGE SIZE: 22" x 34"

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TUALATIN, OR 97062
503.563.6151
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FORESTRY - PLANNING - LANDSCAPE ARCHITECTURE

MATCH LINE "C" SEE SHEET P1-26

TAX LOT 807
TAX MAP 2 4E 23

TAX LOT 806
TAX MAP 2 4E 23

TAX LOT 5300
TAX MAP 2 4E 14DC

TAX LOT 5400
TAX MAP 2 4E 14DC

TAX LOT 5500
TAX MAP 2 4E 14DC

TAX LOT 5600
TAX MAP 2 4E 14DC

TAX LOT 5700
TAX MAP 2 4E 14DC

TAX LOT 5800
TAX MAP 2 4E 14DC

TAX LOT 5900
TAX MAP 2 4E 14DC

TAX LOT 6000
TAX MAP 2 4E 14DC

TAX LOT 6100
TAX MAP 2 4E 14DC

TAX LOT 6200
TAX MAP 2 4E 14DC

TAX LOT 6300
TAX MAP 2 4E 14DC

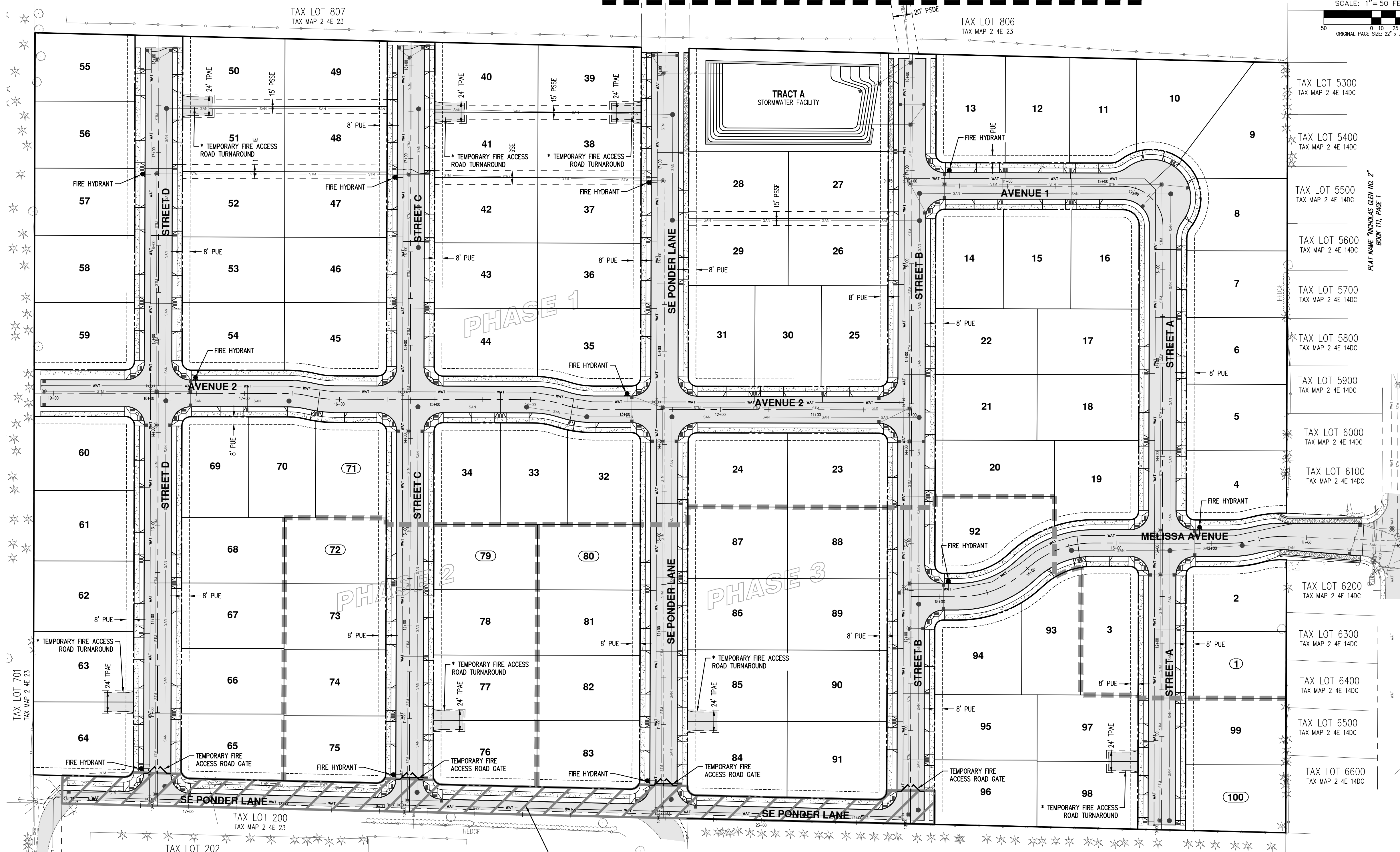
TAX LOT 6400
TAX MAP 2 4E 14DC

TAX LOT 6500
TAX MAP 2 4E 14DC

TAX LOT 6600
TAX MAP 2 4E 14DC

PLAT NAME: "MORIAS GEN. NO. 2"
BOOK 111, PAGE 1

MATCH LINE "B" SEE SHEET P1-26

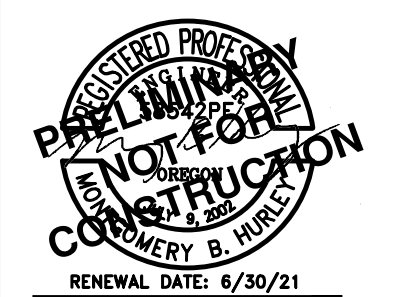


MATCH LINE "A" SEE SHEET P1-26

FEE-IN-LIEU OF STREET IMPROVEMENTS

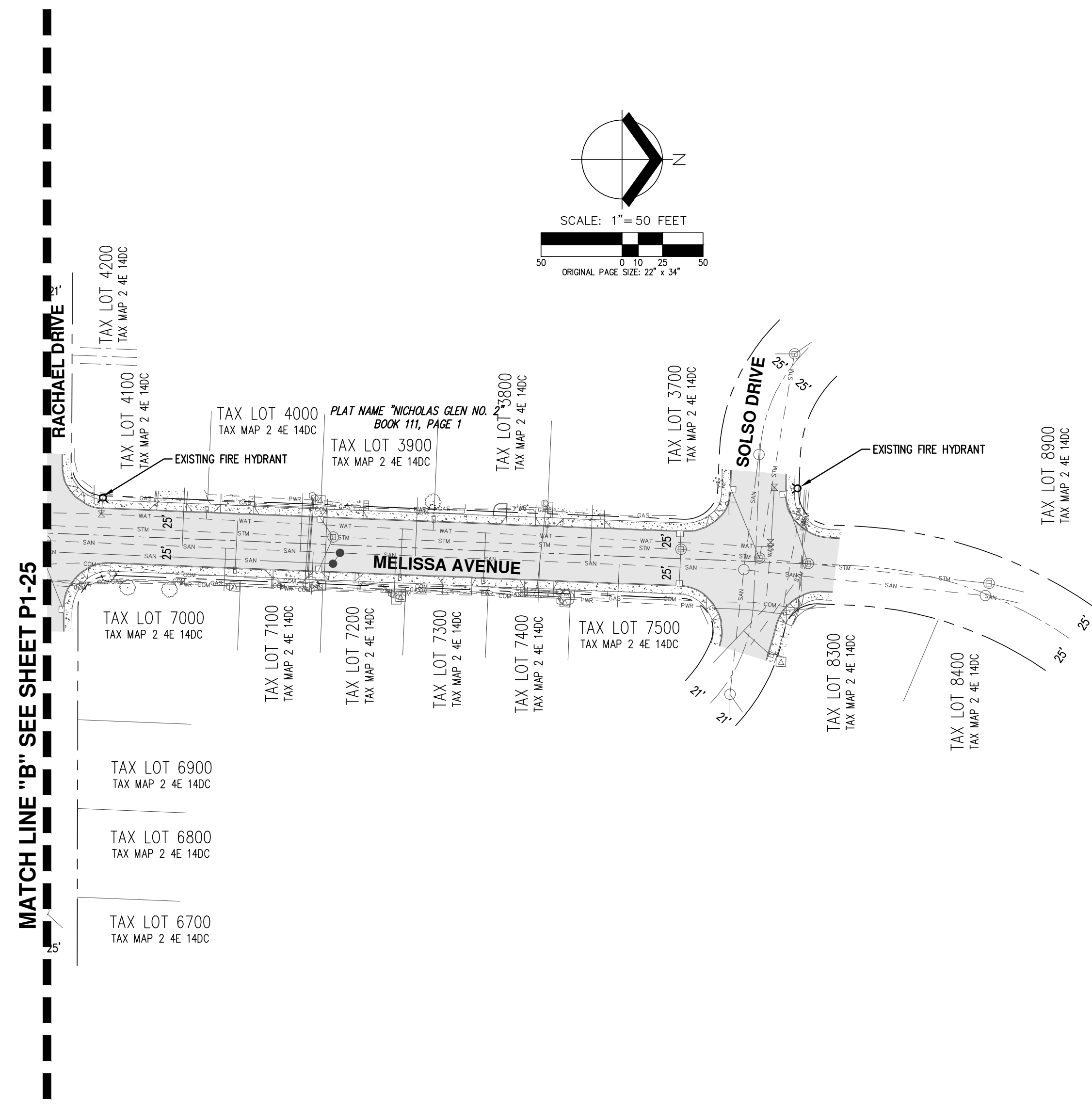
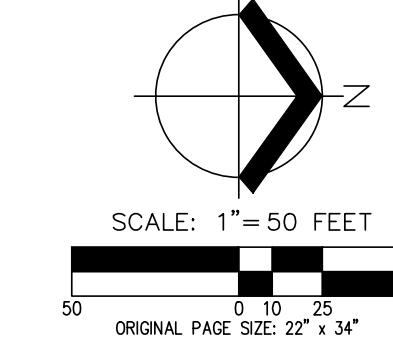
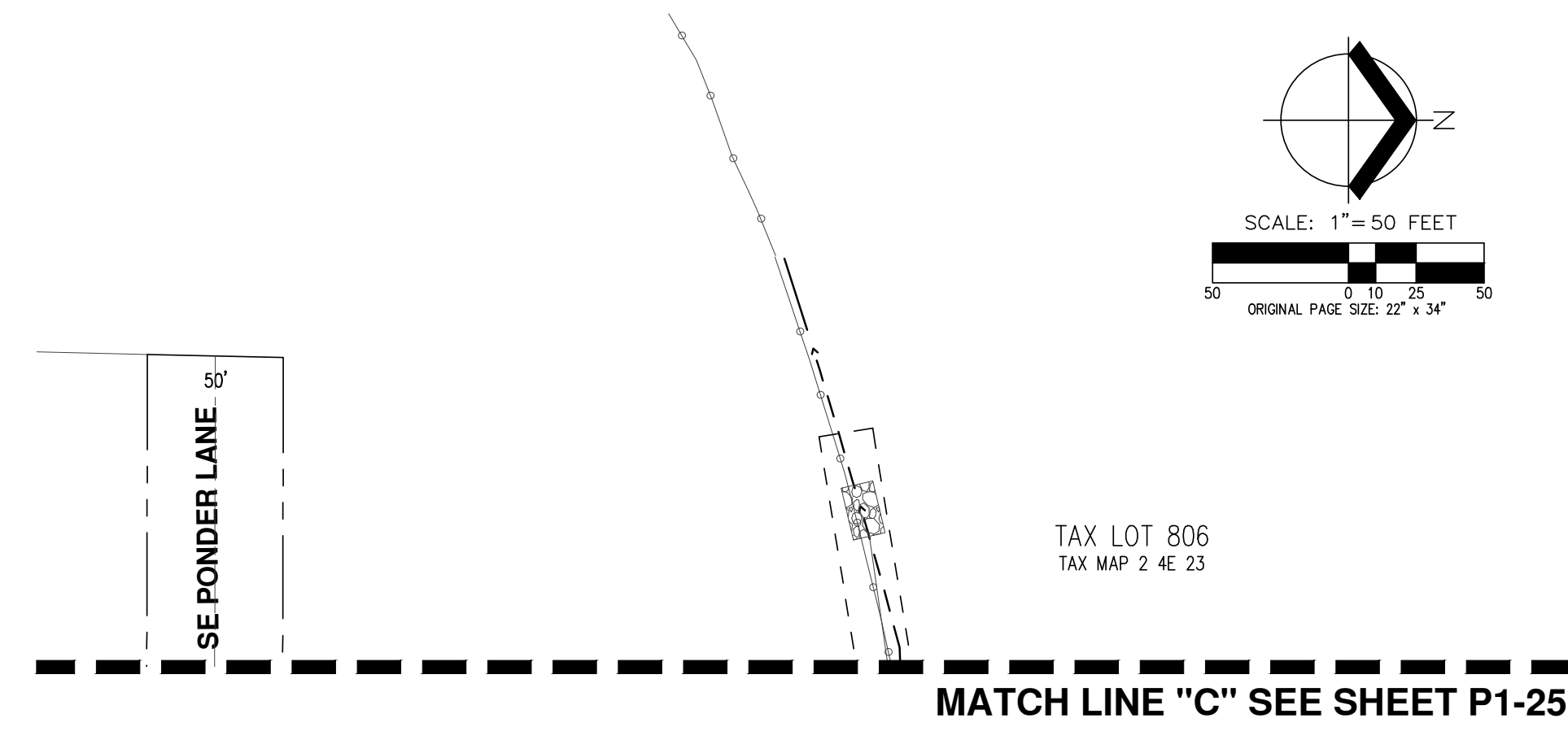
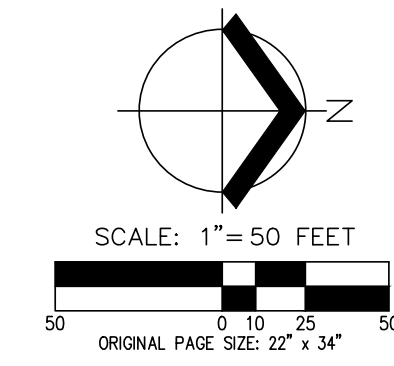
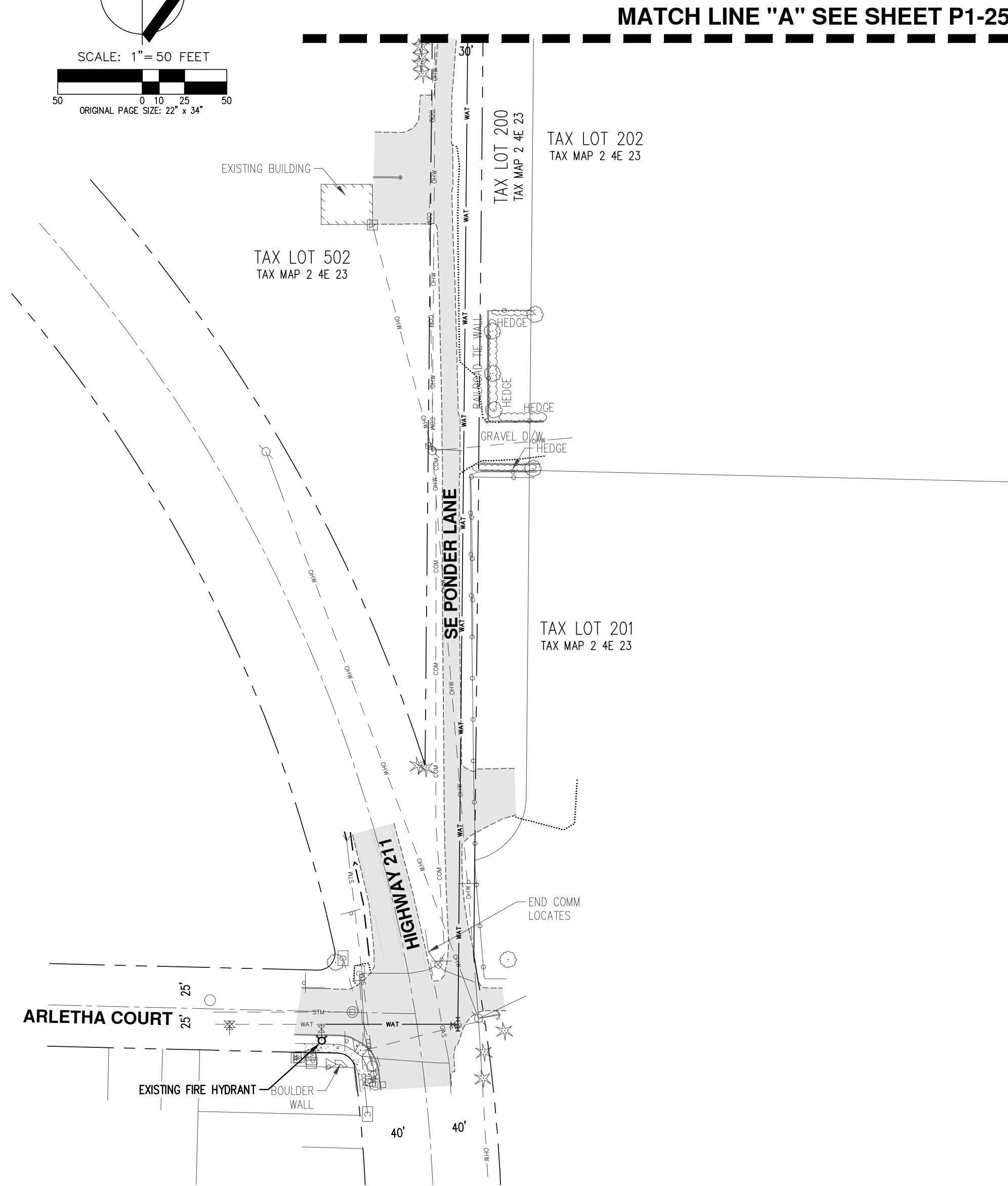
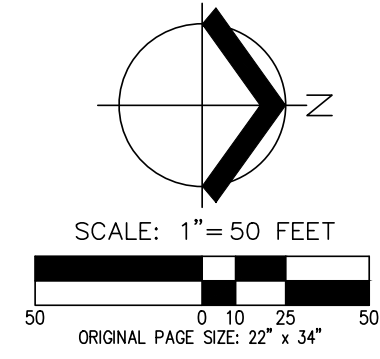
* TEMPORARY EMERGENCY VEHICLE AND FRANCHISE WASTE HAULER TURNAROUND. LOCATIONS SHOWN AREA CONCEPTUAL AND TO BE DETERMINED DURING THE FINAL CONSTRUCTION PLAN REVIEW PROCESS.

**PRELIMINARY EMERGENCY
VEHICLE ACCESS PLAN
BAILEY MEADOWS
SANDY, OREGON**



RENEWAL DATE: 6/30/21
JOB NUMBER: 7107
DATE: 07/03/2019
DESIGNED BY: VN
DRAWN BY: CL
CHECKED BY: RSW

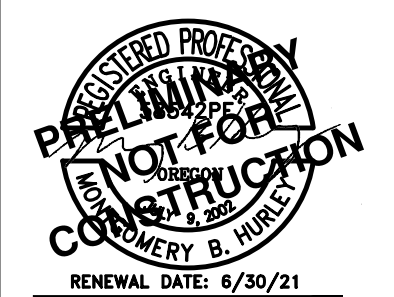
P1-25



AKS DRAWING FILE: 7107 FIRE ACCESS/DWG LAYOUT: P1-26

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503.563.6151
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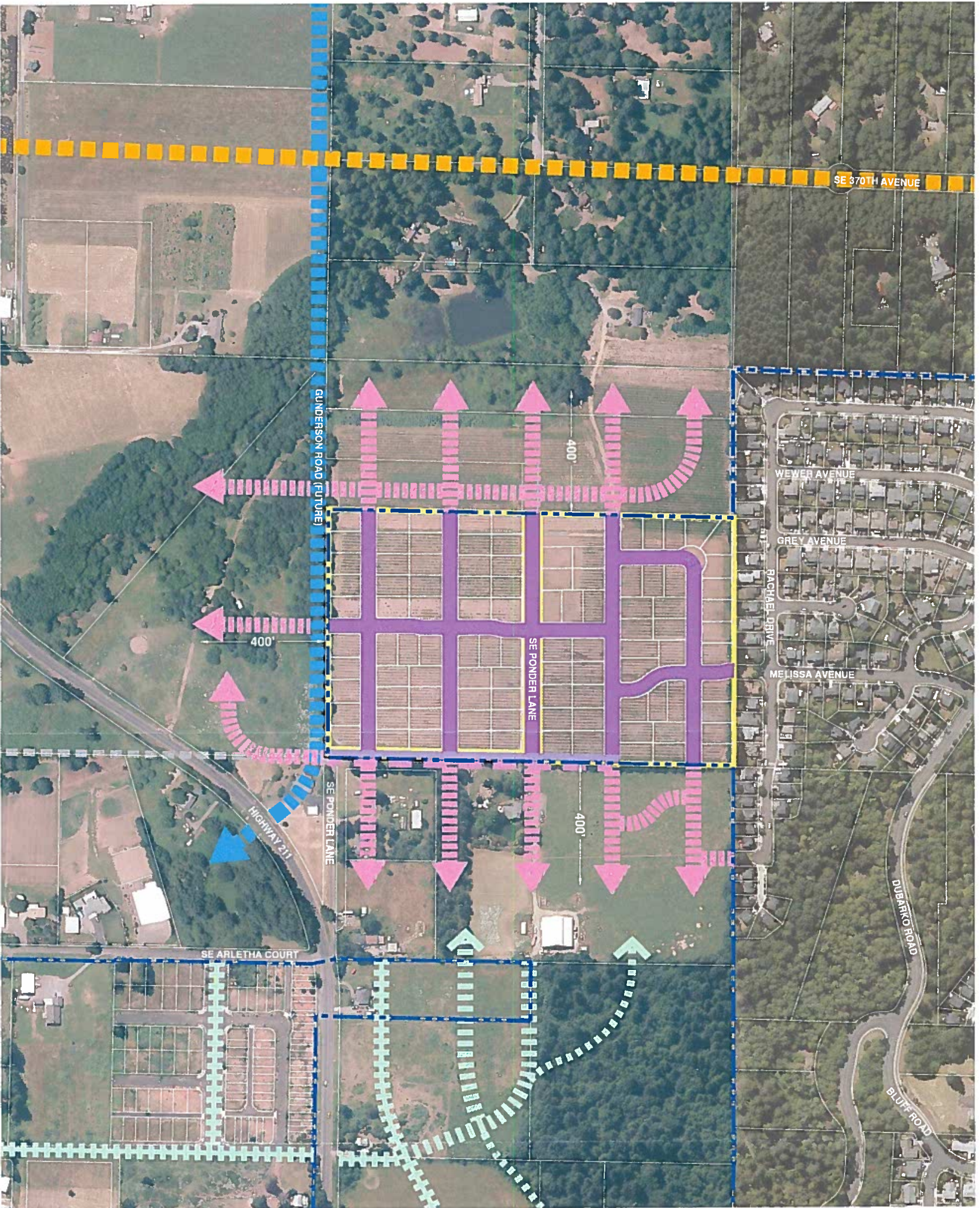
**PRELIMINARY EMERGENCY
VEHICLE ACCESS PLAN
BAILEY MEADOWS
SANDY, OREGON**



RENEWAL DATE: 6/30/21
JOB NUMBER: 7107
DATE: 07/03/2019
DESIGNED BY: VN
DRAWN BY: CL
CHECKED BY: RSW

P1-26

EXHIBIT D

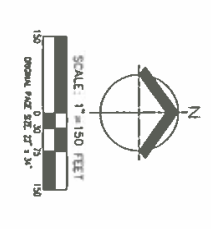


LEGEND

CITY LIMITS	---
URBAN GROWTH BOUNDARY	---
PROJECT SITE BOUNDARY	---
PLANNED LOCAL STREET	---
PLANNED LOCAL STREET (1/2 STREET IMPROVEMENTS)	---
FUTURE MINOR ARTERIAL (0+12')	---
FUTURE COLLECTOR (0+12')	---
FUTURE LOCAL STREET	---
FUTURE LOCAL STREET (1/2 STREET IMPROVEMENTS)	---
CONCEPTUAL STREET FROM BOSTONED VALLEY SPECIFIC AREA PLAN ILLUSTRATING STREET PLAN DATED 6/16/2003	---

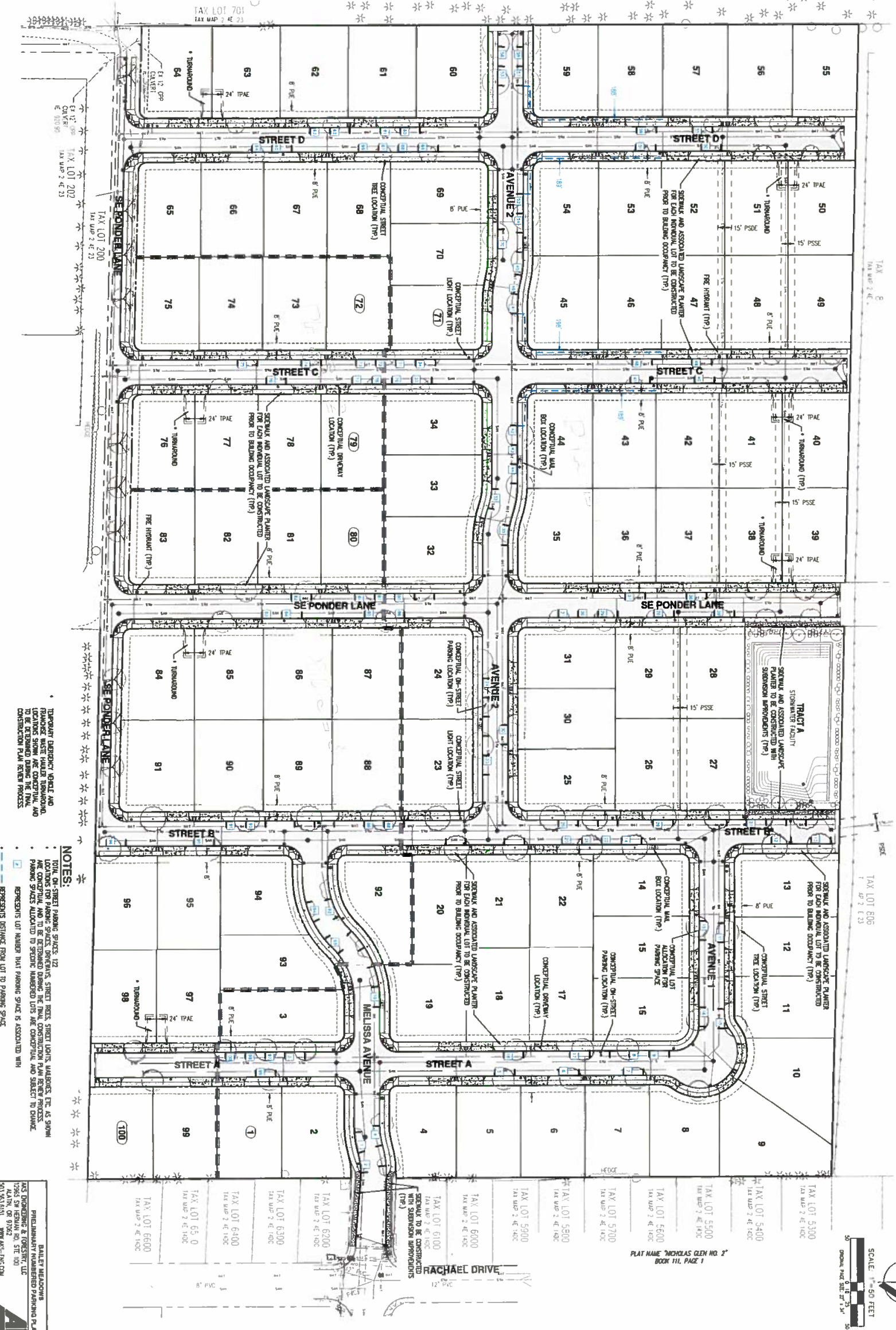
NOTES

1. THIS PLAN IS ACQUIRED TO MEET THE SUBMITTAL REQUIREMENTS FOR A CITY OF SMOOT FOR THE BALEY MEADOWS SUBDIVISION APPLICATION.
2. CONCEPTUAL FUTURE STREET LOCATIONS ARE SHOWN FOR ILLUSTRATIVE PURPOSES FOR THE LAND USE APPLICATION ONLY. BOUNDING ON ANY OTHER PROPERTIES.



DATE: 06/09/2018	DRAWN: C
PROJECT: BALEY MEADOWS CONCEPTUAL CONNECTIVITY PLAN	CHECKED: C
BY: ANDY DOWLING & FORESTRY, LLC	DATE: 06/09/2018
7243 SW VERMILION RD, STE 100	PROJECT NO: 18000000000000000000
PORTLAND, OR 97214	AKS 7107
WWW.AKS-DC.COM	

EXHIBIT E



- NOTES:**
- TOTAL ON-STREET PARKING SPACES: 122
 - LOCATIONS FOR PARKING SPACES, DRIVEWAYS, STREET RECES, STREET LIGHTS, WALLBOARDS, ETC. AS SHOWN ARE CONCEPTUAL AND TO BE DETERMINED DURING THE FINAL CONSTRUCTION PLAN REVIEW PROCESS.
 - PARKING SPACES ALLOCATED TO SPECIFIC PARCELS ARE CONCEPTUAL AND SUBJECT TO CHANGE.
 - PARCELS WITH NUMBERS THAT PARKING SPACES IS ASSOCIATED WITH
 - REPRESENTS DISTANCE FROM LOT TO PARKING SPACE

DATE: 09/02/2019
 PRELIMINARY NUMBERED PARKING PLAN
 D
 100
 1107
AKS
 503.531.9131 WWW.AKS-INC.COM

Bailey Meadows Subdivision

Traffic Impact Analysis
Sandy, Oregon

Date:

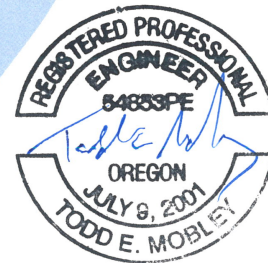
June 20, 2019

Prepared for:

Cody Bjugan, Allied Homes & Development

Prepared by:

Jessica Hijar
Todd Mobley, PE



RENEWS: 12/31/2020



LANCASTER
ENGINEERING

321 SW 4th Ave., Suite 400 | Portland, OR 97204 | 503.248.0313 | lancasterengineering.com



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Executive Summary

1. A 100-lot single family detached swelling unit subdivision is proposed for the following tax lots in Sandy, Oregon: 24E23 800, 801, 802, 803, and 804.
2. Access to the project is planned via an existing right-of-way street stub on Melissa Avenue that was created to provide access to the subject site as part of the adjoining Nicholas Glen No. 2 subdivision.
3. The proposed subdivision is calculated to generate 74 trips during the morning peak hour, 99 trips during the evening peak hour, and 944 trips each weekday.
4. Based on a review of the most recent five years of crash history, no significant safety issues or trends are evident at the study intersections.
5. Due to insufficient major and minor street volumes, preliminary traffic signal warrants were not met at the study intersections under all analysis scenarios.
6. Left-turn lane warrants were analyzed for the intersection of Melissa Avenue at Dubarko Road and not met under any analysis scenario.
7. All study intersections, including the intersection of Melissa Avenue at Dubarko Road, are currently operating within the City's performance standards and are projected to continue operating acceptably through year 2022, with or without the addition of site trips from the proposed development.



Project Description

Introduction

The proposed development will include the construction of a 100-lot subdivision to be located on tax lots 24E23 800, 801, 802, 803, and 804 in Sandy, Oregon. The site is currently within the City of Sandy Urban Growth Boundary, the city limits, and is zoned Single Family Residential (SFR), which allows the subdivision as proposed. The project will be built in three phases, with the expected completion year of 2022.

This report includes traffic counts and a full operational analysis at the intersections listed below. This scope was developed based on City of Sandy's Traffic Impact Analysis (TIA) requirements and was approved by Replinger and Associates, the City's consulting transportation engineer. Coordination of the scope of work with the Oregon Department of Transportation (ODOT) was not necessary since no intersections on the state highway are affected.

1. SE 362nd Drive at Dubarko Road,
2. Ruben Lane at Dubarko Road,
3. Dubarko Road at Melissa Avenue, and
4. Dubarko Road at Bluff Road.

The purpose of this study is to determine whether the transportation system within the vicinity of the site is capable of supporting the existing uses as well as the proposed subdivision and to determine if mitigation is necessary. Detailed information on traffic counts, trip generation calculations, safety analyses, and level-of-service calculations is included in the appendix to this report.

Location Description

The subject site is located south of Rachel Drive and west of Ponder Lane in Sandy, Oregon. Although roadway stubs will be provided within the site for future roadway connections, access to the project is planned via an existing right-of-way street stub on Melissa Avenue that was created to provide access to the subject site as part of the adjoining Nicholas Glen No. 2 subdivision.

Access to the subdivision cannot be provided via SE Ponder Lane in the southeast corner of the site since the existing right-of-way along SE Ponder Lane does not allow for two directions of travel and the current configuration of SE Ponder Lane at Highway 211 cannot support additional vehicle trips. There is not sufficient right-of-way available to realign Ponder Lane at its intersection with Highway 211. It is expected that additional access will be available to the east of the site as other properties develop.

Vicinity Streets

Five roadways have been identified in the traffic study scope. Table 1 provides a description of each of the roadways.



Table 1: Vicinity Roadway Descriptions

Street Name	Jurisdiction	Classification	Speed (MPH)	Curbs	Sidewalks	Bicycle Lanes
SE 362 nd Drive	City of Sandy	Rural Minor Arterial	35 mph posted	Partial	Partial	Partial
Ruben Lane	City of Sandy	Collector	25 mph posted	Yes	Partial	Yes
Dubarko Road	City of Sandy	Minor Arterial	25 mph posted	Yes	Yes	Partial
Melissa Avenue	City of Sandy	Local Road	25 mph statutory	Yes	Yes	No
Bluff Road	City of Sandy	Minor Arterial	25 mph posted	Partial	Partial	Partial

Study Intersections

Four nearby intersections were identified in discussions with City staff that are expected to be impacted by the proposed project. Table 2 below provides a summary of each of the study intersections.

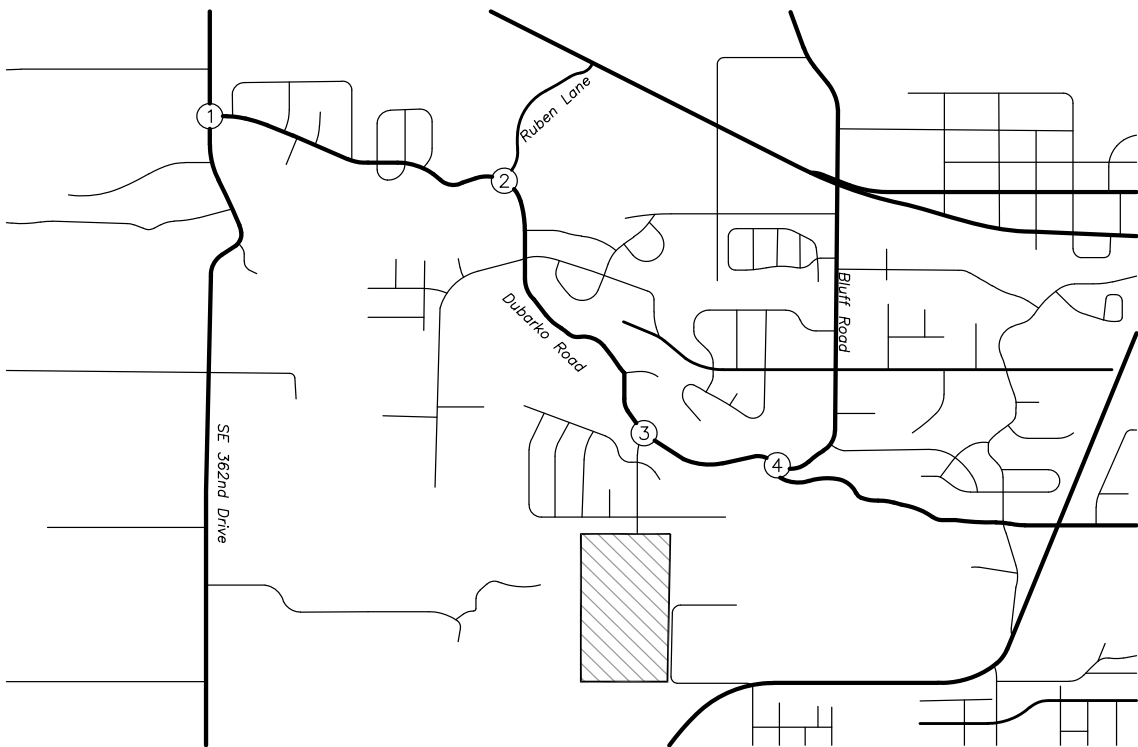
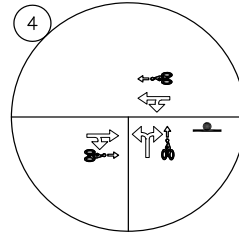
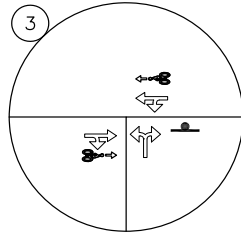
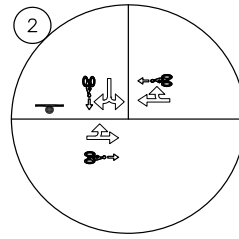
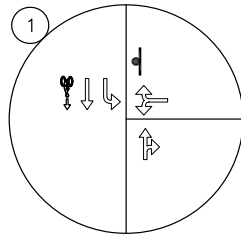
Table 2: Vicinity Intersection Descriptions

Number	Intersection	Geometry	Traffic Control	Stopped Approaches
1	SE 362 nd Drive at Dubarko Road	Three-Legged	Two-Way Stop Controlled	Westbound
2	Ruben Lane at Dubarko Road	Three-Legged	Two-Way Stop Controlled	Southbound
3	Dubarko Road at Melissa Avenue	Three-Legged	Two-Way Stop Controlled	Northbound
4	Dubarko Road at Bluff Rod	Three-Legged	All-Way Stop Controlled	All

The figure on the following page shows the site vicinity and the study intersection configurations.

LEGEND

-  STUDY INTERSECTION (EXISTING)
-  STOP SIGN
-  BIKE LANE
-  PROJECT SITE
-  ARTERIAL ROADWAY
-  COLLECTOR ROADWAY
-  LOCAL ROADWAY



VICINITY MAP



FIGURE 1

PAGE 4



Site Trips

Trip Generation

To estimate the number of trips that will be generated by the proposed use, trip rates from the *Trip Generation Manual*¹ were used. Data from land use codes 210, *Single-Family Detached Housing*, was used to estimate the proposed development’s trip generation based on the number of dwelling units.

The trip generation calculations show that the proposed subdivision is projected to generate 74 morning peak hour trips, 99 evening peak hour trips, and 944 average weekday trips. The trip generation estimates are summarized in Table 3 below and detailed trip generation calculations are included as an attachment to this report.

Table 3: Trip Generation Summary

Land Use Code	Size	Morning Peak Hour			Evening Peak Hour			Weekday Total
		In	Out	Total	In	Out	Total	
210 – Single-Family Detached Housing	100 units	19	55	74	62	37	99	944

Custom Trip Rates

Based on traffic counts collected at the existing intersection of Melissa Avenue at Dubarko Road and 24-hour counts collected along Melissa Avenue, a localized trip rate was derived for the existing subdivision that accesses Dubarko Road via Melissa Avenue. The custom trip rate was calculated to be 0.49 trips per unit during the morning peak hour, 0.63 trips per unit during the evening peak hour, and 6.90 trips per unit during each weekday. A comparison of the ITE trip rates and the trip rates based on localized data is provided in the following table.

Table 4: Trip Rate Comparison

Data	Morning Trip Rate	Evening Trip Rate	Weekday Trip Rate
ITE	0.74 trips/unit	0.99 trips/unit	9.44 trips/unit
Local Data	0.49 trips/unit	0.63 trips/unit	6.90 trips/unit

Since the localized data shows lower trip rates during all analysis periods, it can be expected that the proposed subdivision will yield site trips at a similar rate. Although this lower trip generation rate was not used for analysis, it should be noted that the trip generation based on ITE rates represents a conservative, worst-case analysis.

¹ Institute of Transportation Engineers (ITE), *Trip Generation Manual*, 10th Edition, 2017.

Trip Distribution

The directional distribution of site trips to and from the proposed development was calculated based on travel patterns of trips to and from the existing neighborhood that is served by Melissa Avenue. In addition, the locations of likely trip destinations, locations of major transportation facilities in the site vicinity, and existing travel patterns at the study intersections.

The following trip distribution was estimated and used for analysis:

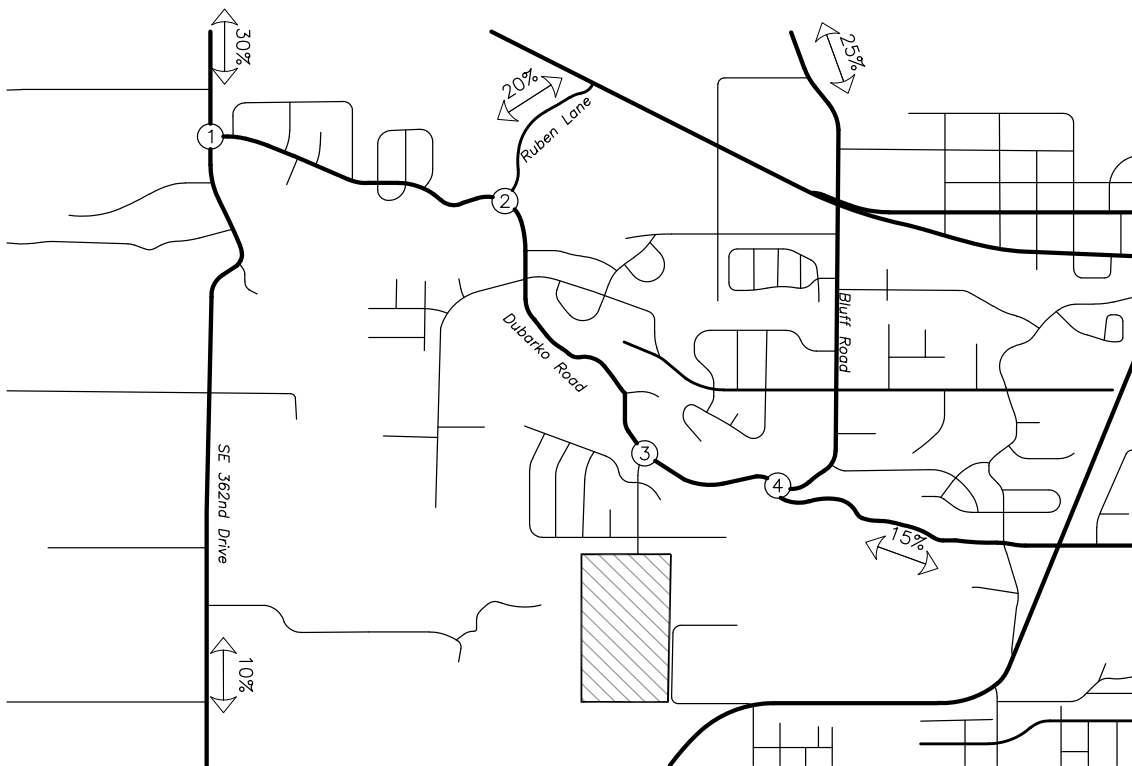
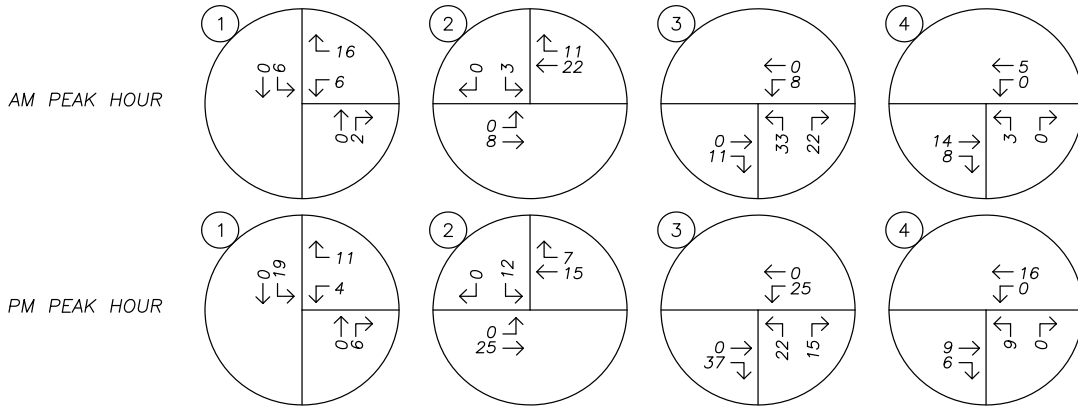
- Approximately 30 percent of site trips will travel to/from the north along SE 362nd Drive;
- Approximately 25 percent of site trips will travel to/from the north along Bluff Road;
- Approximately 20 percent of site trips will travel to/from the north on Ruben Lane;
- Approximately 15 percent of site trips will travel to/from the east along Dubarko Road; and
- Approximately 10 percent of site trips will travel to/from the south along SE 362nd Drive.

Figure 2 on page 7 shows the distribution and assignment of site trips for the proposed development.

LEGEND

XX% PERCENT OF PROJECT TRIPS

TRIP GENERATION			
	IN	OUT	TOTAL
AM	19	55	74
PM	62	37	99



SITE TRIP DISTRIBUTION & ASSIGNMENT
 Proposed Development Plan – Site Trips
 AM & PM Peak Hours



FIGURE
 2
 PAGE
 7



Traffic Volumes

Existing Conditions

Traffic counts were conducted at the intersection of Melissa Avenue at Dubarko Road on Thursday, April 25th, 2019 from 7:00 AM to 9:00 AM, and from 4:00 PM to 6:00 PM. Traffic counts were conducted at all other study intersections on Wednesday, May 22nd, 2019 from 4:00 PM to 6:00 PM, and on Thursday, May 23rd, 2019 from 7:00 AM to 9:00 AM. Each intersection's respective morning and evening peak hours were used for analysis.

Background Conditions

In order to calculate the future traffic volumes on local streets, an exponential growth rate of two percent per year for an assumed period of three years was applied to the measured existing traffic volumes to approximate year 2022 background conditions.

In-Process Trips

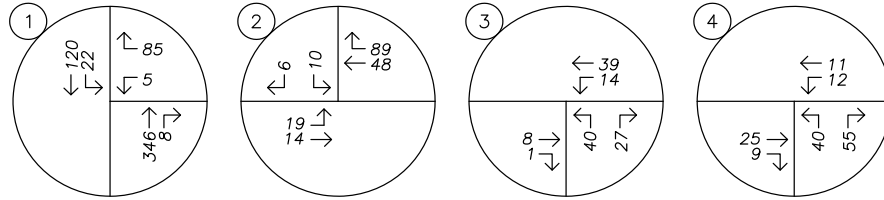
In-process trips associated with previously approved developments were added to the background volumes in order to represent future traffic volumes at the study intersections prior to the approval of the subject development. Trips associated with the approved 138-unit Sandy Heights Apartments were added to the study intersections.

Buildout Conditions

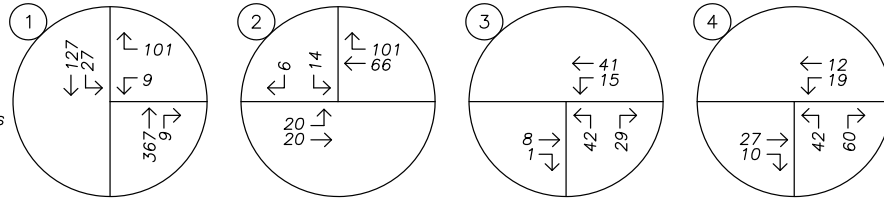
Trips to be generated by the proposed development, as described earlier within the *Site Trips* section, were added to the projected year 2022 background traffic volumes to obtain the expected year 2022 buildout volumes.

Figure 3 on page 9 shows the existing, year 2022 background, and year 2022 buildout traffic volumes for the morning peak hour. Figure 4 on page 10 shows the existing, year 2022 background, and year 2022 buildout traffic volumes for the evening peak hour.

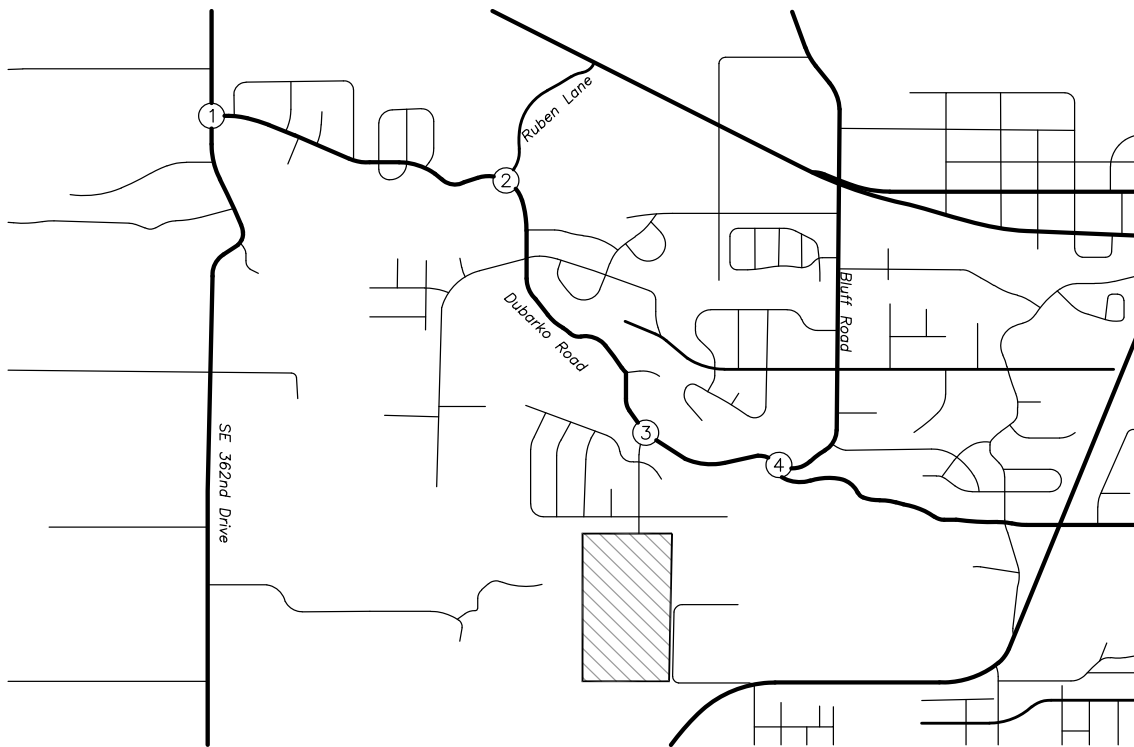
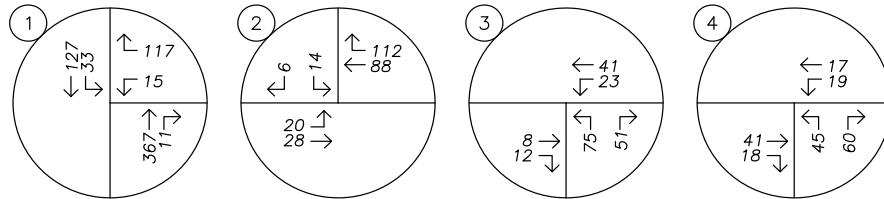
Year 2019
Existing Conditions



Year 2022
Background Conditions



Year 2022
Buildout Conditions



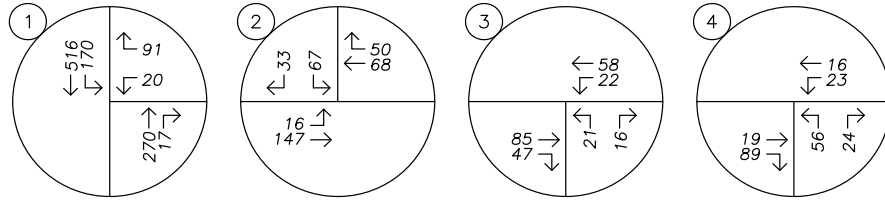
TRAFFIC VOLUMES
All Analysis Scenarios
AM Peak Hour



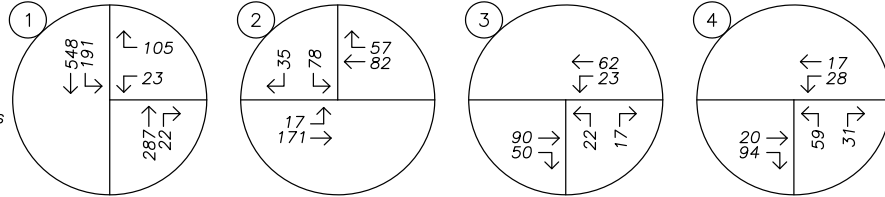
FIGURE
3

PAGE
9

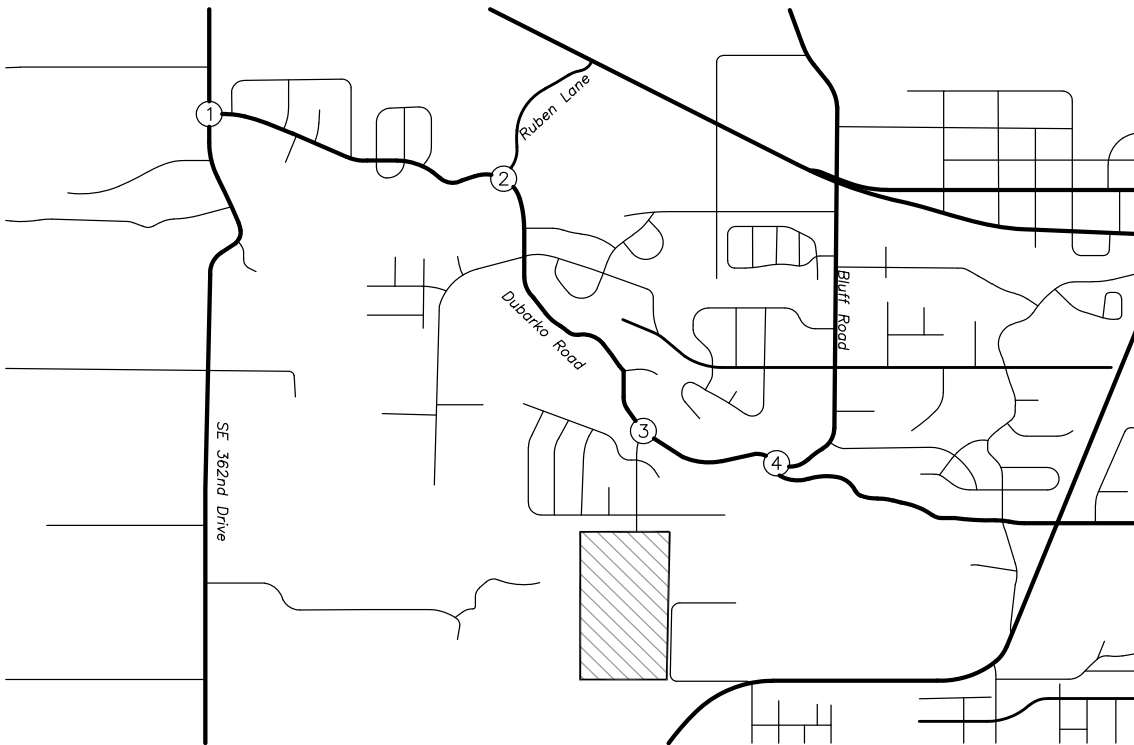
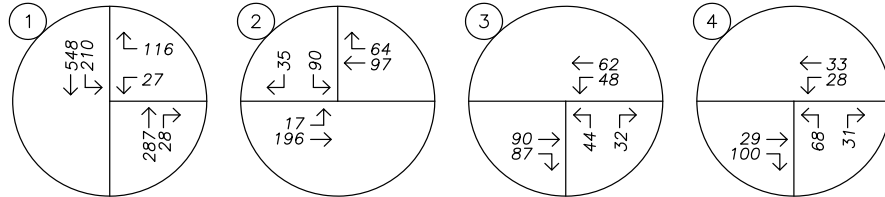
Year 2019
Existing Conditions



Year 2022
Background Conditions



Year 2022
Buildout Conditions



TRAFFIC VOLUMES
All Analysis Scenarios
PM Peak Hour



FIGURE
4
PAGE
10



Safety Analysis

Crash History Review

Using data obtained from the ODOT's Crash Analysis and Reporting Unit, a review of the most recent available five years of crash history (January 2012 to December 2016) at the study intersections was performed. The crash data was evaluated based on the number of crashes, the type of collisions, the severity of the collisions, and the resulting crash rate for the intersection. Crash rates provide the ability to compare safety risks at different intersections by accounting for both the number of crashes that have occurred during the study period and the number of vehicles that typically travel through the intersection. Crash rates were calculated using the common assumption that traffic counted during the evening peak hour represents approximately 10 percent of the annual average daily traffic (AADT) at the intersection. Crash rates in excess of 1.0 crashes per million entering vehicles (CMEV) may be indicative of design deficiencies and therefore require a need for further investigation and possible mitigation.

Table 5: Crash Analysis Summary

Intersection	Crash Type		Crash Severity	Total	AADT	Crash Rate
	Turn	Sideswipe	PDO			
Dubarko Road at SE 362 nd Drive	0	1	1	1	10,840	0.05
Dubarko Road at Melissa Avenue	2	0	2	2	2,490	0.44

The calculated crash rates at the intersections of Dubarko Road at SE 362nd Drive and at Melissa Avenue are not indicative of safety deficiencies or design flaws. No mitigation is recommended.

No reported crashes were found at the intersections of Dubarko Road at Ruben Lane and Dubarko Road at Bluff Road during the analysis period. Accordingly, no safety concerns were identified at these study intersections.

Warrant Analysis

Traffic Signal Warrants

Traffic signal warrants were examined for all study intersections based on the methodologies in the *Manual on Uniform Traffic Control Devices*² (MUTCD). Warrant 1, *Eight Hour Vehicular Volumes*, was used from the MUTCD. Warrants were evaluated based on the common assumption that traffic counted during the evening peak hour represents ten percent of the AADT. Volumes were used for the year 2022 buildout conditions. Traffic signal warrants were not met at any of the study intersections due to low major and minor street

² Federal Highway Administration (FTA), America Traffic Safety Services Association (ATSSA), Institute of Transportation Engineers (ITE), American Association of State Highway and Transportation Officials (AASHTO), *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD), 2009 Edition, 2010.



traffic volumes. Detailed information on the traffic signal warrant analysis is included in the attached appendix.

Left-Turn Lane Warrants

Left-turn lane warrants were examined for the westbound left-turn lane at the intersection of Melissa Avenue at Dubarko Road. A left-turn refuge is primarily a safety consideration for the major-street approach, removing left-turning vehicles from the through traffic stream. Warrants were based on the methodology outlined in the National Cooperative Highway Research Program (NCHRP) Report Number 457³. These turn-lane warrants were evaluated based on the number of left-turning vehicles, the number of advancing and opposing vehicles, and the roadway travel speed.

Left-turn lanes were not warranted during any of the analysis scenarios. No new left-turn lanes are recommended.

³ Bonneson, James A. and Michael D. Fontaine, *NCHRP Report 457: An Engineering Study Guide for Evaluating Intersection Improvements*, Transportation Research Board, 2001.



Operational Analysis

Delay & Capacity Analysis

A capacity and delay analysis was conducted for the study intersection per the unsignalized intersection analysis methodologies in the *Highway Capacity Manual*⁴ (HCM). Intersections are generally evaluated based on the average control delay experienced by vehicles and are assigned a grade according to their operation. The level of service (LOS) of an intersection can range from LOS A, which indicates very little or no delay experienced by vehicles, to LOS F, which indicates a high degree of congestion and delay. The volume-to-capacity (v/c) ratio is a measure that compares the traffic volumes (demand) against the available capacity of an intersection.

The City of Sandy’s Transportation System Plan states that both signalized and unsignalized intersections are required to operate at LOS D or better.

Based on the results of the operational analysis, shown in Table 6, the study intersections are currently operating acceptably and are projected to continue operating acceptably through the 2022 buildout year of the site. Detailed calculations as well as tables showing the relationship between delay and LOS are included in the appendix to this report.

Table 6: Intersection Capacity Analysis Summary

	Morning Peak Hour			Evening Peak Hour		
	Delay	LOS	V/C	Delay	LOS	V/C
SE 362nd Drive at Dubarko Road						
Existing Conditions	12	B	0.17	16	C	0.27
Year 2022 Background Conditions	13	B	0.22	18	C	0.34
Year 2022 Buildout Conditions	13	B	0.27	21	C	0.40
Ruben Lane at Dubarko Road						
Existing Conditions	9	A	0.02	11	B	0.15
Year 2022 Background Conditions	10	A	0.03	11	B	0.18
Year 2022 Buildout Conditions	10	A	0.03	12	B	0.21
Dubarko Road at Melissa Avenue						
Existing Conditions	9	A	0.09	10	A	0.05
Year 2022 Background Conditions	9	A	0.09	10	A	0.06
Year 2022 Buildout Conditions	10	A	0.17	11	B	0.12
Dubarko Road at Bluff Road						
Existing Conditions	8	A	0.15	8	A	0.13
Year 2022 Background Conditions	8	A	0.16	8	A	0.14
Year 2022 Buildout Conditions	8	A	0.17	8	A	0.16

⁴ Transportation Research Board, *Highway Capacity Manual, 6th Edition, 2016.*



Conclusions

Based on a review of the most recent five years of crash history, no significant safety issues or trends are evident at the study intersections.

Due to insufficient major and minor street volumes, traffic signal warrants were not met at the study intersections under all analysis scenarios.

Left-turn lane warrants were analyzed for the intersection of Melissa Avenue at Dubarko Road and not estimated to be met under any analysis scenario.

All study intersections, including the intersection of Melissa Avenue and Dubarko Road are currently operating within the City's performance standards and are projected to continue operating acceptably through year 2022, with or without the addition of site trips from the proposed development.

1e

Appendix



TRIP GENERATION CALCULATIONS

Land Use: Single-Family Detached Housing
Land Use Code: 210
Setting/Location: General Urban/Suburban
Variable: Dwelling Units
Variable Value: 100

AM PEAK HOUR

Trip Rate: 0.74

	Enter	Exit	Total
Directional Distribution	25%	75%	
Trip Ends	19	55	74

PM PEAK HOUR

Trip Rate: 0.99

	Enter	Exit	Total
Directional Distribution	63%	37%	
Trip Ends	62	37	99

WEEKDAY

Trip Rate: 9.44

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	472	472	944

SATURDAY

Trip Rate: 9.54

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	477	477	954

Source: Trip Generation Manual, Tenth Edition

All Traffic Data Services, Inc.
alltrafficdata.net

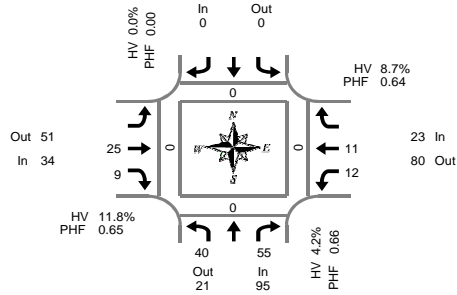
Melissa Ave S-O Dubarko Rd

Start Time	25-Apr-19 Thu	NB	SB							Total
12:00 AM		2	5							7
01:00		1	1							2
02:00		1	0							1
03:00		7	2							9
04:00		20	1							21
05:00		30	5							35
06:00		57	11							68
07:00		67	15							82
08:00		37	17							54
09:00		30	17							47
10:00		25	18							43
11:00		23	22							45
12:00 PM		35	25							60
01:00		16	24							40
02:00		29	46							75
03:00		35	58							93
04:00		44	64							108
05:00		30	54							84
06:00		32	74							106
07:00		28	40							68
08:00		16	36							52
09:00		9	30							39
10:00		5	12							17
11:00		0	4							4
Total		579	581							1160
Percent		49.9%	50.1%							
AM Peak	-	07:00	11:00	-	-	-	-	-	-	07:00
Vol.	-	67	22	-	-	-	-	-	-	82
PM Peak	-	16:00	18:00	-	-	-	-	-	-	16:00
Vol.	-	44	74	-	-	-	-	-	-	108
Grand Total		579	581							1160
Percent		49.9%	50.1%							
ADT		ADT 11,874	AADT 11,874							

Total Vehicle Summary



Clay Carney
(503) 833-2740



Dubarko Rd & Bluff Rd

Thursday, May 23, 2019
7:00 AM to 9:00 AM

5-Minute Interval Summary

7:00 AM to 9:00 AM

Interval Start Time	Northbound Dubarko Rd			Southbound Dubarko Rd			Eastbound Bluff Rd			Westbound Bluff Rd			Interval Total	Pedestrians Crosswalk			
	L	R	Bikes			Bikes	T	R	Bikes	L	T	Bikes		North	South	East	West
7:00 AM	3	4	0			0	2	1	0	0	1	0	11	0	0	0	0
7:05 AM	1	8	0			0	2	0	0	1	0	0	12	0	0	0	0
7:10 AM	3	7	0			0	5	1	0	2	1	0	19	0	0	0	0
7:15 AM	8	6	0			0	4	0	0	0	1	0	19	0	0	0	0
7:20 AM	2	7	0			0	0	0	0	1	1	0	11	0	0	0	0
7:25 AM	6	7	0			0	3	2	0	4	2	0	24	0	0	0	0
7:30 AM	3	2	0			0	6	1	0	1	0	0	13	0	0	0	0
7:35 AM	1	3	0			0	1	0	0	1	1	0	7	0	0	0	0
7:40 AM	3	1	0			0	1	1	0	1	1	0	8	0	0	0	0
7:45 AM	1	2	0			0	0	2	0	1	0	0	6	0	0	0	0
7:50 AM	5	6	0			0	1	0	0	0	3	0	15	0	0	0	0
7:55 AM	4	2	0			0	0	1	0	0	0	0	7	0	0	0	0
8:00 AM	2	1	0			0	1	2	0	2	0	0	8	0	0	0	0
8:05 AM	2	1	0			0	0	1	0	0	0	0	4	0	0	0	0
8:10 AM	1	5	0			0	2	0	0	1	2	0	11	0	0	0	0
8:15 AM	2	7	0			0	0	0	0	2	1	0	12	0	0	0	0
8:20 AM	3	2	0			0	3	0	0	1	0	0	9	0	0	0	0
8:25 AM	3	5	0			0	1	3	0	1	0	0	13	0	0	0	0
8:30 AM	0	5	0			0	0	2	0	1	0	0	8	0	0	0	0
8:35 AM	3	0	0			0	0	2	0	0	0	0	5	0	0	0	0
8:40 AM	3	2	0			0	0	2	0	0	1	0	8	0	0	0	0
8:45 AM	1	1	0			0	1	1	0	3	1	0	8	0	0	0	0
8:50 AM	0	1	0			0	0	1	0	1	0	0	3	0	0	0	0
8:55 AM	1	0	0			0	0	2	0	0	0	0	3	0	0	0	0
Total Survey	61	85	0			0	33	25	0	24	16	0	244	0	0	0	0

15-Minute Interval Summary

7:00 AM to 9:00 AM

Interval Start Time	Northbound Dubarko Rd			Southbound Dubarko Rd			Eastbound Bluff Rd			Westbound Bluff Rd			Interval Total	Pedestrians Crosswalk			
	L	R	Bikes			Bikes	T	R	Bikes	L	T	Bikes		North	South	East	West
7:00 AM	7	19	0			0	9	2	0	3	2	0	42	0	0	0	0
7:15 AM	16	20	0			0	7	2	0	5	4	0	54	0	0	0	0
7:30 AM	7	6	0			0	8	2	0	3	2	0	28	0	0	0	0
7:45 AM	10	10	0			0	1	3	0	1	3	0	28	0	0	0	0
8:00 AM	5	7	0			0	3	3	0	3	2	0	23	0	0	0	0
8:15 AM	8	14	0			0	4	3	0	4	1	0	34	0	0	0	0
8:30 AM	6	7	0			0	0	6	0	1	1	0	21	0	0	0	0
8:45 AM	2	2	0			0	1	4	0	4	1	0	14	0	0	0	0
Total Survey	61	85	0			0	33	25	0	24	16	0	244	0	0	0	0

Peak Hour Summary

7:00 AM to 8:00 AM

By Approach	Northbound Dubarko Rd				Southbound Dubarko Rd				Eastbound Bluff Rd				Westbound Bluff Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	95	21	116	0	0	0	0	0	34	51	85	0	23	80	103	0	0	0	0	0	
%HV	4.2%				0.0%				11.8%				8.7%				6.6%				
PHF	0.66				0.00				0.65				0.64				0.70				

By Movement	Northbound Dubarko Rd				Southbound Dubarko Rd				Eastbound Bluff Rd				Westbound Bluff Rd				Total
	L	R	Total	Bikes			Total	Bikes	T	R	Total	Bikes	L	T	Total	Bikes	
Volume	40	55	95	0			0	0	25	9	34	0	12	11	23	0	
%HV	2.5%	NA	5.5%	4.2%	NA	NA	NA	0.0%	NA	12.0%	11.1%	11.8%	8.3%	9.1%	NA	8.7%	6.6%
PHF	0.63	0.65	0.66				0.00		0.57	0.75	0.65		0.50	0.69	0.64	0.70	

Rolling Hour Summary

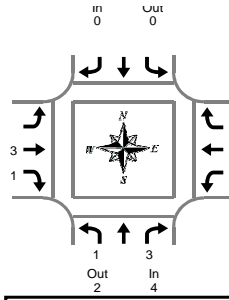
7:00 AM to 9:00 AM

Interval Start Time	Northbound Dubarko Rd			Southbound Dubarko Rd			Eastbound Bluff Rd			Westbound Bluff Rd			Interval Total	Pedestrians Crosswalk			
	L	R	Bikes			Bikes	T	R	Bikes	L	T	Bikes		North	South	East	West
7:00 AM	40	55	0			0	25	9	0	12	11	0	152	0	0	0	0
7:15 AM	38	43	0			0	19	10	0	12	11	0	133	0	0	0	0
7:30 AM	30	37	0			0	16	11	0	11	8	0	113	0	0	0	0
7:45 AM	29	38	0			0	8	15	0	9	7	0	106	0	0	0	0
8:00 AM	21	30	0			0	8	16	0	12	5	0	92	0	0	0	0

Heavy Vehicle Summary



Clay Carney
(503) 833-2740



Dubarko Rd & Bluff Rd

Thursday, May 23, 2019
7:00 AM to 9:00 AM

Peak Hour Summary
7:00 AM to 8:00 AM

Heavy Vehicle 5-Minute Interval Summary

7:00 AM to 9:00 AM

Interval Start Time	Northbound Dubarko Rd			Southbound Dubarko Rd			Eastbound Bluff Rd			Westbound Bluff Rd			Interval Total
	L	R	Total			Total	T	R	Total	L	T	Total	
7:00 AM	0	0	0			0	0	0	0	0	1	0	1
7:05 AM	0	1	1			0	0	0	0	1	0	0	1
7:10 AM	0	0	0			0	1	0	1	0	0	0	0
7:15 AM	1	0	1			0	1	0	1	0	0	0	2
7:20 AM	0	0	0			0	0	0	0	0	0	0	0
7:25 AM	0	0	0			0	0	0	0	0	0	0	0
7:30 AM	0	0	0			0	1	0	1	0	0	0	1
7:35 AM	0	1	1			0	0	0	0	0	0	0	1
7:40 AM	0	0	0			0	0	1	1	0	0	0	1
7:45 AM	0	0	0			0	0	0	0	0	0	0	0
7:50 AM	0	1	1			0	0	0	0	0	0	0	1
7:55 AM	0	0	0			0	0	0	0	0	0	0	0
8:00 AM	0	0	0			0	0	0	0	0	0	0	0
8:05 AM	0	0	0			0	0	0	0	0	0	0	0
8:10 AM	0	1	1			0	0	0	0	0	0	0	1
8:15 AM	1	0	1			0	0	0	0	0	0	0	1
8:20 AM	0	0	0			0	1	0	1	0	0	0	1
8:25 AM	0	1	1			0	0	0	0	0	0	0	1
8:30 AM	0	1	1			0	0	0	0	0	0	0	1
8:35 AM	0	0	0			0	0	0	0	0	0	0	0
8:40 AM	0	0	0			0	0	0	0	0	0	0	0
8:45 AM	0	0	0			0	0	0	0	0	0	0	0
8:50 AM	0	0	0			0	0	0	0	0	0	0	0
8:55 AM	0	0	0			0	0	0	0	0	0	0	0
Total Survey	2	6	8			0	4	1	5	1	1	2	15

Heavy Vehicle 15-Minute Interval Summary

7:00 AM to 9:00 AM

Interval Start Time	Northbound Dubarko Rd			Southbound Dubarko Rd			Eastbound Bluff Rd			Westbound Bluff Rd			Interval Total
	L	R	Total			Total	T	R	Total	L	T	Total	
7:00 AM	0	1	1			0	1	0	1	1	1	0	2
7:15 AM	1	0	1			0	1	0	1	0	0	0	2
7:30 AM	0	1	1			0	1	1	2	0	0	0	3
7:45 AM	0	1	1			0	0	0	0	0	0	0	1
8:00 AM	0	1	1			0	0	0	0	0	0	0	1
8:15 AM	1	1	2			0	1	0	1	0	0	0	3
8:30 AM	0	1	1			0	0	0	0	0	0	0	1
8:45 AM	0	0	0			0	0	0	0	0	0	0	0
Total Survey	2	6	8			0	4	1	5	1	1	2	15

Heavy Vehicle Peak Hour Summary

7:00 AM to 8:00 AM

By Approach	Northbound Dubarko Rd			Southbound Dubarko Rd			Eastbound Bluff Rd			Westbound Bluff Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	4	2	6	0	0	0	4	2	6	2	6	8	10
PHF	0.50			0.00			0.50			0.25			0.50

By Movement	Northbound Dubarko Rd			Southbound Dubarko Rd			Eastbound Bluff Rd			Westbound Bluff Rd			Total
	L	R	Total			Total	T	R	Total	L	T	Total	
Volume	1	3	4			0	3	1	4	1	1	2	10
PHF	0.25	0.75	0.50			0.00	0.38	0.25	0.50	0.25	0.25	0.25	0.50

Heavy Vehicle Rolling Hour Summary

7:00 AM to 9:00 AM

Interval Start Time	Northbound Dubarko Rd			Southbound Dubarko Rd			Eastbound Bluff Rd			Westbound Bluff Rd			Interval Total
	L	R	Total			Total	T	R	Total	L	T	Total	
7:00 AM	1	3	4			0	3	1	4	1	1	2	10
7:15 AM	1	3	4			0	2	1	3	0	0	0	7
7:30 AM	1	4	5			0	2	1	3	0	0	0	8
7:45 AM	1	4	5			0	1	0	1	0	0	0	6
8:00 AM	1	3	4			0	1	0	1	0	0	0	5

Peak Hour Summary

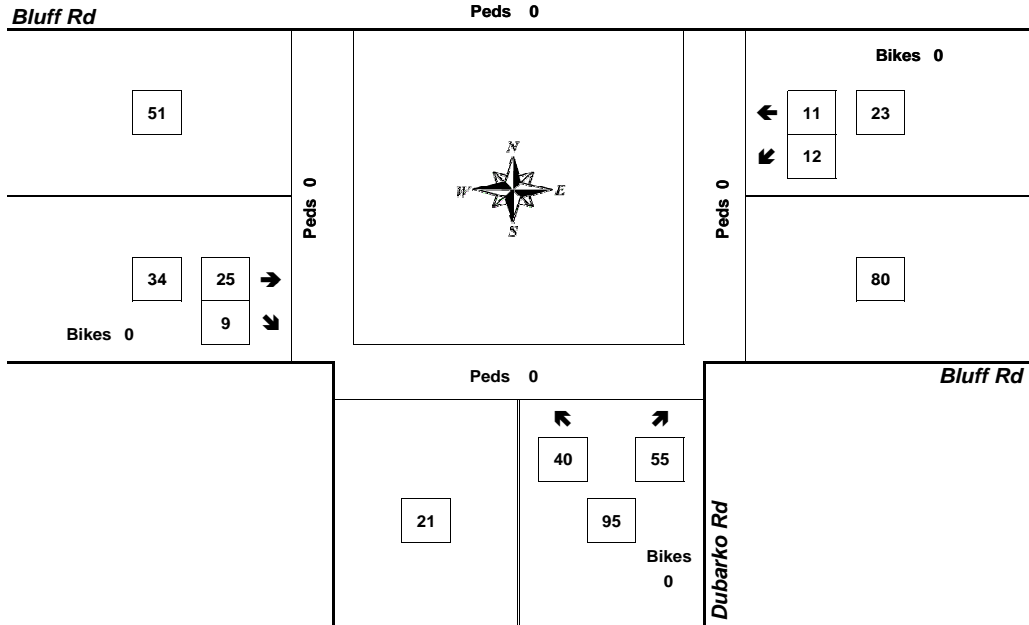


Clay Carney
(503) 833-2740

Dubarko Rd & Bluff Rd

7:00 AM to 8:00 AM
Thursday, May 23, 2019

Bikes
0



Approach	PHF	HV%	Volume
EB	0.65	11.8%	34
WB	0.64	8.7%	23
NB	0.66	4.2%	95
SB	0.00	0.0%	0
Intersection	0.70	6.6%	152

Count Period: 7:00 AM to 9:00 AM

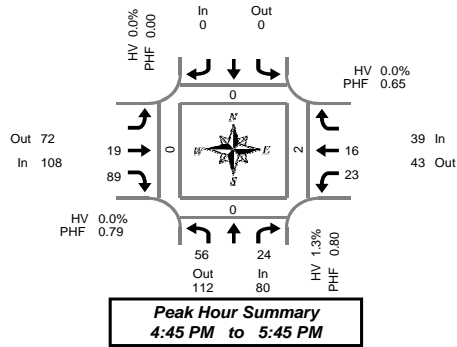
Total Vehicle Summary



Clay Carney
(603) 833-2740

Dubarko Rd & Bluff Rd

Wednesday, May 22, 2019
4:00 PM to 6:00 PM



5-Minute Interval Summary

4:00 PM to 6:00 PM

Interval Start Time	Northbound Dubarko Rd			Southbound Dubarko Rd			Eastbound Bluff Rd			Westbound Bluff Rd			Interval Total	Pedestrians Crosswalk			
	L	R	Bikes			Bikes	T	R	Bikes	L	T	Bikes		North	South	East	West
4:00 PM	4	0	0			0			0	4	7	0	5	0	0	0	0
4:05 PM	2	0	0			0			0	1	4	0	3	3	0	0	0
4:10 PM	7	1	0			0			0	1	4	0	2	0	0	0	0
4:15 PM	5	1	0			0			0	2	7	0	1	1	0	0	0
4:20 PM	3	0	0			0			0	0	5	0	2	3	0	0	0
4:25 PM	7	2	0			0			0	3	8	0	3	0	0	0	0
4:30 PM	6	2	0			0			0	0	6	0	1	0	0	0	0
4:35 PM	2	2	0			0			0	3	9	0	1	0	0	0	0
4:40 PM	7	3	0			0			0	2	7	0	1	0	0	0	0
4:45 PM	7	0	0			0			0	0	10	0	3	0	0	0	0
4:50 PM	8	4	0			0			0	2	5	0	1	0	0	0	0
4:55 PM	3	1	0			0			0	0	6	0	0	1	0	0	0
5:00 PM	4	3	0			0			0	1	5	0	3	2	0	0	0
5:05 PM	6	1	1			0			0	3	8	0	1	2	0	0	1
5:10 PM	1	0	0			0			0	4	9	0	1	0	0	0	0
5:15 PM	3	0	0			0			0	1	9	0	1	2	0	0	0
5:20 PM	7	4	0			0			0	3	6	0	1	3	0	0	0
5:25 PM	1	2	0			0			0	0	8	0	3	1	0	0	0
5:30 PM	5	2	0			0			0	1	6	0	5	1	0	0	0
5:35 PM	3	0	0			0			0	2	9	0	2	3	0	0	0
5:40 PM	8	7	0			0			0	2	8	0	2	1	0	0	1
5:45 PM	7	1	0			0			0	0	3	0	0	1	0	0	0
5:50 PM	6	2	0			0			0	1	6	0	1	0	0	0	0
5:55 PM	3	0	0			0			0	1	2	0	1	2	0	0	0
Total Survey	115	38	1			0			0	37	157	0	44	26	0	0	2

15-Minute Interval Summary

4:00 PM to 6:00 PM

Interval Start Time	Northbound Dubarko Rd			Southbound Dubarko Rd			Eastbound Bluff Rd			Westbound Bluff Rd			Interval Total	Pedestrians Crosswalk			
	L	R	Bikes			Bikes	T	R	Bikes	L	T	Bikes		North	South	East	West
4:00 PM	13	1	0			0			0	6	15	0	10	3	0	0	0
4:15 PM	15	3	0			0			0	5	20	0	6	4	0	0	0
4:30 PM	15	7	0			0			0	5	22	0	3	0	0	0	0
4:45 PM	18	5	0			0			0	2	21	0	4	1	0	0	0
5:00 PM	11	4	1			0			0	8	22	0	5	4	0	0	1
5:15 PM	11	6	0			0			0	4	23	0	5	6	0	0	0
5:30 PM	16	9	0			0			0	5	23	0	9	5	0	0	1
5:45 PM	16	3	0			0			0	2	11	0	2	3	0	0	0
Total Survey	115	38	1			0			0	37	157	0	44	26	0	0	2

Peak Hour Summary

4:45 PM to 5:45 PM

By Approach	Northbound Dubarko Rd			Southbound Dubarko Rd			Eastbound Bluff Rd			Westbound Bluff Rd			Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	80	112	192	1	0	0	0	0	108	72	180	0	39	43	82	0	227
%HV	1.3%			0.0%			0.0%			0.0%			0.4%				
PHF	0.80			0.00			0.79			0.65			0.85				

By Movement	Northbound Dubarko Rd			Southbound Dubarko Rd			Eastbound Bluff Rd			Westbound Bluff Rd			Total
	L	R	Total			Total	T	R	Total	L	T	Total	
Volume	56	24	80			0	19	89	108	23	16	39	227
%HV	1.8%	NA	0.0%	1.3%	NA	NA	0.0%	NA	0.0%	0.0%	0.0%	NA	0.4%
PHF	0.78	0.67	0.80			0.00	0.59	0.86	0.79	0.58	0.67	0.65	0.85

Rolling Hour Summary

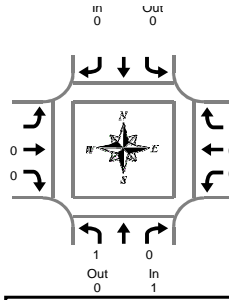
4:00 PM to 6:00 PM

Interval Start Time	Northbound Dubarko Rd			Southbound Dubarko Rd			Eastbound Bluff Rd			Westbound Bluff Rd			Interval Total	Pedestrians Crosswalk			
	L	R	Bikes			Bikes	T	R	Bikes	L	T	Bikes		North	South	East	West
4:00 PM	61	16	0			0			0	18	78	0	23	8	0	0	0
4:15 PM	59	19	1			0			0	20	85	0	18	9	0	0	1
4:30 PM	55	22	1			0			0	19	88	0	17	11	0	0	0
4:45 PM	56	24	1			0			0	19	89	0	23	16	0	0	2
5:00 PM	54	22	1			0			0	19	79	0	21	18	0	0	2

Heavy Vehicle Summary



Clay Carney
(503) 833-2740



Dubarko Rd & Bluff Rd

Wednesday, May 22, 2019
4:00 PM to 6:00 PM

Peak Hour Summary
4:45 PM to 5:45 PM

Heavy Vehicle 5-Minute Interval Summary 4:00 PM to 6:00 PM

Interval Start Time	Northbound Dubarko Rd			Southbound Dubarko Rd		Eastbound Bluff Rd			Westbound Bluff Rd			Interval Total
	L	R	Total		Total	T	R	Total	L	T	Total	
4:00 PM	0	0	0		0	2	0	2	0	0	0	2
4:05 PM	0	0	0		0	0	0	0	0	0	0	0
4:10 PM	0	0	0		0	0	0	0	0	0	0	0
4:15 PM	0	0	0		0	0	0	0	1	0	1	1
4:20 PM	0	0	0		0	0	0	0	0	0	0	0
4:25 PM	0	0	0		0	0	0	0	0	0	0	0
4:30 PM	0	0	0		0	0	0	0	1	0	1	1
4:35 PM	0	0	0		0	0	0	0	0	0	0	0
4:40 PM	0	0	0		0	0	0	0	0	0	0	0
4:45 PM	0	0	0		0	0	0	0	0	0	0	0
4:50 PM	0	0	0		0	0	0	0	0	0	0	0
4:55 PM	0	0	0		0	0	0	0	0	0	0	0
5:00 PM	0	0	0		0	0	0	0	0	0	0	0
5:05 PM	0	0	0		0	0	0	0	0	0	0	0
5:10 PM	0	0	0		0	0	0	0	0	0	0	0
5:15 PM	0	0	0		0	0	0	0	0	0	0	0
5:20 PM	0	0	0		0	0	0	0	0	0	0	0
5:25 PM	0	0	0		0	0	0	0	0	0	0	0
5:30 PM	0	0	0		0	0	0	0	0	0	0	0
5:35 PM	0	0	0		0	0	0	0	0	0	0	0
5:40 PM	1	0	1		0	0	0	0	0	0	0	1
5:45 PM	0	0	0		0	0	0	0	0	0	0	0
5:50 PM	0	0	0		0	0	0	0	0	0	0	0
5:55 PM	0	0	0		0	0	0	0	0	0	0	0
Total Survey	1	0	1		0	2	0	2	2	0	2	5

Heavy Vehicle 15-Minute Interval Summary 4:00 PM to 6:00 PM

Interval Start Time	Northbound Dubarko Rd			Southbound Dubarko Rd		Eastbound Bluff Rd			Westbound Bluff Rd			Interval Total
	L	R	Total		Total	T	R	Total	L	T	Total	
4:00 PM	0	0	0		0	2	0	2	0	0	0	2
4:15 PM	0	0	0		0	0	0	0	1	0	1	1
4:30 PM	0	0	0		0	0	0	0	1	0	1	1
4:45 PM	0	0	0		0	0	0	0	0	0	0	0
5:00 PM	0	0	0		0	0	0	0	0	0	0	0
5:15 PM	0	0	0		0	0	0	0	0	0	0	0
5:30 PM	1	0	1		0	0	0	0	0	0	0	1
5:45 PM	0	0	0		0	0	0	0	0	0	0	0
Total Survey	1	0	1		0	2	0	2	2	0	2	5

Heavy Vehicle Peak Hour Summary 4:45 PM to 5:45 PM

By Approach	Northbound Dubarko Rd			Southbound Dubarko Rd			Eastbound Bluff Rd			Westbound Bluff Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	1	0	1	0	0	0	0	1	1	0	0	0	1
PHF	0.25			0.00			0.00			0.00			0.25

By Movement	Northbound Dubarko Rd			Southbound Dubarko Rd		Eastbound Bluff Rd			Westbound Bluff Rd			Total
	L	R	Total		Total	T	R	Total	L	T	Total	
Volume	1	0	1		0	0	0	0	0	0	0	1
PHF	0.25		0.25		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25

Heavy Vehicle Rolling Hour Summary 4:00 PM to 6:00 PM

Interval Start Time	Northbound Dubarko Rd			Southbound Dubarko Rd		Eastbound Bluff Rd			Westbound Bluff Rd			Interval Total
	L	R	Total		Total	T	R	Total	L	T	Total	
4:00 PM	0	0	0		0	2	0	2	2	0	2	4
4:15 PM	0	0	0		0	0	0	0	2	0	2	2
4:30 PM	0	0	0		0	0	0	0	1	0	1	1
4:45 PM	1	0	1		0	0	0	0	0	0	0	1
5:00 PM	1	0	1		0	0	0	0	0	0	0	1

Peak Hour Summary

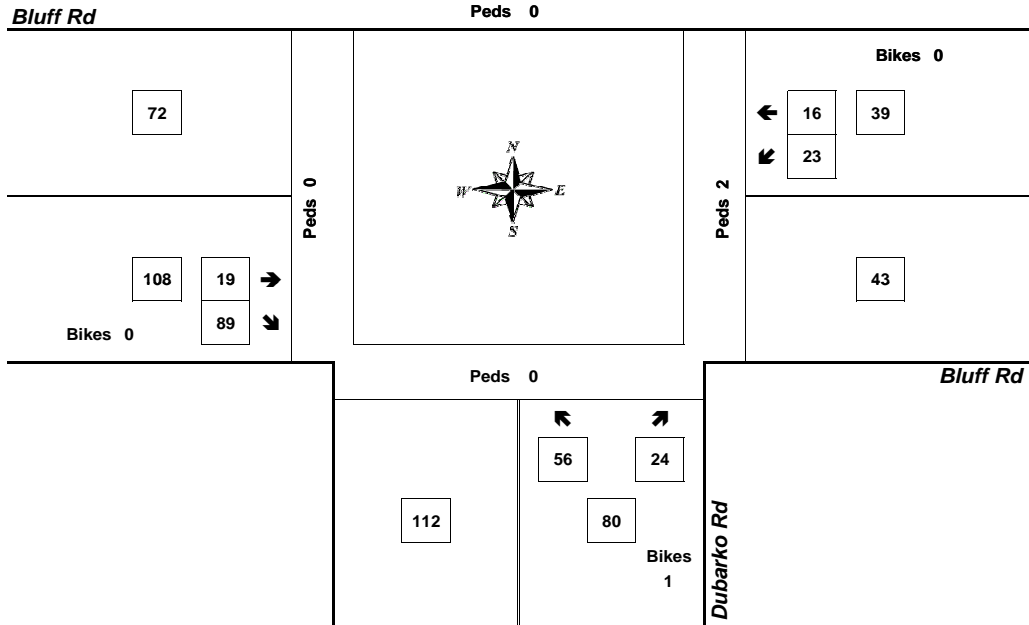


Clay Carney
(503) 833-2740

Dubarko Rd & Bluff Rd

4:45 PM to 5:45 PM
Wednesday, May 22, 2019

Bikes
0



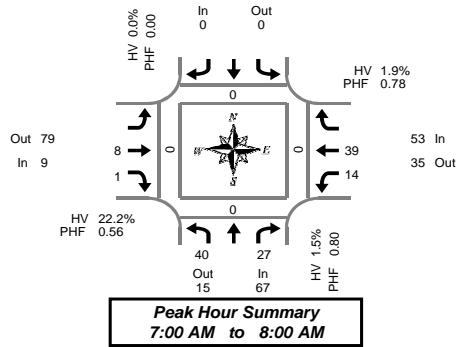
Approach	PHF	HV%	Volume
EB	0.79	0.0%	108
WB	0.65	0.0%	39
NB	0.80	1.3%	80
SB	0.00	0.0%	0
Intersection	0.85	0.4%	227

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary



Clay Carney
(603) 833-2740



Melissa Ave & Dubarko Rd

Thursday, April 25, 2019
7:00 AM to 9:00 AM

5-Minute Interval Summary

7:00 AM to 9:00 AM

Interval Start Time	Northbound Melissa Ave			Southbound Melissa Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total	Pedestrians Crosswalk			
	L	R	Bikes			Bikes	T	R	Bikes	L	T	Bikes		North	South	East	West
7:00 AM	5	2	0			0	0	0	0	2	3	0	12	0	0	0	0
7:05 AM	4	6	0			0	0	0	0	2	4	0	16	0	0	0	0
7:10 AM	2	2	0			0	1	0	0	1	2	0	8	0	0	0	0
7:15 AM	4	1	0			0	0	0	0	0	4	0	9	0	0	0	0
7:20 AM	2	3	0			0	2	0	0	2	3	0	12	0	0	0	0
7:25 AM	2	3	0			0	0	1	0	0	6	0	12	0	0	0	0
7:30 AM	6	4	0			0	1	0	0	3	3	0	17	0	0	0	0
7:35 AM	0	0	0			0	1	0	0	1	3	0	5	0	0	0	0
7:40 AM	2	1	0			0	1	0	0	0	4	0	8	0	0	0	0
7:45 AM	4	1	0			0	0	0	0	0	2	0	7	0	0	0	0
7:50 AM	6	1	0			0	1	0	0	2	3	0	13	0	0	0	0
7:55 AM	3	3	0			0	1	0	0	1	2	0	10	0	0	0	0
8:00 AM	3	0	0			0	0	0	0	0	1	0	4	0	0	0	0
8:05 AM	4	0	0			0	1	0	0	1	2	0	8	0	0	0	0
8:10 AM	3	1	0			0	0	1	0	0	2	0	7	0	0	0	0
8:15 AM	1	0	0			0	1	1	0	1	3	0	7	0	0	0	0
8:20 AM	1	3	0			0	3	1	0	1	4	0	13	0	0	0	0
8:25 AM	3	2	0			0	2	0	0	1	4	0	12	0	0	0	0
8:30 AM	3	3	0			0	5	0	0	0	2	0	13	0	0	0	0
8:35 AM	2	1	0			0	4	1	0	0	1	0	9	0	0	0	0
8:40 AM	0	2	0			0	4	1	0	1	3	0	11	0	0	0	0
8:45 AM	0	2	0			0	5	1	0	0	5	0	13	0	0	0	0
8:50 AM	0	1	0			0	2	2	0	1	2	0	8	0	0	0	0
8:55 AM	2	0	0			0	0	0	0	3	3	0	8	0	0	0	0
Total Survey	62	42	0			0	35	9	0	23	71	0	242	0	0	0	0

15-Minute Interval Summary

7:00 AM to 9:00 AM

Interval Start Time	Northbound Melissa Ave			Southbound Melissa Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total	Pedestrians Crosswalk			
	L	R	Bikes			Bikes	T	R	Bikes	L	T	Bikes		North	South	East	West
7:00 AM	11	10	0			0	1	0	0	5	9	0	36	0	0	0	0
7:15 AM	8	7	0			0	2	1	0	2	13	0	33	0	0	0	0
7:30 AM	8	5	0			0	3	0	0	4	10	0	30	0	0	0	0
7:45 AM	13	5	0			0	2	0	0	3	7	0	30	0	0	0	0
8:00 AM	10	1	0			0	1	1	0	1	5	0	19	0	0	0	0
8:15 AM	5	5	0			0	6	2	0	3	11	0	32	0	0	0	0
8:30 AM	5	6	0			0	13	2	0	1	6	0	33	0	0	0	0
8:45 AM	2	3	0			0	7	3	0	4	10	0	29	0	0	0	0
Total Survey	62	42	0			0	35	9	0	23	71	0	242	0	0	0	0

Peak Hour Summary

7:00 AM to 8:00 AM

By Approach	Northbound Melissa Ave			Southbound Melissa Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	67	15	82	0	0	0	0	0	9	79	88	0	53	35	88	0	129
%HV	1.5%				0.0%				22.2%				1.9%			3.1%	
PHF	0.80				0.00				0.56				0.78			0.79	

By Movement	Northbound Melissa Ave			Southbound Melissa Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Total				
	L	R	Total			Total	T	R	Total	L	T	Total					
Volume	40	27	67			0	8	1	9	14	39	53	129				
%HV	2.5%	NA	0.0%	1.5%	NA	NA	NA	0.0%	NA	12.5%	#####	22.2%	7.1%	0.0%	NA	1.9%	3.1%
PHF	0.77		0.68	0.80			0.00		0.67	0.25	0.56	0.70	0.75	0.78	0.79		

Rolling Hour Summary

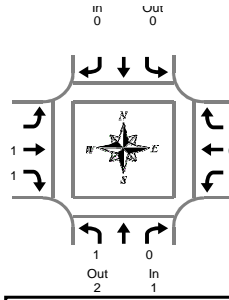
7:00 AM to 9:00 AM

Interval Start Time	Northbound Melissa Ave			Southbound Melissa Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total	Pedestrians Crosswalk			
	L	R	Bikes			Bikes	T	R	Bikes	L	T	Bikes		North	South	East	West
7:00 AM	40	27	0			0	8	1	0	14	39	0	129	0	0	0	0
7:15 AM	39	18	0			0	8	2	0	10	35	0	112	0	0	0	0
7:30 AM	36	16	0			0	12	3	0	11	33	0	111	0	0	0	0
7:45 AM	33	17	0			0	22	5	0	8	29	0	114	0	0	0	0
8:00 AM	22	15	0			0	27	8	0	9	32	0	113	0	0	0	0

Heavy Vehicle Summary



Clay Carney
(503) 833-2740



Melissa Ave & Dubarko Rd

Thursday, April 25, 2019
7:00 AM to 9:00 AM

Peak Hour Summary
7:00 AM to 8:00 AM

Heavy Vehicle 5-Minute Interval Summary 7:00 AM to 9:00 AM

Interval Start Time	Northbound Melissa Ave			Southbound Melissa Ave		Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total
	L	R	Total		Total	T	R	Total	L	T	Total	
7:00 AM	1	0	1		0	0	0	0	1	0	1	2
7:05 AM	0	0	0		0	0	0	0	0	0	0	0
7:10 AM	0	0	0		0	0	0	0	0	0	0	0
7:15 AM	0	0	0		0	0	0	0	0	0	0	0
7:20 AM	0	0	0		0	0	0	0	0	0	0	0
7:25 AM	0	0	0		0	0	1	1	0	0	0	1
7:30 AM	0	0	0		0	0	0	0	0	0	0	0
7:35 AM	0	0	0		0	0	0	0	0	0	0	0
7:40 AM	0	0	0		0	0	0	0	0	0	0	0
7:45 AM	0	0	0		0	0	0	0	0	0	0	0
7:50 AM	0	0	0		0	0	0	0	0	0	0	0
7:55 AM	0	0	0		0	0	1	1	0	0	0	1
8:00 AM	0	0	0		0	0	0	0	0	0	0	0
8:05 AM	0	0	0		0	0	0	0	0	0	0	0
8:10 AM	1	0	1		0	0	0	0	0	0	0	1
8:15 AM	1	0	1		0	0	0	0	1	0	1	2
8:20 AM	0	1	1		0	0	0	0	0	0	0	1
8:25 AM	0	0	0		0	0	0	0	0	0	0	0
8:30 AM	0	1	1		0	0	0	0	0	0	0	1
8:35 AM	0	0	0		0	0	0	0	0	0	0	0
8:40 AM	0	0	0		0	0	0	0	0	0	0	0
8:45 AM	0	0	0		0	0	0	0	0	0	0	0
8:50 AM	0	0	0		0	0	0	0	0	0	0	0
8:55 AM	0	0	0		0	0	0	0	0	0	0	0
Total Survey	3	2	5		0	1	1	2	2	0	2	9

Heavy Vehicle 15-Minute Interval Summary 7:00 AM to 9:00 AM

Interval Start Time	Northbound Melissa Ave			Southbound Melissa Ave		Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total
	L	R	Total		Total	T	R	Total	L	T	Total	
7:00 AM	1	0	1		0	0	0	0	1	0	1	2
7:15 AM	0	0	0		0	0	1	1	0	0	0	1
7:30 AM	0	0	0		0	0	0	0	0	0	0	0
7:45 AM	0	0	0		0	1	0	1	0	0	0	1
8:00 AM	1	0	1		0	0	0	0	0	0	0	1
8:15 AM	1	1	2		0	0	0	0	1	0	1	3
8:30 AM	0	1	1		0	0	0	0	0	0	0	1
8:45 AM	0	0	0		0	0	0	0	0	0	0	0
Total Survey	3	2	5		0	1	1	2	2	0	2	9

Heavy Vehicle Peak Hour Summary 7:00 AM to 8:00 AM

By Approach	Northbound Melissa Ave			Southbound Melissa Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	1	2	3	0	0	0	2	1	3	1	1	2	4
PHF	0.25			0.00			0.50			0.25			0.50

By Movement	Northbound Melissa Ave			Southbound Melissa Ave		Eastbound Dubarko Rd			Westbound Dubarko Rd			Total
	L	R	Total		Total	T	R	Total	L	T	Total	
Volume	1	0	1		0	1	1	2	1	0	1	4
PHF	0.25		0.25		0.00	0.25	0.25	0.50	0.25	0.00	0.25	0.50

Heavy Vehicle Rolling Hour Summary 7:00 AM to 9:00 AM

Interval Start Time	Northbound Melissa Ave			Southbound Melissa Ave		Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total
	L	R	Total		Total	T	R	Total	L	T	Total	
7:00 AM	1	0	1		0	1	1	2	1	0	1	4
7:15 AM	1	0	1		0	1	1	2	0	0	0	3
7:30 AM	2	1	3		0	1	0	1	1	0	1	5
7:45 AM	2	2	4		0	1	0	1	1	0	1	6
8:00 AM	2	2	4		0	0	0	0	1	0	1	5

Peak Hour Summary



Clay Carney
(503) 833-2740

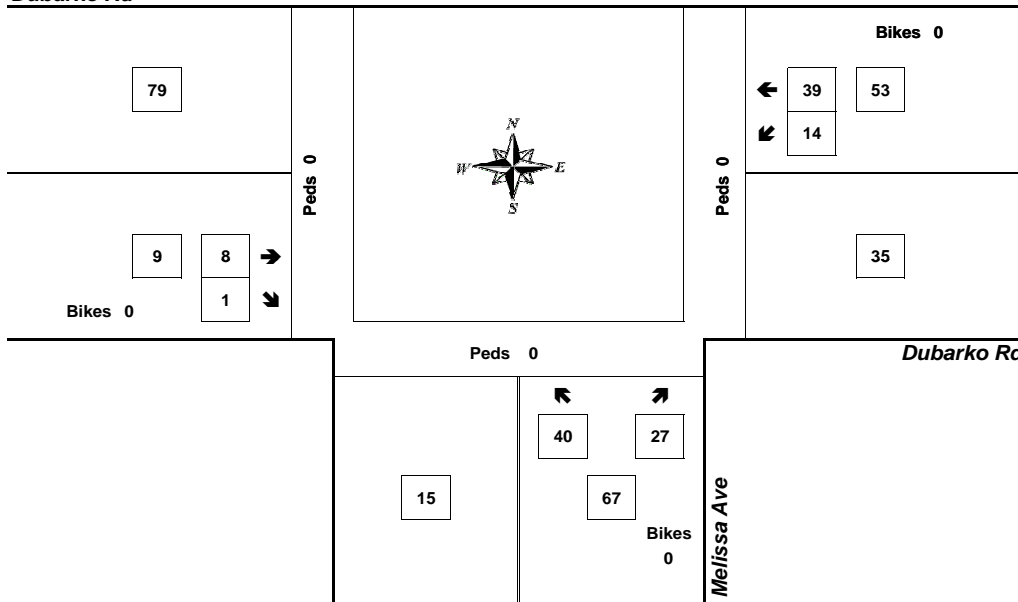
Melissa Ave & Dubarko Rd

7:00 AM to 8:00 AM
Thursday, April 25, 2019

Bikes
0

Dubarko Rd

Peds 0



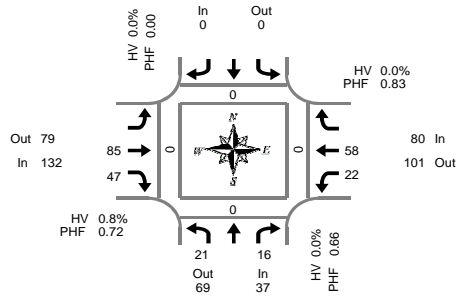
Approach	PHF	HV%	Volume
EB	0.56	22.2%	9
WB	0.78	1.9%	53
NB	0.80	1.5%	67
SB	0.00	0.0%	0
Intersection	0.79	3.1%	129

Count Period: 7:00 AM to 9:00 AM

Total Vehicle Summary



Clay Carney
(603) 833-2740



Melissa Ave & Dubarko Rd

Thursday, April 25, 2019
4:00 PM to 6:00 PM

Peak Hour Summary
4:40 PM to 5:40 PM

5-Minute Interval Summary

4:00 PM to 6:00 PM

Interval Start Time	Northbound Melissa Ave			Southbound Melissa Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total	Pedestrians Crosswalk			
	L	R	Bikes			Bikes	T	R	Bikes	L	T	Bikes		North	South	East	West
4:00 PM	1	3	0			0	12	4	0	3	6	0	29	0	0	0	0
4:05 PM	0	2	0			0	4	2	0	0	3	0	11	0	0	0	0
4:10 PM	4	2	0			0	3	2	0	0	7	0	18	0	0	0	1
4:15 PM	2	2	0			0	5	4	0	2	2	0	17	0	1	0	0
4:20 PM	2	2	0			0	7	1	0	0	1	0	13	0	0	0	0
4:25 PM	3	2	0			0	5	2	0	0	5	0	17	0	0	0	0
4:30 PM	0	1	0			0	7	4	0	2	4	0	18	0	0	0	0
4:35 PM	1	0	0			0	8	2	0	3	5	0	19	0	0	0	0
4:40 PM	1	2	0			0	5	7	0	5	6	0	26	0	0	0	0
4:45 PM	5	2	0			0	4	5	0	0	4	0	20	0	0	0	0
4:50 PM	2	1	0			0	7	8	0	3	6	0	27	0	0	0	0
4:55 PM	2	2	0			0	7	5	0	0	5	0	21	0	0	0	0
5:00 PM	0	0	0			0	14	5	0	1	1	0	21	0	0	0	0
5:05 PM	0	0	0			0	9	1	0	0	5	0	16	0	0	0	0
5:10 PM	2	1	0			0	5	3	0	3	7	0	21	0	0	0	0
5:15 PM	0	1	0			0	4	1	0	1	3	0	10	0	0	0	0
5:20 PM	3	3	0			0	10	4	0	3	4	0	27	0	0	0	0
5:25 PM	1	1	0			0	4	2	0	1	5	0	14	0	0	0	0
5:30 PM	2	1	0			0	7	3	0	3	7	0	23	0	0	0	0
5:35 PM	2	2	0			0	9	3	0	2	5	0	23	0	0	0	0
5:40 PM	3	0	0			0	3	6	0	0	1	0	13	0	0	0	0
5:45 PM	1	1	0			0	8	2	0	4	5	0	21	0	0	0	1
5:50 PM	3	0	0			0	5	2	0	0	5	0	15	0	0	0	0
5:55 PM	2	0	0			0	9	4	0	0	2	0	17	0	0	0	1
Total Survey	43	31	0			0	161	82	0	36	104	0	457	0	1	0	3

15-Minute Interval Summary

4:00 PM to 6:00 PM

Interval Start Time	Northbound Melissa Ave			Southbound Melissa Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total	Pedestrians Crosswalk			
	L	R	Bikes			Bikes	T	R	Bikes	L	T	Bikes		North	South	East	West
4:00 PM	5	7	0			0	19	8	0	3	16	0	58	0	0	0	1
4:15 PM	7	6	0			0	17	7	0	2	8	0	47	0	1	0	0
4:30 PM	2	3	0			0	20	13	0	10	15	0	63	0	0	0	0
4:45 PM	9	5	0			0	18	18	0	3	15	0	68	0	0	0	0
5:00 PM	3	1	0			0	28	9	0	4	13	0	58	0	0	0	0
5:15 PM	4	5	0			0	18	7	0	5	12	0	51	0	0	0	0
5:30 PM	7	3	0			0	19	12	0	5	13	0	59	0	0	0	0
5:45 PM	6	1	0			0	22	8	0	4	12	0	53	0	0	0	2
Total Survey	43	31	0			0	161	82	0	36	104	0	457	0	1	0	3

Peak Hour Summary

4:40 PM to 5:40 PM

By Approach	Northbound Melissa Ave				Southbound Melissa Ave				Eastbound Dubarko Rd				Westbound Dubarko Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	37	69	106	0	0	0	0	0	132	79	211	0	80	101	181	0	249	0	0	0	0
%HV	0.0%				0.0%				0.8%				0.0%				0.4%				
PHF	0.66				0.00				0.72				0.83				0.85				

By Movement	Northbound Melissa Ave				Southbound Melissa Ave				Eastbound Dubarko Rd				Westbound Dubarko Rd				Total
	L	R	Total	Bikes			Total	Bikes	T	R	Total	Bikes	L	T	Total	Bikes	
Volume	21	16	37	0			0	0	85	47	132	0	22	58	80	0	249
%HV	0.0%	NA	0.0%	0.0%	NA	NA	NA	0.0%	NA	1.2%	0.0%	0.8%	0.0%	0.0%	NA	0.0%	0.4%
PHF	0.58		0.80	0.66			0.00		0.71	0.59	0.72		0.69	0.85	0.83		0.85

Rolling Hour Summary

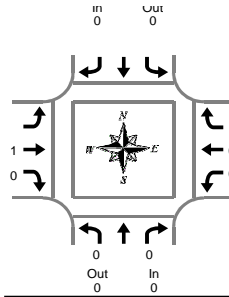
4:00 PM to 6:00 PM

Interval Start Time	Northbound Melissa Ave			Southbound Melissa Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total	Pedestrians Crosswalk			
	L	R	Bikes			Bikes	T	R	Bikes	L	T	Bikes		North	South	East	West
4:00 PM	23	21	0			0	74	46	0	18	54	0	236	0	1	0	1
4:15 PM	21	15	0			0	83	47	0	19	51	0	236	0	1	0	1
4:30 PM	18	14	0			0	84	47	0	22	55	0	240	0	0	0	0
4:45 PM	23	14	0			0	83	46	0	17	53	0	236	0	0	0	0
5:00 PM	20	10	0			0	87	36	0	18	50	0	221	0	0	0	2

Heavy Vehicle Summary



Clay Carney
(503) 833-2740



Peak Hour Summary
4:40 PM to 5:40 PM

Melissa Ave & Dubarko Rd

Thursday, April 25, 2019
4:00 PM to 6:00 PM

Heavy Vehicle 5-Minute Interval Summary

4:00 PM to 6:00 PM

Interval Start Time	Northbound Melissa Ave			Southbound Melissa Ave		Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total
	L	R	Total		Total	T	R	Total	L	T	Total	
4:00 PM	0	0	0		0	0	1	1	0	1	1	2
4:05 PM	0	0	0		0	0	0	0	0	1	1	1
4:10 PM	1	0	1		0	0	0	0	0	0	0	1
4:15 PM	0	0	0		0	0	0	0	0	0	0	0
4:20 PM	0	0	0		0	0	0	0	0	0	0	0
4:25 PM	0	0	0		0	0	0	0	0	0	0	0
4:30 PM	0	0	0		0	0	0	0	0	0	0	0
4:35 PM	0	0	0		0	0	0	0	0	0	0	0
4:40 PM	0	0	0		0	0	0	0	0	0	0	0
4:45 PM	0	0	0		0	0	0	0	0	0	0	0
4:50 PM	0	0	0		0	0	0	0	0	0	0	0
4:55 PM	0	0	0		0	0	0	0	0	0	0	0
5:00 PM	0	0	0		0	0	0	0	0	0	0	0
5:05 PM	0	0	0		0	0	0	0	0	0	0	0
5:10 PM	0	0	0		0	0	0	0	0	0	0	0
5:15 PM	0	0	0		0	1	0	1	0	0	0	1
5:20 PM	0	0	0		0	0	0	0	0	0	0	0
5:25 PM	0	0	0		0	0	0	0	0	0	0	0
5:30 PM	0	0	0		0	0	0	0	0	0	0	0
5:35 PM	0	0	0		0	0	0	0	0	0	0	0
5:40 PM	0	0	0		0	0	0	0	0	0	0	0
5:45 PM	0	0	0		0	0	0	0	0	0	0	0
5:50 PM	0	0	0		0	0	0	0	0	0	0	0
5:55 PM	0	0	0		0	0	0	0	0	0	0	0
Total Survey	1	0	1		0	1	1	2	0	2	2	5

Heavy Vehicle 15-Minute Interval Summary

4:00 PM to 6:00 PM

Interval Start Time	Northbound Melissa Ave			Southbound Melissa Ave		Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total
	L	R	Total		Total	T	R	Total	L	T	Total	
4:00 PM	1	0	1		0	0	1	1	0	2	2	4
4:15 PM	0	0	0		0	0	0	0	0	0	0	0
4:30 PM	0	0	0		0	0	0	0	0	0	0	0
4:45 PM	0	0	0		0	0	0	0	0	0	0	0
5:00 PM	0	0	0		0	0	0	0	0	0	0	0
5:15 PM	0	0	0		0	1	0	1	0	0	0	1
5:30 PM	0	0	0		0	0	0	0	0	0	0	0
5:45 PM	0	0	0		0	0	0	0	0	0	0	0
Total Survey	1	0	1		0	1	1	2	0	2	2	5

Heavy Vehicle Peak Hour Summary

4:40 PM to 5:40 PM

By Approach	Northbound Melissa Ave			Southbound Melissa Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	0	0	0	0	0	0	1	0	1	0	1	1	1
PHF	0.00			0.00			0.25			0.00			0.25

By Movement	Northbound Melissa Ave			Southbound Melissa Ave		Eastbound Dubarko Rd			Westbound Dubarko Rd			Total
	L	R	Total		Total	T	R	Total	L	T	Total	
Volume	0	0	0		0	1	0	1	0	0	0	1
PHF	0.00	0.00	0.00		0.00	0.25	0.00	0.25	0.00	0.00	0.00	0.25

Heavy Vehicle Rolling Hour Summary

4:00 PM to 6:00 PM

Interval Start Time	Northbound Melissa Ave			Southbound Melissa Ave		Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total
	L	R	Total		Total	T	R	Total	L	T	Total	
4:00 PM	1	0	1		0	0	1	1	0	2	2	4
4:15 PM	0	0	0		0	0	0	0	0	0	0	0
4:30 PM	0	0	0		0	1	0	1	0	0	0	1
4:45 PM	0	0	0		0	1	0	1	0	0	0	1
5:00 PM	0	0	0		0	1	0	1	0	0	0	1

Peak Hour Summary



Clay Carney
(503) 833-2740

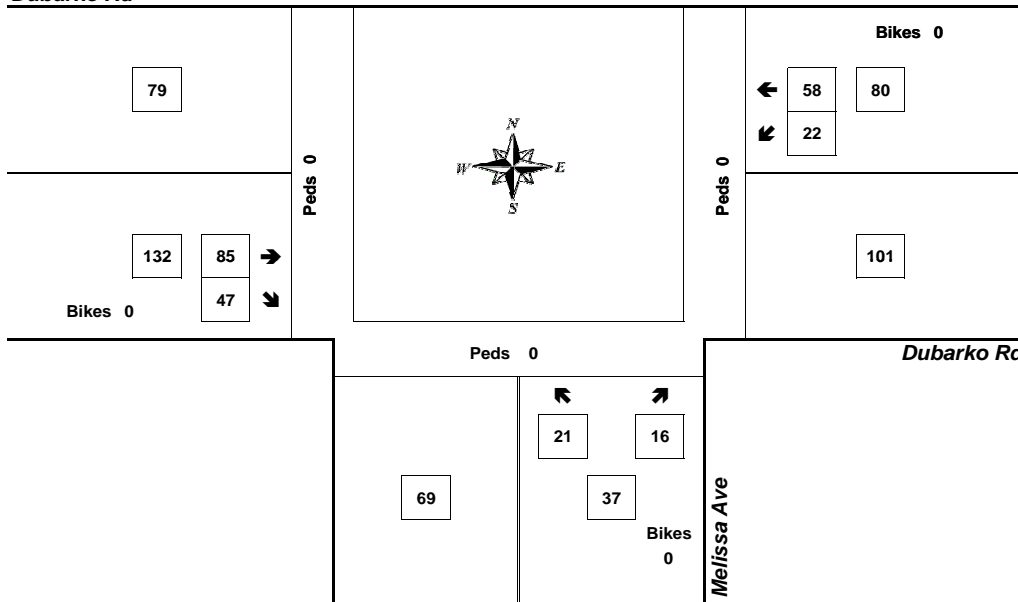
Melissa Ave & Dubarko Rd

4:40 PM to 5:40 PM
Thursday, April 25, 2019

Bikes
0

Dubarko Rd

Peds 0



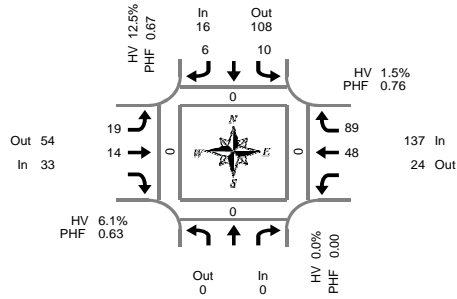
Approach	PHF	HV%	Volume
EB	0.72	0.8%	132
WB	0.83	0.0%	80
NB	0.66	0.0%	37
SB	0.00	0.0%	0
Intersection	0.85	0.4%	249

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary



Clay Carney
(503) 833-2740



Ruben Ln & Dubarko Rd

Thursday, May 23, 2019
7:00 AM to 9:00 AM

Peak Hour Summary
7:05 AM to 8:05 AM

5-Minute Interval Summary

7:00 AM to 9:00 AM

Interval Start Time	Northbound Ruben Ln				Southbound Ruben Ln				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	L	T	Total	Bikes	T	R	Total	Bikes		North	South	East	West
7:00 AM					0	2	0	0	1	0			4	8	0	15	0	0	1	0	
7:05 AM					0	0	0	0	0	1			5	9	0	15	0	0	0	0	
7:10 AM					0	1	0	0	1	2			4	8	0	16	0	0	0	0	
7:15 AM					0	1	0	0	1	0			7	12	0	21	0	0	0	0	
7:20 AM					0	3	0	0	2	1			3	6	0	15	0	0	0	0	
7:25 AM					0	0	1	0	2	1			4	6	0	14	0	0	0	0	
7:30 AM					0	0	0	0	0	1			2	8	0	11	0	0	0	0	
7:35 AM					0	1	4	0	3	3			2	5	0	18	0	0	0	0	
7:40 AM					0	0	0	0	1	1			3	8	0	13	0	0	0	0	
7:45 AM					0	0	0	0	4	1			4	4	0	13	0	0	0	0	
7:50 AM					0	1	0	0	2	2			4	9	0	18	0	0	0	0	
7:55 AM					0	1	0	0	1	0			4	10	0	16	0	0	0	0	
8:00 AM					0	2	1	0	2	1			6	4	0	16	0	0	0	0	
8:05 AM					0	2	1	0	1	2			0	5	0	11	0	0	0	0	
8:10 AM					0	3	0	0	2	0			1	3	0	9	0	0	0	0	
8:15 AM					0	0	0	0	3	4			4	2	0	13	0	0	0	0	
8:20 AM					0	0	0	0	0	2			5	8	0	15	0	0	0	0	
8:25 AM					0	0	0	0	3	2			2	5	0	12	0	0	0	0	
8:30 AM					0	2	0	0	0	4			3	5	0	14	0	0	0	0	
8:35 AM					0	1	1	0	2	1			1	4	0	10	0	0	0	0	
8:40 AM					0	2	0	0	1	2			3	5	0	13	0	0	0	0	
8:45 AM					0	3	2	0	2	2			2	4	0	15	0	0	0	0	
8:50 AM					0	1	0	0	4	3			3	5	0	16	0	0	0	0	
8:55 AM					0	2	1	0	1	3			2	5	0	14	0	0	0	0	
Total Survey					0	28	11	0	39	39			78	148	0	343	0	0	1	0	

15-Minute Interval Summary

7:00 AM to 9:00 AM

Interval Start Time	Northbound Ruben Ln				Southbound Ruben Ln				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	L	T	Total	Bikes	T	R	Total	Bikes		North	South	East	West
7:00 AM					0	3	0	0	2	3			13	25	0	46	0	0	1	0	
7:15 AM					0	4	1	0	5	2			14	24	0	50	0	0	0	0	
7:30 AM					0	1	4	0	4	5			7	21	0	42	0	0	0	0	
7:45 AM					0	2	0	0	7	3			12	23	0	47	0	0	0	0	
8:00 AM					0	7	2	0	5	3			7	12	0	36	0	0	0	0	
8:15 AM					0	0	0	0	6	8			11	15	0	40	0	0	0	0	
8:30 AM					0	5	1	0	3	7			7	14	0	37	0	0	0	0	
8:45 AM					0	6	3	0	7	8			7	14	0	45	0	0	0	0	
Total Survey					0	28	11	0	39	39			78	148	0	343	0	0	1	0	

Peak Hour Summary

7:05 AM to 8:05 AM

By Approach	Northbound Ruben Ln				Southbound Ruben Ln				Eastbound Dubarko Rd				Westbound Dubarko Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	0	0	0	0	16	108	124	0	33	54	87	0	137	24	161	0	186	0	0	0	0
%HV					0.0%	12.5%			6.1%				1.5%				3.2%				
PHF					0.00	0.67			0.63				0.76				0.89				

By Movement	Northbound Ruben Ln				Southbound Ruben Ln				Eastbound Dubarko Rd				Westbound Dubarko Rd				Total	
					L	R	Total	Bikes	L	T	Total	Bikes	T	R	Total	Bikes		
Volume					0	10	6	16	19	14	33		48	89	137			
%HV	NA	NA	NA		0.0%	20.0%	NA	0.0%	12.5%	0.0%	14.3%	NA	6.1%	NA	2.1%	1.1%	1.5%	3.2%
PHF					0.00	0.50	0.30	0.67	0.59	0.70	0.63		0.75	0.77	0.76		0.89	

Rolling Hour Summary

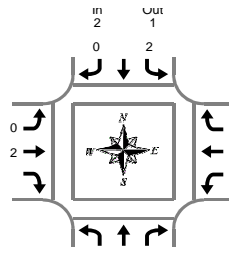
7:00 AM to 9:00 AM

Interval Start Time	Northbound Ruben Ln				Southbound Ruben Ln				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	L	T	Total	Bikes	T	R	Total	Bikes		North	South	East	West
7:00 AM					0	10	5	0	18	13			46	93	0	185	0	0	1	0	
7:15 AM					0	14	7	0	21	13			40	80	0	175	0	0	0	0	
7:30 AM					0	10	6	0	22	19			37	71	0	165	0	0	0	0	
7:45 AM					0	14	3	0	21	21			37	64	0	160	0	0	0	0	
8:00 AM					0	18	6	0	21	26			32	55	0	158	0	0	0	0	

Heavy Vehicle Summary



Clay Carney
(503) 833-2740



Ruben Ln & Dubarko Rd

Thursday, May 23, 2019
7:00 AM to 9:00 AM

Peak Hour Summary
7:05 AM to 8:05 AM

Heavy Vehicle 5-Minute Interval Summary 7:00 AM to 9:00 AM

Interval Start Time	Northbound Ruben Ln			Southbound Ruben Ln			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total
	In	Out	Total	L	R	Total	L	T	Total	T	R	Total	
7:00 AM	0	0	0	0	0	0	0	0	0	0	1	1	1
7:05 AM	0	0	0	0	0	0	0	0	0	0	1	1	1
7:10 AM	0	1	1	0	1	1	0	0	0	0	0	0	1
7:15 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
7:20 AM	0	1	1	0	1	1	0	0	0	0	0	0	1
7:25 AM	0	0	0	0	0	0	0	1	1	0	0	0	1
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:35 AM	0	0	0	0	0	0	0	1	1	0	0	0	1
7:40 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:50 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:55 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:05 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:10 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	1	1	1	1
8:20 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:25 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:35 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:40 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:50 AM	0	0	0	0	0	0	0	0	0	1	1	1	1
8:55 AM	0	0	0	0	0	0	0	0	0	0	1	1	1
Total Survey			0	2	0	2	0	2	2	2	4	6	10

Heavy Vehicle 15-Minute Interval Summary 7:00 AM to 9:00 AM

Interval Start Time	Northbound Ruben Ln			Southbound Ruben Ln			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total
	In	Out	Total	L	R	Total	L	T	Total	T	R	Total	
7:00 AM	0	1	1	0	1	1	0	0	0	0	2	2	3
7:15 AM	0	1	1	0	1	1	0	1	1	1	0	1	3
7:30 AM	0	0	0	0	0	0	0	1	1	0	0	0	1
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	1	1	1
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	1	1	2	2
Total Survey			0	2	0	2	0	2	2	2	4	6	10

Heavy Vehicle Peak Hour Summary 7:05 AM to 8:05 AM

By Approach	Northbound Ruben Ln			Southbound Ruben Ln			Eastbound Dubarko Rd			Westbound Dubarko Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	0	0	0	2	1	3	2	1	3	2	4	6	6
PHF	0.00			0.25			0.25			0.25			0.50

By Movement	Northbound Ruben Ln			Southbound Ruben Ln			Eastbound Dubarko Rd			Westbound Dubarko Rd			Total
	In	Out	Total	L	R	Total	L	T	Total	T	R	Total	
Volume	0	2	2	0	2	2	0	2	2	1	1	2	6
PHF	0.00	0.25	0.25	0.00	0.25	0.25	0.00	0.25	0.25	0.25	0.25	0.25	0.50

Heavy Vehicle Rolling Hour Summary 7:00 AM to 9:00 AM

Interval Start Time	Northbound Ruben Ln			Southbound Ruben Ln			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total
	In	Out	Total	L	R	Total	L	T	Total	T	R	Total	
7:00 AM	0	2	2	0	2	2	0	2	2	1	2	3	7
7:15 AM	0	1	1	0	1	1	0	2	2	1	0	1	4
7:30 AM	0	0	0	0	0	0	0	1	1	0	1	1	2
7:45 AM	0	0	0	0	0	0	0	0	0	0	1	1	1
8:00 AM	0	0	0	0	0	0	0	0	0	1	2	3	3

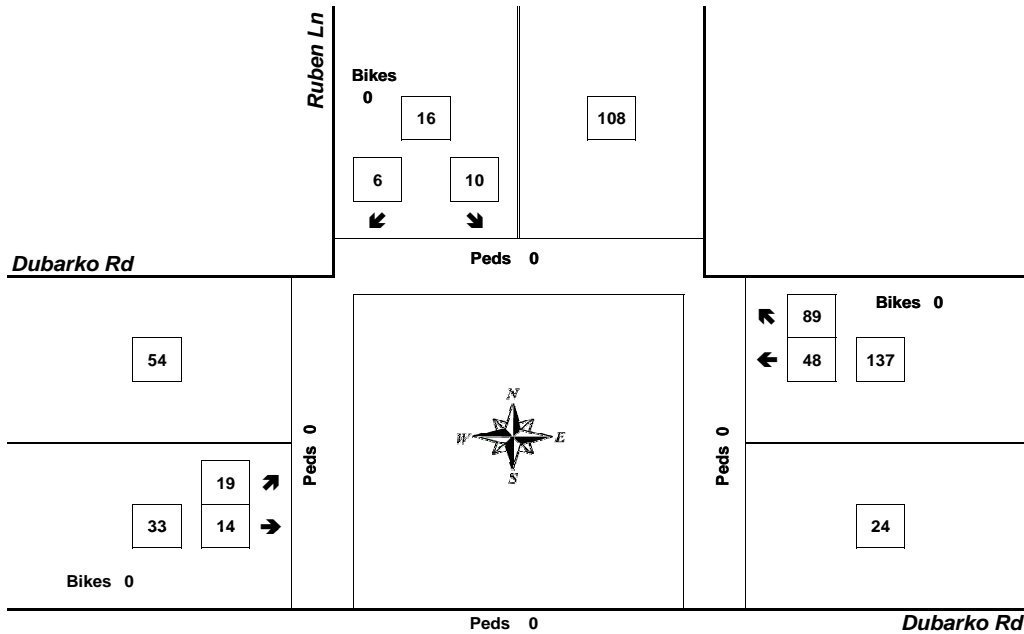
Peak Hour Summary



Clay Carney
(503) 833-2740

Ruben Ln & Dubarko Rd

7:05 AM to 8:05 AM
Thursday, May 23, 2019



Bikes
0

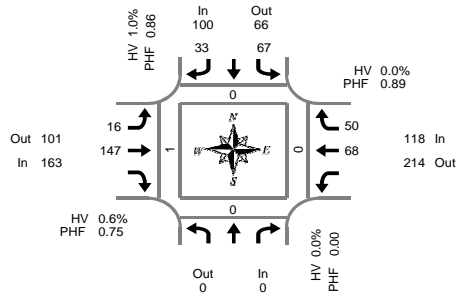
Approach	PHF	HV%	Volume
EB	0.63	6.1%	33
WB	0.76	1.5%	137
NB	0.00	0.0%	0
SB	0.67	12.5%	16
Intersection	0.89	3.2%	186

Count Period: 7:00 AM to 9:00 AM

Total Vehicle Summary



Clay Carney
(503) 833-2740



Peak Hour Summary
4:25 PM to 5:25 PM

Ruben Ln & Dubarko Rd

Wednesday, May 22, 2019
4:00 PM to 6:00 PM

5-Minute Interval Summary

4:00 PM to 6:00 PM

Interval Start Time	Northbound Ruben Ln				Southbound Ruben Ln				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total	Pedestrians Crosswalk			
	Bikes	L	R	Total	Bikes	L	R	Total	Bikes	L	T	Total	Bikes	T	R	Total		North	South	East	West
4:00 PM	0	3	1	0	1	0	1	6	0	0	0	0	6	2	0	19	0	0	0	0	
4:05 PM	0	5	0	0	1	7	0	0	3	4	0	20	0	0	0	0	0	0	0	0	
4:10 PM	0	8	2	0	1	11	0	0	5	4	0	31	0	0	0	1	0	0	0	1	
4:15 PM	0	10	2	0	1	4	0	0	4	4	0	25	0	0	0	0	0	0	0	0	
4:20 PM	0	9	0	0	0	13	0	0	4	2	0	28	0	0	0	0	0	0	0	0	
4:25 PM	0	5	3	0	1	16	0	0	5	5	0	35	0	0	0	0	0	0	0	0	
4:30 PM	0	6	2	0	0	15	0	0	7	6	0	36	0	0	0	1	0	0	0	1	
4:35 PM	0	3	2	0	0	5	0	0	4	3	0	17	0	0	0	0	0	0	0	0	
4:40 PM	0	5	5	0	2	13	0	0	7	6	0	38	0	0	0	0	0	0	0	0	
4:45 PM	0	6	4	0	3	6	0	0	2	1	0	22	0	0	0	0	0	0	0	0	
4:50 PM	0	5	1	0	1	7	0	0	7	5	0	26	0	0	0	0	0	0	0	0	
4:55 PM	0	5	4	0	0	9	0	0	9	3	0	30	0	0	0	0	0	0	0	0	
5:00 PM	0	8	2	0	0	16	0	0	3	5	0	34	0	0	0	0	0	0	0	0	
5:05 PM	0	7	3	0	2	17	0	0	7	4	0	40	0	0	0	0	0	0	0	0	
5:10 PM	0	6	1	0	3	16	0	0	2	3	0	31	0	0	0	0	0	0	0	0	
5:15 PM	0	6	3	0	1	13	0	0	8	5	0	36	0	0	0	0	0	0	0	0	
5:20 PM	0	5	3	0	3	14	0	0	7	4	0	36	0	0	0	0	0	0	0	0	
5:25 PM	0	4	5	0	1	10	0	0	2	1	0	23	1	0	0	0	0	0	0	0	
5:30 PM	0	2	2	0	1	14	0	0	7	4	0	30	0	0	0	0	0	0	0	0	
5:35 PM	0	6	1	0	0	6	0	0	4	3	0	20	0	0	0	0	0	0	0	0	
5:40 PM	0	3	2	0	0	7	0	0	6	11	0	29	0	0	0	0	0	0	0	0	
5:45 PM	0	8	1	0	0	13	0	0	7	2	0	31	0	0	0	0	0	0	0	0	
5:50 PM	0	6	3	0	2	12	0	0	5	3	0	31	0	0	0	0	0	0	0	0	
5:55 PM	0	5	0	0	2	19	0	0	3	2	0	31	1	0	0	0	0	0	0	0	
Total Survey	0	136	52	0	26	269	0	0	124	92	0	699	2	0	0	2	0	0	0	2	

15-Minute Interval Summary

4:00 PM to 6:00 PM

Interval Start Time	Northbound Ruben Ln				Southbound Ruben Ln				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total	Pedestrians Crosswalk			
	Bikes	L	R	Total	Bikes	L	T	Total	Bikes	L	T	Total	Bikes	T	R	Total		North	South	East	West
4:00 PM	0	16	3	0	3	24	0	0	14	10	0	70	0	0	0	1	0	0	0	0	
4:15 PM	0	24	5	0	2	33	0	0	13	11	0	88	0	0	0	0	0	0	0	0	
4:30 PM	0	14	9	0	2	33	0	0	18	15	0	91	0	0	0	1	0	0	0	1	
4:45 PM	0	16	9	0	4	22	0	0	18	9	0	78	0	0	0	0	0	0	0	0	
5:00 PM	0	21	6	0	5	49	0	0	12	12	0	105	0	0	0	0	0	0	0	0	
5:15 PM	0	15	11	0	5	37	0	0	17	10	0	95	1	0	0	0	0	0	0	0	
5:30 PM	0	11	5	0	1	27	0	0	17	18	0	79	0	0	0	0	0	0	0	0	
5:45 PM	0	19	4	0	4	44	0	0	15	7	0	93	1	0	0	0	0	0	0	0	
Total Survey	0	136	52	0	26	269	0	0	124	92	0	699	2	0	0	2	0	0	0	2	

Peak Hour Summary

4:25 PM to 5:25 PM

By Approach	Northbound Ruben Ln				Southbound Ruben Ln				Eastbound Dubarko Rd				Westbound Dubarko Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	0	0	0	0	100	66	166	0	163	101	264	0	118	214	332	0	381	0	0	0	1
%HV	0.0%				1.0%				0.6%				0.0%				0.5%				
PHF	0.00				0.86				0.75				0.89				0.89				

By Movement	Northbound Ruben Ln				Southbound Ruben Ln				Eastbound Dubarko Rd				Westbound Dubarko Rd				Total
				Total	L	R	Total	L	T	Total	T	R	Total				
Volume	0	67	33	100	16	147	163	68	50	118	381						
%HV	NA	NA	NA	0.0%	0.0%	NA	3.0%	1.0%	6.3%	0.0%	NA	0.6%	NA	0.0%	0.0%	0.0%	0.5%
PHF				0.00	0.80	0.75	0.86	0.57	0.75	0.75	0.75	0.89	0.83	0.89	0.89		

Rolling Hour Summary

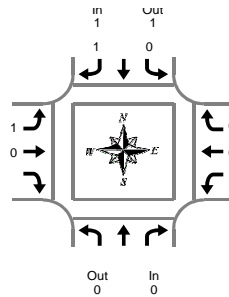
4:00 PM to 6:00 PM

Interval Start Time	Northbound Ruben Ln				Southbound Ruben Ln				Eastbound Dubarko Rd				Westbound Dubarko Rd				Interval Total	Pedestrians Crosswalk			
	Bikes	L	R	Total	Bikes	L	T	Total	Bikes	L	T	Total	Bikes	T	R	Total		North	South	East	West
4:00 PM	0	70	26	0	11	112	0	0	63	45	0	327	0	0	0	2	0	0	0	2	
4:15 PM	0	75	29	0	13	137	0	0	61	47	0	362	0	0	0	1	0	0	0	1	
4:30 PM	0	66	35	0	16	141	0	0	65	46	0	369	1	0	0	0	0	0	0	0	
4:45 PM	0	63	31	0	15	135	0	0	64	49	0	357	1	0	0	0	0	0	0	0	
5:00 PM	0	66	26	0	15	157	0	0	61	47	0	372	2	0	0	0	0	0	0	0	

Heavy Vehicle Summary



Clay Carney
(503) 833-2740



Ruben Ln & Dubarko Rd

Wednesday, May 22, 2019
4:00 PM to 6:00 PM

Peak Hour Summary
4:25 PM to 5:25 PM

Heavy Vehicle 5-Minute Interval Summary 4:00 PM to 6:00 PM

Interval Start Time	Northbound Ruben Ln			Southbound Ruben Ln			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total
	In	Out	Total	L	R	Total	L	T	Total	T	R	Total	
4:00 PM	0	0	0	1	1	0	0	0	0	0	0	0	1
4:05 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:10 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	1	0	1	0	0	0	0	0	0	0	0	1
4:20 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:25 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:35 PM	0	0	0	1	1	0	0	0	0	0	0	0	1
4:40 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:50 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
4:55 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:05 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:10 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:20 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:25 PM	0	0	0	0	0	0	1	1	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:35 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:40 PM	0	0	0	0	0	0	0	0	0	1	1	1	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:50 PM	0	0	0	0	0	0	2	2	0	0	0	0	2
5:55 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	0	1	1	2	3	1	3	4	0	1	1	1	8

Heavy Vehicle 15-Minute Interval Summary 4:00 PM to 6:00 PM

Interval Start Time	Northbound Ruben Ln			Southbound Ruben Ln			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total
	In	Out	Total	L	R	Total	L	T	Total	T	R	Total	
4:00 PM	0	0	0	1	1	0	0	0	0	0	0	0	1
4:15 PM	0	1	0	1	0	0	0	0	0	0	0	0	1
4:30 PM	0	0	0	1	1	0	0	0	0	0	0	0	1
4:45 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	1	1	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	1	1	1	1
5:45 PM	0	0	0	0	0	0	2	2	0	0	0	0	2
Total Survey	0	1	1	2	3	1	3	4	0	1	1	1	8

Heavy Vehicle Peak Hour Summary 4:25 PM to 5:25 PM

By Approach	Northbound Ruben Ln			Southbound Ruben Ln			Eastbound Dubarko Rd			Westbound Dubarko Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	0	0	0	1	1	2	1	1	2	0	0	0	2
PHF	0.00			0.25			0.25			0.00			0.50

By Movement	Northbound Ruben Ln			Southbound Ruben Ln			Eastbound Dubarko Rd			Westbound Dubarko Rd			Total
	In	Out	Total	L	R	Total	L	T	Total	T	R	Total	
Volume	0	0	0	1	1	2	1	0	1	0	0	0	2
PHF	0.00	0.00		0.25	0.25		0.25	0.00		0.25	0.00	0.00	0.50

Heavy Vehicle Rolling Hour Summary 4:00 PM to 6:00 PM

Interval Start Time	Northbound Ruben Ln			Southbound Ruben Ln			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total
	In	Out	Total	L	R	Total	L	T	Total	T	R	Total	
4:00 PM	0	0	0	2	3	1	0	0	1	0	0	0	4
4:15 PM	0	1	0	1	2	1	0	0	1	0	0	0	3
4:30 PM	0	0	0	1	1	1	1	1	2	0	0	0	3
4:45 PM	0	0	0	0	0	1	1	1	2	0	1	1	3
5:00 PM	0	0	0	0	0	0	3	3	3	0	1	1	4

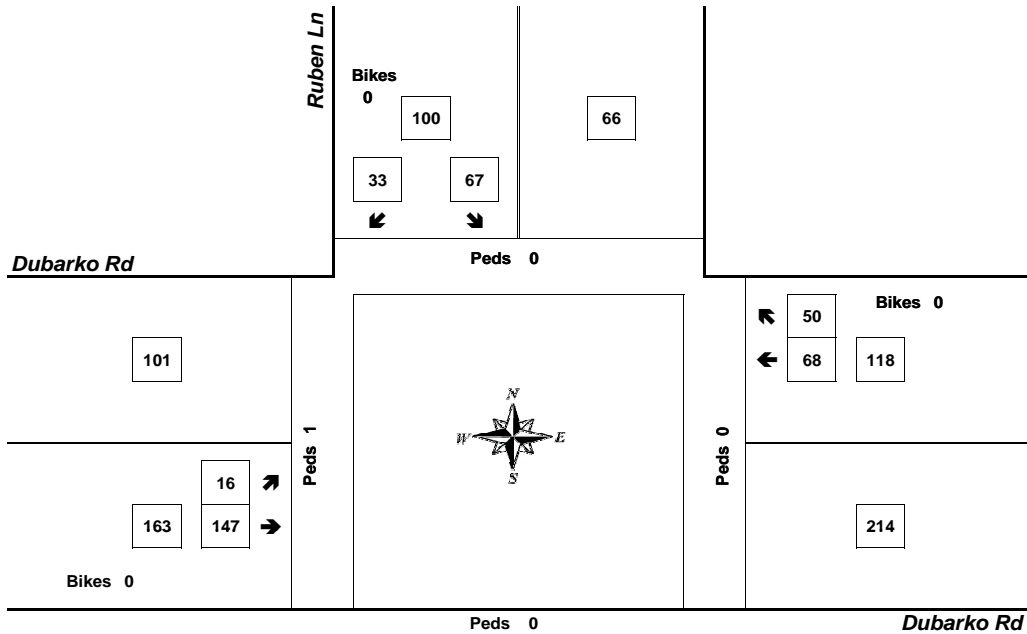
Peak Hour Summary



Clay Carney
(503) 833-2740

Ruben Ln & Dubarko Rd

4:25 PM to 5:25 PM
Wednesday, May 22, 2019



Bikes
0

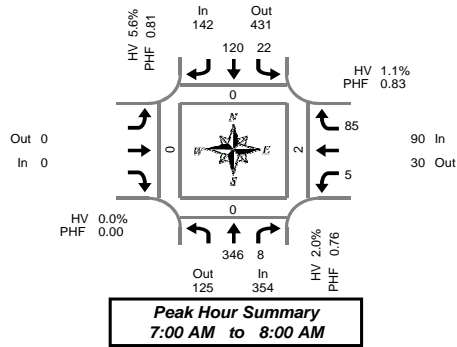
Approach	PHF	HV%	Volume
EB	0.75	0.6%	163
WB	0.89	0.0%	118
NB	0.00	0.0%	0
SB	0.86	1.0%	100
Intersection	0.89	0.5%	381

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary



Clay Carney
(603) 833-2740



SE 362nd Ave & Dubarko Rd

Thursday, May 23, 2019
7:00 AM to 9:00 AM

5-Minute Interval Summary 7:00 AM to 9:00 AM

Interval Start Time	Northbound SE 362nd Ave			Southbound SE 362nd Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total	Pedestrians Crosswalk			
	T	R	Bikes	L	T	Bikes		Bikes	L	R	Bikes	North		South	East	West	
7:00 AM	33	0	0	0	10	0		0	1	11	0	55	0	0	0	0	
7:05 AM	50	1	0	1	7	0		0	0	8	0	67	0	0	0	0	
7:10 AM	32	0	0	3	9	0		0	1	6	0	51	0	0	0	0	
7:15 AM	34	0	0	3	6	0		0	0	9	0	52	0	0	1	0	
7:20 AM	32	1	0	4	13	0		0	0	6	0	56	0	0	0	0	
7:25 AM	25	1	0	1	12	0		0	0	9	0	48	0	0	1	0	
7:30 AM	21	0	0	2	12	0		0	1	7	0	43	0	0	0	0	
7:35 AM	24	1	0	4	8	0		0	0	7	0	44	0	0	0	0	
7:40 AM	34	0	0	1	8	0		0	2	4	0	49	0	0	0	0	
7:45 AM	26	2	0	1	17	0		0	0	5	0	51	0	0	0	0	
7:50 AM	17	2	0	2	11	0		0	0	10	0	42	0	0	0	0	
7:55 AM	18	0	0	0	7	0		0	0	3	0	28	0	0	0	0	
8:00 AM	26	0	0	4	7	0		0	1	8	0	46	0	0	0	0	
8:05 AM	27	2	0	2	15	0		0	1	4	0	51	0	0	1	0	
8:10 AM	33	0	0	1	6	0		0	1	0	0	41	0	0	0	0	
8:15 AM	24	2	0	4	16	0		0	0	3	0	49	0	0	0	0	
8:20 AM	29	0	0	4	6	0		0	1	6	0	46	0	0	0	0	
8:25 AM	33	1	0	3	7	0		0	0	4	0	48	0	0	0	0	
8:30 AM	21	2	0	3	11	0		0	0	6	0	43	0	0	0	0	
8:35 AM	24	2	0	2	15	0		0	0	6	0	49	0	0	0	0	
8:40 AM	21	2	0	1	12	0		0	1	2	0	39	0	0	0	0	
8:45 AM	21	2	0	5	16	0		0	1	7	0	52	0	0	0	0	
8:50 AM	26	2	0	5	16	0		0	0	3	0	52	0	0	0	0	
8:55 AM	16	1	0	1	18	0		0	1	5	0	42	0	0	0	0	
Total Survey	647	24	0	57	265	0		0	12	139	0	1,144	0	0	3	0	

15-Minute Interval Summary 7:00 AM to 9:00 AM

Interval Start Time	Northbound SE 362nd Ave			Southbound SE 362nd Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total	Pedestrians Crosswalk			
	T	R	Bikes	L	T	Bikes		Bikes	L	R	Bikes	North		South	East	West	
7:00 AM	115	1	0	4	26	0		0	2	25	0	173	0	0	0	0	
7:15 AM	91	2	0	8	31	0		0	0	24	0	156	0	0	2	0	
7:30 AM	79	1	0	7	28	0		0	3	18	0	136	0	0	0	0	
7:45 AM	61	4	0	3	35	0		0	0	18	0	121	0	0	0	0	
8:00 AM	86	2	0	7	28	0		0	3	12	0	138	0	0	1	0	
8:15 AM	86	3	0	11	29	0		0	1	13	0	143	0	0	0	0	
8:30 AM	66	6	0	6	38	0		0	1	14	0	131	0	0	0	0	
8:45 AM	63	5	0	11	50	0		0	2	15	0	146	0	0	0	0	
Total Survey	647	24	0	57	265	0		0	12	139	0	1,144	0	0	3	0	

Peak Hour Summary 7:00 AM to 8:00 AM

By Approach	Northbound SE 362nd Ave				Southbound SE 362nd Ave				Eastbound Dubarko Rd				Westbound Dubarko Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	354	125	479	0	142	431	573	0	0	0	0	0	90	30	120	0	586	0	0	2	0
%HV	2.0%				5.6%				0.0%				1.1%				2.7%				
PHF	0.76				0.81				0.00				0.83				0.85				

By Movement	Northbound SE 362nd Ave			Southbound SE 362nd Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Total
	T	R	Total	L	T	Total		Total	L	R	Total		
Volume	346	8	354	22	120	142		0	5	85	90	586	
%HV	NA	2.0%	0.0%	2.0%	13.6%	4.2%	NA	5.6%	NA	NA	NA	2.7%	
PHF	0.75	0.50	0.76	0.55	0.81	0.81		0.00	0.42	0.85	0.83	0.85	

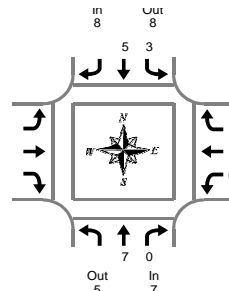
Rolling Hour Summary 7:00 AM to 9:00 AM

Interval Start Time	Northbound SE 362nd Ave			Southbound SE 362nd Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total	Pedestrians Crosswalk			
	T	R	Bikes	L	T	Bikes		Bikes	L	R	Bikes	North		South	East	West	
7:00 AM	346	8	0	22	120	0		0	5	85	0	586	0	0	2	0	
7:15 AM	317	9	0	25	122	0		0	6	72	0	551	0	0	3	0	
7:30 AM	312	10	0	28	120	0		0	7	61	0	538	0	0	1	0	
7:45 AM	299	15	0	27	130	0		0	5	57	0	533	0	0	1	0	
8:00 AM	301	16	0	35	145	0		0	7	54	0	558	0	0	1	0	

Heavy Vehicle Summary



Clay Carney
(503) 833-2740



Out 0
In 0

**Peak Hour Summary
7:00 AM to 8:00 AM**

SE 362nd Ave & Dubarko Rd

Thursday, May 23, 2019
7:00 AM to 9:00 AM

Heavy Vehicle 5-Minute Interval Summary 7:00 AM to 9:00 AM

Interval Start Time	Northbound SE 362nd Ave			Southbound SE 362nd Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total
	T	R	Total	L	T	Total	Total	L	R	Total			
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	
7:05 AM	2	0	2	0	0	0	0	0	0	0	0	2	
7:10 AM	1	0	1	0	0	0	0	0	0	0	0	1	
7:15 AM	1	0	1	0	0	0	0	0	0	0	0	1	
7:20 AM	1	0	1	1	0	1	1	0	0	1	1	3	
7:25 AM	0	0	0	0	0	0	0	0	0	0	0	0	
7:30 AM	0	0	0	1	2	3	0	0	0	0	0	3	
7:35 AM	1	0	1	1	0	1	0	0	0	0	0	2	
7:40 AM	0	0	0	0	0	0	0	0	0	0	0	0	
7:45 AM	1	0	1	0	2	2	0	0	0	0	0	3	
7:50 AM	0	0	0	0	1	1	0	0	0	0	0	1	
7:55 AM	0	0	0	0	0	0	0	0	0	0	0	0	
8:00 AM	0	0	0	0	1	1	0	0	0	0	0	1	
8:05 AM	1	0	1	0	0	0	0	0	0	0	0	1	
8:10 AM	0	0	0	0	0	0	0	0	0	0	0	0	
8:15 AM	3	1	4	0	1	1	0	0	0	0	0	5	
8:20 AM	0	0	0	0	0	0	0	0	0	0	0	0	
8:25 AM	0	0	0	0	2	2	0	0	1	1	1	3	
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	
8:35 AM	0	0	0	0	2	2	0	0	0	0	0	2	
8:40 AM	1	0	1	0	0	0	0	0	0	0	0	1	
8:45 AM	1	0	1	0	0	0	0	0	0	0	0	1	
8:50 AM	1	0	1	0	1	1	0	0	0	0	0	2	
8:55 AM	6	0	6	0	1	1	0	0	1	1	1	8	
Total Survey	20	1	21	3	13	16	0	0	3	3	40		

Heavy Vehicle 15-Minute Interval Summary 7:00 AM to 9:00 AM

Interval Start Time	Northbound SE 362nd Ave			Southbound SE 362nd Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total
	T	R	Total	L	T	Total	Total	L	R	Total			
7:00 AM	3	0	3	0	0	0	0	0	0	0	0	3	
7:15 AM	2	0	2	1	0	1	0	0	1	1	1	4	
7:30 AM	1	0	1	2	2	4	0	0	0	0	0	5	
7:45 AM	1	0	1	0	3	3	0	0	0	0	0	4	
8:00 AM	1	0	1	0	1	1	0	0	0	0	0	2	
8:15 AM	3	1	4	0	3	3	0	0	1	1	1	8	
8:30 AM	1	0	1	0	2	2	0	0	0	0	0	3	
8:45 AM	8	0	8	0	2	2	0	0	1	1	1	11	
Total Survey	20	1	21	3	13	16	0	0	3	3	40		

Heavy Vehicle Peak Hour Summary 7:00 AM to 8:00 AM

By Approach	Northbound SE 362nd Ave			Southbound SE 362nd Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	7	5	12	8	8	16	0	0	0	1	3	4	16
PHF	0.44			0.50			0.00			0.25			0.67

By Movement	Northbound SE 362nd Ave			Southbound SE 362nd Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Total
	T	R	Total	L	T	Total	Total	L	R	Total			
Volume	7	0	7	3	5	8	0	0	0	1	1	16	
PHF	0.44	0.00	0.44	0.38	0.42	0.50	0.00	0.00	0.25	0.25	0.67		

Heavy Vehicle Rolling Hour Summary 7:00 AM to 9:00 AM

Interval Start Time	Northbound SE 362nd Ave			Southbound SE 362nd Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total
	T	R	Total	L	T	Total	Total	L	R	Total			
7:00 AM	7	0	7	3	5	8	0	0	0	1	1	16	
7:15 AM	5	0	5	3	6	9	0	0	0	1	1	15	
7:30 AM	6	1	7	2	9	11	0	0	0	1	1	19	
7:45 AM	6	1	7	0	9	9	0	0	0	1	1	17	
8:00 AM	13	1	14	0	8	8	0	0	0	2	2	24	

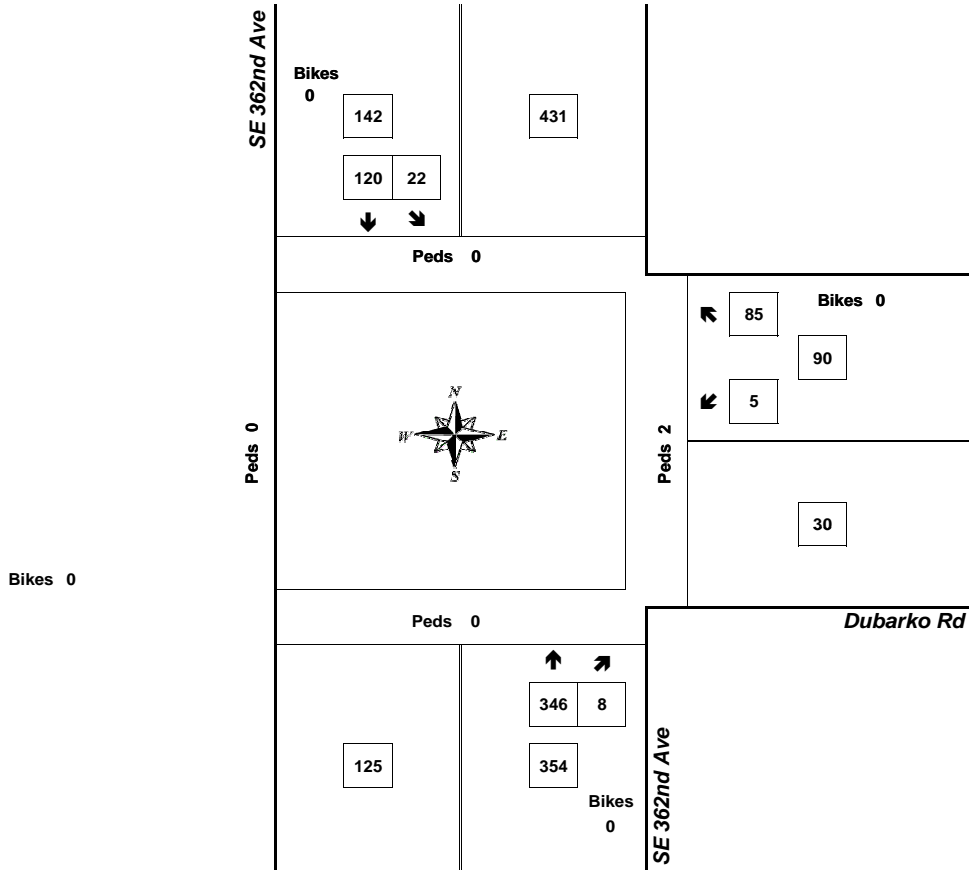
Peak Hour Summary



Clay Carney
(503) 833-2740

SE 362nd Ave & Dubarko Rd

7:00 AM to 8:00 AM
Thursday, May 23, 2019



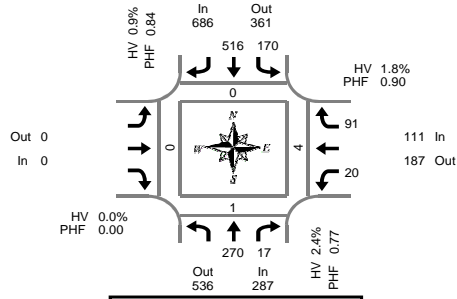
Approach	PHF	HV%	Volume
EB	0.00	0.0%	0
WB	0.83	1.1%	90
NB	0.76	2.0%	354
SB	0.81	5.6%	142
Intersection	0.85	2.7%	586

Count Period: 7:00 AM to 9:00 AM

Total Vehicle Summary



Clay Carney
(603) 833-2740



**Peak Hour Summary
4:30 PM to 5:30 PM**

SE 362nd Ave & Dubarko Rd

Wednesday, May 22, 2019
4:00 PM to 6:00 PM

**5-Minute Interval Summary
4:00 PM to 6:00 PM**

Interval Start Time	Northbound SE 362nd Ave			Southbound SE 362nd Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total	Pedestrians Crosswalk			
	T	R	Bikes	L	T	Bikes		Bikes	L	R	Bikes	North		South	East	West	
4:00 PM	25	0	0	11	35	0		0	1	6	0	78	1	0	3	0	
4:05 PM	21	2	0	7	36	0		0	1	5	0	72	0	0	0	0	
4:10 PM	19	2	0	8	36	0		0	1	6	0	72	0	0	0	0	
4:15 PM	26	3	0	8	32	0		0	0	4	0	73	0	0	1	0	
4:20 PM	22	1	0	14	45	0		0	3	4	0	89	0	0	0	0	
4:25 PM	21	2	0	15	34	0		0	0	5	0	77	0	0	0	0	
4:30 PM	19	2	0	18	30	0		0	1	8	0	78	0	0	2	0	
4:35 PM	27	0	0	9	42	0		0	0	9	0	87	0	0	0	0	
4:40 PM	17	3	0	12	33	0		0	2	9	0	76	0	0	0	0	
4:45 PM	28	0	0	7	46	0		0	1	6	0	88	0	0	0	0	
4:50 PM	28	2	0	14	33	0		0	3	7	0	87	0	0	0	0	
4:55 PM	30	2	0	10	51	0		0	4	3	0	100	0	0	0	0	
5:00 PM	30	1	0	15	42	0		0	3	11	0	102	0	0	0	0	
5:05 PM	21	4	0	16	45	0		0	0	7	0	93	0	0	0	0	
5:10 PM	21	1	0	20	49	0		0	2	6	0	99	0	0	0	0	
5:15 PM	16	1	0	14	60	0		0	1	7	0	99	0	0	0	0	
5:20 PM	17	1	0	19	42	0		0	2	12	0	93	0	1	0	0	
5:25 PM	16	0	0	16	43	0		0	1	6	0	82	0	0	2	0	
5:30 PM	19	0	0	16	24	0		0	2	4	0	65	0	0	0	0	
5:35 PM	16	1	0	12	33	0		0	2	7	0	71	0	0	0	0	
5:40 PM	26	0	0	9	39	0		0	1	6	0	81	0	0	0	0	
5:45 PM	18	2	0	13	36	0		0	2	5	0	76	0	0	0	0	
5:50 PM	19	2	0	17	43	0		0	1	7	0	89	0	0	0	0	
5:55 PM	17	3	0	17	29	0		0	1	7	0	74	0	0	0	0	
Total Survey	519	35	0	317	938	0		0	35	157	0	2,001	1	1	8	0	

**15-Minute Interval Summary
4:00 PM to 6:00 PM**

Interval Start Time	Northbound SE 362nd Ave			Southbound SE 362nd Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total	Pedestrians Crosswalk			
	T	R	Bikes	L	T	Bikes		Bikes	L	R	Bikes	North		South	East	West	
4:00 PM	65	4	0	26	107	0		0	3	17	0	222	1	0	3	0	
4:15 PM	69	6	0	37	111	0		0	3	13	0	239	0	0	1	0	
4:30 PM	63	5	0	39	105	0		0	3	26	0	241	0	0	2	0	
4:45 PM	86	4	0	31	130	0		0	8	16	0	275	0	0	0	0	
5:00 PM	72	6	0	51	136	0		0	5	24	0	294	0	0	0	0	
5:15 PM	49	2	0	49	145	0		0	4	25	0	274	0	1	2	0	
5:30 PM	61	1	0	37	96	0		0	5	17	0	217	0	0	0	0	
5:45 PM	54	7	0	47	108	0		0	4	19	0	239	0	0	0	0	
Total Survey	519	35	0	317	938	0		0	35	157	0	2,001	1	1	8	0	

**Peak Hour Summary
4:30 PM to 5:30 PM**

By Approach	Northbound SE 362nd Ave				Southbound SE 362nd Ave				Eastbound Dubarko Rd				Westbound Dubarko Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	287	536	823	0	686	361	1,047	0	0	0	0	0	111	187	298	0	1,084	0	1	4	0
%HV	2.4%				0.9%				0.0%				1.8%				1.4%				
PHF	0.77				0.84				0.00				0.90				0.92				

By Movement	Northbound SE 362nd Ave			Southbound SE 362nd Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Total
	T	R	Total	L	T	Total		Total	L	R	Total		
Volume	270	17	287	170	516	686		0	20	91	111	1,084	
%HV	NA	2.6%	0.0%	2.4%	1.2%	0.8%	NA	0.9%	NA	NA	NA	1.4%	
PHF	0.77	0.61	0.77	0.80	0.84	0.84		0.00	0.50	0.88	0.90	0.92	

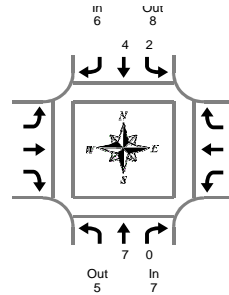
**Rolling Hour Summary
4:00 PM to 6:00 PM**

Interval Start Time	Northbound SE 362nd Ave			Southbound SE 362nd Ave			Eastbound Dubarko Rd			Westbound Dubarko Rd			Interval Total	Pedestrians Crosswalk			
	T	R	Bikes	L	T	Bikes		Bikes	L	R	Bikes	North		South	East	West	
4:00 PM	283	19	0	133	453	0		0	17	72	0	977	1	0	6	0	
4:15 PM	290	21	0	158	482	0		0	19	79	0	1,049	1	0	3	0	
4:30 PM	270	17	0	170	516	0		0	20	91	0	1,084	0	1	4	0	
4:45 PM	268	13	0	168	507	0		0	22	82	0	1,060	0	1	2	0	
5:00 PM	236	16	0	184	485	0		0	18	85	0	1,024	0	1	2	0	

Heavy Vehicle Summary



Clay Carney
(503) 833-2740



Out 0
In 0

Peak Hour Summary
4:30 PM to 5:30 PM

SE 362nd Ave & Dubarko Rd

Wednesday, May 22, 2019
4:00 PM to 6:00 PM

Heavy Vehicle 5-Minute Interval Summary

4:00 PM to 6:00 PM

Interval Start Time	Northbound SE 362nd Ave			Southbound SE 362nd Ave			Eastbound Dubarko Rd		Westbound Dubarko Rd			Interval Total
	T	R	Total	L	T	Total	Total	L	R	Total		
4:00 PM	2	0	2	0	1	1		0	0	0	0	3
4:05 PM	0	0	0	0	0	0		0	0	1	1	1
4:10 PM	2	0	2	0	1	1		0	0	0	0	3
4:15 PM	1	0	1	0	1	1		0	0	0	0	2
4:20 PM	0	0	0	0	1	1		0	0	0	0	1
4:25 PM	0	0	0	0	0	0		0	0	0	0	0
4:30 PM	0	0	0	0	3	3		0	0	0	0	3
4:35 PM	1	0	1	0	0	0		0	0	0	0	1
4:40 PM	0	0	0	1	0	1		0	1	0	1	2
4:45 PM	0	0	0	0	0	0		0	0	0	0	0
4:50 PM	0	0	0	0	0	0		0	0	0	0	0
4:55 PM	0	0	0	0	1	1		0	0	0	0	1
5:00 PM	0	0	0	0	0	0		0	0	0	0	0
5:05 PM	2	0	2	0	0	0		0	0	0	0	2
5:10 PM	0	0	0	0	0	0		0	0	0	0	0
5:15 PM	1	0	1	0	0	0		0	0	0	0	1
5:20 PM	1	0	1	0	0	0		0	0	1	1	2
5:25 PM	2	0	2	1	0	1		0	0	0	0	3
5:30 PM	1	0	1	0	1	1		0	0	0	0	2
5:35 PM	0	0	0	0	0	0		0	0	0	0	0
5:40 PM	0	0	0	0	0	0		0	0	0	0	0
5:45 PM	0	0	0	0	0	0		0	0	0	0	0
5:50 PM	0	0	0	1	0	1		0	0	0	0	1
5:55 PM	1	0	1	0	1	1		0	0	0	0	2
Total Survey	14	0	14	3	10	13		0	1	2	3	30

Heavy Vehicle 15-Minute Interval Summary

4:00 PM to 6:00 PM

Interval Start Time	Northbound SE 362nd Ave			Southbound SE 362nd Ave			Eastbound Dubarko Rd		Westbound Dubarko Rd			Interval Total
	T	R	Total	L	T	Total	Total	L	R	Total		
4:00 PM	4	0	4	0	2	2		0	0	1	1	7
4:15 PM	1	0	1	0	2	2		0	0	0	0	3
4:30 PM	1	0	1	1	3	4		0	1	0	1	6
4:45 PM	0	0	0	0	1	1		0	0	0	0	1
5:00 PM	2	0	2	0	0	0		0	0	0	0	2
5:15 PM	4	0	4	1	0	1		0	0	1	1	6
5:30 PM	1	0	1	0	1	1		0	0	0	0	2
5:45 PM	1	0	1	1	1	2		0	0	0	0	3
Total Survey	14	0	14	3	10	13		0	1	2	3	30

Heavy Vehicle Peak Hour Summary

4:30 PM to 5:30 PM

By Approach	Northbound SE 362nd Ave			Southbound SE 362nd Ave			Eastbound Dubarko Rd		Westbound Dubarko Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total			
Volume	7	5	12	6	8	14	0	0	0	2	4	15
PHF	0.44			0.38			0.00		0.50			0.63

By Movement	Northbound SE 362nd Ave			Southbound SE 362nd Ave			Eastbound Dubarko Rd		Westbound Dubarko Rd			Total
	T	R	Total	L	T	Total	Total	L	R	Total		
Volume	7	0	7	2	4	6	0	1	1	2	15	
PHF	0.44	0.00	0.44	0.50	0.33	0.38	0.00	0.25	0.25	0.50	0.63	

Heavy Vehicle Rolling Hour Summary

4:00 PM to 6:00 PM

Interval Start Time	Northbound SE 362nd Ave			Southbound SE 362nd Ave			Eastbound Dubarko Rd		Westbound Dubarko Rd			Interval Total
	T	R	Total	L	T	Total	Total	L	R	Total		
4:00 PM	6	0	6	1	8	9		0	1	1	2	17
4:15 PM	4	0	4	1	6	7		0	1	0	1	12
4:30 PM	7	0	7	2	4	6		0	1	1	2	15
4:45 PM	7	0	7	1	2	3		0	0	1	1	11
5:00 PM	8	0	8	2	2	4		0	0	1	1	13

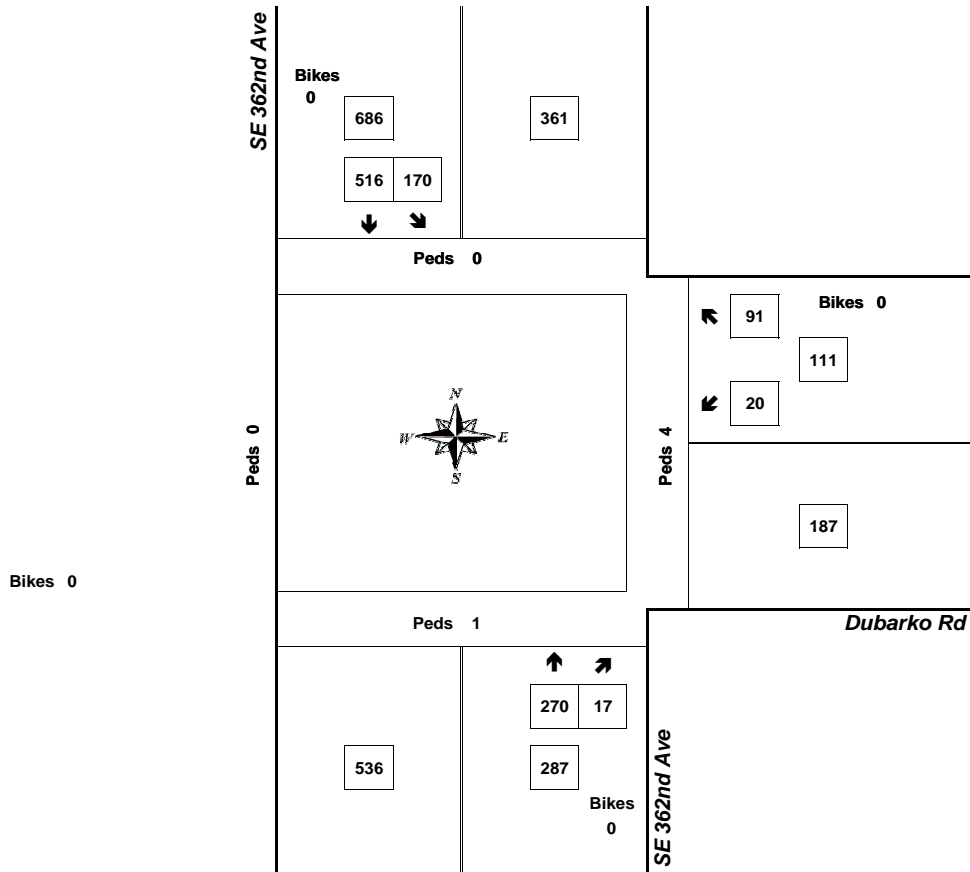
Peak Hour Summary



Clay Carney
(503) 833-2740

SE 362nd Ave & Dubarko Rd

4:30 PM to 5:30 PM
Wednesday, May 22, 2019



Approach	PHF	HV%	Volume
EB	0.00	0.0%	0
WB	0.90	1.8%	111
NB	0.77	2.4%	287
SB	0.84	0.9%	686
Intersection	0.92	1.4%	1,084

Count Period: 4:00 PM to 6:00 PM

CDS380
05/17/2019

CITY OF SANDY, CLACKAMAS COUNTY

OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING
362ND DR at DUBARKO RD, City of Sandy, Clackamas County, 01/01/2012 to 12/31/2016

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Disclaimer: The information contained in this report is compiled from individual driver and police crash reports submitted to the Oregon Department of Transportation as required in ORS 811.720. The Crash Analysis and Reporting Unit is committed to providing the highest quality crash data to customers. However, because submittal of crash report forms is the responsibility of the individual driver, the Crash Analysis and Reporting Unit can not guarantee that all qualifying crashes are represented nor can assurances be made that all details pertaining to a single crash are accurate. Note: Legislative changes to DMV's vehicle crash reporting requirement, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

CDS380
05/12/2019

CITY OF SANDY, CLACKAMAS COUNTY

OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING
DUBARKO RD at BLUFF RD, City of Sandy, Clackamas County, 01/01/2012 to 12/31/2016

Page: 2

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CDS380
05/12/2019

CITY OF SANDY, CLACKAMAS COUNTY

OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING
DUBARKO RD at MELISSA AVE, City of Sandy, Clackamas County, 01/01/2012 to 12/31/2016

Page: 2

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CDS380
05/12/2019

CITY OF SANDY, CLACKAMAS COUNTY

OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING
DUBARKO RD at RUBEN LN, City of Sandy, Clackamas County, 01/01/2012 to 12/31/2016

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Disclaimer: The information contained in this report is compiled from individual driver and police crash reports submitted to the Oregon Department of Transportation as required in ORS 811.720. The Crash Analysis and Reporting Unit is committed to providing the highest quality crash data to customers. However, because submittal of crash report forms is the responsibility of the individual driver, the Crash Analysis and Reporting Unit can not guarantee that all qualifying crashes are represented nor can assurances be made that all details pertaining to a single crash are accurate. Note: Legislative changes to DMV's vehicle crash reporting requirement, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

Traffic Signal Warrant Analysis

Project: 18197 - Ponder Subdivision
 Date: 6/20/2019
 Scenario: Year 2021 Buildout Conditions - Morning Peak Hour

Major Street: SE 362nd Drive Minor Street: Dubarko Road
 Number of Lanes: 1 Number of Lanes: 1
 PM Peak Hour Volumes: 538 PM Peak Hour Volumes: 103

Warrant Used:
 100 percent of standard warrants used
 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
Major St.	Minor St.	100% Warrants	70% Warrants	100% Warrants	70% Warrants
WARRANT 1, CONDITION A					
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
<i>Warrant 1</i>			
<i>Condition A: Minimum Vehicular Volume</i>			
Major Street	5,380	8,850	
Minor Street*	1,030	2,650	No
<i>Condition B: Interruption of Continuous Traffic</i>			
Major Street	5,380	13,300	
Minor Street*	1,030	1,350	No
<i>Combination Warrant</i>			
Major Street	5,380	10,640	
Minor Street*	1,030	2,120	No

* Minor street right-turning traffic volumes reduced by 25%.

Traffic Signal Warrant Analysis

Project: 18197 - Ponder Subdivision
 Date: 6/20/2019
 Scenario: Year 2021 Buildout Conditions - Morning Peak Hour

Major Street: Dubarko Road Minor Street: Ruben Lane
 Number of Lanes: 1 Number of Lanes: 1
 PM Peak Hour Volumes: 248 PM Peak Hour Volumes: 19

Warrant Used:
 100 percent of standard warrants used
 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
Major St.	Minor St.	100% Warrants	70% Warrants	100% Warrants	70% Warrants
WARRANT 1, CONDITION A					
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
<i>Condition A: Minimum Vehicular Volume</i>			
Major Street	2,480	8,850	
Minor Street*	190	2,650	No
<i>Condition B: Interruption of Continuous Traffic</i>			
Major Street	2,480	13,300	
Minor Street*	190	1,350	No
<i>Combination Warrant</i>			
Major Street	2,480	10,640	
Minor Street*	190	2,120	No

* Minor street right-turning traffic volumes reduced by 25%.

Traffic Signal Warrant Analysis

Project: 18197 - Ponder Subdivision
 Date: 6/20/2019
 Scenario: Year 2021 Buildout Conditions - Morning Peak Hour

Major Street: Dubarko Road Minor Street: Melissa Avenue
 Number of Lanes: 1 Number of Lanes: 1
 PM Peak Hour Volumes: 84 PM Peak Hour Volumes: 113

Warrant Used:
 100 percent of standard warrants used
 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
Major St.	Minor St.	100% Warrants	70% Warrants	100% Warrants	70% Warrants
WARRANT 1, CONDITION A					
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
<i>Warrant 1</i>			
<i>Condition A: Minimum Vehicular Volume</i>			
Major Street	840	8,850	
Minor Street*	1,130	2,650	No
<i>Condition B: Interruption of Continuous Traffic</i>			
Major Street	840	13,300	
Minor Street*	1,130	1,350	No
<i>Combination Warrant</i>			
Major Street	840	10,640	
Minor Street*	1,130	2,120	No

* Minor street right-turning traffic volumes reduced by 25%.

Traffic Signal Warrant Analysis

Project: 18197 - Ponder Subdivision
 Date: 6/20/2019
 Scenario: Year 2021 Buildout Conditions - Morning Peak Hour

Major Street: Dubarko Road Minor Street: Bluff Road
 Number of Lanes: 1 Number of Lanes: 1
 PM Peak Hour Volumes: 164 PM Peak Hour Volumes: 36

Warrant Used:
 100 percent of standard warrants used
 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
Major St.	Minor St.	100% Warrants	70% Warrants	100% Warrants	70% Warrants
WARRANT 1, CONDITION A					
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
<i>Warrant 1</i>			
<i>Condition A: Minimum Vehicular Volume</i>			
Major Street	1,640	8,850	
Minor Street*	360	2,650	No
<i>Condition B: Interruption of Continuous Traffic</i>			
Major Street	1,640	13,300	
Minor Street*	360	1,350	No
<i>Combination Warrant</i>			
Major Street	1,640	10,640	
Minor Street*	360	2,120	No

Traffic Signal Warrant Analysis

Project: 18197 - Ponder Subdivision
 Date: 6/20/2019
 Scenario: Year 2021 Buildout Conditions - Evening Peak Hour

Major Street: SE 362nd Drive Minor Street: Dubarko Road
 Number of Lanes: 1 Number of Lanes: 1
 PM Peak Hour Volumes: 1073 PM Peak Hour Volumes: 114

Warrant Used:
 100 percent of standard warrants used
 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
Major St.	Minor St.	100% Warrants	70% Warrants	100% Warrants	70% Warrants
WARRANT 1, CONDITION A					
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
<i>Warrant 1</i>			
<i>Condition A: Minimum Vehicular Volume</i>			
Major Street	10,730	8,850	
Minor Street*	1,140	2,650	No
<i>Condition B: Interruption of Continuous Traffic</i>			
Major Street	10,730	13,300	
Minor Street*	1,140	1,350	No
<i>Combination Warrant</i>			
Major Street	10,730	10,640	
Minor Street*	1,140	2,120	No

* Minor street right-turning traffic volumes reduced by 25%.

Traffic Signal Warrant Analysis

Project: 18197 - Ponder Subdivision
 Date: 6/20/2019
 Scenario: Year 2021 Buildout Conditions - Evening Peak Hour

Major Street: Dubarko Road Minor Street: Ruben Lane
 Number of Lanes: 1 Number of Lanes: 1
 PM Peak Hour Volumes: 374 PM Peak Hour Volumes: 116

Warrant Used:
 100 percent of standard warrants used
 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
Major St.	Minor St.	100% Warrants	70% Warrants	100% Warrants	70% Warrants
WARRANT 1, CONDITION A					
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
<i>Warrant 1</i>			
<i>Condition A: Minimum Vehicular Volume</i>			
Major Street	3,740	8,850	
Minor Street*	1,160	2,650	No
<i>Condition B: Interruption of Continuous Traffic</i>			
Major Street	3,740	13,300	
Minor Street*	1,160	1,350	No
<i>Combination Warrant</i>			
Major Street	3,740	10,640	
Minor Street*	1,160	2,120	No

* Minor street right-turning traffic volumes reduced by 25%.

Traffic Signal Warrant Analysis

Project: 18197 - Ponder Subdivision
 Date: 6/20/2019
 Scenario: Year 2021 Buildout Conditions - Evening Peak Hour

Major Street: Dubarko Road Minor Street: Melissa Avenue
 Number of Lanes: 1 Number of Lanes: 1
 PM Peak Hour Volumes: 287 PM Peak Hour Volumes: 68

Warrant Used:
 100 percent of standard warrants used
 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
Major St.	Minor St.	100% Warrants	70% Warrants	100% Warrants	70% Warrants
WARRANT 1, CONDITION A					
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
<i>Warrant 1</i>			
<i>Condition A: Minimum Vehicular Volume</i>			
Major Street	2,870	8,850	
Minor Street*	680	2,650	No
<i>Condition B: Interruption of Continuous Traffic</i>			
Major Street	2,870	13,300	
Minor Street*	680	1,350	No
<i>Combination Warrant</i>			
Major Street	2,870	10,640	
Minor Street*	680	2,120	No

* Minor street right-turning traffic volumes reduced by 25%.

Traffic Signal Warrant Analysis

Project: 18197 - Ponder Subdivision
 Date: 6/20/2019
 Scenario: Year 2021 Buildout Conditions - Evening Peak Hour

Major Street: Dubarko Road Minor Street: Bluff Road
 Number of Lanes: 1 Number of Lanes: 1
 PM Peak Hour Volumes: 220 PM Peak Hour Volumes: 61

Warrant Used:
 100 percent of standard warrants used
 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
Major St.	Minor St.	100% Warrants	70% Warrants	100% Warrants	70% Warrants
WARRANT 1, CONDITION A					
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
<i>Warrant 1</i>			
<i>Condition A: Minimum Vehicular Volume</i>			
Major Street	2,200	8,850	
Minor Street*	610	2,650	No
<i>Condition B: Interruption of Continuous Traffic</i>			
Major Street	2,200	13,300	
Minor Street*	610	1,350	No
<i>Combination Warrant</i>			
Major Street	2,200	10,640	
Minor Street*	610	2,120	No

* Minor street right-turning traffic volumes reduced by 25%.

Left-Turn Lane Warrant Analysis

Project: 18197 - Ponder Subdivision
 Intersection: Melissa Avenue at Dubarko Road
 Date: 6/20/2019
 Scenario: 2021 Buildout AM

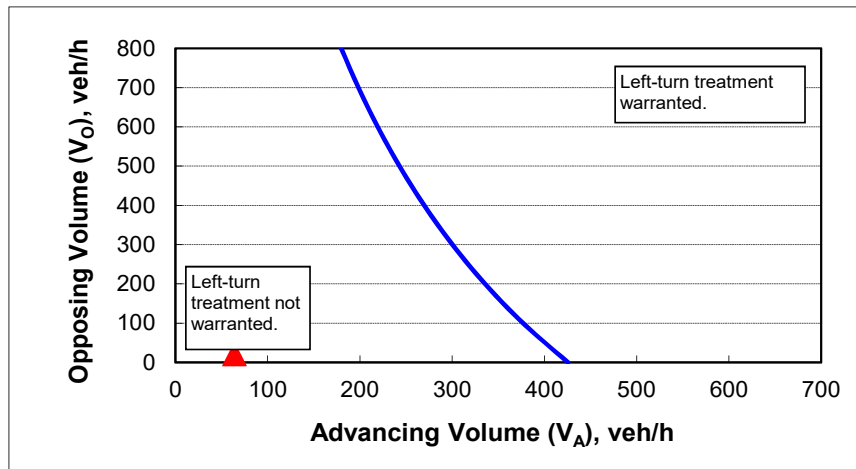
2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	25
Left-turns in advancing volume (V_A), veh/hr:	23
Advancing volume (V_A), veh/h:	64
Opposing volume (V_O), veh/h:	20

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	415
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS (2-Lane Roadway)

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Left-Turn Lane Warrant Analysis

Project: 18197 - Ponder Subdivision
 Intersection: Melissa Avenue at Dubarko Road
 Date: 6/20/2019
 Scenario: 2021 Buildout PM

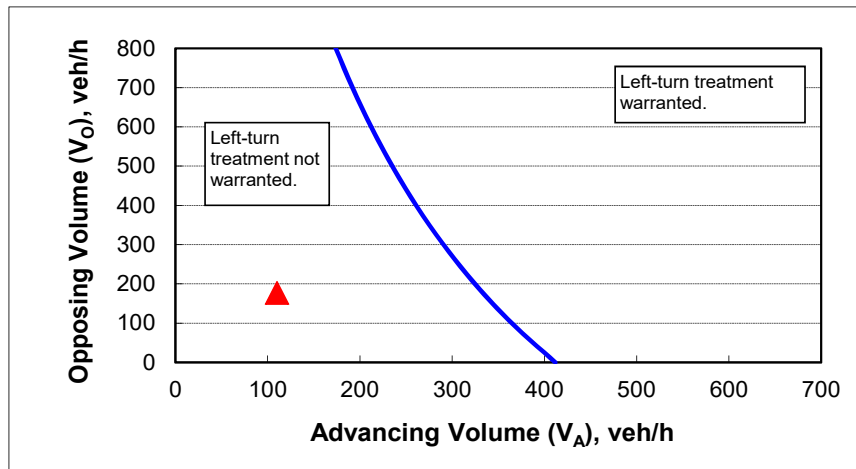
2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	25
Left-turns in advancing volume (V_A), veh/hr:	48
Advancing volume (V_A), veh/h:	110
Opposing volume (V_O), veh/h:	177

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	333
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS (2-Lane Roadway)

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

HCM 2010 TWSC
1: SE 362nd Drive & Dubarko Road

05/28/2019

Intersection

Int Delay, s/veh	2.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		Y		Y	Y
Traffic Vol, veh/h	5	85	346	8	22	120
Future Vol, veh/h	5	85	346	8	22	120
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	115	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	1	1	2	2	6	6
Mvmt Flow	6	100	407	9	26	141

Major/Minor

	Minor1	Major1		Major2	
Conflicting Flow All	605	412	0	0	416
Stage 1	412	-	-	-	-
Stage 2	193	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.16
Critical Hdwy Stg 1	5.41	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.254
Pot Cap-1 Maneuver	462	642	-	-	1122
Stage 1	671	-	-	-	-
Stage 2	842	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	451	642	-	-	1122
Mov Cap-2 Maneuver	451	-	-	-	-
Stage 1	671	-	-	-	-
Stage 2	822	-	-	-	-

Approach

	WB	NB	SB
HCM Control Delay, s	11.9	0	1.3
HCM LOS	B		

Minor Lane/Major Mvmt

	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	627	1122
HCM Lane V/C Ratio	-	-	0.169	0.023
HCM Control Delay (s)	-	-	11.9	8.3
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.6	0.1

HCM 2010 TWSC
2: Dubarko Road & Ruben Lane

05/28/2019

Intersection

Int Delay, s/veh 1.6

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	19	14	48	89	10	6
Future Vol, veh/h	19	14	48	89	10	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	6	6	2	2	13	13
Mvmt Flow	21	16	54	100	11	7

Major/Minor Major1 Major2 Minor2

Conflicting Flow All	154	0	-	0	162	104
Stage 1	-	-	-	-	104	-
Stage 2	-	-	-	-	58	-
Critical Hdwy	4.16	-	-	-	6.53	6.33
Critical Hdwy Stg 1	-	-	-	-	5.53	-
Critical Hdwy Stg 2	-	-	-	-	5.53	-
Follow-up Hdwy	2.254	-	-	-	3.617	3.417
Pot Cap-1 Maneuver	1402	-	-	-	804	922
Stage 1	-	-	-	-	893	-
Stage 2	-	-	-	-	937	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1402	-	-	-	792	922
Mov Cap-2 Maneuver	-	-	-	-	792	-
Stage 1	-	-	-	-	893	-
Stage 2	-	-	-	-	923	-

Approach EB WB SB

HCM Control Delay, s	4.4	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt EBL EBT WBT WBR SBLn1

Capacity (veh/h)	1402	-	-	-	836
HCM Lane V/C Ratio	0.015	-	-	-	0.022
HCM Control Delay (s)	7.6	0	-	-	9.4
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

HCM 2010 TWSC
 3: Melissa Avenue & Dubarko Road

05/28/2019

Intersection

Int Delay, s/veh 5.5

Movement EBT EBR WBL WBT NBL NBR

Lane Configurations	↶			↷	↶	↷
Traffic Vol, veh/h	8	1	14	39	40	27
Future Vol, veh/h	8	1	14	39	40	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	79	79	79	79	79	79
Heavy Vehicles, %	22	22	2	2	2	2
Mvmt Flow	10	1	18	49	51	34

Major/Minor Major1 Major2 Minor1

Conflicting Flow All	0	0	11	0	96	11
Stage 1	-	-	-	-	11	-
Stage 2	-	-	-	-	85	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1608	-	903	1070
Stage 1	-	-	-	-	1012	-
Stage 2	-	-	-	-	938	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1608	-	892	1070
Mov Cap-2 Maneuver	-	-	-	-	892	-
Stage 1	-	-	-	-	1012	-
Stage 2	-	-	-	-	927	-

Approach EB WB NB

HCM Control Delay, s	0	1.9	9.1
HCM LOS			A

Minor Lane/Major Mvmt NBLn1 EBT EBR WBL WBT

Capacity (veh/h)	956	-	-	1608	-
HCM Lane V/C Ratio	0.089	-	-	0.011	-
HCM Control Delay (s)	9.1	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

HCM 2010 AWSC
4: Dubarko Road & Bluff Road

05/28/2019

Intersection	
Intersection Delay, s/veh	7.6
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Vol, veh/h	25	9	12	11	40	55
Future Vol, veh/h	25	9	12	11	40	55
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70
Heavy Vehicles, %	12	12	9	9	4	4
Mvmt Flow	36	13	17	16	57	79
Number of Lanes	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	7.5	7.7	7.6
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	42%	0%	52%
Vol Thru, %	0%	74%	48%
Vol Right, %	58%	26%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	95	34	23
LT Vol	40	0	12
Through Vol	0	25	11
RT Vol	55	9	0
Lane Flow Rate	136	49	33
Geometry Grp	1	1	1
Degree of Util (X)	0.145	0.057	0.04
Departure Headway (Hd)	3.844	4.21	4.435
Convergence, Y/N	Yes	Yes	Yes
Cap	927	844	801
Service Time	1.892	2.267	2.495
HCM Lane V/C Ratio	0.147	0.058	0.041
HCM Control Delay	7.6	7.5	7.7
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.5	0.2	0.1

HCM 2010 TWSC
1: SE 362nd Drive & Dubarko Road

05/28/2019

Intersection

Int Delay, s/veh	2.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		Y		Y	Y
Traffic Vol, veh/h	20	91	270	17	170	516
Future Vol, veh/h	20	91	270	17	170	516
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	115	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	1	1
Mvmt Flow	22	99	293	18	185	561

Major/Minor

	Minor1	Major1		Major2	
Conflicting Flow All	1233	303	0	0	312
Stage 1	303	-	-	-	-
Stage 2	930	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.11
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.209
Pot Cap-1 Maneuver	195	737	-	-	1254
Stage 1	749	-	-	-	-
Stage 2	384	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	166	737	-	-	1254
Mov Cap-2 Maneuver	166	-	-	-	-
Stage 1	749	-	-	-	-
Stage 2	327	-	-	-	-

Approach

	WB	NB	SB
HCM Control Delay, s	15.7	0	2.1
HCM LOS	C		

Minor Lane/Major Mvmt

	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	455	1254
HCM Lane V/C Ratio	-	-	0.265	0.147
HCM Control Delay (s)	-	-	15.7	8.4
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	1.1	0.5

HCM 2010 TWSC
2: Dubarko Road & Ruben Lane

05/28/2019

Intersection						
Int Delay, s/veh	3.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	16	147	68	50	67	33
Future Vol, veh/h	16	147	68	50	67	33
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	1	1	0	0	1	1
Mvmt Flow	18	165	76	56	75	37
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	133	0	-	0	305	104
Stage 1	-	-	-	-	104	-
Stage 2	-	-	-	-	201	-
Critical Hdwy	4.11	-	-	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	2.209	-	-	-	3.509	3.309
Pot Cap-1 Maneuver	1458	-	-	-	689	953
Stage 1	-	-	-	-	923	-
Stage 2	-	-	-	-	835	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	1458	-	-	-	679	953
Mov Cap-2 Maneuver	-	-	-	-	679	-
Stage 1	-	-	-	-	923	-
Stage 2	-	-	-	-	823	-
Approach	EB	WB	SB			
HCM Control Delay, s	0.7	0	10.6			
HCM LOS			B			
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1458	-	-	-	750	
HCM Lane V/C Ratio	0.012	-	-	-	0.15	
HCM Control Delay (s)	7.5	0	-	-	10.6	
HCM Lane LOS	A	A	-	-	B	
HCM 95th %tile Q(veh)	0	-	-	-	0.5	

HCM 2010 TWSC
 3: Melissa Avenue & Dubarko Road

05/28/2019

Intersection

Int Delay, s/veh 2.1

Movement EBT EBR WBL WBT NBL NBR

Lane Configurations	↶			↷	↶	↷
Traffic Vol, veh/h	85	47	22	58	21	16
Future Vol, veh/h	85	47	22	58	21	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	100	55	26	68	25	19

Major/Minor Major1 Major2 Minor1

Conflicting Flow All	0	0	155	0	248	128
Stage 1	-	-	-	-	128	-
Stage 2	-	-	-	-	120	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1438	-	745	927
Stage 1	-	-	-	-	903	-
Stage 2	-	-	-	-	910	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1438	-	731	927
Mov Cap-2 Maneuver	-	-	-	-	731	-
Stage 1	-	-	-	-	903	-
Stage 2	-	-	-	-	893	-

Approach EB WB NB

HCM Control Delay, s	0	2.1	9.7
HCM LOS			A

Minor Lane/Major Mvmt NBLn1 EBT EBR WBL WBT

Capacity (veh/h)	805	-	-	1438	-
HCM Lane V/C Ratio	0.054	-	-	0.018	-
HCM Control Delay (s)	9.7	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

HCM 2010 AWSC
4: Dubarko Road & Bluff Road

05/28/2019

Intersection	
Intersection Delay, s/veh	7.4
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Vol, veh/h	19	89	23	16	56	24
Future Vol, veh/h	19	89	23	16	56	24
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	0	0	0	0	1	1
Mvmt Flow	22	105	27	19	66	28
Number of Lanes	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	7.2	7.6	7.7
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	70%	0%	59%
Vol Thru, %	0%	18%	41%
Vol Right, %	30%	82%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	80	108	39
LT Vol	56	0	23
Through Vol	0	19	16
RT Vol	24	89	0
Lane Flow Rate	94	127	46
Geometry Grp	1	1	1
Degree of Util (X)	0.109	0.127	0.055
Departure Headway (Hd)	4.175	3.606	4.282
Convergence, Y/N	Yes	Yes	Yes
Cap	853	983	829
Service Time	2.228	1.668	2.345
HCM Lane V/C Ratio	0.11	0.129	0.055
HCM Control Delay	7.7	7.2	7.6
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.4	0.4	0.2

HCM 2010 TWSC
1: SE 362nd Drive & Dubarko Road

06/06/2019

Intersection

Int Delay, s/veh	2.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		T		T	T
Traffic Vol, veh/h	9	101	367	9	27	127
Future Vol, veh/h	9	101	367	9	27	127
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	115	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	1	1	2	2	6	6
Mvmt Flow	11	119	432	11	32	149

Major/Minor

	Minor1	Major1	Major2		
Conflicting Flow All	650	437	0	0	442
Stage 1	437	-	-	-	-
Stage 2	213	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.16
Critical Hdwy Stg 1	5.41	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.254
Pot Cap-1 Maneuver	435	622	-	-	1097
Stage 1	653	-	-	-	-
Stage 2	825	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	422	622	-	-	1097
Mov Cap-2 Maneuver	422	-	-	-	-
Stage 1	653	-	-	-	-
Stage 2	801	-	-	-	-

Approach

	WB	NB	SB
HCM Control Delay, s	12.7	0	1.5
HCM LOS	B		

Minor Lane/Major Mvmt

	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	599	1097
HCM Lane V/C Ratio	-	-	0.216	0.029
HCM Control Delay (s)	-	-	12.7	8.4
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.8	0.1

HCM 2010 TWSC
2: Dubarko Road & Ruben Lane

06/06/2019

Intersection

Int Delay, s/veh	1.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	20	20	66	101	14	6
Future Vol, veh/h	20	20	66	101	14	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	6	6	2	2	13	13
Mvmt Flow	22	22	74	113	16	7

Major/Minor

	Major1	Major2		Minor2	
Conflicting Flow All	188	0	-	0	198
Stage 1	-	-	-	-	131
Stage 2	-	-	-	-	67
Critical Hdwy	4.16	-	-	-	6.53
Critical Hdwy Stg 1	-	-	-	-	5.53
Critical Hdwy Stg 2	-	-	-	-	5.53
Follow-up Hdwy	2.254	-	-	-	3.617
Pot Cap-1 Maneuver	1362	-	-	-	766
Stage 1	-	-	-	-	869
Stage 2	-	-	-	-	929
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1362	-	-	-	754
Mov Cap-2 Maneuver	-	-	-	-	754
Stage 1	-	-	-	-	869
Stage 2	-	-	-	-	914

Approach

	EB	WB	SB
HCM Control Delay, s	3.8	0	9.7
HCM LOS			A

Minor Lane/Major Mvmt

	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1362	-	-	-	790
HCM Lane V/C Ratio	0.016	-	-	-	0.028
HCM Control Delay (s)	7.7	0	-	-	9.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

HCM 2010 TWSC
 3: Melissa Avenue & Dubarko Road

06/06/2019

Intersection

Int Delay, s/veh 5.6

Movement EBT EBR WBL WBT NBL NBR

Lane Configurations	↶			↷	↶	↷
Traffic Vol, veh/h	8	1	15	41	42	29
Future Vol, veh/h	8	1	15	41	42	29
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	79	79	79	79	79	79
Heavy Vehicles, %	22	22	2	2	2	2
Mvmt Flow	10	1	19	52	53	37

Major/Minor Major1 Major2 Minor1

Conflicting Flow All	0	0	11	0	101	11
Stage 1	-	-	-	-	11	-
Stage 2	-	-	-	-	90	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1608	-	898	1070
Stage 1	-	-	-	-	1012	-
Stage 2	-	-	-	-	934	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1608	-	887	1070
Mov Cap-2 Maneuver	-	-	-	-	887	-
Stage 1	-	-	-	-	1012	-
Stage 2	-	-	-	-	923	-

Approach EB WB NB

HCM Control Delay, s	0	1.9	9.2
HCM LOS			A

Minor Lane/Major Mvmt NBLn1 EBT EBR WBL WBT

Capacity (veh/h)	954	-	-	1608	-
HCM Lane V/C Ratio	0.094	-	-	0.012	-
HCM Control Delay (s)	9.2	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

HCM 2010 AWSC
4: Dubarko Road & Bluff Road

06/06/2019

Intersection	
Intersection Delay, s/veh	7.6
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Vol, veh/h	27	10	19	12	42	60
Future Vol, veh/h	27	10	19	12	42	60
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70
Heavy Vehicles, %	12	12	9	9	4	4
Mvmt Flow	39	14	27	17	60	86
Number of Lanes	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	7.6	7.8	7.6
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	41%	0%	61%
Vol Thru, %	0%	73%	39%
Vol Right, %	59%	27%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	102	37	31
LT Vol	42	0	19
Through Vol	0	27	12
RT Vol	60	10	0
Lane Flow Rate	146	53	44
Geometry Grp	1	1	1
Degree of Util (X)	0.156	0.062	0.055
Departure Headway (Hd)	3.864	4.233	4.475
Convergence, Y/N	Yes	Yes	Yes
Cap	919	838	794
Service Time	1.923	2.299	2.54
HCM Lane V/C Ratio	0.159	0.063	0.055
HCM Control Delay	7.6	7.6	7.8
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.6	0.2	0.2

HCM 2010 TWSC
1: SE 362nd Drive & Dubarko Road

06/06/2019

Intersection

Int Delay, s/veh	3.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		Y		Y	Y
Traffic Vol, veh/h	23	105	287	22	191	548
Future Vol, veh/h	23	105	287	22	191	548
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	115	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	1	1
Mvmt Flow	25	114	312	24	208	596

Major/Minor

	Minor1	Major1	Major2		
Conflicting Flow All	1335	324	0	0	336
Stage 1	324	-	-	-	-
Stage 2	1011	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.11
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.209
Pot Cap-1 Maneuver	169	717	-	-	1229
Stage 1	733	-	-	-	-
Stage 2	352	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	140	717	-	-	1229
Mov Cap-2 Maneuver	140	-	-	-	-
Stage 1	733	-	-	-	-
Stage 2	292	-	-	-	-

Approach

	WB	NB	SB
HCM Control Delay, s	18.1	0	2.2
HCM LOS	C		

Minor Lane/Major Mvmt

	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	412	1229
HCM Lane V/C Ratio	-	-	0.338	0.169
HCM Control Delay (s)	-	-	18.1	8.5
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	1.5	0.6

HCM 2010 TWSC
2: Dubarko Road & Ruben Lane

06/06/2019

Intersection

Int Delay, s/veh 3.2

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	17	171	82	57	78	35
Future Vol, veh/h	17	171	82	57	78	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	1	1	0	0	1	1
Mvmt Flow	19	192	92	64	88	39

Major/Minor Major1 Major2 Minor2

Conflicting Flow All	156	0	-	0	354	124
Stage 1	-	-	-	-	124	-
Stage 2	-	-	-	-	230	-
Critical Hdwy	4.11	-	-	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	2.209	-	-	-	3.509	3.309
Pot Cap-1 Maneuver	1430	-	-	-	646	929
Stage 1	-	-	-	-	904	-
Stage 2	-	-	-	-	811	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1430	-	-	-	636	929
Mov Cap-2 Maneuver	-	-	-	-	636	-
Stage 1	-	-	-	-	904	-
Stage 2	-	-	-	-	799	-

Approach EB WB SB

HCM Control Delay, s	0.7	0	11.2
HCM LOS			B

Minor Lane/Major Mvmt EBL EBT WBT WBR SBLn1

Capacity (veh/h)	1430	-	-	-	705
HCM Lane V/C Ratio	0.013	-	-	-	0.18
HCM Control Delay (s)	7.6	0	-	-	11.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.7

HCM 2010 TWSC
 3: Melissa Avenue & Dubarko Road

06/06/2019

Intersection

Int Delay, s/veh	2.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↶			↷	↶	↷
Traffic Vol, veh/h	90	50	23	62	22	17
Future Vol, veh/h	90	50	23	62	22	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	106	59	27	73	26	20

Major/Minor

	Major1	Major2	Minor1		
Conflicting Flow All	0	0	165	0	262
Stage 1	-	-	-	-	135
Stage 2	-	-	-	-	127
Critical Hdwy	-	-	4.1	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	-	-	2.2	-	3.5
Pot Cap-1 Maneuver	-	-	1426	-	731
Stage 1	-	-	-	-	896
Stage 2	-	-	-	-	904
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1426	-	716
Mov Cap-2 Maneuver	-	-	-	-	716
Stage 1	-	-	-	-	896
Stage 2	-	-	-	-	886

Approach

	EB	WB	NB
HCM Control Delay, s	0	2	9.8
HCM LOS			A

Minor Lane/Major Mvmt

	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	792	-	-	1426	-
HCM Lane V/C Ratio	0.058	-	-	0.019	-
HCM Control Delay (s)	9.8	-	-	7.6	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

HCM 2010 AWSC
4: Dubarko Road & Bluff Road

06/06/2019

Intersection	
Intersection Delay, s/veh	7.6
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Vol, veh/h	20	94	28	17	59	31
Future Vol, veh/h	20	94	28	17	59	31
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	0	0	0	0	1	1
Mvmt Flow	24	111	33	20	69	36
Number of Lanes	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	7.3	7.7	7.8
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	66%	0%	62%
Vol Thru, %	0%	18%	38%
Vol Right, %	34%	82%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	90	114	45
LT Vol	59	0	28
Through Vol	0	20	17
RT Vol	31	94	0
Lane Flow Rate	106	134	53
Geometry Grp	1	1	1
Degree of Util (X)	0.122	0.135	0.063
Departure Headway (Hd)	4.162	3.631	4.314
Convergence, Y/N	Yes	Yes	Yes
Cap	854	975	822
Service Time	2.222	1.7	2.385
HCM Lane V/C Ratio	0.124	0.137	0.064
HCM Control Delay	7.8	7.3	7.7
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.4	0.5	0.2

HCM 2010 TWSC
1: SE 362nd Drive & Dubarko Road

06/06/2019

Intersection

Int Delay, s/veh	3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		T		T	T
Traffic Vol, veh/h	15	117	367	11	33	127
Future Vol, veh/h	15	117	367	11	33	127
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	115	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	1	1	2	2	6	6
Mvmt Flow	18	138	432	13	39	149

Major/Minor

	Minor1	Major1	Major2		
Conflicting Flow All	665	438	0	0	445
Stage 1	438	-	-	-	-
Stage 2	227	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.16
Critical Hdwy Stg 1	5.41	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.254
Pot Cap-1 Maneuver	427	621	-	-	1094
Stage 1	653	-	-	-	-
Stage 2	813	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	412	621	-	-	1094
Mov Cap-2 Maneuver	412	-	-	-	-
Stage 1	653	-	-	-	-
Stage 2	784	-	-	-	-

Approach

	WB	NB	SB
HCM Control Delay, s	13.3	0	1.7
HCM LOS	B		

Minor Lane/Major Mvmt

	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	587	1094
HCM Lane V/C Ratio	-	-	0.265	0.035
HCM Control Delay (s)	-	-	13.3	8.4
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	1.1	0.1

HCM 2010 TWSC
2: Dubarko Road & Ruben Lane

06/06/2019

Intersection

Int Delay, s/veh 1.3

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	20	28	88	112	14	6
Future Vol, veh/h	20	28	88	112	14	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	6	6	2	2	13	13
Mvmt Flow	22	31	99	126	16	7

Major/Minor Major1 Major2 Minor2

Conflicting Flow All	225	0	-	0	238	162
Stage 1	-	-	-	-	162	-
Stage 2	-	-	-	-	76	-
Critical Hdwy	4.16	-	-	-	6.53	6.33
Critical Hdwy Stg 1	-	-	-	-	5.53	-
Critical Hdwy Stg 2	-	-	-	-	5.53	-
Follow-up Hdwy	2.254	-	-	-	3.617	3.417
Pot Cap-1 Maneuver	1320	-	-	-	727	855
Stage 1	-	-	-	-	841	-
Stage 2	-	-	-	-	920	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1320	-	-	-	715	855
Mov Cap-2 Maneuver	-	-	-	-	715	-
Stage 1	-	-	-	-	841	-
Stage 2	-	-	-	-	904	-

Approach EB WB SB

HCM Control Delay, s	3.2	0	9.9
HCM LOS			A

Minor Lane/Major Mvmt EBL EBT WBT WBR SBLn1

Capacity (veh/h)	1320	-	-	-	752
HCM Lane V/C Ratio	0.017	-	-	-	0.03
HCM Control Delay (s)	7.8	0	-	-	9.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

HCM 2010 TWSC
3: Melissa Avenue & Dubarko Road

06/06/2019

Intersection

Int Delay, s/veh 6.6

Movement EBT EBR WBL WBT NBL NBR

Lane Configurations	↶			↷	↶	↷
Traffic Vol, veh/h	8	12	23	41	75	51
Future Vol, veh/h	8	12	23	41	75	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	79	79	79	79	79	79
Heavy Vehicles, %	22	22	2	2	2	2
Mvmt Flow	10	15	29	52	95	65

Major/Minor Major1 Major2 Minor1

Conflicting Flow All	0	0	25	0	128	18
Stage 1	-	-	-	-	18	-
Stage 2	-	-	-	-	110	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1589	-	866	1061
Stage 1	-	-	-	-	1005	-
Stage 2	-	-	-	-	915	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1589	-	850	1061
Mov Cap-2 Maneuver	-	-	-	-	850	-
Stage 1	-	-	-	-	1005	-
Stage 2	-	-	-	-	898	-

Approach EB WB NB

HCM Control Delay, s	0	2.6	9.7
HCM LOS			A

Minor Lane/Major Mvmt NBLn1 EBT EBR WBL WBT

Capacity (veh/h)	924	-	-	1589	-
HCM Lane V/C Ratio	0.173	-	-	0.018	-
HCM Control Delay (s)	9.7	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0.1	-

HCM 2010 AWSC
4: Dubarko Road & Bluff Road

06/06/2019

Intersection	
Intersection Delay, s/veh	7.8
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↶			↷	↶	↷
Traffic Vol, veh/h	41	18	19	17	45	60
Future Vol, veh/h	41	18	19	17	45	60
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70
Heavy Vehicles, %	12	12	9	9	4	4
Mvmt Flow	59	26	27	24	64	86
Number of Lanes	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	7.8	7.9	7.8
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	43%	0%	53%
Vol Thru, %	0%	69%	47%
Vol Right, %	57%	31%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	105	59	36
LT Vol	45	0	19
Through Vol	0	41	17
RT Vol	60	18	0
Lane Flow Rate	150	84	51
Geometry Grp	1	1	1
Degree of Util (X)	0.164	0.099	0.064
Departure Headway (Hd)	3.944	4.224	4.488
Convergence, Y/N	Yes	Yes	Yes
Cap	897	838	788
Service Time	2.024	2.302	2.572
HCM Lane V/C Ratio	0.167	0.1	0.065
HCM Control Delay	7.8	7.8	7.9
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.6	0.3	0.2

HCM 2010 TWSC
1: SE 362nd Drive & Dubarko Road

06/06/2019

Intersection

Int Delay, s/veh 3.9

Movement WBL WBR NBT NBR SBL SBT

Lane Configurations	Y		Y		Y	Y
Traffic Vol, veh/h	27	116	287	28	210	548
Future Vol, veh/h	27	116	287	28	210	548
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	115	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	1	1
Mvmt Flow	29	126	312	30	228	596

Major/Minor Minor1 Major1 Major2

Conflicting Flow All	1379	327	0	0	342	0
Stage 1	327	-	-	-	-	-
Stage 2	1052	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.11	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.209	-
Pot Cap-1 Maneuver	159	714	-	-	1223	-
Stage 1	731	-	-	-	-	-
Stage 2	336	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	129	714	-	-	1223	-
Mov Cap-2 Maneuver	129	-	-	-	-	-
Stage 1	731	-	-	-	-	-
Stage 2	273	-	-	-	-	-

Approach WB NB SB

HCM Control Delay, s	20.5	0	2.4
HCM LOS	C		

Minor Lane/Major Mvmt NBT NBRWBLn1 SBL SBT

Capacity (veh/h)	-	-	385	1223	-
HCM Lane V/C Ratio	-	-	0.404	0.187	-
HCM Control Delay (s)	-	-	20.5	8.6	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	1.9	0.7	-

HCM 2010 TWSC
2: Dubarko Road & Ruben Lane

06/06/2019

Intersection

Int Delay, s/veh 3.2

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	17	196	97	64	90	35
Future Vol, veh/h	17	196	97	64	90	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	1	1	0	0	1	1
Mvmt Flow	19	220	109	72	101	39

Major/Minor Major1 Major2 Minor2

Conflicting Flow All	181	0	-	0	403	145
Stage 1	-	-	-	-	145	-
Stage 2	-	-	-	-	258	-
Critical Hdwy	4.11	-	-	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	2.209	-	-	-	3.509	3.309
Pot Cap-1 Maneuver	1400	-	-	-	605	905
Stage 1	-	-	-	-	885	-
Stage 2	-	-	-	-	787	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1400	-	-	-	596	905
Mov Cap-2 Maneuver	-	-	-	-	596	-
Stage 1	-	-	-	-	885	-
Stage 2	-	-	-	-	775	-

Approach EB WB SB

HCM Control Delay, s	0.6	0	11.9
HCM LOS			B

Minor Lane/Major Mvmt EBL EBT WBT WBR SBLn1

Capacity (veh/h)	1400	-	-	-	659
HCM Lane V/C Ratio	0.014	-	-	-	0.213
HCM Control Delay (s)	7.6	0	-	-	11.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.8

HCM 2010 TWSC
 3: Melissa Avenue & Dubarko Road

06/06/2019

Intersection

Int Delay, s/veh 3.3

Movement EBT EBR WBL WBT NBL NBR

Lane Configurations	↶			↷	↶	↷
Traffic Vol, veh/h	90	87	48	62	44	32
Future Vol, veh/h	90	87	48	62	44	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	106	102	56	73	52	38

Major/Minor Major1 Major2 Minor1

Conflicting Flow All	0	0	208	0	343	157
Stage 1	-	-	-	-	157	-
Stage 2	-	-	-	-	186	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1375	-	657	894
Stage 1	-	-	-	-	876	-
Stage 2	-	-	-	-	851	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1375	-	629	894
Mov Cap-2 Maneuver	-	-	-	-	629	-
Stage 1	-	-	-	-	876	-
Stage 2	-	-	-	-	815	-

Approach EB WB NB

HCM Control Delay, s	0	3.4	10.7
HCM LOS			B

Minor Lane/Major Mvmt NBLn1 EBT EBR WBL WBT

Capacity (veh/h)	719	-	-	1375	-
HCM Lane V/C Ratio	0.124	-	-	0.041	-
HCM Control Delay (s)	10.7	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-

HCM 2010 AWSC
4: Dubarko Road & Bluff Road

06/06/2019

Intersection	
Intersection Delay, s/veh	7.7
Intersection LOS	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Vol, veh/h	29	100	28	33	68	31
Future Vol, veh/h	29	100	28	33	68	31
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	0	0	0	0	1	1
Mvmt Flow	34	118	33	39	80	36
Number of Lanes	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	7.5	7.8	8
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	69%	0%	46%
Vol Thru, %	0%	22%	54%
Vol Right, %	31%	78%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	99	129	61
LT Vol	68	0	28
Through Vol	0	29	33
RT Vol	31	100	0
Lane Flow Rate	116	152	72
Geometry Grp	1	1	1
Degree of Util (X)	0.137	0.156	0.086
Departure Headway (Hd)	4.249	3.695	4.316
Convergence, Y/N	Yes	Yes	Yes
Cap	833	955	819
Service Time	2.33	1.78	2.401
HCM Lane V/C Ratio	0.139	0.159	0.088
HCM Control Delay	8	7.5	7.8
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.5	0.6	0.3

Bailey Meadows

Preliminary Stormwater Report

Date: June 2019
Client: Allied Homes and Development
Engineering Contact: Monty Hurley, PE, PLS/ Vu Nguyen, PE
Prepared By: Vu Nguyen, PE
Engineering Firm: AKS Engineering & Forestry, LLC
AKS Job No.: 7107



RENEWAL DATE: 6/30/21



12965 SW Herman Road, Suite 100
Tualatin, OR 97062
P: (503) 563-6151
www.aks-eng.com

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APPENDIX F: RELEVANT INFORMATION FROM TECHNICAL RELEASE 55 URBAN HYDROLOGY FOR
SMALL WATERSHEDS BY NATURAL RESOURCE CONSERVATION SERVICE

Preliminary Stormwater Report **Bailey Meadows**

1.0 Purpose of Report

The purpose of this report is to analyze the effect development of this site will have on the downstream stormwater conveyance system, document the criteria the proposed stormwater system was designed to meet, identify the sources of information on which the analysis was based, detail the design methodology, and document the results of the analysis.

2.0 Project Location/Description

The development is located on Tax Lots 800, 801, 802, 803, and 804 of Clackamas County Map 2 4E 23. The project site is located northwest of the Ponder Lane and the Woodburn Sandy Highway (Hwy 211) intersection. Currently, the majority of the existing stormwater runoff from this site drains west to existing drainage ditch across the property that drains to the Bull Frog Reservoir to the west. This project includes approximately ±23.42 acres of the site.

3.0 Regulatory Design Criteria

3.1 STORMWATER QUANTITY MANAGEMENT CRITERIA

The site will provide stormwater quantity management per City of Sandy requirements, including:

- Detain the peak flow from the post-developed site to match the peak flow of the pre-developed site for 2-year, 5-year, 10-year, and 25-year frequency storm events.
- Size the storm sewer pipes to convey stormwater flows for the 25-year storm event.
- Provide an emergency overflow spillway for the 100-year storm, assuming that the flow control manhole is plugged.

The stormwater facility was designed to meet the above criteria for detention, conveyance, and overflow. Slopes in the facility will be no steeper than 3:1 or a retaining wall will be installed. Beyond the top of the stormwater facility, the ground will slope at 2:1 and daylight at the existing ground surface, or a retaining wall will be installed.

3.2 STORMWATER QUALITY MANAGEMENT CRITERIA

The stormwater facility will provide stormwater quality management per City of Sandy standards, which includes treating 80 percent of the average annual volume of stormwater runoff from the site and achieving at least 70% removal of the Total Suspended Solids.

4.0 Design Methodology

The Santa Barbara Urban Hydrograph (SBUH) method was used to design the stormwater facility. The SBUH method utilizes the SCS Type 1A 24-hour storm, as defined by the King County, Washington Surface Water Design Manual. HydroCAD computer software aided in the analysis. Representative runoff curve (CN) numbers were obtained from Technical Release 55 Urban Hydrology for Small Watersheds by the Natural Resources Conservation Service and are included in Appendix E.

5.0 Design Parameters

5.1 DESIGN STORM

5.1.1 24-Hour Rainfall Depths

2-year storm: 3.5 inches

5-year storm: 4.5 inches

10-year storm: 4.8 inches

25-year storm: 5.5 inches

100-year storm: 6.5 inches

5.1.2 On-Site Inlet and Conduit Sizing

Stormwater inlets for the site have been placed at locations that will adequately control stormwater runoff from streets. The onsite stormwater pipes will be sized using Manning's equation, based on peak flows for the 25-year, 24-hour storm event.

5.1.3 Upstream Basin

Stormwater runoff from the off-site upstream (undeveloped) basin area along the eastern property line of the site (catchment 2S) will be collected and routed to the stormwater facility as pass through. The stormwater lines that carry these runoffs will be sized using Manning's equation, based on peak flows for the fully developed 25-year, 24-hour storm event.

5.2 PRE-DEVELOPED SITE TOPOGRAPHY AND LAND USE

5.2.1 Site Topography

The existing stormwater runoff from this site drains west, with slopes ranging from 1% to 10%. The vegetative cover of the site consists of grass, trees, and crops.

5.2.2 Land Use

Currently, the land is being used for agriculture.

5.3 SOIL TYPE

The soils present on the site are classified as Cazadero silty clay loam (hydrologic group "C") and Cottrell silty clay loam (hydrologic group "C") by the USDA Soil Survey for Clackamas County. Information on these soil types is provided in Appendix F.

5.4 POST-DEVELOPED SITE TOPOGRAPHY AND LAND USE

5.4.1 Site Topography

The post-developed site topography will be altered from the pre-developed site topography to allow for the construction of public streets, single-family residential dwellings, and other associated infrastructure and features.

5.4.2 Land Use

The post-developed land use will consist of 100 residential lots, streets, and stormwater facility.

5.4.3 Future Development

The project's stormwater facilities are not sized to treat and detain any future development beyond the planned 100-lot Bailey Meadows subdivision.

5.4.4 Post-Developed Input Parameters

Per City of Sandy requirements, each of the detached single-family dwelling lots was assessed with 2,750 square feet of impervious area.

5.5 DESCRIPTION OF OFF-SITE CONTRIBUTORY BASINS

There are no off-site stormwater runoff basins contributing to this site (other than the basins described in Section 5.1.3).

6.0 Calculation Methodology

6.1 PROPOSED STORMWATER CONDUIT SIZING AND INLET SPACING

To meet City of Sandy standards, the onsite stormwater conduit will be sized using Manning's equation for the 25-year storm event. Catch basins have been placed at locations to adequately convey stormwater runoff from the streets.

6.2 PROPOSED STORMWATER QUANTITY CONTROL FACILITY DESIGN

The stormwater facility (detention pond) was designed to accommodate flows generated by the developed areas of the subject property and to meet City of Sandy water quantity requirements (described in Section 3.1).

6.3 PROPOSED STORMWATER QUALITY FACILITY DESIGN

The CDS manholes were sized to treat stormwater runoff from impervious area generated by a rainfall intensity of 0.2 inches per hour. The designed flow rate for treatment is 1.97 cubic feet per second. Two CDS manholes (CDS Model CDS 2020-5) will be utilized to accommodate flows generated by developed areas of the subject property in compliance with City of Sandy water quality requirements (described in Section 3.2).

6.4 EMERGENCY OVERFLOW CALCULATIONS

The emergency overflow weirs were sized to convey the 100-year storm event. Calculations are included in Appendix D. If the stormwater facility's outlet structures become plugged and cannot convey runoff from the site, the overflow stormwater from the stormwater facility will sheet flow across the access driveway and downhill to the existing drainage ditch.

6.6 DOWNSTREAM ANALYSIS

The stormwater discharge from the stormwater facility (post-developed condition) will discharge to the existing drainage ditch across Tax Lot 806 of Clackamas County Map 2 4E 23. It will continue to flow west to the Bull Frog Reservoir. The stormwater facility has been 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 of the 2-year, 5-year, 10-year, and 25-year storm events. This development will not negatively impact downstream capacity.

7.0 Stormwater Summary Table

The tables below summarize the pre-developed and post-developed peak flows for each storm event

that are routed to the new stormwater facility:

Table 7.1 Pre-Developed Peak Flows

CATCHMENT	PEAK FLOWS (CFS)			
	2-YR	5-YR	10-YR	25-YR
1S (Pre-Developed)	6.60	10.67	11.96	15.03
2S (Existing Upstream)	2.41*	3.91*	4.38*	5.56*

Table 7.2 Post Developed Peak Flows

CATCHMENT	PEAK FLOWS (CFS)			
	2-YR	5-YR	10-YR	25-YR
1S (Post-Developed)	12.23	17.45	19.07	22.94
2S (Existing Upstream)	2.41*	3.91*	4.38*	5.56*
Allowable Release Rate**	9.01	14.58	16.34	20.59
Design Pond Release Rate	8.68	14.20	15.41	17.91
Undetained Rate	0.00	0.00	0.00	0.00
Actual Release Rate to Downstream (Design Pond Release Rate + Undetained Rate)	8.68	14.20	15.41	17.91

*The flows from Catchment 2S are routed to the stormwater facility as pass through flows based on undeveloped area.

**The allowable release rate for the post-developed 2-year storm event per City of Sandy standards is equal to the sum of the pre-developed peak runoff rates for the 2-year storm from Catchments 1S and 2S.

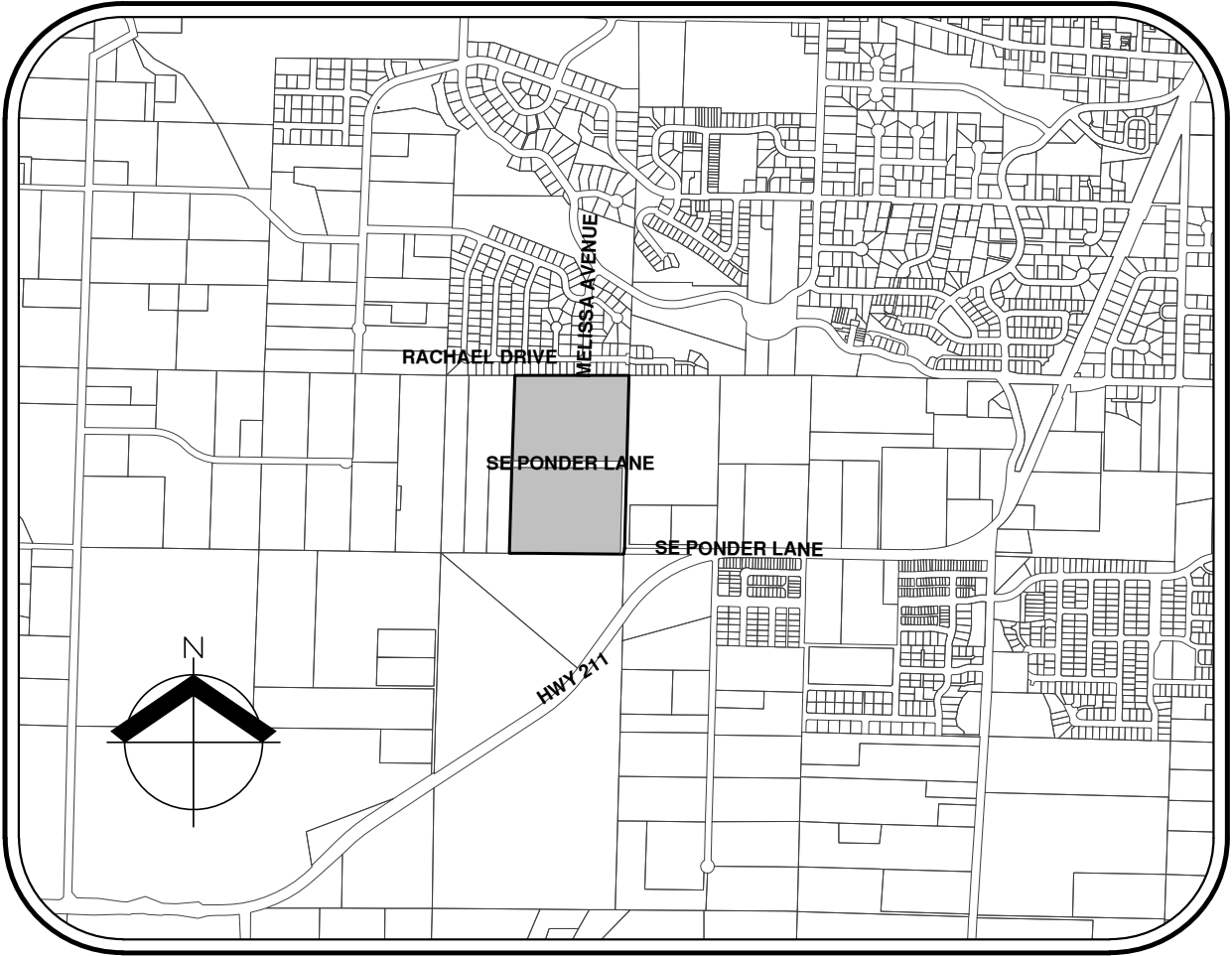
**The allowable release rate for the post-developed 5-year storm event per City of Sandy standards is equal to the sum of the pre-developed peak runoff rates for the 5-year storm from Catchments 1S and 2S.

**The allowable release rate for the post-developed 10-year storm event per City of Sandy standards is equal to the sum of the pre-developed peak runoff rates for the 10-year storm from Catchments 1S and 2S.

**The allowable release rate for the post-developed 25-year storm event per City of Sandy standards is equal to the sum of the pre-developed peak runoff rates for the 25-year storm from Catchments 1S and 2S.



Appendix A: Vicinity Map



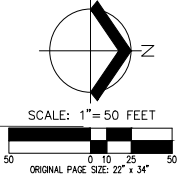
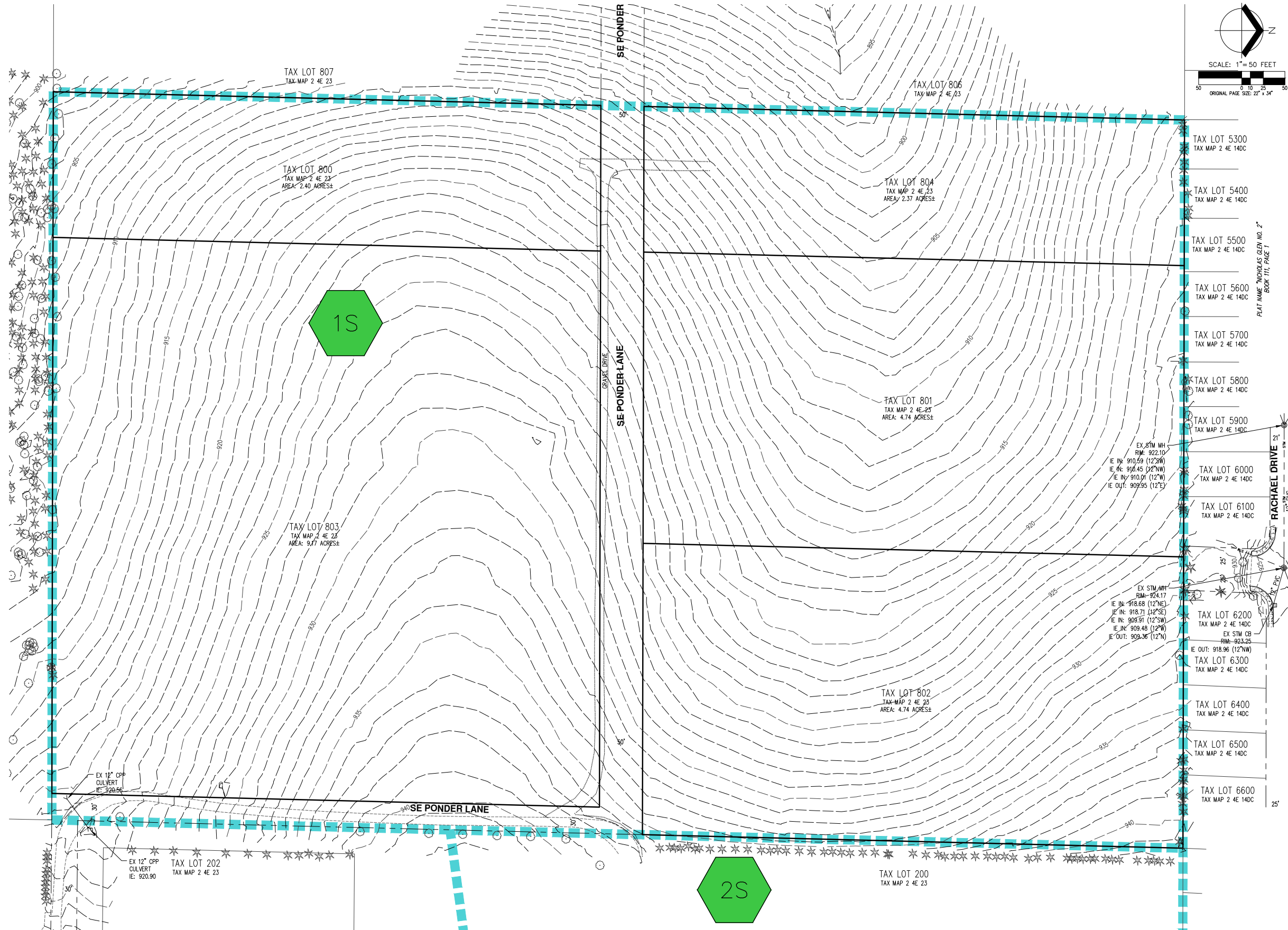
VICINITY MAP

SCALE: 1" = N.T.S.



Appendix B.1: Pre-Developed Catchment Map and Detail

AKS DRAWING FILE: 7107 PRE-DEVELOPED BASIN MAPS | LAYOUT: 1



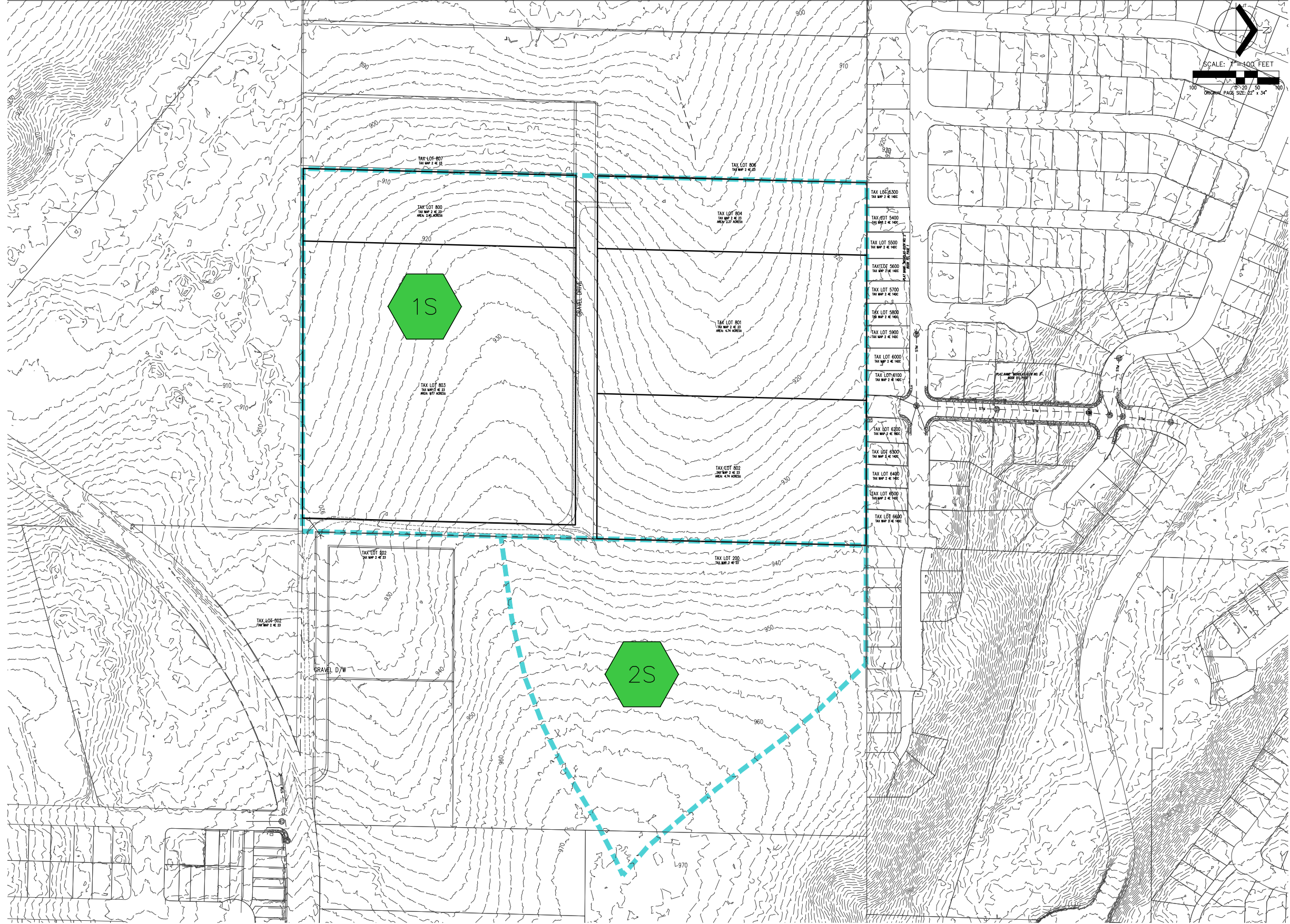
AKS
 AKS ENGINEERING & FORESTRY, LLC
 7400 S. HANCOCK RD., STE 100
 TUALATIN, OR 97062
 503.563.6151
 WWW.AKS-ENG.COM

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PRE-DEVELOPED BASIN MAP

**BAILEY MEADOWS
 SANDY, OREGON**

JOB NUMBER: 7107
 DATE: 06/12/2019
 DESIGNED BY: VN
 DRAWN BY: CL
 CHECKED BY: RSW



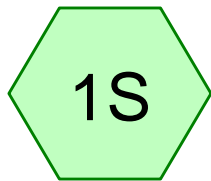
ANS DRAWING FILE: 7107 PRE-DEVELOPED MAP.DWG | LAYOUT: 2

JOB NUMBER: 7107
 DATE: 06/12/2019
 DESIGNED BY: VN
 DRAWN BY: CL
 CHECKED BY: RSW

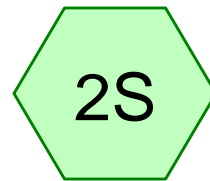
PRE-DEVELOPED BASIN MAP

BAILEY MEADOWS
 SANDY, OREGON

AKS
 AKS ENGINEERING & FORESTRY, LLC
 1700 S. WASHINGTON RD., STE 100
 TUALATIN, OR 97062
 503.563.6151
 WWW.AKS-ENG.COM
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Pre-Developed



Existing Upstream



Routing Diagram for 7107 HydroCAD Pre
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7107 HydroCAD Pre

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Printed 5/28/2019

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
1,497,050	80	Row Crops (C + CR) (1S, 2S)
1,497,050	80	TOTAL AREA



**Appendix B.2:
Pre-Developed Hydrograph and Flow
Information 2-Year Storm Event**

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Type IA 24-hr 2-YR Rainfall=3.50"

Printed 5/28/2019

Time span=0.00-24.00 hrs, dt=0.15 hrs, 161 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Pre-Developed

Runoff Area=1,061,450 sf 0.00% Impervious Runoff Depth>1.62"
Flow Length=900' Tc=23.8 min CN=80/0 Runoff=6.60 cfs 142,858 cf

Subcatchment 2S: Existing Upstream

Runoff Area=10,000 ac 0.00% Impervious Runoff Depth>1.61"
Flow Length=750' Tc=32.3 min CN=80/0 Runoff=2.41 cfs 58,339 cf

Total Runoff Area = 1,497,050 sf Runoff Volume = 201,197 cf Average Runoff Depth = 1.61"
100.00% Pervious = 1,497,050 sf 0.00% Impervious = 0 sf

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Type IA 24-hr 2-YR Rainfall=3.50"

Printed 5/28/2019

Summary for Subcatchment 1S: Pre-Developed

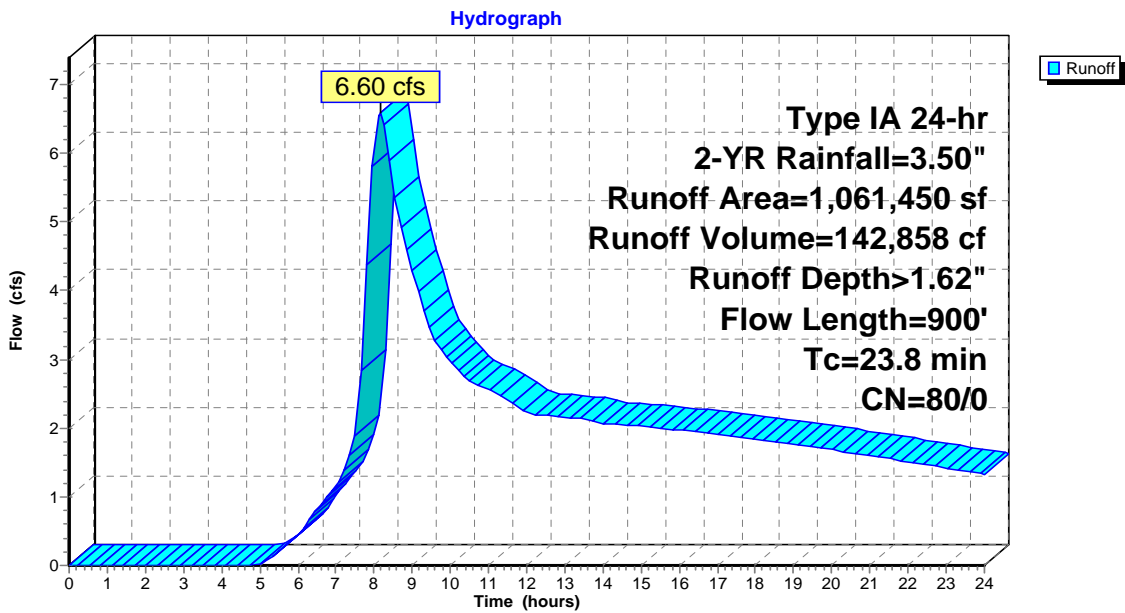
Runoff = 6.60 cfs @ 8.15 hrs, Volume= 142,858 cf, Depth> 1.62"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Type IA 24-hr 2-YR Rainfall=3.50"

Area (sf)	CN	Description
* 1,061,450	80	Row Crops (C + CR)
1,061,450		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.6	300	0.0600	0.27		Sheet Flow, Cultivated: Residue>20% n= 0.170 P2= 2.60"
5.2	600	0.0450	1.91		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
23.8	900	Total			

Subcatchment 1S: Pre-Developed



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Type IA 24-hr 2-YR Rainfall=3.50"

Printed 5/28/2019

Summary for Subcatchment 2S: Existing Upstream

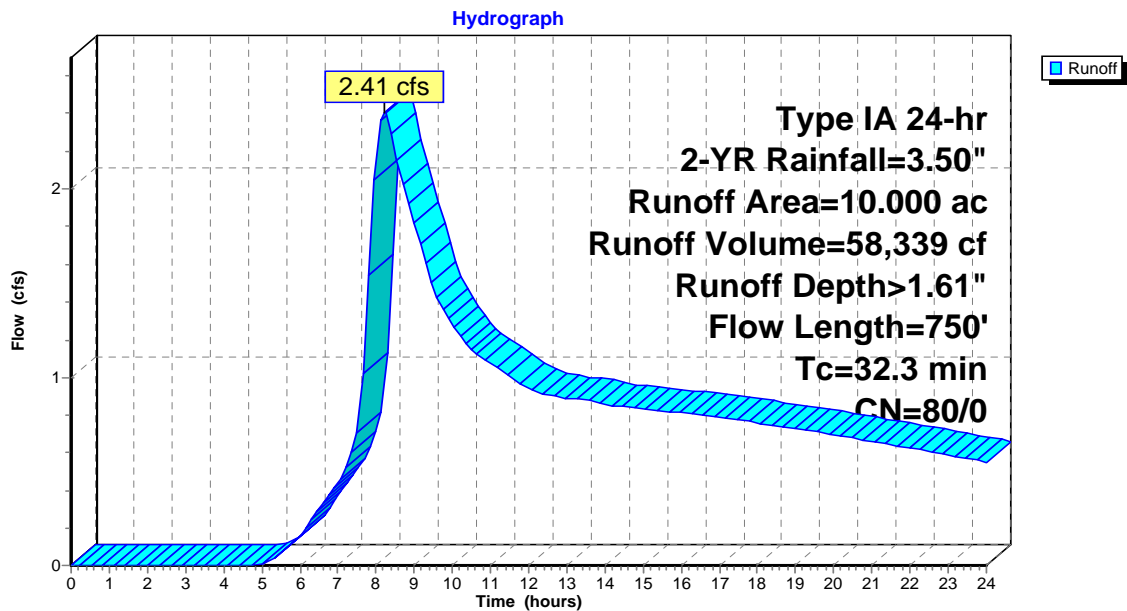
Runoff = 2.41 cfs @ 8.21 hrs, Volume= 58,339 cf, Depth> 1.61"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Type IA 24-hr 2-YR Rainfall=3.50"

Area (ac)	CN	Description
* 10.000	80	Row Crops (C + CR)
10.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.9	300	0.0200	0.17		Sheet Flow, Cultivated: Residue>20% n= 0.170 P2= 2.60"
3.4	450	0.0600	2.20		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
32.3	750	Total			

Subcatchment 2S: Existing Upstream





**Appendix B.3:
Pre-Developed Hydrograph and Flow
Information 5-Year Storm Event**

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Type IA 24-hr 5-YR Rainfall=4.50"

Printed 5/28/2019

Time span=0.00-24.00 hrs, dt=0.15 hrs, 161 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Pre-Developed

Runoff Area=1,061,450 sf 0.00% Impervious Runoff Depth>2.43"
Flow Length=900' Tc=23.8 min CN=80/0 Runoff=10.67 cfs 215,128 cf

Subcatchment 2S: Existing Upstream

Runoff Area=10.000 ac 0.00% Impervious Runoff Depth>2.42"
Flow Length=750' Tc=32.3 min CN=80/0 Runoff=3.91 cfs 87,888 cf

Total Runoff Area = 1,497,050 sf Runoff Volume = 303,016 cf Average Runoff Depth = 2.43"
100.00% Pervious = 1,497,050 sf 0.00% Impervious = 0 sf

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Type IA 24-hr 5-YR Rainfall=4.50"

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Summary for Subcatchment 1S: Pre-Developed

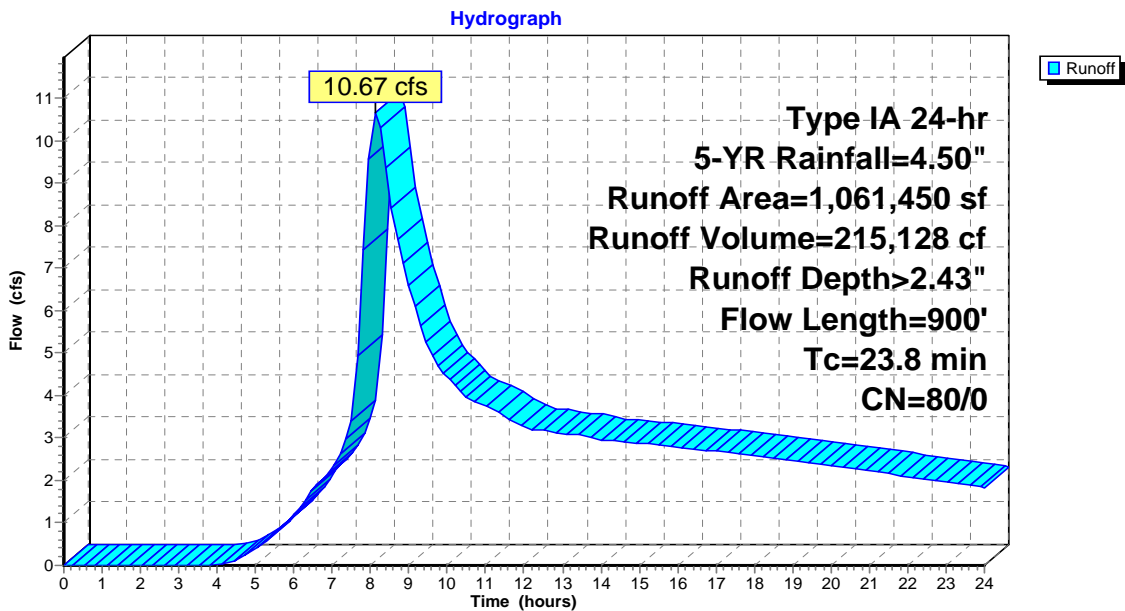
Runoff = 10.67 cfs @ 8.14 hrs, Volume= 215,128 cf, Depth> 2.43"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Type IA 24-hr 5-YR Rainfall=4.50"

Area (sf)	CN	Description
* 1,061,450	80	Row Crops (C + CR)
1,061,450		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.6	300	0.0600	0.27		Sheet Flow, Cultivated: Residue>20% n= 0.170 P2= 2.60"
5.2	600	0.0450	1.91		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
23.8	900	Total			

Subcatchment 1S: Pre-Developed



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Type IA 24-hr 5-YR Rainfall=4.50"

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Summary for Subcatchment 2S: Existing Upstream

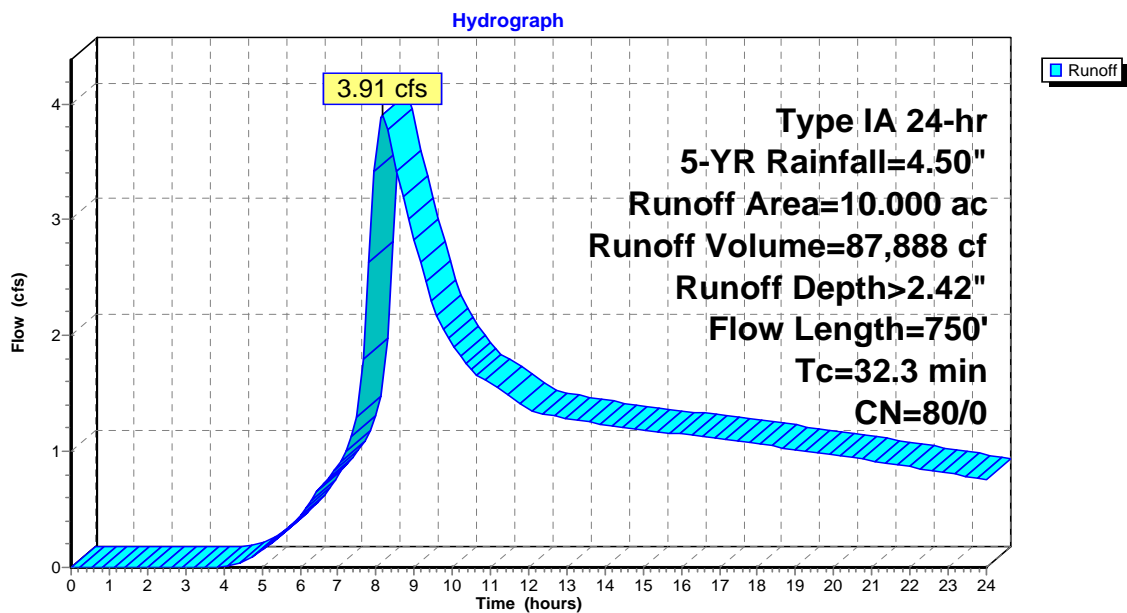
Runoff = 3.91 cfs @ 8.18 hrs, Volume= 87,888 cf, Depth> 2.42"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Type IA 24-hr 5-YR Rainfall=4.50"

Area (ac)	CN	Description
* 10.000	80	Row Crops (C + CR)
10.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.9	300	0.0200	0.17		Sheet Flow, Cultivated: Residue>20% n= 0.170 P2= 2.60"
3.4	450	0.0600	2.20		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
32.3	750	Total			

Subcatchment 2S: Existing Upstream





**Appendix B.4:
Pre-Developed Hydrograph and Flow
Information 10-Year Storm Event**

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Type IA 24-hr 10-YR Rainfall=4.80"

Printed 5/28/2019

Time span=0.00-24.00 hrs, dt=0.15 hrs, 161 points

Runoff by SBUH method, Split Pervious/Imperv.

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Pre-Developed

Runoff Area=1,061,450 sf 0.00% Impervious Runoff Depth>2.68"
Flow Length=900' Tc=23.8 min CN=80/0 Runoff=11.96 cfs 237,696 cf

Subcatchment 2S: Existing Upstream

Runoff Area=10.000 ac 0.00% Impervious Runoff Depth>2.68"
Flow Length=750' Tc=32.3 min CN=80/0 Runoff=4.38 cfs 97,116 cf

Total Runoff Area = 1,497,050 sf Runoff Volume = 334,813 cf Average Runoff Depth = 2.68"
100.00% Pervious = 1,497,050 sf 0.00% Impervious = 0 sf

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Type IA 24-hr 10-YR Rainfall=4.80"

Printed 5/28/2019

Summary for Subcatchment 1S: Pre-Developed

Runoff = 11.96 cfs @ 8.14 hrs, Volume= 237,696 cf, Depth> 2.69"

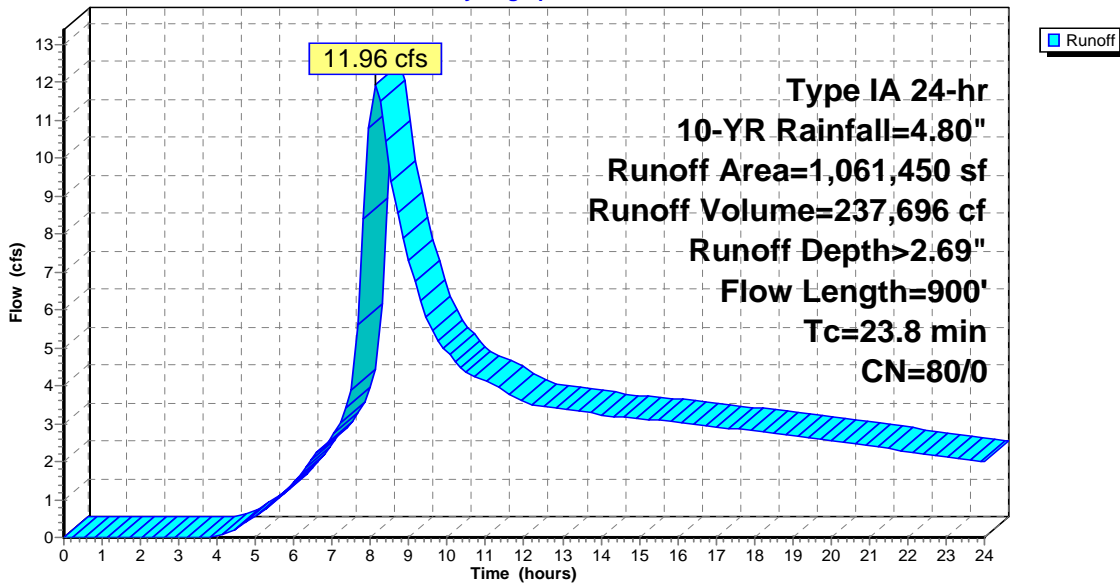
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Type IA 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
* 1,061,450	80	Row Crops (C + CR)
1,061,450		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.6	300	0.0600	0.27		Sheet Flow, Cultivated: Residue>20% n= 0.170 P2= 2.60"
5.2	600	0.0450	1.91		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
23.8	900	Total			

Subcatchment 1S: Pre-Developed

Hydrograph



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Type IA 24-hr 10-YR Rainfall=4.80"

Printed 5/28/2019

Summary for Subcatchment 2S: Existing Upstream

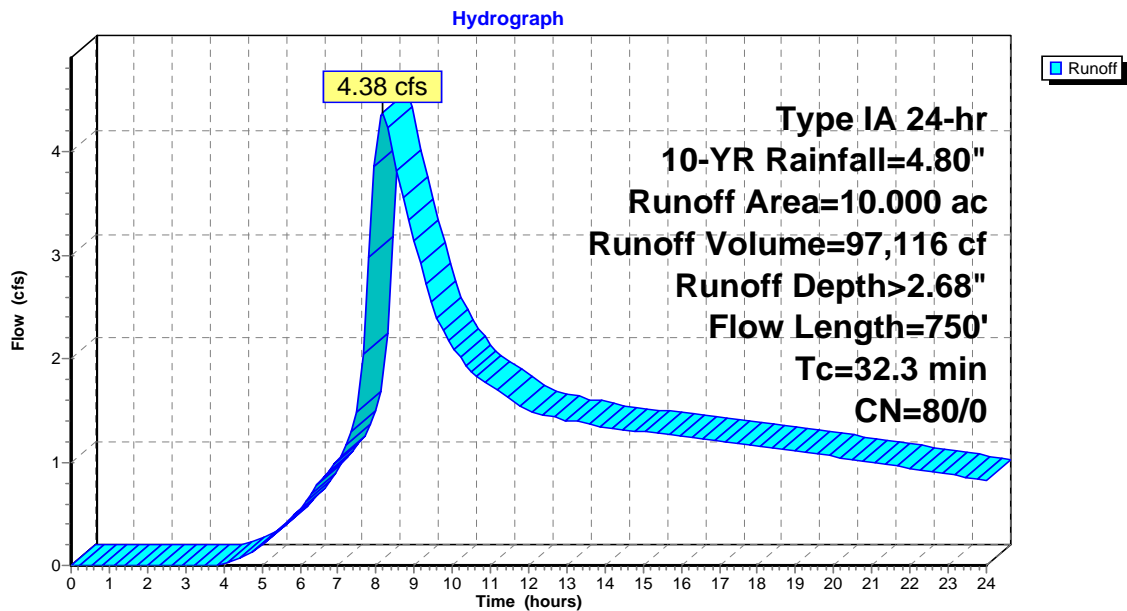
Runoff = 4.38 cfs @ 8.18 hrs, Volume= 97,116 cf, Depth> 2.68"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Type IA 24-hr 10-YR Rainfall=4.80"

Area (ac)	CN	Description
* 10.000	80	Row Crops (C + CR)
10.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.9	300	0.0200	0.17		Sheet Flow, Cultivated: Residue>20% n= 0.170 P2= 2.60"
3.4	450	0.0600	2.20		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
32.3	750	Total			

Subcatchment 2S: Existing Upstream





**Appendix B.5:
Pre-Developed Hydrograph and Flow
Information 25-Year Storm Event**

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Type IA 24-hr 25-YR Rainfall=5.50"

Printed 5/28/2019

Time span=0.00-24.00 hrs, dt=0.15 hrs, 161 points

Runoff by SBUH method, Split Pervious/Imperv.

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Pre-Developed

Runoff Area=1,061,450 sf 0.00% Impervious Runoff Depth>3.30"
Flow Length=900' Tc=23.8 min CN=80/0 Runoff=15.03 cfs 291,524 cf

Subcatchment 2S: Existing Upstream

Runoff Area=10,000 ac 0.00% Impervious Runoff Depth>3.28"
Flow Length=750' Tc=32.3 min CN=80/0 Runoff=5.56 cfs 119,130 cf

Total Runoff Area = 1,497,050 sf Runoff Volume = 410,653 cf Average Runoff Depth = 3.29"
100.00% Pervious = 1,497,050 sf 0.00% Impervious = 0 sf

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Type IA 24-hr 25-YR Rainfall=5.50"

Printed 5/28/2019

Summary for Subcatchment 1S: Pre-Developed

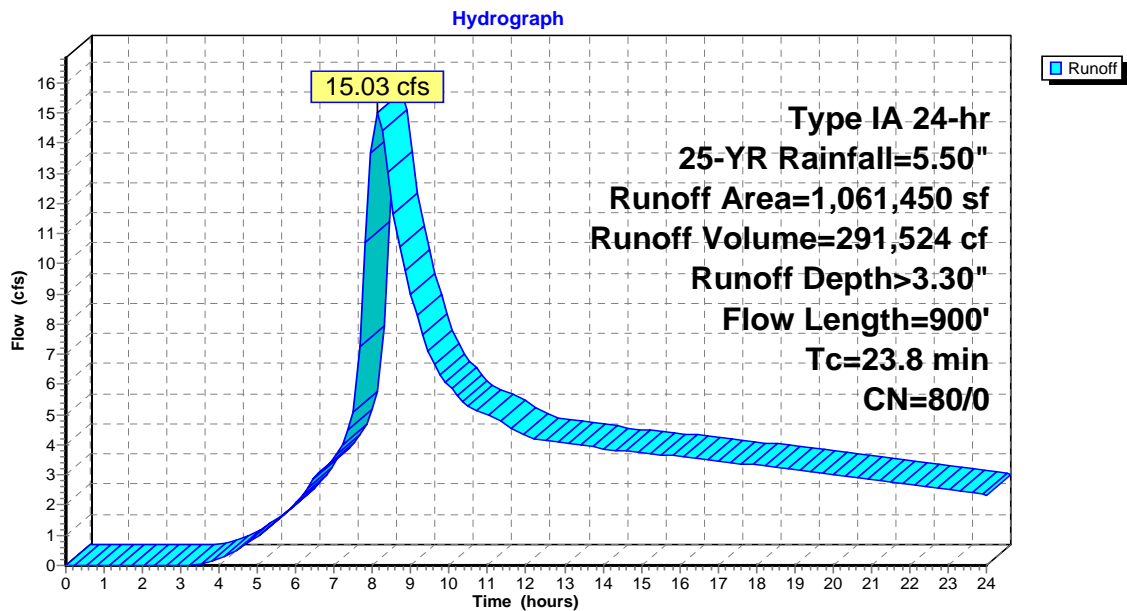
Runoff = 15.03 cfs @ 8.13 hrs, Volume= 291,524 cf, Depth> 3.30"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Type IA 24-hr 25-YR Rainfall=5.50"

Area (sf)	CN	Description
* 1,061,450	80	Row Crops (C + CR)
1,061,450		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.6	300	0.0600	0.27		Sheet Flow, Cultivated: Residue>20% n= 0.170 P2= 2.60"
5.2	600	0.0450	1.91		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
23.8	900	Total			

Subcatchment 1S: Pre-Developed



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Type IA 24-hr 25-YR Rainfall=5.50"

Printed 5/28/2019

Summary for Subcatchment 2S: Existing Upstream

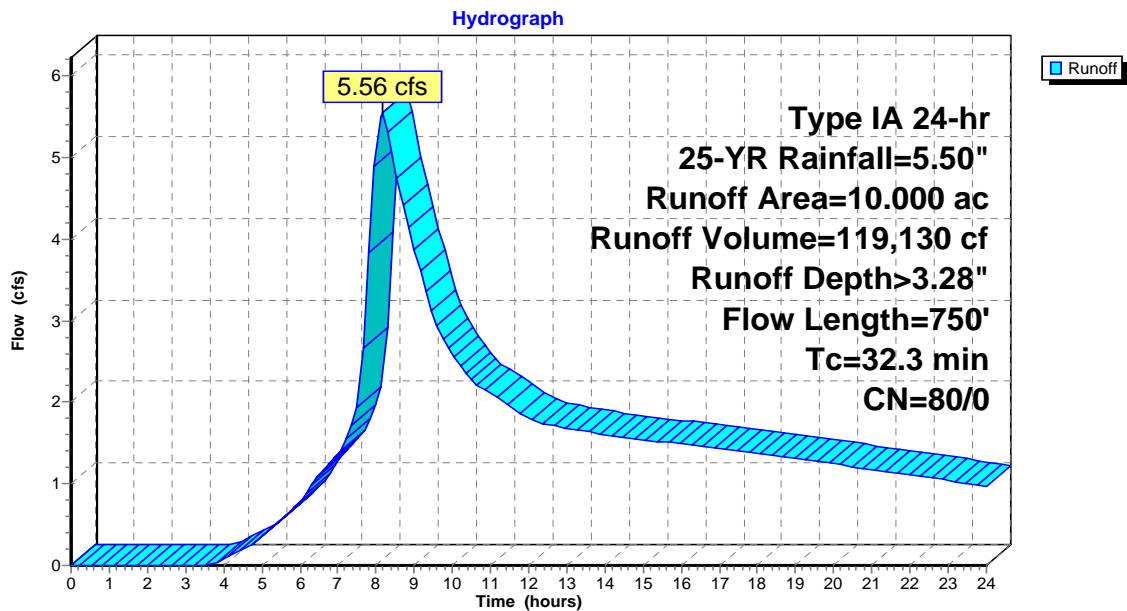
Runoff = 5.56 cfs @ 8.17 hrs, Volume= 119,130 cf, Depth> 3.28"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Type IA 24-hr 25-YR Rainfall=5.50"

Area (ac)	CN	Description
* 10.000	80	Row Crops (C + CR)
10.000		100.00% Pervious Area

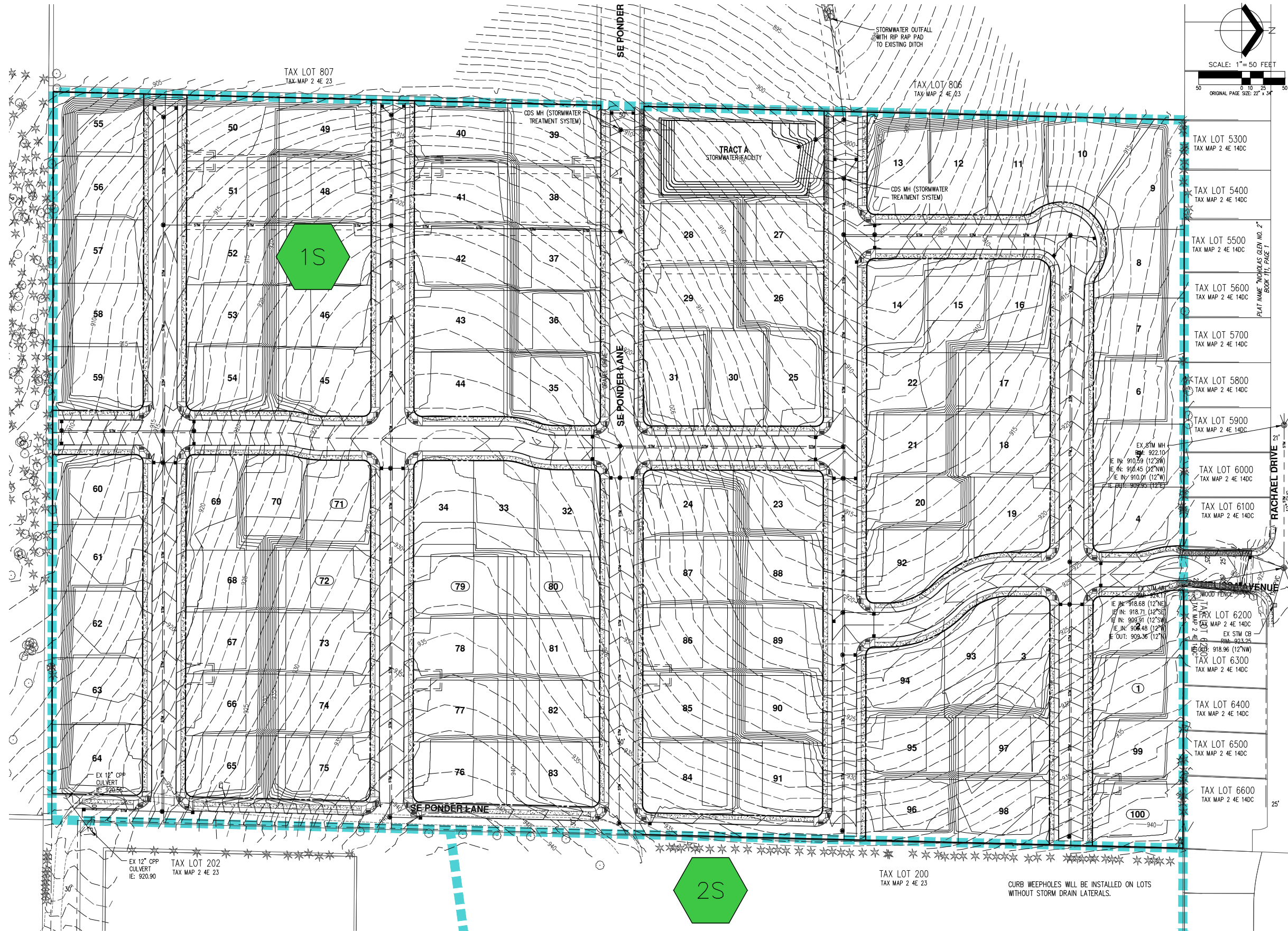
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.9	300	0.0200	0.17		Sheet Flow, Cultivated: Residue>20% n= 0.170 P2= 2.60"
3.4	450	0.0600	2.20		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
32.3	750	Total			

Subcatchment 2S: Existing Upstream





Appendix C.1: Post-Developed Catchment Map and Detail



AKS
 AKS ENGINEERING & FORESTRY, LLC
 700 N. WASHINGTON, 4TH FLOOR, SUITE 100
 TUALATIN, OR 97146
 503.563.6151
 WWW.AKS-ENG.COM
 ENGINEERING - SURVEYING - NATURAL RESOURCES
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POST-DEVELOPED BASIN MAP
BAILEY MEADOWS
SANDY, OREGON

JOB NUMBER: 7107
 DATE: 06/12/2019
 DESIGNED BY: VN
 DRAWN BY: CL
 CHECKED BY: RSW

AKS DRAWING FILE: 7107 POST-DEVELOPED MAP.DWG | LAYOUT: 1

CURB WEEPHOLES WILL BE INSTALLED ON LOTS WITHOUT STORM DRAIN LATERALS.

EX 12" CPP CULVERT IE: 920.90
 TAX LOT 202 TAX MAP 2 4E 23

TAX LOT 200 TAX MAP 2 4E 23

EX 8" MH IE: 922.10
 IE IN: 910.59 (12'2W)
 IE IN: 910.45 (12'2NW)
 IE IN: 910.01 (12'2W)
 IE IN: 909.95 (12'2E)

EX 12" CPP CULVERT IE: 920.90
 TAX LOT 202 TAX MAP 2 4E 23

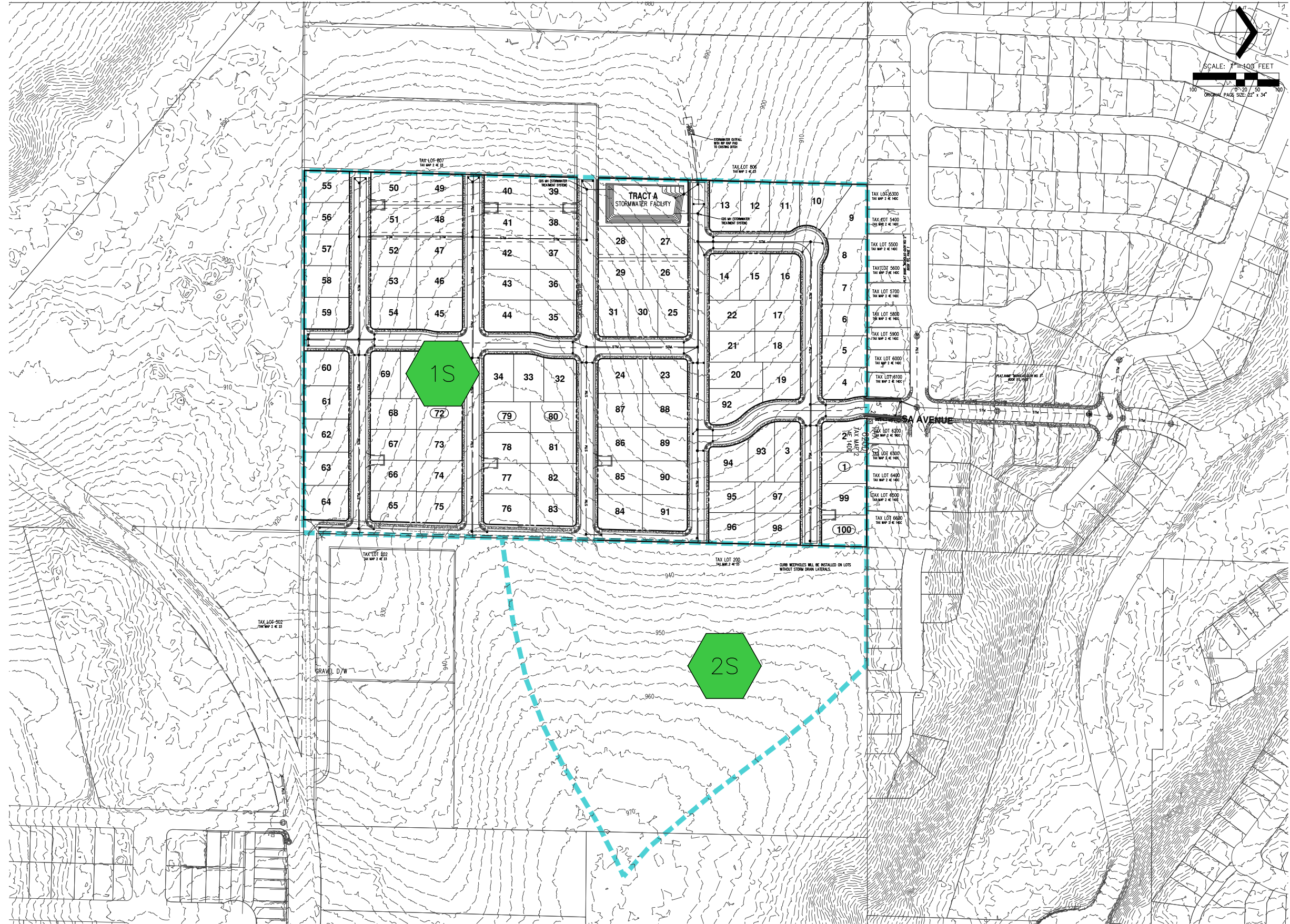
EX 8" MH IE: 922.10
 IE IN: 918.68 (12'2NE)
 IE IN: 918.71 (12'2SE)
 IE IN: 909.91 (12'2SW)
 IE IN: 908.48 (12'2W)
 IE OUT: 909.36 (12'2N)

EX 8" MH IE: 922.10
 IE IN: 918.96 (12'2NW)

EX 8" MH IE: 922.10
 IE IN: 918.68 (12'2NE)
 IE IN: 918.71 (12'2SE)
 IE IN: 909.91 (12'2SW)
 IE IN: 908.48 (12'2W)
 IE OUT: 909.36 (12'2N)

EX 8" MH IE: 922.10
 IE IN: 918.96 (12'2NW)

AKS DRAWING FILE: 7107 POST-DEVELOPED MAP.DWG | LAYOUT: 2



POST-DEVELOPED BASIN MAP

BAILEY MEADOWS
SANDY, OREGON

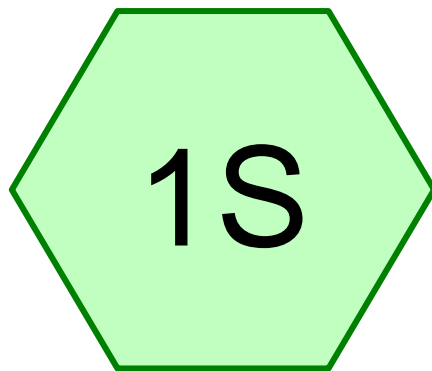
JOB NUMBER:	7107
DATE:	06/12/2019
DESIGNED BY:	VN
DRAWN BY:	CL
CHECKED BY:	RSW

AKS
 AKS ENGINEERING & FORESTRY, LLC
 10000 N. HANCOCK RD., STE 100
 TUALATIN, OR 97062
 503.563.6151
 WWW.AKS-ENC.COM

ENGINEERING - SURVEYING - NATURAL RESOURCES
 FORESTRY - PLANNING - LANDSCAPE ARCHITECTURE



**Appendix C.2:
Post-Developed Hydrograph and Flow
Information Water Quality Storm Event**



Post-Developed



Routing Diagram for 7107 HydroCAD WQ
Prepared by AKS Engineering & Forestry, LLC, Printed 5/28/2019
HydroCAD® 10.00-20 s/n 05095 © 2017 HydroCAD Software Solutions LLC

7107 HydroCAD WQ

Prepared by AKS Engineering & Forestry, LLC

Printed 5/28/2019

HydroCAD® 10.00-20 s/n 05095 © 2017 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	C	Description (subcatchment-numbers)
272,250	0.90	99 Lots - 2750 sf per lot (1S)
218,400	0.90	Pavement and sidewalk (1S)
490,650	0.90	TOTAL AREA

7107 HydroCAD WQ

Prepared by AKS Engineering & Forestry, LLC

HydroCAD® 10.00-20 s/n 05095 © 2017 HydroCAD Software Solutions LLC

Rainfall Duration=5 min, Inten=0.20 in/hr

Printed 5/28/2019

Time span=0.00-3.00 hrs, dt=0.01 hrs, 301 points

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Post-Developed

Runoff Area=490,650 sf 0.00% Impervious Runoff Depth=0.01"

Tc=5.0 min C=0.90 Runoff=1.97 cfs 612 cf

Total Runoff Area = 490,650 sf Runoff Volume = 612 cf Average Runoff Depth = 0.01"

100.00% Pervious = 490,650 sf 0.00% Impervious = 0 sf

7107 HydroCAD WQ

Prepared by AKS Engineering & Forestry, LLC
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Rainfall Duration=5 min, Inten=0.20 in/hr

Printed 5/28/2019

Summary for Subcatchment 1S: Post-Developed

Runoff = 1.97 cfs @ 0.08 hrs, Volume= 612 cf, Depth= 0.01"

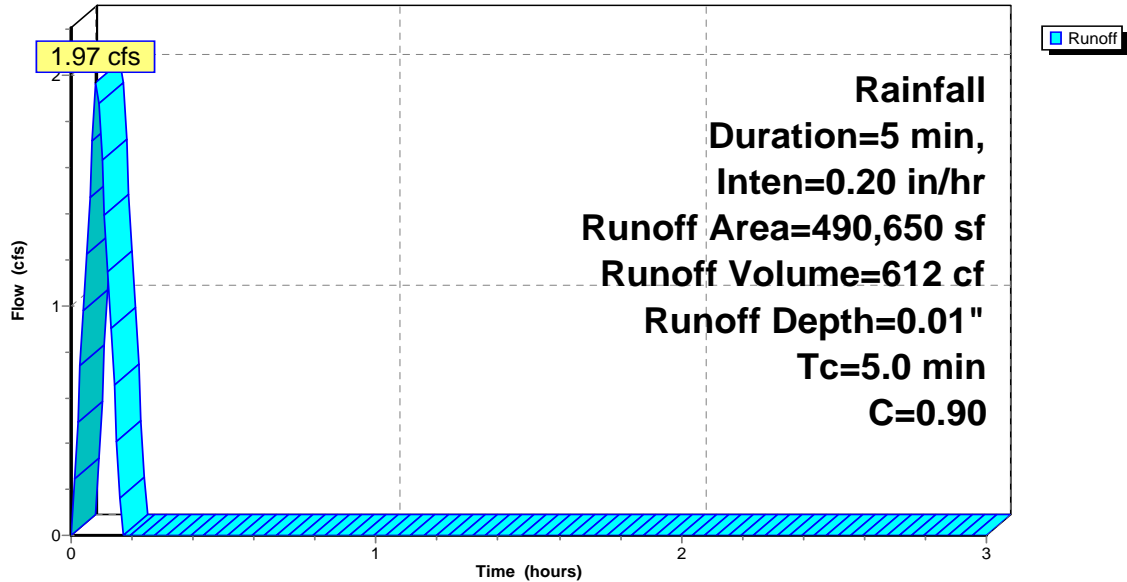
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
 Rainfall Duration=5 min, Inten=0.20 in/hr

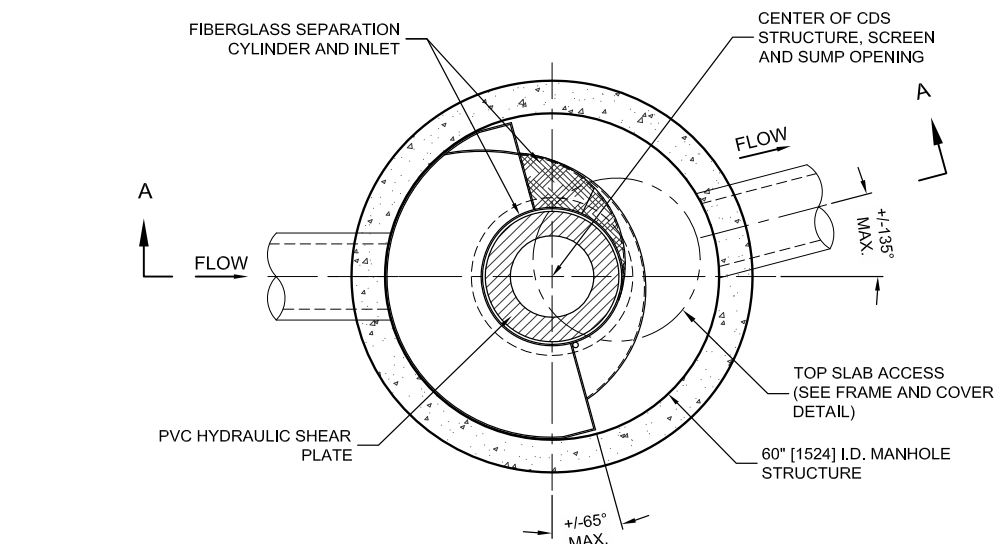
Area (sf)	C	Description
272,250	0.90	99 Lots - 2750 sf per lot
218,400	0.90	Pavement and sidewalk
490,650	0.90	Weighted Average
490,650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

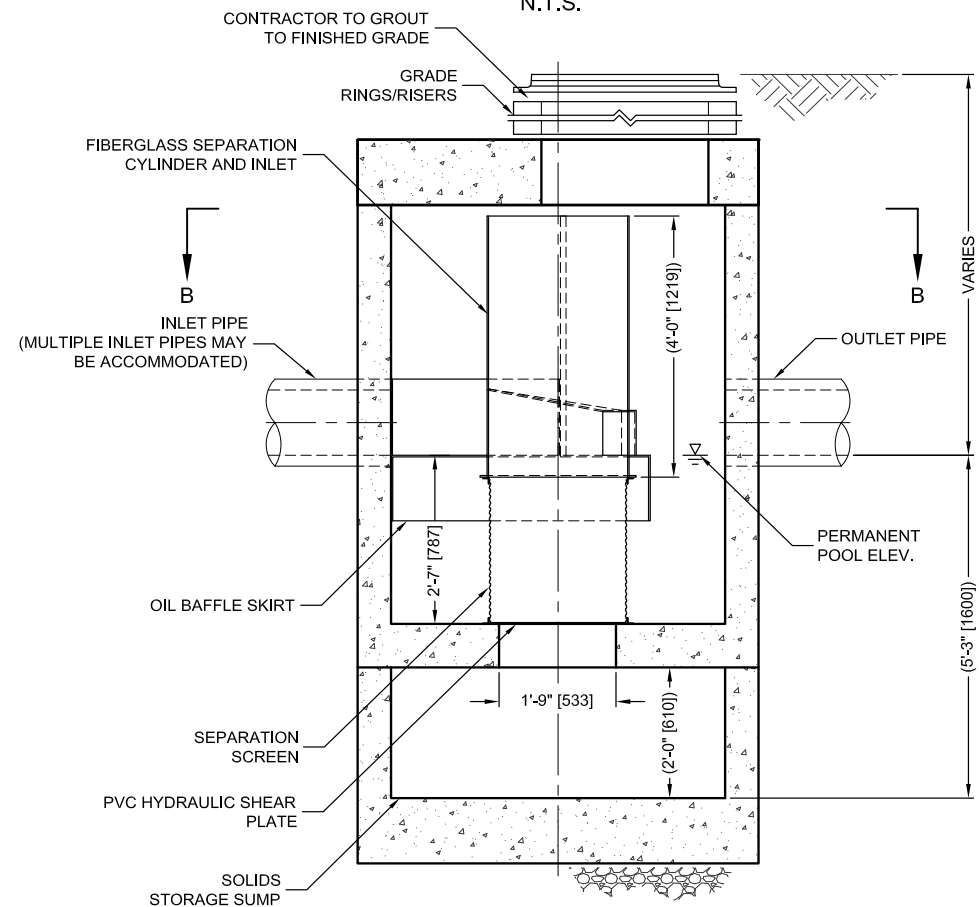
Subcatchment 1S: Post-Developed

Hydrograph



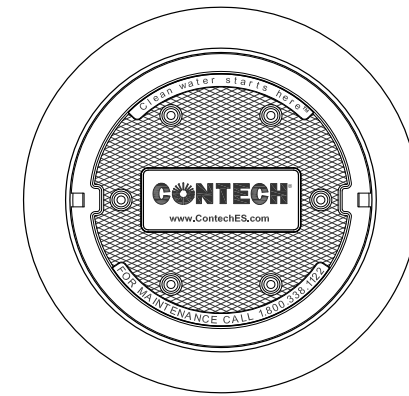


PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.

CDS2020-5-C DESIGN NOTES	
CDS2020-5-C RATED TREATMENT CAPACITY IS 1.1 CFS [31.2 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 14.0 CFS [396 L/s]. IF THE SITE CONDITIONS EXCEED 14.0 CFS [396 L/s], AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.	
THE STANDARD CDS2020-5-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.	
CONFIGURATION DESCRIPTION	
GRATED INLET ONLY (NO INLET PIPE)	
GRATED INLET WITH INLET PIPE OR PIPES	
CURB INLET ONLY (NO INLET PIPE)	
CURB INLET WITH INLET PIPE OR PIPES	
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)	
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS	



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS			
STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST	WIDTH	HEIGHT	
	*	*	
NOTES/SPECIAL REQUIREMENTS:			
* PER ENGINEER OF RECORD			

- GENERAL NOTES**
- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
 - DIMENSIONS MARKED WITH () ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
 - FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
 - CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
 - STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
 - PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.
- INSTALLATION NOTES**
- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
 - CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
 - CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
 - CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
 - CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH
ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

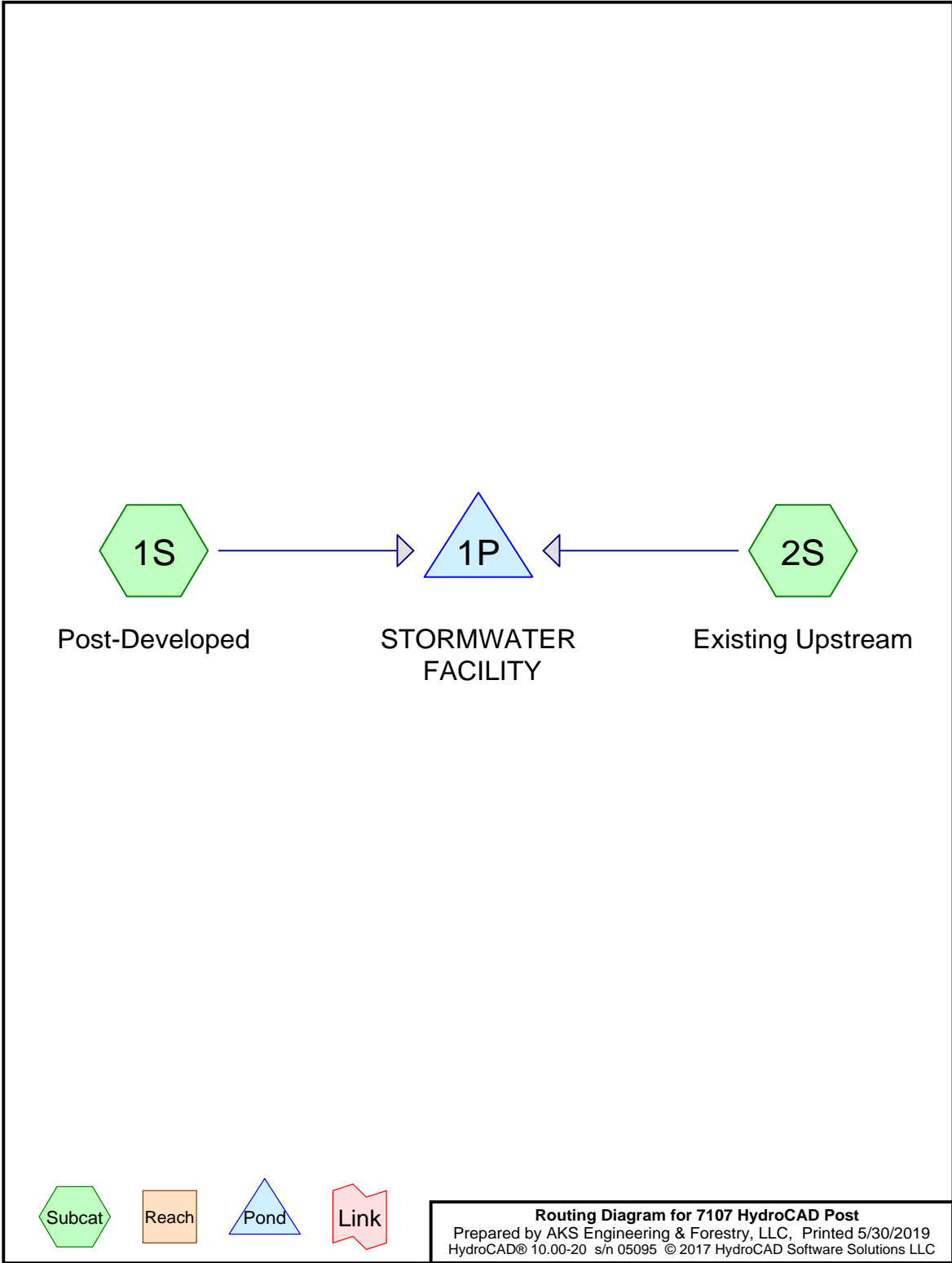
CDS2020-5-C
INLINE CDS
STANDARD DETAIL

I:\STORMWATER\COMMISSIONS\22_CDS\40_STANDARD_DRAWINGS\INLINE (CDS-C)\DWG\CDS2020-5-C-DTL.DWG 5/13/2014 5:55 PM





Appendix C.3: Post-Developed Hydrograph and Flow Information 2-Year Storm Event



7107 HydroCAD Post

Prepared by AKS Engineering & Forestry, LLC

Printed 5/30/2019

HydroCAD® 10.00-20 s/n 05095 © 2017 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
272,250	98	99 Lots - 2750 sf per lot (1S)
570,800	74	Lawns (1S)
218,400	98	Pavement and sidewalk (1S)
435,600	80	Row Crops (C + CR) (2S)
1,497,050	84	TOTAL AREA

7107 HydroCAD Post

Prepared by AKS Engineering & Forestry, LLC
HydroCAD® 10.00-20 s/n 05095 © 2017 HydroCAD Software Solutions LLC

Type IA 24-hr 2-YR Rainfall=3.50"

Printed 5/30/2019

Time span=0.00-24.00 hrs, dt=0.15 hrs, 161 points

Runoff by SBUH method, Split Pervious/Imperv.

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Post-Developed

Runoff Area=1,061,450 sf 46.22% Impervious Runoff Depth>2.17"
Tc=5.0 min CN=74/98 Runoff=12.23 cfs 192,130 cf

Subcatchment 2S: Existing Upstream

Runoff Area=10.000 ac 0.00% Impervious Runoff Depth>1.61"
Flow Length=750' Tc=32.3 min CN=80/0 Runoff=2.41 cfs 58,339 cf

Pond 1P: STORMWATER FACILITY

Peak Elev=896.67' Storage=16,658 cf Inflow=14.30 cfs 250,470 cf
Outflow=8.68 cfs 249,710 cf

Total Runoff Area = 1,497,050 sf Runoff Volume = 250,470 cf Average Runoff Depth = 2.01"
67.23% Pervious = 1,006,400 sf 32.77% Impervious = 490,650 sf

7107 HydroCAD Post

Prepared by AKS Engineering & Forestry, LLC
 HydroCAD® 10.00-20 s/n 05095 © 2017 HydroCAD Software Solutions LLC

Type IA 24-hr 2-YR Rainfall=3.50"

Printed 5/30/2019

Summary for Subcatchment 1S: Post-Developed

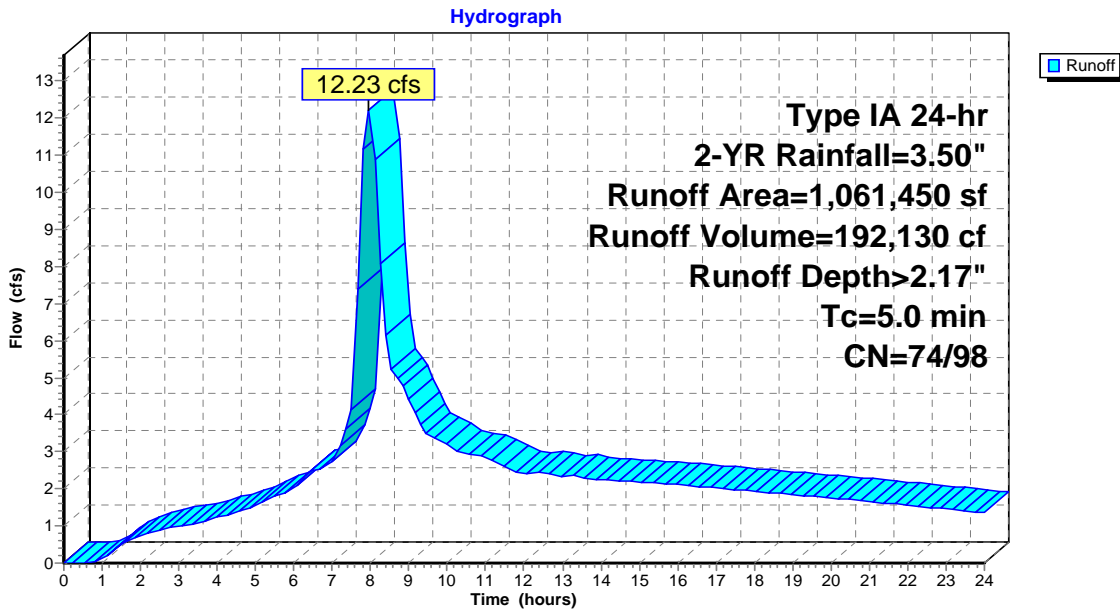
Runoff = 12.23 cfs @ 7.94 hrs, Volume= 192,130 cf, Depth > 2.17"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Type IA 24-hr 2-YR Rainfall=3.50"

Area (sf)	CN	Description
* 272,250	98	99 Lots - 2750 sf per lot
* 218,400	98	Pavement and sidewalk
* 570,800	74	Lawns
1,061,450	85	Weighted Average
570,800		53.78% Pervious Area
490,650		46.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment 1S: Post-Developed



7107 HydroCAD Post

Prepared by AKS Engineering & Forestry, LLC
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Type IA 24-hr 2-YR Rainfall=3.50"

Printed 5/30/2019

Summary for Subcatchment 2S: Existing Upstream

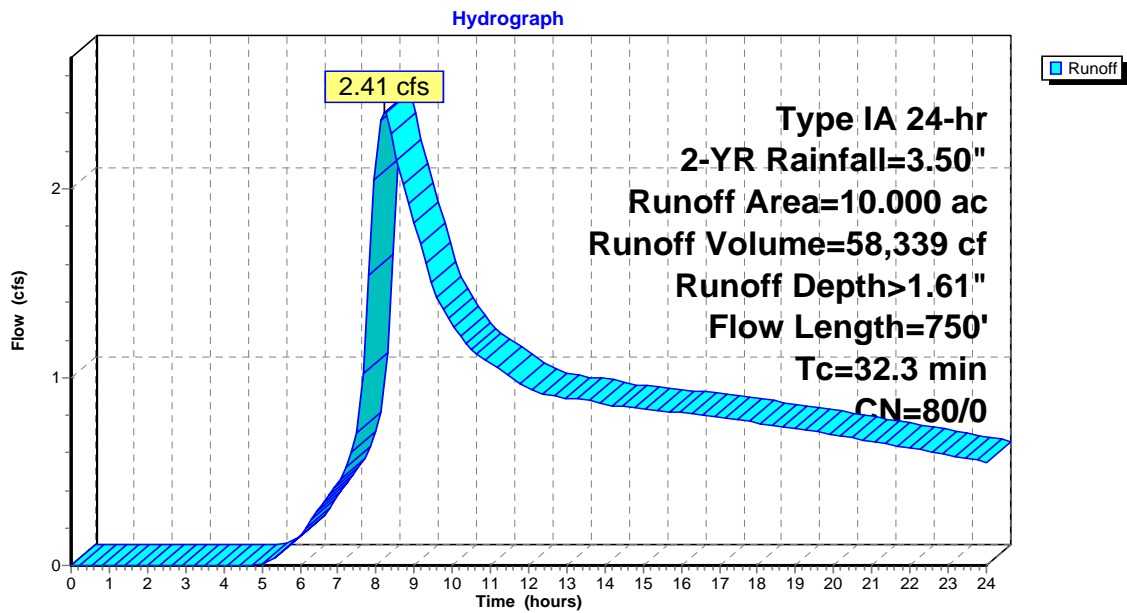
Runoff = 2.41 cfs @ 8.21 hrs, Volume= 58,339 cf, Depth> 1.61"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Type IA 24-hr 2-YR Rainfall=3.50"

Area (ac)	CN	Description
* 10.000	80	Row Crops (C + CR)
10.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.9	300	0.0200	0.17		Sheet Flow, Cultivated: Residue>20% n= 0.170 P2= 2.60"
3.4	450	0.0600	2.20		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
32.3	750	Total			

Subcatchment 2S: Existing Upstream



7107 HydroCAD Post

Prepared by AKS Engineering & Forestry, LLC
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Type IA 24-hr 2-YR Rainfall=3.50"
 Printed 5/30/2019

Summary for Pond 1P: STORMWATER FACILITY

Inflow Area = 1,497,050 sf, 32.77% Impervious, Inflow Depth > 2.01" for 2-YR event
 Inflow = 14.30 cfs @ 7.97 hrs, Volume= 250,470 cf
 Outflow = 8.68 cfs @ 8.41 hrs, Volume= 249,710 cf, Atten= 39%, Lag= 26.4 min
 Primary = 8.68 cfs @ 8.41 hrs, Volume= 249,710 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Peak Elev= 896.67' @ 8.41 hrs Surf.Area= 10,853 sf Storage= 16,658 cf

Plug-Flow detention time= 14.5 min calculated for 249,710 cf (100% of inflow)
 Center-of-Mass det. time= 12.3 min (760.6 - 748.3)

Volume	Invert	Avail.Storage	Storage Description
#1	895.00'	58,640 cf	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
895.00	9,160	0	0	9,160
896.00	10,180	9,666	9,666	10,253
897.00	11,200	10,686	20,351	11,354
898.00	12,200	11,696	32,048	12,443
899.00	13,300	12,746	44,794	13,632
900.00	14,400	13,846	58,640	14,829

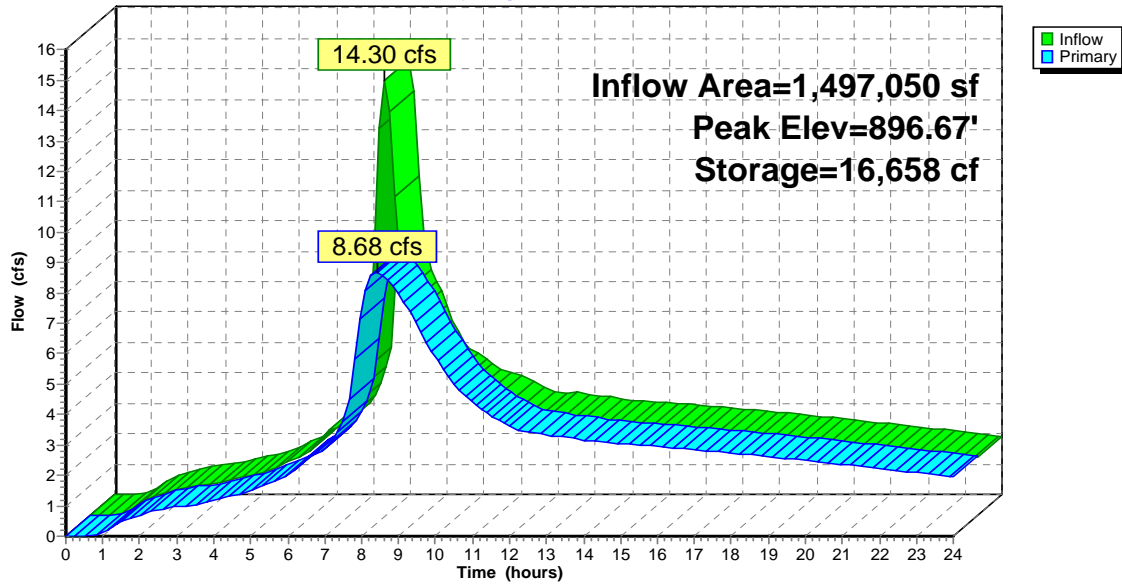
Device	Routing	Invert	Outlet Devices
#1	Primary	895.00'	16.0" Horiz. Orifice/Grate C= 0.600
#2	Primary	896.70'	13.0" Horiz. Orifice/Grate C= 0.600
#3	Primary	898.50'	24.0" Horiz. Riser Overflow Inside of Control MH C= 0.600

Primary OutFlow Max=8.67 cfs @ 8.41 hrs HW=896.66' (Free Discharge)

- 1=Orifice/Grate (Orifice Controls 8.67 cfs @ 6.21 fps)
- 2=Orifice/Grate (Controls 0.00 cfs)
- 3=Riser Overflow Inside of Control MH (Controls 0.00 cfs)

Pond 1P: STORMWATER FACILITY

Hydrograph





**Appendix C.4:
Post-Developed Hydrograph and Flow
Information 5-Year Storm Event**

7107 HydroCAD Post

Prepared by AKS Engineering & Forestry, LLC
HydroCAD® 10.00-20 s/n 05095 © 2017 HydroCAD Software Solutions LLC

Type IA 24-hr 5-YR Rainfall=4.50"

Printed 5/30/2019

Time span=0.00-24.00 hrs, dt=0.15 hrs, 161 points

Runoff by SBUH method, Split Pervious/Imperv.

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Post-Developed

Runoff Area=1,061,450 sf 46.22% Impervious Runoff Depth>3.03"
Tc=5.0 min CN=74/98 Runoff=17.45 cfs 267,615 cf

Subcatchment 2S: Existing Upstream

Runoff Area=10.000 ac 0.00% Impervious Runoff Depth>2.42"
Flow Length=750' Tc=32.3 min CN=80/0 Runoff=3.91 cfs 87,888 cf

Pond 1P: STORMWATER FACILITY

Peak Elev=897.41' Storage=25,071 cf Inflow=20.88 cfs 355,502 cf
Outflow=14.20 cfs 354,070 cf

Total Runoff Area = 1,497,050 sf Runoff Volume = 355,502 cf Average Runoff Depth = 2.85"
67.23% Pervious = 1,006,400 sf 32.77% Impervious = 490,650 sf

7107 HydroCAD Post

Prepared by AKS Engineering & Forestry, LLC
 HydroCAD® 10.00-20 s/n 05095 © 2017 HydroCAD Software Solutions LLC

Type IA 24-hr 5-YR Rainfall=4.50"

Printed 5/30/2019

Summary for Subcatchment 1S: Post-Developed

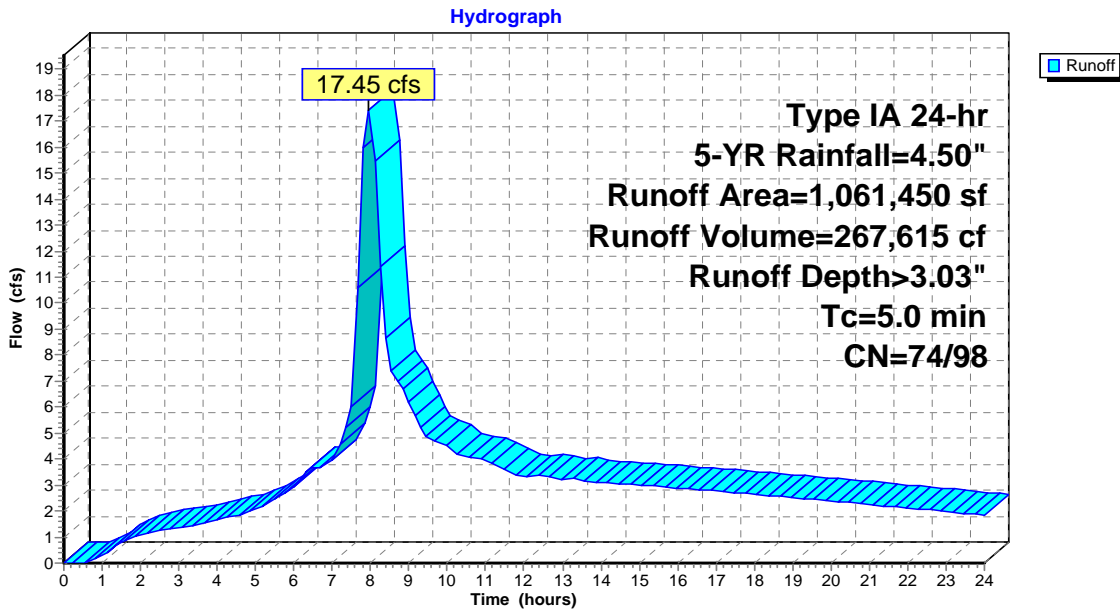
Runoff = 17.45 cfs @ 7.94 hrs, Volume= 267,615 cf, Depth> 3.03"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Type IA 24-hr 5-YR Rainfall=4.50"

Area (sf)	CN	Description
* 272,250	98	99 Lots - 2750 sf per lot
* 218,400	98	Pavement and sidewalk
* 570,800	74	Lawns
1,061,450	85	Weighted Average
570,800		53.78% Pervious Area
490,650		46.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment 1S: Post-Developed



7107 HydroCAD Post

Prepared by AKS Engineering & Forestry, LLC
 HydroCAD® 10.00-20 s/n 05095 © 2017 HydroCAD Software Solutions LLC

Type IA 24-hr 5-YR Rainfall=4.50"

Printed 5/30/2019

Summary for Subcatchment 2S: Existing Upstream

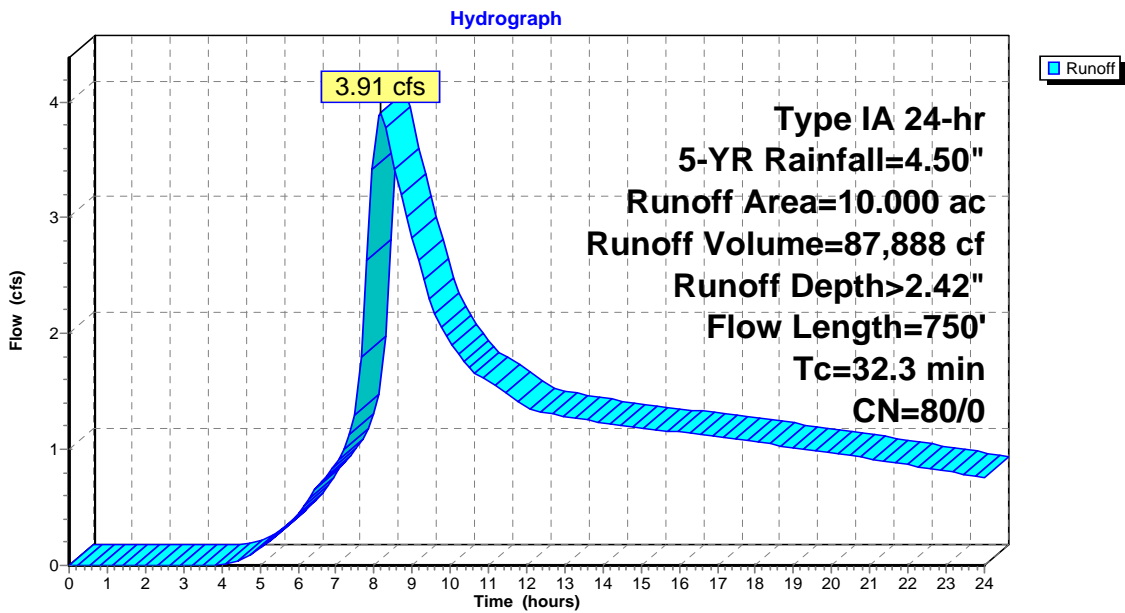
Runoff = 3.91 cfs @ 8.18 hrs, Volume= 87,888 cf, Depth> 2.42"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Type IA 24-hr 5-YR Rainfall=4.50"

Area (ac)	CN	Description
* 10.000	80	Row Crops (C + CR)
10.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.9	300	0.0200	0.17		Sheet Flow, Cultivated: Residue>20% n= 0.170 P2= 2.60"
3.4	450	0.0600	2.20		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
32.3	750	Total			

Subcatchment 2S: Existing Upstream



7107 HydroCAD Post

Prepared by AKS Engineering & Forestry, LLC
 HydroCAD® 10.00-20 s/n 05095 © 2017 HydroCAD Software Solutions LLC

Type IA 24-hr 5-YR Rainfall=4.50"
 Printed 5/30/2019

Summary for Pond 1P: STORMWATER FACILITY

Inflow Area = 1,497,050 sf, 32.77% Impervious, Inflow Depth > 2.85" for 5-YR event
 Inflow = 20.88 cfs @ 7.96 hrs, Volume= 355,502 cf
 Outflow = 14.20 cfs @ 8.32 hrs, Volume= 354,070 cf, Atten= 32%, Lag= 21.1 min
 Primary = 14.20 cfs @ 8.32 hrs, Volume= 354,070 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Peak Elev= 897.41' @ 8.32 hrs Surf.Area= 11,609 sf Storage= 25,071 cf

Plug-Flow detention time= 18.3 min calculated for 354,070 cf (100% of inflow)
 Center-of-Mass det. time= 15.4 min (754.5 - 739.1)

Volume	Invert	Avail.Storage	Storage Description
#1	895.00'	58,640 cf	Custom Stage Data (Pyramidal) Listed below (Recalc)

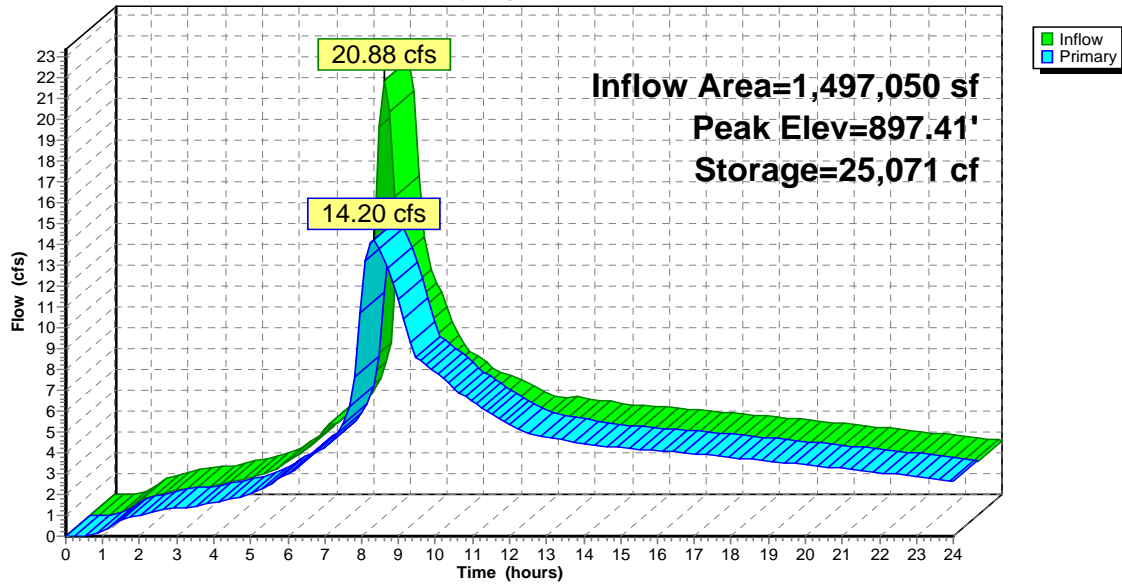
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
895.00	9,160	0	0	9,160
896.00	10,180	9,666	9,666	10,253
897.00	11,200	10,686	20,351	11,354
898.00	12,200	11,696	32,048	12,443
899.00	13,300	12,746	44,794	13,632
900.00	14,400	13,846	58,640	14,829

Device	Routing	Invert	Outlet Devices
#1	Primary	895.00'	16.0" Horiz. Orifice/Grate C= 0.600
#2	Primary	896.70'	13.0" Horiz. Orifice/Grate C= 0.600
#3	Primary	898.50'	24.0" Horiz. Riser Overflow Inside of Control MH C= 0.600

Primary OutFlow Max=14.09 cfs @ 8.32 hrs HW=897.39' (Free Discharge)
 1=Orifice/Grate (Orifice Controls 10.40 cfs @ 7.45 fps)
 2=Orifice/Grate (Orifice Controls 3.69 cfs @ 4.00 fps)
 3=Riser Overflow Inside of Control MH (Controls 0.00 cfs)

Pond 1P: STORMWATER FACILITY

Hydrograph





**Appendix C.5:
Post-Developed Hydrograph and Flow
Information 10-Year Storm Event**

7107 HydroCAD Post

Prepared by AKS Engineering & Forestry, LLC
HydroCAD® 10.00-20 s/n 05095 © 2017 HydroCAD Software Solutions LLC

Type IA 24-hr 10-YR Rainfall=4.80"

Printed 5/30/2019

Time span=0.00-24.00 hrs, dt=0.15 hrs, 161 points

Runoff by SBUH method, Split Pervious/Imperv.

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Post-Developed

Runoff Area=1,061,450 sf 46.22% Impervious Runoff Depth>3.29"
Tc=5.0 min CN=74/98 Runoff=19.07 cfs 290,920 cf

Subcatchment 2S: Existing Upstream

Runoff Area=10.000 ac 0.00% Impervious Runoff Depth>2.68"
Flow Length=750' Tc=32.3 min CN=80/0 Runoff=4.38 cfs 97,116 cf

Pond 1P: STORMWATER FACILITY

Peak Elev=897.68' Storage=28,208 cf Inflow=22.93 cfs 388,036 cf
Outflow=15.41 cfs 386,357 cf

Total Runoff Area = 1,497,050 sf Runoff Volume = 388,036 cf Average Runoff Depth = 3.11"
67.23% Pervious = 1,006,400 sf 32.77% Impervious = 490,650 sf

7107 HydroCAD Post

Prepared by AKS Engineering & Forestry, LLC
 HydroCAD® 10.00-20 s/n 05095 © 2017 HydroCAD Software Solutions LLC

Type IA 24-hr 10-YR Rainfall=4.80"

Printed 5/30/2019

Summary for Subcatchment 1S: Post-Developed

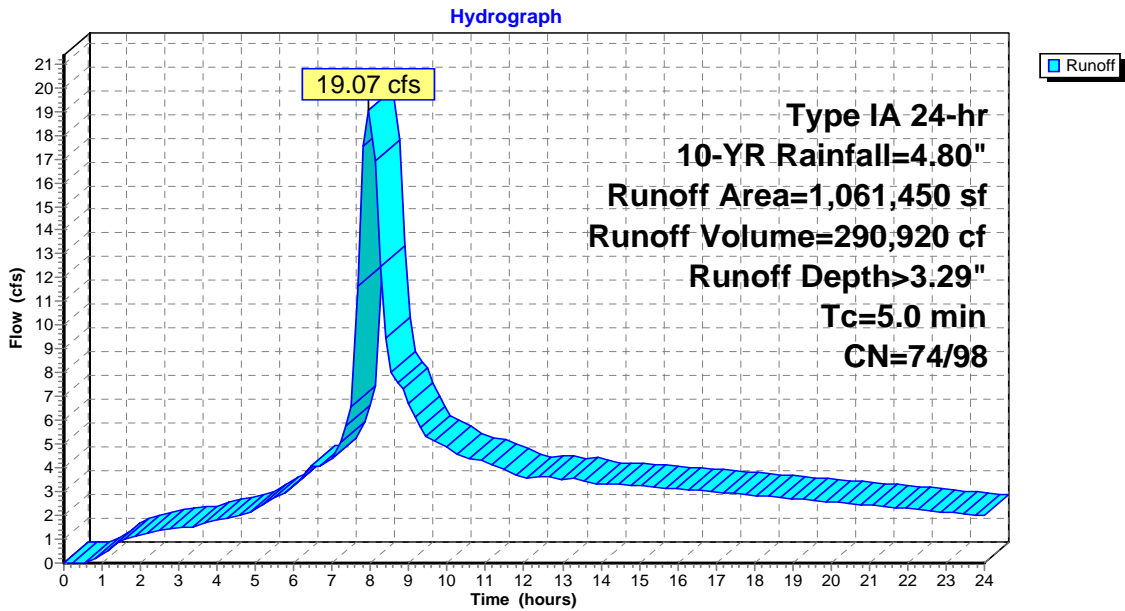
Runoff = 19.07 cfs @ 7.94 hrs, Volume= 290,920 cf, Depth> 3.29"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Type IA 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
* 272,250	98	99 Lots - 2750 sf per lot
* 218,400	98	Pavement and sidewalk
* 570,800	74	Lawns
1,061,450	85	Weighted Average
570,800		53.78% Pervious Area
490,650		46.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment 1S: Post-Developed



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Type IA 24-hr 10-YR Rainfall=4.80"

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Summary for Subcatchment 2S: Existing Upstream

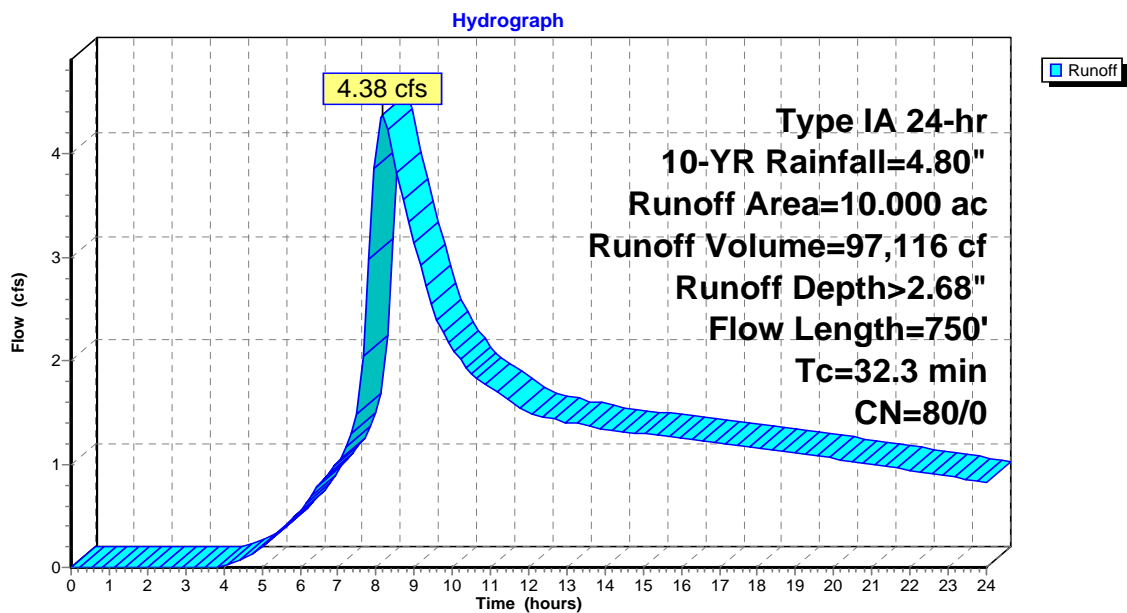
Runoff = 4.38 cfs @ 8.18 hrs, Volume= 97,116 cf, Depth> 2.68"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Type IA 24-hr 10-YR Rainfall=4.80"

Area (ac)	CN	Description
* 10.000	80	Row Crops (C + CR)
10.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.9	300	0.0200	0.17		Sheet Flow, Cultivated: Residue>20% n= 0.170 P2= 2.60"
3.4	450	0.0600	2.20		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
32.3	750	Total			

Subcatchment 2S: Existing Upstream



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Type IA 24-hr 10-YR Rainfall=4.80"

Printed 5/30/2019

Summary for Pond 1P: STORMWATER FACILITY

Inflow Area = 1,497,050 sf, 32.77% Impervious, Inflow Depth > 3.11" for 10-YR event
 Inflow = 22.93 cfs @ 7.96 hrs, Volume= 388,036 cf
 Outflow = 15.41 cfs @ 8.32 hrs, Volume= 386,357 cf, Atten= 33%, Lag= 21.5 min
 Primary = 15.41 cfs @ 8.32 hrs, Volume= 386,357 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Peak Elev= 897.68' @ 8.32 hrs Surf.Area= 11,876 sf Storage= 28,208 cf

Plug-Flow detention time= 19.5 min calculated for 383,957 cf (99% of inflow)
 Center-of-Mass det. time= 16.3 min (752.9 - 736.6)

Volume	Invert	Avail.Storage	Storage Description
#1	895.00'	58,640 cf	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
895.00	9,160	0	0	9,160
896.00	10,180	9,666	9,666	10,253
897.00	11,200	10,686	20,351	11,354
898.00	12,200	11,696	32,048	12,443
899.00	13,300	12,746	44,794	13,632
900.00	14,400	13,846	58,640	14,829

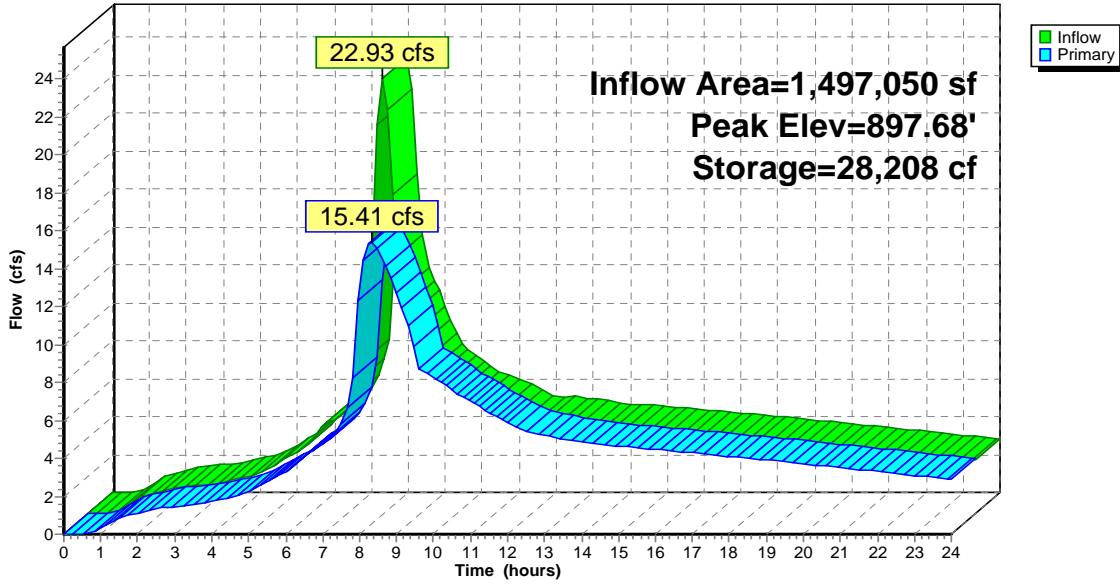
Device	Routing	Invert	Outlet Devices
#1	Primary	895.00'	16.0" Horiz. Orifice/Grate C= 0.600
#2	Primary	896.70'	13.0" Horiz. Orifice/Grate C= 0.600
#3	Primary	898.50'	24.0" Horiz. Riser Overflow Inside of Control MH C= 0.600

Primary OutFlow Max=15.30 cfs @ 8.32 hrs HW=897.66' (Free Discharge)

- 1=Orifice/Grate (Orifice Controls 10.96 cfs @ 7.85 fps)
- 2=Orifice/Grate (Orifice Controls 4.34 cfs @ 4.71 fps)
- 3=Riser Overflow Inside of Control MH (Controls 0.00 cfs)

Pond 1P: STORMWATER FACILITY

Hydrograph





**Appendix C.6:
Post-Developed Hydrograph and Flow
Information 25-Year Storm Event**

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Type IA 24-hr 25-YR Rainfall=5.50"

Printed 5/30/2019

Time span=0.00-24.00 hrs, dt=0.15 hrs, 161 points

Runoff by SBUH method, Split Pervious/Imperv.

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Post-Developed

Runoff Area=1,061,450 sf 46.22% Impervious Runoff Depth>3.91"
Tc=5.0 min CN=74/98 Runoff=22.94 cfs 346,196 cf

Subcatchment 2S: Existing Upstream

Runoff Area=10.000 ac 0.00% Impervious Runoff Depth>3.28"
Flow Length=750' Tc=32.3 min CN=80/0 Runoff=5.56 cfs 119,130 cf

Pond 1P: STORMWATER FACILITY

Peak Elev=898.32' Storage=36,051 cf Inflow=27.83 cfs 465,326 cf
Outflow=17.91 cfs 462,985 cf

Total Runoff Area = 1,497,050 sf Runoff Volume = 465,326 cf Average Runoff Depth = 3.73"
67.23% Pervious = 1,006,400 sf 32.77% Impervious = 490,650 sf

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Prepared by AKS Engineering & Forestry, LLC
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Type IA 24-hr 25-YR Rainfall=5.50"

Printed 5/30/2019

Summary for Subcatchment 1S: Post-Developed

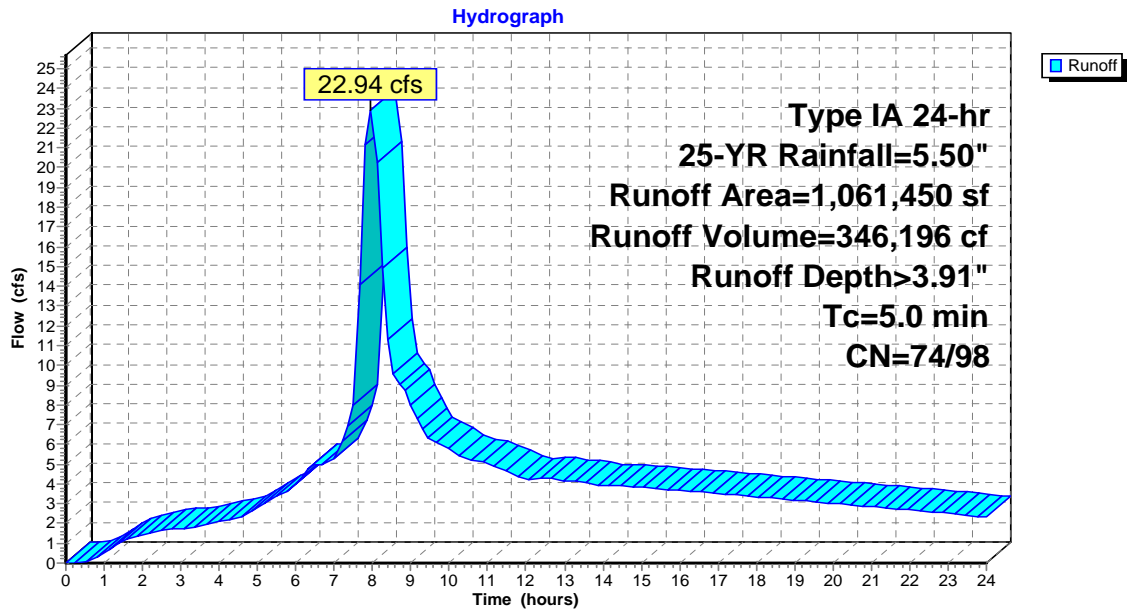
Runoff = 22.94 cfs @ 7.94 hrs, Volume= 346,196 cf, Depth > 3.91"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Type IA 24-hr 25-YR Rainfall=5.50"

Area (sf)	CN	Description
* 272,250	98	99 Lots - 2750 sf per lot
* 218,400	98	Pavement and sidewalk
* 570,800	74	Lawns
1,061,450	85	Weighted Average
570,800		53.78% Pervious Area
490,650		46.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment 1S: Post-Developed



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Type IA 24-hr 25-YR Rainfall=5.50"

Printed 5/30/2019

Summary for Subcatchment 2S: Existing Upstream

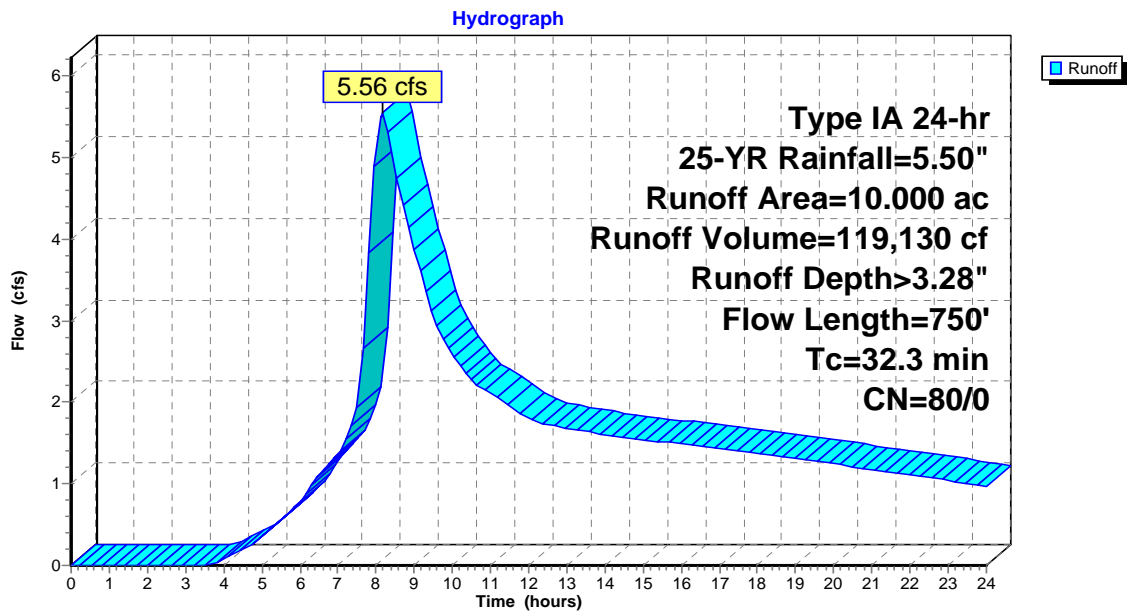
Runoff = 5.56 cfs @ 8.17 hrs, Volume= 119,130 cf, Depth> 3.28"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Type IA 24-hr 25-YR Rainfall=5.50"

Area (ac)	CN	Description
* 10.000	80	Row Crops (C + CR)
10.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.9	300	0.0200	0.17		Sheet Flow, Cultivated: Residue>20% n= 0.170 P2= 2.60"
3.4	450	0.0600	2.20		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
32.3	750	Total			

Subcatchment 2S: Existing Upstream



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Type IA 24-hr 25-YR Rainfall=5.50"

Printed 5/30/2019

Summary for Pond 1P: STORMWATER FACILITY

Inflow Area = 1,497,050 sf, 32.77% Impervious, Inflow Depth > 3.73" for 25-YR event
 Inflow = 27.83 cfs @ 7.96 hrs, Volume= 465,326 cf
 Outflow = 17.91 cfs @ 8.35 hrs, Volume= 462,985 cf, Atten= 36%, Lag= 23.5 min
 Primary = 17.91 cfs @ 8.35 hrs, Volume= 462,985 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Peak Elev= 898.32' @ 8.35 hrs Surf.Area= 12,551 sf Storage= 36,051 cf

Plug-Flow detention time= 22.0 min calculated for 460,109 cf (99% of inflow)
 Center-of-Mass det. time= 18.4 min (749.7 - 731.2)

Volume	Invert	Avail.Storage	Storage Description
#1	895.00'	58,640 cf	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
895.00	9,160	0	0	9,160
896.00	10,180	9,666	9,666	10,253
897.00	11,200	10,686	20,351	11,354
898.00	12,200	11,696	32,048	12,443
899.00	13,300	12,746	44,794	13,632
900.00	14,400	13,846	58,640	14,829

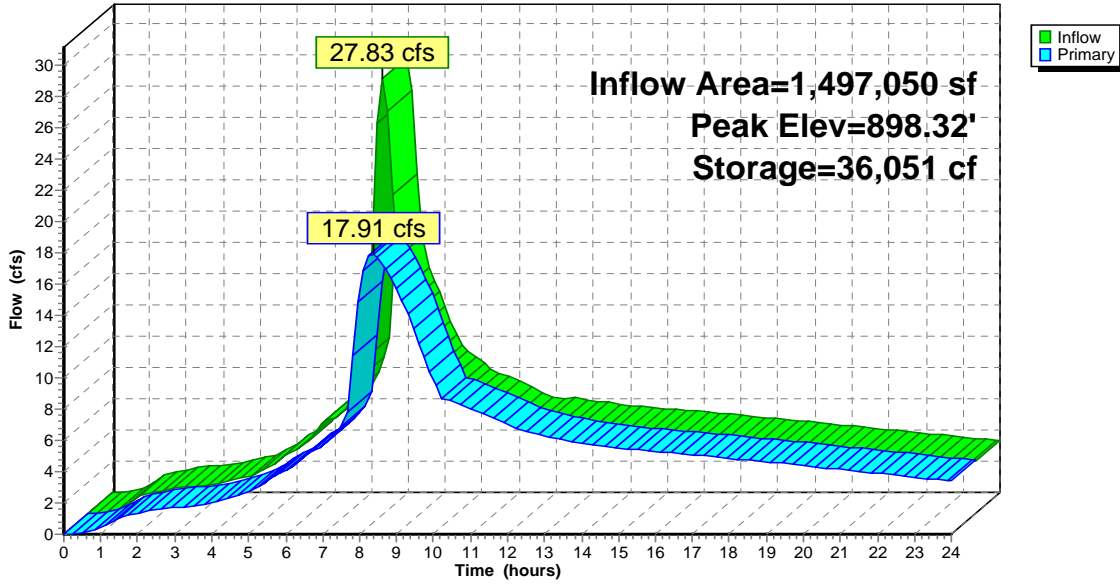
Device	Routing	Invert	Outlet Devices
#1	Primary	895.00'	16.0" Horiz. Orifice/Grate C= 0.600
#2	Primary	896.70'	13.0" Horiz. Orifice/Grate C= 0.600
#3	Primary	898.50'	24.0" Horiz. Riser Overflow Inside of Control MH C= 0.600

Primary OutFlow Max=17.86 cfs @ 8.35 hrs HW=898.31' (Free Discharge)

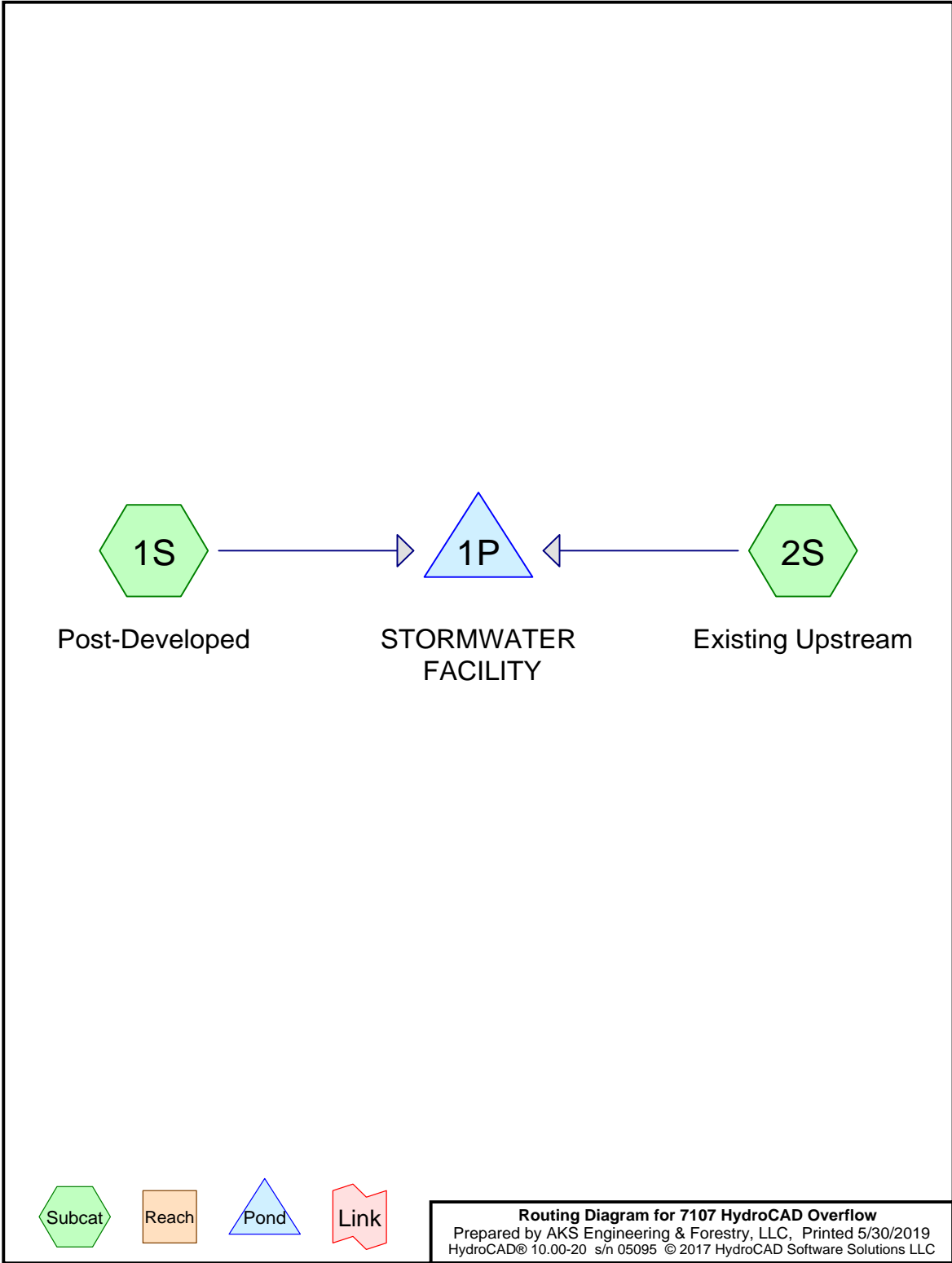
- 1=Orifice/Grate (Orifice Controls 12.23 cfs @ 8.76 fps)
- 2=Orifice/Grate (Orifice Controls 5.63 cfs @ 6.11 fps)
- 3=Riser Overflow Inside of Control MH (Controls 0.00 cfs)

Pond 1P: STORMWATER FACILITY

Hydrograph



Appendix D: Emergency Overflow Calculations



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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
272,250	98	99 Lots - 2750 sf per lot (1S)
570,800	74	Lawns (1S)
218,400	98	Pavement and sidewalk (1S)
435,600	80	Row Crops (C + CR) (2S)
1,497,050	84	TOTAL AREA

7107 HydroCAD Overflow

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Type IA 24-hr 100-YR Rainfall=6.50"

Printed 5/30/2019

Time span=0.00-24.00 hrs, dt=0.15 hrs, 161 points

Runoff by SBUH method, Split Pervious/Imperv.

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Post-Developed

Runoff Area=1,061,450 sf 46.22% Impervious Runoff Depth>4.83"
Tc=5.0 min CN=74/98 Runoff=28.61 cfs 426,873 cf

Subcatchment 2S: Existing Upstream

Runoff Area=10.000 ac 0.00% Impervious Runoff Depth>4.17"
Flow Length=750' Tc=32.3 min CN=80/0 Runoff=7.24 cfs 151,469 cf

Pond 1P: STORMWATER FACILITY

Peak Elev=899.58' Storage=52,646 cf Inflow=35.03 cfs 578,341 cf
Outflow=35.15 cfs 531,569 cf

Total Runoff Area = 1,497,050 sf Runoff Volume = 578,341 cf Average Runoff Depth = 4.64"
67.23% Pervious = 1,006,400 sf 32.77% Impervious = 490,650 sf

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Type IA 24-hr 100-YR Rainfall=6.50"

Printed 5/30/2019

Summary for Subcatchment 1S: Post-Developed

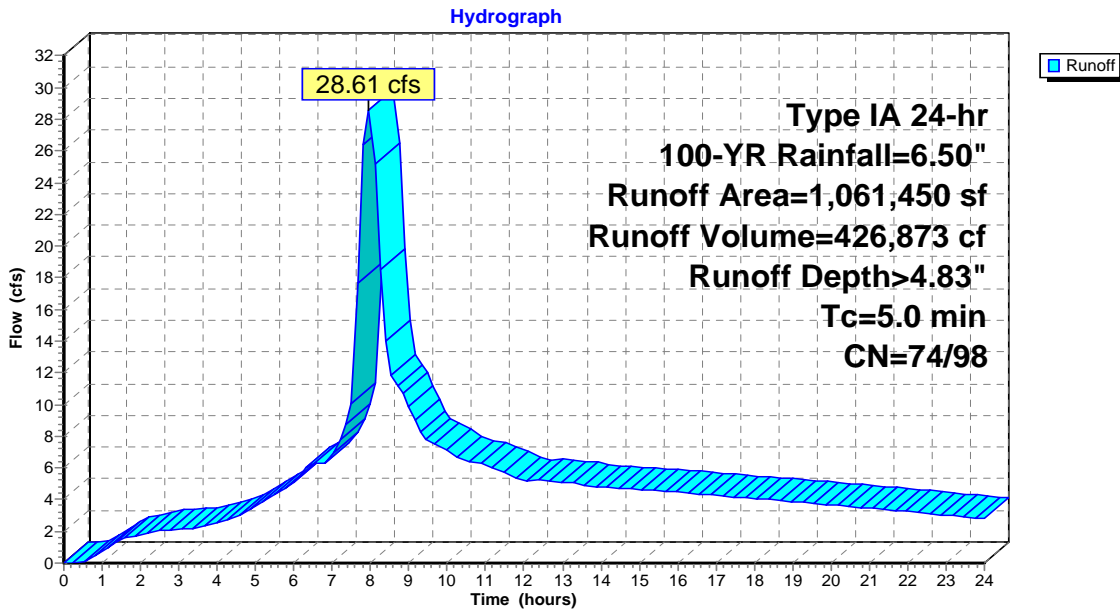
Runoff = 28.61 cfs @ 7.93 hrs, Volume= 426,873 cf, Depth> 4.83"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Type IA 24-hr 100-YR Rainfall=6.50"

Area (sf)	CN	Description
* 272,250	98	99 Lots - 2750 sf per lot
* 218,400	98	Pavement and sidewalk
* 570,800	74	Lawns
1,061,450	85	Weighted Average
570,800		53.78% Pervious Area
490,650		46.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment 1S: Post-Developed



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Type IA 24-hr 100-YR Rainfall=6.50"

Printed 5/30/2019

Summary for Subcatchment 2S: Existing Upstream

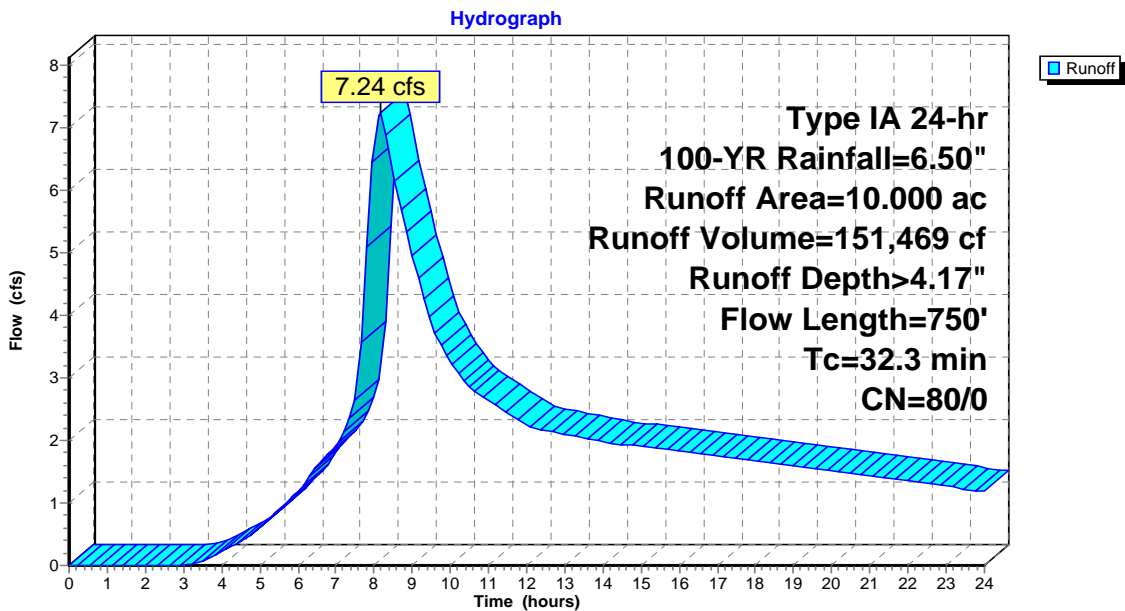
Runoff = 7.24 cfs @ 8.16 hrs, Volume= 151,469 cf, Depth> 4.17"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Type IA 24-hr 100-YR Rainfall=6.50"

Area (ac)	CN	Description
* 10.000	80	Row Crops (C + CR)
10.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.9	300	0.0200	0.17		Sheet Flow, Cultivated: Residue>20% n= 0.170 P2= 2.60"
3.4	450	0.0600	2.20		Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps
32.3	750	Total			

Subcatchment 2S: Existing Upstream



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Type IA 24-hr 100-YR Rainfall=6.50"

Printed 5/30/2019

Summary for Pond 1P: STORMWATER FACILITY

Inflow Area = 1,497,050 sf, 32.77% Impervious, Inflow Depth > 4.64" for 100-YR event
 Inflow = 35.03 cfs @ 7.96 hrs, Volume= 578,341 cf
 Outflow = 35.15 cfs @ 8.00 hrs, Volume= 531,569 cf, Atten= 0%, Lag= 2.2 min
 Primary = 35.15 cfs @ 8.00 hrs, Volume= 531,569 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.15 hrs
 Peak Elev= 899.58' @ 8.00 hrs Surf.Area= 13,929 sf Storage= 52,646 cf

Plug-Flow detention time= 99.8 min calculated for 531,569 cf (92% of inflow)
 Center-of-Mass det. time= 45.4 min (769.9 - 724.6)

Volume	Invert	Avail.Storage	Storage Description
#1	895.00'	58,640 cf	Custom Stage Data (Pyramidal) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
895.00	9,160	0	0	9,160
896.00	10,180	9,666	9,666	10,253
897.00	11,200	10,686	20,351	11,354
898.00	12,200	11,696	32,048	12,443
899.00	13,300	12,746	44,794	13,632
900.00	14,400	13,846	58,640	14,829

Device	Routing	Invert	Outlet Devices
#1	Primary	899.00'	30.0' long x 5.0' breadth Broad-Crested Rectangular Weir - Driveway Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=34.32 cfs @ 8.00 hrs HW=899.57' (Free Discharge)
 ↳1=Broad-Crested Rectangular Weir - Driveway (Weir Controls 34.32 cfs @ 2.01 fps)

7107 HydroCAD Overflow

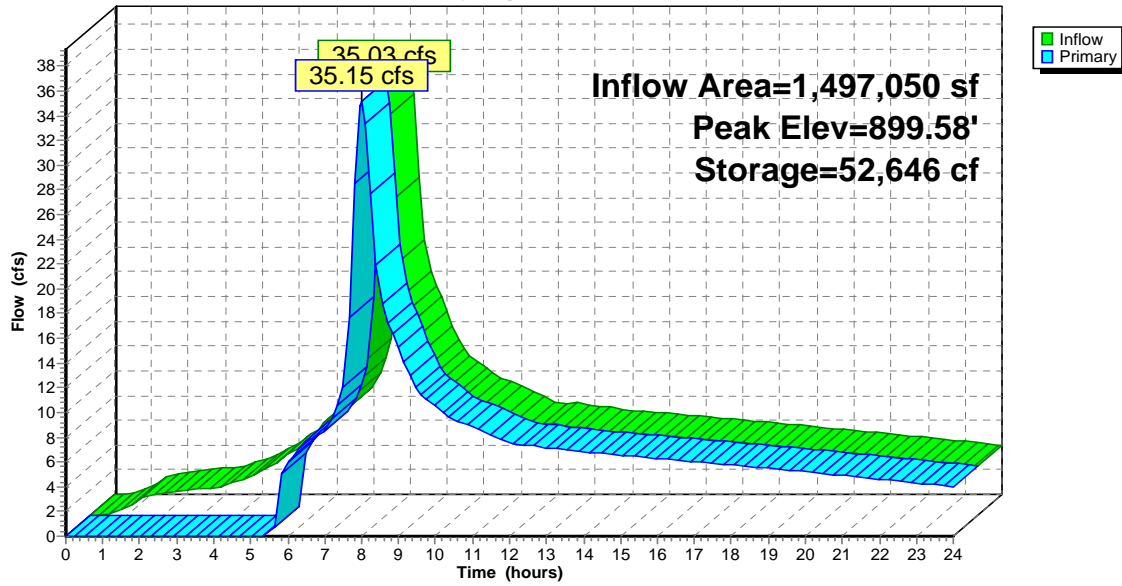
Prepared by AKS Engineering & Forestry, LLC
HydroCAD® 10.00-20 s/n 05095 © 2017 HydroCAD Software Solutions LLC

Type IA 24-hr 100-YR Rainfall=6.50"

Printed 5/30/2019

Pond 1P: STORMWATER FACILITY

Hydrograph



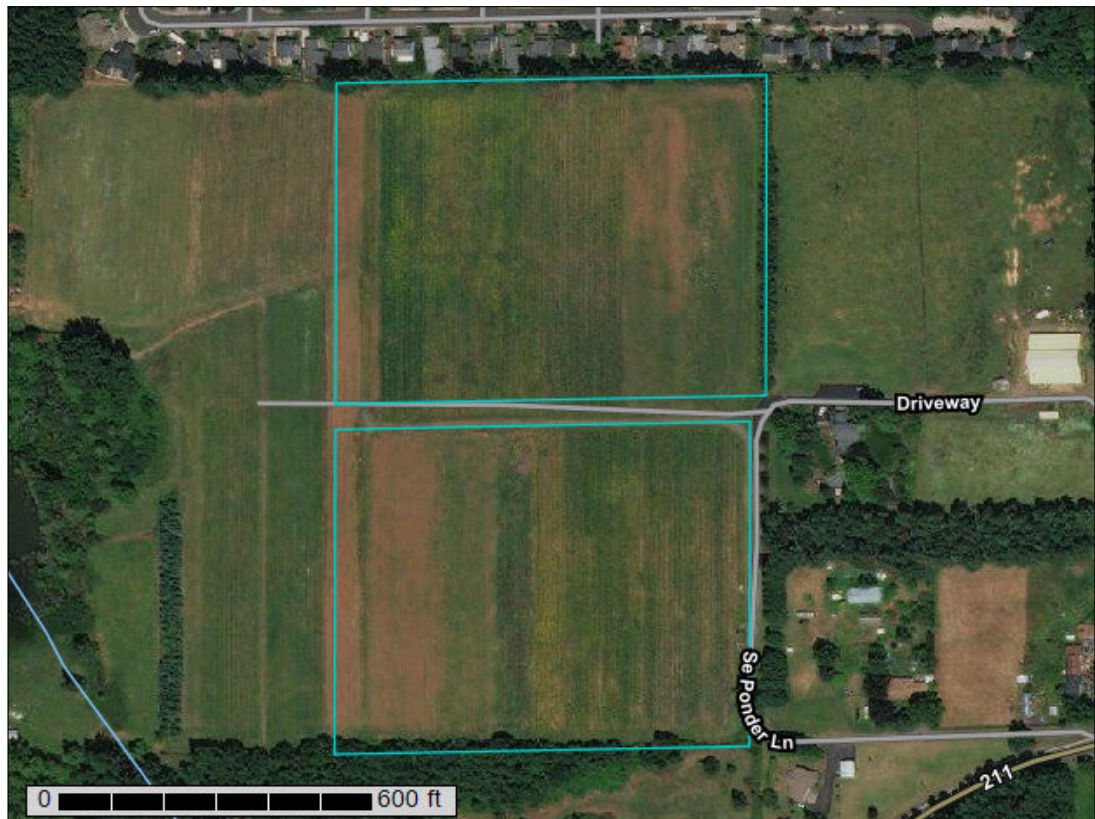


**Appendix E:
Soils Information from the USDA Soil Survey
of Clackamas County, Oregon**



A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Clackamas County Area, Oregon



May 22, 2019

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

Custom Soil Resource Report

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

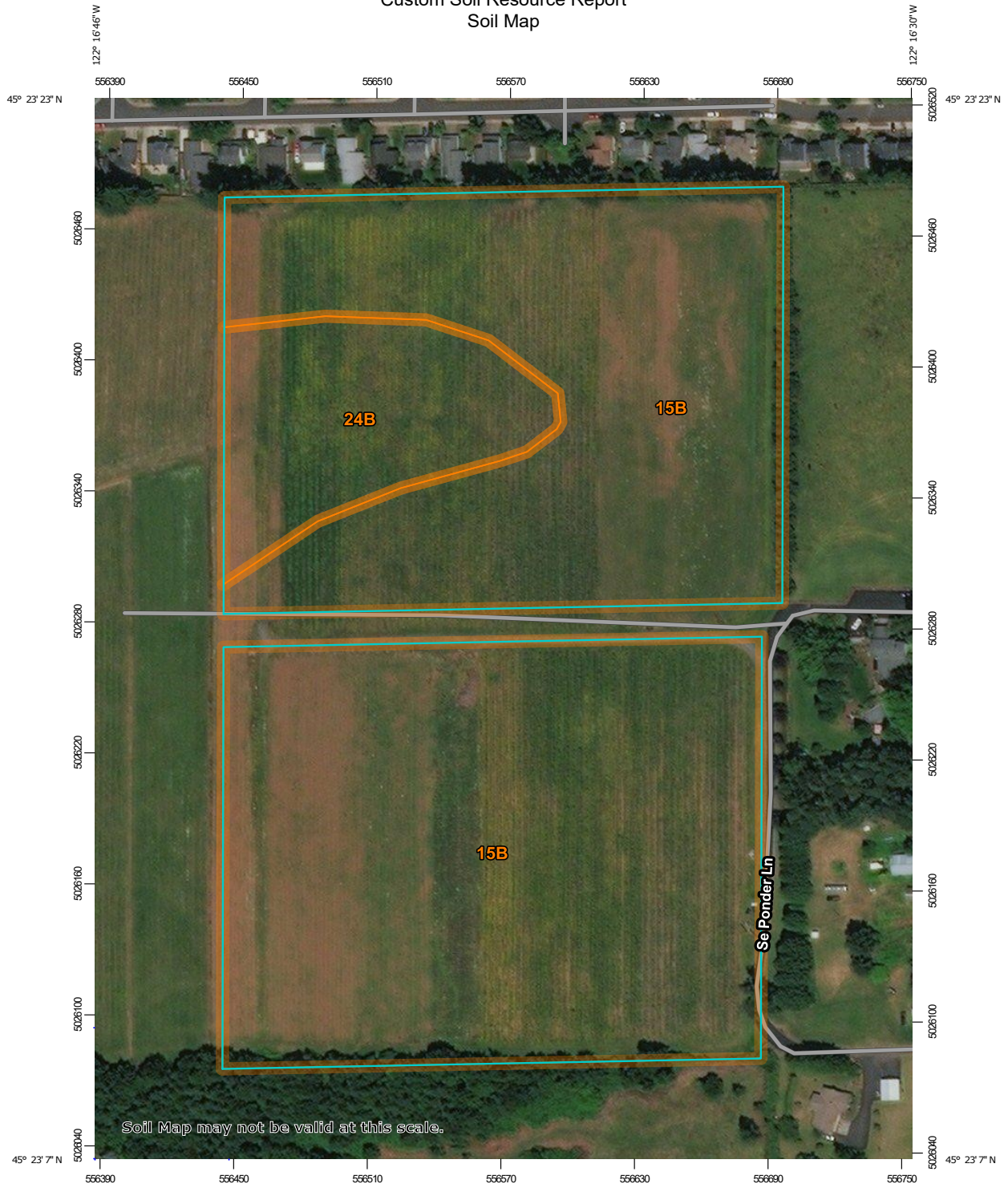
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identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

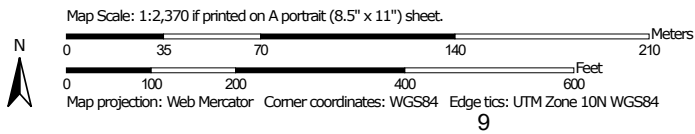
Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

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Soil Map







































Soil Map may not be valid at this scale.



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MAP LEGEND

Area of Interest (AOI)		 Spoil Area	
 Area of Interest (AOI)		 Stony Spot	
Soils		 Very Stony Spot	
 Soil Map Unit Polygons		 Wet Spot	
 Soil Map Unit Lines		 Other	
 Soil Map Unit Points		 Special Line Features	
Special Point Features		Water Features	
 Blowout		 Streams and Canals	
 Borrow Pit		Transportation	
 Clay Spot		 Rails	
 Closed Depression		 Interstate Highways	
 Gravel Pit		 US Routes	
 Gravelly Spot		 Major Roads	
 Landfill		 Local Roads	
 Lava Flow		Background	
 Marsh or swamp		 Aerial Photography	
 Mine or Quarry			
 Miscellaneous Water			
 Perennial Water			
 Rock Outcrop			
 Saline Spot			
 Sandy Spot			
 Severely Eroded Spot			
 Sinkhole			
 Slide or Slip			
 Sodic Spot			

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 14, Sep 18, 2018

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

Date(s) aerial images were photographed: Jul 2, 2015—Sep 21, 2016

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
15B	Cazadero silty clay loam, 0 to 7 percent slopes	20.6	87.8%
24B	Cottrell silty clay loam, 2 to 8 percent slopes	2.9	12.2%
Totals for Area of Interest		23.5	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

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onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Clackamas County Area, Oregon

15B—Cazadero silty clay loam, 0 to 7 percent slopes

Map Unit Setting

National map unit symbol: 223c
Elevation: 300 to 900 feet
Mean annual precipitation: 48 to 85 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 140 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cazadero and similar soils: 85 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cazadero

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old mixed alluvium

Typical profile

H1 - 0 to 21 inches: silty clay loam
H2 - 21 to 75 inches: clay

Properties and qualities

Slope: 0 to 7 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Forage suitability group: Well drained < 15% Slopes (G002XY002OR)
Hydric soil rating: No

Minor Components

Borges

Percent of map unit: 2 percent
Landform: Depressions on terraces, hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear

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Across-slope shape: Linear
Hydric soil rating: Yes

24B—Cottrell silty clay loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 223v
Elevation: 300 to 900 feet
Mean annual precipitation: 45 to 80 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 140 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Cottrell and similar soils: 90 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cottrell

Setting

Landform: Terraces, hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, interfluve, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old alluvium

Typical profile

H1 - 0 to 24 inches: silty clay loam
H2 - 24 to 55 inches: silty clay
H3 - 55 to 86 inches: silty clay loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 24 to 35 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Forage suitability group: Moderately Well Drained < 15% Slopes (G002XY004OR)
Hydric soil rating: No

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Minor Components

Borges

Percent of map unit: 4 percent

Landform: Depressions on terraces, hillslopes

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Base slope, tread

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: Yes

Aquults

Percent of map unit: 1 percent

Landform: Depressions

Hydric soil rating: Yes

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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.

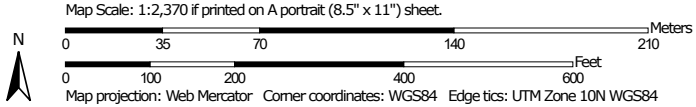
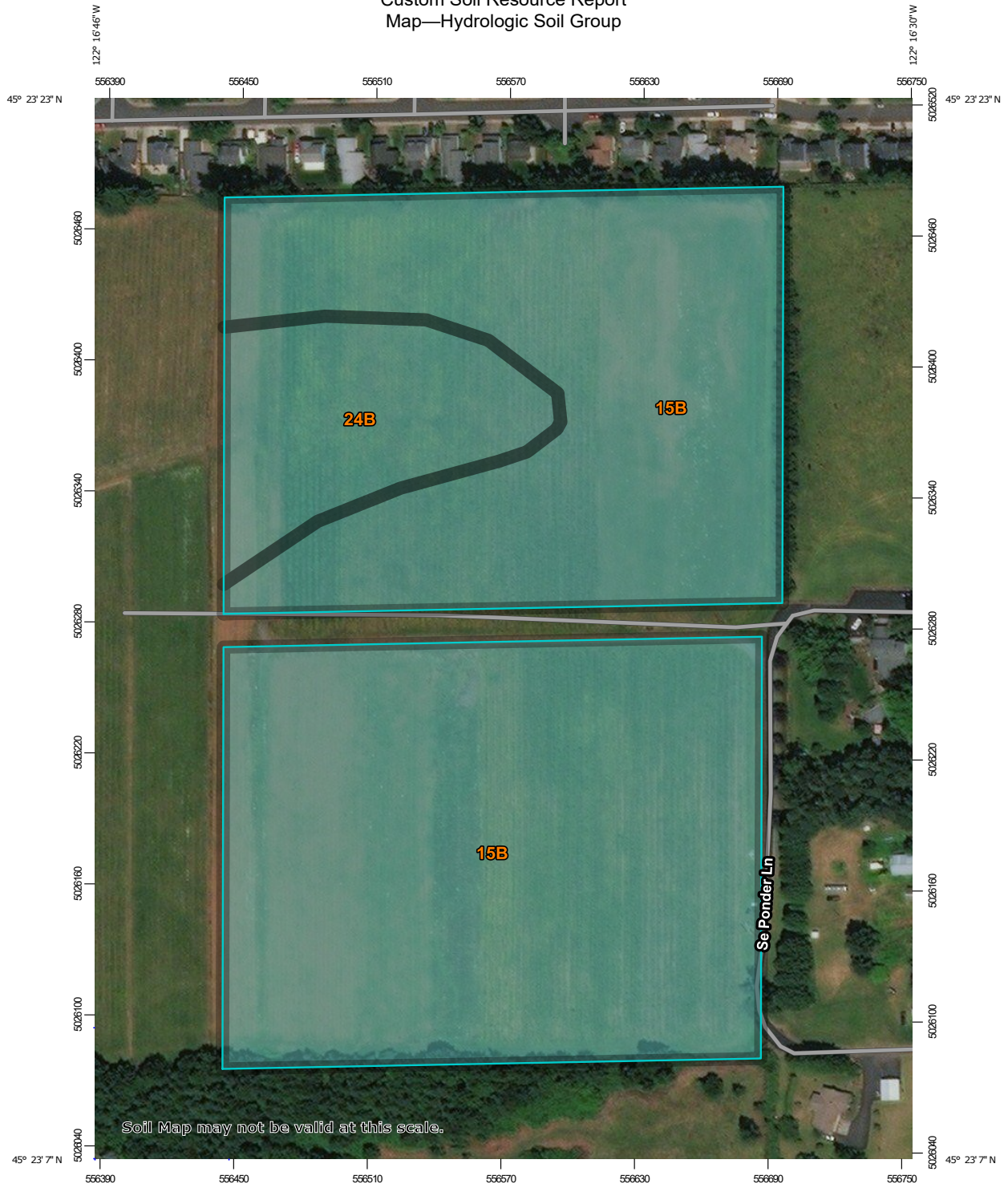
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Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water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

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Map—Hydrologic Soil Group











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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 14, Sep 18, 2018

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

Date(s) aerial images were photographed: Jul 2, 2015—Sep 21, 2016

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.

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Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
15B	Cazadero silty clay loam, 0 to 7 percent slopes	C	20.6	87.8%
24B	Cottrell silty clay loam, 2 to 8 percent slopes	C	2.9	12.2%
Totals for Area of Interest			23.5	100.0%

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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**Appendix F:
Relevant Information from Technical Release
55 Urban Hydrology for Small Watersheds by
Natural Resource Conservation Service**

Table 2-2a Runoff curve numbers for urban areas ^{1/}

Cover description	Average percent impervious area ^{2/}	Curve numbers for hydrologic soil group			
		A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) ^{3/} :					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) ^{4/}		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82

Developing urban areas

Newly graded areas
(pervious areas only, no vegetation) ^{5/}

77 86 91 94

Idle lands (CN's are determined using cover types
similar to those in table 2-2c).

¹ Average runoff condition, and $I_a = 0.2S$.

² The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

³ CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

⁴ Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

⁵ Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2b Runoff curve numbers for cultivated agricultural lands ^{1/}

Cover description			Curve numbers for hydrologic soil group			
Cover type	Treatment ^{2/}	Hydrologic condition ^{3/}	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
C&T+ CR	Poor	65	73	79	81	
	Good	61	70	77	80	
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T+ CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

¹ Average runoff condition, and $I_a=0.2S$

² Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.

³ Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good $\geq 20\%$), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

Table 2-2c Runoff curve numbers for other agricultural lands ^{1/}

Cover description Cover type	Hydrologic condition	Curve numbers for hydrologic soil group			
		A	B	C	D
Pasture, grassland, or range—continuous forage for grazing. ^{2/}	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element. ^{3/}	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30 ^{4/}	48	65	73
Woods—grass combination (orchard or tree farm). ^{5/}	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods. ^{6/}	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30 ^{4/}	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

¹ Average runoff condition, and $I_a = 0.2S$.

² **Poor:** <50% ground cover or heavily grazed with no mulch.

Fair: 50 to 75% ground cover and not heavily grazed.

Good: > 75% ground cover and lightly or only occasionally grazed.

³ **Poor:** <50% ground cover.

Fair: 50 to 75% ground cover.

Good: >75% ground cover.

⁴ Actual curve number is less than 30; use CN = 30 for runoff computations.

⁵ CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.

⁶ **Poor:** Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.

Fair: Woods are grazed but not burned, and some forest litter covers the soil.

Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

Table 2-2d Runoff curve numbers for arid and semiarid rangelands ^{1/}

Cover description Cover type	Hydrologic condition ^{2/}	Curve numbers for hydrologic soil group			
		A ^{3/}	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

¹ Average runoff condition, and $I_{ar} = 0.2S$. For range in humid regions, use table 2-2c.

² Poor: <30% ground cover (litter, grass, and brush overstory).

Fair: 30 to 70% ground cover.

Good: > 70% ground cover.

³ Curve numbers for group A have been developed only for desert shrub.

EXHIBIT H

**Bailey Meadows Subdivision
Sandy, Oregon
Flood & Slope Hazard (FSH)
Analysis**

Date: June 6, 2019

Prepared for: Allied Homes & Development
12042 SE Sunnyside Road, Suite 706
Sandy, OR 97015

Prepared By: AKS Engineering & Forestry, LLC
Stacey Reed, PWS, Senior Wetland Scientist
Haley Smith, MS, Natural Resource Specialist

Site Information: Tax Map 2 4E 23, Tax Lots 800, 801, 802, 803,
and 804
Clackamas County
Sandy, Oregon



12965 SW Herman Road, Suite 100
Tualatin, OR 97062
(503) 563-6151

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List of Preparers	4
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Appendices

A. Maps

- i. Figure 1. USGS Vicinity Map
- ii. Figure 2. Clackamas County Assessor's Map
- iii. Figure 3. NRCS Soil Survey Map
- iv. Figure 4. National Wetland Inventory Map
- v. Figure 5. FEMA Floodplain Map
- vi. Figure 6. Wetland Determination Map

B. Precipitation Data

C. Wetland Determination Data Form

D. Representative Site Photographs

Introduction

AKS Engineering & Forestry, LLC (AKS) has prepared this report in accordance with Chapter 17.60 Flood & Slope Hazard (FSH) Overlay District from the City of Sandy Development Code.

The project is a residential subdivision consisting of Tax Lots 800, 801, 802, 803, and 804 of Assessor's Tax Map 2 4E 23, located off SE Ponder Lane in Sandy, Clackamas County, Oregon (Figures 1-2 in Appendix A).

The site is located within the Urban Growth Boundary (UGB), outside of City of Sandy (City) limits. The project site was not included on the City's Goal 5 Inventory to determine whether wetlands, streams, or the FSH Overlay applies to the site, because that inventory was created prior to the site's inclusion within the UGB and annexation into the City.

This report documents that wetlands and/or waters are not present within the project site. The site is not located within a Federal Emergency Management Agency (FEMA) mapped Special Flood Hazard Area, nor is it located on a steep (greater than 25%) slope. It is our conclusion the project will not have an impact on flooding, erosion, or degradation of water quality resources; therefore, the FSH Overlay District does not apply to the project site.

Landscape Setting, Land Use, and Background Mapping

The project site consists of an undeveloped Christmas tree and blueberry farm. Ponder Lane, a gravel farm road, extends through the central portion of the site. According to a review of Google Earth imagery, the site appears to have been used for agricultural purposes since as early as 1995.

Residential development abuts the study area to the north with rural residential development to the east, south, and west. Topography within the study area has a gentle westerly slope (less than 5% overall slope; see Figure 6, Appendix A). Bull Frog Reservoir is located approximately 500 feet off-site to the west of the project site.

According to the Natural Resources Conservation Service (NRCS) Clackamas County, Oregon Area Soil Survey Map, the following non-hydric soil units are mapped within the project site (Figure 3, Appendix A):

- (Unit 15B) Cazadero silty clay loam, 0% to 7% slopes– Non-hydric, with 2% hydric Borges inclusions in depressions
- (Unit 24B) Cottrell silty clay loam, 2% to 8% slopes– Non-hydric, with 4% hydric Borges and 1% hydric Aqualts inclusions in depressions

The project site is located outside of the City of Sandy's Oregon Department of State Lands (DSL) approved Local Wetland Inventory (LWI). According to the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) map, wetland and/or water features are not mapped within the study area (Figure 4, Appendix A).

According to FEMA mapping, Special Flood Hazard areas are not mapped within the project site (Figure 5, Appendix A).



Results of Site Visit

Methodology

A site visit was conducted by AKS Senior Wetland Scientist Stacey Reed, PWS, and AKS Natural Resource Specialist Sonya Templeton on December 4, 2018 to determine whether any potentially jurisdictional wetlands or waters were present on the project site or immediately off-site. Soils, vegetation, and indicators of hydrology were recorded at one sample plot (Plot 1, data sheet included in Appendix C) to document site conditions. The plot location was recorded during the site visit using a hand-held Trimble Geo7x by AKS, with submeter accuracy (as shown on attached Figure 6).

The methodology used to determine the presence of wetlands followed the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)* (Wakeley et al. 2010). *The National Wetland Plant List 2016* (Lichvar 2016) was used to assign wetland indicator status for the appropriate region.

Representative ground level site photographs are included in Appendix D. References cited and literature used are listed at the end of this report.

Precipitation Data Analysis

Observed precipitation data from the day of the December 4, 2018 site visit was obtained from the Estacada 2 SE, Oregon weather station via the National Oceanic and Atmospheric Administration (NOAA) Applied Climate Information System (AgACIS). This was the closest official weather station to the project site. The closest NRCS Wetlands Climate Tables (WETS) Station is the Estacada 2 SE Station.

According to the Estacada 2 SE station, no rainfall was received on the day of the December 4, 2018 site visit and ± 2.02 inches of rainfall were received in the two weeks prior to the site visit. According to the WETS table, monthly observed precipitation was below normal for the three months preceding the December 4, 2018 site visit.

Because the site visit was conducted during a drier-than-normal period, a lack of hydrology indicators was not relied upon to determine upland conditions. Instead, the presence of hydric soil indicators were more strongly relied upon to determine if wetland conditions were present. Raw precipitation data and the antecedent rainfall according to the WETS Estacada 2 SE station for the three months prior to the December 4, 2018 site visit is included in Appendix B.

Results

No wetland or waters were documented in the project site. Plot 1 documents conditions in the lowest elevation portion of the site. This area was dominated by colonial bent (*Agrostis capillaris*, FAC) and lacked hydric soil and wetland hydrology indicators. Therefore, Plot 1 was determined to be upland.

There were no defined channels (i.e. no defined bed and bank) observed within the project site. A narrow (less than 2-foot-wide) ditch was observed off-site to the west, parallel to an unimproved farm road. The ditch was located at least 50 feet from the western project site boundary. Plot 1 was located in-line with the off-site ditch.

No evidence of previous ponding, flow, or hydrophytic (wetland) vegetation was observed on the project site. The study area is not located within a FEMA Floodplain. According to LIDAR data, the slopes on the site are less than 10%. Therefore, FHS overlay does not apply to this site.



List of Preparers

Haley Smith

Haley Smith, MS
Natural Resource Specialist
Report Preparation

Stacey Reed

Stacey Reed, PWS
Senior Wetland Scientist
Fieldwork and Report QA/QC



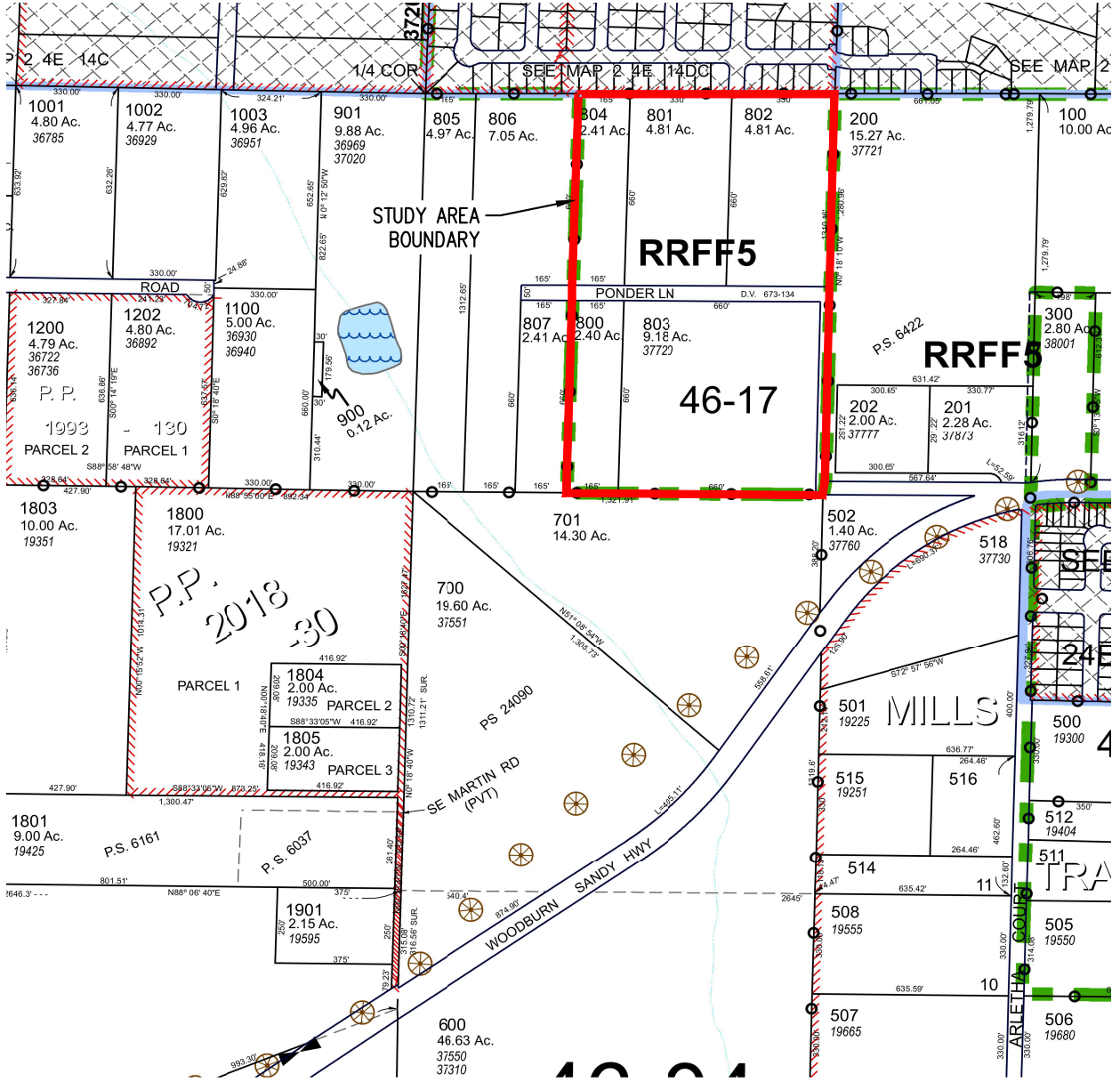
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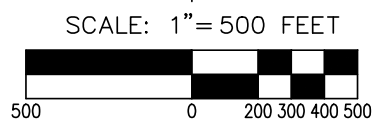
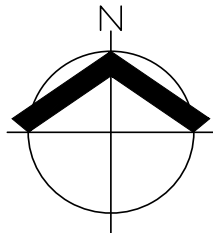




Appendix A: Maps

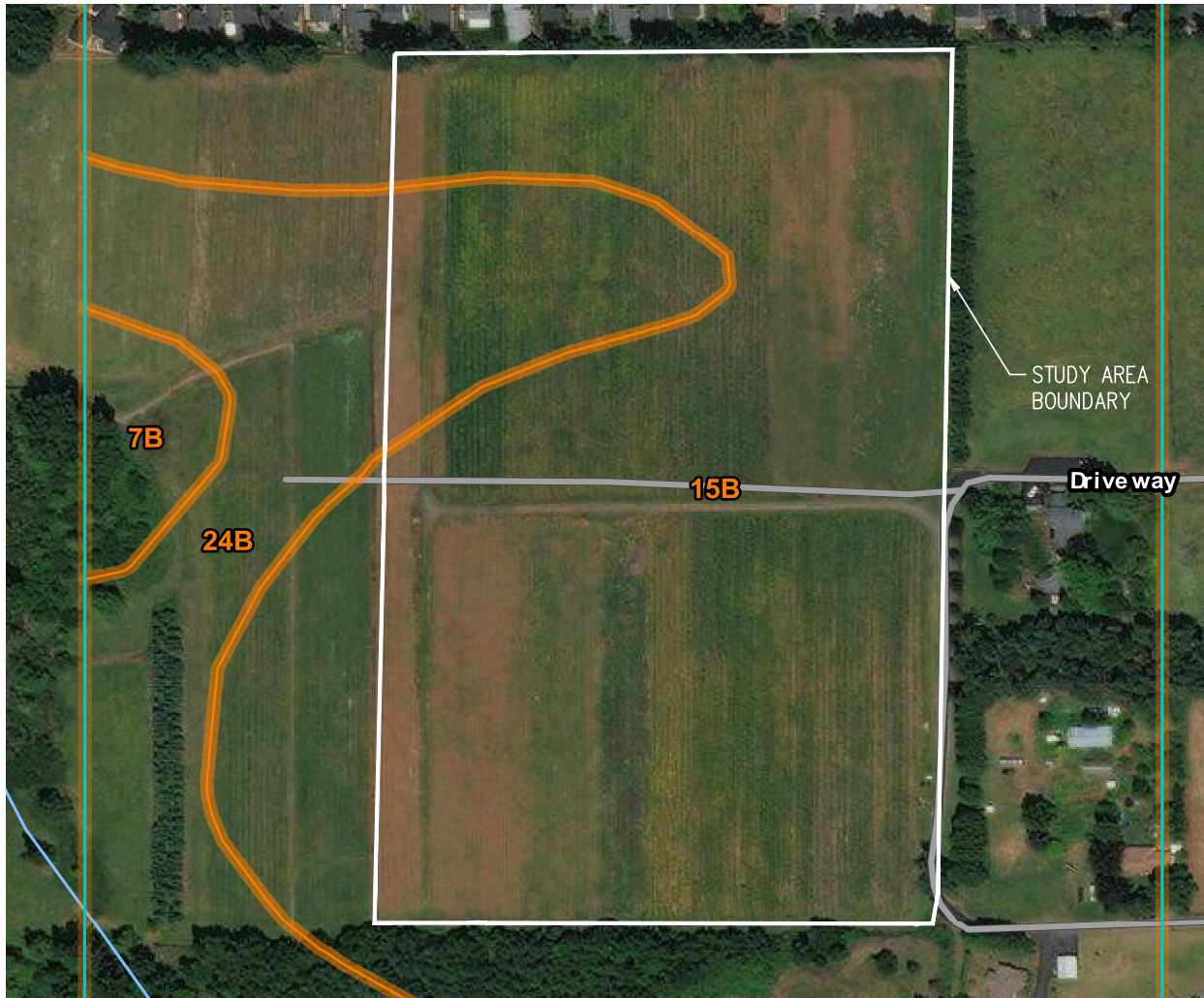


CLACKAMAS COUNTY
 TAX LOTS 800, 801, 802,
 803, AND 804
 TAX MAP 2 4E 23



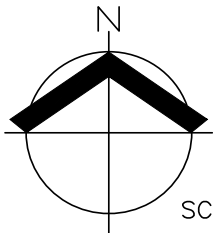
DATE: 06/06/2019

CLACKAMAS COUNTY ASSESSOR'S MAP (MAP 2 4E 23) BAILEY MEADOWS SUBDIVISION- SANDY FLOOD & SLOPE HAZARD ANALYSIS		FIGURE 2
AKS ENGINEERING & FORESTRY, LLC 12965 SW HERMAN RD SUITE 100 TUALATIN, OR 97062 www.aks-eng.com PHONE: 503.563.6151 FAX: 503.563.6152		DRWN: SAS CHKD: SAR AKS JOB: 7107

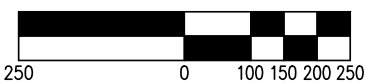


MAP UNIT SYMBOL	MAP UNIT NAME
15B	CAZADERO SILTY CLAY LOAM, 0% TO 7% SLOPES; NON-HYDRIC
24B	COTTRELL SILTY CLAY LOAM, 2% TO 8% SLOPES; NON-HYDRIC

NRCS WEB SOIL SURVEY FOR
CLACKAMAS COUNTY



SCALE: 1" = 250 FEET



DATE: 06/06/2019

NRCS SOIL SURVEY MAP BAILEY MEADOWS SUBDIVISION - SANDY FLOOD & SLOPE HAZARD ANALYSIS		FIGURE 3
AKS ENGINEERING & FORESTRY, LLC 12965 SW HERMAN RD SUITE 100 TUALATIN, OR 97062 www.aks-eng.com PHONE: 503.563.6151 FAX: 503.563.6152		DRWN: SAS CHKD: SAR AKS JOB: 7107

