CITY OF NORTH PLAINS PLANNING COMMISSION
REGULAR SESSION AGENDA
North Plains Senior Center
31450 NW Commercial Street
WEDNESDAY, February 11, 2015 - 7:00 P.M.

1. CALL TO ORDER

2. FLAG SALUTE

3. ROLL CALL

4. PUBLIC COMMENTS
(This time is provided for questions or statements by persons in the audience on any item of Planning Commission business, except those items that appear on this agenda. Comments shall be limited as determined by the Chairperson.)

***5.* CONSENT AGENDA:** (*The items on the Consent Agenda are normally considered in a single motion. Any item may be removed for separate consideration upon request by any member of the Planning Commission.)*

A. Approval of Regular Session Agenda
B. Approval of January 14, 2014, Regular Session Minutes

6. PUBLIC HEARING

A. A quasi-judicial Public Hearing will be held to hear comments regarding the preliminary plat for the McKay Creek Crossing Development. This is a 58-lot single family residential subdivision proposal to be located at 9960 NW 307th Avenue in North Plains. Tax Lot #1N301DD1601. Public is welcome.

7. STAFF COMMENTS
City Manager

8. ADDITIONAL BUSINESS

A. Review of Land Use/Building Permit Project List
B. Time allowed for Commissioners to bring up old, unfinished or additional issues before meeting is closed.

9. ADJOURNMENT

The Planning Commission meetings to be held at the North Plains Senior Center, 31450 NW Commercial Street, North Plains, Oregon. Meetings will be held on the following dates at 7:00 p.m.:

Wednesday, March 11, 2015 ***Wednesday, April 8, 2015*** ***Wednesday, May 13, 2015***

CITY OF NORTH PLAINS PLANNING COMMISSION.
REGULAR SESSION MINUTES
January 14, 2015, 7:00 P.M.
North Plains Senior Center
31450 NW Commercial St

1. Chairperson King called the meeting to order at 7:00 p.m.

2. The pledge of allegiance was led by Chairperson King.

3. ROLL CALL

Chair Stewart King, Vice Chair Heather LaBonte, Doug Nunnenkamp, Garth Eimers, Daryl Olson and Larry Gonzales.
Ex-Officio: City Councilor Sherrie Simmons.
Staff Present: City Manager Martha DeBry and City Recorder Margaret Reh

Audience: Lonnie Knodel, Margaret Wold, Mike Eggiman

4. PUBLIC COMMENTS

Mike Eggiman, 22865 NW Yungen Road, Hillsboro, OR 97124 approached the Commission. Eggiman stated he was present to talk about 9.8 parcel of commercial land that is off of Glencoe which he owns. He wanted to get a sense from the Commission regarding the viability of a proposal to rezone the eastern portion of the property from commercial to residential. Eggiman distributed maps of the area. He has had the property for seven years and has not been able to develop it commercially. Discussion ensured. Eggiman felt that he received enough positive feedback that he will move forward and make this an official request. Eggiman thanked the Commission for their time.

5. ELECTION OF CHAIRPERSON AND VICE-CHAIRPERSON

Chair Stewart King opened the floor for nominations for the 2015 Planning Commission Chairperson position. Doug Nunnenkamp nominated Stewart King. Second by Gonzales. No other nominations were made. King closed the nominations.
King called for a vote for Commissioner King remaining the Chair. Nomination was approved unanimously.

Chair Stewart King opened the floor for nominations for the 2015 Planning Commission Vice-Chair position. Doug Nunnenkamp nominated Heather LaBonte. Second by Gonzales. No other nominations were made. King closed the nominations.
King called for a vote for LaBonte remaining the Vice-Chair. Nomination was approved unanimously.

6. CONSENT AGENDA

A. Approval of the Regular Session Agenda.
B. Approval of November 12, 2014, Regular Session Minutes

Motion by LaBonte. Second by Nunnenkamp to take the Consent Agenda items separately. Motion was approved unanimously.

A. Approval of the Regular Session Agenda.

Motion by Nunnenkamp. Second by Eimers to approve the Regular Session Agenda. Motion was approved unanimously.

B. Approval of November 12, 2014, Regular Session Minutes

Commissioners King and LaBonte had contacted staff indicating some desired changes in the draft minutes. Staff distributed a revised copy of the November 12, 2014 minutes to the Commissioners. Working from the newly distributed copy LaBonte, King and Nunnenkamp proposed a few minor revisions.

Motion by Gonzales. Seconded by Nunnenkamp to approve the November 12, 2014 Regular Session Minutes with the additions and modifications stated by LaBonte, King and Nunnenkamp. Motion was approved unanimously.

7. PUBLIC HEARING

None Scheduled

8. NEW BUSINESS

A. Interview Planning Commissioner applicant Lonnie Knodel

Lonnie Knodel appeared before the Commission to be interviewed. King invited Knodel to give a brief statement as to why he decided to apply for the Planning Commission.

Motion by LaBonte. Second by Eimers to make recommendation to City Council that Lonnie Knodel be appointed to the Planning Commission. Motion was approved unanimously.

9. OLD BUSINESS

A. Review of draft changes to Municipal Code sections 16.20, 16.25, 16.30, and new section Mixed-Use Neighborhood District

DeBry presented the staff report. The Commission reviewed and discussed the proposed code changes. DeBry walked the Commission through the proposed changes.

Zoning District R-7.5

DeBry reviewed the proposed changes included in the packet for the Zoning District R-7.5.

Some editing suggestions were made for consistent language.

Eimers questioned the development standards listed in 16.20.025. Discussion ensued regarding architectural standards. He stated there are all kinds of gradations for these standards. This could be more explicit to prevent ending up with cookie cutter residential housing. It was suggested more design elements be added. Eimers will provide some ideas to staff.

Zoning District R-5

In R-5 there is a 5,000 square foot minimum/unit for all housing types, providing no distinct advantage to building attached housing. Discussion ensued about lot sizes. It was noted there is a limited amount of R5 properties to which the standard can be applied.

Commissioner Nunnenkamp asked if a 20 ft setback for garages is adequate, as it cannot accommodate full-size pick. Discussion ensued about standards used by municipalities and the use of alley loaded garages.

Chair King suggested that the impervious surface lot coverage standard of 65% may need to be higher on smaller lots? Staff noted no developers have expressed concern about the impervious surface requirement.

Zoning District R-2.5
The permitted uses are very similar to other zones. The same adjustments will be made to R-2.5 as was done in R-7.5 and R-5.

The draft proposes adjusting the minimum lot parcel size for single family unit from 2,500 sf to 4,000 sf. This minimum is also being recommended for attached dwellings and triplexes. . The Commission generally supported this revision. Discussion ensued regarding if there should be some incentive to develop multi-family homes or apartment complexes. Smaller lots in R2.5 for multi families are more important than in the R-5 zone. The municipal code has traditionally not supported apartments. It was noted the Highland Court and McKay Fields subdivisions were originally approved as duplexes. Council reduced the minimum lot sizes to encourage the development of single family homes. After the construction of Highland Court residents have offered feedback that larger lots are preferred.

Discussion continued regarding density in North Plains. The consensus is to require larger single family lots consistent with State adopted safe harbor rules.

The Commission requested staff to research other municipalities to see what allowances they make for multifamily units.

Mixed-Use Neighborhood Districts

The City of North Plains does not currently have a mixed-use code. The document in the packet was very liberally borrowed from Hillsboro. It provides much greater guidance on how to deal with a mixed use proposal and gives us something to work with, but we could develop code based on what our zoning is now.

Since the Hillsboro municipality is in close proximity to North Plains, they may be able to be contracted to assist us with the process. We need a section in our code to provide guidance for mixed-use. The expansion area to the east has a proposed plan for five acres of mixed use.

Discussion ensured regarding the Neighborhood Community (NC) zone. The 8.4 density requirement is what drove the NC, which may be higher than required under current law.

The next steps include waiting for the Comprehensive Plan to be revised. The sections reviewed by the Commission will be submitted to DLCD for review, and then presented to the Planning Commission during a public hearing.

LaBonte inquired about the other sections the Planning Commission has worked on. DeBry stated they were submitted to DLCD and no comments were returned. The Planning Commission can still amend those sections.. It may be desirable to postpone further revisions until more progress has been made on the Comprehensive Plan. It can then be presented as a whole package.

B. Staff Comments

DeBry stated we are anticipating having the public hearing for McKay Creek Crossing at the February Planning Commission meeting. 3J is reviewing the application. The developer has elected to not show the City the alignment of any trail, preferring to establish subsequent to a condition of approval.

Discussion ensued regarding the building permit process followed by Washington County Building Department. The County will verify the final plat is recorded for their purposes. Discussion ensued regarding the process.

DeBry suggested a model home section of the code could be developed.

C. Commissioner Comments

King asked ex officio member Simmons if she had any comments. Simmons stated it is good to get a refresher on the codes and updates.

11. ADJOURNMENT.

Chairperson King adjourned the meeting at 8:46 p.m. The next scheduled regular session of the Planning Commission is February 11, 2015, which will be held at the North Plains Senior Center.

Submitted by:

_____
Margaret L. Reh, City Recorder

Date Minutes Approved: _____

CITY OF NORTH PLAINS PLANNING COMMISSION

Agenda Item No.6A

Subject: McKay Creek Crossing Subdivision
From: Heather Austin, AICP, Consulting Land Use Planner

City Staff Report
February 4, 2015

City File: #14-014

Application Purpose:	An application for approval of a 58 lot preliminary subdivision plan, flood plan permit, significant natural resources permit and a variance
Public Hearing Date:	February 11, 2015
Applicant:	**Biggi Construction, LLC** 11605 SW Normandy Lane Wilsonville, OR 97070 Contact: Vince Biggi
Applicant's Representative:	**AKS Engineering & Forestry, LLC** 12965 SW Herman Road #100 Tualatin, OR 97062 Contact:Chris Goodell, AICP, LEED-AP
Transportation Consultants:	**Lancaster Engineering** 321 SW 4th Avenue, Suite 400 Portland, OR 97204 Contact: Michael Ard, PE
Geotechnical Consultants:	**GeoPacific Engineering, Inc.** 14835 SW 72nd Avenue Portland, OR 97224 Contact: Beth K. Rapp, R.G.
Environmental Consultants:	**SWCA Environmental Consultants** 1220 SW Morrison, Suite 700 Portland, OR 97205 Contact: Stacey Reed, Wetland Scientist
Property Owners:	**North Plains Acres, LLC** 3390 NW 178th Avenue Portland, OR 97229 No contact listed

Site Location:	Southeastern corner of NW Pacific St & NW 307th Ave
Tax Lot:	1N301DD01601
Size:	10.9 acres
City Land Use Classification:	R-2.5 Single Family
Residential	
Pre-Application Meeting Date:	July 31, 2014
Application Submitted:	November 10, 2014
Application Deemed Complete:	January 9, 2015
Public Notice mailed:	January 9, 2015
Public Notice Published:	January 14 and 16, 2015
120-Day Deadline:	May 9, 2015

EXHIBITS

1. Applicant's application forms & narrative, dated November 2014; 12 plan sheets dated 11-06-2014
2. Comments provided by Mark Prince, Washington County Fire District No. 2, dated January 14, 2015
3. Comments provided by Jackie Sue Humphreys, Clean Water Services, dated January 20, 2015
4. Public Comments provided by Garth Eimers dated January 12, 2015
5. Public Comments provided by Stewart King dated January 14, 2015

REQUEST

The applicant requests approval of the following:

- Subdivision
- Flood Plain Permit
- Significant Natural Resources Permit
- Variance

This request is subject to a Type III process for quasi-judicial review by the Planning Commission. The proposed preliminary subdivision plat contains 58 dwelling units. The application also includes a request for a variance for encroachment into the McKay Creek Riparian Corridor, designated a Significant Natural Resource.

Summary Conclusions

The City accepts many of the Applicant's findings. Areas where information was missing from the Applicant's submittal or inconsistent with code criteria have been addressed with a recommended condition of approval of the subdivision application.

SITE DESCRIPTION

The property is located at the southeast corner of NW Pacific Street and NW 307th Avenue. The project site is 10.90 acres and is located within Tax Lot 1601 on Map 1N3W01DD. The site is located within the City of North Plains and is zoned R-2.5 for residential high density development.

The site includes a portion of McKay Creek, a perennial tributary of the Tualatin River, running north/south along the eastern edge of the property. The portion of the site containing the creek and surrounding buffer and floodplain is within the Floodplain Overlay and Significant Natural Resource Overlay.

I. Compliance with City of North Plains Comprehensive Plan

The North Plains Municipal Code Chapter 16 Zoning and Development implements the goals of Chapter 15 Comprehensive Plan. Public comments included a request to identify the consistency between the application and Comprehensive Plan 15.01.050 *The Vision* which reads in part:

We, the City of North Plains, shall create a new community identity by focusing on the following concepts:

1. Livability - We will establish a community that is based on the notion of livability and the principles of new urbanism. At the forefront of these principles is the walk-able neighborhood that is highly connected through a traditional street grid network that facilitates pedestrian traffic. These principles call for increased density and a range of residential, commercial and retail uses within walking distance of each other. Such compact communities promote greater pedestrian traffic without excluding automobiles. Major roads are designed to be at the edges of neighborhoods so as not to disrupt the pedestrian movement or rent the social fabric. Neighborhoods will have defined centers which include public spaces such as a park or community square. Architecture and landscape design will celebrate local history, climate, ecology, and building practices. Commercial buildings will be designed to front on pedestrian-friendly streets rather than parking lots or major highways and houses are primarily designed with garage doors and driveways facing rear alleys so as not to conflict with sidewalks, to promote social interaction between residences and passers-by and to increase safety by accommodating more "eyes on the neighborhood". Housing will be situated relatively close to the city's center, thereby enhancing the center's economic viability. Developing offices, retail and residential spaces within the same neighborhoods will create an aesthetically appealing street scene. A sense of community and belonging will be promoted by mixing development uses such as parks, schools, homes, shopping and jobs close to one another and by providing a range of housing options that facilitates diversity in income and age levels, ethnic backgrounds and family units that live and work in the same neighborhood.

As a result, it is our goal that our community will a) promote healthier lifestyles that reduce stress by reducing vehicle miles traveled and by providing pedestrian-friendly narrow streets, b) facilitate greater community involvement through mixed-use land planning and quality architecture, and c) cultivate stronger social equity through diversity in housing choices and less dependence on the automobile.

Finding: *The City Attorney has determined that 15.01.050(1) uses the words: "concept" and "primarily designed" in reference to the goal of alley loaded housing. In his opinion these aspirational words do not bind the City to consider only subdivisions with alley loaded configurations, and as such the proposed plan is consistent with the Comprehensive Plan.*

15.02.020 Land Use Planning

To insure an adequate supply of land for residential, commercial and industrial development purposes as well as land for uses related that provide for a complete community such as open space, institutional, public/private facility, community service, historic uses, the following categories have been developed for use in the comprehensive plan map, which will provide the basis for the City's zoning map. These categories are defined as follows:

Residential: The City's goal is to achieve a mix of low density (40%), medium density (40%), and high density (20%) residential uses providing an average density of 8.4 units per acre.

High Density Residential: Areas suitable primarily for multi-family dwellings and manufactured home parks and subdivisions although single family dwellings and duplexes are also permitted. In this category, residential densities are not to exceed 17.4 dwellings units per net acre (a minimum lot size of 5,000 square feet and density of one unit for each 2,500 square feet). Corresponds to R2.5 on zoning map.

Finding: *The proposed subdivision is located within the R*-2.5 zone. The proposed density is 13.84 dwelling units per net acre (58 dwelling units/4.19 acres developable land). The proposed density does not exceed the maximum of 17.4 dwelling units per net acre.

15.02.148 Open Spacing

2. Objective: Promote and encourage development in character with the natural features of the land

A. Policies
   (1) All land within the 100-year flood plain should be preserved as much as possible for open space, fish and wildlife habitat, urban buffers, neighborhood boundaries, future recreational development, drainage and runoff retention.

Finding: *All land within the 100-year flood plain is preserved for open space; however, all of this is privately-owned open space. To allow for future recreational development, the flood plain area could be acquired by the City for a future trail development.*

II. Compliance with City of North Plains Municipal Code

ZONES

16.30 ZONING DISTRICT R-2.5

16.30.005 Permitted Uses

The following uses are permitted outright within the R-2.5 subject to the requirements of the Design Review section of this chapter, if applicable.

N. Single family detached dwelling

Finding: *This application is for a 58-lot subdivision for the purpose of constructing single family detached dwellings on each of the lots.*

16.30.015 Dimensional Standards

The following dimensional standards shall be the minimum requirements for all development in the R-2.5 District except for modifications permitted under Lot, Building, & Yard Exceptions or Planned Unit Development sections of this chapter. In addition, a minor adjustment of up to 10% of the required setback, area, lot size, lot depth or lot width may be granted by the City pursuant to Variance section of this chapter provided the adjustment complies with administrative variance review criteria.

A. Lot/Parcel Size
   - Lots created by subdivision: 6,000 square feet maximum lot size per dwelling unit
   - Single-family dwelling: 2,500 square feet minimum

B. Lot/Parcel Depth and Width
   - No minimum lot width or depth

Finding: *Sheet P03 – Preliminary Subdivision Plat illustrates proposed lot size, width, and depth. The size, width, and depth of each lot, were compared with the minimum requirements for the zone. All proposed lots fall between 2,500 square feet (minimum) and 6,000 square feet (maximum) in size. The lot widths and depths are shown but no minimums are required in this zone. Therefore, the proposed preliminary plat meets the standards of 16.30.015.A and 16.30.015.B.*

C. Setback Requirements
   Principle structures, accessory dwellings and accessory structures with a floor area greater than 200 square feet shall maintain the following minimum setbacks except that development on flag lots shall be subject to the setback standards for Flag Lots.

D. Front Yard:
   - For all structures: 10 feet
   - Garage: 20 feet

   Garages, carports, accessory dwellings and accessory structures shall be flush with, or recessed behind, the front building elevation of the principle structure.

Finding: *Sheet P04 – Preliminary Building Setback Plan illustrates proposed setbacks for all lots. The proposed setbacks were compared with the minimum requirements for the zone. All proposed lots show a minimum front yard structure setback of 10 feet and garage setback of 20 feet.*

Building footprints are not shown and therefore it is not possible to review compliance with subsection D. above, which states, "Garages, carports, accessory dwellings and accessory structures shall be flush with, or recessed behind, the front building elevation of the principle structure." However, compliance with this criterion can be verified at time of building permit submittal. Therefore, the proposed preliminary plat meets or can be conditioned to meet the standards of 16.30.015.C and 16.30.015.D.

Recommended condition: *Prior to issuance of building permits, submit building permit applications which identify structure placement in compliance with section 16.30.015.D, ensuring garages, carports, accessory dwellings and accessory structures are flush with, or recessed behind, the front building elevation of the principle structure.*

E. Rear Yard:
   - Street-access lots: 10 feet
   - Alley-access lots: 6 feet
   - Accessory structures and accessory dwellings: 5 feet

F. Side Yard:
   - Side yards should be established to create separation between structures and meet fire codes and provide space for pervious surface area
   - Single family dwellings created by subdivision must have at least one side yard
   - Adjacent to street- 10 feet plus additional necessary to comply with the standards of Clear Vision Areas section of this chapter.
   - Accessory Structures and Accessory Dwellings- 5 foot adjacent to street setback, except as provided for in the Accessory Use, Structures and Dwellings section of this chapter.

Finding: *Sheet P04 – Preliminary Building Setback Plan illustrates proposed setbacks for all lots. The proposed setbacks were compared with the minimum requirements for the zone. All proposed lots show a minimum rear yard setback of 10 feet. All proposed lots show two side yards and all street side yards are a minimum of 10 feet. Therefore, the proposed preliminary plat meets the standards of 16.30.015.E and 16.30.015.F.*

G. Flag lots approved:
   - 10 feet for all yards, except for the yard facing a garage.
   - The yard facing the garage shall be a minimum of 20 feet.

H. Height of Buildings:
   Buildings shall not exceed a height of 35 feet or two and a half stories, whichever is less. Accessory dwellings (excluding accessory structures) shall not exceed 25 feet in height.

Finding: *No flag lots are proposed as part of this application. The height of the buildings is not indicated on the plans; however, compliance with this criterion can be verified at time of building permit submittal.*

Therefore, subsection 16.30.015.G is not applicable and the proposed preliminary plat can be conditioned to meet the standards of 16.30.015.H.

Recommended condition: *Prior to issuance of building permits, submit building permit applications which identify structure height in compliance with section 16.30.015.H, ensuring that the building height does not exceed 35 feet or two and a half stories, whichever is less.*

I. Lot/Parcel Coverage
In the R-2.5 District, the maximum lot coverage for impervious surfaces shall not exceed 65%.

Finding: *Building footprints are not indicated on the preliminary subdivision plat submittal. However, the Applicant's narrative states that the lots are sized to accommodate a dwelling that will not exceed the 65% coverage maximum. Compliance with this criterion can be verified at time of building permit submittal. Therefore, the proposed preliminary plat can be conditioned to meet the standards of 16.30.015.I.*

Recommended condition: *Prior to issuance of building permits, submit building permit applications which identify lot coverage in compliance with section 16.30.015.I, ensuring that the maximum lot coverage for impervious surfaces does not exceed 65%.*

16.30.025 Development Standards
The following standards will be applied to all single family dwellings (site-build, modular and manufactured homes) to be constructed or located in the City of North Plains:

A. All units shall utilize at least two of the following design features to provide visual relief along the front of the home:
   1. Dormers;
   2. Gables;
   3. Recessed entries;
   4. Covered porch entries;
   5. Cupolas;
   6. Pillars or posts;
   7. Bay or bow windows;
   8. Eaves (minimum 6" projection)
   9. Offsets on building face or roof (minimum 16");

All manufactured homes shall also comply with the requirements of the Manufactured Homes section of this chapter.

Finding: *Building elevations are not included with the preliminary subdivision plat submittal. However, compliance with this criterion can be verified at time of building permit submittal. Therefore, the proposed preliminary plat can be conditioned to meet the standards of 16.30.025.*

Recommended condition: *Prior to issuance of building permits, submit building permit applications identifying the front building elevations in compliance with section 16.30.025, ensuring that at least two of the required design features are provided.*

16.65 FLOODPLAIN OVERLAY DISTRICT (FP)

16.65.010 General Provisions

A. Area of Application

All property, regardless of the underlying zoning designation, which falls within the boundaries of the 100-year Flood Plain, also known as the area of special flood hazard, shall be subject to the provisions of Zoning District (FP) of this Ordinance.

Finding: *Sheet P02 – Existing Conditions Plan indicates that approximately half of this site falls within the boundaries of the 100-year Flood Plain, identified as "FEMA BASE FLOOD ELEVATION 169.1'". Therefore, a large portion of this site is subject to the provisions of Section 16.65-Floodplain Overlay District. Compliance with this section is demonstrated in the responses to the subsections below.*

G. Critical Facilities

Critical facilities as defined by this Chapter shall not be located in a flood way or flood plain.

Finding: *Sheet P02 – Existing Conditions Plan identifies the flood plain. No critical facilities are shown on any plan set within the flood way or flood plain. Therefore, the submitted application complies with this criterion.*

H. Accessory Structures

Accessory structures shall not be located within a floodplain or floodway.

Finding: *No accessory structures are shown within the floodplain or floodway and, therefore, the proposal is in compliance with this criterion.*

16.65.015 Administration

A. **Development Permit Required**

A development permit shall be obtained before construction or development begins within any area of special flood hazard established in Chapter 16.65.010 (A). The permit shall be required for all structures including manufactured homes, as set forth in the Definitions, and for all other development including fill and other activities, also as set forth in the Definitions.

Finding: *In addition to the subdivision, the Applicant requests approval of a Flood Plain Development Permit. This permit will be required prior to any construction or development within the special flood hazard area, as conditioned below.*

Recommended condition: *Prior to approval of the final plat, provide evidence of a Flood Plain Development Permit.*

B. **Application for Development Permit**

Application for a development permit shall be made on forms furnished by the City Recorder, and accompanied by the appropriate fee, and may include, but not be limited to, plans in duplicate drawn to scale showing the nature, location, dimensions, and elevations of the area in question, existing or proposed structures, fill, storage of materials and drainage facilities. Specifically, the following

information is required:
1. Elevation in relation to mean sea level of the lowest floor (including basement) of all structures;

2. Elevation in relation to mean sea level to which the structure has been flood proofed;

3. Certification by a registered professional engineer or architect that the flood proofing methods for any nonresidential structure meet the flood proofing criteria in Floodplain Overlay section of this code.

4. Description of the extent to which any watercourse will be altered or relocated as a result of proposed development.

Finding: *The Applicant's submittal materials state that "future homes will be built such that the lowest floor is more than 1 foot above base flood elevation". No buildings are proposed within the flood plain and no flood proofing is proposed. No changes to the watercourse are proposed. This standard is met and will continue to be met with home elevations provided at time of building permit submittal.*

C. **Designation of Planning Commission as Administrative Body**
The Planning Commission is hereby appointed to administer and implement this ordinance by granting or denying development permit applications in accordance with its provisions. "Flood Plain Development Permits shall be subject to the public notice requirements and public hearing requirements of this chapter.
The duties of the Planning Commission shall include, but not be limited to:

1. **Permit Review**

a. Review all development permits to determine that the permit requirements of this ordinance have been satisfied.

b. Review all development permits to determine that all necessary permits have been obtained from those federal, state, or local governmental agencies from which prior approval is required.

c. Review all development permits to determine if the proposed development is located in the flood way. If located in the flood way, assure that the encroachment provisions of Chapter 16.65.025 (D) are met.

Finding: *The Planning Commission is the review authority for this proposed subdivision with flood plain development permit. This staff report accompanies the Applicant's submittal materials for the Planning Commission's review prior to the public hearing. This standard is met.*

2. **Use of Other Base Flood Data**

When base flood elevation data has not been provided in accordance with Chapter 16.65.010 (B), the Planning Commission shall obtain, review and reasonably utilize any base flood elevation and flood way data available from federal, state, or other sources, in order to administer Chapter 16.65.025.

Finding: *The Applicant has provided base flood elevation data on Sheet P02- Existing Conditions Plan. This standard is met.*

3. **Information to be Obtained and Maintained**

a. Where base flood elevation data is provided through the Flood Insurance Study or required as in Chapter 16.65.015 (2), obtain and record the actual elevation (in relation to mean sea level) of the lowest habitable floor (including basement) of all new or substantially improved structures, and whether or not the structure contains a basement.

b. For all new or substantially improved flood proofed structures:

i. Verify and record the actual elevation (in relation to the mean sea level), and

ii. Maintain the flood proofing certifications required in this Chapter.

c. Maintain for public inspection all records pertaining to the provisions of this ordinance.

Finding: *The Applicant's submittal materials state that "future homes will be built such that the lowest floor is more than 1 foot above base flood elevation". No buildings are proposed within the flood plain and no flood proofing is proposed. No changes to the watercourse are proposed. This standard is met and will continue to be met with home elevations provided at time of building permit submittal.*

4. **Alteration of Watercourses**

a. Notify adjacent communities and the Oregon Department of Land Conservation and Development prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Insurance Administration.

b. Require that maintenance is provided within the altered or relocation portion of said watercourse so that the flood carrying capacity is not diminished.

Finding: *This application does not include alteration or relocation of a watercourse. This standard is not applicable.*

5. **Interpretation of FIRM Boundaries**
Make interpretations where needed as to exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions). The person contesting the location of the boundary shall be given a reasonable opportunity to appeal the interpretation.

Finding: *Sheet P02- Existing Conditions Plan identifies the "ordinary high water line as delineated by SWCA August 2014" at an approximate location of 164 feet above sea level. The identified Base Flood Elevation is at 169.1 feet above sea level- this is also the identified boundary of the area of special flood hazard. No interpretation is needed beyond the base data provided. This standard is met.*

16.65.020 Provisions for Flood Hazard Protection

In all areas of special flood hazards the following standards are required:

A. Anchoring

1. All new construction and substantial improvements shall be anchored to prevent flotation, collapse or lateral movement of the structure.

Finding: *The submitted plans do not show any buildings in the area of special flood hazards. The Applicant's narrative indicates that no homes will be constructed in this area. Any structures proposed within the area of special flood hazard will be required to be anchored, as verified by the building permit review. Therefore, the submitted preliminary plat is in compliance with this criterion.*

B. Construction Materials and Methods

1. All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.

2. All new construction and substantial improvements shall be constructed using methods and practices that minimize flood damage.

3. Electrical, heating, ventilation, plumbing, and air-conditioning equipment and other service facilities shall be designed and/or otherwise elevated or located so as to prevent water from entering or accumulating within components during conditions of flooding.

Finding: *The Applicant's narrative indicates that "where applicable, all new construction will utilize material and methods to minimize flood damage". There are no homes proposed within the area of special flood hazard. The proposal satisfies this criterion.*

C. **Utilities**

1. All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system;

2. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters; and

3. On-site disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

Finding: *The Applicant proposes a stormwater line running approximately 20 feet through the area of special flood hazard as it connects to the stormwater facility that is also within the area. No new water, sanitary sewer or disposal systems are proposed*

in the special hazard area. The proposed subdivision is in compliance with this criterion.

D. **Subdivision Proposals**

1. All subdivision proposals shall be consistent with the need to minimize flood damage;

2. All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize or eliminate flood damage;

3. All subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage; and

4. Base flood elevation data shall be provided for subdivision proposals and other proposed development which contain at least 50 lots or 5 acres, whichever is less.

Finding: *The proposed subdivision layout is such that no homes are located within the 100-year floodplain. A small portion of some backyards are within the floodplain. The only utilities are a stormwater line and stormwater facility. Drainage is proposed so as to reduce exposure to flood damage. The Applicant's submitted plans show the base flood elevation data. The proposed application satisfies all sections of this criterion.*

16.65.025 Specific Standards

In all areas of special flood hazards where base flood elevations data has been provided as set forth in this Chapter, the following provisions are required:

A. **All Development**

All development within the boundaries of the 100-year Flood Plain shall conform to the following cut and fill standards:

1. No net fill in the flood plain is allowed. All fill placed in a flood plain shall be balanced within at least an equal amount of soil material removal;

2. Excavation areas shall not exceed fill areas by more than 50 percent of the area;

3. Any excavation below the bank full stage of No Name Creek or McKay Creek shall not compensate for fill;

4. Excavation to balance a fill shall be located on the same parcel as the fill unless it is not reasonable or practicable to do so. In such cases, the excavation shall be located in the same drainage basin and as close as possible to the fill site, so long as the proposed excavation and fill in the Flood plain Overlay District and to minimize erosive velocities. Stream crossings shall be as close to perpendicular to stream flow as practicable. Bridges shall be used instead of culverts wherever practicable.

Finding: *The proposed subdivision development does not include net fill in the flood plain or excavation below the bank full stage of McKay Creek compensating for fill. All*

excavation will be done on the same parent parcel of this proposal within the same drainage basin. No stream crossings or bridges are proposed. The proposal complies with this standard.

B. **Residential Construction**

New construction and substantial improvement of any residential structure shall have the lowest floor, including basement, elevated to one foot above base flood elevations. Below grade crawl spaces shall not be permitted. Fully enclosed areas below the lowest floor that are subject to flooding are prohibited. Parking, crawl spaces and storage is allowed below the lowest floor provided the area is designed to permit the entry and exit of flood waters. Openings may be equipped with screens, louvers, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.

Finding: *The applicant's narrative states "future homes will be built such that the lowest floor is more than 1 foot above base flood elevation". This can be further identified at time of building permit review. This standard has been met.*

C. Nonresidential Construction

B. Manufactured Home

Finding: *There is no nonresidential construction or manufactured home construction proposed with this application. Therefore, subsections C. and D. are not applicable.*

C. Flood Ways

Located within areas of special flood hazard established in Chapter 16.65.010(A) are areas designated as flood ways. Since the flood way is an extremely hazardous area due to the velocity of flood waters which carry debris, potential projectiles and erosion potential, the following provisions apply, these provisions apply to all floodways:

1. Prohibit encroachments, including fill, new construction, substantial improvements, and other development within Zones A1 and A2 (as defined by the Federal Emergency Management Agency) unless certification by registered professional engineer or architect is provided demonstrating that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.

2. If Chapter 16.65.025 (D)(1) is satisfied, all new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of Chapter 16.65.025.

3. Prohibit the placement of any mobile homes, except in an existing mobile home park or existing mobile home subdivision.

4. The placement of mobile homes in existing mobile home parks and subdivisions will comply with Subsections 16.65.025 (C) 1-3.

Finding: *No homes are proposed within the floodway. The only construction within the flood way is the stormwater facility which will not contain improvements that would constrict the flow of water during a storm event. This standard is met.*

D. Recreational Vehicles

Finding: *Recreational vehicle storage is not proposed as part of this subdivision application and, therefore, this criterion is not applicable.*

16.75 SIGNIFICANT NATURAL RESOURCES OVERLAY DISTRICT (SNR)

16.75.005 Definitions
For the purposes of this Section, the following definitions apply:

Q. Riparian Corridor: A Goal 5 resource that includes the water areas, fish habitat, riparian areas, and wetlands within the riparian corridor boundary. In the City of North Plains, Riparian Corridor boundaries are measured as follows:

a. The unnamed tributary of McKay Creek: 50 feet from the top of bank or from the edge of a delineated significant wetland, whichever is further landward, and;

b. McKay Creek: 75 feet from the top of bank or from the edge of a delineated significant wetland, whichever is further landward.

Finding: *McKay Creek traverses the east side of the subject property and, as such, the riparian area is delineated in the submitted materials (Figure 5 of the Natural Resource Assessment prepared by AKS Engineering & Forestry), consistent with this definition.*

16.75.010 General Provisions

A. Affected Property: The procedures and requirements of the Significant Natural Resources Overlay Zone District (SNR):

1. apply to any parcel designated as having a Significant Natural Resource on any portion of the tax lot;
2. apply in addition to the standards of the property's underlying zone;
3. supercede the property's underlying zone where the underlying zone does not provide the level of Significant Natural Resource protection afforded by the Significant Natural Resources Overlay Zone District.

Finding: *The subdivision is located on an "Affected Property" because of the location of McKay creek on the subject site, a Significant Natural Resource (SNR). The SNR standards are applicable to this development.*

B. Activities Subject to Review: Activities subject to the review shall include all development on properties outlined in 16.16.030 A and not specifically exempted from review as outlined in 16.16.030 C, including:

1. Partitioning and subdividing of land.
2. New structural development.

3. Exterior expansion of any building or structure, or increases in impervious surfaces or storage areas.
4. Site modifications including grading, excavation or fill, installation of new above or below ground utilities, construction of roads, driveways, or paths.
5. Removal of trees or the clearing of native vegetation within a Significant Natural Resource.

Finding: *The proposed land use action is a subdivision and, therefore, subject to review according to the SNR standards.*

16.75.015 General Development Standards

A. The permanent alteration of the Significant Natural Resource by grading, by excavation or fill, by the placement of structures or impervious surfaces, or by the removal of native vegetation is prohibited, except for the following uses provided they are designed to minimize intrusion into the significant natural resource, and no other options or locations are feasible:

1. Streets, roads, paths, and driveways; Public or private streets, driveways, or paths may be placed within a Significant Natural Resource to access development activities if it is shown to the satisfaction of the reviewing authority that no other practicable method of access exists. If allowed, the applicant shall comply with the following requirements:

a. Demonstrate to the reviewing authority that no other practicable access to the build able area exists or access from an off-site location through the use of easements is not possible;
b. Design roads, driveways, and paths to be the minimum width necessary and for the minimum intrusion into the Significant Natural Resource while also allowing for safe passage of vehicles and/or pedestrians;
c. Use bridges, arched culverts, or box culverts with a natural bottom for crossing of a Significant Natural Resource if the crossing is found unavoidable. The lower lip of any culvert must meet the channel bed at or below grade. The number of channel crossings shall be minimized through use of shared access for abutting lots and access through easements for adjacent lots;
d. Consider the need for future extensions of shared access, access easements, or private streets to access potential new building sites at the time of this application in order to avoid subsequent encroachments into the Significant Natural Resource; Prior to construction, the Significant Natural Resource area shall be flagged, fenced or otherwise marked and shall remain undisturbed except as allowed by the provisions of this ordinance. Such markings shall be maintained until construction is complete;
e. During construction, no stockpiling of fill materials, parking, or storage of equipment shall be allowed within the Significant Natural Resource;
f. Erosion control measures, such as silt fences and bio-filter bags, shall be used to reduce the likelihood of sediment and untreated storm water entering the Significant Natural Resource.

g. Permanent alteration of the Significant Natural Resource by the placement of public or private streets, driveways, or paths is subject to the mitigation requirements of Section VII.

Finding: *A very small portion of the stormwater facility access road (the corner of the northern end of the hammerhead turnaround) is located within the riparian corridor/significant natural resource. The Applicant's submitted natural resource assessment addresses all of the requirements for construction of the road in the SNR and proposes mitigation pursuant to Section VII below. The proposal complies with this criterion.*

2. Utilities and drainage facilities; Public and private utilities or drainage facilities may be placed within a significant natural resource when it is shown to the satisfaction of the review body that no other practicable alternative location exists. If a utility or drainage facility is allowed within a Significant Natural Resource the following standards shall apply:

a. Demonstrate to the reviewing authority that no other practicable access exists or access from an off-site location through the use of easements is not possible;
b. The corridor necessary to construct utilities shall be the minimum width practical so as to minimize intrusion into the Significant Natural Resource. Removal of trees and native vegetation shall be avoided unless absolutely necessary. The existing grade of the land shall be restored after construction. Native vegetation shall be used to restore the vegetative character of the construction corridor.
c. Prior to construction, the Significant Natural Resource area shall be flagged, fenced or otherwise marked and shall remain undisturbed except as allowed by the provisions of this ordinance. Such markings shall be maintained until construction is complete;
d. During construction, no stockpiling of fill materials, parking, or storage of equipment shall be allowed within the Significant Natural Resource.
e. Erosion control measures, such as silt fences and bio-filter bags, shall be used to reduce the likelihood of sediment and untreated storm water entering the Significant Natural Resource.

Finding: *The Applicant's proposal includes placement of the stormwater facility within the riparian corridor/SNR. Due to the size of the McKay Creek corridor and buffer area, as well as the natural drainage of the site east, toward the creek, the applicant has demonstrated that no other site or access is practical or feasible. The Applicant's Natural Resource Assessment details the design of the stormwater facility, demonstrating the efforts made to minimize intrusion into the SNR. Construction flagging and fencing and erosion control, as well as stockpiling, parking and equipment storage will be subject to these standards and monitored throughout the grading permit review, approval and inspection process. The standards of this section have been met.*

3. Replacement of existing structures with structures in the same location that do not disturb additional surface area;

4. Structures or other non-conforming alterations existing fully or partially within the Significant Natural Resource may be expanded provided the expansion occurs outside of the Significant Natural Resource. Substantial improvement of a non-conforming structure in the Significant Natural Resource shall require compliance with the standards of this ordinance.

5. Existing lawn within the Significant Natural Resource may be maintained, but not expanded within the limits of the Significant Natural Resource. Development activities shall not justify replacement of native vegetation, especially native riparian vegetation, with lawn.

6. Existing bank stabilization and flood control structures may be maintained. Any expansion of existing structures or development of new structures shall be evaluated by the Planning Department and appropriate state or federal natural resource agency. Such alteration of Significant Natural Resources shall be approved only if less-invasive or non-structural methods, such as bioengineering, will not adequately meet stabilization or flood control needs.

7. The types, sizes, and intensities of lights must be placed so that they do not shine directly into the Significant Natural Resource.

Finding: *There are no existing structures or lawns in the riparian corridor/significant natural resource area on this site. The submitted materials do not indicate any lighting shining directly into the Significant Natural Resource. While full compliance with this section cannot be verified, compliance can be conditioned as part of the land use approval.*

Recommended condition: *As an ongoing condition, the types, sizes and intensities of lights must be placed so that they do not shine directly into the McKay Creek Riparian Corridor/Significant Natural Resource.*

B. Removal of vegetation from the Significant Natural Resource is prohibited, except for:

1. Removal of non-native vegetation and replacement with native plant species. The replacement vegetation shall cover, at a minimum, the area from which vegetation was removed, shall maintain or exceed the density of the removed vegetation, and shall maintain or improve the shade provided by the vegetation.

2. Removal of vegetation necessary for the continued maintenance of dikes, drainage ditches, or other storm water or flood control facilities. Vegetation removal shall be kept to the minimum necessary.

3. Trees in danger of falling and thereby posing a hazard to life or property may be removed, following consultation from a certified arborist and approval from the Planning Department. If no hazard will be created, the department may require these trees, if felled, to be left in place in the Significant Natural Resource.

4. The control or removal of nuisance plants should primarily be by mechanical means (e.g. hand-pulling). If mechanical means fail to adequately control nuisance plant populations, a glyphosate-based herbicide is the only type of

herbicide that can be used in a significant natural resource area. No pre-emergent herbicides or auxin herbicides that pose a risk of contaminating water should be used. A herbicide application is preferred to be made early in the morning or during windless periods at least 4 hours before probable rainfall.

Finding: *The Applicant's submitted Natural Resource Assessment details vegetation removal consistent with this requirement. This standard has been met.*

16.75.020 NATURAL RESOURCE ENHANCEMENT AND RESTORATION
The City strongly encourages the enhancement or restoration of natural resources, such as riparian corridors along the unnamed tributary of McKay Creek and McKay Creek, in-channel habitat improvements, non-native plant control, and similar projects which propose to improve the quality of a Significant Natural Resource. However, no enhancement activity requiring the excavation or filling of material in a wetland shall be allowed unless all applicable State and Federal wetland permits have been granted.

16.75.025 Variances to Chapter 16.75
A variance to the provisions of Chapter 16.75 is permitted only as a last resort and is only considered necessary to allow reasonable economic use of the subject property, pursuant to Chapter 16.185. The property must be owned by the applicant and not created after the effective date of this Section. Approval of a variance is based on meeting the requirements of both subsections A and B, below.

A. A variance shall only apply to:

1. Lots on which the location of a Significant Natural Resource results in a building area depth for a single-family dwelling of 25 feet or less or a building envelope of 800 square feet or less;

2. Lots where strict adherence to the standards and conditions of Chapter 16.75 would effectively preclude a use of the parcel that could be reasonably expected to occur in the zone, and that the property owner would be precluded a substantial property right enjoyed by the majority of landowners in the vicinity.

Finding: *The proposed subdivision includes a variance request to allow an encroachment into the Riparian Corridor/Significant Natural Resource. The request is to allow the rear yards of lots 6-9 and 15-25 to encroach into the outer 25-feet of the 75-foot corridor. This variance is applicable because of A.2 above, where strict adherence to the standards and conditions of Chapter 16.75 would effectively preclude a use of the parcel that could be reasonably expected to occur in the zone, and that the property owner would be precluded a substantial property right enjoyed by the majority of landowners in the vicinity. The encroachment would allow development of the lots while maintaining a 50-foot Riparian Corridor buffer, the standard width utilized by Clean Water Services.*

B. Permanent alteration of the Significant Natural Resources by an action requiring a variance is subject to the procedures and criteria of Article and the mitigation requirements of Section VII.

Finding: *The proposed variance includes a detailed mitigation plan that is included in the submitted materials.*

16.75.30 Mitigation Standards

When approved impacts to any identified Significant Natural Resource occurs, mitigation will be required. For impacts to Significant Wetlands, the standards and criteria of Section 16.75.030 (A) shall apply. For impacts to Riparian Corridors, the standards and criteria of Section 16.75.030 (B) shall apply.

A. When mitigation for impacts to a Significant Wetland is proposed, the mitigation plan shall comply with all Oregon Division of State Lands and U.S. Army Corps of Engineers wetland regulations. The City may approve a development but shall not issue a building permit until all applicable State and Federal wetland permit approvals have been granted and copies of those approvals have been submitted to the City.

B. When mitigation for impacts to a non-wetland riparian area is proposed, a mitigation plan prepared by a qualified professional shall be submitted to the review authority. The mitigation plan shall meet the following criteria:

1. Mitigation for negative impacts to a Riparian Corridor shall follow all of the requirements of Clean Water Services - Design and Construction Standards - Resolution and Order 00-7;
2. Mitigation shall occur on-site and as close to the impact area as possible. If this is not feasible, mitigation shall occur within the same drainage basin as the impact;
3. All vegetation planted within the mitigation area shall be native to the region. Species to be planted in the mitigation area shall replace those impacted by the development activity;

Finding: *The proposal is subject to subsection B. above because the proposed subdivision includes a request for a variance to the 75-foot Riparian Corridor for a total encroachment of 11,466 square feet. The encroachment includes the stormwater facility, a portion of the access road to the stormwater facilities, and a portion of the rear yards of lots 6-9 and 15-25.*

The proposed mitigation for the impacts described above are included in the Applicant's submittal as detailed in Figure 6 of the Natural Resource Assessment provided by AKS Engineering & Forestry. The mitigation is proposed on-site as close to the impact area as possible. The mitigation plan calls for native vegetation to replace those impacted by development activity. The proposal meets the standards for riparian corridor mitigation.

LAND DIVISION

16.125 LOT DEVELOPMENT STANDARDS

16.125.005 Scope

The provisions of this subsection shall apply to all partitions and subdivisions within the City of North Plains.

Finding: *This subdivision is located within the City of North Plains. Therefore Section 16.125 applies.*

16.125.010 Standards for Lots

A. Minimum lot area: Minimum lot area shall conform to the requirements of the zoning district in which the lot is located.

Finding: *The minimum lot area in the R-2.5 zone is 2,500 square feet per lot. All of the proposed lots exceed 2,500 square feet in size, meeting the criterion of this section.*

B. Access: All lots created after the effective date of this Ordinance shall provide a minimum of 20 feet of frontage on an existing or proposed public street, with the following exception: Flag lots, accessed by a private driveway.

Finding: *Sheet P03 – Preliminary Subdivision Plat, identifies a minimum of 20 feet of frontage on an existing or proposed public street for all 58 lots, meeting the criterion of this Section.*

C. Flag lots: When authorized by the Planning Commission pursuant to the access requirements of Subsection Chapter 16.125.010 (B).(1), flag lots shall be subject to the following development standards.

Finding: *No flag lots are proposed with this application.*

D. Through lots: Through lots shall be avoided except where essential to provide separation of residential development from major traffic arteries, adjacent nonresidential activities, or to overcome specific disadvantages of topography and orientation. Screening or buffering may be required by the Planning Commission during the review of the land division request.

Finding: *Sheet P03 – Preliminary Subdivision Plat identifies Lots 1-4 as being through lots, with frontage on both NW Pacific Street (existing) and NW McKay Creek Drive (proposed). These lots, however, are essential to provide separation of this residential development from NW Pacific Street, a collector roadway, and to overcome the disadvantages of the topography and orientation of the site adjacent to McKay Creek, rendering much of the site unbuildable. Therefore, the submitted subdivision application complies with this criterion.*

E. Lot Side Lines: The side lines of lots, as far as practicable, shall run at right angles to the street upon which the lots face.

Finding: *Preliminary Plans illustrate that side lot lines run at right angles to the street as far as practicable.*

F. Lot Grading: Lot grading shall conform to the requirements of Chapter 70 of the Uniform Building Code, hereby adopted by reference, and to the following standards unless physical conditions demonstrate the propriety of other standards:

1. Cut slopes shall not exceed one and one-half feet horizontally to one foot vertically.
2. Fill slopes shall not exceed two feet horizontally to one foot vertically.

3. The character of soil for fill and the characteristics of lots and parcels made usable by fill shall be suitable for the purpose intended.

Finding: *Sheet P07 – Preliminary Grading and Erosion and Sediment Control Plan, illustrates compliance with the requirements of Chapter 70 of the Uniform Building Code as required in this subsection. This will be further verified at time of grading permit review.*

G. Large Lots: In dividing tracts into large lots which at some future time are likely to be re-divided, the applicant's tentative plan shall also demonstrate that any redevelopment or re-subdivision may readily take place at the planned residential density without violating the requirements of this ordinance.

The Planning Commission may require that the blocks be of such size and shape, be so divided into building sites and contain such site restrictions as will provide for extension and opening of streets at intervals which will permit a subsequent division of any tract into lots of small size.

Finding: *The proposed subdivision does not include the creation of any large lots to be re-divided at some time within the future.*

H. **Land for Public Purposes:** Where a proposed park, school or other public use indicated on the Comprehensive Plan is located in whole or in part within a subdivision, the sub-divider shall dedicate and reserve said area for such purpose. Where the City or other public authority has declared its intention to acquire said area, it shall proceed to perfect the title or a contract right to the same within three (3) years from the date of platting, and failing such, this reservation shall automatically expire. The public body shall expeditiously proceed, within its financial ability, to consummate such acquisitions.

Finding: *The submitted plans do not propose a park, school or other public use. Comprehensive Plan Section 15.02.065.2.A(3)- Recreation- City's Objectives and Policies states "The City shall designate stream corridors and flood plains as open space and possible linear park land". Additionally, the City's Parks & Recreation Facilities Master Plan: Appendix A: Community Trails Plan calls for the McKay Creek Greenway Trail, a walking rail following the McKay Creek natural area. A portion of this trail is on the eastside of this property.*

The Applicant has designated the McKay Creek Significant Natural Resource Area for the purpose of open space. The City will require a 15-foot wide easement for a walking trail through the area designated as open space in as close proximity as practical to McKay Creek. This will allow the City to construct the trail in the future to directly serve the residents of these proposed 58 lots as well as other residents of North Plains who may travel to the area. Construction of the walking trail would not be proportional to the impact of the 58-lot subdivision and is therefore not required as a condition of approval. This standard may be met as conditioned below.

Recommended condition: *Prior to approval of the final plat, submit a revised plat which identifies a 15-foot wide easement for a walking trail through the area designated as open space in as close proximity as practical to McKay Creek.*

16.125.015 Standards for Blocks

A. General: The length, width, and shape of blocks shall take into account the need for adequate building site size and street width and shall recognize the limitations of the topography.

B. Sizes: Residential Districts shall have a maximum 600 foot block length, a minimum 160 foot adjacent lot depth, and a 1,600 foot perimeter. A block shall have sufficient width to provide for two tiers of building sites unless topography of the location of adjoining streets justifies an exception.

Finding: *The Applicant proposes to construct NW McKay Creek Drive which will intersect NW 307th Avenue at the north and south of the site. The block created along NW 307th Avenue will be approximately 550 feet in length, meeting the 600 foot length maximum. The block will have a minimum 160 foot adjacent lot depth.*
The perimeter of the block is approximately 1,300 feet, below the 1,600 foot maximum. The block is of sufficient width to provide for two tiers of building sites. Based on the information above, the submitted application meets the criteria of this subsection.

16.125.020 Easements

A. **Utility Lines:** Minimum 5 foot wide easements for sewers, water mains, electric lines, or other public utilities shall be dedicated along the front, side, and rear lot or parcel lines of each lot. Easements shall be centered on lot lines.
B. **Water Courses:** If a tract is traversed by a water course such as a drainage way, channel or stream, a storm water easement or drainage right-of-way shall be provided which substantially parallels the lines of the water course.
C. **Pedestrian and Bicycle Ways:** When desirable for public convenience and access, a pedestrian or bicycle way easement may be required to connect to a cul-de-sac or to pass through an unusually long or oddly spaced block, or to otherwise provide appropriate circulation.

Finding: *Sheet P03 Preliminary Subdivision Plat identifies all of the utility easements, including a 15'storm sewer easement along the rear property lines of lots 31-38 and 44-51, a 25'sanitary sewer easement along the rear and/or to the east of lots 5-25 (existing), a storm inlet easement and a water quality access, sanitary and storm easement to CWS. The plat notes indicate easements to CWS over the stormwater facility and the vegetated corridor/wetlands/waters of the state.*

The site is traversed by McKay Creek, a water course. No stormwater easement or drainage right-of-way is indicated but can be conditioned.

The application does not include cul-de-sacs or unusually long or oddly spaced blocks.

This section is not fully met due to the lack of a stormwater easement or drainage right-of-way over McKay Creek; however, this can be conditioned.

Recommended condition: *Prior to approval of the final plat, submit a revised plat which indicates a stormwater easement or drainage right-of-way which substantially parallels the lines of McKay Creek water course.*

16.125.025 Improvement Requirements

B. Subdivisions: The following improvements shall be required for all subdivisions in the City of North Plains.

1. Frontage improvements: Street improvements to full City standards shall be required for all public streets on which a proposed subdivision fronts. Such improvements shall be blended to match with existing improved surfaces across the centerline and for a reasonable distance beyond the frontage of the property. Additional frontage improvements shall include: sidewalks, curbing, storm sewer, sanitary sewer, waterlines, other public utilities as necessary, and such other improvements as the City shall determine to be reasonably necessary to serve the development or the immediate neighborhood.

Finding: *Street improvements to full City standards are proposed for NW 307th Avenue. Half-street improvements are proposed to NW Highland Court; however, full-street improvements are required as discussed and conditioned in Section 16.150.115.*

2. Proposed streets: All public streets within the subdivision shall be constructed as required by the provisions of the Street Standards section of this chapter.

Finding: *Preliminary Plans illustrate public streets are planned in compliance with the Washington County Local Road Section. This is further discussed and conditioned as necessary in Section 16.150.155.*

3. Monuments: Upon completion of street improvements, monuments shall be reestablished and protected in monument boxes at every street intersection and all points of curvature and points at tangency of street center lines. Elevation bench marks shall be established at each street intersection monument with elevations to U.S. Geological Survey datum.

Finding: *As a condition of approval upon completion of street improvements, a registered professional land surveyor will establish monumentation and elevation benchmarks in compliance with 16.125.025.3.*

4. Sanitary Sewers: Sanitary sewers shall be installed to serve the subdivision and to connect the subdivision to existing mains both on and off the property being subdivided.

   If the required sewer facilities will, without further sewer construction, directly serve property outside the subdivision, the Planning Commission may recommend to the City Council construction as an assessment project with such arrangement with the sub-divider as is desirable to assure financing his share of the construction.

   The City may require that the sub-divider construct sewage lines of a size in excess of that necessary to adequately serve the development in question, where such facilities are or will be necessary to serve the entire area within which the development is located when the area is ultimately developed. The City may also require that the construction take place as an assessment project with such arrangement with the sub-divider as is desirable to assure his share of the construction.

Finding: *Sheet P08- Preliminary Composite Utility Plan illustrates the sanitary sewer system to serve the proposed subdivision. Sanitary sewer lines will be extended to the north and south. The need to oversize the sewage lines to serve adjacent development has not been identified by Clean Water Services. This standard has been met.*

5. Water System: Water lines with valves and fire hydrants serving the subdivision and connecting the subdivision to the city mains shall be installed. The design shall take into account provisions for extension beyond the subdivision to adequately grid the City system and to serve the area within which the development is located when the area is ultimately developed.

Finding: *Sheet P08- Preliminary Composite Utility Plan illustrates the water system to be provided including valves and fire hydrants to serve the subdivision and connecting the subdivision to city mains. Washington County Fire District No. 2 reviewed the proposal and noted that per Oregon Fire Code, fire hydrants used for suppression purposes should be no further than 600 road feet from any structure. This is not clearly addressed on the submitted plans and, therefore, the proposal is not in compliance with this section but can be conditioned.*

Recommended condition: *Prior to approval of the public improvement plans, submit a revised plan which shows fire hydrants used for suppression purposes no further than 300 ft apart per Public Works Standards.*

6. Street Lights and Street Trees: The installation of street lights and street trees is required at locations and of a type established by City standards.

Finding: *The submitted materials do not include information regarding street lights and street trees. Street trees must be planted in accordance with the recently adopted Public Works Standards (October 2013). A diverse set of tree species with varied life cycles should be planted on each street to prevent a catastrophic loss of trees to disease or life cycle term. Street lights and locations must meet Public Works Standards and use energy-conserving technology such as LED's. This standard is not met but could be met as conditioned below.*

Recommended condition: *Prior to approval of the final plat, submit a revised plan which includes street lights and street trees pursuant to section 16.125.025.6. Street lights are to be installed by the applicant and dedicated to the City upon acceptance of the final plat.*

7. Street Signs: The installation of street name signs and traffic control signs is required at locations determined appropriate by the City and shall be of a type established by City standards.

All improvements required under this subsection shall be completed to City standards, or assured through an irrevocable letter of credit, assignment of bank account, performance bond or other instrument acceptable to the City Attorney, prior to the approval of the Final Plat of the subdivision.

Finding: *Street name signs and traffic control signs will be provided at sites determined to be appropriate by the City and will be of a type established by City*

Standards.

16.125.030 Improvement Procedures
Improvements installed by a developer for any land division, either as a requirement of these regulations or at his own opinion, shall conform to the requirements of this Ordinance and improvement standards and specifications adopted by the City, and shall be installed in accordance with the following procedure:

A. Improvement work shall not be commenced until plans have been checked for adequacy and approved by the City. Plans shall be prepared in accordance with requirements of the City.

B. Improvement work shall not be commenced until the City has been notified in advance; and, if work has been discontinued for any reason, it shall not be resumed until the City has been notified.

C. Improvements shall be constructed under the inspection and to the satisfaction of the city engineer or the superintendent of public works. The City may require changes in typical sections and details in the public interest, if unusual conditions arise during construction to warrant the change.

D. All underground utilities, sanitary sewers, storm drains installed in streets by the sub-divider shall be constructed prior to the surfacing of the streets. Stubs for service connections for underground utilities and sanitary sewers shall be placed to a length eliminating the necessity for disturbing the street improvements when service connections are made.

E. A map showing all public improvements as built shall be filed with the superintendent of public works upon completion of the improvements.

Finding: *Sheets P08- Preliminary Composite Utility Plan and P09- Preliminary Street Plan illustrate utilities and street improvements to be provided with the subdivision. City staff approval in accordance with the development code and all applicable standards and regulations will be obtained prior to approval of the Final Plat or grading permit. Improvements installed by the developer will comply with the criteria of 16.125.030.*

Recommended condition: *Prior to approval of the final plat, the Applicant shall be responsible for reimbursing the City for the reasonable costs associated with inspection of public works improvements.*

16.135 SUBDIVISIONS

16.135.005 General Provisions

A. All subdivisions shall conform to applicable Zoning District Standards, Development Standards of this ordinance and the comprehensive plan.

Finding: *The proposed subdivision is located within the City of North Plains R-2.5 Zone. The response above to Section 16.30 of the development code demonstrates compliance with applicable criteria of the R-2.5 Zone. Therefore, this standard is met.*

B. A master plan for development shall be required for any application which leaves a portion of the subject property capable of redevelopment.

Finding: *There is no portion of this subject property that will be capable of redevelopment after completion of the proposed subdivision. Therefore, this standard is not applicable to this request.*

C. Pre-application conferences shall be required prior to the submittal of all subdivision applications.

Finding: A pre-application conference was held with the City Manager of the City of North Plains on July 31, 2014 regarding the proposed subdivision preliminary plat.

16.135.010 Submittal Requirements for Tentative Subdivision Plans

A. All Subdivision applications shall be submitted on forms provided by the City and accompanied by the appropriate filing fee.

B. Each application shall include fifteen (15) copies of the tentative subdivision plan drawn on a sheet of 18 x 24 inches in size at a scale of 1 inch equals 100 feet.

C. The following information shall be shown on the tentative subdivision plan:

1. Proposed name of the subdivision. This name shall not duplicate or resemble the name of any other subdivision in the county and shall be approved by the Planning Commission and the County Surveyor.
2. Date, north point and scale of drawing.
3. Appropriate identification of the drawing as a tentative plan.
4. Description of the subdivision sufficient to define its location and boundaries and legal description of the tract boundaries.
5. Names and addresses of the owner, subdivider, and engineer, surveyor or planner.
6. The location, widths and names of both improved and unimproved streets within or adjacent to the tract, together with easements and other important features such as section lines, section corner, city boundary lines and monuments.
7. Contour lines related to some established bench mark or other datum approved by the city engineer and having minimum intervals as follows:
    a. For slopes of less than five per cent: two feet, together with not less than four spot elevations per acre, evenly distributed, if necessary.
    b. For slopes of five percent to 15 percent: five feet.
    c. For slopes of 15 percent to 20 percent: ten feet.
    d. For slopes of over 20 percent: 20 feet.
8. The location of at least one temporary bench mark within the subdivision boundaries pursuant to ORS 96.060.
9. The location and direction of water courses and the location of areas subject to flooding and/or within a designated 100-year flood plain.
10. Natural features such as rock outcroppings, marshes, wooded areas and isolated preservable trees having a caliper (diameter) of 6 inches or greater at 4 feet above grade.
11. Existing uses of the property and location of existing structures designated historic and cultural resources on the site and structures to

remain on the property after platting.

12. A vicinity map showing existing subdivisions and unsubdivided land ownerships adjacent to the proposed subdivision and showing how proposed streets and utilities may be extended to connect to existing streets and utilities.
13. Proposed deed restrictions, if any, in outline form.
14. The location of existing sewage disposal facilities, water mains, culverts, storm drainage facilities and electric lines within and adjacent to the subdivision.
15. The location, width, names, approximate grades and radii of curves of proposed streets as shown on any development plan.
16. Dimensions and area of each proposed lot.
17. Proposed lot and block numbers.
18. Proposed sites, if any, allocated for development,
19. If the proposed subdivision includes only part of the tract owned or controlled by the sub-divider, the City Planner or Planning Commission may require a sketch or tentative layout for streets and lots in the unsubdivided portion.
20. Any of the following may be required by the City Planner or Planning Commission to supplement the tentative subdivision plan:
    a. Approximate center line profiles with extensions for a reasonable distance beyond the limits of the proposed subdivision showing the finished grade of streets and sidewalks and the nature and extent of street construction.
    b. A schematic plan for domestic water supply lines and related water service and sewage disposal facilities.
    c. Proposals for storm water drainage and flood control, including profiles of proposed drainage ways.
    d. If lot areas are to be graded or filled, a plan showing the nature of cuts and fills and information on the character of the soil.
    e. Proposals for other improvements such as electric utilities.

Finding: *The preliminary plans have been prepared in compliance with 16.135.010 and include the application requirements for a preliminary subdivision plat. The requirements of this section have been met.*

16.135.011 Preliminary Plat Approval Criteria

The City may approve, approve with conditions or deny a preliminary plat based on the following approval criteria:

A. The proposed preliminary plat complies with the applicable Development Code chapters and all other applicable ordinances and regulations. At a minimum, the provisions of this section and the applicable sections of this chapter including Zoning Districts, Development Standards, and Streets and Facilities shall apply. Where a variance is necessary to receive preliminary plat approval, the application shall also comply with the Variance section of this chapter;

Finding: *The applicant has demonstrated or can be conditioned to demonstrate compliance with applicable criteria of the City of North Plains Zoning and Development Code, including Section 16.125 Lot Development Standards, Section 16.135,*

Subdivisions, Section 16.145 Public Facility and Service Requirements, Section 16.150 Street Standards, Section 16.160 Clear Vision Areas, Section 16.170 Application Requirements and Review Procedures and Section 16.185 Variances.

B. The proposed plat name is not already recorded for another subdivision, and satisfies the provisions of ORS Chapter 92;

Finding: *It is unclear whether the plat name has been approved by the County; however, this can be conditioned.*

Recommended condition: *Prior to approval of the final plat, submit the plat name approval form from Washington County.*

C. The proposed streets, roads, sidewalks, bicycle lanes, pathways, utilities, and surface water management facilities are laid out so as to conform or transition to the plats of subdivision and maps of major partitions already approved for adjoining property as to width, general direction and in all other respects. All proposed public improvements and dedications are identified on the preliminary plat;

Finding: *Preliminary Plans illustrate proposed streets, sidewalks, alleys, pathways, utilities, and surface water management facilities. The proposed infrastructure and utilities are laid out to conform to adjacent existing development.*

D. All proposed private common areas and improvements (e.g. homeowners association property) are identified on the preliminary plat;

Finding: *According to the applicant, private common areas within the subject area will consist of open space areas. Tracts for private open space areas are identified on Sheet P03 - Preliminary Subdivision Plat and will be retained by the Homeowner's Association. The Applicant has not submitted a Homeowners' Association articles of incorporation explicitly stating responsibility of the open space; however, this can be conditioned. This standard will be met once HOA ownership and responsibility of the open space is established, as conditioned below.*

Recommended condition: *Prior to final plat approval, the Applicant must create and submit Homeowners' Association articles of incorporation, which explicitly state the homeowners' responsibility to maintain the open space designated on the plat.*

E. Evidence that any required State and federal permits have been obtained, or shall be obtained before approval of the final plat;

Finding: *Applications for a wetland fill permit will be submitted for approval to the Department of State Lands and Army Corps of Engineers as necessary. Required permits will be obtained prior to approval of the final plat.*

F. Evidence the improvements or conditions required by the City, road authority, Washington County, Clean Water Services, special districts, utilities, and/or other service providers, as applicable to the project, have been or can be met;

Finding: *A CWS Service Provider Letter is included in the submitted materials. Sheet*

P08 – Preliminary Composite Utility Plan shows proposed utilities designed to comply with CWS, City, and County requirements. Compliance with Washington County requirements for road improvements will be addressed with engineering plans, to be submitted to Washington County Development Services (Public Assurances) as necessary.

G. A Traffic Impact Study (TIS) has been provided, if applicable, in accordance with the provisions of Chapter 16.170; and

Finding: *Lancaster Engineering completed a Traffic Impact Study on October 27, 2014. This TIS is included with the submitted materials.*

H. If any part of the site is located within a Specific Area Plan District, Overlay District, or previously approved Master Planned Development, it shall conform to the applicable regulations and/or conditions.

Finding: *The subject site is within the floodplain overlay district and significant natural resource overlay district. Conformance with the applicable regulations of these districts is discussed previously in this report, Sections 16.65 (Floodplain) and 16.75 (Significant Natural Resource).*

16.135.012 Lot Access Provisions

In addition to the provisions of this chapter, all lots and parcels shall conform to the specific requirements below, as applicable:

A. In conformance with the Uniform Fire Code (UFC), a 20-foot wide fire apparatus drive shall be provided to serve all portions of a building that are located more than 150 feet from a public right-of-way or approved access drive.

B. When a common drive is to be provided to serve more than one lot, a reciprocal easement which will ensure access and maintenance rights shall be recorded with the approved subdivision or partition plat. The minimum drive width shall be 10 to 15 feet, except as required by the UFC, and improved with an all-weather surface approved by the City.

C. Access reserve strips may be required to be granted to the City for the purpose of controlling access to adjoining undeveloped properties.

D. Street and building placement and alignment shall be designed so that all future street connections can be made as surrounding properties develop.

Finding: *Sheet P03 – Preliminary Subdivision Plat shows that all future buildings on proposed lots will be located within 150 feet from a public right-of-way. Common drives are not proposed. There are no adjoining undeveloped properties for which the City needs access reserve strips. The only remaining surrounding property that could develop is to the south and would be served by the existing NW 307th Avenue. The proposal is in compliance with these standards.*

STANDARDS FOR DEVELOPMENT
16.145 PUBLIC FACILITY AND SERVICE REQUIREMENTS

16.145.005 Application of Public Facility Standards
The provisions of Chapter 16.145 Public Facility and Service Requirements shall apply to development within the City of North Plains as listed in the following table. No development permit shall be approved unless the following required improvements are provided to City standards prior to occupancy or operation unless an exception is approved by the City Council per Chapter 16.145.020 or future provision of the improvement is assured per Chapter 16.145.030.

Public Facilities Improvement Requirements Table						
	Fire Hydrants	Street Improvements	Water Line	Sewer Liner	Storm Drainage & Trees	Street Lights
Single Family Homes	N	C [2]	Y	C [4]	Y	N
Two Family & Multifamily Dwellings	Y	Y	Y	Y	Y	Y
Partitions, Subdivisions and Manufactured Home Parks	Y	Y	Y	Y	Y	Y
New Commercial Buildings	Y	Y	Y	Y	Y	Y
Commercial Expansions	C [1]	C [3]	Y	Y	Y	Y
New Industrial Buildings	Y	Y	Y	Y	Y	Y
Industrial Expansions	C [1]	C [3]	Y	Y	Y	Y
N = Not required Y = Yes, required C=Conditional, required in some case						
Note: Street lights shall be installed using PGE Option B.						

Finding: *Preliminary Plans illustrate public facility improvements will comply with Section 16.145.005*

16.145.010 Public Facility Standards
The following public facility standards shall be applicable to all development as specified in the Application Review section of this chapter.

A. Streets: Street improvements required by Chapter 16.145.005 Public Facility & Service Standards shall be provided in compliance with Street Standards of this ordinance.

Finding: *Streets are discussed in detail and conditioned as necessary in Section 16.150, further in this report.*

B. Storm Drainage: No development permit shall be approved for any property until the City Engineer has reviewed and approved provisions for storm water drainage in accordance with the following criteria:

1. For storm drainage across or over the property on which the development is located, there are storm drainage facilities available which are capable of handling a one-hundred year flood without damage to any improvement on the property, or inundation of the lowest habitable floor of any residential structure thereon.

2. For storm drainage along or from streets adjacent to the property on which the development is located, there are storm drainage facilities available in accordance with the City of North Plains adopted street standard.

Finding: *Sheet P08 – Preliminary Composite Utility Plan illustrates existing and proposed storm drainage and is submitted for review by the City Engineer. Storm drainage will be provided in compliance with Section 16.145.010(B). Storm drainage lines will be extended to the east and will outlet to the stormwater facility adjacent to McKay Creek. The proposed preliminary plat is in compliance with this criterion.*

C. Sewage Disposal: No development permit shall be approved until the City Engineer and Clean Water Services has reviewed and approved provisions for connection to the public sewer system.

Finding: *Sheet P08 – Preliminary Composite Utility Plan illustrates existing and proposed sanitary sewer lines. The final plans will be submitted for review and approval by the City and Clean Water Services. The preliminary subdivision plat complies with this criterion.*

D. Water Supply: No development permit shall be approved for any property unless all affected water mains are either:

1. Fully improved to a standard providing both adequate potable water and fire flows, as established by the applicable State Plumbing Code and approved by the City Engineer; or
2. Improved to a standard providing adequate potable water flows pursuant to the City Water Master Plan and approved by the City Engineer and the Fire Chief for Washington County Fire District No. 2.

Finding: *Sheet 08 – Preliminary Composite Utility Plan shows the existing and proposed water lines. The proposed water system has been designed to supply sufficient flows for potable water and fire uses within the subject site. As conditioned previously, the location of fire suppression hydrants is needed to verify compliance with Oregon Fire Code.*

16.145.120 Methods to Assure Facilities and Services

A legal and enforceable document, contract or process which assures the City that a public improvement will be accomplished is required. Assurances may include but are not limited to the following:

A. Cash in escrow, assignment of letter of credit, etc.

B. Establishment of a Local Improvement District (LID) through the post-remonstrance period. Failure of the City to accept the LID shall constitute a

waiver of the assurance requirement.

C. Evidence of formal action by public or private agencies or companies, including the City of North Plains, appropriating monies for the requisite public improvement.

D. Any other legally binding arrangement that assures the improvements will be made within the required time frame, including:

    1. Phasing of the development;

    2. Construction of interim improvements;

    3. Construction of improvements on a phased basis.

Finding: *The City will require la legal and enforceable document, contract or process to ensure public improvement completion. This generally occurs prior to issuance of development permits. This standard can be conditioned to be met.*

Recommended condition: *Prior to approval of the final plat, submit a revised plan which includes street lights and street trees pursuant to section 16.125.025.6.*

16.145.130 Requirement for Public Work Permit

No person, firm or corporation shall commence construction of improvements within a public right-of-way or upon public property without first obtaining a Public Works Construction Permit on a form or forms provided by the City.

Finding: *the applicant is required to obtain permits from the City of North Plains or Washington County, as applicable, for work performed in the right of way.*

16.150 STREET STANDARDS

16.150.010 GENERAL PROVISIONS

The following general provisions shall apply to the dedication, construction, improvement or other development of all public streets in the City of North Plains:

A. The location, width, and grade of streets shall be considered in their relation to existing and planned streets, to topographical conditions, to public convenience and safety, and to the proposed use of the land to be served by the streets.

Finding: *Sheet P09 Preliminary Street Plan illustrates the location, width, and grade of streets. Streets have been designed to city standards with consideration of existing and planned streets, topographical conditions, public convenience and safety. The proposal includes a half-street improvement with rolled AC curb on NW Highland Court. In order to fully serve the residents of the proposed 58 lots, a sidewalk along the southern edge of NW Highland Court as well as a full-width paved section of NW Highland Court from NW 307th Avenue to the proposed NW McKay Creek Drive are necessary and will be conditioned as follows.*

Recommended condition: *Prior to approval of the public improvement plans, submit a revised plan which includes a full-street improvement of NW Highland Court from NW 307th Avenue to the proposed NW McKay Creek Drive, including sidewalk along the south side of the street.*

B. Development proposals shall provide for the continuation of existing principal streets where necessary to promote appropriate traffic circulation in the vicinity of the development.

Finding: *The subject site adjacent to NW Pacific Street and NW 307th Avenue, both of which continue beyond the site. The street network has been designed to promote appropriate traffic circulation within the vicinity of the subdivision. This standard has been met.*

C. Reserve strips: Reserve strips or street plugs controlling the access to streets will not be approved unless necessary for the protection of the public welfare or of substantial property rights, and in these cases they may be required. The control and disposal of the land composing such strips shall be placed within the jurisdiction of the City under conditions approved by the Planning Commission.

Finding: No reserve strips or street plugs are proposed and, therefore, this standard is met.

D. Alignment: All streets other than minor streets or cul-de-sacs, as far as practical, shall be in alignment with existing streets by continuation of the center lines thereof. The staggering of street alignments resulting in "T" intersections shall, wherever practical, leave a minimum distance of 200 feet between the center lines of streets having approximately the same direction and otherwise shall not be less than 100 feet.

Finding: NW Highland Court will be extended in alignment with the existing centerline. The centerline of the northern portion of NW McKay Creek Drive intersects NW 307th Avenue south of NW Pacific Street. The distance between the center lines of NW McKay Creek Drive and NW Pacific Street is approximately 130 feet, greater than the 100 foot minimum. The proposed alignment of streets complies with the standards of 16.150.010.D.

E. Future extension of streets: Where necessary to give access to or permit a satisfactory future development of adjoining land, streets shall be extended to the boundary of a tract being developed and the resulting dead-end streets may be approved without turnarounds. Reserve strips and street plugs may be required to preserve the objectives of street extensions.

Finding: *NW 307th Avenue extends north and south of this site along the western border of the property. There are no street extensions possible to the east given the location of McKay Creek. No future extension of streets is possible and, therefore, this standard is met.*

F. Intersection angles: Streets shall be laid out to intersect at angles as near to right angles as practical, except where topography requires lesser angle, but in no case shall the acute angle be less than 80 degrees unless there is a special intersection design. An arterial or collector street intersecting with another

street shall have at least 100 feet of centerline tangent adjacent to the intersection unless topography requires a lesser distance. Other streets, except alleys, shall have at least 50 feet of tangent adjacent to the intersection unless topography requires a lesser distance. Intersections which contain an acute angle of less than 80 degrees or which include an arterial or collector street shall have a minimum corner radius sufficient to allow for a roadway radius of 20 feet and maintain a uniform width between the roadway and the right-of-way line. All other intersections shall have a minimum corner radius sufficient to allow for a roadway radius of 10 feet and maintain a uniform width between the roadway and the right-of-way line. Ordinarily, the intersection of more than two streets at any one point will not be approved.

Finding: *All streets within the preliminary subdivision plat are laid out to intersect as near to right angles as practical. No arterial or collector streets are proposed within the preliminary subdivision plat. The submitted proposal complies with this criterion.*

G. Existing streets: Whenever existing public streets adjacent to or within a tract are of inadequate width, additional right-of-way shall be provided at the time of subdivision or development.

Finding: The right-of-way of SW 307th Avenue is of sufficient width to complete the street construction to city standards. No additional right-of-way is necessary and, therefore, this standard is met.

H. Cul-de-sacs: Cul-de-sacs shall be as short as possible, and shall have maximum lengths of 600 feet and shall not serve more than 20 dwelling units. All cul-de-sacs shall terminate with circular turnarounds. Commercial and industrial cul-de-sacs shall have a minimum 55' bulb radius. Additional cul-de sac specifications, including specifications for residential cul-de-sacs, are contained within the most recently adopted public works/street standards of the City of North Plains and/or Washington County development standards.

Finding: No cul-de-sacs are proposed with the preliminary subdivision plat.

I. Street names: No street names shall be used which will duplicate or be confused with the names of existing streets, except for extensions of existing streets. Street names and number shall conform to the established pattern in the City and shall be subject to the approval of the Planning Commission.

Finding: Proposed street names are shown on the Preliminary Plans. The Applicant proposes "NW McKay Creek Drive" for the name of the new street in the development. A street name must be selected from the City's list of street names or reflecting the County numbering grid. The proposed street name is not compliant with this criterion as there is already a McKay Creek Court in North Plains, but can be conditioned to meet this standard.

Recommended condition: *Prior to approval of the public improvement plans, obtain approval for the name of the new local street in the subdivision.*

J. Grades and curves: Grades shall not exceed 6 percent on arterials, 10 percent

on collector streets or 12 percent on any other street. Center line radii of curves shall not be less than 300 feet on arterials, 200 feet on collectors or 100 feet on other streets, and shall be to an even 10 feet. Where existing conditions, particularly topography, make it otherwise impractical to provide buildable sites, the Planning Commission may accept steeper grades and sharper curves. In flat areas, allowance shall be made for finished street grades having a minimum slope of 0.5 percent.

Finding: *Sheet P10 – Preliminary Street Cross Sections illustrates compliance with grade and curve standards and, therefore, this criterion is met.*

K. Marginal access streets: If a development abuts or contains an existing or proposed arterial street, the Planning Commission may require marginal access streets, reverse frontage lots with suitable depth, screen planting contained in a non-access reservation along the rear or side property line, or such other treatment as may be necessary for adequate protection of residential properties and to afford separation of through and local traffic.

Finding: *The property does not abut or contain an existing or proposed arterial street and, therefore, this criterion is not applicable to this proposal.*

L. Alleys: Alleys shall be provided in commercial and industrial districts unless other permanent provisions for access to off-street parking and loading facilities are made as approved by the Planning Commission. While alley intersections and sharp changes in alignment shall be avoided, the corners of necessary alley intersections shall have radii of not less than 10 feet.

Finding: *The subject site is not located within a commercial or industrial district and, therefore, this criterion is not applicable to this proposal.*

M. Sidewalks shall be a minimum of five feet in width. Curbs and sidewalks shall be required along both sides of all public streets. All new development upon lots, tracts or parcels of land adjacent to a public street will be required to construct curbs and sidewalks.

Finding: *Sheet P10 – Preliminary Street Cross Sections identifies sidewalks as a minimum of 5 feet in width. The proposal does not show curbs and sidewalks on both sides of NW Highland Court; however, this was previously recommended to be conditioned above, in Section 16.150.010.A.*

N. Street trees, where provided, shall not be of a species which has a shallow spreading root system which is likely to disturb sidewalk or street improvements.

Finding: *The Applicant's narrative states, "street trees will be planted within the planter strips along NW 307th Avenue". The narrative further states, "since there is no planter strip on the looped local street, as a condition of approval street trees will be planted in the front yard of each parcel to City specifications". As no street trees are indicated on the proposed plans and details regarding species is not indicated in the narrative, this criterion is not met but could be met as conditioned below.*

Recommended condition: *Prior to approval of the public improvement plans, submit a revised plan which*

includes street trees along NW 307th, NW Highland Court and NW McKay Creek Drive.

O. Access Spacing Standards shall, to the greatest extent possible, comply with Washington County's standards and the most recently adopted public works/street standards of the City of North Plains. Washington County's access spacing standards by street functional classification are as follows:

Major Arterial: 1,000 feet
Minor Arterial: 600 feet
Major Collector: 150 feet
Minor Collector: 50 feet
Local Street: 10 feet

Finding: NW 307th Avenue is a collector between NW Highland Court to the south and NW Pacific Street to the north. Lots 44-55 will take access from this collector street; however, each lot is 30 or 32 feet in width and therefore cannot individually meet the minor collector spacing standard of 50 feet.

The City of North Plains Public Works Design Standards, updated March 2013, states, "Access to private property shall be permitted with the use of driveway curb cuts. The access points with the street shall be the minimum necessary to provide access while not inhibiting the safe circulation and carrying capacity of the street. On Collector streets and above, one driveway per site frontage will be the normal maximum number".

Permitting one driveway per lot will, to the greatest extent possible, comply with Washington County's standards and the most recently adopted public works/street standards of the City of North Plains. Therefore, this criterion is satisfied.

16.150.115 General Right-of-Way and Improvement Widths

Construction specifications for all street and right-of-way improvement widths shall comply with the criteria of the most recently adopted public works/street standards of the City of North Plains, the North Plains Transportation System Plan, and/or Washington County standards. These standards shall be the minimum requirements for all streets, except where modifications are permitted under this chapter or the Street Standard adopted by the City Council of North Plains, whichever is less restrictive. Refer to Figures 5-2A-5-2P in the Transportation System Plan for detailed diagrams depicting street right-of-way, improved, and roadway width requirements.

Finding: *Sheet P10- Preliminary Street Cross Sections details the proposed cross sections for NW 307th Avenue, NW Highland Court and NW McKay Creek Drive.*

NW 307th Avenue is designed to match the existing portion of the street on the west side of centerline.

NW Highland Court is designed to be a local street with sidewalk on one side. The condition was recommended previously to revise the plans to include sidewalk on both sides of the street.

NW McKay Creek Drive is designed to meet the Washington County Local Road Section L-3 standard. The proposed cross section for NW McKay Creek places the 5' public sidewalk halfway within the right-of-way and halfway within an easement on private

property, consistent with the L-3 standard.

Therefore, the proposed 34-foot right-of-way with sidewalk on both sides meets the Washington County Local Road Section standard. This criterion is met.

16.150.025 Construction Specifications

Construction specifications for all public improvements shall comply with the criteria of the most recently adopted public works/street standards of the City of North Plains.

Finding: *Construction of all public improvements will comply with the most recently adopted public works/street standards of the City of North Plains.*

16.31.070 Bikeways and Sidewalks Required on Arterials and Collectors

A. Glencoe Road: Include bicycle lanes and sidewalks on both sides of the road. This would provide connectivity to the existing sidewalks and future growth to the east of Glencoe Road.

B. Commercial Street: Include bicycle lanes and sidewalks on both sides of the road. A detailed plan should be developed to make sure these facilities coexist with parking demand in the downtown area.

C. North Avenue: On the near term a sidewalk should be constructed on the south side of North Avenue to connect the existing sidewalk to Gordon Road. Sidewalks should also be added on the south side of North Avenue between NW 309th Avenue and Glencoe Road. These improvements would complete a system of sidewalks on North Avenue in addition to providing connectivity to the adjacent street system. In the Long term sidewalks should to added to the north side of North Avenue also.

D. Gordon Road: Provide sidewalk on the east side. This improvement will facilitate a connection to the future extension of sidewalk on the south side of North Avenue and to sidewalks along Commercial Street.

Finding: *The proposed subdivision does not abut any of the listed streets and, therefore, this criterion is not applicable.*

16.160 OFF STREET PARKING AND LOADING

16.155.005 General Provisions

E. Off-street parking spaces for dwellings shall be located on the same tax lot with the structure, and within 250 feet of the dwelling unit for which the parking space is required. Garages and/or carports may be used to satisfy the off-street parking requirements for dwellings, however, one required parking space may be uncovered. Parking spaces required for other uses may be located on a separate tax lot and shall be located not farther than 500 feet from the building or use they are to serve.

F. Parking and loading spaces shall not be located in a required side or rear yard, except that off street parking spaces may be located in a required side or rear yard adjacent to a street on commercial or industrial zoned land provided that

the parking spaces are developed consistent with the development standards of this chapter.

16.155.015 Automotive Parking Requirements
A. Residential
1. Detached single family - Two (2) spaces per dwelling unit

Finding: *The Applicant's narrative indicates that each dwelling will have space for at least two (2) parking spaces on the same lot as the home within the garage and/or on the driveway. The parking standards have been met.*

16.160 CLEAR VISION AREAS

16.160.000 Requirements

Except in the C-1 zone, a clear vision area shall be maintained on the corners of all property adjacent to the intersection of two streets, a street and a railroad, or a driveway providing vehicular access to a public street, including alleys.

A. Lots or parcels on street corners (public and/or private) shall maintain a sight triangle with no sight obstruction between three (3) feet and ten (10) feet in height as measured from street grade. Sight obstructions include, but are not limited to, fences, vegetation, berms, signs and structures. The sight triangle shall be measured from the street corner (apex), to a distance of twenty (20) feet along each street side (see Figure 1). For the purpose of this Section, a street corner is defined as that point where the extended edges of the road surface of two intersecting streets meet. The City may require additional vision clearance based on a hazard identified by the City. However, tree trunks and sign poles not exceeding 12 inches in diameter may be located within the vision clearance area, provided the diameter does not exceed 24 inches.

B. A private access shall be treated as a public street for the purpose of this section. The vision clearance area shall be determined in the manner set forth form in Chapter 16.160.000.010(A). The edge of the paved surface area of the private access, be it roadway, curb or sidewalk, shall be treated as the right-of-way line in determining the vision clearance area.

Finding: *No construction on residential lots or parcels that would create any sight obstruction is proposed with this application. Compliance with 16.160.000 will be addressed through subsequent construction plans.*

16.170 APPLICATION REQUIREMENTS AND REVIEW PROCEDURES

Administrative, Limited Land Use, Quasi-Judicial & Legislative Decisions

16.170.000 General Provisions

C. Type III Quasi-Judicial Permits by Planning Commission

14. Subdivision Permit

Finding: *This application is classified as Type III because it includes a preliminary subdivision plat.*

16.170.001 Pre-application Conference

A pre-application conference is recommended for a Type II, III and IV permit. The applicant shall file the appropriate application, pay the review fee and meet with the City Planner, other city staff and affected agencies. At the conference the City Planner shall identify the relevant comprehensive plan policies, map designations, zone and development standards and procedural requirements applicable to the application. The planner and affected agencies shall provide technical data and identify opportunities or constraints concerning the application.

Failure of the City to provide any information required by this section does not constitute a waiver of any of the standards, criteria or requirements for the application. Due to possible changes in federal, state, regional and local law, the applicant is responsible for assuring the application complies with all applicable laws on the day the application is deemed complete.

Finding: *A pre-application conference was held with the City Manager and staff of North Plains on July 31, 2014.*

16.170.002 Neighborhood Meeting

Applicants or their representatives are encouraged to meet with adjacent property owners and neighborhood representatives prior to submitting an application to the City in order to solicit input and exchange information about the proposed development. The applicant for a Type III application is encouraged to hold a neighborhood meeting with a recognized neighborhood or community organization. If no organization exists, then the applicant is encouraged to hold a meeting with adjacent property owners within a radius of 250 feet who will receive public notice.

Finding: *The Applicant did not hold a neighborhood meeting regarding this development. Because a neighborhood meeting is encouraged but not required, this standard is met.*

16.170.003 Traffic Impact Study

The purpose of this section of the code is to assist in determining which road authorities participate in a land use decision, and to implement Section 660-012-0045 (2) of the State Transportation Planning Rule that requires the City to apply conditions to development proposals in order to minimize impacts and protect transportation facilities. This Chapter establishes the standards for when a proposal must be reviewed for potential traffic impacts; when a Traffic Impact Study must be submitted with a development application in order to determine whether conditions are needed to minimize impacts to and protect transportation facilities; what must be in a Traffic Impact Study; and who is qualified to prepare the Study.

A. When a Traffic Impact Study is required. The City or other road authority with jurisdiction may require a Traffic Impact Study (TIS) as part of an application for development, a change in use, or a change in access. A TIS shall be required when a land use application involves one or more of the following actions:

1. A change in zoning or a plan amendment designation;
2. Any proposed development of land use action that a road authority states may have operational or safety concerns along its facility;
3. An increase in site traffic volume generation by 300 Average Daily Trips (ADT) or more; or
4. An increase in site traffic volume of a particular movement to and from the State Highway by 20 percent or more; or\
5. An increase in use of adjacent streets by vehicles exceeding the 20,000 pound gross vehicle weights by 10 vehicles or more per day; or
6. The location of the access driveway does not meet minimum sight distance requirements, or is located where vehicles entering or leaving the property are restricted, or such vehicles queue or hesitate on the State Highway, creating a safety hazard; or
7. A change in internal traffic patterns that may cause safety problems, such as back up onto a street or greater potential for traffic accidents.

B. Traffic Impact Study Preparation. A Traffic Impact Study shall be prepared by a professional engineer in accordance with the requirements of the road authority. If the road authority is the Oregon Department of Transportation (ODOT), consult ODOT's regional development review planner and OAR 734-051-180.

Finding: *A Traffic Impact Study was completed by Lancaster Engineering on October 27, 2014 and is included in the submitted documents in support of this subdivision.*

C. City Street Improvement Requirements. In addition to street improvement requirements in this code for new development, see Chapters 16.145 and 16.150 for street improvement requirements related to single family homes and commercial and industrial expansions.

Finding: *Section II of this report addresses compliance with the City of North Plains Zoning & Development Code, including Section 16.145 and Section 16.150.*

16.170.012 Type III Quasi-Judicial Decisions by the Planning Decision

A. Pre-application Conference. A pre-application conference is required for all Type III quasi-judicial applications under this Section. The requirements and procedures for a pre-application conference are described in Chapter 16.170.001.

Finding: *As previously described, a pre-application conference was held with the City of North Plains City Manager on July 31, 2014 in compliance with Section 16.170.001.*

B. Application Requirements.

1. Application form. A quasi-judicial application shall be made on forms provided by the City Planner or designee. The application shall include the property owner's signature of consent. Entities with condemnation authority are not required to provide a consent signature.

2. Submittal Information. When a quasi-judicial application is required, it shall

include:

a. The information requested on the application form;
b. One copy of a narrative statement that explains how the application satisfies each of the relevant criteria and standards insufficient detail for review and decision-making.
c. The required fee pursuant to Chapter 16.00.070; and
d. One set of pre-stamped and pre-addressed envelopes for all real property owners of record who will receive a notice of the application within 250 feet. The records of the Washington County Assessor's office are the official records for determining ownership. The applicant shall produce the notice list. At the applicant's request, and upon payment of a fee noted on the City's fee list, the City may prepare the public notice mailing list. The City or the applicant shall use the most current County real property assessment records to produce the notice list. The City shall mail the notice of application.

Finding: *The applicant has met the requirements of 16.170.020 and was deemed to have submitted a complete application on January 9, 2015.*

16.85 VARIANCE

16.185.010 Type III Variance Review Criteria

A variance may be authorized upon adequate demonstration by the applicant that the proposed variance satisfies the following criteria:

Finding: *The Applicant requests a variance to Section 16.75.015- General Development Standards, which limits development within the Significant Natural Resource. Specifically, the Applicant requests to encroach 25-feet into the 75-foot riparian corridor with the rear yards of lots 6-9 and 15-25.*

the Significant Resource Overlay District Riparian Corridor

A. That special conditions and circumstances exist which are peculiar to the land, building or structure involved;

Finding: *The subject site is encumbered with multiple environmental constraints (special conditions and circumstances), including floodplain and floodway designations, Clean Water Services sensitive area vegetated corridors (buffers), and the City of North Plains significant natural resource overlay zoning. As a result, approximately 55 percent of the subject property is required to be placed in both open space and conservation tracts to accommodate the site's environmental elements. The area in question is located outside of the FEMA floodway and the 100 year flood plain as well as Clean Water Services vegetated corridor (50-foot buffer). Based on requirements of other jurisdictions regarding vegetated corridors, the additional 25 feet of buffer beyond the 50-foot buffer required by Clean Water Services is considered "peculiar" to the development of the subject site.*

B. That granting the proposed variance would be in the public interest and would be in harmony with the purpose of the underlying zoning district and the intent and purpose of this Ordinance;

Finding: *Granting this variance would be in harmony with the purpose of the R-2.5 zoning district, permitting high-density residential development of the site. The buffer area would be maintained for a width of 50 feet without encroachment. The encroachment area would be mitigated on-site. The variance also accommodates properly sized streets, sidewalks and block patterns, which affect the overall functionality and livability of the neighborhood. Absent the variance, the project would have insufficient "usable" private outdoor living space, which in turn would require reduced right-of-way widths and alternative sidewalk designs in order to develop the site to the desired density of the R-2.5 zoning district.*

C. That the variance would result in minimal detriment to the immediate vicinity;

Finding: *If the variance is approved allowing use of 25-feet of the Riparian Corridor, the 50-foot remaining buffer is the standard buffer utilized by Clean Water Services for resource protection. The Applicant will mitigate the area of the variance by enhancing other sections of the McKay Creek sensitive area, thus enhancing the immediate vicinity.*

D. That the variance requested is the minimum variance which would make possible the reasonable use of the applicant's land, building or structure; and

Finding: *The 25-foot use of the Riparian Corridor in the rear yards of the lots would still maintain the remaining 50-feet of the corridor while allowing reasonable use of the applicant's land. The 50-foot remaining buffer is the standard buffer utilized by Clean Water Services for resource protection.*

E. That the special conditions and circumstances on which the application is based do not result from the negligent or knowing violation of this Ordinance by the applicant.

Finding: *The conditions and circumstances on which the variance is based are not the result of negligence or a knowing violation of the City of North Plains Development Ordinance.*

16.185.020 Conditions of Approval

In approving an application for a Type III variance, the Planning Commission may impose such conditions as it deems appropriate to ensure that the intent of this Section is carried out. Such conditions shall be reasonably related to the variance criteria set forth in this chapter.

Finding: *The variance request is for the encroached Riparian Corridor buffer area to be in the rear yards of the lots. Mitigation is proposed consistent with Section 16.75. Additional conditions are not necessary to ensure that the intent of this Section is carried out.*

III. CONCLUSIONS

The Planning Commission is considering approval of the Preliminary Subdivision Plan for McKay Creek Crossing.

Staff recommends approval of the application with conditions of approval outlined below.

IV. CONDITIONS OF APPROVAL

Prior to approval of a grading permit or any other preliminary permits, the Applicant shall provide evidence that the following conditions have been satisfied:

1. All sanitary sewer, storm sewer, and surface water management provisions shall be designed in accordance with Clean Water Services (CWS) "Design and Construction Standards for Sanitary Sewer and Surface Water Management," as contained in CWS Resolution and Order No. 07-20 (R&) 07-20). This shall include both the conveyance system and off-site improvements and modifications to existing systems necessary to provide adequate services to the site.

2. Sanitary sewer service improvements shall be provided in compliance with R&O 07-20 and City of North Plains Public Works Design Standards, Planning, Zoning, and Development Codes and other applicable City and Washington County Policies.

3. Surface water conveyance and surface water management facilities shall be provided in compliance with R&O 07-20 and other Washington County standards that apply, as well as the City of North Plains Public Works Design Standards, Planning, Zoning, and Development Codes and other applicable City and Washington County Policies. All system improvements located outside of the Urban Growth Boundary (UGB) shall require approvals from Washington County in addition to the City.

4. Public water system improvements are required and shall be planned, designed, and constructed in accordance with current City of North Plains Public Works Design Standards, the City Engineer's recommendations and the APWA Standard Specifications for Public Works Construction. The system improvements shall be looped with the existing water system as approved by the City and be constructed with minimum 8 inch diameter pipes. Following approval of the subdivision and prior to any on-site development, the water system shall be verified by the City Engineer, at the applicant's expense, to demonstrate that the proposed water system improvements meet all applicable City and State requirements and is consistent with the City Water Master Plan and water distribution model.

5. All off-site sanitary sewer and storm water easements of sufficient width, as determined by the approving authority, shall be dedicated to the appropriate jurisdictional authority prior to approval of any construction agreements, engineered plans, plat, grading or construction permits. Any easements proposed outside the Urban Growth Boundary shall be approved by Washington County.

6. Comply with the CWS Service Provider letter dated November 6, 2014. Comply with all applicable DSL and the Army Corps of Engineers and DSL permits as required.

Prior to Final Plat approval, the Applicant shall:

1. Submit to the City Engineer for review and approval public improvement plans consistent with the proposed plans completed by AKS Engineering and Forestry, LLC and dated 11-06-2014, with the following revisions:

   A. Street trees along NW 307th, NW Highland Court and NW McKay Creek Drive.
   B. A full-street improvement of NW Highland Court from NW 307th Avenue to

the proposed NW McKay Creek Drive, including sidewalk along the south side of the street.

C. A revised name for the proposed "McKay Creek Drive" that meets city street naming standards.
D. Fire hydrants used for suppression purposes no further than 300 feet apart per Public Works Standards.
E. Street lights and street trees pursuant to section 16.125.025.6. Street lights are to be installed by the applicant and dedicated to the City upon acceptance of the final plat.

2. Submit to the Planning Department for review and approval a revised subdivision plat consistent with the proposed plans completed by AKS Engineering and Forestry, LLC and dated 11-06-2014, with the following revisions:

A. Identify a stormwater easement or drainage right-of-way which substantially parallels the lines of McKay Creek water course.
B. Identify a 15-foot wide easement for a walking trail through the area designated as open space in as close proximity as practical to McKay Creek.

3. Submit to the Planning Department for review and approval:

A. The plat name approval from Washington County.
B. Homeowners' Association articles of incorporation, which explicitly state the homeowners' responsibility to maintain the open space designated on the plat.
C. Evidence of a Flood Plain Development Permit.

4. Obtain approval of the Public Improvement Plans and construct all public improvements or adequately guarantee completion of public improvements consistent with Development Code Section 16.145.120.

Prior to Issuance of Building Permits, the Applicant shall submit building permit applications which identify:

1. Structure placement in compliance with section 16.30.015.D, ensuring garages, carports, accessory dwellings and accessory structures are flush with, or recessed behind, the front building elevation of the principle structure;

2. Structure height in compliance with section 16.30.105.H, ensuring that the building height does not exceed 35 feet or two and a half stories, whichever is less;

3. Lot coverage in compliance with section 16.30.015.I, ensuring that the minimum lot coverage for impervious surfaces does not exceed 65%; and

4. The front building elevations in compliance with section 16.30.025, ensuring that at least two of the required design features are provided.

Ongoing Conditions:

1. Streets shall be dedicated and designed in accordance with the City of North Plains Development Code and Public Works Design Standards.

2. An 8' public utility easement should be located across all lot and tract frontages adjacent to public right-of-way.

3. Street names shall be provided in accordance with the north/south County numbered street sequence for the north/south streets if applicable. Otherwise streets shall be approved by City staff based upon names of local area pioneers or settlers, community leaders or local flora or fauna. Include pedestrian trail signage and in other appropriate street crossings to assure pedestrian safety. Preliminary street names are recommended on page 28.

4. Applicant shall comply with Washington County Fire District No. 2 regarding hydrant locations and other district requirements.

5. Applicant shall comply with the development standards of the City Zoning and Development Code Chapter 16.30 R-2.5 High-Density Residential.

6. Applicant shall comply with City Zoning and Development Code Chapter 16.57 Subdivisions Final Plat.

7. The applicant shall provide street intersection monumentation and elevation benchmarks per City and County Surveyor requirements. Applicant shall provide a metes and bounds description of the subdivision.

8. All conditions of approval must be completed within one year of the date of this approval or the approval is void, unless specifically modified by an approved phased construction schedule, approval of an extension, or unless the applicant/owners provides assurances otherwise.

9. Prior to obtaining approval to begin construction of any public improvements, the applicant/owner shall provide a performance bond to the City in the amount of 125% of the total cost of such construction. Upon completion of all public improvements, the applicant/owner shall provide a maintenance bond to the City, in the amount of 40% of the total cost of such construction, guaranteeing said improvements for a period of one (1) year following City acceptance of said improvements. Comply with the recommended conditions of the Public Works Director.

10. Street lights on city local streets shall be installed as per IES standards and the PGE "Acorn" fixture. The developer is to contact PGE outdoor Lighting services 503-844-5361.

11. All utilities shall be constructed underground.

12. The types, sizes and intensities of lights must be placed so that they do not shine directly into the McKay Creek Riparian Corridor/Significant Natural Resource.

13. The applicant/owners shall have a licensed land surveyor prepare a Final Plat of the proposed subdivision and submit it to the City for City approval, and then record it with the Washington County Surveyor's Office and County Clerk's Office. The applicant/owners shall then send a copy of the recorded Plat to the City Recorder.

14. The applicant/owners agree to waive their right to remonstrate against the

formation of a local improvement district or other mechanism to construct future improvements to the streets, storm water, water and sewer systems that may be assessed against the subject property.

15. Prior to City approval of the final subdivision plat for the subject property, the applicant/owners shall sign and record a Development Agreement with the City, covering all of the conditions of approval and pay all fees.

16. The applicant shall be responsible for reimbursing the City for the reasonable costs associated with inspection of public works improvements.

17. It shall be the responsibility of the Developer or his representative to coordinate all design requirements with the appropriate agencies and utilities. In addition to the City of North Plains, Clean Water Services (CWS) must review and approve the proposed sanitary sewer /storm water sewer improvements. Also, the Fire District must review and approve the site plan for emergency access vehicles. Approval must be obtained in written form and any coordination work with all agencies shall be the Developers sole responsibility. Documentation of all written approvals and permits from affected agencies should be provided to the City for their records.

18. Approved plans do not guarantee the adequacy of the design, or guarantee that there will not be any design conflicts during construction. The design engineer should be notified of any design conflicts that are noted during construction and he/she should then immediately notify the City of North Plains. Modifications to the design must be approved by the City of North Plains and the appropriate Agency prior to continuing with any relevant construction activities.

19. After Planning Commission review the Developer must submit separate construction plans that meet all Conditions of Approval, City of North Plains Public Works Design Standards, 1990 APWA Standard Specifications for Public Works Construction with August 1996 revisions, and Clean Water Services to the City for review and approval. Prior to the start of construction the plans must be approved by the City and all City and Agency permits must be obtained.

Preliminary Subdivision Plat Application for McKay Creek Crossing

Date: November 2014

Submitted to: City of North Plains
Planning Department
31360 NW Commercial Street
North Plains, OR 97133

Owner: North Plains Acres, LLC
3390 NW 178th Avenue
Portland, OR 97229

Applicant: Biggi Construction, LLC
11605 NW Normandy Lane
Wilsonville, OR 97070

AKS Engineering & Forestry
12965 SW Herman Road, Suite 100
Tualatin, OR 97062
P: (503) 563-6151
F: (503) 563-6152
www.aks-eng.com

Preliminary Subdivision Plat Application For McKay Creek Crossing

Table of Contents

Application Contents (1 Copy):

- Signed City Application Form
- Written Narrative
- Traffic Impact Study
- Geotechnical Report
- Clean Water Services Service Provider Letter
- Natural Resource Assessment
- Significant Natural Resource Assessment
- Preliminary Stormwater Report
- County Assessor's Map

Included Separately with Application (1 Copy):

- Preliminary Plans – 24" x 36"
- Mailing Address Labels (1 Set)
- Digital (pdf) Copy of Application (1 Compact Disc)
- City Application Fee (1 Check)

Signed City Application Form

Contact: Applicant's Consultant
AKS Engineering & Forestry, LLC (Chris Goodell)
12965 SW Herman Road #100
Tualatin, OR 97062
phone: (503) 563-6151
email: chrisg@aks-eng.com

NORTH PLAINS
City to the Sunset

City of North Plains
31360 NW Commercial St. North Plains, OR 97133
Ph. 503-647-5555 Fax 503-647-2031
Email: info@northplains.org

GENERAL LAND USE APPLICATION

Applicant General Information

Applicant Name: Biggi Construction, LLC

Mailing Address: 11605 SW Normandy Lane
Street *Apartment/Unit #*
Wilsonville OR 97070
City *State* *ZIP Code*

Email Address: Contact applicant's consultant Phone: ( ) -

Property Owner: North Plains Acres, LLC

Mailing Address: 3390 NW 178th Avenue
Street *Apartment/Unit #*
Portland OR 97229
City *State* *ZIP Code*

Email Address: Contact applicant's consultant Phone: ( ) -

Property Description

Address: 9960 NW 307th Ave
Street *Apartment/Unit #*
North Plains OR 97133
City *State* *ZIP Code*

Tax Lot ID: Tax Lot 1601 1N3 01DD Existing Zoning: R-2.5

Property Area: +/-10.90 acres Existing Land Use: 1 single family dwelling

General Development Description: 58 lot subdivision with 5.87 acres of open space

Fees

Land Use Process	Fee	Land Use Process	Fee
☐ Annexation	$10,000 deposit*	☐ Non-Conforming Use	$265
☐ Appeal	$315	☑ Subdivision	$2,880
☐ Comp Plan Amendment, Text	$8,000	☐ Manu Home Park	$4,000
☐ Comp Plan Amendment, Map	$5,000	☐ Modification – Minor	$150
☐ Conditional Use, Residential	$395	☐ Modification – Major	$2,125
☐ Conditional Use, Ind. & Comm.	$745	☑ SNR Permit	$1,640
☐ Design Review Type II	$185	☐ Similar Use	$615
☐ Design Review Type III	$890	☐ Street Vacation	$1,675
☑ Floodplain Permit	$1,925	☐ UGB Expansion	$28,000
☐ Partition, with street dedication	$640	☐ Variance, Administrative	$145
☐ Partition, no street dedication	$400	☑ Variance, PC Hearing	$1,115
☐ Lot Line Adjustment	$275	☐ Zoning Code Amendment	$2,825
☐ Other:			

* plus $9,000 election deposit

Forms/Planning & Building Forms/Planning Forms/Current Forms/General Land Use Application (2)

Information to Include with Your Application

- Narrative describing the Development Proposal and addressing the Decision Criteria. *All applications will be reviewed based on the criteria of North Plains Zoning Ordinance*. Ask Staff for the applicable chapters to address in your narrative.
- Application and fee
- Plans drawn to scale showing:
  - All property boundaries in which development is occurring
  - All adjacent roads (with names and dimensions)
  - Location and dimensions of all existing and proposed access ways/driveways
  - Location, number, dimensions, setbacks, and types of existing and proposed utilities, including water, sewer, storm water, electric, gas, phone, and cable
  - Location, size (area), and setbacks of all existing and proposed fire hydrants
  - Location, size (area), and setbacks of all existing and proposed buildings and structures
  - Location, size (area), and layout of existing and proposed landscaping
  - Location, number and dimensions of existing and proposed parking areas, including handicapped spaces
  - Location, number and dimensions of existing and proposed loading areas
  - Location, number, dimensions, and types of existing and proposed lighting
  - Location, number, dimensions, setbacks, and types of existing and proposed fencing and or/screening
  - Location, number, dimensions, setbacks, and types of existing and proposed mechanical equipment, such as rooftop equipment and transformer boxes. Show any screening of proposed equipment.
  - Pedestrian circulation
  - Outdoor seating areas
  - Flood plains
  - Water courses
  - Significant vegetation
  - Easements
- If required, mailing labels for all property owners <u>and</u> residents within 250 feet of the subject property or properties. A list of property owners/site addresses may be obtained from a title insurance company. Please ask staff if mailing labels are required for your application.
- If required, a traffic study shall be submitted. Please ask staff if a traffic study is required.

<u>After initial review, the City may require additional information.</u>

Additional Information

In order to expedite and complete the processing of this application, the City of North Plains requires that all pertinent material required for review of this application be submitted at the time application is made. If the application is found to be incomplete, review and processing of the application will not begin until the application is made complete.

I certify that the statements made in this application are complete and true to the best of my knowledge. I understand that any false statements may result in denial of this application.

I understand that there may be additional costs of processing this application including, but not limited to, planning, engineering, city attorney and administration. The City will notify the applicant if there will be additional costs.

Date: 10/14/14 Signature of Applicant: _____

Date: _____ Signature of Property Owner: _____

FOR OFFICE USE

Received by: _____ Date: _____

Fee paid: _____ Receipt No. _____ Application No. _____

Information to Include with Your Application

- ✓ Narrative describing the Development Proposal and addressing the Decision Criteria. *All applications will be reviewed based on the criteria of North Plains Zoning Ordinance*. Ask Staff for the applicable chapters to address in your narrative.
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  - All property boundaries in which development is occurring
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I understand that there may be additional costs of processing this application including, but not limited to, planning, engineering, city attorney and administration. The City will notify the applicant if there will be additional costs.

Date: _____ Signature of Applicant: _____

Date: 10/16/14 Signature of Property Owner: Janet L. Cole, agent

FOR OFFICE USE

Received by: _____ Date: _____

Fee paid: _____ Receipt No. _____ Application No. _____

Written Narrative

Preliminary Subdivision Plat Application For McKay Creek Crossing

Date:	November 2014
Submitted to:	City of North Plains Planning Department 31360 NW Commercial Street North Plains, OR 97133
Owner:	North Plains Acres, LLC 3390 NW 178th Avenue Portland, OR 97229
Applicant:	Biggi Construction, LLC 11605 SW Normandy Lane Wilsonville, OR 97070
Applicant's Consultant:	AKS Engineering & Forestry, LLC 12965 SW Herman Road, Suite 100 Tualatin, OR 97062 Contact(s): Alex Hurley (alex@aks-eng.com) Chris Goodell (chrisg@aks-eng.com) Phone: (503) 563-6151 Fax: (503) 563-6152
Site Location:	9960 NW 307th Avenue
Assessor's Info:	Tax Map 1N3W01DD Tax Lot 1601
Site Size/Zone:	+/- 10.90 acres/Zone R-2.5

I. Executive Summary

The applicant is pleased to submit this land use application for a new residential subdivision 'McKay Creek Crossing' to the City of North Plains. The subject property is approximately 10.95 acres and is located east of NW 307th Avenue between NW Pacific Street and NW Highland Court. Similar to other recently completed subdivisions to the west, the property is designated R-2.5 by the City of North Plains Zoning Map. The essential components of the project are:

- 58 lots for the future construction of single-family detached homes
- Over 5 ½ acres of open space, dedicated to the protection and preservation of McKay Creek
- New public streets, including the completion of NW 307th Avenue to City standards
- New public utilities, including sanitary sewer, water, and stormwater services

This land use application includes four primary components: subdivision review, a floodplain permit, a significant natural resource permit, and a variance. As McKay Creek flows through the eastern portion of the site, the property is encumbered multiple environmental constraints. This includes flood plain and floodway designations, a Clean Water Services vegetated corridor, and the City of North Plains Significant Natural Resource Overlay. These constraints necessitate the flood plain permit and significant natural resource permit. The variance application involves balancing protection of the natural resources associated with McKay Creek with the need to provide proper public street alignments (for vehicular travel), suitably sized and spaced blocks (for pedestrian circulation), critical public infrastructure, and sufficiently sized lots to accommodate new homes with useable back yards(for future residents). Detailed information regarding each component of the application is provided throughout this written narrative.

The approval criteria for the application are found in Section 16.65 (Floodplain Overlay District), Section 16.75 (Significant Natural Overlay District), Section 16.16 (Land Divisions), and Section 16.185 (Variance) of the City of North Plains Zoning and Development Ordinance. This written narrative, together with preliminary plans, significant natural resource assessment, traffic impact study, geotechnical engineering report, and other documentation included in the application materials, establish that the application is in compliance with all applicable approval criteria. This documentation represents substantial evidence and provides the basis for City's approval of the application.

II. Site Description

The subject property is located east of NW 307th Avenue and north of NW Highland Court. The site consists of Tax Lot 1601 of Tax Map 1N3W01DD. The City's Natural Resource map shows the Significant Natural Resource (SNR) designation impacting a large portion of the property. McKay Creek bisects the property as it flows from north to south.

Surrounding Area / Zoning

North. Undeveloped properties zoned General Commercial (C-2) for the western portion and Residential (R-2.5) for the eastern portion.

South. An existing industrial development as well as underdeveloped residential sites zoned M-2 and R-2.5.

East. A large farm located in unincorporated Washington County and designated EFU.

West. NW 307th Avenue and developed lots designated R-2.5.

III. Applicable Review Criteria

16.30.000 *Purpose of R2-5 District*

The purpose of the R2.5 District is to provide for the development of multi-family housing, and to implement the housing policies of the Comprehensive Plan

16.30.005 *Permitted Uses*

Permitted uses are subject to the requirements of the Design Review section of this chapter, if applicable. Refer to Zoning Code Use Table.

A. Accessory Dwellings, Subject to Chapter 16.105, Accessory Uses, Structures & Dwellings

B. Attached you will find our authorization for professional services form.
Accessory Structures related to residential uses, Subject to Chapter 16.105, Accessory Uses, Structures, & Dwellings

C. Child Care, Certified Home

D. Child Care, Registered Home

E. Duplexes, Subject to Chapter 16.100, Duplex, Triplex, and Attached Single Family Dwellings

F. Home occupations, Subject to Chapter 16.85, Home Occupations

G. Manufactured Homes, Subject to Chapter 16.110, Manufactured Homes

H. Manufactured Home Parks, Subject to Chapter 16.110, Manufactured Homes

I. Attached you will find our authorization for professional services form.
Multi-family dwellings, Subject to Chapter 16.175 Multi-Family Dwelling(s)Section and Chapter 16.100, Duplex, Triplex, and Attached Single Family Dwelling

J. Planned Unit Development, Subject to Chapter 16.140, Planned Unit Development

K. Residential Facility

L. Residential Homes

M. Attached you will find our authorization for professional services form.
Single family attached homes row houses, 4 units. Subject to Chapter 16.100, Duplex, Triplex, and Attached Single Family Dwellings

N. Single family detached dwelling

Response: the application includes 58 lots for the future construction of single-family detached dwellings, a permitted use in the R-2.5 district.

16.30.015 Dimensional Standards

The following dimensional standards shall be the minimum requirements for all development in the R 2.5 District except for modifications permitted under Lot, Building, & Yard Exceptions or Planned Unit Development sections of this chapter. In addition, a minor adjustment of up to 10% of the required setback, area, lot size, lot depth or lot width may be granted by the City pursuant to Variance section of this chapter provided the adjustment complies with administrative variance review criteria.

A. Lot/Parcel Size:

- *Lots created by subdivision: 6,000 square feet maximum lot size per dwelling unit.*
- *Single-family dwelling: 2,500 square feet minimum.*
- *Two-family dwelling (duplexes), Triplexes & attached single family dwellings: 2,500 square feet per unit minimum lot size.*
- *Multi-family dwelling developments (greater than 3 units):4,000 square feet minimum foot lot.*
- *All other uses 4,000 square feet minimum.*

Response: The single-family detached lots comply with the minimum lot size of 2,500 square feet and the maximum lot size of the largest lot is less than 6,000 square feet.

B. Lot Depth and Width: There is no minimum lot width or depth

Response: There are no minimum lot dimensional requirements. Lots are suitably sized for future home construction.

C. Setback Requirements: Principle structures, accessory dwellings, attached accessory structures and detached accessory structures with a floor area greater than 120 square feet shall maintain the following minimum yard setbacks except that development on flag lots shall be subject to the setback standards for flag lots:

a. Front Yard (garage or carport)	*20 feet*
b. Front Yard (all other structures)	*15 feet*
c. Rear Yard	*10 feet for street-access lots 6 feet for alley-access lots*
d. Side Yard (interior)	
e. Side Yard (adjacent to street)	*10 feet plus additional necessary to comply with the standards of Clear Vision Areas*
f. Flag lots	*10 feet for all yards, except yard facing the garage shall be a minimum of 20 feet*

Response: The preliminary plat illustrates a building envelope on each lot showing compliance with the required future building setbacks.

H. Height of Buildings: Buildings shall not exceed a height, measured from grade, of 35 feet. Accessory dwellings and accessory structures shall not exceed 25 feet.

Response: All of the new buildings will comply with the 35 foot height requirement.

I. Lot Coverage: In the R-2.5 District, the maximum lot coverage for impervious surfaces shall not exceed 65%.

Response: While individual homes have not yet been determined for each lot, the lots have been sized to accommodate a dwelling that will not exceed the 65% coverage requirement.

16.65 Flood Plain Overlay District (FP) General Provisions

A. Area of Application:

All property, regardless of the underlying zoning designation, which falls within the boundaries of the 100-year Flood Plain, also known as the area of special flood hazard, shall be subject to the provisions of Chapter 16.65 Flood Plain Overlay District (FP).

Response: As shown on the existing conditions plan, the 100 year flood plain impacts approximately half of the subject property.

Basis for Establishing the Areas of Special Flood Hazard

The areas of special flood hazard identified by the Federal Insurance Administration in a scientific and engineering report entitled "The Flood Insurance Study of the City of North Plains, Oregon, Washington County, Oregon," dated October 1, 1981, with the accompanying Flood Insurance Maps are hereby adopted by reference and declared to be a part of this Ordinance. The Flood Insurance Study is on file at the City of North Plains, City Hall, North Plains, Oregon. The City shall utilize all authoritative information available in determining the location of special flood hazard areas.

Response: The special flood hazard area (100 year flood plain) as established above, is shown on the preliminary plan set.

Compliance

No structure or land shall hereafter be constructed, located, extended, converted, or altered without full compliance with the terms of this Ordinance and other applicable regulations.

Response: Full compliance with the provisions of this Ordinance will occur both in the construction of the lots as well as the future homes.

Flood Plain Permit Administration

A. Development Permit Required

A development permit shall be obtained before construction or development begins within any area of special flood hazard. The permit shall be required for all structures including manufactured homes, as set forth in the Definitions, and for all other development including fill and other activities, also as set forth in the Definitions.

Response: All required permits will be obtained prior to any work commencing within the 100 year flood plain. The only work anticipated within the 100 year flood plain is a minor amount of grading in the rear portions of a few lots in the northeast portion of the subdivision and associated with the required stormwater facility and the access drive provided to that facility.

Application for Development Permit

Application for a development permit shall be made on forms furnished by the City Recorder and may include, but not be limited to, plans in duplicate drawn to scale showing the nature, location, dimensions, and elevations of the area in question, existing or proposed structures, fill, storage of materials and drainage facilities. Specifically, the following information is required:

1. *Elevation in relation to mean sea level of the lowest floor (including basement) of all structures;*

2. *Elevation in relation to mean sea level to which the structure has been flood proofed;*

3. *Certification by a registered professional engineer or architect that the flood proofing methods for any nonresidential structure meet the flood proofing criteria of this chapter.*

4. *Description of the extent to which any watercourse will be altered or relocated as a result of proposed development.*

Response: The application includes all of the required information mentioned above.

Provisions for Flood Hazard Protection

In all areas of special flood hazards the following standards are required:

A. Anchoring

1. *All new construction and substantial improvements shall be anchored to prevent flotation, collapse or lateral movement of the structure.*

Response: Based on the subdivision design, construction of homes in the flood plain is not anticipated.

B. Construction Materials and Methods

1. *All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.*

2. *All new construction and substantial improvements shall be constructed using methods and practices that minimize flood damage.*

3. *Electrical, heating, ventilation, plumbing, and air-conditioning equipment and other service facilities shall be designed and/or otherwise elevated or located so as to prevent water from entering or accumulating within components during conditions of flooding.*

Response: Where applicable, all new construction will utilize material and methods to minimize flood damage. Therefore, this criterion will be met.

C. Utilities

1. *All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system;*
2. *New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters; and*
3. *On-site disposal systems shall be located to avoid impairment to them or contamination from them during flooding.*

Response: As shown on the Preliminary Composite Utility Plan, the only utility line proposed to be constructed within the 100 year flood plain is a stormwater line to the stormwater facility. The portion of this line to be constructed within the 100 year flood plain is less than 20 feet long. This construction will be designed to comply with all applicable standards and requirements. Therefore, this criterion will be met.

D. Subdivision Proposals

1. *All subdivision proposals shall be consistent with the need to minimize flood damage;*

2. *All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize flood damage;*

3. *All subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage; and*

4. *Base flood elevation data shall be provided for subdivision proposals and other proposed development which contain at least 50 lots or 5 acres, whichever is less.*

Response: McKay Creek Crossing has been designed to minimize the potential for flood damage by limiting development within the flood plain to small portions of the back yards of a few lots and to provide a connection to the required stormwater facility. As shown on the Preliminary Grading Plan, grading within the 100 year flood plain will be limited to these areas as well as the access necessary to get a vehicle to the stormwater facility for maintenance. The base flood elevation shown is based on the existing FEMA information. Therefore, this criterion has been met.

Specific Standards

In all areas of special flood hazards where base flood elevations data has been provided as set forth in this Chapter, the following provisions are required:

A. Residential Construction

New construction and substantial improvement of any residential structure shall have the lowest floor, including basement, elevated to one foot above base flood elevations. Fully enclosed areas below the lowest floor that are subject to flooding are prohibited. Parking, crawl spaces and storage is allowed below the lowest floor provided the area is designed to permit the entry and exit of flood waters.

Response: Future homes will be built such that the lowest floor is more than 1 foot above base flood elevation. Therefore, this criteria will be met.

Flood Ways

Located within areas of special flood hazard established in this chapter are areas designated as flood ways. Since the flood way is an extremely hazardous area due to the velocity of flood waters which carry debris, potential projectiles and erosion potential, the following provisions apply, these provisions apply to all floodways:

1. *Prohibit encroachments, including fill, new construction, substantial improvements, and other development within Zones A1 and A2 (as defined by the Federal Emergency Management Agency) unless certification by registered professional engineer or architect is provided demonstrating that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.*

2. *Indicate how the proposal minimizes flood damage.*

Response: No lots are located within the Flood Way and the only construction to be done within the Flood Way is the Stormwater Facility. The Stormwater Facility will not contain improvements which would constrict the flow of water during a storm event. Therefore, the application meets the criteria of this section.

16.75 Significant Natural Resource Overlay District

Purpose Significant Natural Resources Overlay District (SNR)

The Significant Natural Resources Overlay District provides protection for identified significant natural resources within the City of North Plains as designated under Statewide Planning Goal 5. For the purpose of this overlay zone, significant natural resources are designated as Significant Wetlands and Riparian Corridors. These resources have been inventoried within the City of North Plains according to procedures, standards and definitions established under Goal 5 and are identified on the Significant Natural Resources Map as adopted in the Comprehensive Plan. The Significant Natural Resources Overlay Zone District is intended to:

A. *Protect valuable natural resources within the City of North Plains Urban Growth Boundary, while ensuring reasonable economic use of property;*

B. *Augment existing regulations of water quality sensitive areas, vegetated corridors wetlands and water resources, including Clean Water Services Design and Construction Standards, the Division of State Lands Removal Fill Law (ORS 196.800-196.990), and by the US Army Corps of Engineers' administration of Section 404 of the Clean Water Act;*

C. *Encourage public knowledge, understanding and appreciation of the City's natural resources;*

D. *Provide protection of wetlands and riparian corridors to maintain salmonid habitat, water quality, thermal regulation, sediment trapping, hydrologic control of flood waters; stream bank stabilization and other important functions and conditions;*

E. *Encourage restoration of wetlands and riparian corridors; and*

F. *Carry out the provisions of Statewide Planning Goal 5.*

Response: Due to the presence of McKay Creek traversing the project site, a large portion of the property is designated with a Significant Natural Resources Overlay District. Therefore, the following standards are relevant to the application.

16.75.005 Definitions

Q. *Riparian Corridor: A Goal 5 resource that includes the water areas, fish habitat, riparian areas, and wetlands within the riparian corridor boundary. In the City of North Plains, Riparian Corridor boundaries are measured as follows:*

   a. *The unnamed tributary of McKay Creek: 50 feet from the top of bank or from the edge of a delineated significant wetland, whichever is further landward, and;*

   b. *McKay Creek: 75 feet from the top of bank or from the edge of a delineated significant wetland, whichever is further landward.*

Response: The on-site riparian corridor associated with McKay Creek has been located and delineated in the field by a professional natural resource consultant and then surveyed and mapped by a professional land surveyor. As shown on the preliminary plans, a 75-foot wide riparian corridor is provided along much of the McKay Creek bank. Necessary encroachments into the 75-foot riparian corridor are included in the application such as the stormwater treatment facility and outfall and the rear portions of several lots. Each of these is consistent with Clean Water Services requirements for vegetated corridors as evidence by the Service Provider Letter from Clean Water Services.

The application's Significant Resource Assessment includes a detailed Riparian Corridor Evaluation, Alternatives Analysis, and Mitigation Plan. Please refer to that document for detailed information regarding this aspect of the project.

16.75.0154 General Development Standards

A. The permanent alteration of the Significant Natural Resource by grading, by excavation or fill, by the placement of structures or impervious surfaces, or by the removal of native vegetation is prohibited, except for the following uses provided they are designed to minimize intrusion into the significant natural resource, and no other options or locations are feasible:

1. Streets, roads, paths and driveways;
Public or private streets, driveways, or paths may be placed within a Significant Natural Resource to access development activities if it is shown to the satisfaction of the reviewing authority that no other practicable method of access exists. If allowed, the applicant shall comply with the following requirements:

a. Demonstrate to the reviewing authority that no other practicable access to the build able area exists or access from an off-site location through the use of easements is not possible;

b. Design roads, driveways, and paths to be the minimum width necessary and for the minimum intrusion into the Significant Natural Resource while also allowing for safe passage of vehicles and/or pedestrians;

c. Use bridges, arched culverts, or box culverts with a natural bottom for crossing of a Significant Natural Resource if the crossing is found unavoidable. The lower lip of any culvert must meet the channel bed at or below grade. The number of channel crossings shall be minimized through use of shared access for abutting lots and access through easements for adjacent lots;

d. Consider the need for future extensions of shared access, access easements, or private streets to access potential new building sites at the time of this application in order to avoid subsequent encroachments into the Significant Natural Resource;

e. Prior to construction, the Significant Natural Resource area shall be flagged, fenced or otherwise marked and shall remain undisturbed except as allowed by the provisions of this ordinance. Such markings shall be maintained until construction is complete;

f. During construction, no stockpiling of fill materials, parking, or storage of equipment shall be allowed within the Significant Natural Resource;

g. Erosion control measures, such as silt fences and bio-filter bags, shall be used to reduce the likelihood of sediment and untreated storm water entering the Significant Natural Resource.

h. Permanent alteration of the Significant Natural Resource by the placement of public or private streets, driveways, or paths is subject to the mitigation requirements of Section VII.

Response: Please refer to the Significant Natural Resource Assessment for a complete description of the riparian corridor, any encroachments, and planned mitigation.

Public and private utilities or drainage facilities may be placed within a significant natural resource when it is shown to the satisfaction of the review body that no other practicable alternative location exists. If a utility or drainage facility is allowed within a Significant Natural Resource the following standards shall apply:

i. Demonstrate to the reviewing authority that no other practicable access exists or access from an off-site location through the use of easements is not possible;

j. The corridor necessary to construct utilities shall be the minimum width practical so as to minimize intrusion into the Significant Natural Resource. Removal of trees and native vegetation shall be avoided unless absolutely necessary. The existing grade of the land shall be restored after construction. Native vegetation shall be used to restore the vegetative character of the construction corridor.

k. Prior to construction, the Significant Natural Resource area shall be flagged, fenced or otherwise marked and shall remain undisturbed except as allowed by the provisions of this ordinance. Such markings shall be maintained until construction is complete;

l. During construction, no stockpiling of fill materials, parking, or storage of equipment shall be allowed within the Significant Natural Resource.

m. Erosion control measures, such as silt fences and bio-filter bags, shall be used to reduce the likelihood of sediment and untreated storm water entering the Significant Natural Resource.

Response: Please refer to the Significant Natural Resource Assessment for a complete description of the riparian corridor, any encroachments, and planned mitigation.

2. Replacement of existing structures with structures in the same location that do not disturb additional surface area;

3. Structures or other non-conforming alterations existing fully or partially within the Significant Natural Resource may be expanded provided the expansion occurs outside of the Significant Natural Resource. Substantial improvement of a non- conforming structure in the Significant Natural Resource shall require compliance with the standards of this ordinance.

4. Existing lawn within the Significant Natural Resource may be maintained, but not expanded within the limits of the Significant Natural Resource. Development activities shall not justify replacement of native vegetation, especially native riparian vegetation, with lawn.

5. Existing bank stabilization and flood control structures may be maintained. Any expansion of existing structures or development of new structures shall be evaluated by the Planning Department and appropriate state or federal natural resource agency. Such alteration of Significant Natural Resources shall be approved only if less-invasive or non-structural methods, such as bioengineering, will not adequately meet stabilization or flood control needs.

6. The types, sizes, and intensities of lights must be placed so that they do not shine directly into the Significant Natural Resource.

Response: Please refer to the Significant Natural Resource Assessment for a complete description of the riparian corridor, any encroachments, and planned mitigation.

B. Removal of vegetation from the Significant Natural Resource is prohibited, except for:

1. Removal of non-native vegetation and replacement with native plant species. The replacement vegetation shall cover, at a minimum, the area from which vegetation was removed, shall maintain or exceed the density of the removed vegetation, and shall maintain or improve the shade provided by the vegetation.

2. *Removal of vegetation necessary for the continued maintenance of dikes, drainage ditches, or other storm water or flood control facilities. Vegetation removal shall be kept to the minimum necessary.*

3. *Trees in danger of falling and thereby posing a hazard to life or property may be removed, following consultation from a certified arborist and approval from the Planning Department. If no hazard will be created, the department may require these trees, if felled, to be left in place in the Significant Natural Resource.*

4. *The control or removal of nuisance plants should primarily be by mechanical means (e.g. hand-pulling). If mechanical means fail to adequately control nuisance plant populations, a glyphosate-based herbicide is the only type of herbicide that can be used in a significant natural resource area. No pre- emergent herbicides or auxin herbicides that pose a risk of contaminating water should be used. A herbicide application is preferred to be made early in the morning or during windless periods at least 4 hours before probable rainfall.*

Response: Please refer to the Significant Natural Resource Assessment for a complete description of the riparian corridor, any encroachments, and planned mitigation.

16.75.30 Mitigation Standards

When approved impacts to any identified Significant Natural Resource occurs, mitigation will be required. For impacts to Significant Wetlands, the standards and criteria of Section 16.75.030 (A) shall apply. For impacts to Riparian Corridors, the standards and criteria of Section 16.75.030 (B) shall apply.

A. *When mitigation for impacts to a Significant Wetland is proposed, the mitigation plan shall comply with all Oregon Division of State Lands and U.S. Army Corps of Engineers wetland regulations. The City may approve a development but shall not issue a building permit until all applicable State and Federal wetland permit approvals have been granted and copies of those approvals have been submitted to the City.*

B. *When mitigation for impacts to a non-wetland riparian area is proposed, a mitigation plan prepared by a qualified professional shall be submitted to the review authority. The mitigation plan shall meet the following criteria:*

    1. *Mitigation for negative impacts to a Riparian Corridor shall follow all of the requirements of Clean Water Services - Design and Construction Standards - Resolution and Order 00-7;*

    2. *Mitigation shall occur on-site and as close to the impact area as possible. If this is not feasible, mitigation shall occur within the same drainage basin as the impact;*

    3. *All vegetation planted within the mitigation area shall be native to the region. Species to be planted in the mitigation area shall replace those impacted by the development activity.*

Response: As detailed in the Significant Natural Resource Assessment, onsite mitigation is being provided that is contiguous and adjacent to the existing 50 foot wide vegetation corridor. The replacement area will result in a similar condition of that area being disturbed but with additional replacement mitigation area. Mitigation plantings in the above mentioned Assessment are all to be native species. Please refer to the Significant Natural Resource Assessment for further details regarding mitigation.

16.125 Development Code Standards for Lots

A. *Minimum lot area: Minimum lot area shall conform to the requirements of the zoning district in which the lot is located.*

Response: All of the lots comply with the minimum lot area requirements of the R-2.5 District as described earlier in this report.

B. *Access: All lots created after the effective date of this Ordinance shall provide a minimum of 20 feet of frontage on an existing or proposed public street, with the provision for exceptions.*

Response: All lots exceed the minimum frontage standard of 20 feet.

C. *Through Lots: Through lots shall be avoided except where essential to provide separation of residential development from major traffic arteries, adjacent nonresidential activities, or to overcome specific disadvantages of topography and orientation. Screening or buffering may be required by the Planning Commission during the review of the land division request.*

Response: The project does not include any through lots.

D. *Lot Side Lines: The side lines of lots, as far as practicable, shall run at right angles to the street upon which the lots face.*

Response: As shown on the preliminary plans, as for as practicable, the side lines or lots have been designed to have their side lot lines run at right angles to the street on which they face.

E. *Lot Grading: Lot grading shall conform to the requirements of Chapter 70 of the Uniform Building Code, hereby adopted by reference, and to the following standards unless physical conditions demonstrate the propriety of other standards:*

1. *Cut slopes shall not exceed one and one-half feet horizontally to one foot vertically.*
2. *Fill slopes shall not exceed two feet horizontally to one foot vertically.*
3. *The character of soil for fill and the characteristics of lots and parcels made usable by fill shall be suitable for the purpose intended.*

Response: As shown on the Preliminary Grading and Erosion and Sediment Control Plan, grading has been designed to meet these standards.

F. *Large Lots: In dividing tracts into large lots which at some future time are likely to be re-divided, the applicant's tentative plan shall also demonstrate that any redevelopment or re-subdivision may readily take place at the planned residential density without violating the requirements of this ordinance.*
The Planning Commission may require that the blocks be of such size and shape, be so divided into building sites and contain such site restrictions as will provide for extension and opening of streets at intervals which will permit a subsequent division of any tract into lots of smaller size.

Response: As illustrated by the Preliminary Subdivision Plat, none of the lots are of a size which would allow redevelopment in the future.

G. Land for Public Purposes: Where a proposed park, school or other public use indicated on the Comprehensive Plan is located in whole or in part within a subdivision, the sub-divider shall dedicate and reserve said area for such purpose. Where the City or other public authority has declared its intention to acquire said area, it shall proceed to perfect the title or a contract right to the same within three (3) years from the date of platting, and failing such, this reservation shall automatically expire. The public body shall expeditiously proceed, within its financial ability, to consummate such acquisitions.

Response: Although the application does not involve a proposed park, the applicant is willing to work with the City, if the City wishes to acquire the open space areas for a future city park.

Easements

A. Utility Lines: Minimum 5 foot wide easements for sewers, water mains, electric lines, or other public utilities shall be dedicated along the front, side, and rear lot or parcel lines of each lot. Easements shall be centered on lot lines.

Response: All public utility lines adjoin the public street with the exception of a storm sewer line along the rear property lines of Lots 43-50 and a storm and sewer main each running between Lots 10 and 11. The storm line will convey runoff to the stormwater facility and the sewer line will connect to an existing main which runs through the property from north to south.

B. Water Courses: If a tract is traversed by a water course such as a drainage way, channel or stream, a storm water easement or drainage right-of-way shall be provided which substantially parallels the lines of the water course.

Response: The site does contain a water course which is McKay Creek. The storm water from the lots adjacent to the water course will be provided with a system to direct all storm water collected from hard surfaces to the street and then through pipes to be discharged into the creek from the proposed Stormwater Facility. However, if required, an additional storm water easement or drainage right-of-way will be provided which substantially parallels the lines of the water course as requested by this section.

C. Pedestrian and Bicycle Ways: When desirable for public convenience and access, a pedestrian or bicycle way easement may be required to connect to a cul-de-sac or to pass through an unusually long or oddly spaced block, or to otherwise provide appropriate circulation.

Response: The subdivision layout provides a looped street without any dead ends or cul-de-sacs. Sidewalks will be established with the construction of the homes within the project and will provide appropriate pedestrian circulation.

16.135 Subdivisions

Preliminary Plat Approval Criteria

The City may approve, approve with conditions or deny a preliminary plat based on the following approval criteria:

A. The proposed preliminary plat complies with the applicable Development Code chapters and all other applicable ordinances and regulations. At a minimum, the provisions of this section and the applicable sections of this chapter including Zoning Districts, Development Standards, and Streets and Facilities shall apply. Where a variance is necessary to receive preliminary plat approval, the application shall also comply

with the Variance section of this chapter;

B. The proposed plat name is not already recorded for another subdivision, and satisfies the provisions of ORS Chapter 92;

C. The proposed streets, roads, sidewalks, bicycle lanes, pathways, utilities, and surface water management facilities are laid out so as to conform or transition to the plats of subdivision and maps of major partitions already approved for adjoining property as to width, general direction and in all other respects. All proposed public improvements and dedications are identified on the preliminary plat;

D. All proposed private common areas and improvements (e.g. homeowners association property) are identified on the preliminary plat;

E. Evidence that any required State and federal permits have been obtained, or shall be obtained before approval of the final plat;

F. Evidence the improvements or conditions required by the City, road authority, Washington County, Clean Water Services, special districts, utilities, and/or other service providers, as applicable to the project, have been or can be met;

G. A Traffic Impact Study (TIS) has been provided, if applicable, in accordance with the provisions of Chapter 16.170; and

H. If any part of the site is located within a Specific Area Plan District, Overlay District, or previously approved Master Planned Development, it shall conform to the applicable regulations and/or conditions.

Response: This subdivision application complies with all or the above requirements. Streets will be dedicated to the City of North Plains. It is anticipated that the water quality facility will be dedicated to CWS or the City of North Plains. Formation of a HOA is being considered in order to maintain the open space tracts, and compliance with conditions of other public agencies will occur. A Traffic Impact Study has been prepared in accordance with City requirements and is included in the application materials.

Lot Access Provisions

In addition to the provisions of this chapter, all lots and parcels shall conform to the specific requirements below, as applicable:

A. In conformance with the Uniform Fire Code (UFC), a 20-foot wide fire apparatus drive shall be provided to serve all portions of a building that are located more than 150 feet from a public right-of-way or approved access drive.

B. When a common drive is to be provided to serve more than one lot, a reciprocal easement which will ensure access and maintenance rights shall be recorded with the approved subdivision or partition plat. The minimum drive width shall be 10 to 15 feet, except as required by the UFC, and improved with an all- weather surface approved by the City.

C. Access reserve strips may be required to be granted to the City for the purpose of controlling access to adjoining undeveloped properties.

D. Street and building placement and alignment shall be designed so that all future street connections can be made as surrounding properties develop.

Response: As shown on the preliminary plans, no portion of any lot will be more than 150 feet from a public street.

16.145 Application of Public Facility Standards

The provisions of the Public Facility and Service Requirements shall apply to development within the City of North Plains as listed in the following table. No development permit shall be approved unless the following required improvements are provided to City standards prior to occupancy or operation unless an exception is approved by the City Council.

Response: Per the requirements of the following table (excerpt), the project will include the following improvements.

	Fire Hydrants	***Street Improvement***	***Water Line***	***Sewer Line***	***Storm Drainage***	***Street Lights and Trees***
Subdivisions	***Yes***	***Yes***	***Yes***	***Yes***	***Yes***	***Yes***

Response: Final construction plans will be provided to the City for review and approval of required public improvements. The improvements will be substantially complete or bonded for prior to Final Subdivision Plat recordation.

Public Facility Standards

The following public facility standards shall be applicable to all development as specified for Public Hearings on Quasi-Judicial Actions.

A. Streets
Street improvements shall be provided in compliance with Chapter 16.150 Street Standards of this ordinance utilizing the proposed 28' and 36' wide local street standards.

Response: Please refer to the Preliminary Street Plan and Preliminary Street Cross Sections Plan for dimensional standards.

B. Storm Drainage
No development permit shall be approved for any property until the City Engineer has reviewed and approved provisions for storm water drainage in accordance with the following criteria:

1. *For storm drainage across or over the property on which the development is located, there are storm drainage facilities available which are capable of handling a one-hundred year flood without damage to any improvement on the property, or inundation of the lowest habitable floor of any residential structure thereon.*

2. *For storm drainage along or from streets adjacent to the property on which the development is located, there are storm drainage facilities available in accordance with the City of North Plains adopted street standard.*

Response: The above standards are being met as depicted on the Preliminary Composite Utility Plan and as illustrated in the Preliminary Stormwater Report. The plans will be reviewed by the City as well as Clean Water Services.

C. Sewage Disposal
No development permit shall be approved until the City Engineer and the Clean Water Services have reviewed and approved provisions for connection to the public sewer system.

Response: The Preliminary Composite Utility Plan depicts how the project will be served with sanitary sewer. The final plans will be submitted for review and approval for connection to the existing public sewer system in accordance with City and Clean Water Services specifications.

D. Water Supply
No development permit shall be approved for any property unless all affected water mains are either:

1. *Fully improved to a standard providing both adequate potable water and fire flows, as established by the applicable State Plumbing Code and approved by the City Engineer; or*

2. *Improved to a standard providing adequate potable water flows pursuant to the City Water Master Plan and approved by the City Engineer and the Fire Chief for Washington County Fire District No. 2.*

Response: As shown on the Preliminary Composite Utility Plan a water main is planned to be installed within the new loop street with connections provided to each lot. In addition, fire hydrants are included along NW 307th Avenue and the new looped street.

16.150 Streets General Provisions

The following general provisions shall apply to the dedication, construction, improvement or other development of all public streets in the City of North Plains:

A. The location, width, and grade of streets shall be considered in their relation to existing and planned streets, to topographical conditions, to public convenience and safety, and to the proposed use of the land to be served by the streets.

Response: The location, width, and grade of the proposed public streets were considered in relation to existing streets, topographical conditions, public convenience and safety, and to the proposed use of the land created from the subdivision.

B. Development proposals shall provide for the continuation of existing principal streets where necessary to promote appropriate traffic circulation in the vicinity of the development.

Response: As shown on the preliminary plans, NW Highland Court, which exists to the west of NW 307th Avenue, continues through the site and promotes appropriate circulation in the area.

C. Reserve strips: Reserve strips or street plugs controlling the access to streets will not be approved unless necessary for the protection of the public welfare or of substantial property rights, and in these cases they may be required. The control and disposal of the land composing such strips shall be placed within the jurisdiction of the City under conditions approved by the Planning Commission.

Response: Reserve strips are not included as there are no opportunities for streets to extend from this project due to the Significant Natural Resource and flood plain that extends across the entirety of the property to the east.

D. Alignment: All streets other than minor streets or cul-de-sacs, as far as practical, shall be in alignment with existing streets by continuation of the center lines thereof. The staggering of street alignments resulting in "T" intersections shall, wherever practical, leave a minimum distance of 200 feet between the center lines of streets having approximately the same direction and otherwise shall not be less than 100 feet.

Response: The new public street aligns with NW Highland Court at the south and is over 100 feet from NW Pacific Street at the north. Therefore, this criteria is met.

E. Future extension of streets: Where necessary to give access to or permit a satisfactory future development of adjoining land, streets shall be extended to the boundary of a tract being developed and the resulting dead-end streets may be approved without turnarounds. Reserve strips and street plugs may be required to preserve the objectives of street extensions.

Response: The new public street will not be able to be extended eastward due to the floodplain located in the eastern portion of the site.

F. Intersection angles: Streets shall be laid out to intersect at angles as near to right angles as practical, except where topography requires lesser angle, but in no case shall the acute angle be less than 80 degrees unless there is a special intersection design. An arterial or collector street intersecting with another street shall have at least 100 feet of centerline tangent adjacent to the intersection unless topography requires a lesser distance. Other streets, except alleys, shall have at least 50 feet of tangent adjacent to the intersection unless topography requires a lesser distance. Intersections which contain an acute angle of less than 80 degrees or which include an arterial or a collector street shall have a minimum corner radius sufficient to allow for a roadway radius of 20 feet and maintain a uniform width between the roadway and the right-of-way line.

Response: The new public street has been laid out to provide a 90 degree angle intersection at the north and nearly 90 degree intersection at the south with NW 307th Avenue.

G. Existing streets: Whenever existing public streets adjacent to or within a tract are of inadequate width, additional right-of-way shall be provided at the time of subdivision or development.

Response: No additional right-of-way is needed to construct NW 307th Avenue to the standards required by the City of North Plains.

H. Cul-de-sacs: Cul-de-sacs shall be as short as possible, and shall have maximum lengths of 600 feet and shall not serve more than 20 dwelling units. All cul-de-sacs shall terminate with circular turnarounds.

Response: No cul-de-sacs are planned within McKay Creek Crossing.

I. Street names: No street name shall be used which will duplicate or be confused with the names of existing streets, except for extensions of existing streets. Street names and number shall conform to the established pattern in the City and shall be subject to the approval of the Planning Commission.

Response: The applicant will coordinate a street name for the new public street which does not duplicate an existing street name.

J. *Grades and curves: Grades shall not exceed 6 percent on arterials, 10 percent on collector streets or 12 percent on any other street. Center line radii of curves shall not be less than 300 feet on arterials, 200 feet on collectors or 100 feet on other streets, and shall be to an even 10 feet. Where existing conditions, particularly topography, make it otherwise impractical to provide buildable sites, the Planning Commission may accept steeper grades and sharper curves. In flat areas, allowance shall be made for finished street grades having a minimum slope of 0.5 percent.*

Response: As indicated on the Preliminary Street Plan and Preliminary Street Profiles Plan, all of the above standards concerning grades and curves for streets are met.

K. *Marginal access streets: If a development abuts or contains an existing or proposed arterial street, the Planning Commission may require marginal access streets, reverse frontage lots with suitable depth, screen planting contained in a non-access reservation along the rear or side property line, or such other treatment as may be necessary for adequate protection of residential properties and to afford separation of through and local traffic.*

Response: The property does not abut an arterial street. Therefore, this criterion does not apply.

L. *Alleys: Alleys shall be provided in commercial and industrial districts unless other permanent provisions for access to off-street parking and loading facilities are made as approved by the Planning Commission. While alley intersections and sharp changes in alignment shall be avoided, the corners of necessary alley intersections shall have radii of not less than 10 feet.*

Response: Alleys are not included in the project and this site is not in a commercial or industrial district. Therefore, this standard is not relevant.

M. *Sidewalks: shall be a minimum of five feet in width. Curbs and sidewalks shall be required along both sides of all public streets. All new development upon lots, tracts or parcels of land adjacent to a public street will be required to construct curbs and sidewalks.*

Response: As shown on the Preliminary Street Plan and Preliminary Cross Sections Plan, a 5 foot sidewalk is proposed along both sides of the looped street as well as along NW 307th Avenue.

N. *Street trees: where provided, shall not be of a species which has a shallow spreading root system which is likely to disturb sidewalk or street improvements.*

Response: Street trees will be planted within the planter strips along NW 307th Avenue, per the requirements of this section. Since there is no planter strip on the looped local street, as a condition of approval street trees will be planted in the front yard of each parcel to City specifications.

General Right-of-Way and Improvement Widths

The following standards are the general criteria for public streets in the City of North Plains. These standards shall be the minimum requirements for all streets, except where modifications are permitted or where the Street Standard adopted by the City Council of North Plains is less restrictive.

Street Classification	*Minimum Right- of-Way*	*Minimum Improved Width*	*Minimum Roadway Width*
Arterial	*County Standard*	*County Standard*	*County Standard*
Local Street	*34 feet*	*28 feet*	*24 feet*
Local Sidewalk		*5 feet*	

Response: Please refer to the Preliminary Street Plan and Preliminary Street Cross Sections Plan for dimensional standards.

16.155 Parking Requirements

At least two (2) off-street parking spaces shall be provided for each single family detached dwelling unit.

Response: Each of the future dwellings will have room for 2 off-street parking spaces either within a garage and/or in the driveway.

16.160 Requirement for Vision Areas

A clear vision area shall be maintained on the corners of all property adjacent to the intersection of two streets, a street and a railroad, or a driveway providing vehicular access to a public street, including alleys.

A. Lots or parcels on street corners (public and/or private) shall maintain a sight triangle with no sight obstruction between three (3) feet and ten (10) feet in height as measured from street grade. Sight obstructions include, but are not limited to, fences, vegetation, berms, signs and structures. The sight triangle shall be measured from the street corner (apex), to a distance of twenty (20) feet along each street side.

For the purpose of this Section, a street corner is defined as that point where the extended edges of the road surface of two intersecting streets meet. The City may require additional vision clearance based on a hazard identified by the City. However, tree trunks and sign poles not exceeding 12 inches in diameter may be located within the vision clearance area, provided the diameter does not exceed 24 inches.

B. A private access shall be treated as a public street for the purpose of this section. The vision clearance area shall be determined in the manner set forth above. The edge of the paved surface area of the private access, be it roadway, curb or sidewalk, shall be treated as the right-of-way line in determining the vision clearance area.

Response: The front of the houses and garages will be located 20 feet from the property line or sidewalk, whichever is a greater distance. This automatically complies with the above vision clearance requirements

Traffic Impact Study

A. When a Traffic Impact Study is required.

The City or other road authority with jurisdiction may require a Traffic Impact Study (TIS) as part of an application for development, a change in use, or a change in access. A TIS shall be required when a land use application involves one or more of the following actions:

1. *A change in zoning or a plan amendment designation;*
2. *Any proposed development of land use action that a road authority states may have operational or safety concerns along its facility;*
3. *An increase in site traffic volume generation by 300 Average Daily Trips (ADT) or more; or*
4. *An increase in site traffic volume of a particular movement to and from the State Highway by 20 percent or more; or*
5. *An increase in use of adjacent streets by vehicles exceeding the 20,000 pound gross vehicle weights by 10 vehicles or more per day; or*
6. *The location of the access driveway does not meet minimum sight distance requirements, or is located where vehicles entering or leaving the property are restricted, or such vehicles queue or hesitate on the State Highway, creating a safety hazard; or*
7. *A change in internal traffic patterns that may cause safety problems, such as back up onto a street or greater potential for traffic accidents.*

Response: At the request of City staff, a Traffic Impact Study is included in the application materials. The scope of the study was confirmed with the City Engineering Consultant and has been prepared by a Registered Professional Engineer in accordance with traffic engineering practice. Please refer to the Impact Study for details concerning this aspect of the application.

16.185 Variance Purpose and Scope

The purpose of a variance is to provide administrative relief when a strict application of the zoning requirements of lot width, lot depth, building height, setback, access, or other dimensional or site requirements would impose practical difficulties. These difficulties may result from geographic, topographic or other physical conditions on the site or in the immediate vicinity. No variance shall be granted which allows the establishment or expansion of use otherwise prohibited or subject to conditional use procedures.

Response: As discussed previously in this written narrative, the property is significantly impacted by physical conditions (floodplain, floodway, CWS Sensitive Areas, and City significant natural resource overlay) that severely limit the amount of property that can be utilized for residential purposes. As discussed with City staff in a pre-application conference, the Zoning and Development Ordinance permits subdivision applications to create lots that include riparian corridors. However, those corridors are not permitted to be utilized for residential purposes such as useable yard space, gardens, landscaping, children's play areas, etc. In the case of the subject property, Clean Water Services requires a 50 foot wide vegetated corridor along McKay Creek to protect the water quality resource. The City Zoning and Development Ordinance requires a 75 foot setback from McKay Creek. As found in

the Natural Resource Assessment included in the application materials, the resource is generally considered marginal or degraded in these areas. Consistent with Clean Water Services standards, the applications includes a request for relief (a variance) to a dimensional/site requirement (permit a 50 foot wide riparian corridor for certain portions of the project). As covered in the Natural Resource Assessment and Significant Natural Resource Assessment, a significant amount of enhancement to the resource and mitigation for potential impacts to the resource are included in the application, primarily in the form of native species vegetation plantings.

Variance Review Criteria

A variance may be authorized upon adequate demonstration by the applicant that the proposed variance satisfies the following criteria:

A. That special conditions and circumstances exist which are peculiar to the land, building or structure involved;

Response: The subject site is encumbered with multiple environmental constraints (special conditions and circumstances), including floodplain and floodway designations, Clean Water Services sensitive area vegetated corridors (buffers), and the City of North Plains significant natural resource overlay zoning. As a result, approximately 55 percent of the subject property is required to be placed in both open space and conservation tracts to accommodate the site's environmental elements. Due to the identified site constraints and substantial amount of open space being provided, it is important to efficiently utilize the developable land left and maximize its potential. Therefore, in order to provide properly sized streets, block spacing patterns, and necessary infrastructure for the requested lots with sufficiently sized building areas, a small (+/- 12, 185 square foot) area within the City's natural resource buffer area is requested to be included in the project to accommodate "usable" rear yards for the lots. The area in question is located outside of the FEMA floodway and the 100 year flood plain as well as Clean Water Services vegetated corridor (50-foot buffer). Based on requirements of other jurisdictions regarding vegetated corridors, the additional 25 feet of buffer beyond that required by Clean Water Services is considered "peculiar" to the development of the subject site.

B. That granting the proposed variance would be in the public interest and would be in harmony with the purpose of the underlying zoning district and the intent and purpose of this Ordinance;

Response: Approximately 5 ½ acres of open space is being provided as a result of this development for the benefit of public interest. The planned open space for this project is considered an investment that produces important benefit to existing and future residents by defining and conserving the area's identity and providing societal value beyond ecological and economic benefits. As mentioned above, the variance to accommodate properly sized streets, sidewalks and block patterns, which affect the overall functionality and livability of the neighborhood, is requested. Absent the variance, the project would have insufficient "usable" private outdoor living space, which in turn would require reduced right-of-way widths and alternative sidewalk designs in order to develop the site to the desired density of the R-2.5 zoning district.

C. That the variance would result in minimal detriment to the immediate vicinity;

Response: The variance matching Clean Water Services 50-foot buffer requirement would result in a "minimal detriment to the immediate vicinity" based on an existing 25-foot sanitary sewer line easement located within the corridor. The portion of the buffer containing the sanitary sewer line is in a degraded state, as indicated in the Natural Resource Assessment included in the application materials, which is dominated by non-native grasses, forbs, and invasive Himalayan blackberry. With the variance, the applicant will increase the on-site replacement mitigation by approximately 12,185 square feet. Therefore, the variance will increase the quality of the immediate vicinity.

D. That the variance requested is the minimum variance which would make possible the reasonable use of the applicant's land, building or structure; and

Response: The variance is the least needed to achieve the desired effect. The desired effect is to provide "reasonable use" of the rear yards affected by the full extent of the required corridor. The 50-foot buffer is equivalent to that required by Clean Water Services adjacent to the ordinary high water mark of McKay Creek or other similar Significant Natural Resources.

E. That the special conditions and circumstances on which the application is based do not result from the negligent or knowing violation of this Ordinance by the applicant.

Response: The conditions and circumstances on which the variance is based are not the result of negligence or a knowing violation of the City of North Plains Development Ordinance.

IV. Conclusion

The listed findings and accompanying documentation demonstrates that the proposal is consistent with the applicable provisions of the City of North Plains Municipal Code. Therefore, the applicant respectfully requests approval of the McKay Creek Crossing subdivision application.

Traffic Impact Study

MCKAY CREEK CROSSING SUBDIVISION
TRAFFIC IMPACT STUDY

NORTH PLAINS, OREGON

DATE:
October 27, 2014

PREPARED FOR:
Biggi Construction, LLC

PREPARED BY:
Michael Ard, PE

10/27/14

REGISTERED PROFESSIONAL ENGINEER
54983PE
OREGON
JULY 10, 2002
MICHAEL T. ARD
EXPIRES: 12/31/14

LANCASTER ENGINEERING

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

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EXECUTIVE SUMMARY

1. A new 58-lot residential subdivision is proposed for a site located immediately east of NW 307th Avenue between NW Highland Court and NW Pacific Street in North Plains, Oregon. The proposed development will take access via an extension of NW Highland Court into the site as well as a new intersection on NW 307th Avenue approximately 120 feet south of NW Pacific Street. The development is expected to be completed within three years.

2. The proposed development is projected to generate 43 additional site trips during the morning peak hour, with 11 entering and 32 exiting the site. During the evening peak hour, 57 additional trips are projected, with 36 entering and 21 exiting the site. A weekday increase of 542 trips is projected, with half entering and half exiting the site.

3. Based on the most recent five years of crash data, there was one report crash at the intersection of 1st Street at NW Pacific Street and eight collisions were reported at the intersection of 1st Street and NW Highland Court. Examination of the detailed crash data as well as the crash rates at the study intersections showed no patterns indicative of existing design deficiencies. Based on the detailed analysis, no significant hazards were identified, and no safety mitigations are recommended.

4. Based on a detailed examination of the projected traffic volumes at the intersection of NW 307th Avenue and NW Highland Court, it is recommended that upon completion of the proposed east leg of the intersection that will serve the subject property the intersection should be converted to two-way stop-control with stop signs on the northbound and southbound approaches. This intersection control option conforms to the requirements of the Manual on Uniform Traffic Control Devices, reduces delays for through traffic, and improves safety at the intersection. Upon conversion of the intersection to two-way stop control, the northbound and southbound approaches should have temporary signs installed indicating that there is a traffic control change ahead and that cross-street traffic does not stop.

5. The study area intersections are currently operating acceptably and are projected to continue to operate acceptably through 2017 either with or without the addition of site trips from the proposed development. No operational mitigations are recommended.

PROJECT DESCRIPTION

INTRODUCTION

A 58-lot residential subdivision is proposed for a site located immediately east of NW 307th Avenue between NW Highland Court and NW Pacific Street in North Plains, Oregon. The proposed development will take access via an extension of NW Highland Court into the site as well as a new intersection on NW 307th Avenue approximately 120 feet south of NW Pacific Street. The development is expected to be completed within three years.

The purpose of this study is to assess the traffic impact of the proposed development on the nearby street system and to recommend any required mitigative measures. The analysis will include level of service calculations and an evaluation of crash history at the study area intersections.

Detailed information on traffic counts, trip generation calculations, and level of service calculations is included in the appendix to this report.

LOCATION DESCRIPTION

The subject property is located on an under-developed parcel immediately east of NW 307th Avenue on the east side of NW Glencoe Road/NW 1st Street in North Plains, Oregon. The site is surrounded by existing residential development to the west, by agricultural land uses to the east, and by commercial and industrial land uses to the south and southwest.

Access to the proposed development will be taken via an extension of NE Highland Court into the south end of the site. The roadway extension will turn to the north and ultimately will connect back to NW 307th Avenue approximately 120 feet south of NW pacific Street. The homes within the proposed subdivision will have driveways on either the new street extension or on the east side of NW 307th Avenue.

The City of North Plains has requested a detailed operational and safety analysis for the intersections of NW Glencoe Road (1st Street) at NW Highland Court and NW Pacific Street as well as for the intersection of NW 307th Avenue at NW Highland Court.

NW Glencoe Road (1st Street) is classified by the City of North Plains as an Arterial roadway with a posted speed limit of 35 mph. It has a three-lane cross-section with one through lane in each direction and a center two-way left-turn lane. Bike lanes and sidewalks are provided along both sides of the roadway in the site vicinity.

NW Pacific Street is classified by the City of North Plains as a Collector roadway. It has a two-lane cross-section with one through lane in each direction and a posted speed limit of 25 mph. Partial curbs and sidewalks are in place along the south side of the roadway west of NW 307th Avenue.

NW Highland Court is classified by the City of North Plains as a Collector roadway. It generally has a two-lane cross-section, with one through lane in each direction and a posted speed limit of 25 mph. Partial curbs and sidewalks are in place on both sides of the roadway.

NW 307th Avenue is classified by the City of North Plains as a Collector roadway north of NW Highland Court and as a Local Street south of NW Highland Court. It has a two-lane cross-section without center-line striping. It has a statutory residential speed limit of 25 mph in the site vicinity. Curbs and sidewalks are in place along the west side of the roadway between NW Pacific Street and NW Highland Court opposite the proposed development site.

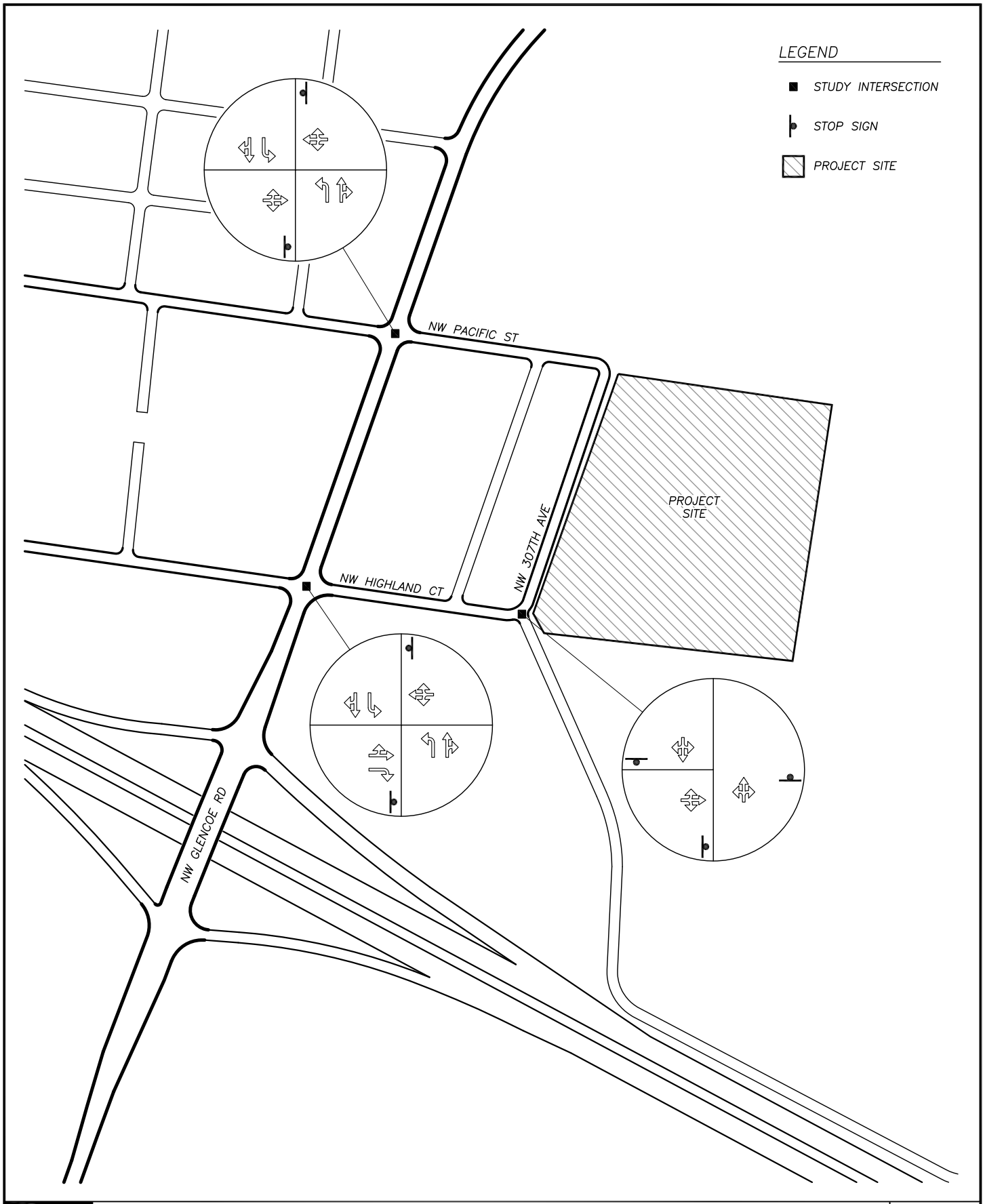
The intersection of NW Glencoe Road (1st Street) at NW Pacific Street is a four-way intersection operating under stop control for the eastbound and westbound Pacific Street approaches. Through traffic traveling along 1st Street is free-flowing. The eastbound and westbound approaches each have a single, shared lane for all turning movements. The northbound and southbound approaches each have a left-turn lane (within the striped center median) and a shared through/right lane. Marked crosswalks are in place crossing the east and west legs of the intersection, while the north and south side crosswalks are unmarked.

The intersection of NW Glencoe Road (1st Street) at NW Highland Court is a four-way intersection operating under stop control for the eastbound and westbound Highland Court approaches. Through traffic traveling along 1st Street is free-flowing. The eastbound approach has a single, shared lane for all turning movements. The westbound approach has a shared left/through lane and a dedicated right-turn lane. The northbound and southbound approaches each have a dedicated left-turn lane and a shared through/right lane. The west side of the intersection has a marked crosswalk, while the other three crosswalks are unmarked.

The intersection of NW 307th Avenue at NW Highland Court is currently a T-intersection operating under all-way stop control. Each of the intersection approaches has a single, shared travel lane for all turning movements. Upon completion of the proposed development the intersection will be a four-way intersection.

Manual turning movement counts were made at the study intersections during October, 2014 from 7:00 to 9:00 AM and from 4:00 to 6:00 PM. The peak hours generally occurred from about 7:00 to 8:00 AM and from about 4:10 to 5:10 PM. Detailed traffic count data is included in the appendix to this report.

Figure 1 on page six shows the project study area and the location of the site. Figure 2 on page seven shows the existing traffic volumes at the study area intersections.

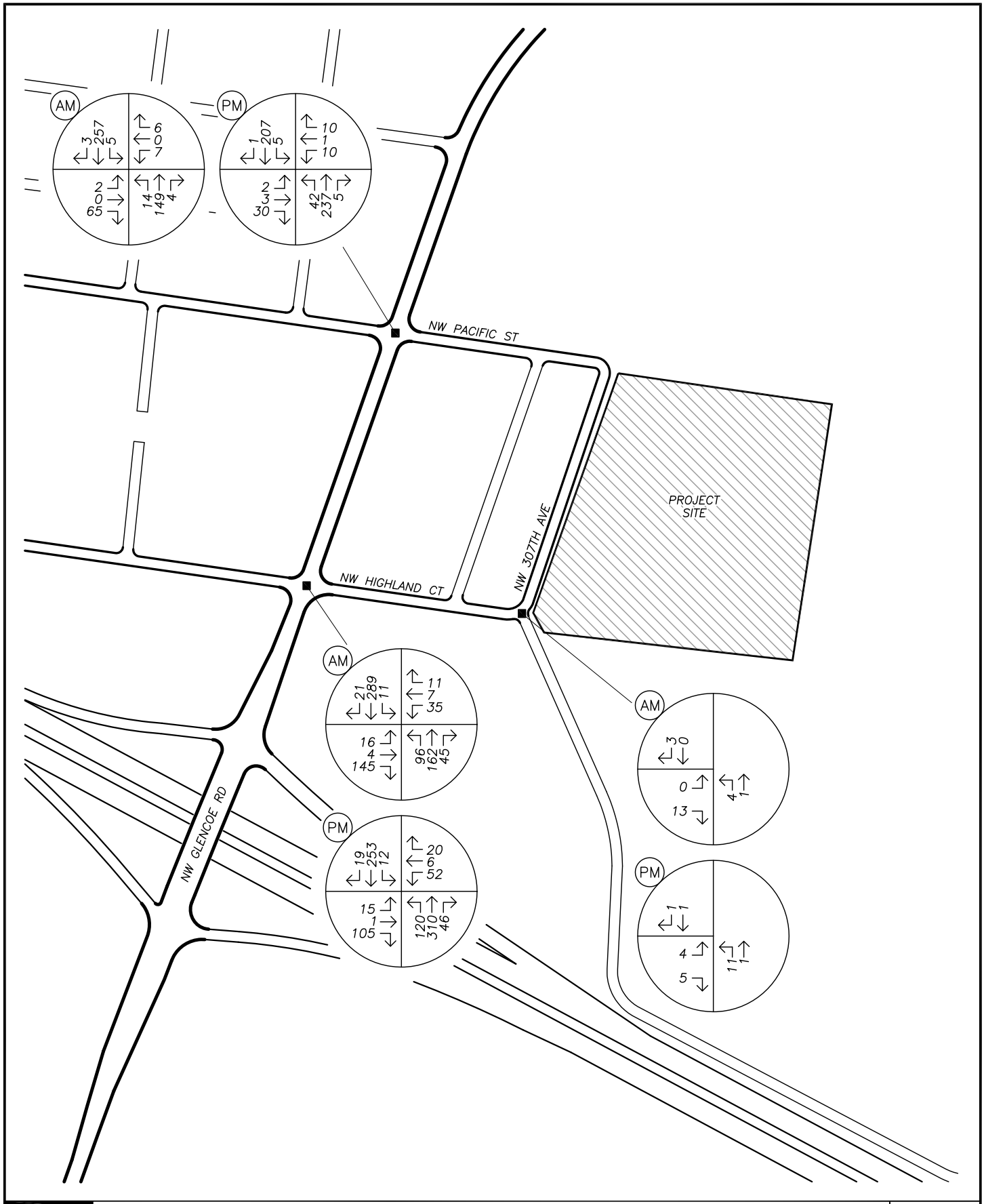


VICINITY MAP

no scale

FIGURE 1

PAGE 6



TRAFFIC VOLUMES
Existing Conditions
AM & PM Peak Hours

no scale

FIGURE 2

PAGE 7

TRIP GENERATION & DISTRIBUTION

TRIP GENERATION – PROPOSED DEVELOPMENT

To estimate the number of trips that will be generated by the proposed residential development, trip rates from the *TRIP GENERATION MANUAL*, Ninth Edition, published by the Institute of Transportation Engineers, were referenced. The trip rates used were those for land use code 210, Single-Family Residential and are based on the number of dwelling units.

There is currently one home on the subject property, which will be removed as part of the proposed development. Since site trips from this existing home are already present on the surrounding transportation system, redevelopment of the subject property will result in a net increase of 57 homes.

The proposed 58-lot residential development is projected to result in an increase of 43 trips during the morning peak hour, with 11 entering and 32 exiting the site. During the evening peak hour, an increase of 57 trips is projected, with 36 entering and 21 exiting the site. A weekday increase of 542 trips is projected, with half entering and half exiting the site.

The table below summarizes the trip generation data. Detailed trip generation worksheets are also included in the technical appendix.

TRIP GENERATION SUMMARY

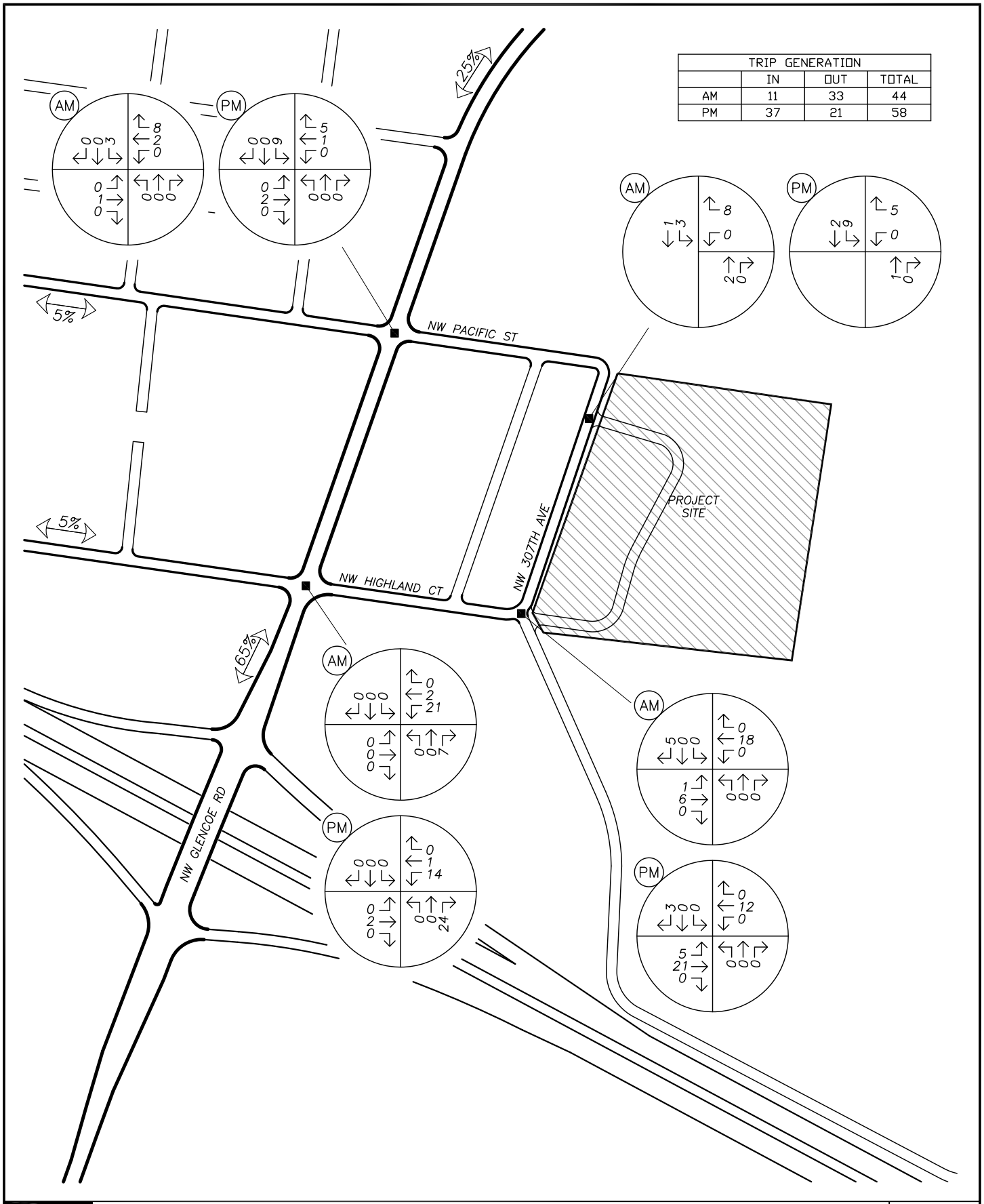
	AM Peak Hour			PM Peak Hour		
	Entering	Exiting	Total	Entering	Exiting	Total
57 Additional Single-Family Homes	11	32	43	36	21	57

For a conservative analysis, no reductions to the trip generation estimate were taken for transit use.

TRIP DISTRIBUTION

The distribution of site trips was determined based on existing travel patterns in the site vicinity as well as the locations of major transportation facilities and commercial, institutional and industrial uses that are likely destinations for site trips.

Figure 3 on page 10 illustrates the distribution and assignment of the site trips.



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

no scale

FIGURE 3

PAGE 10

SAFETY ANALYSIS

CRASH HISTORY

In order to identify any existing safety hazards in the site vicinity, the most recent five years of crash data was examined for the study intersections. The crash data was obtained through the Oregon Department of Transportation's Crash Analysis and Reporting Unit.

In addition to evaluation of the detailed crash data, crash rates were calculated for the study intersections. Crash rates allow comparison of crash risks at intersections with widely different lane configurations and volumes by accounting for both the number of crashes and the number of entering vehicles. The crash rate is expressed as the number of crashes per million entering vehicles. Crash rates in excess of one to two crashes per million entering vehicles may be indicative of specific design deficiencies and require more detailed analysis of crash patterns to identify whether safety mitigations are appropriate for the intersection.

For the intersection of NW Glencoe Road (1st Street) at NW Pacific Street, there was one reported crash during the five-year analysis period. It occurred when a driver attempted to park adjacent to the intersection and struck a parked vehicle. The crash did not appear to be directly related to operation of the intersection. Regardless, a crash rate of 0.10 crashes per million entering vehicles was calculated for the intersection. Based on the detailed crash data and the crash rate, no existing safety deficiencies were identified at the intersection.

For the intersection of NW Glencoe Road (1st Street) at NW Highland Court, there were eight reported collisions during the five-year analysis period. They included four turning-movement collisions, two backing collisions, one angle collision and one sideswipe-overtaking collision. The crashes resulted in one non-incapacitating injury and one report of a "possible injury/complaint of pain". The sideswipe-overtaking collision involved a bicycle and occurred when a person riding a bicycle eastbound along the shoulder was struck by an eastbound vehicle while passing the bike. It resulted in the report of a "possible injury/complaint of pain". The crash rate for the intersection was calculated to be 0.46 crashes per million entering vehicles. Based on the detailed crash data and the crash rate, again no existing safety deficiencies were identified at the intersection.

There were no reported collisions during the five-year analysis period at the intersection of NW 307th Avenue and NW Highland Court.

Based on the most recent five years of crash data available through ODOT, no significant safety hazards contributing to the crash history are evident and no specific safety mitigation is recommended.

INTERSECTION TRAFFIC CONTROL DEVICES

The intersection of NW 307th Avenue at NW Highland Court currently operates as a T-intersection under all-way stop control. Upon completion of the proposed development, a new fourth leg will be added to the east side of the intersection, at which point the traffic control for the intersection will need to change either to a four-way stop control or two-way stop control.

In order to determine the appropriate traffic control devices for the intersection, the projected traffic volumes were examined in conjunction with the standards established in the *Manual on Uniform Traffic Control Devices for Streets and Highways* (Section 2B.07 Multi-Way Stop Applications). Based on the guidance provided, all-way stop control can be installed as an interim measure where installation of a traffic signal is justified, or for safety where five or more crashes are reported in a 12-month period that are susceptible to correction by a multi-way stop installation, or where minimum volume thresholds are met. The minimum traffic volumes required are 300 vehicles per hour on the major-street approaches during each of eight hours of an average day and a combined total of 200 vehicles per hour on the minor-street approaches for the same eight hours.

By inspection, traffic volumes at the intersection of NW 307th Avenue at NW Highland Court are far below the level at which installation of either a traffic signal or all-way stop control is warranted. Accordingly, it is recommended that the intersection be converted to operation under two-way stop control. Based on the traffic volumes at the intersection, it is further recommended that the northbound and southbound approaches operate under stop control while the eastbound and westbound approaches are free-flowing. This approach to traffic control results in minimization of control delays at the intersection while maximizing intersection safety.

It should be noted that all-way stop control is often perceived as being the safest form of traffic control for an intersection. However, the reality is that unwarranted stop control overwhelmingly results in higher crash incidence as compared to two-way stop control. This is primarily because reasonable drivers learn that conflicts are rare and begin to roll through what is perceived as an unnecessary stop. This results in potentially hazardous conditions when drivers approach from conflicting directions, and particularly results in significant safety concerns when pedestrians are crossing the intersection. Reasonable pedestrians will cross in front of oncoming vehicles at a four-way stop, believing that the oncoming traffic will stop. In general, pedestrian safety is better served when pedestrians assume that oncoming vehicles on the major street will not stop unless it is clear from a combination of eye contact, slowing or gestures that the oncoming driver has seen the pedestrian and is stopping to allow them to cross the street.

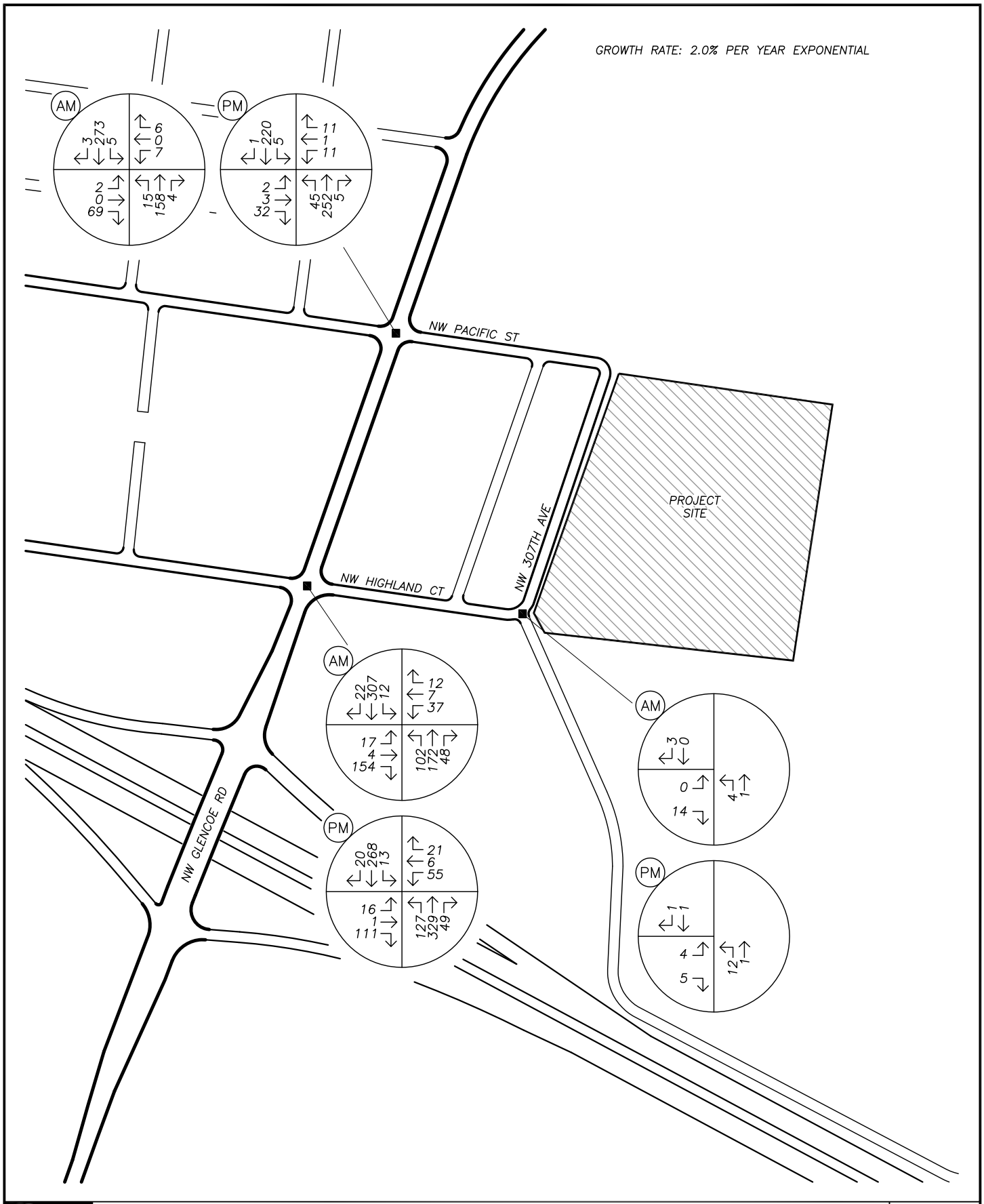
Since the intersection currently operates under all-way stop control it is recommended that upon conversion of the intersection to two-way stop control, temporary signs should be installed on the northbound and southbound approaches indicating that there is a traffic control change ahead and that cross-street traffic does not stop.

OPERATIONAL ANALYSIS

BACKGROUND TRAFFIC

Prior to analyzing the impact of the projected site trips from the proposed development, the existing traffic volumes were adjusted to account for background growth that will occur prior to full occupancy within the proposed subdivision. The proposed 58-lot subdivision can reasonably be fully developed and occupied within three years, so the existing traffic volumes were adjusted to account for two years of growth. A two percent per year exponential growth rate was applied to the study area intersections in order to account for the anticipated background traffic volume growth.

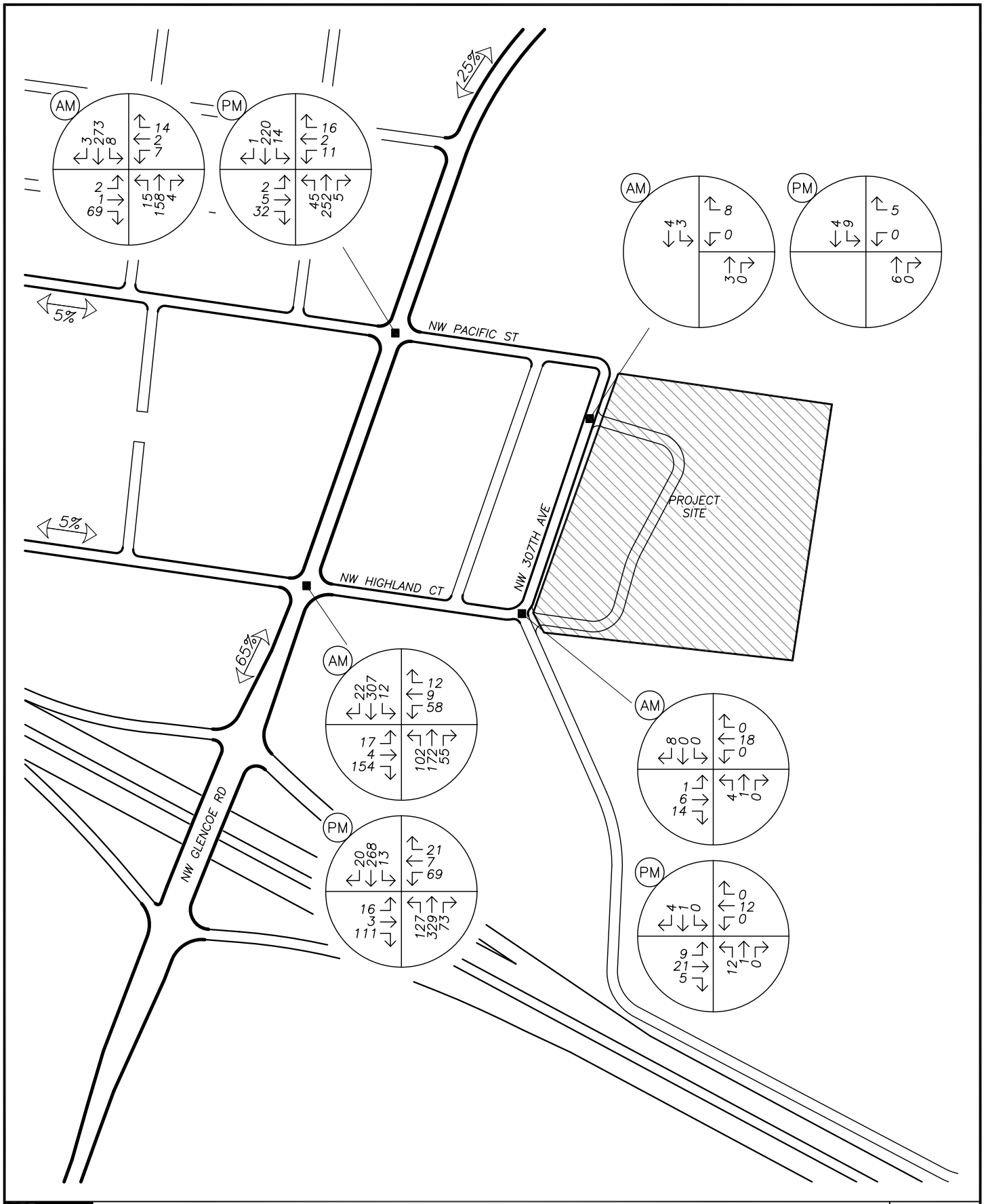
Figure 4 on page 14 shows the projected year 2017 background traffic volumes. Figure 5 on page 15 shows the year 2017 traffic volumes with the addition of site trips from the proposed 58-lot subdivision.



TRAFFIC VOLUMES
Year 2017 Background Conditions
AM & PM Peak Hours

no scale

FIGURE 4



TRAFFIC VOLUMES
Year 2017 Background Plus Site Conditions
AM & PM Peak Hours

no scale

FIGURE 5

PAGE 15

CAPACITY ANALYSIS

To determine the level of service at the study intersections, a capacity analysis was conducted. The analysis was conducted according to unsignalized intersection analysis methodologies in the 2000 *HIGHWAY CAPACITY MANUAL* (HCM) published by the Transportation Research Board. Level of service can range from A, which indicates little or no delay, to F, which indicates a significant amount of congestion and delay. Level of service E is generally considered the minimum acceptable level for unsignalized intersections. Detailed level of service descriptions are included in the appendix to this report.

The intersection of NW Glencoe Road (1st Street) at NW Pacific Street is currently operating at level of service D during the morning and evening peak hours. Under year 2017 traffic conditions, the intersection is projected to operate at level of service D during the morning peak hour and level of service E during the evening peak hour. With the addition of site trips from the proposed development, the intersection is projected to operate at level of service E during the morning and evening peak hours.

The intersection of NW Glencoe Road (1st Street) at NW Highland Court is currently operating at level of service B during the morning and evening peak hours. The intersection is projected to continue to operate at level of service B during the morning and evening peak hours through 2017 either with or without the addition of site trips from the proposed development.

The intersection of NW 307th Avenue at NW Highland Court is currently operating at level of service A during the morning and evening peak hours. Under year 2017 background conditions, the intersection is projected to continue to operate at level of service A during the morning and evening peak hours. Upon completion of the proposed development and conversion of the intersection to two-way stop control, the intersection is projected to continue to operate at level of service A during the morning and evening peak hours.

The results of the capacity analysis including the Levels of Service (LOS), delays and volume-to-capacity (v/c) ratios are shown in the table on the following page. Detailed capacity analysis results are included in the appendix to this report.

LEVEL OF SERVICE SUMMARY

	AM Peak Hour			PM Peak Hour		
	LOS	Delay	V/C	LOS	Delay	V/C
NW Glencoe Road (1st Street) at NW Pacific Street						
2014 Existing Conditions	D	30	0.29	D	31	0.38
2017 Background	D	35	0.34	E	37	0.44
2017 Background plus Site Trips	E	48	0.52	E	47	0.56
NW Glencoe Road (1st Street) at NW Highland Court						
2014 Existing Conditions	B	13	0.19	B	13	0.17
2017 Background	B	14	0.20	B	14	0.18
2017 Background plus Site Trips	B	13	0.20	B	14	0.18
NW 307th Avenue at NW Highland Court						
2014 Existing Conditions	A	8	N/A	A	7	N/A
2017 Background	A	8	N/A	A	7	N/A
2017 Background plus Site Trips	A	10	0.02	A	9	0.03

LOS = Level of Service
Delay = Average Delay per Vehicle in Seconds
V/C = Volume-to-Capacity Ratio

As shown in the table above, the study area intersections currently operate acceptably during the morning and evening peak hours and will continue to operate acceptably upon completion of the proposed development. No operational mitigations are necessary or recommended.

CONCLUSIONS

Based on the most recent five years of crash data, there was one report crash at the intersection of 1st Street at NW Pacific Street and eight collisions were reported at the intersection of 1st Street and NW Highland Court. Examination of the detailed crash data as well as the crash rates at the study intersections showed no patterns indicative of existing design deficiencies. Based on the detailed analysis, no significant hazards were identified, and no safety mitigations are recommended.

Based on a detailed examination of the projected traffic volumes at the intersection of NW 307th Avenue and NW Highland Court, it is recommended that upon completion of the proposed east leg of the intersection that will serve the subject property the intersection should be converted to two-way stop-control with stop signs on the northbound and southbound approaches. This intersection control option conforms to the requirements of the Manual on Uniform Traffic Control Devices, reduces delays for through traffic, and improves safety at the intersection. Upon conversion of the intersection to two-way stop control, the northbound and southbound approaches should have temporary signs installed indicating that there is a traffic control change ahead and that cross-street traffic does not stop.

The study area intersections are currently operating acceptably and are projected to continue to operate acceptably through 2017 either with or without the addition of site trips from the proposed development. No operational mitigations are recommended.

APPENDIX

LEVEL OF SERVICE

Level of service is used to describe the quality of traffic flow. Levels of service A to C are considered good, and rural roads are usually designed for level of service C. Urban streets and signalized intersections are typically designed for level of service D. Level of service E is considered to be the limit of acceptable delay. For unsignalized intersections, level of service E is generally considered acceptable. Here is a more complete description of levels of service:

Level of service A: Very low delay at intersections, with all traffic signal cycles clearing and no vehicles waiting through more than one signal cycle. On highways, low volume and high speeds, with speeds not restricted by other vehicles.

Level of service B: Operating speeds beginning to be affected by other traffic; short traffic delays at intersections. Higher average intersection delay than for level of service A resulting from more vehicles stopping.

Level of service C: Operating speeds and maneuverability closely controlled by other traffic; higher delays at intersections than for level of service B due to a significant number of vehicles stopping. Not all signal cycles clear the waiting vehicles. This is the recommended design standard for rural highways.

Level of service D: Tolerable operating speeds; long traffic delays occur at intersections. The influence of congestion is noticeable. At traffic signals many vehicles stop, and the proportion of vehicles not stopping declines. The number of signal cycle failures, for which vehicles must wait through more than one signal cycle, are noticeable. This is typically the design level for urban signalized intersections.

Level of service E: Restricted speeds, very long traffic delays at traffic signals, and traffic volumes near capacity. Flow is unstable so that any interruption, no matter how minor, will cause queues to form and service to deteriorate to level of service F. Traffic signal cycle failures are frequent occurrences. For unsignalized intersections, level of service E or better is generally considered acceptable.

Level of service F: Extreme delays, resulting in long queues which may interfere with other traffic movements. There may be stoppages of long duration, and speeds may drop to zero. There may be frequent signal cycle failures. Level of service F will typically result when vehicle arrival rates are greater than capacity. It is considered unacceptable by most drivers.

1e

LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS

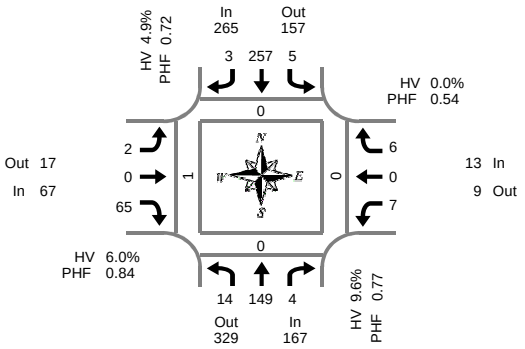
LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (Seconds)
A	<10
B	10-20
C	20-35
D	35-55
E	55-80
F	>80

LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (Seconds)
A	<10
B	10-15
C	15-25
D	25-35
E	35-50
F	>50

Total Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



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

NW Glencoe Rd & NW Pacific St

Wednesday, October 08, 2014
7:00 AM to 9:00 AM

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Pacific St				Westbound NW Pacific St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	1	12	1	0	1	21	0	0	1	0	5	0	1	0	1	0	44	0	0	0	0
7:05 AM	0	9	1	0	0	18	0	0	1	0	5	0	0	0	0	0	34	0	0	0	1
7:10 AM	0	14	0	0	0	19	0	0	0	0	6	0	0	0	0	0	39	0	0	0	0
7:15 AM	1	13	0	0	0	17	2	0	0	0	5	0	1	0	1	0	40	0	0	0	0
7:20 AM	2	17	1	0	0	16	0	0	0	0	5	0	2	0	0	0	43	0	0	0	0
7:25 AM	4	15	1	0	1	17	1	0	0	0	2	0	0	0	0	0	41	0	0	0	0
7:30 AM	1	12	0	0	0	28	0	0	0	0	8	0	0	0	1	0	50	0	0	0	0
7:35 AM	0	17	0	0	0	35	0	0	0	0	3	0	0	0	1	0	56	0	0	0	0
7:40 AM	2	10	0	0	1	28	0	0	0	0	9	0	2	0	1	0	53	0	0	0	0
7:45 AM	1	10	0	0	2	24	0	0	0	0	4	0	1	0	1	0	43	0	0	0	0
7:50 AM	1	8	0	0	0	19	0	0	0	0	4	0	0	0	0	0	32	0	0	0	0
7:55 AM	1	12	0	0	0	15	0	0	0	0	9	0	0	0	0	0	37	0	0	0	0
8:00 AM	0	5	0	0	1	15	0	0	0	0	4	0	1	0	0	0	26	0	0	0	0
8:05 AM	2	11	0	0	0	16	0	0	1	0	2	0	0	0	0	0	32	0	0	0	0
8:10 AM	1	10	0	0	0	13	0	0	0	0	3	0	1	0	1	0	29	0	0	0	0
8:15 AM	0	13	0	0	0	17	0	0	0	0	4	0	0	0	0	0	34	0	0	0	0
8:20 AM	0	8	0	0	1	10	1	0	0	0	3	0	0	0	0	0	23	0	0	0	0
8:25 AM	1	12	0	0	1	15	0	0	0	0	5	0	1	0	0	0	35	0	0	0	0
8:30 AM	2	13	0	0	0	13	0	0	0	0	8	0	0	0	0	0	36	0	0	0	0
8:35 AM	1	17	0	0	0	16	0	0	0	0	5	0	1	0	0	0	40	0	0	0	0
8:40 AM	2	15	0	0	0	19	0	0	0	0	5	0	0	0	1	0	42	1	0	0	0
8:45 AM	3	15	0	0	0	11	0	0	0	0	5	0	0	0	1	0	35	0	0	0	0
8:50 AM	3	9	0	0	0	17	0	0	0	0	5	0	2	0	0	0	36	0	2	0	0
8:55 AM	2	20	0	0	0	11	0	0	0	0	4	0	1	0	1	0	39	0	0	0	0
Total Survey	31	297	4	0	8	430	4	0	3	0	118	0	14	0	10	0	919	1	2	0	1

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Pacific St				Westbound NW Pacific St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	1	35	2	0	1	58	0	0	2	0	16	0	1	0	1	0	117	0	0	0	1
7:15 AM	7	45	2	0	1	50	3	0	0	0	12	0	3	0	1	0	124	0	0	0	0
7:30 AM	3	39	0	0	1	91	0	0	0	0	20	0	2	0	3	0	159	0	0	0	0
7:45 AM	3	30	0	0	2	58	0	0	0	0	17	0	1	0	1	0	112	0	0	0	0
8:00 AM	3	26	0	0	1	44	0	0	1	0	9	0	2	0	1	0	87	0	0	0	0
8:15 AM	1	33	0	0	2	42	1	0	0	0	12	0	1	0	0	0	92	0	0	0	0
8:30 AM	5	45	0	0	0	48	0	0	0	0	18	0	1	0	1	0	118	1	0	0	0
8:45 AM	8	44	0	0	0	39	0	0	0	0	14	0	3	0	2	0	110	0	2	0	0
Total Survey	31	297	4	0	8	430	4	0	3	0	118	0	14	0	10	0	919	1	2	0	1

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

By Approach	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Pacific St				Westbound NW Pacific St				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	167	329	496	0	265	157	422	0	67	17	84	0	13	9	22	0	512
%HV	9.6%				4.9%				6.0%				0.0%				6.4%
PHF	0.77				0.72				0.84				0.54				0.81

Pedestrians Crosswalk			
North	South	East	West
0	0	0	1

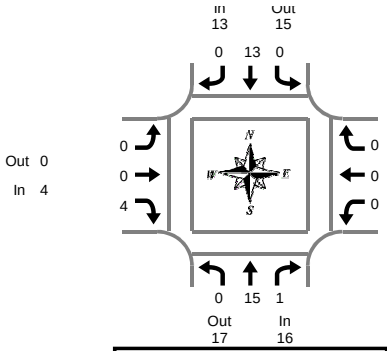
By Movement	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Pacific St				Westbound NW Pacific St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	14	149	4	167	5	257	3	265	2	0	65	67	7	0	6	13	512
%HV	0.0%	10.1%	25.0%	9.6%	0.0%	5.1%	0.0%	4.9%	0.0%	0.0%	6.2%	6.0%	0.0%	0.0%	0.0%	0.0%	6.4%
PHF	0.50	0.83	0.50	0.77	0.42	0.71	0.25	0.72	0.25	0.00	0.81	0.84	0.58	0.00	0.50	0.54	0.81

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Pacific St				Westbound NW Pacific St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	14	149	4	0	5	257	3	0	2	0	65	0	7	0	6	0	512	0	0	0	1
7:15 AM	16	140	2	0	5	243	3	0	1	0	58	0	8	0	6	0	482	0	0	0	0
7:30 AM	10	128	0	0	6	235	1	0	1	0	58	0	6	0	5	0	450	0	0	0	0
7:45 AM	12	134	0	0	5	192	1	0	1	0	56	0	5	0	3	0	409	1	0	0	0
8:00 AM	17	148	0	0	3	173	1	0	1	0	53	0	7	0	4	0	407	1	2	0	0

Heavy Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



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

NW Glencoe Rd & NW Pacific St

Wednesday, October 08, 2014
7:00 AM to 9:00 AM

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Pacific St				Westbound NW Pacific St				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
7:05 AM	0	0	1	1	0	4	0	4	0	0	0	0	0	0	0	0	5
7:10 AM	0	1	0	1	0	2	0	2	0	0	1	1	0	0	0	0	4
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:20 AM	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
7:25 AM	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4
7:30 AM	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	2
7:35 AM	0	3	0	3	0	0	0	0	0	0	1	1	0	0	0	0	4
7:40 AM	0	1	0	1	0	4	0	4	0	0	1	1	0	0	0	0	6
7:45 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
7:50 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
7:55 AM	0	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0	2
8:00 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
8:05 AM	0	2	0	2	0	1	0	1	0	0	0	0	0	0	0	0	3
8:10 AM	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	2
8:15 AM	0	1	0	1	0	3	0	3	0	0	0	0	0	0	0	0	4
8:20 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:25 AM	0	2	0	2	0	4	0	4	0	0	0	0	0	0	0	0	6
8:30 AM	0	3	0	3	0	3	0	3	0	0	0	0	0	0	0	0	6
8:35 AM	0	3	0	3	0	1	0	1	0	0	0	0	0	0	0	0	4
8:40 AM	0	3	0	3	0	3	0	3	0	0	0	0	0	0	0	0	6
8:45 AM	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	2
8:50 AM	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	2
8:55 AM	0	4	0	4	0	1	0	1	0	0	0	0	0	0	0	0	5
Total Survey	0	36	1	37	0	33	0	33	0	0	4	4	0	0	0	0	74

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Pacific St				Westbound NW Pacific St				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	0	2	1	3	0	6	0	6	0	0	1	1	0	0	0	0	10
7:15 AM	0	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	7
7:30 AM	0	4	0	4	0	6	0	6	0	0	2	2	0	0	0	0	12
7:45 AM	0	2	0	2	0	1	0	1	0	0	1	1	0	0	0	0	4
8:00 AM	0	4	0	4	0	2	0	2	0	0	0	0	0	0	0	0	6
8:15 AM	0	3	0	3	0	7	0	7	0	0	0	0	0	0	0	0	10
8:30 AM	0	9	0	9	0	7	0	7	0	0	0	0	0	0	0	0	16
8:45 AM	0	5	0	5	0	4	0	4	0	0	0	0	0	0	0	0	9
Total Survey	0	36	1	37	0	33	0	33	0	0	4	4	0	0	0	0	74

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

By Approach	Northbound NW Glencoe Rd			Southbound NW Glencoe Rd			Eastbound NW Pacific St			Westbound NW Pacific St			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	16	17	33	13	15	28	4	0	4	0	1	1	33
PHF	0.57			0.54			0.50			0.00			0.69

By Movement	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Pacific St				Westbound NW Pacific St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	0	15	1	16	0	13	0	13	0	0	4	4	0	0	0	0	33
PHF	0.00	0.54	0.25	0.57	0.00	0.54	0.00	0.54	0.00	0.00	0.50	0.50	0.00	0.00	0.00	0.00	0.69

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Pacific St				Westbound NW Pacific St				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	0	15	1	16	0	13	0	13	0	0	4	4	0	0	0	0	33
7:15 AM	0	17	0	17	0	9	0	9	0	0	3	3	0	0	0	0	29
7:30 AM	0	13	0	13	0	16	0	16	0	0	3	3	0	0	0	0	32
7:45 AM	0	18	0	18	0	17	0	17	0	0	1	1	0	0	0	0	36
8:00 AM	0	21	0	21	0	20	0	20	0	0	0	0	0	0	0	0	41

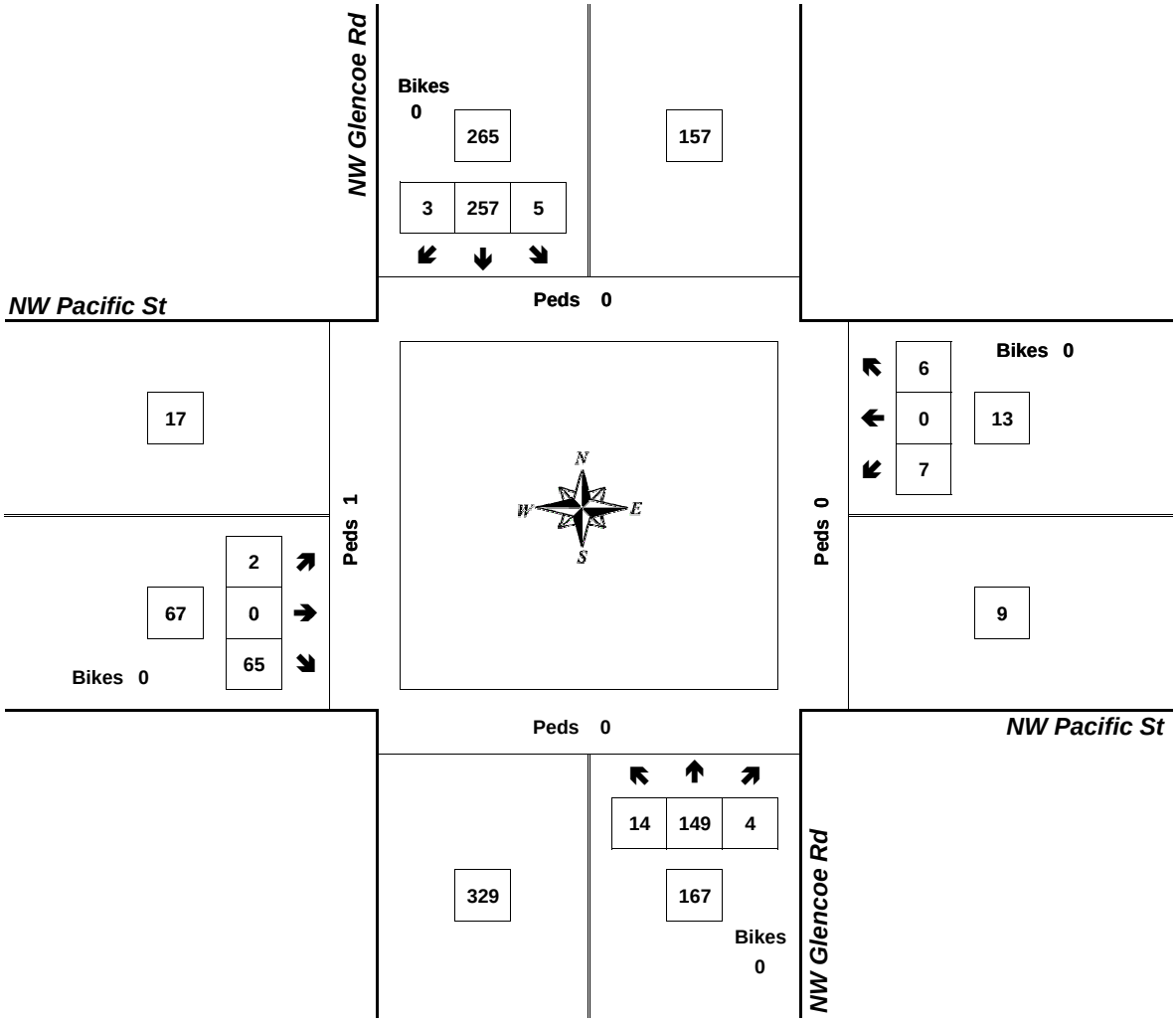
Peak Hour Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740

NW Glencoe Rd & NW Pacific St

7:00 AM to 8:00 AM
Wednesday, October 08, 2014

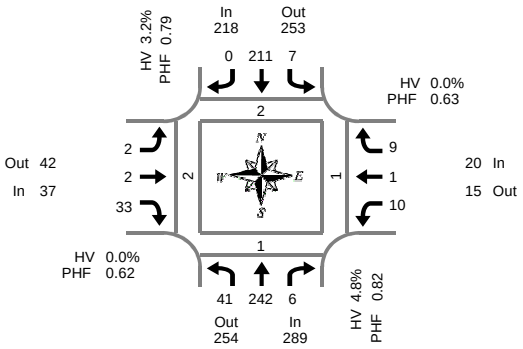


Approach	PHF	HV%	Volume
EB	0.84	6.0%	67
WB	0.54	0.0%	13
NB	0.77	9.6%	167
SB	0.72	4.9%	265
Intersection	0.81	6.4%	512

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

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:00 PM to 5:00 PM

NW Glencoe Rd & NW Pacific St

Wednesday, October 08, 2014
4:00 PM to 6:00 PM

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Pacific St				Westbound NW Pacific St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	1	15	1	0	2	14	0	1	0	0	4	0	0	0	1	0	38	0	0	0	1
4:05 PM	4	25	1	0	1	17	0	0	0	0	4	0	0	0	0	0	52	0	0	0	0
4:10 PM	1	18	0	0	0	13	0	0	0	0	5	0	1	0	1	0	39	0	1	0	0
4:15 PM	1	20	2	0	0	15	0	0	1	1	4	0	1	1	1	0	47	1	0	0	0
4:20 PM	1	18	0	0	1	16	0	0	0	0	2	0	2	0	1	0	41	0	0	0	0
4:25 PM	7	28	1	0	0	20	0	0	0	0	1	0	1	0	0	0	58	0	0	0	0
4:30 PM	5	26	0	0	1	22	0	0	1	0	4	0	1	0	0	0	60	0	0	0	0
4:35 PM	1	20	0	0	0	18	0	0	0	0	2	0	0	0	1	0	42	0	0	0	0
4:40 PM	6	18	0	0	0	26	0	0	0	1	2	0	2	0	0	0	55	0	0	0	0
4:45 PM	6	21	1	0	2	23	0	0	0	0	2	0	0	0	0	0	55	0	0	0	0
4:50 PM	4	18	0	0	0	13	0	0	0	0	1	0	2	0	1	0	39	0	0	0	0
4:55 PM	4	15	0	0	0	14	0	0	0	0	2	0	0	0	3	0	38	1	0	1	1
5:00 PM	4	18	1	0	1	12	0	0	0	0	2	0	0	0	0	0	38	0	0	0	0
5:05 PM	2	17	0	0	0	15	1	0	0	1	3	0	0	0	2	0	41	0	0	0	0
5:10 PM	4	14	0	0	0	17	0	0	0	0	6	0	1	1	2	0	45	0	0	0	0
5:15 PM	2	13	0	0	0	11	0	0	0	0	0	0	0	0	0	0	26	0	2	0	0
5:20 PM	4	18	0	0	0	14	0	0	2	0	5	0	0	0	0	0	43	0	0	0	0
5:25 PM	4	10	0	0	0	12	0	0	0	0	6	0	0	0	0	0	32	0	0	0	0
5:30 PM	2	22	0	0	0	7	0	0	0	0	7	0	0	0	0	0	38	0	0	0	0
5:35 PM	6	17	0	0	0	20	1	0	0	0	5	0	0	0	1	0	50	0	0	0	0
5:40 PM	4	12	0	0	0	14	0	0	0	0	4	0	1	0	0	0	35	0	1	0	1
5:45 PM	4	21	1	0	0	17	0	0	0	1	2	0	0	0	1	0	47	1	0	0	0
5:50 PM	4	24	0	0	0	25	0	0	0	0	4	0	0	0	1	0	58	0	0	0	0
5:55 PM	5	24	0	0	1	17	0	0	0	0	2	0	1	0	0	0	50	0	0	0	0
Total Survey	86	452	8	0	9	392	2	1	4	4	79	0	13	2	16	0	1,067	3	4	1	3

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Pacific St				Westbound NW Pacific St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	6	58	2	0	3	44	0	1	0	0	13	0	1	0	2	0	129	0	1	0	1
4:15 PM	9	66	3	0	1	51	0	0	1	1	7	0	4	1	2	0	146	1	0	0	0
4:30 PM	12	64	0	0	1	66	0	0	1	1	8	0	3	0	1	0	157	0	0	0	0
4:45 PM	14	54	1	0	2	50	0	0	0	0	5	0	2	0	4	0	132	1	0	1	1
5:00 PM	10	49	1	0	1	44	1	0	0	1	11	0	1	1	4	0	124	0	0	0	0
5:15 PM	10	41	0	0	0	37	0	0	2	0	11	0	0	0	0	0	101	0	2	0	0
5:30 PM	12	51	0	0	0	41	1	0	0	0	16	0	1	0	1	0	123	0	1	0	1
5:45 PM	13	69	1	0	1	59	0	0	0	1	8	0	1	0	2	0	155	1	0	0	0
Total Survey	86	452	8	0	9	392	2	1	4	4	79	0	13	2	16	0	1,067	3	4	1	3

Peak Hour Summary
4:00 PM to 5:00 PM

By Approach	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Pacific St				Westbound NW Pacific St				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	289	254	543	0	218	253	471	1	37	42	79	0	20	15	35	0	564
%HV	4.8%				3.2%				0.0%				0.0%				3.7%
PHF	0.82				0.79				0.62				0.63				0.88

Pedestrians Crosswalk			
North	South	East	West
2	1	1	2

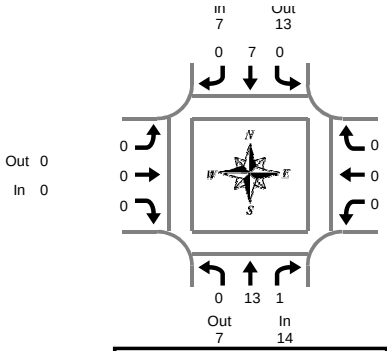
By Movement	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Pacific St				Westbound NW Pacific St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	41	242	6	289	7	211	0	218	2	2	33	37	10	1	9	20	564
%HV	0.0%	5.4%	16.7%	4.8%	0.0%	3.3%	0.0%	3.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.7%
PHF	0.64	0.82	0.50	0.82	0.58	0.79	0.00	0.79	0.50	0.50	0.63	0.62	0.63	0.25	0.56	0.63	0.88

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Pacific St				Westbound NW Pacific St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	41	242	6	0	7	211	0	1	2	2	33	0	10	1	9	0	564	2	1	1	2
4:15 PM	45	233	5	0	5	211	1	0	2	3	31	0	10	2	11	0	559	2	0	1	1
4:30 PM	46	208	2	0	4	197	1	0	3	2	35	0	6	1	9	0	514	1	2	1	1
4:45 PM	46	195	2	0	3	172	2	0	2	1	43	0	4	1	9	0	480	1	3	1	2
5:00 PM	45	210	2	0	2	181	2	0	2	2	46	0	3	1	7	0	503	1	3	0	1

Heavy Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



Peak Hour Summary
4:00 PM to 5:00 PM

NW Glencoe Rd & NW Pacific St

Wednesday, October 08, 2014
4:00 PM to 6:00 PM

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Pacific St				Westbound NW Pacific St				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	2
4:05 PM	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
4:10 PM	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	2
4:15 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
4:20 PM	0	2	0	2	0	2	0	2	0	0	0	0	0	0	0	0	4
4:25 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
4:35 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
4:40 PM	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
4:45 PM	0	1	1	2	0	1	0	1	0	0	0	0	0	0	0	0	3
4:50 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
4:55 PM	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
5:00 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
5:05 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
5:10 PM	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	2
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:20 PM	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	2
5:25 PM	0	0	0	0	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	0	0	0	0
5:35 PM	0	0	0	0	0	1	0	1	0	0	1	1	0	0	0	0	2
5:40 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
5:50 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:55 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
Total Survey	0	16	1	17	0	13	0	13	0	0	2	2	0	0	0	0	32

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Pacific St				Westbound NW Pacific St				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	4	0	4	0	2	0	2	0	0	0	0	0	0	0	0	6
4:15 PM	0	3	0	3	0	2	0	2	0	0	0	0	0	0	0	0	5
4:30 PM	0	3	0	3	0	1	0	1	0	0	0	0	0	0	0	0	4
4:45 PM	0	3	1	4	0	2	0	2	0	0	0	0	0	0	0	0	6
5:00 PM	0	1	0	1	0	3	0	3	0	0	0	0	0	0	0	0	4
5:15 PM	0	1	0	1	0	1	0	1	0	0	1	1	0	0	0	0	3
5:30 PM	0	0	0	0	0	1	0	1	0	0	1	1	0	0	0	0	2
5:45 PM	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	2
Total Survey	0	16	1	17	0	13	0	13	0	0	2	2	0	0	0	0	32

Heavy Vehicle Peak Hour Summary
4:00 PM to 5:00 PM

By Approach	Northbound NW Glencoe Rd			Southbound NW Glencoe Rd			Eastbound NW Pacific St			Westbound NW Pacific St			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	14	7	21	7	13	20	0	0	0	0	1	1	21
PHF	0.88			0.58			0.00			0.00			0.75

By Movement	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Pacific St				Westbound NW Pacific St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	0	13	1	14	0	7	0	7	0	0	0	0	0	0	0	0	21
PHF	0.00	0.81	0.25	0.88	0.00	0.58	0.00	0.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Pacific St				Westbound NW Pacific St				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	13	1	14	0	7	0	7	0	0	0	0	0	0	0	0	21
4:15 PM	0	10	1	11	0	8	0	8	0	0	0	0	0	0	0	0	19
4:30 PM	0	8	1	9	0	7	0	7	0	0	1	1	0	0	0	0	17
4:45 PM	0	5	1	6	0	7	0	7	0	0	2	2	0	0	0	0	15
5:00 PM	0	3	0	3	0	6	0	6	0	0	2	2	0	0	0	0	11

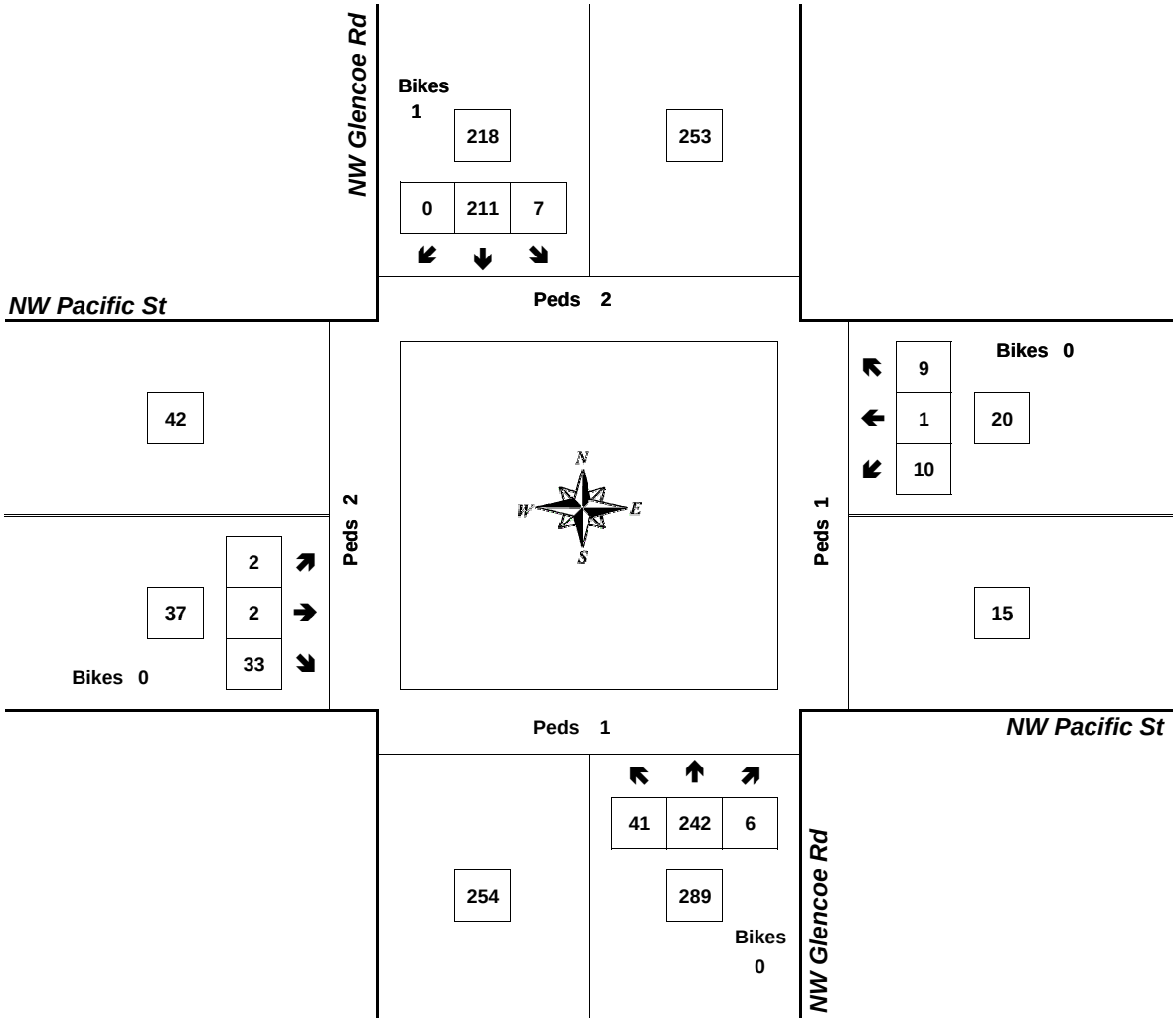
Peak Hour Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740

NW Glencoe Rd & NW Pacific St

4:00 PM to 5:00 PM
Wednesday, October 08, 2014

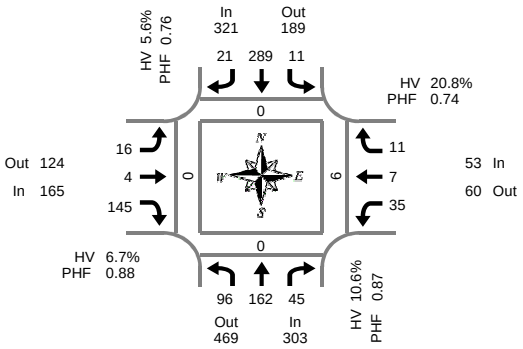


Approach	PHF	HV%	Volume
EB	0.62	0.0%	37
WB	0.63	0.0%	20
NB	0.82	4.8%	289
SB	0.79	3.2%	218
Intersection	0.88	3.7%	564

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

Total Vehicle Summary

Clay Carney
(503) 833-2740



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

NW Glencoe Rd & NW Highland Ct

Wednesday, October 08, 2014
7:00 AM to 9:00 AM

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	9	14	2	0	1	21	4	0	1	0	10	0	2	1	2	0	67	0	0	0	0
7:05 AM	8	11	7	0	1	23	1	0	0	2	12	0	2	0	1	0	68	0	0	0	0
7:10 AM	11	10	2	0	1	25	2	0	1	0	9	0	1	2	3	0	67	0	0	0	0
7:15 AM	5	15	4	0	0	24	1	0	4	2	15	0	5	1	0	0	76	0	0	0	0
7:20 AM	6	18	4	0	1	15	4	0	2	0	12	0	5	1	0	0	68	0	0	0	0
7:25 AM	9	15	2	0	1	16	1	0	2	0	10	0	3	0	1	0	60	0	0	0	0
7:30 AM	8	18	7	0	1	32	1	0	1	0	11	0	1	0	0	0	80	0	0	0	0
7:35 AM	3	13	3	0	3	29	3	0	0	0	12	0	4	1	2	0	73	0	0	0	0
7:40 AM	13	13	2	0	1	35	1	0	1	0	12	0	3	0	0	0	81	0	0	0	0
7:45 AM	8	10	8	0	1	26	1	0	1	0	19	0	2	0	0	0	76	0	0	0	0
7:50 AM	12	11	3	0	0	24	0	0	0	0	10	0	5	1	1	0	67	0	0	3	0
7:55 AM	4	14	1	0	0	19	2	0	3	0	13	0	2	0	1	0	59	0	0	3	0
8:00 AM	8	7	2	0	1	16	1	0	1	1	13	0	3	0	1	0	54	0	0	0	0
8:05 AM	7	17	3	0	0	16	2	0	0	0	12	0	1	1	0	0	59	0	0	0	0
8:10 AM	9	11	5	0	0	19	0	0	2	1	12	0	1	0	0	0	60	0	0	0	0
8:15 AM	7	11	1	0	1	20	1	0	1	0	8	0	4	0	2	0	56	0	0	0	0
8:20 AM	5	11	0	0	2	12	1	0	0	1	9	0	1	0	0	0	42	0	0	0	0
8:25 AM	11	17	3	0	0	15	1	0	0	0	9	0	2	0	2	0	60	0	0	0	0
8:30 AM	7	11	6	0	0	21	2	0	2	0	13	0	1	0	2	0	65	0	0	0	0
8:35 AM	10	17	1	0	0	23	2	0	1	0	12	0	4	0	1	0	71	0	0	0	0
8:40 AM	4	18	4	0	0	24	2	0	1	0	13	0	1	1	0	0	68	0	0	0	0
8:45 AM	3	16	2	0	1	14	2	0	1	0	7	1	4	1	0	0	51	0	0	0	0
8:50 AM	4	13	2	0	3	20	1	0	0	0	10	0	1	0	2	0	56	1	0	1	0
8:55 AM	9	18	5	0	2	12	2	0	2	0	7	0	3	0	2	0	62	1	0	0	0
Total Survey	180	329	79	0	21	501	38	0	27	7	270	1	61	10	23	0	1,546	2	0	7	0

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	28	35	11	0	3	69	7	0	2	2	31	0	5	3	6	0	202	0	0	0	0
7:15 AM	20	48	10	0	2	55	6	0	8	2	37	0	13	2	1	0	204	0	0	0	0
7:30 AM	24	44	12	0	5	96	5	0	2	0	35	0	8	1	2	0	234	0	0	0	0
7:45 AM	24	35	12	0	1	69	3	0	4	0	42	0	9	1	2	0	202	0	0	6	0
8:00 AM	24	35	10	0	1	51	3	0	3	2	37	0	5	1	1	0	173	0	0	0	0
8:15 AM	23	39	4	0	3	47	3	0	1	1	26	0	7	0	4	0	158	0	0	0	0
8:30 AM	21	46	11	0	0	68	6	0	4	0	38	0	6	1	3	0	204	0	0	0	0
8:45 AM	16	47	9	0	6	46	5	0	3	0	24	1	8	1	4	0	169	2	0	1	0
Total Survey	180	329	79	0	21	501	38	0	27	7	270	1	61	10	23	0	1,546	2	0	7	0

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

By Approach	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Highland Ct				Westbound NW Highland Ct				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	303	469	772	0	321	189	510	0	165	124	289	0	53	60	113	0	842
%HV	10.6%				5.6%				6.7%				20.8%				8.6%
PHF	0.87				0.76				0.88				0.74				0.90

Pedestrians Crosswalk			
North	South	East	West
0	0	6	0

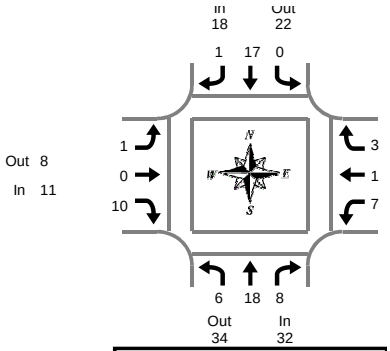
By Movement	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Highland Ct				Westbound NW Highland Ct				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	96	162	45	303	11	289	21	321	16	4	145	165	35	7	11	53	842
%HV	6.3%	11.1%	17.8%	10.6%	0.0%	5.9%	4.8%	5.6%	6.3%	0.0%	6.9%	6.7%	20.0%	14.3%	27.3%	20.8%	8.6%
PHF	0.73	0.79	0.87	0.87	0.55	0.75	0.75	0.76	0.50	0.25	0.84	0.88	0.67	0.44	0.46	0.74	0.90

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	96	162	45	0	11	289	21	0	16	4	145	0	35	7	11	0	842	0	0	6	0
7:15 AM	92	162	44	0	9	271	17	0	17	4	151	0	35	5	6	0	813	0	0	6	0
7:30 AM	95	153	38	0	10	263	14	0	10	3	140	0	29	3	9	0	767	0	0	6	0
7:45 AM	92	155	37	0	5	235	15	0	12	3	143	0	27	3	10	0	737	0	0	6	0
8:00 AM	84	167	34	0	10	212	17	0	11	3	125	1	26	3	12	0	704	2	0	1	0

Heavy Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



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

NW Glencoe Rd & NW Highland Ct

Wednesday, October 08, 2014
7:00 AM to 9:00 AM

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	2	1	1	4	0	2	0	2	0	0	1	1	0	0	0	0	7
7:05 AM	0	0	2	2	0	3	0	3	0	0	4	4	1	0	1	2	11
7:10 AM	0	0	0	0	0	3	1	4	1	0	1	2	0	0	0	0	6
7:15 AM	0	1	1	2	0	0	0	0	0	0	0	0	0	1	0	1	3
7:20 AM	1	3	0	4	0	1	0	1	0	0	1	1	1	0	0	1	7
7:25 AM	1	4	1	6	0	0	0	0	0	0	1	1	1	0	0	1	8
7:30 AM	1	1	1	3	0	1	0	1	0	0	0	0	0	0	0	0	4
7:35 AM	0	2	1	3	0	1	0	1	0	0	1	1	1	0	1	2	7
7:40 AM	1	1	0	2	0	3	0	3	0	0	0	0	1	0	0	1	6
7:45 AM	0	1	1	2	0	0	0	0	0	0	0	0	1	0	0	1	3
7:50 AM	0	2	0	2	0	2	0	2	0	0	1	1	0	0	0	0	5
7:55 AM	0	2	0	2	0	1	0	1	0	0	0	0	1	0	1	2	5
8:00 AM	0	1	0	1	1	1	0	2	0	0	5	5	2	0	0	2	10
8:05 AM	0	3	1	4	0	1	0	1	0	0	0	0	0	0	0	0	5
8:10 AM	1	2	3	6	0	1	0	1	0	0	3	3	0	0	0	0	10
8:15 AM	0	0	0	0	0	5	0	5	0	0	0	0	1	0	1	2	7
8:20 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:25 AM	2	4	1	7	0	1	0	1	0	0	1	1	0	0	0	0	9
8:30 AM	1	2	1	4	0	6	0	6	1	0	0	1	0	0	1	1	12
8:35 AM	0	2	0	2	0	1	0	1	1	0	2	3	1	0	0	1	7
8:40 AM	0	5	1	6	0	2	0	2	0	0	2	2	0	0	0	0	10
8:45 AM	0	0	0	0	0	2	0	2	0	0	0	0	1	0	0	1	3
8:50 AM	0	1	0	1	0	2	0	2	0	0	0	0	0	0	0	0	3
8:55 AM	1	4	1	6	0	2	0	2	0	0	0	0	1	0	0	1	9
Total Survey	11	42	16	69	1	41	1	43	3	0	23	26	13	1	5	19	157

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	2	1	3	6	0	8	1	9	1	0	6	7	1	0	1	2	24
7:15 AM	2	8	2	12	0	1	0	1	0	0	2	2	2	1	0	3	18
7:30 AM	2	4	2	8	0	5	0	5	0	0	1	1	2	0	1	3	17
7:45 AM	0	5	1	6	0	3	0	3	0	0	1	1	2	0	1	3	13
8:00 AM	1	6	4	11	1	3	0	4	0	0	8	8	2	0	0	2	25
8:15 AM	2	4	1	7	0	6	0	6	0	0	1	1	1	0	1	2	16
8:30 AM	1	9	2	12	0	9	0	9	2	0	4	6	1	0	1	2	29
8:45 AM	1	5	1	7	0	6	0	6	0	0	0	0	2	0	0	2	15
Total Survey	11	42	16	69	1	41	1	43	3	0	23	26	13	1	5	19	157

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

By Approach	Northbound NW Glencoe Rd			Southbound NW Glencoe Rd			Eastbound NW Highland Ct			Westbound NW Highland Ct			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	32	34	66	18	22	40	11	8	19	11	8	19	72
PHF	0.62			0.50			0.39			0.69			0.75

By Movement	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Highland Ct				Westbound NW Highland Ct				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	6	18	8	32	0	17	1	18	1	0	10	11	7	1	3	11	72
PHF	0.50	0.56	0.67	0.62	0.00	0.53	0.25	0.50	0.25	0.00	0.42	0.39	0.58	0.25	0.75	0.69	0.75

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	6	18	8	32	0	17	1	18	1	0	10	11	7	1	3	11	72
7:15 AM	5	23	9	37	1	12	0	13	0	0	12	12	8	1	2	11	73
7:30 AM	5	19	8	32	1	17	0	18	0	0	11	11	7	0	3	10	71
7:45 AM	4	24	8	36	1	21	0	22	2	0	14	16	6	0	3	9	83
8:00 AM	5	24	8	37	1	24	0	25	2	0	13	15	6	0	2	8	85

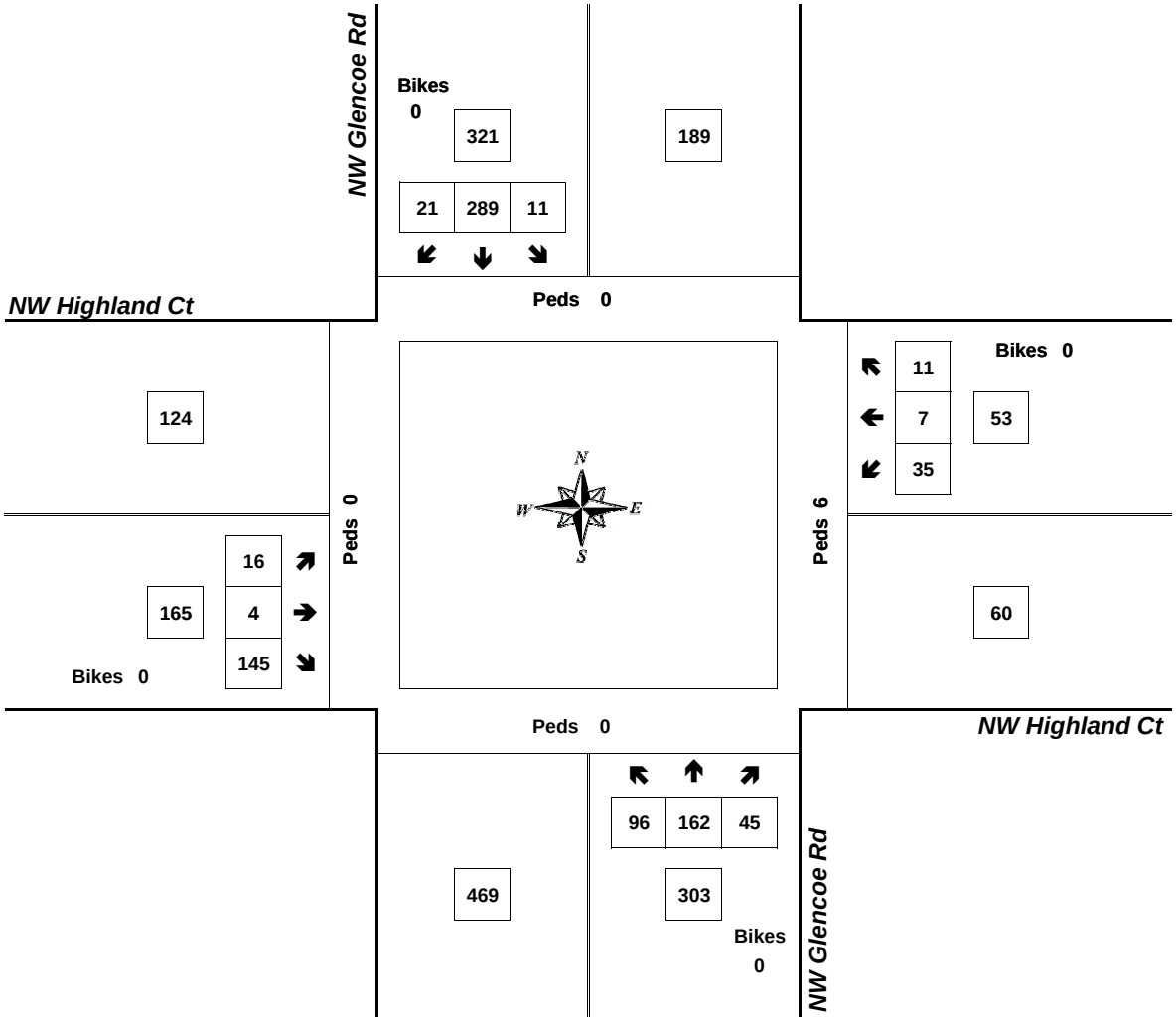
Peak Hour Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740

NW Glencoe Rd & NW Highland Ct

7:00 AM to 8:00 AM
Wednesday, October 08, 2014

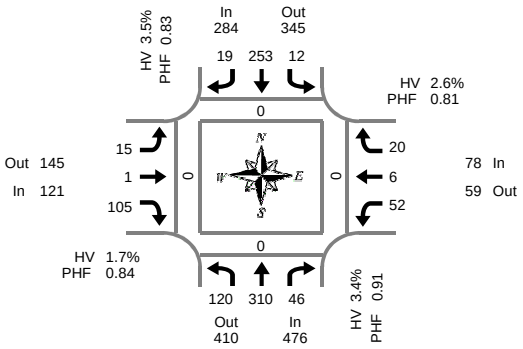


Approach	PHF	HV%	Volume
EB	0.88	6.7%	165
WB	0.74	20.8%	53
NB	0.87	10.6%	303
SB	0.76	5.6%	321
Intersection	0.90	8.6%	842

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

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:10 PM to 5:10 PM

NW Glencoe Rd & NW Highland Ct

Tuesday, October 07, 2014
4:00 PM to 6:00 PM

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	8	31	5	0	2	22	1	0	0	0	10	0	1	0	1	0	81	0	0	0	0
4:05 PM	6	25	2	0	1	21	3	0	1	0	7	0	1	0	1	0	68	0	0	0	0
4:10 PM	12	32	4	0	2	18	0	0	0	0	10	0	4	0	1	0	83	0	0	0	0
4:15 PM	9	27	4	0	0	17	1	0	0	0	12	0	3	1	3	0	77	0	0	0	0
4:20 PM	13	24	3	0	1	17	0	0	2	0	8	0	4	1	2	0	75	0	0	0	0
4:25 PM	9	24	1	0	1	17	3	0	1	0	12	0	2	0	0	0	70	0	0	0	0
4:30 PM	10	26	4	0	4	21	1	0	0	1	7	0	5	1	2	0	82	0	0	0	0
4:35 PM	10	30	4	0	1	25	1	0	3	0	7	0	8	0	3	0	92	0	0	0	0
4:40 PM	12	24	4	0	1	15	2	0	2	0	10	0	4	1	0	0	75	0	0	0	0
4:45 PM	12	28	7	0	1	25	1	0	0	0	4	0	3	1	3	0	85	0	0	0	0
4:50 PM	8	22	2	0	0	23	0	0	3	0	8	0	2	1	3	0	72	0	0	0	0
4:55 PM	9	24	5	0	0	17	4	0	0	0	10	0	0	0	1	0	70	0	0	0	0
5:00 PM	5	21	4	1	0	33	2	0	4	0	11	0	8	0	0	0	88	0	0	0	0
5:05 PM	11	28	4	0	1	25	4	0	0	0	6	0	9	0	2	0	90	0	0	0	0
5:10 PM	6	17	4	0	2	24	1	1	2	0	9	0	10	0	1	0	76	0	0	0	0
5:15 PM	4	28	4	0	5	16	0	0	0	0	6	0	3	1	2	0	69	0	0	0	0
5:20 PM	6	22	2	0	0	20	1	0	1	0	11	0	4	0	2	0	69	0	0	0	0
5:25 PM	10	30	4	0	0	26	1	0	1	0	7	0	2	1	1	0	83	1	0	0	0
5:30 PM	7	26	8	0	0	22	0	0	1	0	7	0	3	2	3	0	79	0	0	0	0
5:35 PM	9	25	3	0	2	21	0	0	0	0	8	0	4	0	2	0	74	0	0	0	0
5:40 PM	10	20	2	0	0	20	1	0	0	0	5	0	4	1	1	0	64	0	0	0	0
5:45 PM	9	25	5	0	2	13	0	0	0	1	10	0	4	0	0	0	69	0	0	0	1
5:50 PM	5	20	2	0	0	15	1	0	3	0	7	0	2	1	3	0	59	0	0	0	0
5:55 PM	7	24	1	0	0	25	1	0	2	0	6	0	0	0	0	0	66	0	0	0	0
Total Survey	207	603	88	1	26	498	29	1	26	2	198	0	90	12	37	0	1,816	1	0	0	1

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	26	88	11	0	5	61	4	0	1	0	27	0	6	0	3	0	232	0	0	0	0
4:15 PM	31	75	8	0	2	51	4	0	3	0	32	0	9	2	5	0	222	0	0	0	0
4:30 PM	32	80	12	0	6	61	4	0	5	1	24	0	17	2	5	0	249	0	0	0	0
4:45 PM	29	74	14	0	1	65	5	0	3	0	22	0	5	2	7	0	227	0	0	0	0
5:00 PM	22	66	12	1	3	82	7	1	6	0	26	0	27	0	3	0	254	0	0	0	0
5:15 PM	20	80	10	0	5	62	2	0	2	0	24	0	9	2	5	0	221	1	0	0	0
5:30 PM	26	71	13	0	2	63	1	0	1	0	20	0	11	3	6	0	217	0	0	0	0
5:45 PM	21	69	8	0	2	53	2	0	5	1	23	0	6	1	3	0	194	0	0	0	1
Total Survey	207	603	88	1	26	498	29	1	26	2	198	0	90	12	37	0	1,816	1	0	0	1

Peak Hour Summary
4:10 PM to 5:10 PM

By Approach	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Highland Ct				Westbound NW Highland Ct				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	476	410	886	1	284	345	629	0	121	145	266	0	78	59	137	0	959
%HV	3.4%				3.5%				1.7%				2.6%				3.1%
PHF	0.91				0.83				0.84				0.81				0.95

Pedestrians Crosswalk			
North	South	East	West
0	0	0	0

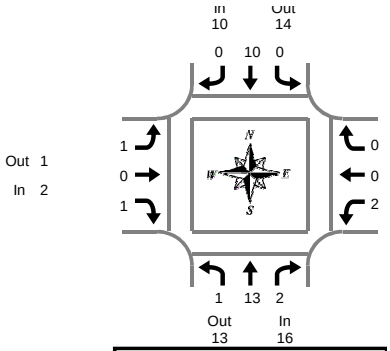
By Movement	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Highland Ct				Westbound NW Highland Ct				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	120	310	46	476	12	253	19	284	15	1	105	121	52	6	20	78	959
%HV	0.8%	4.2%	4.3%	3.4%	0.0%	4.0%	0.0%	3.5%	6.7%	0.0%	1.0%	1.7%	3.8%	0.0%	0.0%	2.6%	3.1%
PHF	0.88	0.93	0.77	0.91	0.50	0.84	0.48	0.83	0.54	0.25	0.82	0.84	0.76	0.50	0.71	0.81	0.95

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	118	317	45	0	14	238	17	0	12	1	105	0	37	6	20	0	930	0	0	0	0
4:15 PM	114	295	46	1	12	259	20	1	17	1	104	0	58	6	20	0	952	0	0	0	0
4:30 PM	103	300	48	1	15	270	18	1	16	1	96	0	58	6	20	0	951	1	0	0	0
4:45 PM	97	291	49	1	11	272	15	1	12	0	92	0	52	7	21	0	919	1	0	0	0
5:00 PM	89	286	43	1	12	260	12	1	14	1	93	0	53	6	17	0	886	1	0	0	1

Heavy Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



NW Glencoe Rd & NW Highland Ct

Tuesday, October 07, 2014
4:00 PM to 6:00 PM

Peak Hour Summary
4:10 PM to 5:10 PM

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	1	4	0	5	0	2	0	2	0	0	2	2	0	0	0	0	9
4:05 PM	0	2	0	2	1	2	0	3	0	0	1	1	0	0	0	0	6
4:10 PM	1	3	1	5	0	0	0	0	0	0	0	0	1	0	0	1	6
4:15 PM	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	1	2
4:20 PM	0	2	0	2	0	1	0	1	0	0	0	0	0	0	0	0	3
4:25 PM	0	1	0	1	0	2	0	2	0	0	0	0	0	0	0	0	3
4:30 PM	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	2
4:35 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:40 PM	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	2
4:45 PM	0	2	0	2	0	2	0	2	0	0	0	0	0	0	0	0	4
4:50 PM	0	1	1	2	0	1	0	1	0	0	0	0	0	0	0	0	3
4:55 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
5:00 PM	0	0	0	0	0	1	0	1	1	0	0	1	0	0	0	0	2
5:05 PM	0	0	0	0	0	1	0	1	0	0	1	1	0	0	0	0	2
5:10 PM	0	0	0	0	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	0	0	0	0
5:20 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:25 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
5:30 PM	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
5:35 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
5:40 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
5:50 PM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1
5:55 PM	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
Total Survey	4	23	2	29	1	16	0	17	2	0	4	6	2	0	0	2	54

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	2	9	1	12	1	4	0	5	0	0	3	3	1	0	0	1	21
4:15 PM	0	4	0	4	0	3	0	3	0	0	0	0	1	0	0	1	8
4:30 PM	0	2	0	2	0	2	0	2	0	0	0	0	0	0	0	0	4
4:45 PM	0	4	1	5	0	3	0	3	0	0	0	0	0	0	0	0	8
5:00 PM	0	0	0	0	0	2	0	2	1	0	1	2	0	0	0	0	4
5:15 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
5:30 PM	1	1	0	2	0	1	0	1	0	0	0	0	0	0	0	0	3
5:45 PM	1	3	0	4	0	0	0	0	1	0	0	1	0	0	0	0	5
Total Survey	4	23	2	29	1	16	0	17	2	0	4	6	2	0	0	2	54

Heavy Vehicle Peak Hour Summary
4:10 PM to 5:10 PM

By Approach	Northbound NW Glencoe Rd			Southbound NW Glencoe Rd			Eastbound NW Highland Ct			Westbound NW Highland Ct			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	16	13	29	10	14	24	2	1	3	2	2	4	30
PHF	0.50			0.63			0.25			0.25			0.68

By Movement	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Highland Ct				Westbound NW Highland Ct				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	1	13	2	16	0	10	0	10	1	0	1	2	2	0	0	2	30
PHF	0.25	0.54	0.50	0.50	0.00	0.63	0.00	0.63	0.25	0.00	0.25	0.25	0.25	0.00	0.00	0.25	0.68

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

Interval Start Time	Northbound NW Glencoe Rd				Southbound NW Glencoe Rd				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	2	19	2	23	1	12	0	13	0	0	3	3	2	0	0	2	41
4:15 PM	0	10	1	11	0	10	0	10	1	0	1	2	1	0	0	1	24
4:30 PM	0	6	1	7	0	8	0	8	1	0	1	2	0	0	0	0	17
4:45 PM	1	5	1	7	0	7	0	7	1	0	1	2	0	0	0	0	16
5:00 PM	2	4	0	6	0	4	0	4	2	0	1	3	0	0	0	0	13

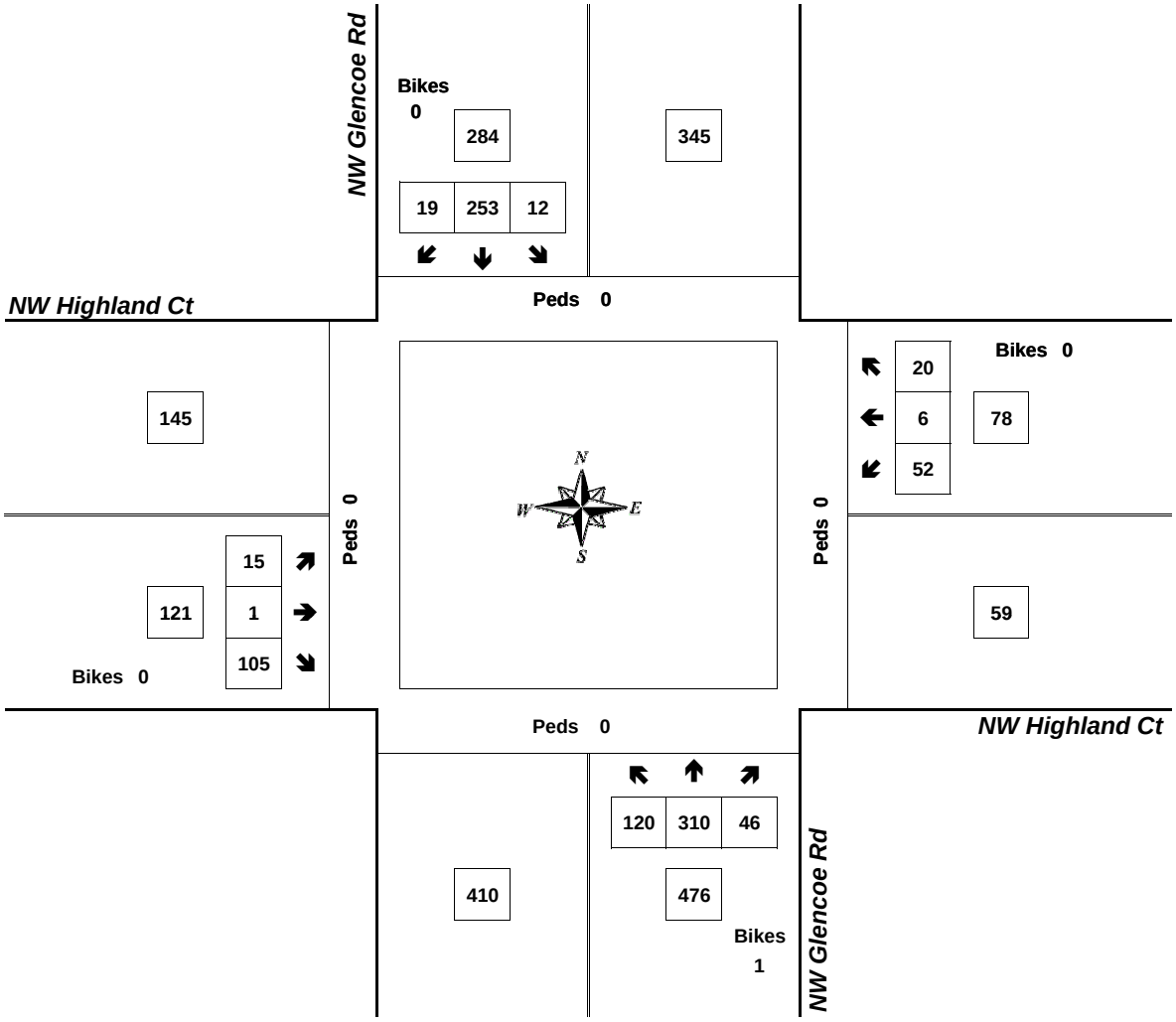
Peak Hour Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740

NW Glencoe Rd & NW Highland Ct

4:10 PM to 5:10 PM
Tuesday, October 07, 2014

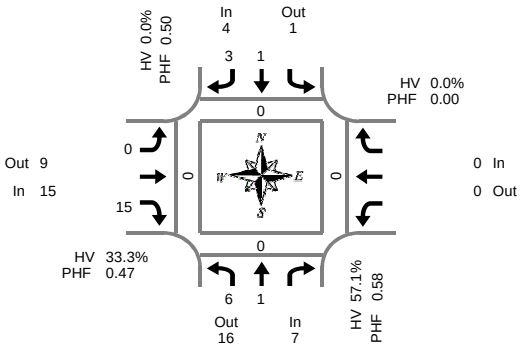


Approach	PHF	HV%	Volume
EB	0.84	1.7%	121
WB	0.81	2.6%	78
NB	0.91	3.4%	476
SB	0.83	3.5%	284
Intersection	0.95	3.1%	959

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

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
7:25 AM to 8:25 AM

NW 307th Ave & NW Highland Ct

Wednesday, October 08, 2014
7:00 AM to 9:00 AM

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

Interval Start Time	Northbound NW 307th Ave				Southbound NW 307th Ave				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total	Pedestrians Crosswalk			
	L	T		Bikes		T	R	Bikes	L		R	Bikes				Bikes		North	South	East	West
7:00 AM	0	0		0		0	0	0	0		0	0				0	0	0	0	0	0
7:05 AM	0	0		0		0	0	0	0		2	0				0	2	0	0	0	0
7:10 AM	0	0		0		0	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	0	0	0	0
7:20 AM	0	0		0		0	0	0	0		0	0				0	0	0	0	0	0
7:25 AM	0	0		0		0	1	0	0		1	0				0	2	0	0	0	0
7:30 AM	1	0		0		0	1	0	0		4	0				0	6	0	0	0	0
7:35 AM	0	0		0		0	0	0	0		3	0				0	3	0	0	0	0
7:40 AM	1	1		0		0	0	0	0		0	0				0	2	0	0	0	0
7:45 AM	1	0		0		0	1	0	0		2	0				0	4	0	0	0	0
7:50 AM	0	0		0		0	0	0	0		0	0				0	0	0	0	0	0
7:55 AM	1	0		0		0	0	0	0		1	0				0	2	0	0	0	0
8:00 AM	1	0		0		1	0	0	0		0	0				0	2	0	0	0	0
8:05 AM	1	0		0		0	0	0	0		0	0				0	1	0	0	0	0
8:10 AM	0	0		0		0	0	0	0		2	0				0	2	0	0	0	0
8:15 AM	0	0		0		0	0	0	0		0	0				0	0	0	0	0	0
8:20 AM	0	0		0		0	0	0	0		2	0				0	2	0	0	0	0
8:25 AM	0	0		0		0	0	0	0		0	0				0	0	0	0	0	0
8:30 AM	0	0		0		0	0	0	0		2	0				0	2	0	0	0	0
8:35 AM	2	0		0		0	0	0	0		0	0				0	2	0	0	0	0
8:40 AM	0	0		0		0	0	0	0		0	0				0	0	0	0	0	0
8:45 AM	1	0		0		0	0	0	0		0	0				0	1	0	0	0	0
8:50 AM	0	0		0		0	0	0	0		2	0				0	2	1	0	0	0
8:55 AM	1	0		0		0	0	0	0		2	0				0	3	0	0	0	0
Total Survey	10	1		0		1	3	0	0		23	0				0	38	1	0	0	0

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

Interval Start Time	Northbound NW 307th Ave				Southbound NW 307th Ave				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total	Pedestrians Crosswalk			
	L	T		Bikes		T	R	Bikes	L		R	Bikes				Bikes		North	South	East	West
7:00 AM	0	0		0		0	0	0	0		2	0				0	2	0	0	0	0
7:15 AM	0	0		0		0	1	0	0		1	0				0	2	0	0	0	0
7:30 AM	2	1		0		0	1	0	0		7	0				0	11	0	0	0	0
7:45 AM	2	0		0		0	1	0	0		3	0				0	6	0	0	0	0
8:00 AM	2	0		0		1	0	0	0		2	0				0	5	0	0	0	0
8:15 AM	0	0		0		0	0	0	0		2	0				0	2	0	0	0	0
8:30 AM	2	0		0		0	0	0	0		2	0				0	4	0	0	0	0
8:45 AM	2	0		0		0	0	0	0		4	0				0	6	1	0	0	0
Total Survey	10	1		0		1	3	0	0		23	0				0	38	1	0	0	0

Peak Hour Summary
7:25 AM to 8:25 AM

By Approach	Northbound NW 307th Ave				Southbound NW 307th Ave				Eastbound NW Highland Ct				Westbound NW Highland Ct				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	7	16	23	0	4	1	5	0	15	9	24	0	0	0	0	0	26
%HV	57.1%				0.0%				33.3%				0.0%				34.6%
PHF	0.58				0.50				0.47				0.00				0.59

Pedestrians Crosswalk			
North	South	East	West
0	0	0	0

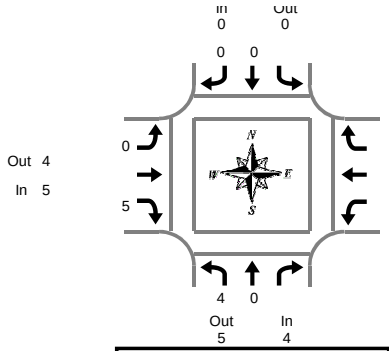
By Movement	Northbound NW 307th Ave				Southbound NW 307th Ave				Eastbound NW Highland Ct				Westbound NW Highland Ct				Total
	L	T		Total		T	R	Total	L		R	Total				Total	
Volume	6	1		7		1	3	4	0		15	15				0	26
%HV	66.7%	0.0%	NA	57.1%	NA	0.0%	0.0%	0.0%	0.0%	NA	33.3%	33.3%	NA	NA	NA	0.0%	34.6%
PHF	0.50	0.25		0.58		0.25	0.38	0.50	0.00		0.47	0.47				0.00	0.59

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

Interval Start Time	Northbound NW 307th Ave				Southbound NW 307th Ave				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total	Pedestrians Crosswalk			
	L	T		Bikes		T	R	Bikes	L		R	Bikes				Bikes		North	South	East	West
7:00 AM	4	1		0		0	3	0	0		13	0				0	21	0	0	0	0
7:15 AM	6	1		0		1	3	0	0		13	0				0	24	0	0	0	0
7:30 AM	6	1		0		1	2	0	0		14	0				0	24	0	0	0	0
7:45 AM	6	0		0		1	1	0	0		9	0				0	17	0	0	0	0
8:00 AM	6	0		0		1	0	0	0		10	0				0	17	1	0	0	0

Heavy Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



Peak Hour Summary
7:25 AM to 8:25 AM

NW 307th Ave & NW Highland Ct

Wednesday, October 08, 2014
7:00 AM to 9:00 AM

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

Interval Start Time	Northbound NW 307th Ave				Southbound NW 307th Ave				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total
	L	T		Total		T	R	Total	L		R	Total				Total	
7:00 AM	0	0		0		0	0	0	0		0	0				0	0
7:05 AM	0	0		0		0	0	0	0		2	2				0	2
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	0	0		0	0				0	0
7:30 AM	0	0		0		0	0	0	0		1	1				0	1
7:35 AM	0	0		0		0	0	0	0		1	1				0	1
7:40 AM	1	0		1		0	0	0	0		0	0				0	1
7:45 AM	1	0		1		0	0	0	0		1	1				0	2
7:50 AM	0	0		0		0	0	0	0		0	0				0	0
7:55 AM	1	0		1		0	0	0	0		0	0				0	1
8:00 AM	1	0		1		0	0	0	0		0	0				0	1
8:05 AM	0	0		0		0	0	0	0		0	0				0	0
8:10 AM	0	0		0		0	0	0	0		2	2				0	2
8:15 AM	0	0		0		0	0	0	0		0	0				0	0
8:20 AM	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
8:30 AM	0	0		0		0	0	0	0		1	1				0	1
8:35 AM	1	0		1		0	0	0	0		0	0				0	1
8:40 AM	0	0		0		0	0	0	0		0	0				0	0
8:45 AM	1	0		1		0	0	0	0		0	0				0	1
8:50 AM	0	0		0		0	0	0	0		0	0				0	0
8:55 AM	0	0		0		0	0	0	0		1	1				0	1
Total Survey	6	0		6		0	0	0	0		9	9				0	15

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

Interval Start Time	Northbound NW 307th Ave				Southbound NW 307th Ave				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total
	L	T		Total		T	R	Total	L		R	Total				Total	
7:00 AM	0	0		0		0	0	0	0		2	2				0	2
7:15 AM	0	0		0		0	0	0	0		0	0				0	0
7:30 AM	1	0		1		0	0	0	0		2	2				0	3
7:45 AM	2	0		2		0	0	0	0		1	1				0	3
8:00 AM	1	0		1		0	0	0	0		2	2				0	3
8:15 AM	0	0		0		0	0	0	0		0	0				0	0
8:30 AM	1	0		1		0	0	0	0		1	1				0	2
8:45 AM	1	0		1		0	0	0	0		1	1				0	2
Total Survey	6	0		6		0	0	0	0		9	9				0	15

Heavy Vehicle Peak Hour Summary
7:25 AM to 8:25 AM

By Approach	Northbound NW 307th Ave			Southbound NW 307th Ave			Eastbound NW Highland Ct			Westbound NW Highland Ct			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	4	5	9	0	0	0	5	4	9	0	0	0	9
PHF	0.50			0.00			0.63			0.00			0.56

By Movement	Northbound NW 307th Ave				Southbound NW 307th Ave				Eastbound NW Highland Ct				Westbound NW Highland Ct				Total
	L	T		Total		T	R	Total	L		R	Total				Total	
Volume	4	0		4		0	0	0	0		5	5				0	9
PHF	0.50	0.00		0.50		0.00	0.00	0.00	0.00		0.63	0.63				0.00	0.56

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

Interval Start Time	Northbound NW 307th Ave				Southbound NW 307th Ave				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total
	L	T		Total		T	R	Total	L		R	Total				Total	
7:00 AM	3	0		3		0	0	0	0		5	5				0	8
7:15 AM	4	0		4		0	0	0	0		5	5				0	9
7:30 AM	4	0		4		0	0	0	0		5	5				0	9
7:45 AM	4	0		4		0	0	0	0		4	4				0	8
8:00 AM	3	0		3		0	0	0	0		4	4				0	7

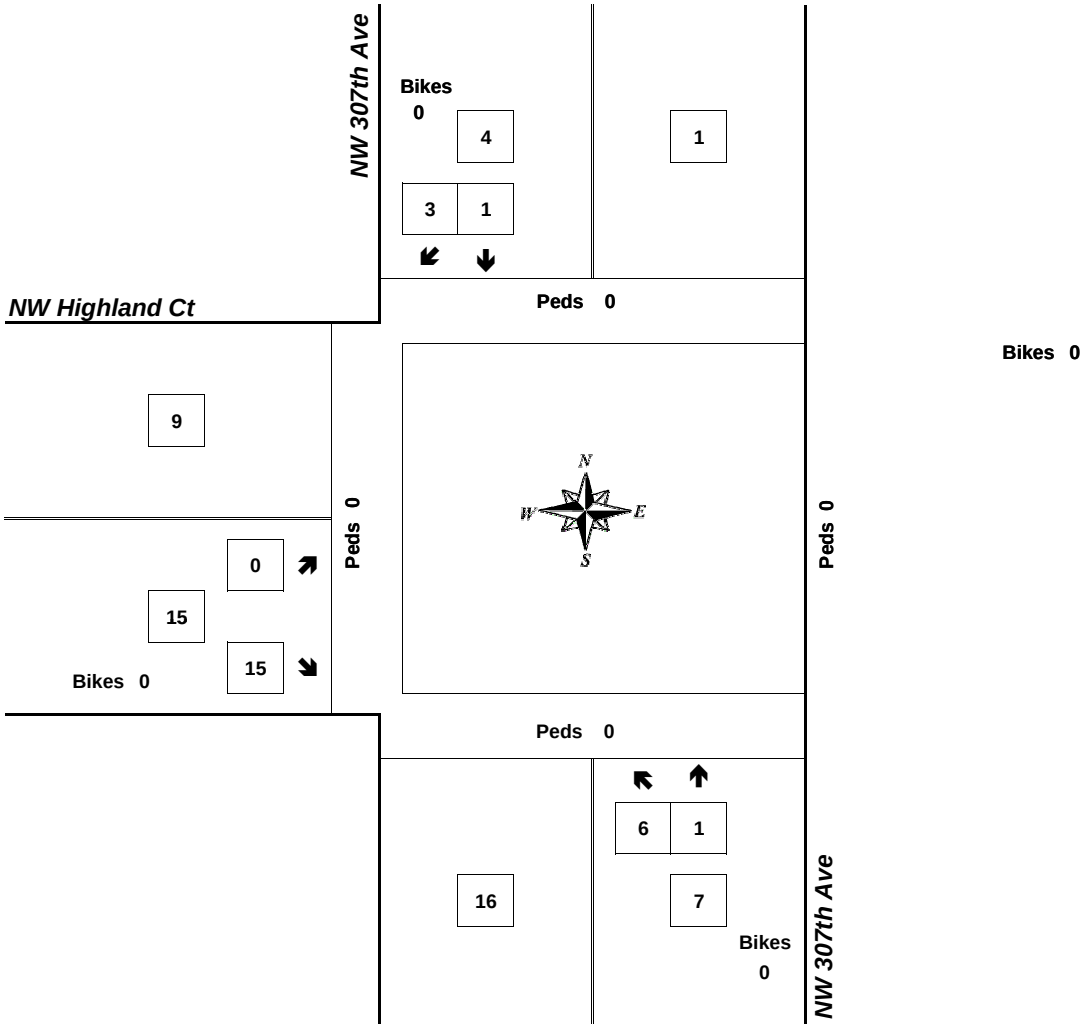
Peak Hour Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740

NW 307th Ave & NW Highland Ct

7:25 AM to 8:25 AM
Wednesday, October 08, 2014

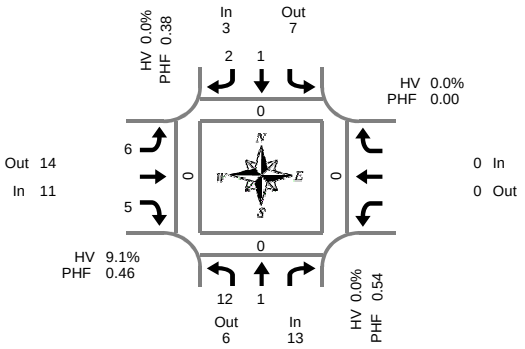


Approach	PHF	HV%	Volume
EB	0.47	33.3%	15
WB	0.00	0.0%	0
NB	0.58	57.1%	7
SB	0.50	0.0%	4
Intersection	0.59	34.6%	26

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

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:35 PM to 5:35 PM

NW 307th Ave & NW Highland Ct

Tuesday, October 07, 2014
4:00 PM to 6:00 PM

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

Interval Start Time	Northbound NW 307th Ave				Southbound NW 307th Ave				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total	Pedestrians Crosswalk			
	L	T		Bikes		T	R	Bikes	L		R	Bikes				Bikes		North	South	East	West
4:00 PM	0	0		0		0	0	0	0		1	0				0	1	0	0	0	0
4:05 PM	0	0		0		0	0	0	0		0	0				0	0	0	0	0	0
4:10 PM	2	0		0		0	0	0	1		0	0				0	3	0	0	0	0
4:15 PM	0	0		0		0	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	0	0	0	0
4:25 PM	0	0		0		0	0	0	0		0	0				0	0	0	0	0	0
4:30 PM	1	0		0		0	0	0	0		0	0				0	1	0	0	0	0
4:35 PM	0	0		0		1	1	0	0		0	0				0	2	0	0	0	0
4:40 PM	0	0		0		0	0	0	0		0	0				0	0	0	0	0	0
4:45 PM	1	0		0		0	0	0	1		1	0				0	3	0	0	0	0
4:50 PM	2	1		0		0	0	0	0		3	0				0	6	0	0	0	0
4:55 PM	0	0		0		0	0	0	0		1	0				0	1	0	0	0	0
5:00 PM	1	0		0		0	0	0	2		0	0				0	3	0	0	0	0
5:05 PM	4	0		0		0	0	0	0		0	0				0	4	0	0	0	0
5:10 PM	1	0		0		0	0	0	1		0	0				0	2	0	0	0	0
5:15 PM	1	0		0		0	1	0	1		0	0				0	3	0	0	0	0
5:20 PM	0	0		0		0	0	0	0		0	0				0	0	0	0	0	0
5:25 PM	0	0		0		0	0	0	1		0	0				0	1	0	0	0	0
5:30 PM	2	0		0		0	0	0	0		0	0				0	2	0	0	0	0
5:35 PM	2	0		0		0	0	0	0		0	0				0	2	0	0	0	0
5:40 PM	0	0		0		0	0	0	0		0	0				0	0	0	0	0	0
5:45 PM	2	0		0		0	0	0	0		0	0				0	2	0	0	0	0
5:50 PM	0	0		0		0	0	0	1		0	0				0	1	0	0	0	0
5:55 PM	0	0		0		0	0	0	0		0	0				0	0	0	0	0	0
Total Survey	19	1		0		1	2	0	8		6	0				0	37	0	0	0	0

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

Interval Start Time	Northbound NW 307th Ave				Southbound NW 307th Ave				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total	Pedestrians Crosswalk			
	L	T		Bikes		T	R	Bikes	L		R	Bikes				Bikes		North	South	East	West
4:00 PM	2	0		0		0	0	0	1		1	0				0	4	0	0	0	0
4:15 PM	0	0		0		0	0	0	0		0	0				0	0	0	0	0	0
4:30 PM	1	0		0		1	1	0	0		0	0				0	3	0	0	0	0
4:45 PM	3	1		0		0	0	0	1		5	0				0	10	0	0	0	0
5:00 PM	6	0		0		0	0	0	3		0	0				0	9	0	0	0	0
5:15 PM	1	0		0		0	1	0	2		0	0				0	4	0	0	0	0
5:30 PM	4	0		0		0	0	0	0		0	0				0	4	0	0	0	0
5:45 PM	2	0		0		0	0	0	1		0	0				0	3	0	0	0	0
Total Survey	19	1		0		1	2	0	8		6	0				0	37	0	0	0	0

Peak Hour Summary
4:35 PM to 5:35 PM

By Approach	Northbound NW 307th Ave				Southbound NW 307th Ave				Eastbound NW Highland Ct				Westbound NW Highland Ct				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	13	6	19	0	3	7	10	0	11	14	25	0	0	0	0	0	27
%HV	0.0%				0.0%				9.1%				0.0%				3.7%
PHF	0.54				0.38				0.46				0.00				0.68

Pedestrians Crosswalk			
North	South	East	West
0	0	0	0

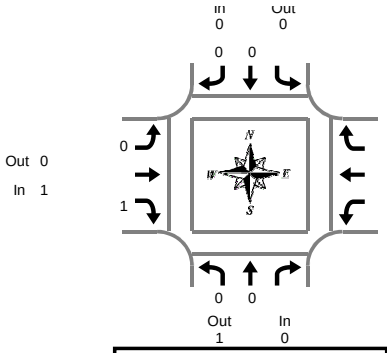
By Movement	Northbound NW 307th Ave				Southbound NW 307th Ave				Eastbound NW Highland Ct				Westbound NW Highland Ct				Total
	L	T		Total		T	R	Total	L		R	Total				Total	
Volume	12	1		13		1	2	3	6		5	11				0	27
%HV	0.0%	0.0%	NA	0.0%	NA	0.0%	0.0%	0.0%	0.0%	NA	20.0%	9.1%	NA	NA	NA	0.0%	3.7%
PHF	0.50	0.25		0.54		0.25	0.50	0.38	0.50		0.25	0.46				0.00	0.68

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

Interval Start Time	Northbound NW 307th Ave				Southbound NW 307th Ave				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total	Pedestrians Crosswalk			
	L	T		Bikes		T	R	Bikes	L		R	Bikes				Bikes		North	South	East	West
4:00 PM	6	1		0		1	1	0	2		6	0				0	17	0	0	0	0
4:15 PM	10	1		0		1	1	0	4		5	0				0	22	0	0	0	0
4:30 PM	11	1		0		1	2	0	6		5	0				0	26	0	0	0	0
4:45 PM	14	1		0		0	1	0	6		5	0				0	27	0	0	0	0
5:00 PM	13	0		0		0	1	0	6		0	0				0	20	0	0	0	0

Heavy Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



Peak Hour Summary
4:35 PM to 5:35 PM

NW 307th Ave & NW Highland Ct

Tuesday, October 07, 2014
4:00 PM to 6:00 PM

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

Interval Start Time	Northbound NW 307th Ave				Southbound NW 307th Ave				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total
	L	T		Total		T	R	Total	L		R	Total				Total	
4:00 PM	0	0		0		0	0	0	0		0	0				0	0
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		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		1	1				0	1
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	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	0	0		0		0	0	0	0		1	1				0	1

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

Interval Start Time	Northbound NW 307th Ave				Southbound NW 307th Ave				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total
	L	T		Total		T	R	Total	L		R	Total				Total	
4:00 PM	0	0		0		0	0	0	0		0	0				0	0
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		1	1				0	1
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	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	0	0		0		0	0	0	0		1	1				0	1

Heavy Vehicle Peak Hour Summary
4:35 PM to 5:35 PM

By Approach	Northbound NW 307th Ave			Southbound NW 307th Ave			Eastbound NW Highland Ct			Westbound NW Highland Ct			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	0	1	1	0	0	0	1	0	1	0	0	0	1
PHF	0.00			0.00			0.25			0.00			0.25

By Movement	Northbound NW 307th Ave				Southbound NW 307th Ave				Eastbound NW Highland Ct				Westbound NW Highland Ct				Total
	L	T		Total		T	R	Total	L		R	Total				Total	
Volume	0	0		0		0	0	0	0		1	1				0	1
PHF	0.00	0.00		0.00		0.00	0.00	0.00	0.00		0.25	0.25				0.00	0.25

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

Interval Start Time	Northbound NW 307th Ave				Southbound NW 307th Ave				Eastbound NW Highland Ct				Westbound NW Highland Ct				Interval Total
	L	T		Total		T	R	Total	L		R	Total				Total	
4:00 PM	0	0		0		0	0	0	0		1	1				0	1
4:15 PM	0	0		0		0	0	0	0		1	1				0	1
4:30 PM	0	0		0		0	0	0	0		1	1				0	1
4:45 PM	0	0		0		0	0	0	0		1	1				0	1
5:00 PM	0	0		0		0	0	0	0		0	0				0	0

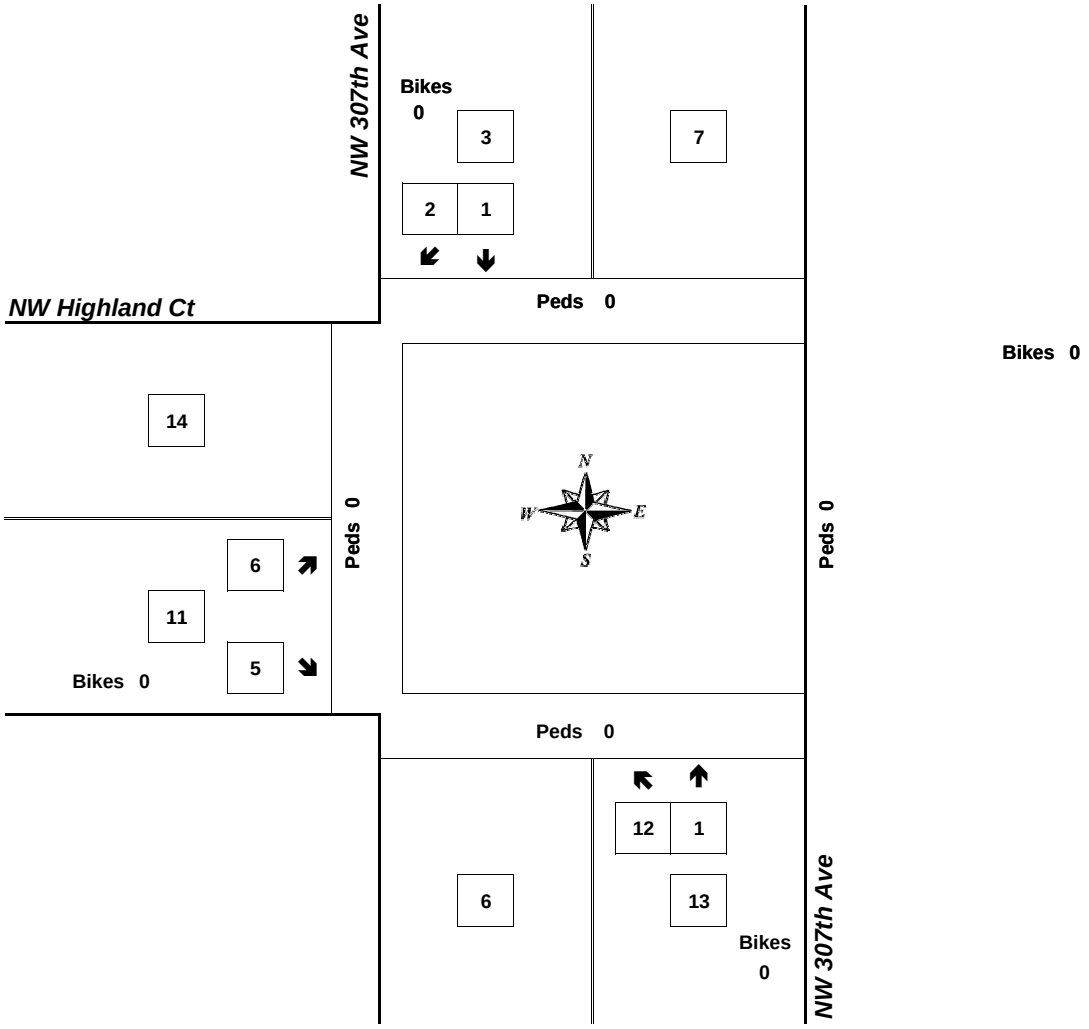
Peak Hour Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740

NW 307th Ave & NW Highland Ct

4:35 PM to 5:35 PM
Tuesday, October 07, 2014



Approach	PHF	HV%	Volume
EB	0.46	9.1%	11
WB	0.00	0.0%	0
NB	0.54	0.0%	13
SB	0.38	0.0%	3
Intersection	0.68	3.7%	27

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

TRIP GENERATION CALCULATIONS

Land Use: Single-Family Detached Housing
Land Use Code: 210
Variable: Dwelling Units
Variable Value: 57

AM PEAK HOUR

Trip Rate: 0.75

	Enter	Exit	Total
Directional Distribution	25%	75%	
Trip Ends	**11**	**32**	**43**

PM PEAK HOUR

Trip Rate: 1.00

	Enter	Exit	Total
Directional Distribution	63%	37%	
Trip Ends	**36**	**21**	**57**

WEEKDAY

Trip Rate: 9.52

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**271**	**271**	**542**

SATURDAY

Trip Rate: 9.91

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**282**	**282**	**564**

Source: TRIP GENERATION, Ninth Edition

OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANAYLYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF NORTH PLAINS, WASHINGTON COUNTY

1ST ST/GLENCOE RD and PACIFIC ST, City of North Plains, Washington County, 01/01/2009 to 12/31/2013

Total crash records: 1

SER# / INVE	S P E D	A L C	D R U G S	S C H L	W O R K	DATE / DAY / TIME	CLASS / DIST / FROM	CITY STREET / FIRST STREET / SECOND STREET	RD CHAR / DIRECT / LOCTN	INT-TYPE (MEDIAN) / LEGS (#LANES)	INT-REL / TRAF-CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	V#	SPCL USE / TRLR QTY / OWNER / TYPE	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS / RES	PED LOC	ERROR	ACT	EVENT	CAUSE
021	N	N	N	N	N	04/24/2013	09	NW PACIFIC ST	STRGHT		N	N	CLR	ANGL-OTH	01	NONE 0	PARKNG											10
CITY						WE	110	NW 1ST ST/GLENCOE RD	E	(NONE)	NONE	N	DRY	PARK		PRVTE	NE-W									009		00
						11A			08			N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	60	F	OR-Y		018	000		10
										(02)													OR<25					
															02	NONE 0	PRKD-P											
																PRVTE	E -W									008		00
																PSNGR CAR												

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OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANAYLYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF NORTH PLAINS, WASHINGTON COUNTY

1ST ST/GLENCOE RD and HIGHLAND CT, City of North Plains, Washington County, 01/01/2009 to 12/31/2013

Total crash records: 8

SER# / INVNO	P E D	A L C	U G S	C S L	O H L	R K	W T H	DATE / DAY / TIME	CLASS / DIST / FROM	CITY STREET / FIRST STREET / SECOND STREET	RD CHAR / DIRECT / LOCTN	INT-TYPE (MEDIAN) / LEGS (#LANES)	INT-REL / TRAF-CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	V#	SPCL USE / TRLR QTY / OWNER / TYPE	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT	EVENT	CAUSE
04533	N	N	N					08/16/2013	06	NW HIGHLAND CT	INTER	CROSS	N	N	CLR	O-1TURN	01	NONE 0	TURN-L											02
NONE								FR		NW 1ST ST/GLENCOE RD	CN		STOP SIGN	N	DRY	TURN		PRVTE	SW-W								000		00
								4P			01	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	48	M	OR-Y OR<25		028	000		02
																	02	NONE 0	STRGHT											
																		PRVTE	NE-SW									000		00
																		PSNGR CAR		01	DRVR	NONE	00	F	OTH-Y N-RES		000	000		00
00158	N	N	N	N	N			01/09/2009	06	NW HIGHLAND CT	INTER	CROSS	N	N	FOG	ANGL-OTH	01	NONE 0	STRGHT											02
COUNTY								FR	0	NW 1ST ST/GLENCOE RD	CN		STOP SIGN	N	WET	ANGL		PRVTE	N -S								000		00
								6A			01	0		N	DLIT	INJ		PSNGR CAR		01	DRVR	INJC	28	M	OR-Y OR<25		000	000		00
																	02	NONE 0	STRGHT											
																		PRVTE	E -W									015		00
																		PSNGR CAR		01	DRVR	INJB	37	M	OR-Y OR<25		028	000		02
06016	N	N	N	N	N			11/24/2009	06	NW HIGHLAND CT	INTER	CROSS	N	N	CLR	S-OTHER	01	NONE 0	BACK											10
COUNTY								TU	0	NW 1ST ST/GLENCOE RD	CN		STOP SIGN	N	DRY	BACK		PRVTE	N -W								000		00
								7A			03	0		N	DAY	PDO		TRUCK		01	DRVR	NONE	45	M	OR-Y OR<25		011	000		10
																	02	NONE 0	STOP											
																		PRVTE	W -E									011		00
																		PSNGR CAR		01	DRVR	NONE	30	F	OR-Y OR<25		000	000		00
																	02	NONE 0	STOP											
																		PRVTE	W -E									011		00
																		PSNGR CAR		02	PSNG	NO<5	03	M			000	000		00
																	02	NONE 0	STOP											
																		PRVTE	W -E									011		00
																		PSNGR CAR		03	PSNG	NO<5	01	M			000	000		00
05130	N	N	N					09/22/2011	06	NW HIGHLAND CT	INTER	CROSS	N	N	CLR	S-OTHER	01	NONE 1	TURN-R											08
NONE								TH	0	NW 1ST ST/GLENCOE RD	CN		STOP SIGN	N	DRY	TURN		PRVTE	W -SW								015		00
								11A			03	0		N	DAY	PDO		SEMI TOW		01	DRVR	NONE	36	M	OR-Y OR<25		006	000		08
																	02	NONE 0	TURN-R											
																		PRVTE	W -SW									015	040	00
																		PSNGR CAR		01	DRVR	NONE	58	M	OR-Y OR<25		000	000		00
05607	N	N	N		Y			10/17/2012	06	NW HIGHLAND CT	INTER	CROSS	N	N	CLR	O-1TURN	01	NONE 0	STRGHT											02
COUNTY								WE	0	NW 1ST ST/GLENCOE RD	CN		STOP SIGN	N	DRY	TURN		PRVTE	N -S								000		00
								6A			01	0		N	DLIT	PDO		PSNGR CAR		01	DRVR	NONE	56	M	OR-Y OR<25		000	000		00
																	02	NONE 0	TURN-L											
																		PRVTE	S -W									000		00
																		PSNGR CAR		01	DRVR	NONE	53	M	OR-Y OR<25		004,028	000		02
06754	N	N	N		Y			11/30/2012	06	NW HIGHLAND CT	INTER	CROSS	N	N	RAIN	ANGL-OTH	01	NONE 0	TURN-L											02
CITY								FR	0	NW 1ST ST/GLENCOE RD	CN		STOP SIGN	N	WET	TURN		PRVTE	W -N								015		00
								4P			02	0		N	DUSK	PDO		PSNGR CAR		01	DRVR	NONE	47	F	OR-Y		028	000		02

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1ST ST/GLENCOE RD and HIGHLAND CT, City of North Plains, Washington County, 01/01/2009 to 12/31/2013

Total crash records: 8

SER# INVD	S P E D	A L C	D R S U G S	C H L	W O R K	DATE DAY TIME	CLASS DIST FROM	CITY STREET FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYPE (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CONTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH COLL SVRTY	V#	SPCL USE TRLR QTY OWNER TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT	EVENT	CAUSE
																							OR<25					
															02	NONE 0	STRGHT											
																PRVTE	S -N									000		00
																PSNGR CAR		01	DRVR	NONE	51	M	OR-Y		000	000		00
																							OR<25					
029[illegible]		N	N	N	N	06/05/2013	09	NW HIGHLAND CT	STRGHT		N	N	CLR	O-1STOP	01	NONE 0	BACK											10
CITY						WE	46	NW 1ST ST/GLENCOE RD	E	(NONE)	NONE	N	DRY	BACK		PRVTE	W -E									000		00
						9A			06			N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	36	M	OR-Y		011	000		10
										(02)													OR<25					
															02	NONE 0	STOP											
																PRVTE	E -W									011		00
																PSNGR CAR		01	DRVR	NONE	34	M	OR-Y		000	000		00
																							OR<25					
038[illegible]		N	N	N	N	07/25/2012	08	NW HIGHLAND CT	STRGHT		N	Y	CLR	BIKE	01	NONE 0	STRGHT											10
COUNTY						WE	300	NW 1ST ST/GLENCOE RD	W	(NONE)	NONE	N	DRY	SS-O		PRVTE	W -E									000		00
						1P			08			N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	81	F	OR-Y		080,081	088		10
										(02)													OR>25					
																	-											
																	STRGHT	01	BIKE	INJC	62	F		SHLDR	000	000		00
																	W E											

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	16	4	145	35	7	11	96	162	45	11	289	21
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	18	4	161	39	8	12	107	180	50	12	321	23
Pedestrians					6							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					4.0							
Percent Blockage					1							
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	767	807	333	933	793	211	344			236		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	767	807	333	933	793	211	344			236		
tC, single (s)	7.2	6.6	6.3	7.3	6.7	6.4	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.7	4.2	3.5	2.3			2.3		
p0 queue free %	94	98	77	75	97	98	91			99		
cM capacity (veh/h)	277	277	698	158	269	780	1166			1301		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	22	161	59	107	230	12	344
Volume Left	18	0	39	107	0	12	0
Volume Right	0	161	12	0	50	0	23
cSH	277	698	203	1166	1700	1301	1700
Volume to Capacity	0.08	0.23	0.29	0.09	0.14	0.01	0.20
Queue Length 95th (ft)	6	22	29	8	0	1	0
Control Delay (s)	19.1	11.7	29.8	8.4	0.0	7.8	0.0
Lane LOS	C	B	D	A		A	
Approach Delay (s)	12.6		29.8	2.7		0.3	
Approach LOS	B		D				

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	41.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	2	0	65	7	0	6	14	149	4	5	257	3
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	2	0	80	9	0	7	17	184	5	6	317	4
Pedestrians		1										
Lane Width (ft)		12.0										
Walking Speed (ft/s)		4.0										
Percent Blockage		0										
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		0			0							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	558	556	320	631	555	186	322			189		
vC1, stage 1 conf vol	332	332		221	221							
vC2, stage 2 conf vol	226	223		410	334							
vCu, unblocked vol	558	556	320	631	555	186	322			189		
tC, single (s)	7.2	6.6	6.3	7.1	6.5	6.2	4.2			4.1		
tC, 2 stage (s)	6.2	5.6		6.1	5.5							
tF (s)	3.6	4.1	3.4	3.5	4.0	3.3	2.3			2.2		
p0 queue free %	99	100	89	97	100	99	99			100		
cM capacity (veh/h)	382	369	711	323	371	858	1193			1367		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	83	16	17	189	6	321
Volume Left	2	9	17	0	6	0
Volume Right	80	7	0	5	0	4
cSH	693	453	1193	1700	1367	1700
Volume to Capacity	0.12	0.04	0.01	0.11	0.00	0.19
Queue Length 95th (ft)	10	3	1	0	0	0
Control Delay (s)	10.9	13.2	8.1	0.0	7.6	0.0
Lane LOS	B	B	A		A	
Approach Delay (s)	10.9	13.2	0.7		0.1	
Approach LOS	B	B				

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	25.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	0	13	4	1	0	3
Peak Hour Factor	0.48	0.48	0.48	0.48	0.48	0.48
Hourly flow rate (vph)	0	27	8	2	0	6

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	27	10	6
Volume Left (vph)	0	8	0
Volume Right (vph)	27	0	6
Hadj (s)	0.06	1.18	-0.58
Departure Headway (s)	4.0	5.1	3.4
Degree Utilization, x	0.03	0.01	0.01
Capacity (veh/h)	889	686	1047
Control Delay (s)	7.1	8.2	6.4
Approach Delay (s)	7.1	8.2	6.4
Approach LOS	A	A	A

Intersection Summary			
Delay	7.3		
HCM Level of Service	A		
Intersection Capacity Utilization	13.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	15	1	105	52	6	20	120	310	46	12	253	19
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	16	1	111	55	6	21	126	326	48	13	266	20
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	905	929	276	1006	915	351	286			375		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	905	929	276	1006	915	351	286			375		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	100	86	68	97	97	90			99		
cM capacity (veh/h)	224	238	762	171	242	691	1270			1173		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	17	111	82	126	375	13	286
Volume Left	16	0	55	126	0	13	0
Volume Right	0	111	21	0	48	0	20
cSH	225	762	218	1270	1700	1173	1700
Volume to Capacity	0.07	0.14	0.38	0.10	0.22	0.01	0.17
Queue Length 95th (ft)	6	13	41	8	0	1	0
Control Delay (s)	22.3	10.5	31.2	8.1	0.0	8.1	0.0
Lane LOS	C	B	D	A		A	
Approach Delay (s)	12.1		31.2	2.1		0.3	
Approach LOS	B		D				

Intersection Summary			
Average Delay	5.2		
Intersection Capacity Utilization	43.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	2	3	30	10	1	10	42	237	5	5	207	1
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	2	3	35	12	1	12	49	276	6	6	241	1
Pedestrians		1			1			2			1	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		0			0							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	640	634	244	668	632	280	243			282		
vC1, stage 1 conf vol	254	254		377	377							
vC2, stage 2 conf vol	386	380		291	254							
vCu, unblocked vol	640	634	244	668	632	280	243			282		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	99	99	96	96	100	98	96			100		
cM capacity (veh/h)	348	343	795	329	340	760	1311			1273		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	41	24	49	281	6	242
Volume Left	2	12	49	0	6	0
Volume Right	35	12	0	6	0	1
cSH	670	452	1311	1700	1273	1700
Volume to Capacity	0.06	0.05	0.04	0.17	0.00	0.14
Queue Length 95th (ft)	5	4	3	0	0	0
Control Delay (s)	10.7	13.4	7.9	0.0	7.8	0.0
Lane LOS	B	B	A		A	
Approach Delay (s)	10.7	13.4	1.2		0.2	
Approach LOS	B	B				

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	31.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	4	5	11	1	1	1
Peak Hour Factor	0.58	0.58	0.58	0.58	0.58	0.58
Hourly flow rate (vph)	7	9	19	2	2	2

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	16	21	3
Volume Left (vph)	7	19	0
Volume Right (vph)	9	0	2
Hadj (s)	-0.06	0.20	-0.28
Departure Headway (s)	3.9	4.1	3.7
Degree Utilization, x	0.02	0.02	0.00
Capacity (veh/h)	912	854	970
Control Delay (s)	7.0	7.2	6.7
Approach Delay (s)	7.0	7.2	6.7
Approach LOS	A	A	A

Intersection Summary			
Delay	7.1		
HCM Level of Service	A		
Intersection Capacity Utilization	17.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	17	4	154	37	7	12	102	172	48	12	307	22
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	19	4	171	41	8	13	113	191	53	13	341	24
Pedestrians					6							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					4.0							
Percent Blockage					1							
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	815	857	353	992	843	224	366			250		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	815	857	353	992	843	224	366			250		
tC, single (s)	7.2	6.6	6.3	7.3	6.7	6.4	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.7	4.2	3.5	2.3			2.3		
p0 queue free %	93	98	75	70	97	98	90			99		
cM capacity (veh/h)	255	257	679	139	249	767	1145			1286		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	23	171	62	113	244	13	366
Volume Left	19	0	41	113	0	13	0
Volume Right	0	171	13	0	53	0	24
cSH	255	679	181	1145	1700	1286	1700
Volume to Capacity	0.09	0.25	0.34	0.10	0.14	0.01	0.22
Queue Length 95th (ft)	7	25	36	8	0	1	0
Control Delay (s)	20.5	12.1	35.0	8.5	0.0	7.8	0.0
Lane LOS	C	B	D	A		A	
Approach Delay (s)	13.1		35.0	2.7		0.3	
Approach LOS	B		D				

Intersection Summary			
Average Delay	5.8		
Intersection Capacity Utilization	43.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	2	0	69	7	0	6	15	158	4	5	273	3
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	2	0	85	9	0	7	19	195	5	6	337	4
Pedestrians		1										
Lane Width (ft)		12.0										
Walking Speed (ft/s)		4.0										
Percent Blockage		0										
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		0			0							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	592	589	340	669	589	198	342			200		
vC1, stage 1 conf vol	352	352		235	235							
vC2, stage 2 conf vol	240	237		435	354							
vCu, unblocked vol	592	589	340	669	589	198	342			200		
tC, single (s)	7.2	6.6	6.3	7.1	6.5	6.2	4.2			4.1		
tC, 2 stage (s)	6.2	5.6		6.1	5.5							
tF (s)	3.6	4.1	3.4	3.5	4.0	3.3	2.3			2.2		
p0 queue free %	99	100	88	97	100	99	98			100		
cM capacity (veh/h)	370	359	693	307	361	846	1173			1354		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	88	16	19	200	6	341
Volume Left	2	9	19	0	6	0
Volume Right	85	7	0	5	0	4
cSH	676	435	1173	1700	1354	1700
Volume to Capacity	0.13	0.04	0.02	0.12	0.00	0.20
Queue Length 95th (ft)	11	3	1	0	0	0
Control Delay (s)	11.1	13.6	8.1	0.0	7.7	0.0
Lane LOS	B	B	A		A	
Approach Delay (s)	11.1	13.6	0.7		0.1	
Approach LOS	B	B				

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	25.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	0	14	4	1	0	3
Peak Hour Factor	0.48	0.48	0.48	0.48	0.48	0.48
Hourly flow rate (vph)	0	29	8	2	0	6

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	29	10	6
Volume Left (vph)	0	8	0
Volume Right (vph)	29	0	6
Hadj (s)	0.06	1.18	-0.58
Departure Headway (s)	4.0	5.1	3.4
Degree Utilization, x	0.03	0.01	0.01
Capacity (veh/h)	889	685	1045
Control Delay (s)	7.1	8.2	6.4
Approach Delay (s)	7.1	8.2	6.4
Approach LOS	A	A	A

Intersection Summary			
Delay	7.3		
HCM Level of Service	A		
Intersection Capacity Utilization	13.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	16	1	111	55	6	21	127	329	49	13	268	20
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	17	1	117	58	6	22	134	346	52	14	282	21
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	959	985	293	1066	970	372	303			398		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	959	985	293	1066	970	372	303			398		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	100	84	62	97	97	89			99		
cM capacity (veh/h)	204	219	747	152	223	672	1252			1150		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	18	117	86	134	398	14	303
Volume Left	17	0	58	134	0	14	0
Volume Right	0	117	22	0	52	0	21
cSH	205	747	195	1252	1700	1150	1700
Volume to Capacity	0.09	0.16	0.44	0.11	0.23	0.01	0.18
Queue Length 95th (ft)	7	14	52	9	0	1	0
Control Delay (s)	24.3	10.7	37.2	8.2	0.0	8.2	0.0
Lane LOS	C	B	E	A		A	
Approach Delay (s)	12.5		37.2	2.1		0.4	
Approach LOS	B		E				

Intersection Summary				
Average Delay	5.7			
Intersection Capacity Utilization	44.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	2	3	32	11	1	11	45	252	5	5	220	1
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	2	3	37	13	1	13	52	293	6	6	256	1
Pedestrians		1			1			2			1	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		0			0							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	681	674	259	710	671	298	258			300		
vC1, stage 1 conf vol	269	269		402	402							
vC2, stage 2 conf vol	412	404		308	270							
vCu, unblocked vol	681	674	259	710	671	298	258			300		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	99	99	95	96	100	98	96			100		
cM capacity (veh/h)	333	332	780	314	327	743	1294			1255		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	43	27	52	299	6	257
Volume Left	2	13	52	0	6	0
Volume Right	37	13	0	6	0	1
cSH	660	435	1294	1700	1255	1700
Volume to Capacity	0.07	0.06	0.04	0.18	0.00	0.15
Queue Length 95th (ft)	5	5	3	0	0	0
Control Delay (s)	10.8	13.8	7.9	0.0	7.9	0.0
Lane LOS	B	B	A		A	
Approach Delay (s)	10.8	13.8	1.2		0.2	
Approach LOS	B	B				

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	32.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	4	5	12	1	1	1
Peak Hour Factor	0.58	0.58	0.58	0.58	0.58	0.58
Hourly flow rate (vph)	7	9	21	2	2	2

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	16	22	3
Volume Left (vph)	7	21	0
Volume Right (vph)	9	0	2
Hadj (s)	-0.06	0.20	-0.28
Departure Headway (s)	3.9	4.1	3.7
Degree Utilization, x	0.02	0.03	0.00
Capacity (veh/h)	911	854	970
Control Delay (s)	7.0	7.2	6.7
Approach Delay (s)	7.0	7.2	6.7
Approach LOS	A	A	A

Intersection Summary			
Delay	7.1		
HCM Level of Service	A		
Intersection Capacity Utilization	17.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	17	4	154	58	9	12	102	172	55	12	307	22
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	19	4	171	64	10	13	113	191	61	13	341	24
Pedestrians					6							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					4.0							
Percent Blockage					1							
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	816	865	353	995	847	228	366			258		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	816	865	353	995	847	228	366			258		
tC, single (s)	7.2	6.6	6.3	7.3	6.7	6.4	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.7	4.2	3.5	2.3			2.3		
p0 queue free %	93	98	75	53	96	98	90			99		
cM capacity (veh/h)	252	254	679	138	247	763	1145			1277		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	23	171	88	113	252	13	366
Volume Left	19	0	64	113	0	13	0
Volume Right	0	171	13	0	61	0	24
cSH	253	679	168	1145	1700	1277	1700
Volume to Capacity	0.09	0.25	0.52	0.10	0.15	0.01	0.22
Queue Length 95th (ft)	8	25	65	8	0	1	0
Control Delay (s)	20.7	12.1	47.9	8.5	0.0	7.8	0.0
Lane LOS	C	B	E	A		A	
Approach Delay (s)	13.1		47.9	2.6		0.3	
Approach LOS	B		E				

Intersection Summary			
Average Delay	7.6		
Intersection Capacity Utilization	44.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	2	1	69	7	2	14	15	158	4	8	273	3
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	2	1	85	9	2	17	19	195	5	10	337	4
Pedestrians		1										
Lane Width (ft)		12.0										
Walking Speed (ft/s)		4.0										
Percent Blockage		0										
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		0			0							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	610	597	340	677	596	198	342			200		
vC1, stage 1 conf vol	360	360		235	235							
vC2, stage 2 conf vol	251	237		443	361							
vCu, unblocked vol	610	597	340	677	596	198	342			200		
tC, single (s)	7.2	6.6	6.3	7.1	6.5	6.2	4.2			4.1		
tC, 2 stage (s)	6.2	5.6		6.1	5.5							
tF (s)	3.6	4.1	3.4	3.5	4.0	3.3	2.3			2.2		
p0 queue free %	99	100	88	97	99	98	98			99		
cM capacity (veh/h)	359	355	693	303	357	846	1173			1354		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	89	28	19	200	10	341
Volume Left	2	9	19	0	10	0
Volume Right	85	17	0	5	0	4
cSH	667	508	1173	1700	1354	1700
Volume to Capacity	0.13	0.06	0.02	0.12	0.01	0.20
Queue Length 95th (ft)	11	4	1	0	1	0
Control Delay (s)	11.2	12.5	8.1	0.0	7.7	0.0
Lane LOS	B	B	A		A	
Approach Delay (s)	11.2	12.5	0.7		0.2	
Approach LOS	B	B				

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	26.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	1	6	14	0	18	0	4	1	0	0	0	8
Peak Hour Factor	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
Hourly flow rate (vph)	2	12	29	0	38	0	8	2	0	0	0	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	38			42			85	69	27	70	83	38
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	38			42			85	69	27	70	83	38
tC, single (s)	4.5			4.1			7.7	7.1	6.8	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.6			2.2			4.0	4.5	3.8	3.5	4.0	3.3
p0 queue free %	100			100			99	100	100	100	100	98
cM capacity (veh/h)	1365			1567			765	722	904	921	808	1037

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	44	38	10	17
Volume Left	2	0	8	0
Volume Right	29	0	0	17
cSH	1365	1567	756	1037
Volume to Capacity	0.00	0.00	0.01	0.02
Queue Length 95th (ft)	0	0	1	1
Control Delay (s)	0.4	0.0	9.8	8.5
Lane LOS	A		A	A
Approach Delay (s)	0.4	0.0	9.8	8.5
Approach LOS			A	A

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	13.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	16	3	111	69	7	21	127	329	73	13	268	20
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	17	3	117	73	7	22	134	346	77	14	282	21
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	959	1011	293	1080	983	385	303			423		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	959	1011	293	1080	983	385	303			423		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	99	84	51	97	97	89			99		
cM capacity (veh/h)	203	211	747	148	219	661	1252			1125		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	20	117	102	134	423	14	303
Volume Left	17	0	73	134	0	14	0
Volume Right	0	117	22	0	77	0	21
cSH	204	747	183	1252	1700	1125	1700
Volume to Capacity	0.10	0.16	0.56	0.11	0.25	0.01	0.18
Queue Length 95th (ft)	8	14	73	9	0	1	0
Control Delay (s)	24.6	10.7	47.1	8.2	0.0	8.2	0.0
Lane LOS	C	B	E	A		A	
Approach Delay (s)	12.7		47.1	2.0		0.4	
Approach LOS	B		E				

Intersection Summary			
Average Delay	7.0		
Intersection Capacity Utilization	47.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	2	5	32	11	2	16	45	252	5	14	220	1
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	2	6	37	13	2	19	52	293	6	16	256	1
Pedestrians		1			1			2			1	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		0			0							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	708	694	259	732	692	298	258			300		
vC1, stage 1 conf vol	290	290		402	402							
vC2, stage 2 conf vol	418	404		330	291							
vCu, unblocked vol	708	694	259	732	692	298	258			300		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	99	98	95	96	99	97	96			99		
cM capacity (veh/h)	319	323	780	305	320	743	1294			1255		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	45	34	52	299	16	257
Volume Left	2	13	52	0	16	0
Volume Right	37	19	0	6	0	1
cSH	621	454	1294	1700	1255	1700
Volume to Capacity	0.07	0.07	0.04	0.18	0.01	0.15
Queue Length 95th (ft)	6	6	3	0	1	0
Control Delay (s)	11.3	13.6	7.9	0.0	7.9	0.0
Lane LOS	B	B	A		A	
Approach Delay (s)	11.3	13.6	1.2		0.5	
Approach LOS	B	B				

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	33.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	9	21	5	0	12	0	12	1	0	0	1	4
Peak Hour Factor	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58
Hourly flow rate (vph)	16	36	9	0	21	0	21	2	0	0	2	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	21			45			100	92	41	93	97	21
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	21			45			100	92	41	93	97	21
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			98	100	100	100	100	99
cM capacity (veh/h)	1539			1563			870	792	1034	885	787	1060

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	60	21	22	9
Volume Left	16	0	21	0
Volume Right	9	0	0	7
cSH	1539	1563	863	991
Volume to Capacity	0.01	0.00	0.03	0.01
Queue Length 95th (ft)	1	0	2	1
Control Delay (s)	2.0	0.0	9.3	8.7
Lane LOS	A		A	A
Approach Delay (s)	2.0	0.0	9.3	8.7
Approach LOS			A	A

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	22.6%	ICU Level of Service	A
Analysis Period (min)	15		

Geotechnical Report

Real-World Geotechnical Solutions
Investigation • Design • Construction Support

October 20, 2014
Project No. 14-3505

Vince Biggi
Biggi Construction, LLC.
11605 SW Normandy Road
Wilsonville, Oregon 97070

CC: Alex Hurley, AKS Engineering & Forestry via email: alex@aks-eng.com

SUBJECT: GEOTECHNICAL ENGINEERING REPORT
MCKAY CREEK CROSSING SUBDIVISION
9960 NW 307TH AVENUE
NORTH PLAINS, WASHINGTON COUNTY, OREGON

This report presents the results of a geotechnical engineering study conducted by GeoPacific Engineering, Inc. (GeoPacific) for the above-referenced project. The purpose of our investigation was to evaluate subsurface conditions at the site and to provide geotechnical recommendations for site development. This geotechnical study was performed in accordance with GeoPacific Proposal No. P-4914, dated July 11, 2014, and your subsequent authorization of our proposal and *General Conditions for Geotechnical Services*.

SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The subject site is located on the east side of NW 307th Avenue in the City of North Plains, Washington County, Oregon. The parcel is approximately 11 acres in size. McKay Creek flows through the eastern portion of the site. Topography is predominantly flat to gently sloping towards the east with moderately to steeply sloping areas immediately adjacent to McKay Creek. The property is occupied by one home. Vegetation consists primarily of short grasses and dense to sparse trees.

Preliminary site plans indicate the proposed development will consist of 58 lots for single family homes, new street, a water quality facility, and associated underground utilities. The grading plan indicates maximum cuts and fills will be on the order of 8 feet or less.

REGIONAL AND LOCAL GEOLOGIC SETTING

The project site is located on the southwestern margin of the Portland West Hills, in the northwest portion of the Tualatin Basin. The Tualatin Basin is an east/west trending structural feature produced by broad regional down warping of the area. Regionally, the subject site lies within the Willamette Valley/Puget Sound lowland, a broad structural depression situated between the Coast Range on the west and the Cascade Range on the east. A series of discontinuous faults subdivide

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the Willamette Valley into a mosaic of fault-bounded, structural blocks (Yeats et al., 1996). Uplifted structural blocks form bedrock highlands, while down-warped structural blocks form sedimentary basins.

The site is underlain by the Quaternary age (last 1.6 million years) Willamette Formation, a catastrophic flood deposit associated with repeated glacial outburst flooding of the Willamette Valley (Yeats et al., 1996). The last of these outburst floods occurred about 10,000 years ago. These deposits typically consist of horizontally layered, micaceous, silt to coarse sand forming poorly-defined to distinct beds less than 3 feet thick.

Underlying the Willamette Formation is an unnamed sequence of non-marine, fine-grained strata that consists of moderately to poorly lithified siltstone, sandstone, mudstone, and claystone with common wood fragments and minor volcanic ash and pumice (Yeats et al., 1996). These rocks are tentatively correlated with the Sandy River Mudstone, and the Troutdale and Helvetia Formations. The unnamed strata rest on Miocene (about 14.5 to 16.5 million years ago) Columbia River Basalt, a thick sequence of lava flows which forms the crystalline basement of the basin.

REGIONAL SEISMIC SETTING

At least three major fault zones capable of generating damaging earthquakes are thought to exist in the vicinity of the subject site. These include the Portland Hills Fault Zone, the Gales Creek-Newberg-Mt. Angel Structural Zone, and the Cascadia Subduction Zone.

Portland Hills Fault Zone

The Portland Hills Fault Zone is a series of NW-trending faults that include the central Portland Hills Fault, the western Oatfield Fault, and the eastern East Bank Fault. These faults occur in a northwest-trending zone that varies in width between 3.5 and 5.0 miles. The combined three faults vertically displace the Columbia River Basalt by 1,130 feet and appear to control thickness changes in late Pleistocene (approx. 780,000 years) sediment (Madin, 1990). The Portland Hills Fault occurs along the Willamette River at the base of the Portland Hills, and is about 8 miles east of the site. The Oatfield Fault occurs along the western side of the Portland Hills, and is about 6.5 miles east of the site. The accuracy of the fault mapping is stated to be within 500 meters (Wong, et al., 2000). No historical seismicity is correlated with the mapped portion of the Portland Hills Fault Zone, but in 1991 a M3.5 earthquake occurred on a NW-trending shear plane located 1.3 miles east of the fault (Yelin, 1992). Although there is no definitive evidence of recent activity, the Portland Hills Fault Zone is assumed to be potentially active (Geomatrix Consultants, 1995).

Gales Creek-Newberg-Mt. Angel Structural Zone

The Gales Creek-Newberg-Mt. Angel Structural Zone is a 50-mile-long zone of discontinuous, NW-trending faults that lies about 9 miles southwest of the subject site. These faults are recognized in the subsurface by vertical separation of the Columbia River Basalt and offset seismic reflectors in the overlying basin sediment (Yeats et al., 1996; Werner et al., 1992). A geologic reconnaissance and photogeologic analysis study conducted for the Scoggins Dam site in the Tualatin Basin revealed no evidence of deformed geomorphic surfaces along the structural zone (Unruh et al., 1994). No seismicity has been recorded on the Gales Creek Fault or Newberg Fault (the fault closest to the subject site); however, these faults are considered to be potentially active because they may connect with the seismically active Mount Angel Fault and the rupture plane of the 1993 M5.6 Scotts Mills earthquake (Werner et al. 1992; Geomatrix Consultants, 1995).

Cascadia Subduction Zone

The Cascadia Subduction Zone is a 680-mile-long zone of active tectonic convergence where oceanic crust of the Juan de Fuca Plate is subducting beneath the North American continent at a rate of 4 cm per year (Goldfinger et al., 1996). A growing body of geologic evidence suggests that prehistoric subduction zone earthquakes have occurred (Atwater, 1992; Carver, 1992; Peterson et al., 1993; Geomatrix Consultants, 1995). This evidence includes: (1) buried tidal marshes recording episodic, sudden subsidence along the coast of northern California, Oregon, and Washington, (2) burial of subsided tidal marshes by tsunami wave deposits, (3) paleoliquefaction features, and (4) geodetic uplift patterns on the Oregon coast. Radiocarbon dates on buried tidal marshes indicate a recurrence interval for major subduction zone earthquakes of 250 to 650 years with the last event occurring 300 years ago (Atwater, 1992; Carver, 1992; Peterson et al., 1993; Geomatrix Consultants, 1995). The inferred seismogenic portion of the plate interface lies roughly along the Oregon Coast at depths of 20 and 40 kilometers below the ocean surface.

FIELD EXPLORATION

Our site-specific exploration for this report was conducted on August 18, 2014. A total of 4 exploratory test pits were excavated with a small trackhoe to depths ranging between 8.5 and 12 feet at the approximate locations shown on Figure 2. Test pit locations were located in the field by pacing or taping distances from apparent property corners and other site features shown on the plans provided. As such, the locations of the explorations should be considered approximate.

A GeoPacific geologist continuously monitored the field exploration program and logged the test pits. Soils observed in the explorations were classified in general accordance with the Unified Soil Classification System. During exploration, our geologist also noted geotechnical conditions such as soil consistency, moisture and groundwater conditions. Logs of test pits are attached to this report. The following report sections are based on the exploration program and summarize subsurface conditions encountered at the site.

SUBSURFACE CONDITIONS

Results of the field exploration program indicate the site is underlain by undocumented fill, topsoil horizon, and soils belonging to the Willamette Formation. The observed soil and groundwater conditions are summarized below.

Soil

Undocumented Fill – Undocumented fill was encountered in test pit TP-2 and extended to a depth of 10 feet. The fill generally consisted of stiff to very stiff, sandy silt (ML) with trace subangular gravel. Beneath a depth of 5 feet, the fill contained trace clay and varying amounts of organic and inorganic debris (glass, metal, concrete). Other areas of undocumented fill may be present outside our explorations – especially in the vicinity of the existing structures and driveway.

Topsoil – The ground surface in test pits TP-1, TP-3, and TP-4 was directly underlain by a topsoil horizon generally consisting of brown, low to moderately organic silt (ML-OL) with trace sand. The topsoil horizon was loose, contained fine roots throughout and extended to a depth of about 8 to 9 inches below the ground surface. A thin topsoil horizon had developed on the fill in test pit TP-2.

Willamette Formation – Underlying the topsoil horizon in test pits TP-1, TP-3, and TP-4 and the fill in test pit TP-2 was sandy silt (ML) with trace clay belonging to the Willamette Formation. These soils were typically stiff to very stiff and light brown in color with subtle to strong orange and gray mottling. In explorations, the Willamette Formation extended beyond the maximum depth of exploration (12 feet).

Portable Dynamic Cone Penetrometer Testing

Field tests were also conducted with a Portable Dynamic Cone Penetrometer (PDCP) to determine the strength parameters of the soil for support of pavement. Correlated California Bearing Ratio (CBR) values at the test locations are summarized on Table 1, for the depth intervals indicated.

Table 1 - PDCP Field Test Results and Correlated CBR Values

PDCP Designation	Material Tested	Depth Interval of Test (inches)	Average Penetration Per Blow (mm)	Correlated CBR
TP-1	Native Silt	12-37	16.7	15
TP-3	Native Silt	12-35	36.1	6

The test results indicate good subgrade soil conditions for support of traffic loading. Based on the results of PDCP testing, we estimate that the subgrade exhibits a resilient modulus of at least 9,000 psi, which correlates to a CBR value of 6. This value was used for subgrade soils in our analyses for analyzing the proposed light-duty public streets, discussed in a subsequent report section.

Groundwater

On August 18, 2014, neither static groundwater nor groundwater seepage was encountered in test pits to a depth of 12 feet below the ground surface. Experience has shown that temporary perched groundwater conditions often occur over fine-grained native deposits such as those beneath the site, particularly during the wet season. It is anticipated that groundwater conditions will vary depending on the season, local subsurface conditions, changes in site utilization, and other factors.

CONCLUSIONS AND RECOMMENDATIONS

Results of this study indicate that the proposed development is geotechnically feasible, provided that the recommendations of this report are incorporated into the design and construction phases of the project. Our explorations indicate the soils on site are stiff to very stiff and are suitable for development utilizing conventional spread footing foundations.

Slope Stability and CWS Slope Setbacks

Clean Water Services (CWS) allows a 15-foot minimum slope setback, with a geotechnical engineer's review. GeoPacific's evaluation of the slope stability setback was based on geologic reconnaissance, excavator test pits performed along the top of the steep slope area, and published geologic mapping. Visual criterion considered by the geologist when evaluating slope stability included topographic grade and smoothness or regularity; degree of creep; age, density, condition and degree on deformity of native trees; and evidence of erosion and past fill placement.

McKay Creek forms the approximate eastern boundary of the site (see Figure 1). Our reconnaissance of the steeply sloping portion of the site (immediately adjacent to McKay Creek) indicates slopes are generally stable with some minor slope creep immediately adjacent to McKay Creek. No springs or seeps were observed. Based on our reconnaissance, a 15 foot offset from the break in slope is adequate.

Site Preparation

Areas of proposed buildings, streets, and areas to receive fill should be cleared of vegetation and any organic and inorganic debris. Existing fill should be completely removed. Explorations indicate 10 feet of fill is present in the vicinity of test pit TP-2. Existing buried structures such as septic tanks, should be demolished and any cavities structurally backfilled. Inorganic debris should be removed from the site.

Organic-rich topsoil should then be stripped from native soil areas of the site. The estimated average necessary depth of removal in undisturbed areas for moderately organic soils is about 9 inches. The final depth of soil removal will be determined on the basis of a site inspection after the stripping/excavation has been performed. Stripped topsoil should preferably be removed from the site due to the high density of the proposed development. Any remaining topsoil should be stockpiled only in designated areas and stripping operations should be observed and documented by the geotechnical engineer or his representative.

Once topsoil stripping and removal of organic and inorganic debris is approved in a particular area, the area must be ripped or tilled to a depth of 12 inches, moisture conditioned, root-picked, and compacted in-place prior to the placement of engineered fill or crushed aggregate base for pavement. Exposed subgrade soils should be evaluated by the geotechnical engineer. For large areas, this evaluation is normally performed by proof-rolling the exposed subgrade with a fully loaded scraper or dump truck. For smaller areas where access is restricted, the subgrade should be evaluated by probing the soil with a steel probe. Soft/loose soils identified during subgrade preparation should be compacted to a firm and unyielding condition, over-excavated and replaced with engineered fill (as described below), or stabilized with rock prior to placement of engineered fill. The depth of overexcavation, if required, should be evaluated by the geotechnical engineer at the time of construction.

Engineered Fill

In general, we anticipate that soils from planned cuts and utility trench excavations will be suitable for use as engineered fill provided they are adequately moisture conditioned prior to compacting. Imported fill material should be reviewed by GeoPacific prior to being imported to the site. Oversize material greater than 6 inches in size should not be used within 3 feet of foundation footings, and material greater than 12 inches in diameter should not be used in engineered fill.

Engineered fill should be compacted in horizontal lifts not exceeding 8 inches using standard compaction equipment. We recommend that engineered fill be compacted to at least 95 percent of the maximum dry density determined by ASTM D698 (Standard Proctor). On-site soils may be wet or dry of optimum; therefore, we anticipate that moisture conditioning of native soil will be necessary for compaction operations.

Proper test frequency and earthwork documentation usually requires daily observation and testing during stripping, rough grading, and placement of engineered fill. Field density testing should generally conform to ASTM D2922 and D3017, or D1556. Engineered fill should be periodically

observed and tested by the project geotechnical engineer or his representative. Typically, one density test is performed for at least every 2 vertical feet of fill placed or every 500 cubic yards, whichever requires more testing. Because testing is performed on an on-call basis, we recommend that the earthwork contractor be held contractually responsible for test scheduling and frequency.

Anticipated Foundations

The proposed residential structures may be supported on shallow foundations bearing on competent undisturbed, native soils and/or engineered fill, appropriately designed and constructed as recommended in this report. Foundation design, construction, and setback requirements should conform to the applicable building code at the time of construction. For maximization of bearing strength and protection against frost heave, spread footings should be embedded at a minimum depth of 12 inches below exterior grade. The recommended minimum widths for continuous footings supporting wood-framed walls without masonry are 12 inches for single-story, 15 inches for two-story, and 18 inches for three-story homes. Minimum foundation reinforcement should consist of one No. 4 bar at the top of stem wall, and one No. 4 bar at the bottom of the footing. Concrete slab-on-grade reinforcement should consist of No. 4 bars placed on 24-inch centers in a grid pattern.

The anticipated allowable soil bearing pressure is 2,000 lbs/ft^2 for footings bearing on competent, native soil and/or engineered fill. A maximum chimney and column load of 50 kips is recommended for the site. The recommended maximum allowable bearing pressure may be increased by 1/3 for short-term transient conditions such as wind and seismic loading. For heavier loads, the geotechnical engineer should be consulted. The coefficient of friction between on-site soil and poured-in-place concrete may be taken as 0.45, which includes no factor of safety. The maximum anticipated total and differential footing movements (generally from soil expansion and/or settlement) are 1 inch and ¾ inch over a span of 20 feet, respectively. We anticipate that the majority of the estimated settlement will occur during construction, as loads are applied. Excavations near structural footings should not extend within a 1H:1V plane projected downward from the bottom edge of footings.

Footing excavations should penetrate through topsoil and any loose soil to competent subgrade that is suitable for bearing support. All footing excavations should be trimmed neat, and all loose or softened soil should be removed from the excavation bottom prior to placing reinforcing steel bars. Due to the moisture sensitivity of on-site native soils, foundations constructed during the wet weather season may require overexcavation of footings and backfill with compacted, crushed aggregate.

Our recommendations are for house construction incorporating raised wood floors and conventional spread footing foundations. If living space of the structures will incorporate basements or slab-on-grade foundations, a geotechnical engineer should be consulted to make additional recommendations for retaining walls, water-proofing, underslab drainage and wall subdrains. After site development, a Final Soil Engineer's Report should either confirm or modify the above recommendations.

Drainage

The outside edge of upslope footings may be provided with a drainage system consisting of 3-inch diameter, slotted, plastic pipe embedded in a minimum of 1 ft^3 per lineal foot of clean, free-draining gravel or 3/4" – ¼" rock. Water collected from the footing drains should be directed into the local storm drain system or other suitable outlet. A minimum 0.5 percent fall should be maintained throughout the drain and non-perforated pipe outlet. Down spouts and roof drains should not be connected to the foundation drains in order to reduce the potential for clogging. The footing drains should include clean-outs to allow periodic maintenance and inspection. Grades around the proposed structure should be sloped such that surface water drains away from the building. Footing drains are recommended to prevent detrimental effects of groundwater on foundations, and should not be expected to eliminate all potential sources of water entering a crawlspace. An adequate grade to a low point outlet drain in the crawlspace is required by code.

Excavating Conditions and Utility Trenches

Subsurface test pit exploration indicates that, in general, utility trenches can be excavated using conventional heavy equipment such as dozers and trackhoes. All temporary cuts in excess of 4 feet in height should be sloped in accordance with U.S. Occupational Safety and Heath Administration (OSHA) regulations (29 CFR Part 1926), or be shored. The existing, near surface, native soils classify as Type B Soil and shallow, temporary excavation side slope inclinations as steep as 1H:1V may be assumed for planning purposes. This cut slope inclination is applicable to excavations above the water table only. Maintenance of safe working conditions, including temporary excavation stability, is the responsibility of the contractor. Actual slope inclinations at the time of construction should be determined based on safety requirements and actual soil and groundwater conditions.

Saturated soils and groundwater may be encountered in utility trenches, particularly during the wet season. We anticipate that dewatering systems consisting of ditches, sumps and pumps would be adequate for control of perched groundwater. Regardless of the dewatering system used, it should be installed and operated such that in-place soils are prevented from being removed along with the groundwater.

Vibrations created by traffic and construction equipment may cause some caving and raveling of excavation walls. In such an event, lateral support for the excavation walls should be provided by the contractor to prevent loss of ground support and possible distress to existing or previously constructed structural improvements.

PVC pipe should be installed in accordance with the procedures specified in ASTM D2321. We recommend that trench backfill be compacted to at least 95% of the maximum dry density obtained by Standard Proctor ASTM D698 or equivalent. Initial backfill lift thickness for a ¾"-0 crushed aggregate base may need to be as great as 4 feet to reduce the risk of flattening underlying flexible pipe. Subsequent lift thickness should not exceed 1 foot. If imported granular fill material is used, then the lifts for large vibrating plate-compaction equipment (e.g. hoe compactor attachments) may be up to 2 feet, provided that proper compaction is being achieved and each lift is tested. Use of large vibrating compaction equipment should be carefully monitored near existing structures and improvements due to the potential for vibration-induced damage.

Adequate density testing should be performed during construction to verify that the recommended relative compaction is achieved. Typically, one density test is taken for every 4 vertical feet of backfill on each 200-lineal-foot section of trench.

Erosion Control Considerations

During our field exploration program, we did not observe soil types that would be considered highly susceptible to erosion. In our opinion, the primary concern regarding erosion potential will occur during construction, in areas that have been stripped of vegetation. Erosion at the site during construction can be minimized by implementing the project erosion control plan, which should include judicious use of straw bales and silt fences. If used, these erosion control devices should be in place and remain in place throughout site preparation and construction.

Erosion and sedimentation of exposed soils can also be minimized by quickly re-vegetating exposed areas of soil, and by staging construction such that large areas of the project site are not denuded and exposed at the same time. Areas of exposed soil requiring immediate and/or temporary protection against exposure should be covered with either mulch or erosion control netting/blankets. Areas of exposed soil requiring permanent stabilization should be seeded with an approved grass seed mixture, or hydroseeded with an approved seed-mulch-fertilizer mixture.

Wet Weather Earthwork

Soils underlying the site are likely to be moisture sensitive and may be difficult to handle or traverse with construction equipment during periods of wet weather. Earthwork is typically most economical when performed under dry weather conditions. Earthwork performed during the wet-weather season will probably require expensive measures such as cement treatment or imported granular material to compact fill to the recommended engineering specifications. If earthwork is to be performed or fill is to be placed in wet weather or under wet conditions when soil moisture content is difficult to control, the following recommendations should be incorporated into the contract specifications.

- Earthwork should be performed in small areas to minimize exposure to wet weather. Excavation or the removal of unsuitable soils should be followed promptly by the placement and compaction of clean engineered fill. The size and type of construction equipment used may have to be limited to prevent soil disturbance. Under some circumstances, it may be necessary to excavate soils with a backhoe to minimize subgrade disturbance caused by equipment traffic;
- The ground surface within the construction area should be graded to promote run-off of surface water and to prevent the ponding of water;
- Material used as engineered fill should consist of clean, granular soil containing less than 5 percent fines. The fines should be non-plastic. Alternatively, cement treatment of on-site soils may be performed to facilitate wet weather placement;
- The ground surface within the construction area should be sealed by a smooth drum vibratory roller, or equivalent, and under no circumstances should be left uncompacted and exposed to moisture. Soils which become too wet for compaction should be removed and replaced with clean granular materials;
- Excavation and placement of fill should be observed by the geotechnical engineer to verify that all unsuitable materials are removed and suitable compaction and site drainage is achieved; and
- Bales of straw and/or geotextile silt fences should be strategically located to control erosion.

If cement or lime treatment is used to facilitate wet weather construction, GeoPacific should be contacted to provide additional recommendations and field monitoring.

Pavement Design

We understand that the proposed on site, light duty public streets will be surfaced with asphalt pavement. We assume the proposed new streets will be subjected to an initial two-way ADT (average daily traffic count) of 552 vehicles per day. Further, we assumed 2 percent of the vehicles will be heavy trucks (FHWA Class 5 or greater). For design purposes, we used an estimated resilient modulus of 9,000 pci for existing subgrade soils. This correlates to a CBR value of about 6, which is supported by our PDCP test results and our experience with similar soils in the vicinity of the site.

Table 2 presents the recommended section thicknesses for the proposed on-site, light duty public streets that are to be completed as part of the project, in dry weather conditions. In our opinion, this pavement section is suitable to support up to 1,000 trips per day. If the anticipated levels of traffic loading is greater than 1,000 trips per day, GeoPacific should be consulted to provide revised section thickness recommendations. See attached pavement section calculations for details.

Table 2 - Recommended Minimum Pavement Section for Light Duty Public Streets in Dry Weather Conditions

Material Layer	Light-duty Public Streets	Compaction Standard
Asphaltic Concrete (AC)	3 in.	91%/ 92% of Rice Density AASHTO T-209
Crushed Aggregate Base ¾"-0 (leveling course)	2 in.	95% of Modified Proctor AASHTO T-180
Crushed Aggregate Base 1½"-0	8 in.	95% of Modified Proctor AASHTO T-180
Subgrade	12 in.	95% of Standard Proctor AASHTO T-99

Subgrade in pavement areas should be ripped or tilled to a minimum depth of 12 inches, moisture conditioned, and recompacted in-place to at least 95 percent of ASTM D698 (Standard Proctor) or equivalent. Any pockets of organic debris or loose fill encountered during subgrade preparation should be removed and replaced with engineered fill (see *Site Preparation* Section). In order to verify subgrade strength, we recommend proof-rolling directly on subgrade with a loaded dump truck during dry weather and on top of base course in wet weather. Soft areas that pump, rut, or weave should be stabilized prior to paving.

The moisture sensitive subgrade soils make the site a difficult wet weather construction project. General recommendations for wet weather construction are provided in the following report section. However, the subgrade and construction plan shouldbe evaluated at the time of construction so that condition-specific recommendations can be provided.

During placement of pavement section materials, density testing should be performed to verify compliance with project specifications. Generally, one subgrade, one base course, and one asphalt compaction test is performed for every 100 to 200 linear feet of paving.

Wet Weather Construction Pavement Section

This section presents our preliminary recommendations for wet weather pavement section and construction, for the proposed driveway to be constructed as part of the project. Wet weather pavement section provisions will be needed where it is not feasible to compact the subgrade soils to City of North Plains requirements, due to wet subgrade soil conditions and/or construction during wet weather. If pavement areas are to be constructed during wet weather, the subgrade and construction plan should be reviewed by the project geotechnical engineer at the time of construction so that condition-specific recommendations can be provided. These wet weather pavement section recommendations are intended for use in situations where it is not feasible to compact the subgrade soils to City of North Plains requirements, due to wet subgrade soil conditions, and/or construction during wet weather.

Based on our site review, we recommend a wet weather section with a minimum subgrade deepening of 6 inches to accommodate a working subbase of additional 1½"-0 crushed rock. Geotextile fabric, Mirafi 500x or equivalent, should be placed on subgrade soils prior to placement of base rock.

In some instances it may be preferable to treat the subgrade with cement instead of overexcavation and increasing the thickness of the rock section. GeoPacific should be consulted for additional recommendations regarding use of cement treatment in wet weather pavement sections if it is desired to pursue this alternative. For planning purposes, we anticipate that treatment of the on site soils would involve mixing cement powder to approximately 6 percent cement content and a mixing depth on the order of 12 inches.

With implementation of the above recommendations, it is our opinion that the resulting pavement section will provide equivalent or greater structural strength than the dry weather pavement section currently planned. However, it should be noted that construction in wet weather is risky and the performance of pavement subgrades depend on a number of factors including the weather conditions, the contractor's methods, and the amount of traffic the road is subjected to. There is a potential that soft spots may develop even with implementation of the wet weather provisions recommended in this letter. If soft spots in the subgrade are identified during roadway excavation, or develop prior to paving, the soft spots should be overexcavated and backfilled with additional crushed rock.

During subgrade excavation, care should be taken to avoid disturbing the subgrade soils. Removals should be performed using an excavator with a smooth-bladed bucket. Truck traffic should be limited until an adequate working surface has been established. We suggest that the crushed rock be spread using bulldozer equipment rather than dump trucks, to reduce the amount of traffic and potential disturbance of subgrade soils.

Care should be taken to avoid overcompaction of the base course materials, which could create pumping, unstable subgrade soil conditions. Heavy and/or vibratory compaction efforts should be applied with caution. Following placement and compaction of the crushed rock to project specifications (95% of Modified Proctor), a finish proof-roll should be performed before paving.

The above recommendations are subject to field verification. GeoPacific should be on-site during construction to verify subgrade strength and to take density tests on the engineered fill, and base rock materials.

Seismic Design

Structures should be designed to resist earthquake loading in accordance with the methodology described in the 2010 ASCE-7 Standard. We recommend Site Class D be used for design. Design values determined for the site using the USGS (United States Geological Survey) *U.S. Seismic Design Maps* tool (Version 3.1.0) are summarized on Table 3, on the following page.

Table 3 - Recommended Earthquake Ground Motion Parameters (2010 ASCE-7)

Parameter	Value
Location (Lat, Long), degrees	45.593, -122.992
Mapped Spectral Acceleration Values (MCE, Site Class D):	
Peak Ground Acceleration	0.451
Short Period, S_s	1.012 g
1.0 Sec Period, S_1	0.455 g
Soil Factors for Site Class D:	
F_a	1.095
F_v	1.545
Residential Site Value = 2/3 x F_a x S_s	0.739 g
Residential Seismic Design Category	D_1

Soil liquefaction is a phenomenon wherein saturated soil deposits temporarily lose strength and behave as a liquid in response to earthquake shaking. Soil liquefaction is generally limited to loose, granular soils located below the water table. Following development, on-site soils will consist predominantly of engineered fill or native fine-grained soils, which are not considered susceptible to liquefaction. Therefore, it is our opinion that special design or construction measures are not required to mitigate the effects of liquefaction.

UNCERTAINTIES AND LIMITATIONS

We have prepared this report for the owner and their consultants for use in design of this project only. This report should be provided in its entirety to prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented in this report should not be construed as a warranty of the subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, GeoPacific should be notified for review of the recommendations of this report, and revision of such if necessary.

Sufficient geotechnical monitoring, testing and consultation should be provided during construction to confirm that the conditions encountered are consistent with those indicated by explorations. Recommendations for design changes will be provided should conditions revealed during construction differ from those anticipated, and to verify that the geotechnical aspects of construction comply with the contract plans and specifications.

Within the limitations of scope, schedule and budget, GeoPacific attempted to execute these services in accordance with generally accepted professional principles and practices in the fields of geotechnical engineering and engineering geology at the time the report was prepared. No warranty, expressed or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or groundwater at this site.

We appreciate this opportunity to be of service.

Sincerely,

GEOPACIFIC ENGINEERING, INC.

REGISTERED PROFESSIONAL ENGINEER
14743PE
OREGON
JAN. 23, 1990
JAMES D. IMBRIE

EXPIRES: 06/30/2015

For BKR

Beth K. Rapp, R.G.
Senior Geologist

James D. Imbrie, P.E., G.E., C.E.G.
Principal Engineer

Attachments: References
Figure 1 – Vicinity Map
Figure 2 – Site and Exploration Plan
Test Pit Logs (TP-1 – TP-4)
Pavement Design Calculations (3 Pages)

REFERENCES

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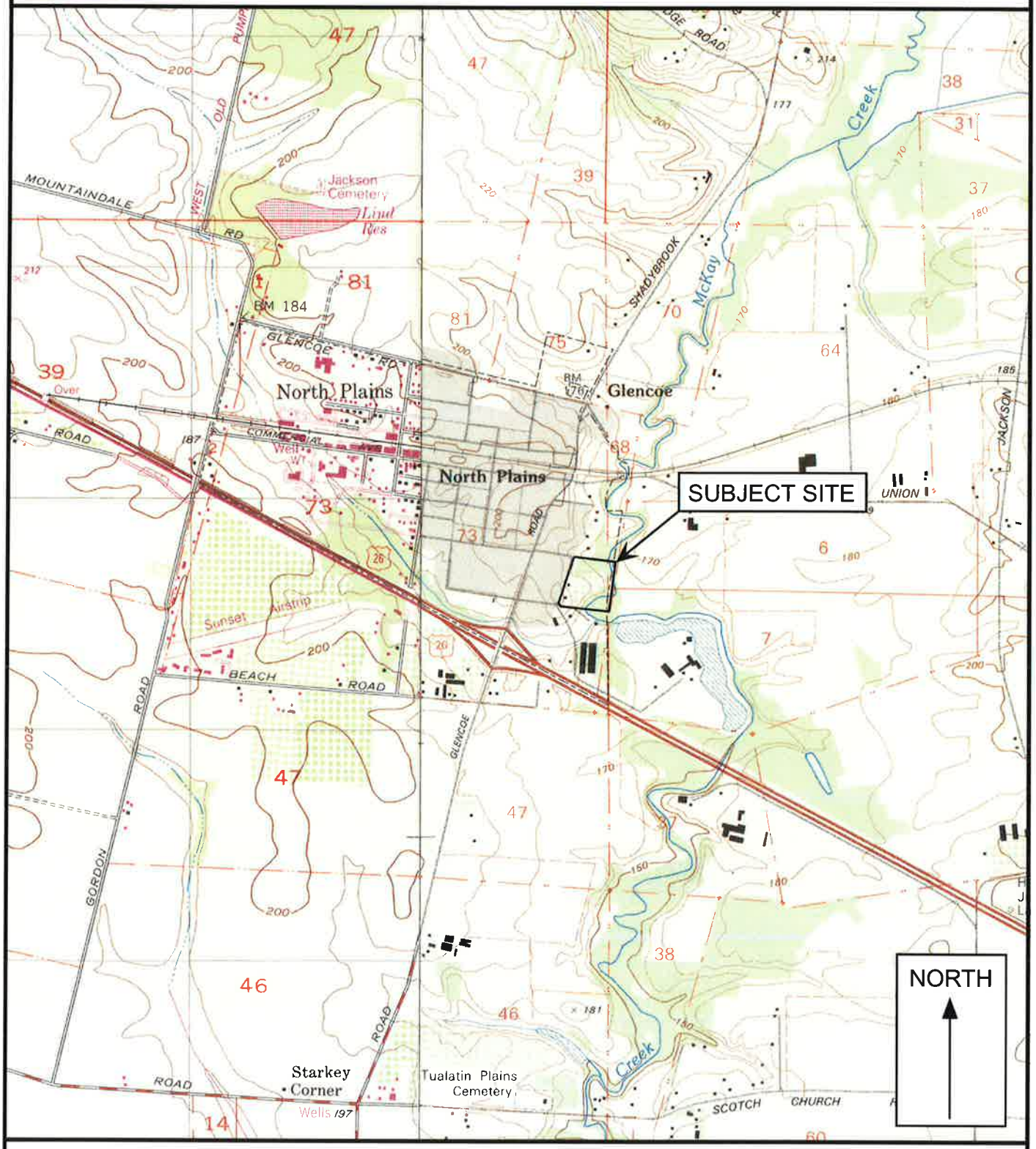
GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

VICINITY MAP



Legend

Approximate Scale 1 in = 2,000 ft

Date: 10/13/2014
Drawn by: EKR

Base maps: U.S. Geological Survey 7.5 minute Topographic Map Series, Forest Grove, Oregon Quadrangle, 1956 (Photorevised in 1992) and Hillsboro, Oregon Quadrangle, 1961 (Photorevised in 1985).

Project: McKay Creek Crossing North Plains, Oregon	Project No. 14-3505	FIGURE 1

GeoPacific Engineering, Inc.
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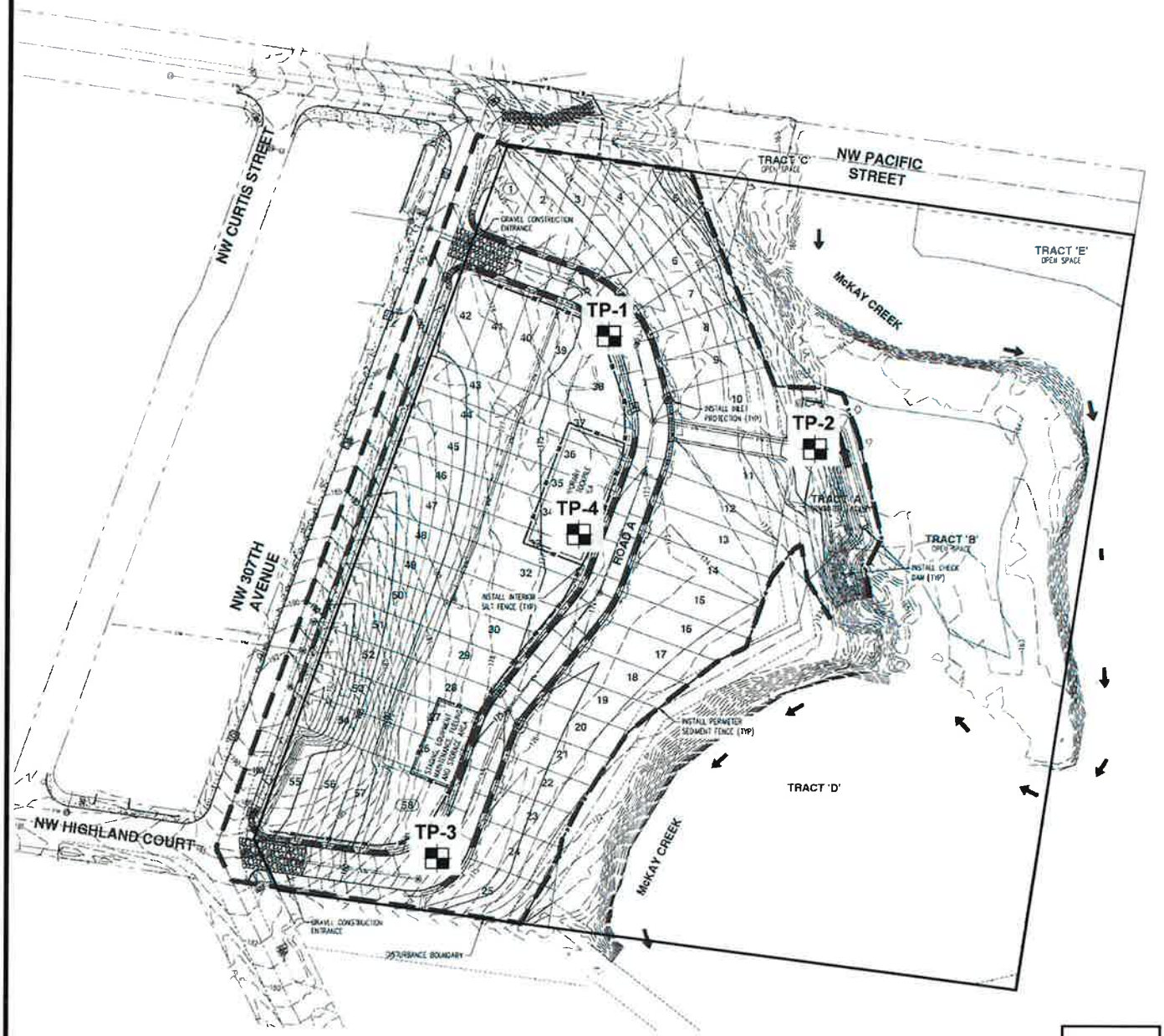
SITE PLAN AND EXPLORATION LOCATIONS



North

Legend

TP-1

Test Pit Designation and Approximate Location

0 150'

APPROXIMATE SCALE 1"=150'

Date: 10/13/2014
Drawn by: EKR

Project: McKay Creek Crossing North Plains, Oregon	Project No. 14-3505	FIGURE 2

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: McKay Creek Crossing
North Plains, Oregon

Project No. 14-3505

Test Pit No. **TP-1**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
						Low to moderately organic SILT (OL-ML), trace sand, light brown, fine roots throughout, loose, damp to moist (Topsoil)
1	4.5					Very stiff, sandy SILT (ML), trace clay, light brown, micaceous, trace roots throughout, subtle orange and gray mottling, damp to moist (Willamette Formation)
2	4.5					
3	4.5					
4	4.5					
5						
6						
7						
8						
9						
10						
11						Test Pit Terminated at 10.5 Feet.
12						Note: No seepage or groundwater encountered.

LEGEND

Bag Sample | Bucket Sample | Shelby Tube Sample | Seepage | Water Bearing Zone | Water Level at Abandonment

Date Excavated: 8/18/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: McKay Creek Crossing
North Plains, Oregon

Project No. 14-3505

Test Pit No. **TP-2**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
						Low organic SILT (OL-ML), light brown, fine roots throughout, loose, damp to moist (Topsoil on Fill)
1	3.0					
2	3.0					Stiff to very stiff, sandy SILT (ML), with subangular gravel, light brown, trace roots throughout, subtle orange and gray mottling, damp to moist (Fill)
3	4.0					
4	4.0					
5						
6						
7						Stiff, sandy SILT (ML), trace clay, light brown, with inorganic and organic debris throughout (glass, metal, wood, concrete), subtle to strong orange and gray mottling, damp to moist (Fill)
8						
9						
10						
11						Very stiff, sandy SILT (ML), trace clay, light brown, micaceous, trace roots throughout, subtle orange and gray mottling, damp to moist (Willamette Formation)
12						Test Pit Terminated at 12 Feet.
						Note: No seepage or groundwater encountered.

LEGEND

Bag Sample | Bucket Sample | Shelby Tube Sample | Seepage | Water Bearing Zone | Water Level at Abandonment

Date Excavated: 8/18/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: McKay Creek Crossing
North Plains, Oregon

Project No. 14-3505

Test Pit No. **TP-3**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
						Low to moderately organic SILT (OL-ML), trace sand, light brown, fine roots throughout, loose, damp to moist (Topsoil)
1	2.0					
2	3.5					
3	3.5					Very stiff, sandy SILT (ML), trace clay, light brown, micaceous, trace roots throughout, subtle orange and gray mottling, trace black staining, damp to moist (Willamette Formation)
4	3.5					
5						
6						
7						
8						
9						Test Pit Terminated at 8.5 Feet.
10						Note: No seepage or groundwater encountered.
11						
12						

LEGEND

Bag Sample (100 to 1,000 g) | Bucket Sample (5 Gal Bucket) | Shelby Tube Sample | Seepage | Water Bearing Zone | Water Level at Abandonment

Date Excavated: 8/18/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: McKay Creek Crossing
North Plains, Oregon

Project No. 14-3505

Test Pit No. **TP-4**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
						Low to moderately organic SILT (OL-ML), trace sand, light brown, fine roots throughout, loose, damp to moist (Topsoil)
1	4.5					Very stiff, sandy SILT (ML), trace clay, light brown, micaceous, trace roots throughout, subtle orange and gray mottling, damp to moist (Willamette Formation)
2	4.5					
3	4.5					
4	4.0					
5						
6						
7						
8						
9						
10						Test Pit Terminated at 9.5 Feet.
11						Note: No seepage or groundwater encountered.
12						

LEGEND

Bag Sample | Bucket Sample | Shelby Tube Sample | Seepage | Water Bearing Zone | Water Level at Abandonment

Date Excavated: 8/18/2014
Logged By: B. Rapp
Surface Elevation:

==========

DARWin(tm) - Pavement Design

A Proprietary AASHTOWARE(tm)
Computer Software Product

Flexible Structural Design Module

Project Description
McKay Creek Estates - Light-Duty Public Roads

Flexible Structural Design Module Data

18-kip ESALs Over Initial Performance Period:	113,995
Initial Serviceability:	4.2
Terminal Serviceability:	2.5
Reliability Level (%):	85
Overall Standard Deviation:	.44
Roadbed Soil Resilient Modulus (PSI):	9,000
Stage Construction:	1

Calculated Structural Number: 2.16

Specified Layer Design

```
                    Layer: 1
     Material Description: Class B ACP
Structural Coefficient (Ai): .44
  Drainage Coefficient (Mi): 1
  Layer Thickness (Di) (in): 3.00
       Calculated Layer SN: 1.32

                    Layer: 2
     Material Description: 3/4"-0 crushed rock
Structural Coefficient (Ai): .11
  Drainage Coefficient (Mi): 1
  Layer Thickness (Di) (in): 2.00
       Calculated Layer SN: .22

                    Layer: 3
     Material Description: 1-1/2"-0 crushed rock
Structural Coefficient (Ai): .11
  Drainage Coefficient (Mi): 1
  Layer Thickness (Di) (in): 8.00
       Calculated Layer SN: .88

     Total Thickness (in): 13.00
      Total Calculated SN: 2.42
```

Simple ESAL Calculation

Initial Performance Period (years):	20
Initial Two-Way Daily Traffic (ADT):	552
% Heavy Trucks (of ADT) FHWA Class 5 or Greater:	2
Number of Lanes In Design Direction:	1
Percent of All Trucks In Design Lane (%):	100
Percent Trucks In Design Direction (%):	50
Average Initial Truck Factor (ESALs/truck):	2.2
Annual Truck Factor Growth Rate (%):	0
Annual Truck Volume Growth Rate (%):	3
Growth:	Simple

Total Calculated Cumulative Esals: 113,995

Clean Water Services Service Provider Letter

Clean Water Services
Our commitment is clear.

CWS File Number
14-002673

Service Provider Letter

This form and the attached conditions will serve as your Service Provider Letter in accordance with Clean Water Services Design and Construction Standards (R&O 07-20).

Jurisdiction:	North Plains	**Review Type:**	Tier 2 Analysis
Site Address / Location:	9960 NW 307th AVE North Plains, OR 97133	**SPL Issue Date:** **SPL Expiration Date:**	November 06, 2014 November 05, 2016

Applicant Information:		**Owner Information:**	
Name		Name	
Company	BIGGI CONSTRUCTION, LLC	Company	BIGGI CONSTRUCTION, LLC
Address	11605 SW NORMANDY LN WILSONVILLE OR 97070	Address	11605 SW NORMANDY LN WILSONVILLE OR 97070
Phone/Fax	(503) 816-3243	Phone/Fax	(503) 816-3243
E-mail:		E-mail:	

Tax lot ID	**Development Activity**
1N301DD01601	McKay Creek Estates

Pre-Development Site Conditions:		**Post Development Site Conditions:**	
Sensitive Area Present:	[X] On-Site [X] Off-Site	Sensitive Area Present:	[X] On-Site [X] Off-Site
Vegetated Corridor Width:	50	Vegetated Corridor Width:	Variable
Vegetated Corridor Condition:	Degraded/ Good		

Enhancement of Remaining Vegetated Corridor Required: [X] **Square Footage to be enhanced:** 18,036

Encroachments into Pre-Development Vegetated Corridor:

Type and location of Encroachment:	Square Footage:
Trail and Water Quality Facility (Permanent Encroachment; Mitigation Required)	4,565

Mitigation Requirements:

Type/Location	Sq. Ft./Ratio/Cost
On-site (Per Allowed Use Criteria; 3ft. Allotment for trail reduces the required mitigation)	3,497
Total area required to be planted to District Density Standards	21,533

[X] Conditions Attached [X] Development Figures Attached (2) [ ] Planting Plan Attached [ ] Geotech Report Required

This Service Provider Letter does NOT eliminate the need to evaluate and protect water quality sensitive areas if they are subsequently discovered on your property.

The proposed project results in unavoidable permanent encroachment within *good* condition vegetated corridor, requiring a Tier 2 Alternatives Analysis. The project meets all of the Tier 2 criteria. Details are described below.

3.07.4.b.1 Description of why the encroachment is needed including rejected alternatives that would result in less encroachment.
Due to the existing grade of the stormwater quality treatment swale (proposed beyond the 50-foot vegetated corridor), the treated outflow needs to discharge in an area with lower elevation, which occurs near the OHWM of McKay Creek. Therefore, there are no alternatives that avoid encroachment within on-site vegetated corridor. An option is to hard pipe the outflow through the vegetated corridor. Hard piping the outflow would not permanently change the existing grade within the vegetated corridor, but trees could not be planted over the hard pipe. Therefore, this alternative was rejected as the proposed conveyance swale can be planted with native trees and shrubs, providing shade trees within the vegetated corridor, and maintaining the function and values of the riparian corridor.

3.07.4.c.1 The proposed encroachment area is mitigated in accordance with Section 3.08.
The project will result in permanent encroachment to 1,897 square feet of *good* condition vegetated corridor. Approximately 2,000 square feet of replacement mitigation is proposed on-site continuous and adjacent to the existing on-site vegetated corridor. The proposed mitigation is consistent with Section 3.08 of CWS R&O 07-20.

3.07.4.c.2 The replacement mitigation protects the functions and values of the Vegetated Corridor and Sensitive Area.
Replacement mitigation is continuous and adjacent to existing vegetated corridor and will protect the functions and values of McKay Creek and the adjacent vegetated corridor.

3.07.4.c.3 Enhancement of the replacement area, if not already in Good condition, and either the remaining Vegetated Corridor on the site or the first 50 feet of width closest to the resource, whichever is less, to a Good corridor condition.
The site plan proposes enhancement of 18,036 square feet of *degraded* and *marginal* condition vegetated corridor to *good* condition, per the attached Vegetated Corridor Enhancement Planting Specification Table. In addition, non-native vegetation species within remaining on-site *good* condition corridor will be removed by hand and cleared areas greater than 25 square feet will be replanted with native shrubs.

3.07.4.c.5 Location of the development and site planning minimizes incursion into the Vegetated Corridor.
The location of the conveyance swale is dictated by the location of the outfall. Alternative alignments for the conveyance swale included an alignment located in the northern portion of the site. This configuration did avoid impact to native trees, however, required grading below the OHWM of McKay Creek which resulted in permanent water impacts. The proposed conveyance swale configuration does require the removal of 4 native trees; however, the total area of encroachment within *good* condition vegetated corridor for the proposed site plan is less than the alternative alignment and does not require water impacts to McKay Creek (an Essential Salmonid Habitat stream). Therefore, the proposed site plan proposes the least amount of vegetated corridor and sensitive area impacts.

3.07.4.c.6 No practicable alternative to the location of the development exists that will not disturb the Sensitive Area or Vegetated Corridor.
Due to the site constraints (such as floodplain, topography) there is no other practical alternative location for the stormwater treatment facility and the associated conveyance outflow swale that avoids impact to the vegetated corridor. The proposed outflow conveyance swale configuration avoids impact to McKay Creek (Sensitive Area).

In order to comply with Clean Water Services water quality protection requirements the project must comply with the following conditions:

1. No structures, development, construction activities, gardens, lawns, application of chemicals, uncontained areas of hazardous materials as defined by Oregon Department of Environmental Quality, pet wastes, dumping of materials of any kind, or other activities shall be permitted within the sensitive area or Vegetated Corridor which may negatively impact water quality, except those allowed in R&O 07-20, Chapter 3.
2. Prior to any site clearing, grading or construction the Vegetated Corridor and water quality sensitive areas shall be surveyed, staked, and temporarily fenced per approved plan. During

construction the Vegetated Corridor shall remain fenced and undisturbed except as allowed by R&O 07-20, Section 3.06.1 and per approved plans.

3. **If there is any activity within the sensitive area, the applicant shall gain authorization for the project from the Oregon Department of State Lands (DSL) and US Army Corps of Engineers (USACE). The applicant shall provide Clean Water Services or its designee (appropriate city) with copies of all DSL and USACE project authorization permits.**
4. An approved Oregon Department of Forestry Notification is required for one or more trees harvested for sale, trade, or barter, on any non-federal lands within the State of Oregon.
5. **Prior to ground disturbance an erosion control permit is required. Appropriate Best Management Practices (BMP's) for Erosion Control, in accordance with Clean Water Services' Erosion Prevention and Sediment Control Planning and Design Manual, shall be used prior to, during, and following earth disturbing activities.**
6. Prior to construction, a Stormwater Connection Permit from Clean Water Services or its designee is required pursuant to Ordinance 27, Section 4.B.
7. Activities located within the 100-year floodplain shall comply with R&O 07-20, Section 5.10.
8. Removal of native, woody vegetation shall be limited to the greatest extent practicable.
9. **The water quality facility shall be planted with Clean Water Services approved native species, and designed to blend into the natural surroundings.**
10. **Should final development plans differ significantly from those submitted for review by Clean Water Services, the applicant shall provide updated drawings, and if necessary, obtain a revised Service Provider Letter.**

SPECIAL CONDITIONS

11. The Vegetated Corridor width for sensitive areas within the project site shall be a minimum of 50 feet wide, as measured horizontally from the delineated boundary of the sensitive area.
12. **The applicant shall enhance the entire Vegetated Corridor to meet or exceed good corridor condition as defined in R&O 07-20, Section 3.14.2, Table 3-3.**
13. **Removal of invasive non-native species by hand is required in all Vegetated Corridors rated ""good."" Replanting is required in any cleared areas larger than 25 square feet using low impact methods. The applicant shall calculate all cleared areas larger than 25 square feet prior to the preparation of the required Vegetated Corridor enhancement/restoration plan.**
14. **Prior to any site clearing, grading or construction, the applicant shall provide Clean Water Services with a Vegetated Corridor enhancement/restoration plan. Enhancement/restoration of the Vegetated Corridor shall be provided in accordance with R&O 07-20, Appendix A, and shall include planting specifications for all Vegetated Corridor, including any cleared areas larger than 25 square feet in Vegetated Corridor rated ""good.""**
15. Prior to installation of plant materials, all invasive vegetation within the Vegetated Corridor shall be removed per methods described in Clean Water Services' Integrated Pest Management Plan. During removal of invasive vegetation care shall be taken to minimize impacts to existing native tree and shrub species.
16. Clean Water Services shall be notified 72 hours prior to the start and completion of enhancement/restoration activities. Enhancement/restoration activities shall comply with the guidelines provided in Landscape Requirements (R&0 07-20, Appendix A).
17. **Maintenance and monitoring requirements shall comply with R&O 07-20, Section 2.11.2. If at any time during the warranty period the landscaping falls below the 80% survival level, the owner shall reinstall all deficient planting at the next appropriate planting opportunity and the two year maintenance period shall begin again from the date of replanting.**
18. **Performance assurances for the Vegetated Corridor shall comply with R&O 07-20, Section 2.06.2.**

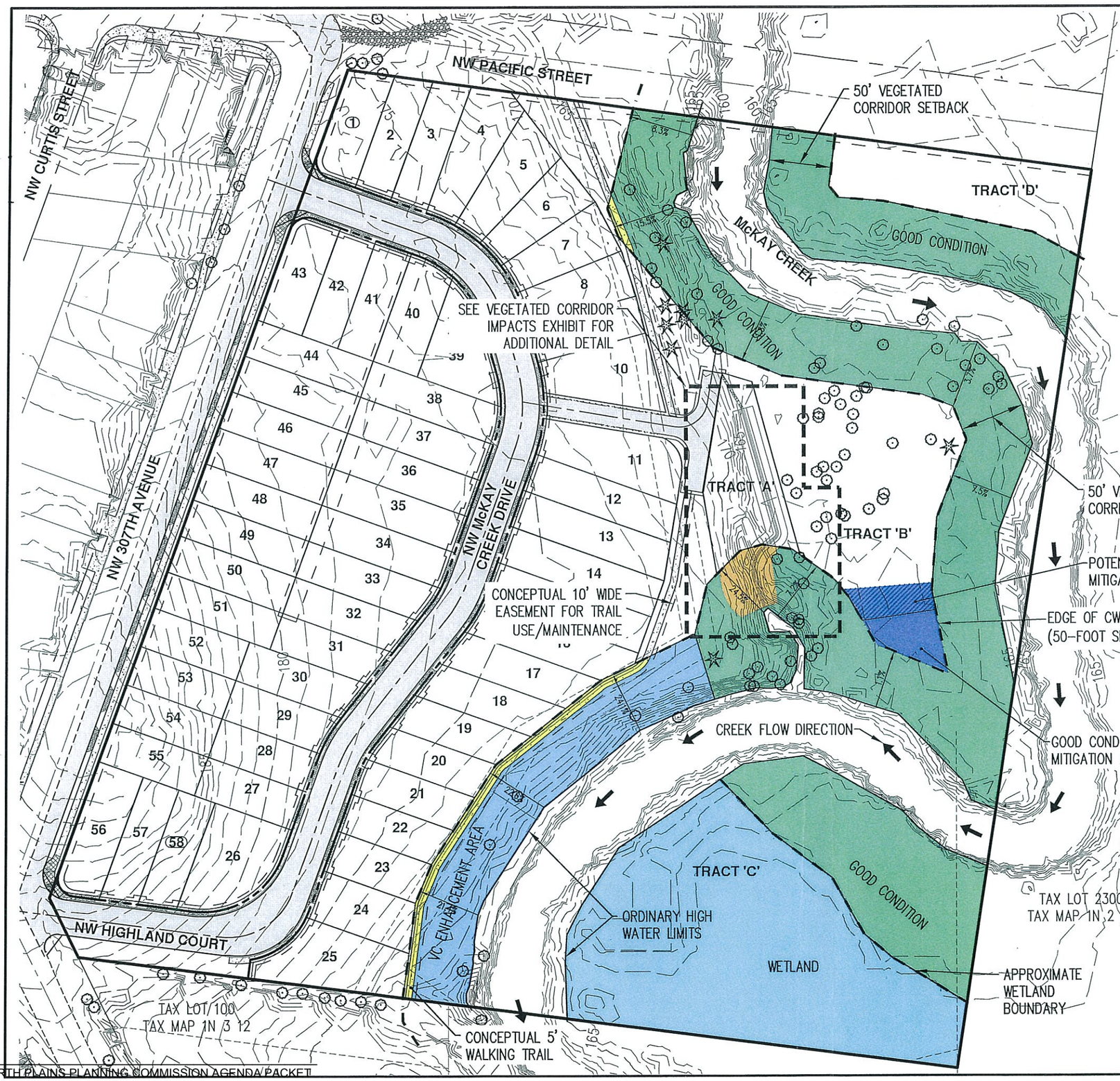
19. **For any developments which create multiple parcels or lots intended for separate ownership, Clean Water Services SHALL require that the sensitive area and Vegetated Corridor be contained in a separate tract and subject to a ""STORM SEWER, SURFACE WATER, DRAINAGE AND DETENTION EASEMENT OVER ITS ENTIRETY"" to be granted to Clean Water Services.**
20. **Final construction plans shall include landscape plans.** In the details section of the plans, a description of the methods for removal and control of exotic species, location, distribution, condition and size of plantings, existing plants and trees to be preserved, and installation methods for plant materials is required. Plantings shall be tagged for dormant season identification and shall remain on plant material after planting for monitoring purposes.
21. **A Maintenance Plan shall be included on final plans** including methods, responsible party contact information, and dates (minimum two times per year, by June 1 and September 30).
22. **Final construction plans shall clearly depict the location and dimensions of the sensitive area and the Vegetated Corridor** (indicating good, marginal, or degraded condition). Sensitive area boundaries shall be marked in the field.
23. Protection of the Vegetated Corridors and associated sensitive areas shall be provided by the installation of permanent fencing and signage between the development and the outer limits of the Vegetated Corridors. **Fencing and signage details to be included on final construction plans.**

This Service Provider Letter is not valid unless CWS-approved site plan is attached.

Please call (503) 681-3653 with any questions.

Amber Wierck
Environmental Plan Review

Attachments (2)



LEGEND

PROPOSED SITE PLAN – REQUEST FOR SPL

WETLAND – APPROXIMATE	= 41,296 SQ. FT.
VEGETATED CORRIDOR (GOOD CONDITION)	= 81,794 SQ. FT.
VEGETATED CORRIDOR ENHANCEMENT AREA	= 18,036 SQ. FT.
PERMANENT VEGETATED CORRIDOR IMPACT AREA	= 1,897 SQ. FT.
VEGETATED CORRIDOR MITIGATION AREA (GOOD CONDITION)	= 2,000 SQ. FT.
PUBLIC BENEFIT MITIGATION NET TOTAL	= 103 SQ. FT.

CONCEPTUAL TRAIL REQUIRING A FUTURE SPL

VEGETATED CORRIDOR IMPACT AREA CONCEPTUAL TRAIL ALIGNMENT (5' WIDE TRAIL PLUS 2' SHOULDER)	= 2,668 SQ. FT.
POTENTIAL VEGETATED CORRIDOR MITIGATION AREA FOR CONCEPTUAL TRAIL ALIGNMENT IN VEGETATED CORRIDOR (2' TRAIL WIDTH PLUS 2' SHOULDER)	= 1,497 SQ. FT.

* ALLOWED USE 3 ft ALLOTMENT

NOTE:
CONCEPTUAL TRAIL ALIGNMENT NOT PART OF THE CURRENT SUBDIVISION APPLICATION. THE POTENTIAL FUTURE TRAIL WILL REQUIRE A SEPARATE SPL.

SCALE 1" = 80 FEET
80 0 32 48 64 80

COLOR COPY
(PRINTOUT ON 11X17)

COLOR COPY
CWS FILE NO. 14-002673

Approved
Clean Water Services
FOR ENVIRONMENTAL REVIEW
By AW Date 11/6/14

SPL ATTACHMENT 1 OF 2

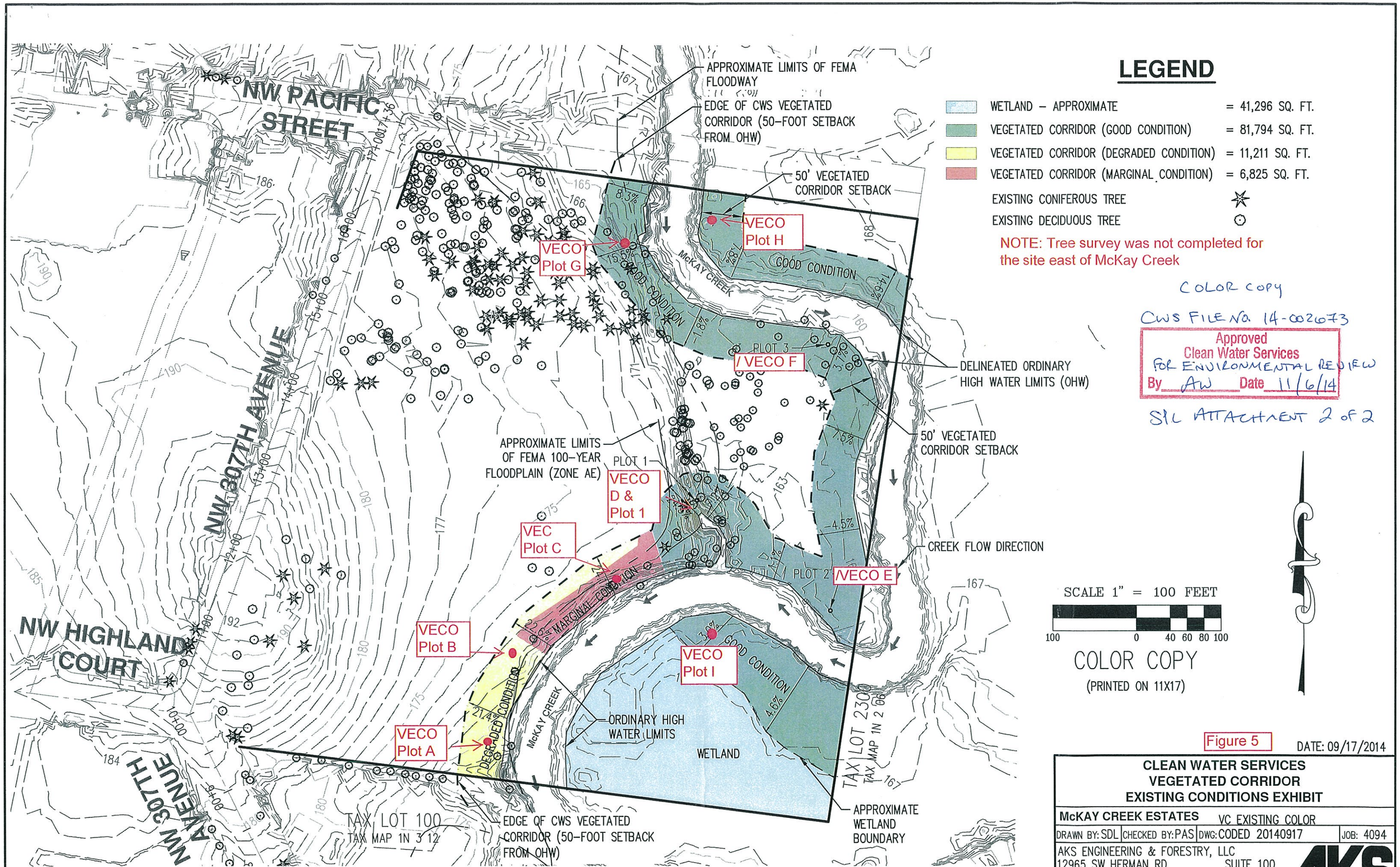
DATE: 10-29-2014

CITY OF NORTH PLAINS WALKING TRAIL CONCEPTUAL VEGETATED CORRIDOR MITIGATION EXHIBIT

MCKAY CREEK CROSSING VC REVISED MITIGATION

DRAWN BY: DS | CHECKED BY: PAS | DWG: COLOR CODED | JOB: 4094

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



COLOR COPY

CWS FILE No. 14-002673

Approved
Clean Water Services
FOR ENVIRONMENTAL REVIEW
By AW Date 11/6/14

S/L ATTACHMENT 2 of 2

Figure 5

DATE: 09/17/2014

CLEAN WATER SERVICES
VEGETATED CORRIDOR
EXISTING CONDITIONS EXHIBIT

McKAY CREEK ESTATES VC EXISTING COLOR

DRAWN BY: SDL | CHECKED BY: PAS | DWG: CODED 20140917 | JOB: 4094

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

AKS

Natural Resource Assessment

TUALATIN · VANCOUVER · SALEM
12965 SW HERMAN RD., SUITE 100 · TUALATIN, OR 97062
AKS ENGINEERING & FORESTRY
WWW.AKS-ENG.COM
P: (503) 563-6151 F: (503) 563-6152

Natural Resource Assessment

To: City of North Plains Planning Department

From: Stacey Reed, Wetland Scientist

CC: Vince Biggi, Biggi Construction

Date: 11/7/2014

Re: McKay Creek Crossing Subdivision
9960 NW 307th Avenue, North Plains, Washington County; Tax lot 1601 of tax map 1N 3 01DD

Introduction and Background

Biggi Construction is proposing residential development on a site (referred to as McKay Creek Crossing) located at 9960 NW 307th Avenue in North Plains, Washington County, Oregon (Figure 1). The study area is approximately 10.90 acres and consists of tax lot 1601 of tax map 1N 3 01DD (Figure 2). The on-site portions of the ordinary high water mark (OHWM) associated with McKay Creek were delineated on the site. No wetlands were documented on-site above the OHWM on the western side of the creek. Palustrine forested (PFO) wetlands were present in the southeast corner of the site, east of McKay Creek. The City of North Plains requires a 75-foot Riparian Corridor buffer extending from the top of bank (or OHWM) of McKay Creek or significant wetlands, whichever is further landward.

The project proposes residential development on the site. The project will result in a total of 11,446 square feet of permanent unavoidable encroachment within the 75-foot Riparian Corridor to accommodate site development, requiring a variance to Chapter 16.75 of the City's Development Code. Portions of the proposed Riparian Corridor impacts are associated with rear lots. The applicant requests a variance to utilize these areas for future residential use. Approximately 11,560 square feet of on-site replacement mitigation is proposed to offset the permanent encroachment within the Significant Riparian Corridor. The site plan will result in dedication of approximately 48 percent of the site as open space to preserve and protect the natural resources on the site. The proposed mitigation is consistent with Clean Water Services mitigation requirements and is located on-site and as close to the impacted area as possible. This memorandum has been prepared to meet Chapter 16.75 Significant Natural Resources (SNR) Overlay District of the City of North Plains Development Code.

Existing Conditions

The site is undeveloped. McKay Creek flows southerly in the eastern portion of the site. McKay Creek is a perennial tributary to the Tualatin River. According to the 2010 Oregon Department of Fish and Wildlife (ODFW) essential salmonid habitat (ESH) map, McKay Creek within the project area is mapped as ESH.

An old cultivated apple orchard was present west of the riparian area during SWCA's August 12, 2014, site visit. Himalayan blackberry, beaked hazelnut, and other non-native weedy forbs were also dominant in the old apple orchard. A predominantly native mixed deciduous/coniferous riparian forest is present on the site adjacent to McKay Creek. The forest is dominated by big-leaf maple, Douglas-fir, Oregon white oak, red alder, cascara false buckthorn, common snowberry, creambush, California dewberry, vine maple, beaked hazelnut, dull Oregon grape, pineland sword fern, and English ivy. A list of all vegetation observed on the site and their scientific names is attached for reference.

Residential development is present west of the site. Agricultural land use is present north, south, and east of the site. The topography on the site is relatively flat (approximately 3–5% slope throughout) with a gently slope to the east toward McKay Creek.

According to the Natural Resources Conservation Service (NRCS) Washington County area soil survey, the following soil units are mapped on the site (Figure 3):

- Unit 30 – McBee silty clay loam;
- Unit 45A – Woodburn silt loam, 0% to 3% slopes;
- Unit 45B – Woodburn silt loam, 3% to 7% slopes

According to the NRCS Washington County, Oregon, hydric soil list, soils mapped on the site are not hydric; however, McBee silty clay loam (Unit 30) can have hydric Wapato soil and Cove inclusions in floodplains.

Wetlands are mapped throughout the eastern portion of the site on the City of North Plains' Local Wetlands Inventory (LWI) map (Figure 4). According to the LWI Wetland Characterization Sheet for Wetland Unit MK-5, the mapping of the wetlands on the site was conducted based on an off-site assessment using aerial photographs. Our site visit confirmed wetlands are not present on-site on the western side of McKay Creek. Forested wetlands are present in the southeast corner of the site, on the eastern side of McKay Creek. The forested canopy on the western side of the creek was primarily dominated by Douglas-fir and big-leaf maple trees, with only a few scattered Oregon ash trees.

Water Quality Sensitive Resources

Fieldwork for documenting site conditions and delineating the wetland boundaries was conducted in accordance with the U.S. Army Corps of Engineers' (Corps') *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Valleys, Mountains, and Coast Region* on August 12, 2014, by Stacey Reed and Anthony Vingiello. Soils, vegetation, and indicators of hydrology were recorded at three sample plot locations to document site conditions. The water boundaries were flagged in the field and professionally land surveyed by AKS Engineering & Forestry, LLC (Figure 5). The OHWM for the on-site portions of McKay Creek was delineated in the field in accordance with Oregon Administrative Rule (OAR) 141-085-0515(3), which consisted of a change in the vegetation community and included bankfull stage. The approximate on-site portions of the OHWM for the left bank were hand mapped based on visual on-site reconnaissance from the right bank and topographic interpretation.

McKay Creek

The OHWM was generally delineated based on a change in vegetation community from a facultative wetland (FACW)–dominated riparian community located below the OHWM of the creek (red osier, Pacific ninebark, Oregon ash, willow, reed canarygrass) to an upland plant community (facultative upland [FACU]–dominated community) located above the OHWM (beaked hazelnut, big-leaf maple, pineland sword fern, dull Oregon grape, creambush). No flood debris was observed above the delineated OHWM. Sediment marks and water staining were observed at the base of tree trunks below the delineated OHWM. Water staining and sediment deposits were not observed above the delineated OHWM. Two backwater side channels were delineated below the OHWM adjacent to the right bank of the creek. Approximately 57,644 square feet (1.32 acres) of perennial waters were delineated on the site.

Forested Wetlands

PFO wetland appears to be present in the southeastern portion of the site, adjacent to the left bank of the creek. This area is dominated by 100% Oregon ash canopy, with 100% cover of dense thickets of red osier in the understory (both FACW species). Due to access constraints, sample plots were not conducted in this area; however, based on the presence of a FACW-dominated plant community and low-elevation topography, this area appears to be wetland. The approximate wetland boundary was hand mapped on Figure 5 using topography and aerial photograph interpretation. Approximately 41,296 square feet (0.95 acre) of wetlands appear to be present on the site. Wetland conditions appear to extend off-site to the south and to the east. The on-site adjacent upland to the north is higher in elevation than the on-site low-elevation floodplain forested wetland. The change in land form also coincides with a change in the plant community from a FACW-dominated community in wetland to a FACU-dominated community in upland (Douglas-fir, big-leaf maple, beaked hazelnut, creambush, and pineland sword fern) that was visible from on-site reconnaissance and aerial photo interpretation. The extent of wetland on the site is only approximate. A wetland delineation will be required to determine the exact wetland boundary if future development is proposed in this portion of the site.

Upland Riparian

Plot 1 was located upslope of a backwater channel in the center of the site. Plot 1 was dominated by a non-hydrophytic vegetation community and lacked hydric soil and wetland hydrology indicators; therefore, it was determined to be upland.

Plot 2 documents the conditions of a somewhat flat area above the OHWM of the creek dominated by a hydrophytic vegetation community. However, Plot 2 lacked hydric soil and wetland hydrology indicators and was determined to be upland.

Plot 3 documents the conditions upslope of a small backwater area in the northern portion of the site. The vegetation at Plot 3 was also dominated by a hydrophytic plant community, but lacked hydric soils and wetland hydrology indicators.

The wetland determination data sheets and representative photos are attached for reference. Plot locations are shown on attached Figure 5.

Extent and existing condition of on-site riparian corridor

According to Chapter 16.75 of the North Plains Development Code, McKay Creek requires a 75-foot setback from the top of bank or significant wetland, whichever is farther landward. According to City code, the top of bank is defined as "A distinct break in slope between the stream bottom and the surrounding terrain, which corresponds with the bankfull stage of the stream." The OHWM delineated under this study coincides with the top of bank, as defined by the City. Therefore, the 75-foot setback is shown on attached Figures 5 and 6 as extending from the OHWM. Approximately 139,799 square feet (3.21 acres) of riparian corridor is present on the site. The extent of the on-site riparian corridor is shown on attached Figure 5, Existing Conditions.

The majority of the on-site riparian corridor was determined to be in *good* condition, according to Clean Water Services standards. The on-site riparian corridor contained greater than 50% canopy cover and greater than 80% cover by native vegetation species and was generally dominated by big-leaf maple, red alder, Douglas-fir, Oregon ash, cascara, beaked hazelnut, creambush, sword fern, common snowberry, and California dewberry.

The Riparian Corridor in the southern portion of the site was determined to be in *marginal* and *degraded* condition. The riparian communities in this area generally lacked tree canopy and were dominated by non-native grasses, forbs, and invasive Himalayan blackberry.

Proposed riparian corridor impacts

The project proposes a 58-lot subdivision. Approximately 11,446 square feet of permanent encroachment is proposed within the outer edges of the 75-foot-wide Riparian Corridor (Significant Resource) to accommodate the rear of residential lots, the stormwater treatment swale, and a portion of the stormwater utility maintenance road, requiring a variance to Chapter 16.75 of the City's Development Code. The location and extent of the encroachment is shown on the attached site plan in Figure 6.

Alternatives analysis

The project site is encumbered with multiple environmental constraints including floodplain and floodway designations, McKay Creek, as well as Clean Water Services (CWS) vegetated corridor, and the City of North Plains Significant Natural Resource overlay zoning. Due to the constrained nature of the site, approximately 48 percent of the property will be set aside as open space to preserve and protect the natural resources on the site. Due to the environmental constraints and substantial amount of open space proposed, the proposed layout efficiently utilizes the remaining developable area as much as practicable. However, in order to provide properly sized streets, spaced blocks, infrastructure, as well as create lots with sufficiently sized buildable areas, the site plan includes minor encroachment within the outer edges of the Riparian Corridor for the rear of lots 6-9 and 15-25. We understand the City will allow residential lots within the 75 foot Riparian Corridor; however, we are requesting a variance to allow for the rear 25 feet of lots 6-9 and 15-25 to be accounted for as permanent encroachment within Riparian Corridor to accommodate future residential purposes (rear yard lawns and landscaping, children's play area, gardens, etc). Replacement mitigation is proposed to off-set the encroachment for these lots. As part of the mitigation (described in the subsequent section of this report), non-native invasive

vegetation species will be removed from the proposed replacement mitigation area, which will provide an overall net benefit to the remaining resources on the site.

Due to the site constraints mentioned above (floodplain, topography) there are no other practical alternative locations that avoid impacts within the Significant Resource for the stormwater treatment facility and the associated conveyance outflow swale. The location of the treatment and conveyance swale is dictated by the location of the outfall. Due to the existing grade of the stormwater quality treatment swale, the treated outflow needs to discharge in an area with lower elevation, which occurs near the OHWM of McKay Creek. Therefore, there are no alternatives that avoid encroachment within the Riparian Corridor. An option is to hard pipe the outflow through the Riparian Corridor. Hard piping the outflow would not permanently change the existing grade, but trees could not be planted over the hard pipe. Therefore, this alternative was rejected as the proposed treatment and conveyance swale side slopes can be planted with native trees, providing shade and maintaining the function and values of the riparian corridor. The proposed alternative for the conveyance swale also avoids impact to McKay Creek (an Essential Salmonid Habitat stream). A detailed cross section, including proposed grading within the Riparian Corridor for the water quality swale, is shown on attached Figure 7. Since the side slopes of the swale will be planted with native woody vegetation, the grading to construct the side slopes of the swale are proposed as temporary encroachment within the Riparian Corridor on the attached site plan Figure 6. The bottom of the swale will be planted with native herbaceous vegetation; therefore, since the bottom of the swale cannot be restored to a forested riparian community, was depicted as permanent encroachment within the Significant Riparian Corridor.

Proposed riparian corridor mitigation

To mitigate for the 11,446 square feet of permanent encroachment within the Significant Riparian Corridor, approximately 11,560 square feet of replacement mitigation is proposed on-site continuous and adjacent to the existing on-site Riparian Corridor. The location of the proposed mitigation area is shown on the attached site plan, Figure 6, and it is located as close to the impact area as possible. The proposed replacement mitigation area is consistent with the mitigation requirements listed under Section 3.08 of CWS's Design and Construction Standards, Resolution and Order (R&O) 07. The proposed replacement mitigation area is currently dominated by a native forest and is considered to be in *good* condition according to CWS standards; therefore, an enhancement planting plan is not included with this submittal. However, non-dominant patches of non-native invasive vegetation species (English ivy and Himalayan blackberry) were noted within portions of the remaining 75-foot Riparian Corridor, including the proposed mitigation areas. We recommend non-native invasive vegetation be removed by hand and any cleared areas greater than 25 square feet be planted with native shrubs listed on CWS's plant list.

In addition to the removal of non-native invasive vegetation species from the 11,560 square foot Riparian Corridor mitigation area, the proposed site plan includes removal of non-native vegetation species from 81,794 square feet of CWS good condition corridor, and densely planting native trees and shrubs within 18,036 square feet of additional existing marginal and degraded condition vegetated corridor for CWS. The project will result in a total of 111,390 square feet (2.56 acres) of riparian enhancement, which will off-set the minor encroachment proposed within Riparian Corridor.

As mentioned, the remaining on-site vegetated corridor and the vegetated corridor mitigation area will be placed in a separate tract to protect them from future development. The open space will preserve and protect the remaining Riparian Corridor and the proposed replacement mitigation area.

Please do not hesitate to contact me with any questions concerning the proposed project.

Stacey Reed

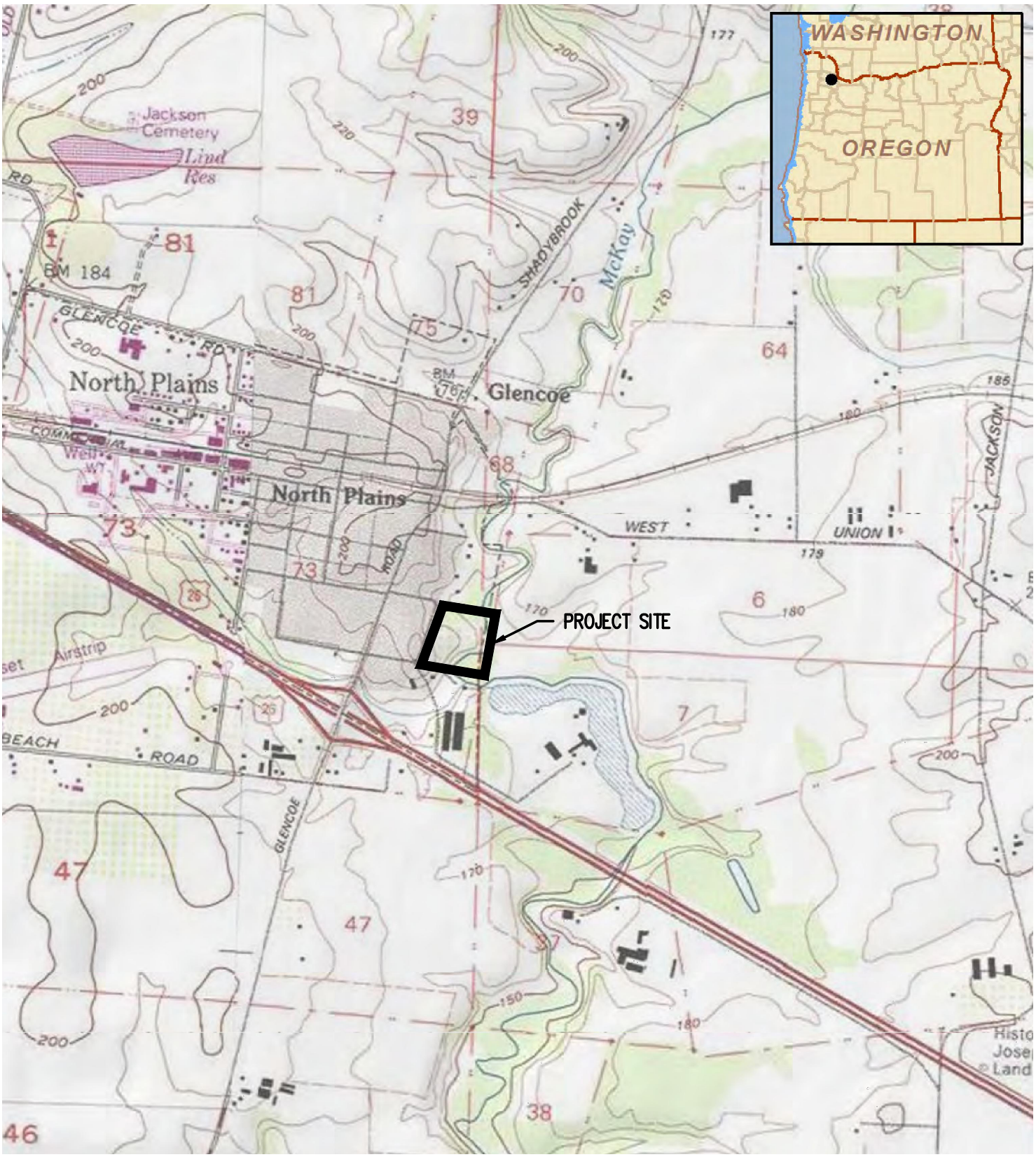
Stacey Reed, PWS
Wetland Scientist

List of Figures:

Figure 1. Site location map.
Figure 2. Tax lot map.
Figure 3. Soil survey map.
Figure 4. City of North Plains Local Wetland Inventory map.
Figure 5. Riparian Corridor existing conditions exhibit.
Figure 6. Riparian Corridor mitigation exhibit.
Figure 7. Riparian Corridor grading impacts.

List of Attachments:

Vegetation List
Wetland Determination Plots 1–3
Representative site photographs



SOURCE: USGS 7.5' TOPOGRAPHIC
QUADRANGLE: HILLSBORO, OR (1986)

PROJECT SITE

SCALE 1" = 1500 FEET

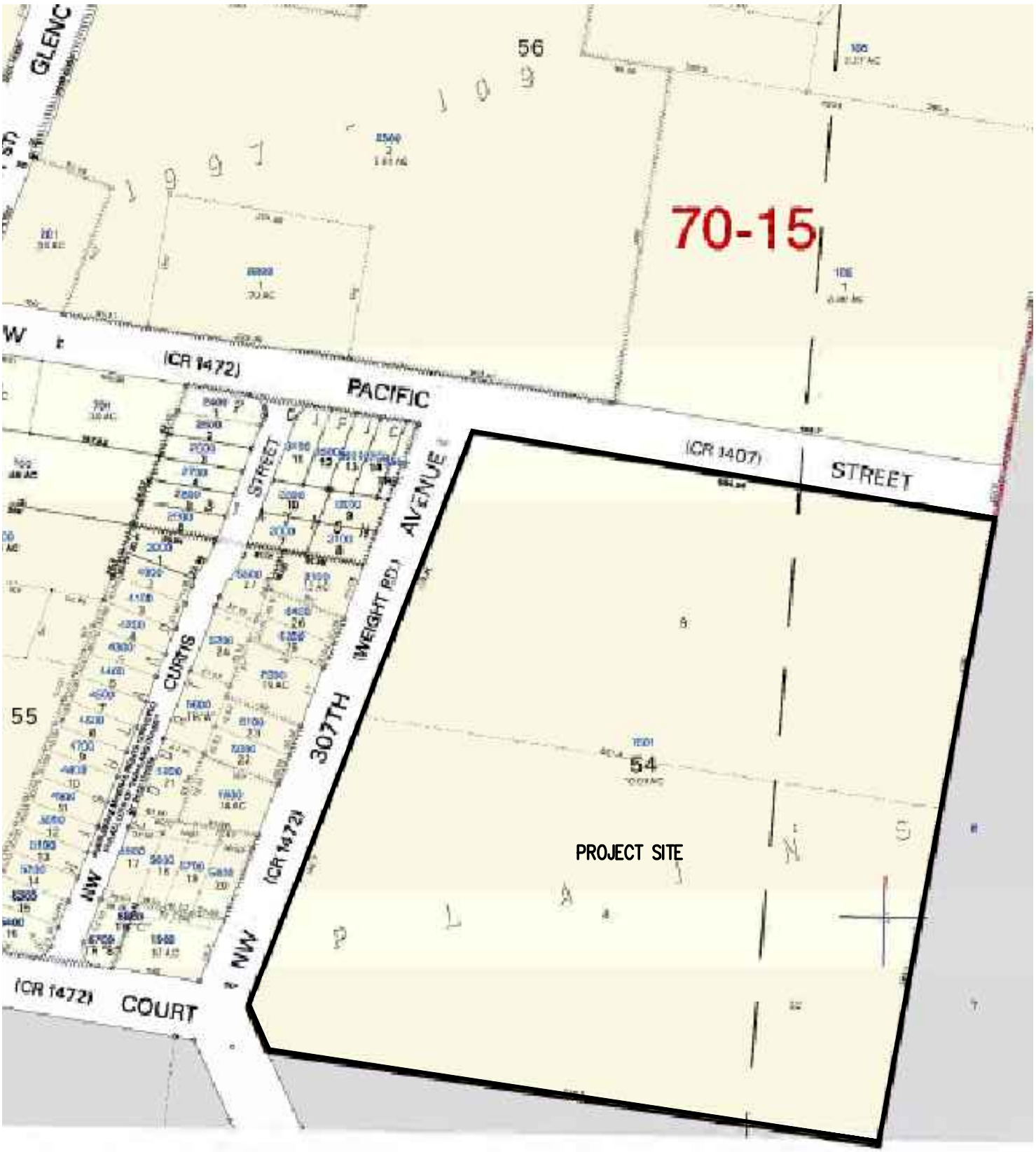
1500 0 600 900 1200 1500

FIGURE 1: SITE LOCATION MAP DATE: 11-04-2014

McKAY CREEK CROSSING

DRAWN BY: DS	CHECKED BY: PAS	DWG: 4094 SITE MAPS	JOB: 4094

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



WASHINGTON COUNTY ASSESSOR'S MAP
TAX LOT 1601 TAX MAP 1N 3 01DD

PROJECT SITE

SCALE 1" = 150 FEET

150 0 60 90 120 150

FIGURE 2: TAX LOT MAP DATE: 11-04-2014

McKAY CREEK CROSSING

DRAWN BY: DS	CHECKED BY: PAS	DWG: 4094 SITE MAPS	JOB: 4094

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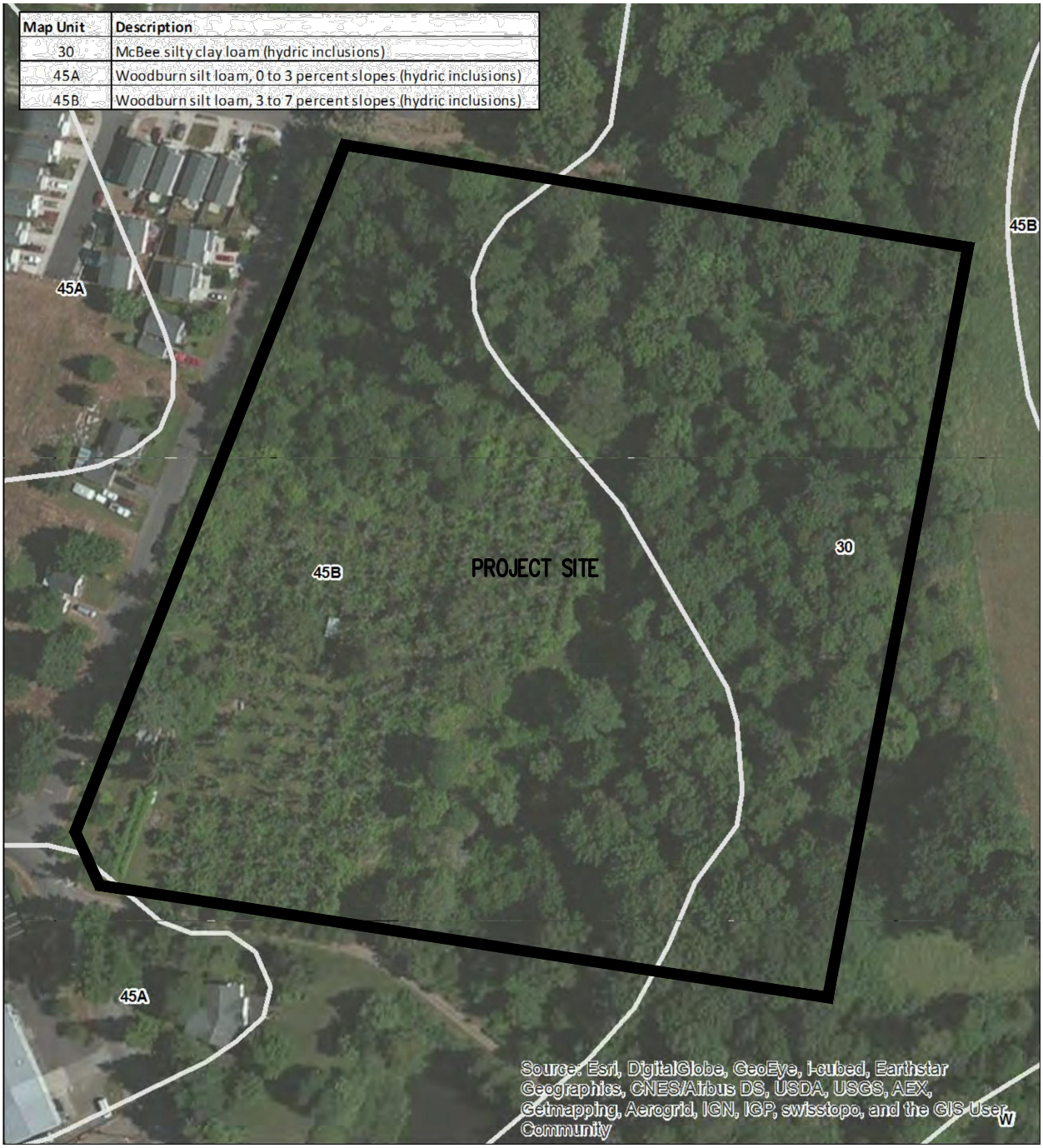

Map Unit	Description
30	McBee silty clay loam (hydric inclusions)
45A	Woodburn silt loam, 0 to 3 percent slopes (hydric inclusions)
45B	Woodburn silt loam, 3 to 7 percent slopes (hydric inclusions)

PROJECT SITE

SCALE 1" = 150 FEET

150 0 60 90 120 150

FIGURE 3: SOIL SURVEY MAP DATE: 11-04-2014

McKAY CREEK CROSSING

DRAWN BY: DS | CHECKED BY: PAS | DWG: 4094 SITE MAPS | JOB: 4094

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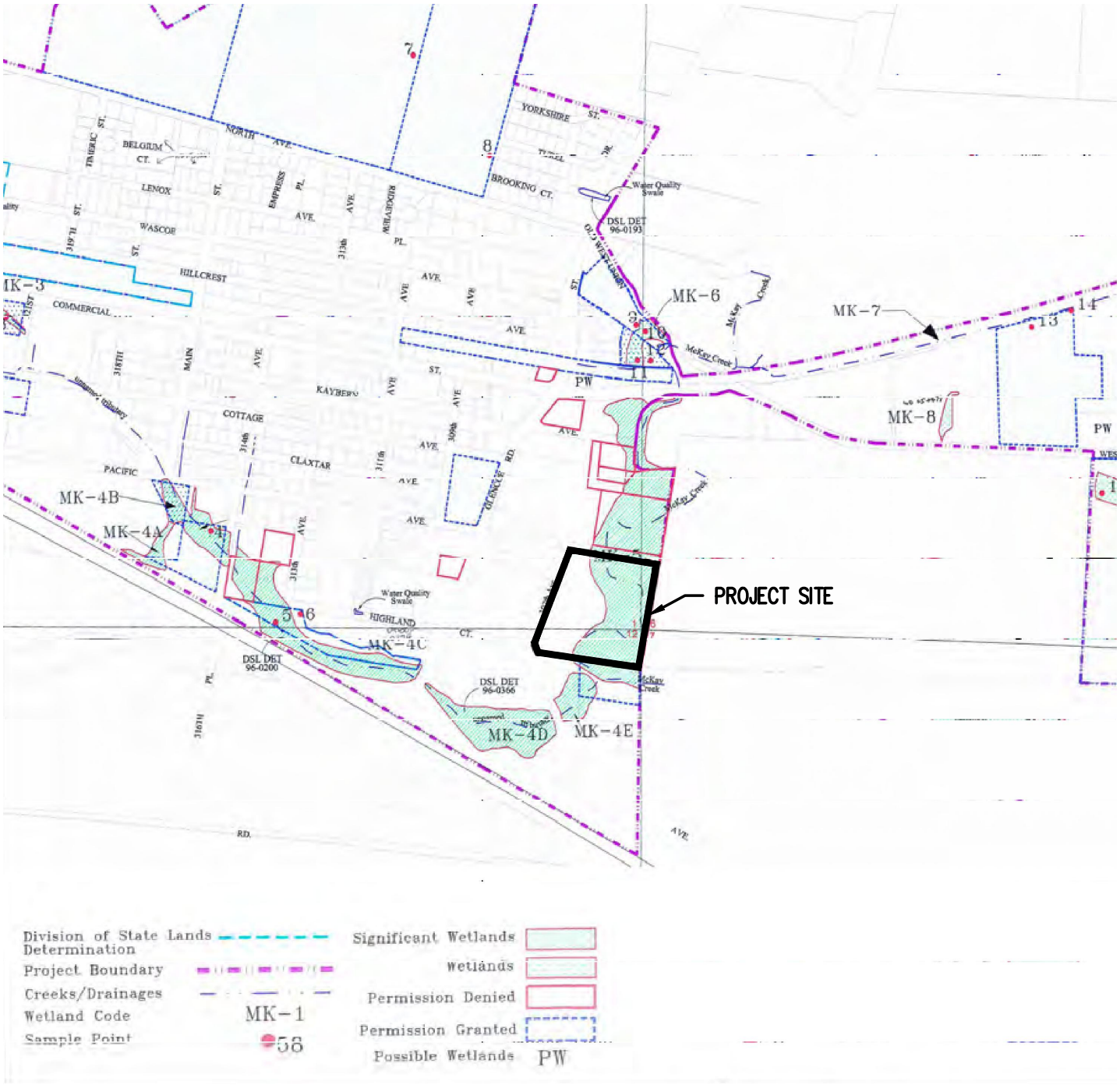

SOURCE: NORTH PLAINS LOCAL WETLAND INVENTORY (2012)

PROJECT SITE

SCALE 1" = 1000 FEET

1000 0 400 600 800 1000

FIGURE 4: CITY OF NORTH PLAINS LOCAL WETLANDS INVENTORY MAP

DATE: 11-04-2014

McKAY CREEK CROSSING

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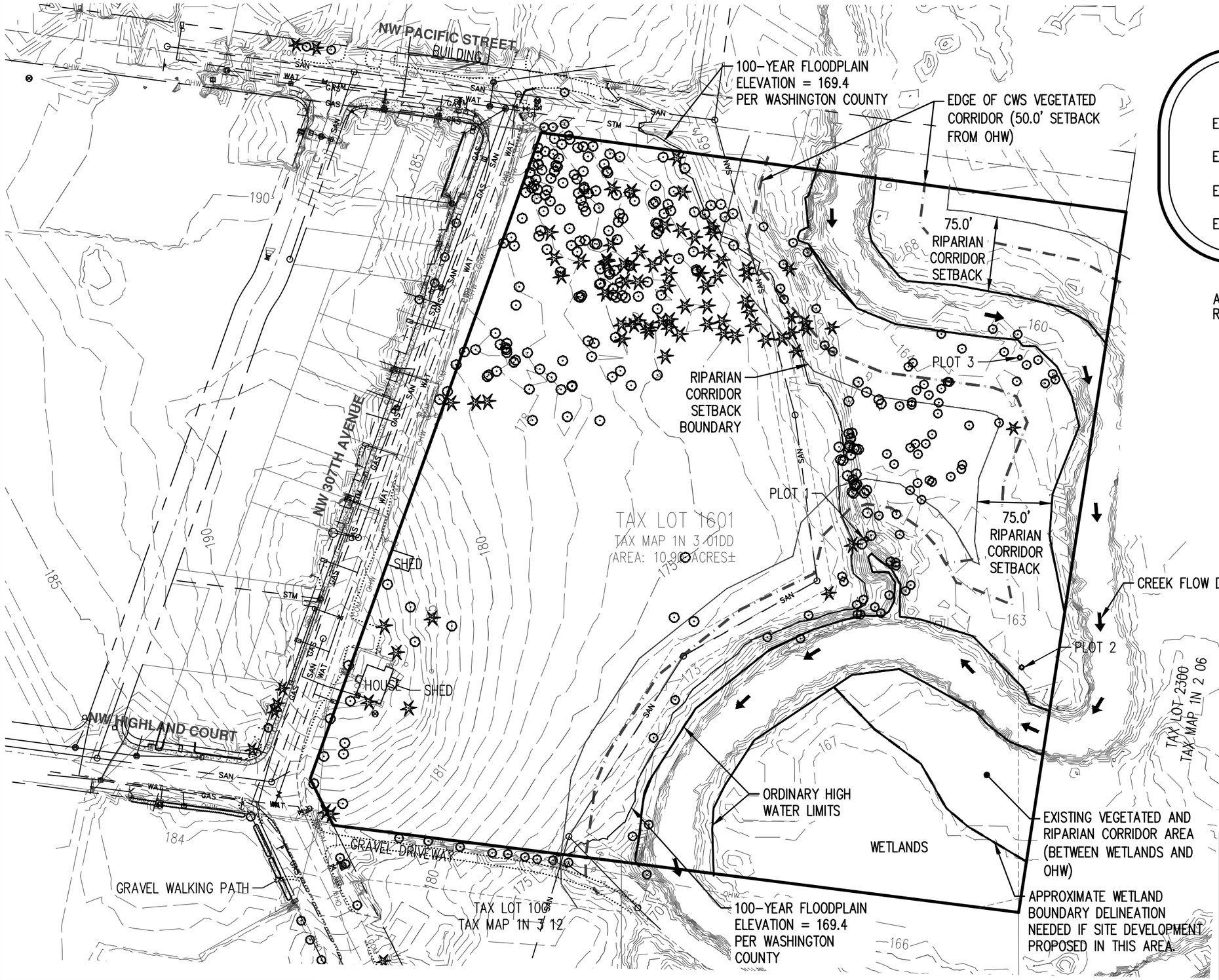

LEGEND

EXISTING GROUND CONTOUR (1 FT)	
EXISTING GROUND CONTOUR (5 FT)	180
EXISTING CONIFEROUS TREE	
EXISTING DECIDUOUS TREE	

APPROXIMATELY 139,799 (3.21 ACRES) OF SIGNIFICANT RIPARIAN CORRIDOR PRESENT ONSITE.

SCALE 1" = 100 FEET

100 0 40 60 80 100

FIGURE 5

DATE: 11-03-2014

CITY OF NORTH PLAINS
RIPARIAN CORRIDOR EXISTING CONDITIONS EXHIBIT

McKAY CREEK CROSSING

DRAWN BY: SDL	CHECKED BY: PAS	DWG: RIPARIAN EXISTING	JOB: 4094

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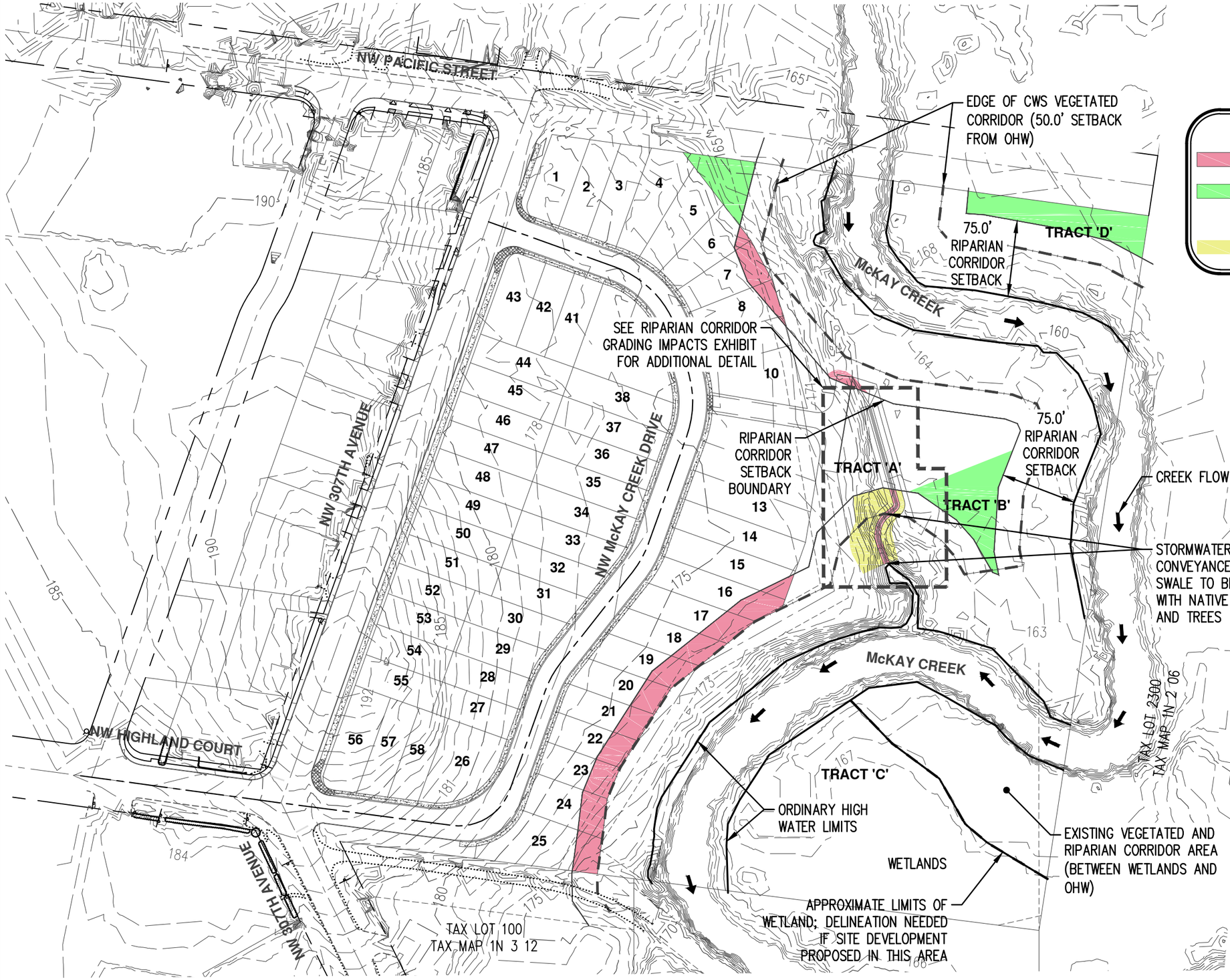

LEGEND

RIPARIAN CORRIDOR PERMANENT IMPACT AREA	= 11,446 SQ. FT.
RIPARIAN CORRIDOR MITIGATION AREA	= 11,560 SQ. FT.
NET MITIGATION	= 114 SQ. FT.
RIPARIAN CORRIDOR TEMPORARY IMPACT AREA	= 2,804 SQ. FT.

THE EXISTING CONDITION OF THE PROPOSED RIPARIAN CORRIDOR MITIGATION AREA IS CONSIDERED TO BE IN GOOD CONDITION. HOWEVER, ANY NON-NATIVE INVASIVE VEGETATION SPECIES SHALL BE REMOVED BY HAND AND CLEARED AREAS RESULTING IN >25 SF SHALL BE REPLANTED WITH NATIVE SHRUBS LISTED ON CLEAN WATER SERVICES NATIVE PLANT LIST.

TEMPORARY IMPACTED RIPARIAN CORRIDOR WILL BE PLANTED WITH NATIVE SHRUBS PER CWS STANDARDS.

SCALE 1" = 100 FEET

100 0 40 60 80 100

COLOR COPY

FIGURE 6

DATE: 11-04-2014

CITY OF NORTH PLAINS
RIPARIAN CORRIDOR MITIGATION EXHIBIT

McKAY CREEK CROSSING

DRAWN BY: SDL	CHECKED BY: PAS	DWG: RIPARIAN MITIGATION	JOB: 4094

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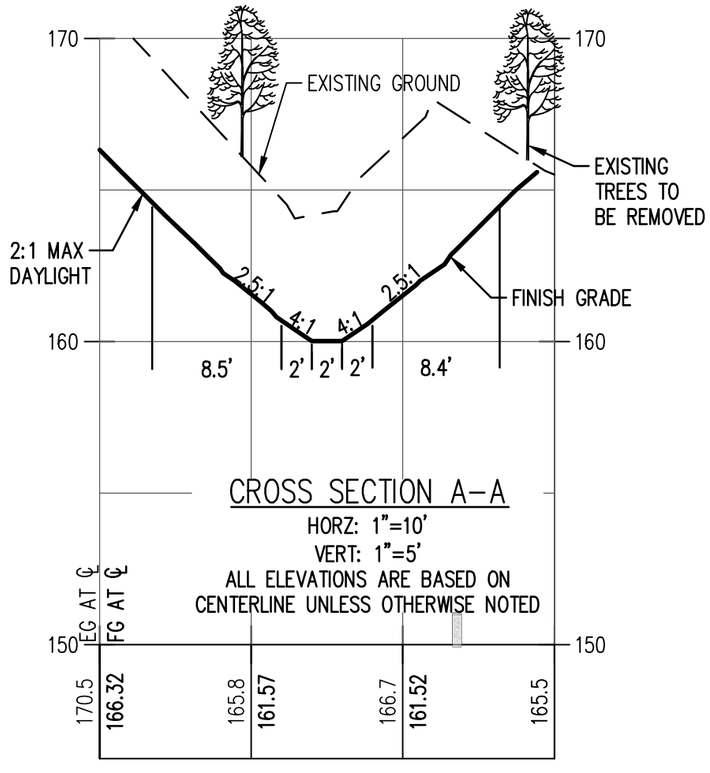

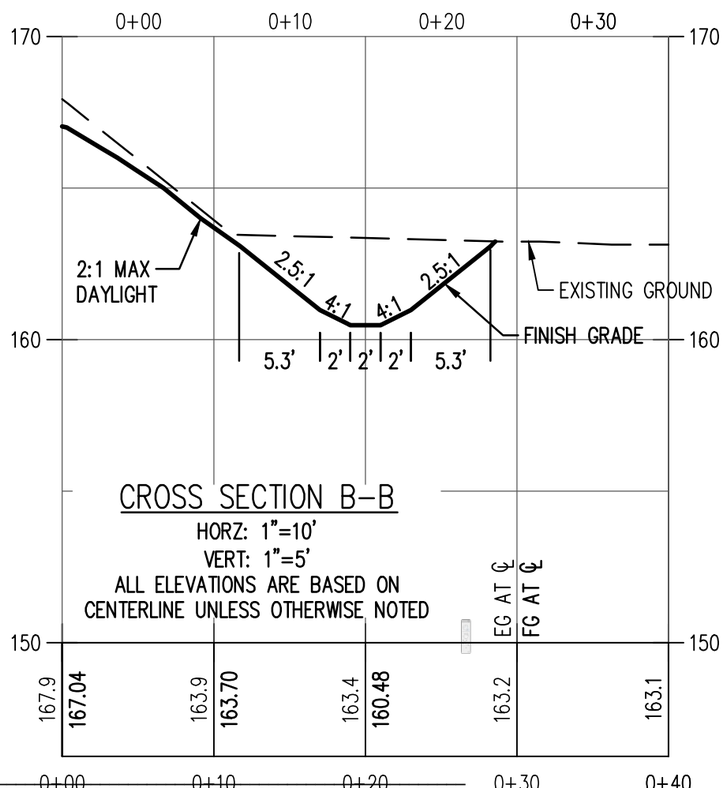

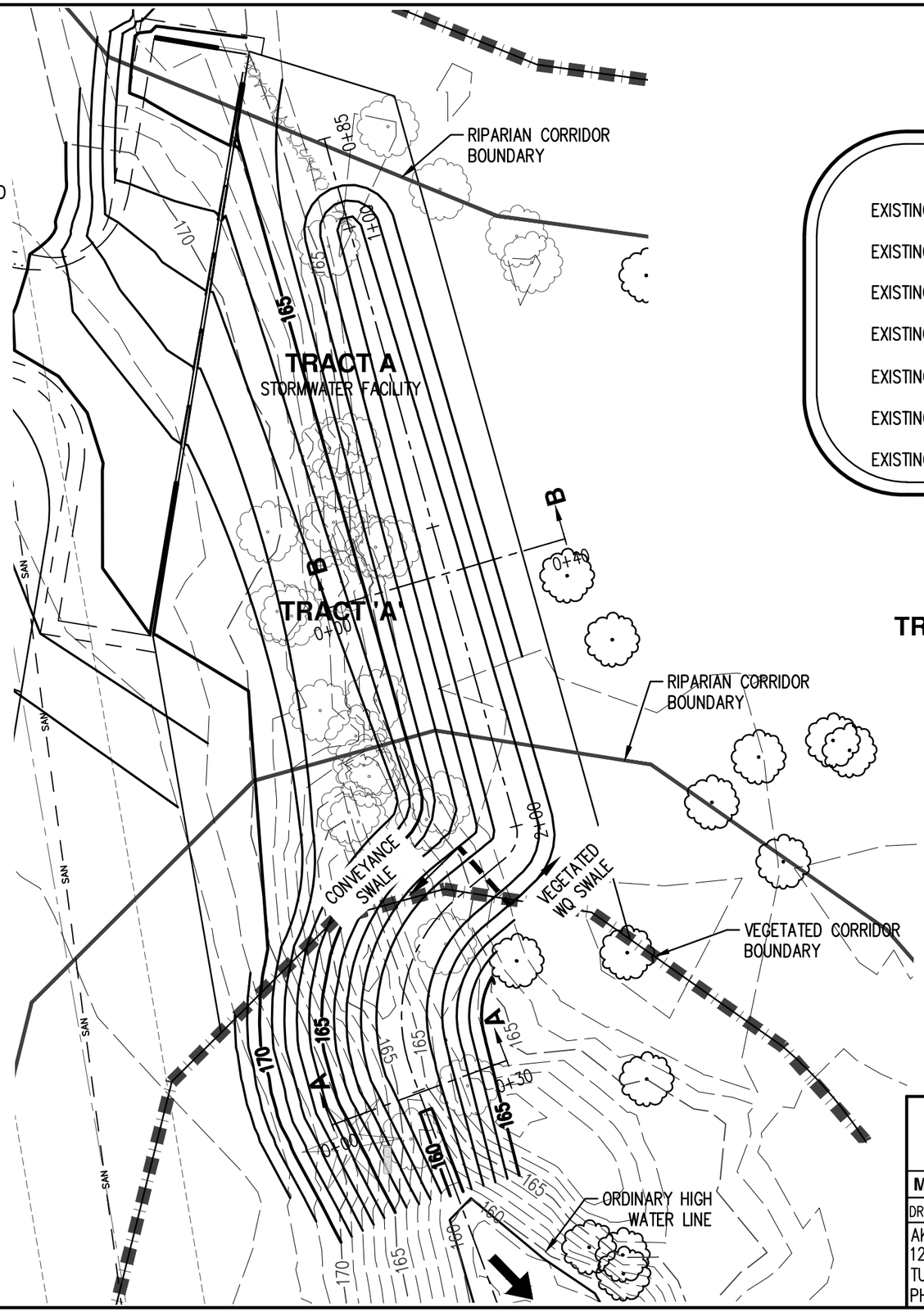

LEGEND

EXISTING GROUND CONTOUR (1 FT)	
EXISTING GROUND CONTOUR (5 FT)	180
EXISTING GROUND CONTOUR (1 FT)	
EXISTING GROUND CONTOUR (5 FT)	180
EXISTING CONIFEROUS TREE	
EXISTING DECIDUOUS TREE	
EXISTING TREE TO BE REMOVED	

TR

SCALE 1" = 20 FEET

20 0 8 12 16 20

FIGURE 7

DATE: 11-04-2014

RIPARIAN CORRIDOR GRADING IMPACTS

MCKAY CREEK CROSSING

DRAWN BY: DS	CHECKED BY: PAS	DWG: WATER QUALITY SWALE	JOB: 4094

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McKay Creek Crossing Table of Vegetation August 12, 2014			
Common Name	Scientific Name	Wetland Indicator Status	Native and Invasive, Noxious
Wetlands / Below OHWM			
Oregon ash	*Fraxinus latifolia*	FACW	native
red osier	*Cornus alba*	FACW	native
reed canary grass	*Phalaris arundinacea*	FACW	invasive
willow	*Salix species*	OBL to FAC	native
Pacific ninebark	*Physocarpus capitatus*	FACW	native
Uplands			
beaked hazelnut	*Corylus cornuta*	FACU	native
vine maple	*Acer circinatum*	FAC	native
big-leaf maple	*Acer macrophyllum*	FACU	native
red alder	*Alnus rubra*	FAC	native
taper-fruit short-scale sedge	*Carex leptopoda*	FAC	native
Canadian thistle	*Cirsium arvense*	FAC	invasive, noxious
Queen Anne's-lace	*Daucus carota*	FACU	non-native
Oregon ash	*Fraxinus latifolia*	FACW	native
cascara false buckthorn	*Frangula purshiana*	FAC	native
dovefoot geranium	*Geranium molle*	NOL	non-native
large-leaf avens	*Geum macrophyllum*	FAC	native
English ivy	*Hedera helix*	FACU	invasive, noxious
creambush	*Holodiscus discolor*	FACU	native
common velvet grass	*Holcus lanatus*	FAC	non-native
English holly	*Ilex aquifolium*	FACU	non-native
dull Oregon grape, Cascade Oregon-grape	*Mahonia nervosa*	FACU	native
oso-berry	*Oemleria cerasiformis*	FACU	native
King Solomon's-seal	*Polygonatum biflorum*	FACU	native
pineland sword fern	*Polystichum munitum*	FACU	native
Douglas-fir	*Pseudotsuga menziesii*	FACU	native
northern bracken fern	*Pteridium aquilinum*	FACU	native
Oregon white oak	*Quercus garryana*	FACU	native
Himalayan blackberry	*Rubus armeniacus*	FACU	invasive, noxious
western thimble-berry	*Rubus parviflorus*	FACU	native
California dewberry	*Rubus ursinus*	FACU	native
Scouler's willow	*Salix scouleriana*	FAC	native
red elder	*Sambucus racemosa*	FACU	native
tall false rye grass	*Schedonorus arundinaceus*	FAC	non-native
common snowberry	*Symphoricarpos albus*	FACU	native
stinging nettle	*Urtica dioica*	FAC	non-native invasive

Wetland Indicator Status and taxonomy for the Western Mountains, Valleys, and Coast Region per the National Wetland Plant List 2014v1.
Accessed April 25,2014. http://rsgisias.crrel.usace.army.mil/NWPL/

Native per Hitchcock & Cronquist 1973 and http://plants.usda.gov/
Invasive per Clean Water Services 2008: http://www.cleanwaterservices.org/PermitCenter/DesignAndConstruction/default
Noxious per ODA 2014: http://www.oregon.gov/ODA/PLANT/WEEDS/lists.shtml

WETLAND INDICATOR STATUS - Western Mountains, Valleys, and Coast Region	
OBL	**Obligate Wetland** Plant – Aalmost always occurs in wetlands (hydrophyte), rarely in uplands
FACW	**Facultative Wetland** Plant - Usually occur in wetlands (hydrophyte), but may occur found in non-wetlands
FAC	**Facultative** Plant – Occurs in wetlands (hydrophyte) and uplands (nonhydrophyte)
FACU	**Facultative Upland** Plant - Usually occur in non-wetlands (non-hydrophyte), but may occur in wetlands
UPL	**Upland** Plant - Almost always occurs in uplands (non-hydrophyte), almost never occurs in wetlands
NOL	**Not Listed** - Plants that are not on the list are assumed to be UPL

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: McKay Creek Crossing City/County: North Plains / Washington Sampling Date: 8/12/2014

Applicant/Owner: Biggi Construction State: OR Sampling Point: **P1**

Investigator(s): Stacey Reed and Anthony Vingiello Section, Township, Range: Sec 1DD, T1N, R3W

Landform (hillslope, terrace, etc.): Floodplain Terrace Local relief (concave, convex, none): Concave Slope (%): 3-5

Subregion (LRR): A, Northwest Forests and Coast Lat: Long: Datum:

Soil Map Unit Name: Unit 30- McBee silty clay loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks)

Are Vegetation ,Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ,Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	No **X**	**Is the Sampled Area within a Wetland?** Yes No **X**
Hydric Soil Present?	Yes	No **X**	
Wetland Hydrology Present?	Yes	No **X**	

Precipitation prior to fieldwork: 0.04 inches day of site visit and 0.01 inches 2 weeks prior in Hillsboro.

Remarks:

Plot located upslope of backwater channel in central portion of site.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer macrophyllum*	80%	Yes	FACU
2.			
3.			
4.			
	80% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Symphoricarpos albus*	40%	Yes	FACU
2. *Corylus cornuta*	10%	No	FACU
3. *Mahonia nervosa*	10%	No	FACU
4. *Oemleria cerasiformis*	5%	No	FACU
5.			
	65% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Polystichum munitum*	15%	Yes	FACU
2. *Geum macrophyllum*	15%	Yes	FAC
3. *Geranium molle*	10%	Yes	NOL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	40% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 60%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	15	x 3 =	45
FACU species	80	x 4 =	320
UPL species	10	x 5 =	50
Column Totals:	105 (A)		415 (B)

Prevalence Index = B/A = 3.95

Hydrophytic Vegetation Indicators:

- 1 - Rapid Test for Hydrophytic Vegetation
- 2 - Dominance Test is >50%
- 3 - Prevalence Index is ≤3.0[1]
- 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- 5 - Wetland Non-Vascular Plants[1]
- Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes No **X**

Remarks:

Entered by: AJV QC by: SAR

SOIL

Sampling Point: **P1**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12+	10YR3/2	100					SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** **X**

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes ___	No X	Depth (inches): >12
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): >12

Wetland Hydrology Present? **Yes** ___ **No** **X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Entered by: AJV QC by: SAR

Soils were very dry throughout. No secondary hydrology indicators.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: McKay Creek Crossing City/County: North Plains / Washington Sampling Date: 8/12/2014

Applicant/Owner: Biggi Construction State: OR Sampling Point: **P2**

Investigator(s): S. Reed, A. Vingiello Section, Township, Range: Sec 1DD, T1N, R3W

Landform (hillslope, terrace, etc.): Floodplain Terrace Local relief (concave, convex, none): None Slope (%): 3-5

Subregion (LRR): A, Northwest Forests and Coast Lat: Long: Datum:

Soil Map Unit Name: Unit 30- McBee silty clay loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks)

Are Vegetation ,Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ,Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes **X**	No	**Is the Sampled Area within a Wetland?** Yes ___ No **X**
Hydric Soil Present?	Yes	No **X**	
Wetland Hydrology Present?	Yes	No **X**	

Precipitation prior to fieldwork: 0.04 inches day of site visit and 0.01 inches 2 weeks prior in Hillsboro.

Remarks:

Plot located in somewhat flat area above OHWM of creek.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fraxinus latifolia*	30%	Yes	FACW
2. *Rhamnus purshiana*	10%	No	FAC
3. *Acer macrophyllum*	10%	No	FACU
4.			
	50%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Physocarpus capitatus*	30%	Yes	FACW
2. *Sambucus racemosa*	20%	Yes	FACU
3. *Holodiscus discolor*	10%	No	FACU
4. *Acer circinatum*	10%	No	FAC
5. *Oemlaria cerasiformis*	10%	No	FACU
	80%	= Total Cover	
Herb Stratum (Plot size: 5' r)			
1. *Geum macrophyllum*	10%	Yes	FAC
2. *Polystichum munitum*	5%	Yes	FACU
3. *Hedera helix*	3%	No	FACU
4. *Geranium molle*	2%	No	NOL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	20%	= Total Cover	
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0%	= Total Cover	

% Bare Ground in Herb Stratum 80%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	120
FAC species	30	x 3 =	90
FACU species	58	x 4 =	232
UPL species	2	x 5 =	10
Column Totals:	150 (A)		452 (B)

Prevalence Index = B/A = 3.01

Hydrophytic Vegetation Indicators:

- 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- 3 - Prevalence Index is ≤3.0[1]
- 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- 5 - Wetland Non-Vascular Plants[1]
- Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes **X** No

Remarks:

Entered by: AJV QC by: SAR

SOIL

Sampling Point: **P2**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16+	10YR 3/2	100					SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** **X**

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes ___	No X	Depth (inches): >16
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): >16

Wetland Hydrology Present? **Yes** ___ **No** **X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Entered by: AJV QC by: SAR

Soils very dry throuhgout. No secondary hydrology indicators.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: McKay Creek Crossing City/County: North Plains / Washington Sampling Date: 8/12/2014

Applicant/Owner: Biggi Construction State: OR Sampling Point: **P3**

Investigator(s): Stacey Reed and Anthony Vingiello Section, Township, Range: Sec 1DD, T1N, R3W

Landform (hillslope, terrace, etc.): Floodplain Terrace Local relief (concave, convex, none): Concave Slope (%): <3

Subregion (LRR): A, Northwest Forests and Coast Lat: Long: Datum:

Soil Map Unit Name: Unit 30- McBee silty clay loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks)

Are Vegetation ,Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ,Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No	**Is the Sampled Area within a Wetland?** Yes ___ No X
Hydric Soil Present?	Yes	No X	
Wetland Hydrology Present?	Yes	No X	

Precipitation prior to fieldwork: 0.04 inches day of site visit and 0.01 inches 2 weeks prior in Hillsboro.

Remarks:
Plot located upslope of small backwater channel in northern portion of site.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Alnus rubra*	80%	Yes	FAC
2.			
3.			
4.			
	80% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Acer circinatum*	30%	Yes	FAC
2. *Sambucus racemosa*	20%	Yes	FACU
3. *Frangula purshiana*	10%	No	FAC
4. *Symphoricarpos albus*	10%	No	FACU
5. *Oemleria cerasiformis*	5%	No	FACU
	75% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Geum macrophyllum*	20%	Yes	FAC
2. *Maianthemum racemosum*	10%	Yes	FAC
3. *Hedera helix*	10%	Yes	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	40% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1. *Rubus ursinus*	20%	Yes	FACU
2.			
	20% = Total Cover		

% Bare Ground in Herb Stratum 60%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 57% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	150	x 3 =	450
FACU species	65	x 4 =	260
UPL species	0	x 5 =	0
Column Totals:	215 (A)		710 (B)

Prevalence Index = B/A = 3.30

Hydrophytic Vegetation Indicators:

- 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- 3 - Prevalence Index is ≤3.0[1]
- 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- 5 - Wetland Non-Vascular Plants[1]
- Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes X No

Remarks: one ILEAQU

Entered by: AJV QC by: SAR

SOIL

Sampling Point: **P3**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16+	10YR3/2	100					Silt	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** **X**

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): >16
Water Table Present?	Yes ___	No X	Depth (inches): >16
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): >16

Wetland Hydrology Present? **Yes** ___ **No** **X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: AJV QC by: SAR

Photo A. View south of Riparian Corridor in southern portion of site.

Photo B. View north of Riparian Corridor in southern portion of site.

Photo C. View north of side channel associated with right bank of McKay Creek.

Photo D. View north of upland conditions upslope of the side channel, as documented at Plot 1.

Photos taken by Stacey Reed, August 12, 2013

Photo E. View north of Plot 1.

Photo G. View north of good condition Riparian Corridor on western side of McKay Creek in central portion of site.

Photo F. View northwest of Plot 2.

Photo H. View west of good condition Riparian Corridor in northern portion of site.

Photos taken by Stacey Reed, August 12, 2013

Photo I. View northwest of Plot 3.

Photo K. View southeast of good condition Riparian Corridor east of McKay Creek.

Photo J. View southeast of good condition Riparian Corridor on eastern side of McKay Creek.

Photo L. View southeast of wetland conditions in southeast portion of site.

Photos taken by Stacey Reed, August 12, 2013

Significant Natural Resource Assessment

SWCA
ENVIRONMENTAL CONSULTANTS
Sound Science. Creative Solutions.

Portland Office
1220 SW Morrison, Suite 700
Portland, Oregon 97205
Tel 503.224.0333 Fax 503.224.1851
www.swca.com

Significant Natural Resource Assessment

Date: October 14, 2014
To: City of North Plains Planning Department
CC: Vince Biggi, Biggi Construction
Alex Hurley, AKS Engineering & Forestry, LLC
From: Stacey Reed, Wetland Scientist
Subject: McKay Creek Crossing Residential Development
9960 NW 307th Ave, North Plains, Washington County Oregon
Tax lot 1601 of tax map 1N 3 01DD; 10.90 acres

INTRODUCTION

Biggi Construction is proposing residential development on a site (referred to as McKay Creek Crossing) located at 9960 NW 307th Avenue in North Plains, Washington County, Oregon (Figure 1). The study area is approximately 10.90 acres and consists of tax lot 1601 of tax map 1N 3 01DD (Figure 2). SWCA Environmental Consultants (SWCA) delineated the ordinary high water mark (OHWM) for the on-site portions of McKay Creek. No wetlands were documented on-site above the OHWM on the western side of the creek. Palustrine forested (PFO) wetlands were present in the southeast corner of the site, east of McKay Creek. The City of North Plains requires a 75-foot Riparian Corridor buffer extending from the top of bank (or OHWM) of McKay Creek or significant wetlands, whichever is further landward.

The project proposes residential development on the site. The project will result in a total of 11,446 square feet of permanent unavoidable encroachment within the 75-foot Riparian Corridor to accommodate site development, requiring a variance to Chapter 16.75 of the City's Development Code. Portions of the proposed Riparian Corridor impacts are associated with rear lots. The applicant requests a variance to utilize these areas for future residential use. Approximately 11,560 square feet of on-site replacement mitigation is proposed to offset the permanent encroachment within the Significant Riparian Corridor. The site plan will result in dedication of approximately 48 percent of the site as open space to preserve and protect the natural resources on the site. The proposed mitigation is consistent with Clean Water Services mitigation requirements and is located on-site and as close to the impacted area as possible. This memorandum has been prepared to meet Chapter 16.75 Significant Natural Resources (SNR) Overlay District of the City of North Plains Development Code.

BACKGROUND

The site is undeveloped. McKay Creek flows southerly in the eastern portion of the site. McKay Creek is a perennial tributary to the Tualatin River. According to the 2010 Oregon Department of Fish and

Wildlife (ODFW) essential salmonid habitat (ESH) map, McKay Creek within the project area is mapped as ESH.

An old cultivated apple orchard was present west of the riparian area during SWCA's August 12, 2014, site visit. Himalayan blackberry, beaked hazelnut, and other non-native weedy forbs were also dominant in the old apple orchard. A predominantly native mixed deciduous/coniferous riparian forest is present on the site adjacent to McKay Creek. The forest is dominated by big-leaf maple, Douglas-fir, Oregon white oak, red alder, cascara false buckthorn, common snowberry, creambush, California dewberry, vine maple, beaked hazelnut, dull Oregon grape, pineland sword fern, and English ivy. A list of all vegetation observed on the site and their scientific names is attached for reference.

Residential development is present west of the site. Agricultural land use is present north, south, and east of the site. The topography on the site is relatively flat (approximately 3–5% slope throughout) with a gently slope to the east toward McKay Creek.

According to the Natural Resources Conservation Service (NRCS) Washington County area soil survey, the following soil units are mapped on the site (Figure 3):

- Unit 30 – McBee silty clay loam;
- Unit 45A – Woodburn silt loam, 0% to 3% slopes;
- Unit 45B – Woodburn silt loam, 3% to 7% slopes

According to the NRCS Washington County, Oregon, hydric soil list, soils mapped on the site are not hydric; however, McBee silty clay loam (Unit 30) can have hydric Wapato soil and Cove inclusions in floodplains.

Wetlands are mapped throughout the eastern portion of the site on the City of North Plains' Local Wetlands Inventory (LWI) map (Figure 4). According to the LWI Wetland Characterization Sheet for Wetland Unit MK-5, the mapping of the wetlands on the site was conducted based on an off-site assessment using aerial photographs. Our site visit confirmed wetlands are not present on-site on the western side of McKay Creek. Forested wetlands are present in the southeast corner of the site, on the eastern side of McKay Creek. The forested canopy on the western side of the creek was primarily dominated by Douglas-fir and big-leaf maple trees, with only a few scattered Oregon ash trees.

EXISTING ON-SITE WATER QUALITY–SENSITIVE RESOURCES

Fieldwork for documenting site conditions and delineating the wetland boundaries was conducted in accordance with the U.S. Army Corps of Engineers' (Corps') *Regional Supplement to the Corps of*

Engineers Wetland Delineation Manual: Western Valleys, Mountains, and Coast Region on August 12, 2014, by Stacey Reed and Anthony Vingiello. Soils, vegetation, and indicators of hydrology were recorded at three sample plot locations to document site conditions. The water boundaries were flagged in the field and professionally land surveyed by AKS Engineering & Forestry, LLC (Figure 5). The OHWM for the on-site portions of McKay Creek was delineated in the field in accordance with Oregon Administrative Rule (OAR) 141-085-0515(3). The approximate on-site portions of the OHWM for the left bank were hand mapped based on visual on-site reconnaissance from the right bank and topographic interpretation.

McKay Creek

The OHWM was generally delineated based on a change in vegetation community from a facultative wetland (FACW)–dominated riparian community located below the OHWM of the creek (red osier, Pacific ninebark, Oregon ash, willow, reed canarygrass) to an upland plant community (facultative upland [FACU]–dominated community) located above the OHWM (beaked hazelnut, big-leaf maple, pineland sword fern, dull Oregon grape, creambush). No flood debris was observed above the delineated OHWM. Sediment marks and water staining were observed at the base of tree trunks below the delineated OHWM. Water staining and sediment deposits were not observed above the delineated OHWM. Two backwater side channels were delineated below the OHWM adjacent to the right bank of the creek. Approximately 57,644 square feet (1.32 acres) of perennial waters were delineated on the site.

Forested Wetlands

PFO wetland appears to be present in the southeastern portion of the site, adjacent to the left bank of the creek. This area is dominated by 100% Oregon ash canopy, with 100% cover of dense thickets of red osier in the understory (both FACW species). Due to access constraints, sample plots were not conducted in this area; however, based on the presence of a FACW-dominated plant community and low-elevation topography, this area appears to be wetland. The approximate wetland boundary was hand mapped on Figure 5 using topography and aerial photograph interpretation. Approximately 41,296 square feet (0.95 acre) of wetlands appear to be present on the site. Wetland conditions appear to extend off-site to the south and to the east. The on-site adjacent upland to the north is higher in elevation than the on-site low-elevation floodplain forested wetland. The change in land form also coincides with a change in the plant community from a FACW-dominated community in wetland to a FACU-dominated community in upland (Douglas-fir, big-leaf maple, beaked hazelnut, creambush, and pineland sword fern) that was visible from on-site reconnaissance and aerial photo interpretation. The extent of wetland on the site is only approximate. A wetland delineation will be required to determine the exact wetland boundary if future development is proposed in this portion of the site.

Upland Riparian

Plot 1 was located upslope of a backwater channel in the center of the site. Plot 1 was dominated by a non-hydrophytic vegetation community and lacked hydric soil and wetland hydrology indicators; therefore, it was determined to be upland.

Plot 2 documents the conditions of a somewhat flat area above the OHWM of the creek dominated by a hydrophytic vegetation community. However, Plot 2 lacked hydric soil and wetland hydrology indicators and was determined to be upland.

Plot 3 documents the conditions upslope of a small backwater area in the northern portion of the site. The vegetation at Plot 3 was also dominated by a hydrophytic plant community, but lacked hydric soils and wetland hydrology indicators.

The wetland determination data sheets and representative photos are attached for reference. Plot locations are shown on attached Figure 5.

EXTENT AND EXISTING CONDITION OF ON-SITE RIPARIAN CORRIDOR

According to Chapter 16.75 of the North Plains Development Code, McKay Creek requires a 75-foot setback from the top of bank or significant wetland, whichever is farther landward. Approximately 139,799 square feet (3.21 acres) of riparian corridor is present on the site. The extent of the on-site riparian corridor is shown on attached Figure 5, Existing Conditions.

The majority of the on-site riparian corridor was determined to be in *good* condition, according to Clean Water Services standards. The on-site riparian corridor contained greater than 50% canopy cover and greater than 80% cover by native vegetation species and was generally dominated by big-leaf maple, red alder, Douglas-fir, Oregon ash, cascara, beaked hazelnut, creambush, sword fern, common snowberry, and California dewberry.

The Riparian Corridor in the southern portion of the site was determined to be in *marginal* and *degraded* condition. The riparian communities in this area generally lacked tree canopy and were dominated by non-native grasses, forbs, and invasive Himalayan blackberry.

PROPOSED RIPARIAN CORRIDOR IMPACTS

The project proposes a 58-lot subdivision. Approximately 11,446 square feet of permanent encroachment is proposed within the outer edges of the 75-foot-wide Riparian Corridor (Significant Resource) to accommodate the rear of residential lots, the stormwater treatment swale, and a portion of the stormwater utility maintenance road, requiring a variance to Chapter 16.75 of the City's Development Code. The location and extent of the encroachment is shown on the attached site plan in Figure 6.

ALTERNATIVES ANALYSIS

The project site is encumbered with multiple environmental constraints including floodplain and floodway designations, McKay Creek, as well as Clean Water Services (CWS) vegetated corridor, and the City of North Plains Significant Natural Resource overlay zoning. Due to the constrained nature of the site, approximately 48 percent of the property will be set aside as open space to preserve and protect the natural resources on the site. Due to the environmental constraints and substantial amount of open space proposed, the proposed layout efficiently utilizes the remaining developable area as much as practicable. However, in order to provide properly sized streets, spaced blocks, infrastructure, as well as create lots with sufficiently sized buildable areas, the site plan includes minor encroachment within the outer edges of the Riparian Corridor for the rear of lots 6-9 and 15-25. We understand the City will allow residential lots within the 75 foot Riparian Corridor; however, we are requesting a variance to allow for the rear 25 feet of lots 6-9 and 15-25 to be accounted for as permanent encroachment within Riparian Corridor to accommodate future residential purposes (rear yard lawns and landscaping, children's play area, gardens, etc). Replacement mitigation is proposed to off-set the encroachment for these lots. As part of the mitigation (described in the subsequent section of this report), non-native invasive vegetation species will be removed from the proposed replacement mitigation area, which will provide an overall net benefit to the remaining resources on the site.

Due to the site constraints mentioned above (floodplain, topography) there are no other practical alternative locations that avoid impacts within the Significant Resource for the stormwater treatment facility and the associated conveyance outflow swale. The location of the treatment and conveyance swale is dictated by the location of the outfall. Due to the existing grade of the stormwater quality treatment swale, the treated outflow needs to discharge in an area with lower elevation, which occurs near the OHWM of McKay Creek. Therefore, there are no alternatives that avoid encroachment within the Riparian Corridor. An option is to hard pipe the outflow through the Riparian Corridor. Hard piping the outflow would not permanently change the existing grade, but trees could not be planted over the hard pipe. Therefore, this alternative was rejected as the proposed treatment and conveyance swale side slopes can be planted with native trees, providing shade and maintaining the function and values of the riparian corridor. The proposed alternative for the conveyance swale also avoids impact to McKay Creek (an Essential Salmonid Habitat stream). A detailed cross section, including proposed grading within the Riparian Corridor for the water quality swale, is shown on attached Figure 7. Since the side slopes of the swale will be planted with native woody vegetation, the grading to construct the side slopes of the swale are proposed as temporary encroachment within the Riparian Corridor on the attached site plan Figure 6. The bottom of the swale will be planted with native herbaceous vegetation; therefore, since the bottom of the swale cannot be restored to a forested riparian community, was depicted as permanent encroachment within the Significant Riparian Corridor.

PROPOSED RIPARIAN CORRIDOR MITIGATION

To mitigate for the 11,446 square feet of permanent encroachment within the Significant Riparian Corridor, approximately 11,560 square feet of replacement mitigation is proposed on-site continuous and adjacent to the existing on-site Riparian Corridor. The location of the proposed mitigation area is shown on the attached site plan, Figure 6, and it is located as close to the impact area as possible. The proposed replacement mitigation area is consistent with the mitigation requirements listed under Section 3.08 of CWS's Design and Construction Standards, Resolution and Order (R&O) 07. The proposed replacement mitigation area is currently dominated by a native forest and is considered to be in *good* condition according to CWS standards; therefore, an enhancement planting plan is not included with this submittal. However, non-dominant patches of non-native invasive vegetation species (English ivy and Himalayan blackberry) were noted within portions of the remaining 75-foot Riparian Corridor, including the proposed mitigation areas. We recommend non-native invasive vegetation be removed by hand and any cleared areas greater than 25 square feet be planted with native shrubs listed on CWS's plant list.

In addition to the removal of non-native invasive vegetation species from the 11,560 square foot Riparian Corridor mitigation area, the proposed site plan includes removal of non-native vegetation species from 81,794 square feet of CWS good condition corridor, and densely planting native trees and shrubs within 18,036 square feet of additional existing marginal and degraded condition vegetated corridor for CWS. The project will result in a total of 111,390 square feet (2.56 acres) of riparian enhancement, which will off-set the minor encroachment proposed within Riparian Corridor.

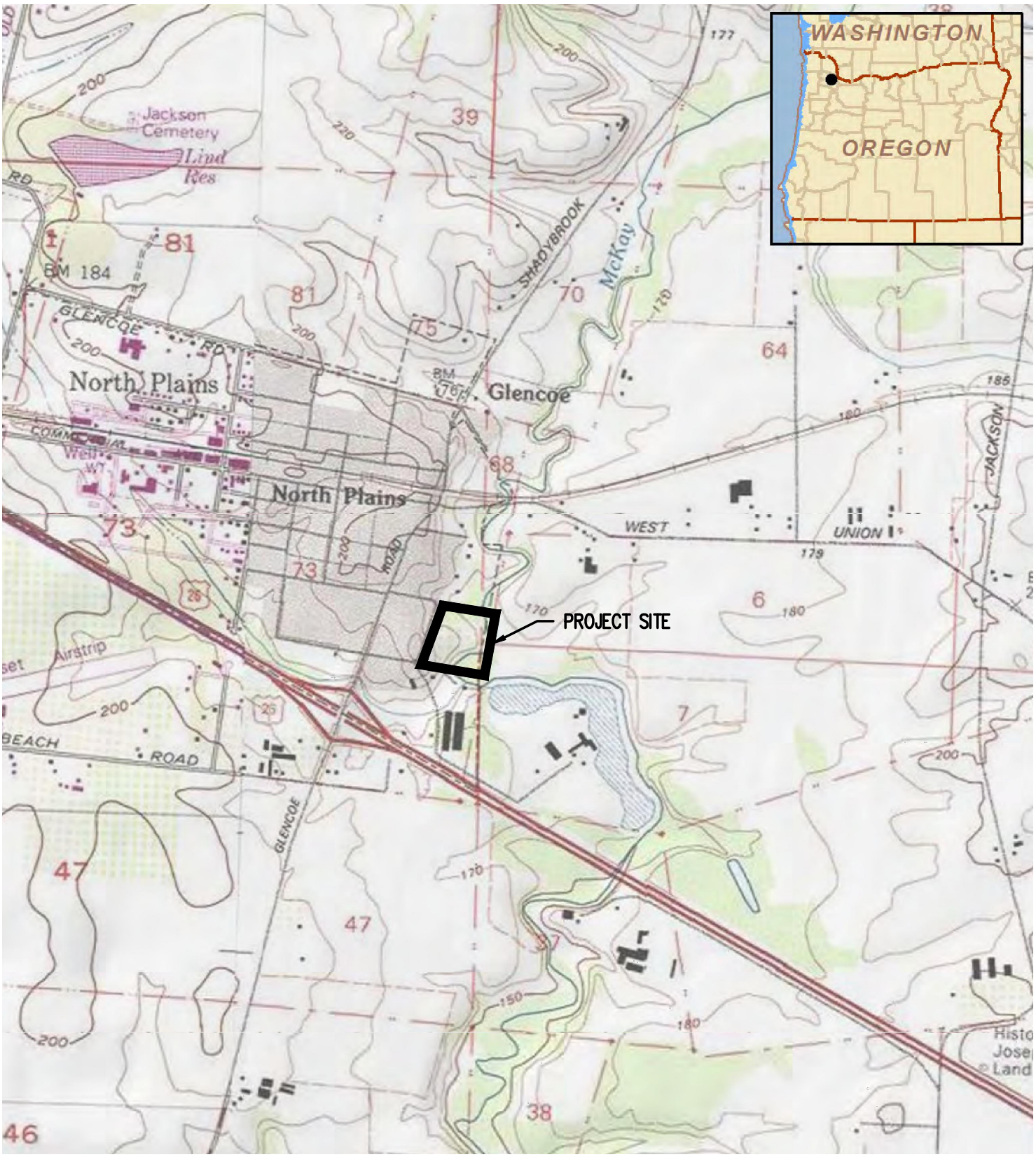
As mentioned, the remaining on-site vegetated corridor and the vegetated corridor mitigation area will be placed in a separate tract to protect them from future development. The open space will preserve and protect the remaining Riparian Corridor and the proposed replacement mitigation area.

List of Figures:

Figure 1. Site location map.
Figure 2. Tax lot map.
Figure 3. Soil survey map.
Figure 4. City of North Plains Local Wetland Inventory map.
Figure 5. Riparian Corridor existing conditions exhibit.
Figure 6. Riparian Corridor mitigation exhibit.
Figure 7. Riparian Corridor grading impacts.

Attachments:

Vegetation List
Wetland Determination Plots 1–3
Representative site photographs



SOURCE: USGS 7.5' TOPOGRAPHIC
QUADRANGLE: HILLSBORO, OR (1986)

PROJECT SITE

SCALE 1" = 1500 FEET

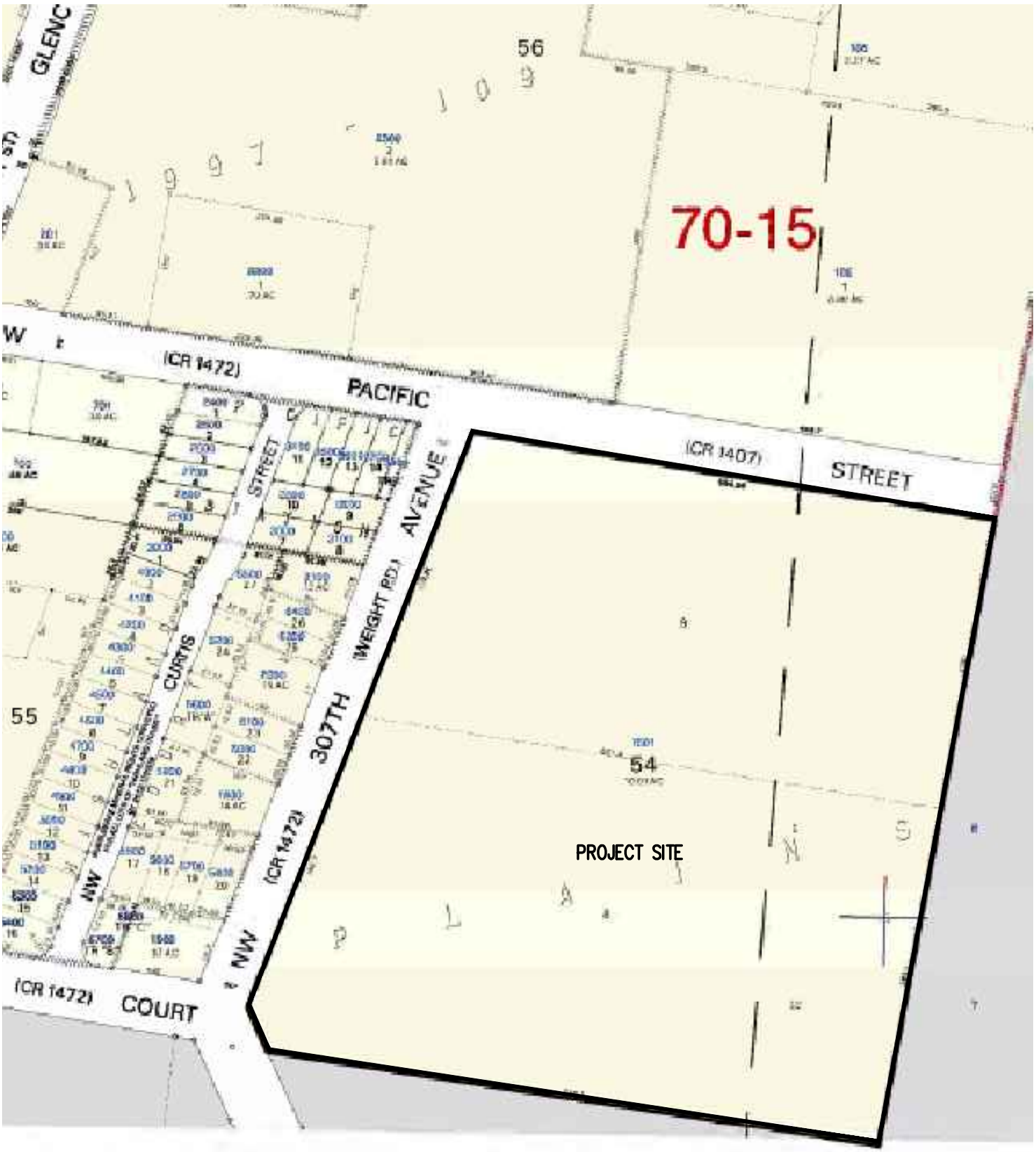
1500 0 600 900 1200 1500

FIGURE 1: SITE LOCATION MAP DATE: 11-04-2014

McKAY CREEK CROSSING

DRAWN BY: DS	CHECKED BY: PAS	DWG: 4094 SITE MAPS	JOB: 4094

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



WASHINGTON COUNTY ASSESSOR'S MAP
TAX LOT 1601 TAX MAP 1N 3 01DD

PROJECT SITE

SCALE 1" = 150 FEET

150 0 60 90 120 150

FIGURE 2: TAX LOT MAP DATE: 11-04-2014

McKAY CREEK CROSSING

DRAWN BY: DS	CHECKED BY: PAS	DWG: 4094 SITE MAPS	JOB: 4094

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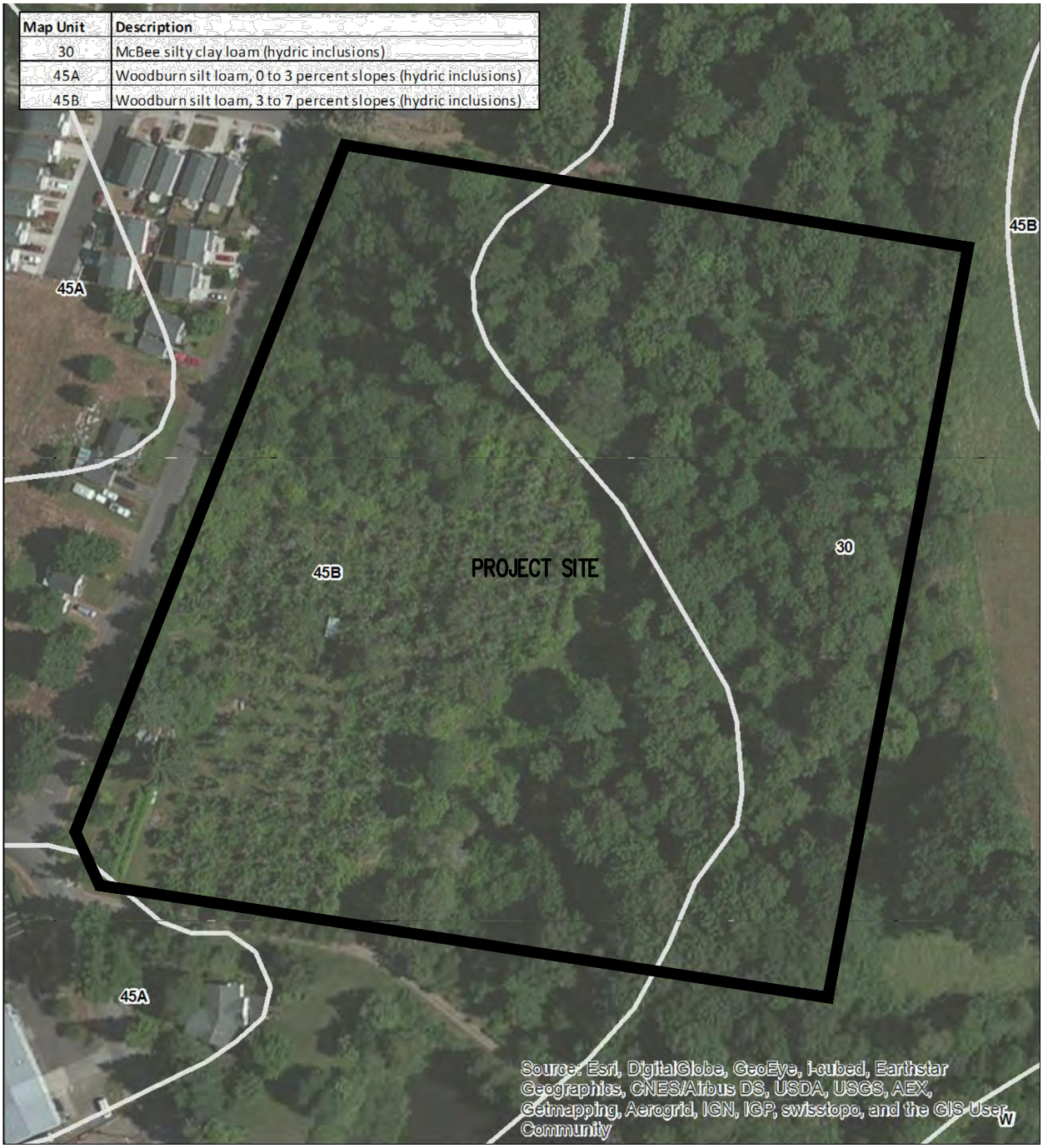

Map Unit	Description
30	McBee silty clay loam (hydric inclusions)
45A	Woodburn silt loam, 0 to 3 percent slopes (hydric inclusions)
45B	Woodburn silt loam, 3 to 7 percent slopes (hydric inclusions)

PROJECT SITE

SCALE 1" = 150 FEET

150 0 60 90 120 150

FIGURE 3: SOIL SURVEY MAP DATE: 11-04-2014

McKAY CREEK CROSSING

DRAWN BY: DS | CHECKED BY: PAS | DWG: 4094 SITE MAPS | JOB: 4094

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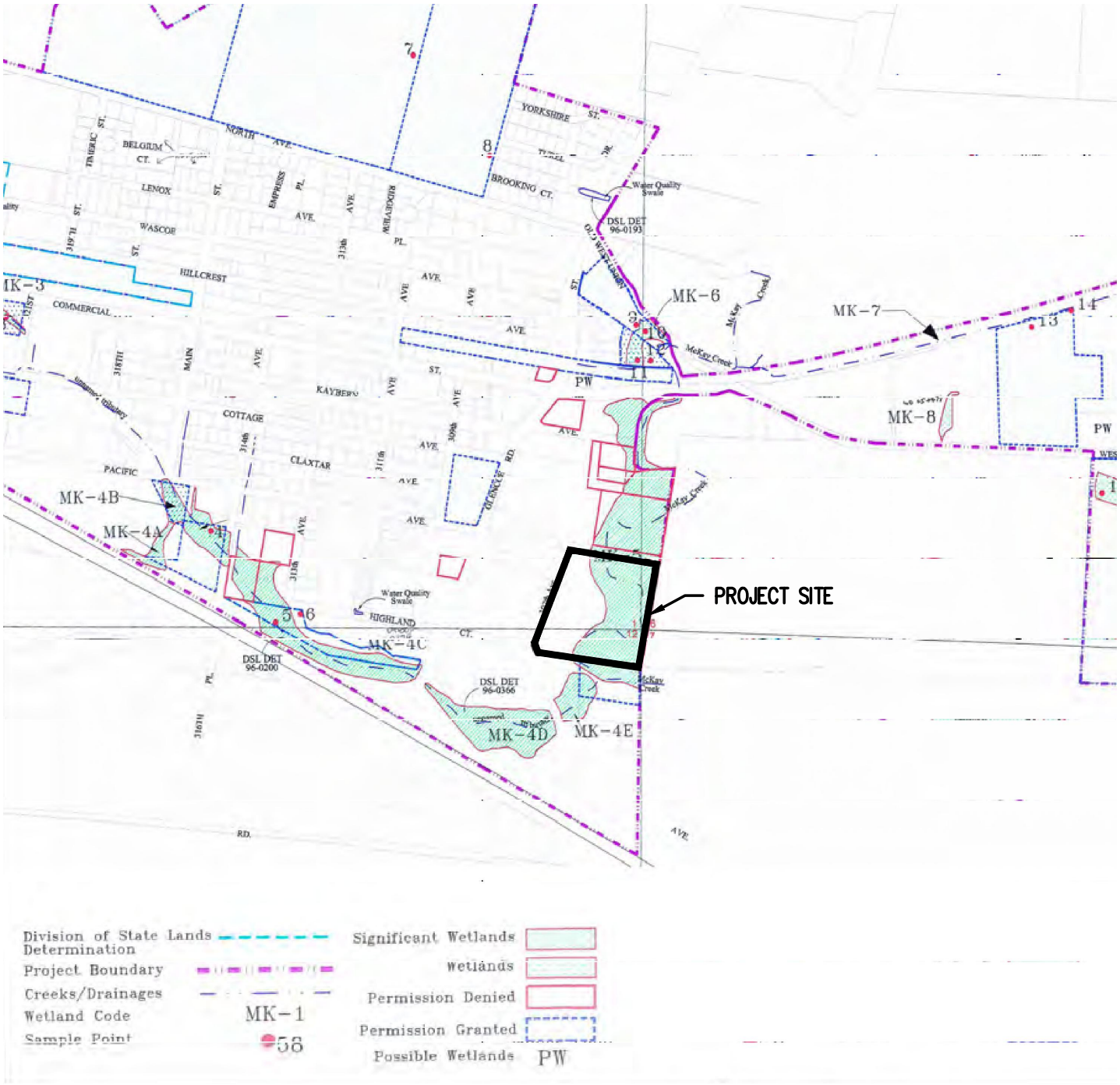

SOURCE: NORTH PLAINS LOCAL WETLAND INVENTORY (2012)

PROJECT SITE

SCALE 1" = 1000 FEET

1000 0 400 600 8001000

FIGURE 4: CITY OF NORTH PLAINS LOCAL WETLANDS INVENTORY MAP

DATE: 11-04-2014

McKAY CREEK CROSSING

DRAWN BY: DS	CHECKED BY: PAS	DWG: 4094 SITE MAPS	JOB: 4094

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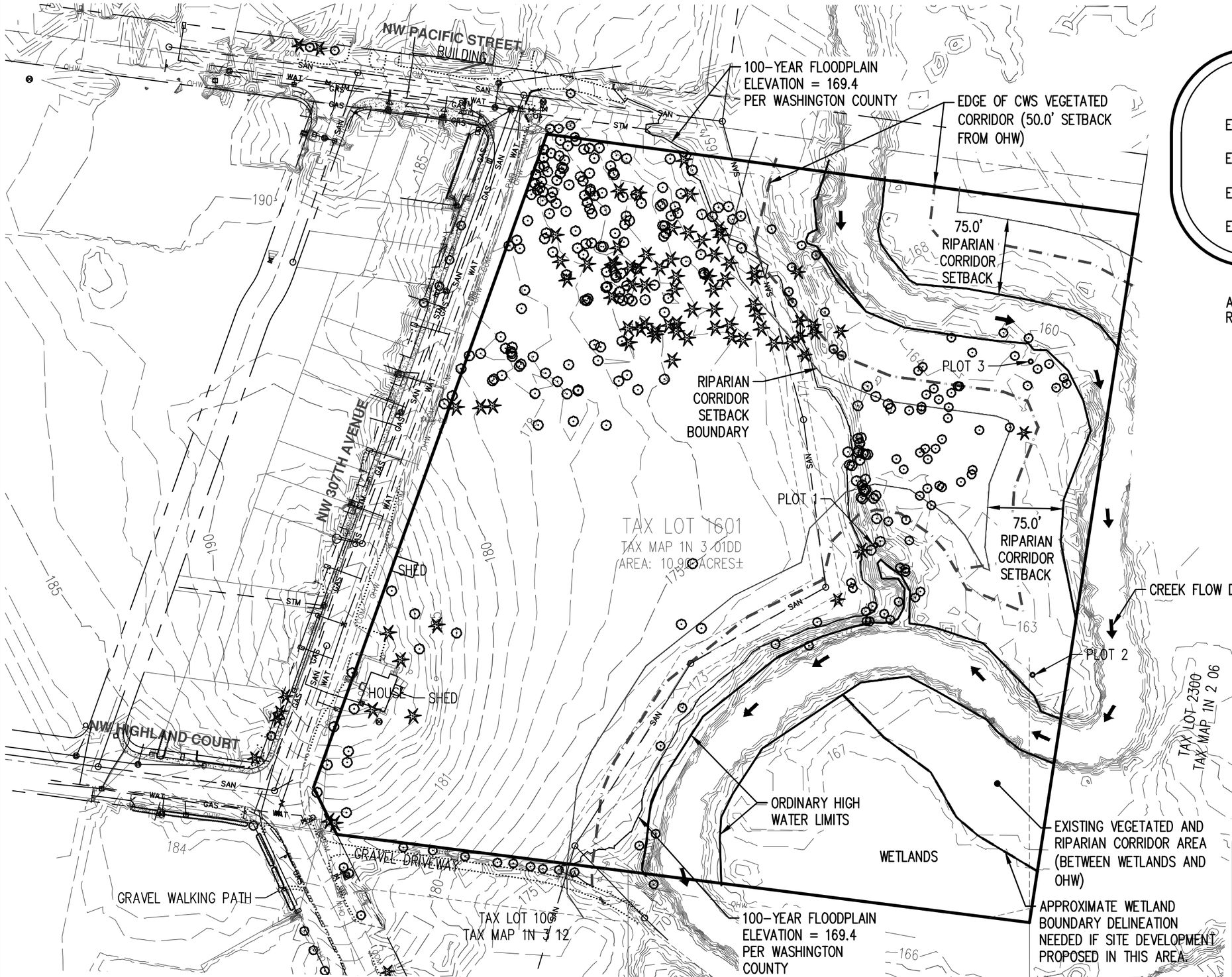

LEGEND

EXISTING GROUND CONTOUR (1 FT)	
EXISTING GROUND CONTOUR (5 FT)	180
EXISTING CONIFEROUS TREE	
EXISTING DECIDUOUS TREE	

APPROXIMATELY 139,799 (3.21 ACRES) OF SIGNIFICANT RIPARIAN CORRIDOR PRESENT ONSITE.

SCALE 1" = 100 FEET

100 0 40 60 80 100

FIGURE 5

DATE: 11-03-2014

CITY OF NORTH PLAINS
RIPARIAN CORRIDOR EXISTING CONDITIONS EXHIBIT

McKAY CREEK CROSSING

DRAWN BY: SDL	CHECKED BY: PAS	DWG: RIPARIAN EXISTING	JOB: 4094

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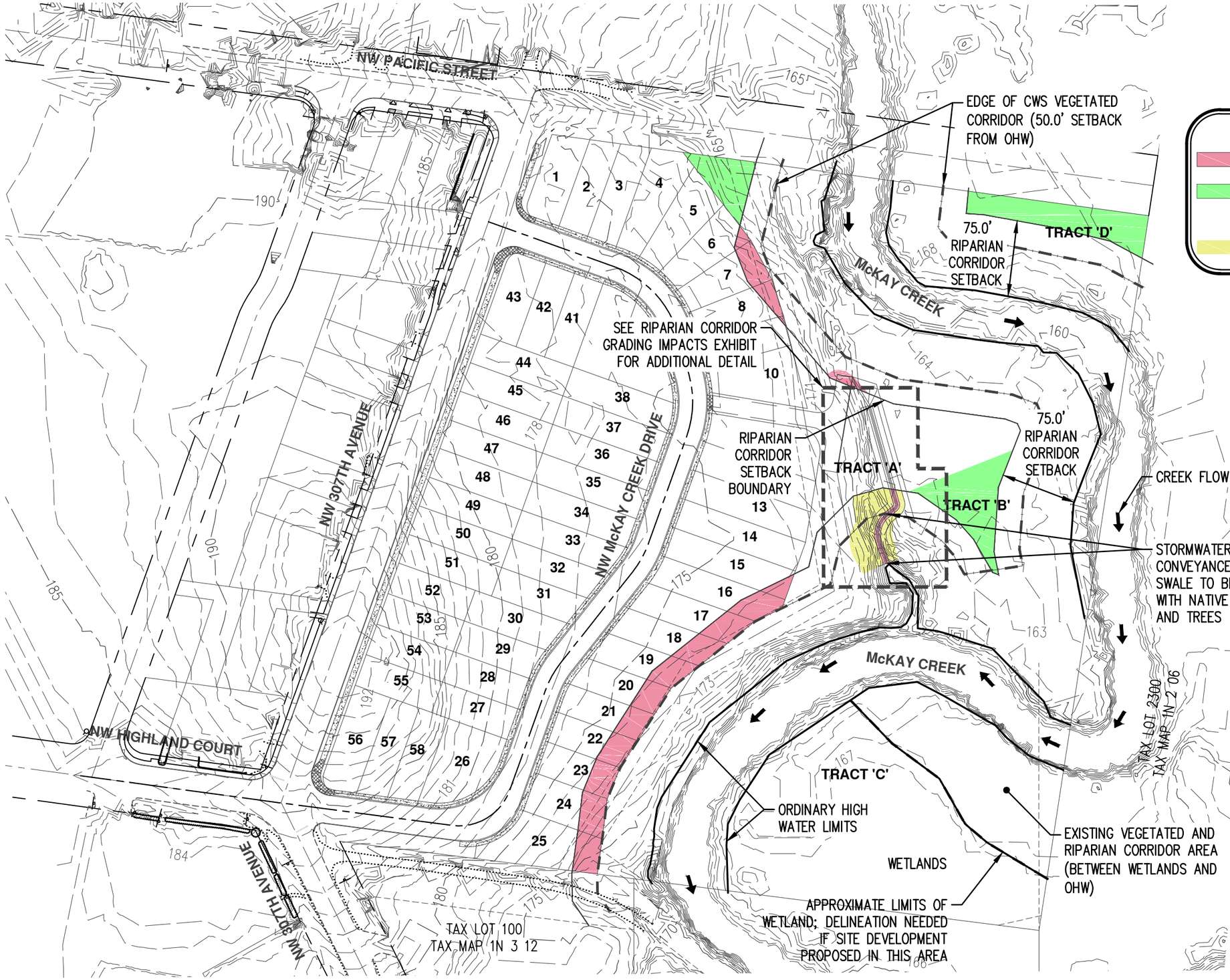

LEGEND

RIPARIAN CORRIDOR PERMANENT IMPACT AREA	= 11,446 SQ. FT.
RIPARIAN CORRIDOR MITIGATION AREA	= 11,560 SQ. FT.
NET MITIGATION	= 114 SQ. FT.
RIPARIAN CORRIDOR TEMPORARY IMPACT AREA	= 2,804 SQ. FT.

THE EXISTING CONDITION OF THE PROPOSED RIPARIAN CORRIDOR MITIGATION AREA IS CONSIDERED TO BE IN GOOD CONDITION. HOWEVER, ANY NON-NATIVE INVASIVE VEGETATION SPECIES SHALL BE REMOVED BY HAND AND CLEARED AREAS RESULTING IN >25 SF SHALL BE REPLANTED WITH NATIVE SHRUBS LISTED ON CLEAN WATER SERVICES NATIVE PLANT LIST.

TEMPORARY IMPACTED RIPARIAN CORRIDOR WILL BE PLANTED WITH NATIVE SHRUBS PER CWS STANDARDS.

SCALE 1" = 100 FEET

100 0 40 60 80 100

COLOR COPY

FIGURE 6

DATE: 11-04-2014

CITY OF NORTH PLAINS
RIPARIAN CORRIDOR MITIGATION EXHIBIT

McKAY CREEK CROSSING

DRAWN BY: SDL	CHECKED BY: PAS	DWG: RIPARIAN MITIGATION	JOB: 4094

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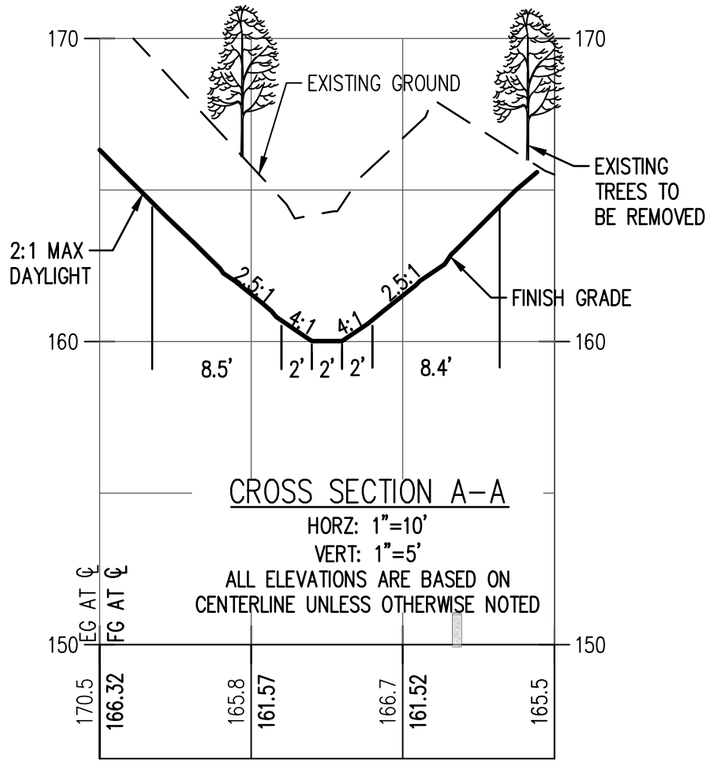

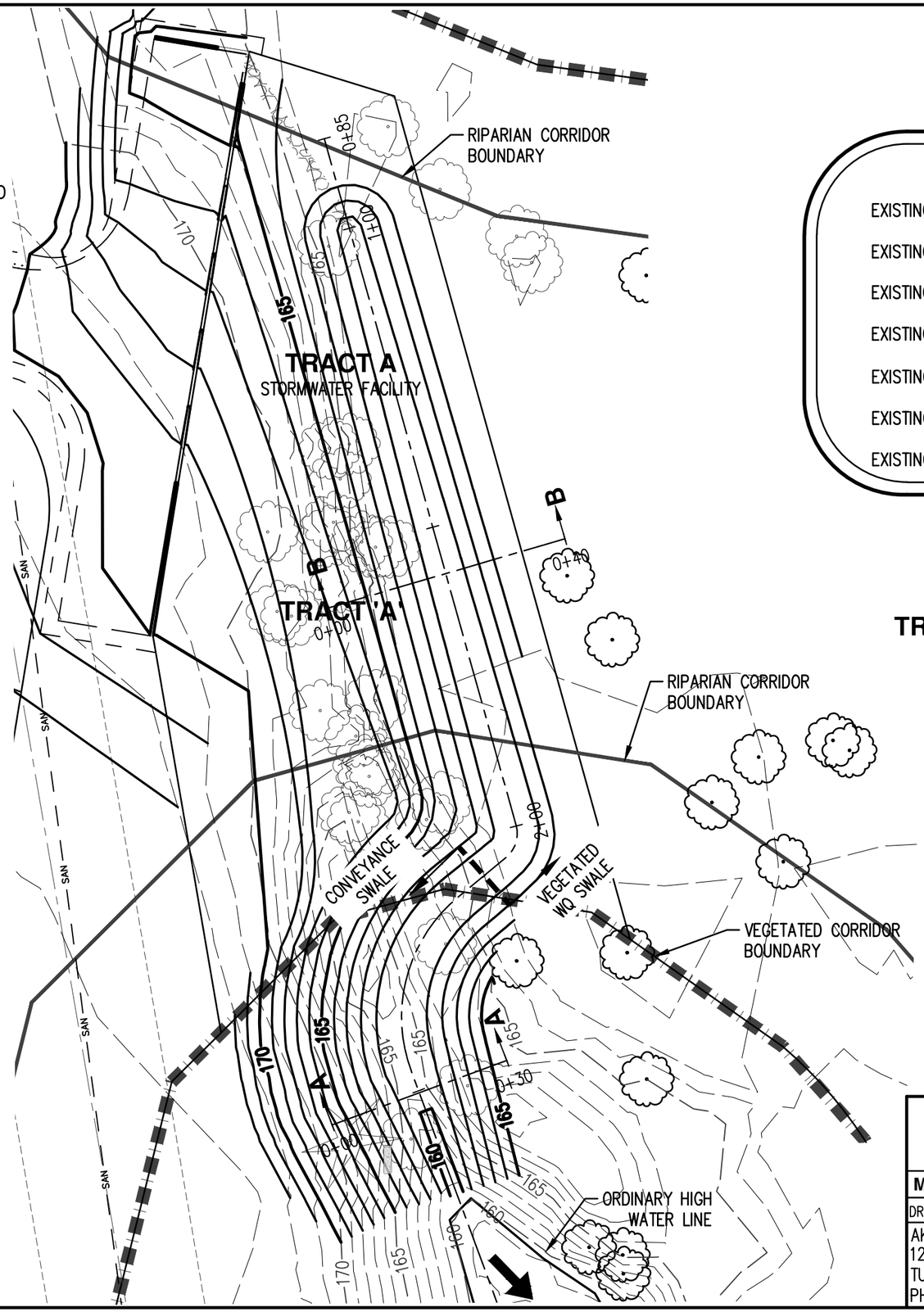

LEGEND

EXISTING GROUND CONTOUR (1 FT)	
EXISTING GROUND CONTOUR (5 FT)	180
EXISTING GROUND CONTOUR (1 FT)	
EXISTING GROUND CONTOUR (5 FT)	180
EXISTING CONIFEROUS TREE	
EXISTING DECIDUOUS TREE	
EXISTING TREE TO BE REMOVED	

TR

SCALE 1" = 20 FEET

20 0 8 12 16 20

FIGURE 7

DATE: 11-04-2014

RIPARIAN CORRIDOR GRADING IMPACTS

MCKAY CREEK CROSSING

DRAWN BY: DS	CHECKED BY: PAS	DWG: WATER QUALITY SWALE	JOB: 4094

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McKay Creek Crossing Table of Vegetation August 12, 2014			
Common Name	Scientific Name	Wetland Indicator Status	Native and Invasive, Noxious
Wetlands / Below OHWM			
Oregon ash	*Fraxinus latifolia*	FACW	native
red osier	*Cornus alba*	FACW	native
reed canary grass	*Phalaris arundinacea*	FACW	invasive
willow	*Salix species*	OBL to FAC	native
Pacific ninebark	*Physocarpus capitatus*	FACW	native
Uplands			
beaked hazelnut	*Corylus cornuta*	FACU	native
vine maple	*Acer circinatum*	FAC	native
big-leaf maple	*Acer macrophyllum*	FACU	native
red alder	*Alnus rubra*	FAC	native
taper-fruit short-scale sedge	*Carex leptopoda*	FAC	native
Canadian thistle	*Cirsium arvense*	FAC	invasive, noxious
Queen Anne's-lace	*Daucus carota*	FACU	non-native
Oregon ash	*Fraxinus latifolia*	FACW	native
cascara false buckthorn	*Frangula purshiana*	FAC	native
dovefoot geranium	*Geranium molle*	NOL	non-native
large-leaf avens	*Geum macrophyllum*	FAC	native
English ivy	*Hedera helix*	FACU	invasive, noxious
creambush	*Holodiscus discolor*	FACU	native
common velvet grass	*Holcus lanatus*	FAC	non-native
English holly	*Ilex aquifolium*	FACU	non-native
dull Oregon grape, Cascade Oregon-grape	*Mahonia nervosa*	FACU	native
oso-berry	*Oemleria cerasiformis*	FACU	native
King Solomon's-seal	*Polygonatum biflorum*	FACU	native
pineland sword fern	*Polystichum munitum*	FACU	native
Douglas-fir	*Pseudotsuga menziesii*	FACU	native
northern bracken fern	*Pteridium aquilinum*	FACU	native
Oregon white oak	*Quercus garryana*	FACU	native
Himalayan blackberry	*Rubus armeniacus*	FACU	invasive, noxious
western thimble-berry	*Rubus parviflorus*	FACU	native
California dewberry	*Rubus ursinus*	FACU	native
Scouler's willow	*Salix scouleriana*	FAC	native
red elder	*Sambucus racemosa*	FACU	native
tall false rye grass	*Schedonorus arundinaceus*	FAC	non-native
common snowberry	*Symphoricarpos albus*	FACU	native
stinging nettle	*Urtica dioica*	FAC	non-native invasive

Wetland Indicator Status and taxonomy for the Western Mountains, Valleys, and Coast Region per the National Wetland Plant List 2014v1.
Accessed April 25,2014. http://rsgisias.crrel.usace.army.mil/NWPL/

Native per Hitchcock & Cronquist 1973 and http://plants.usda.gov/
Invasive per Clean Water Services 2008: http://www.cleanwaterservices.org/PermitCenter/DesignAndConstruction/default
Noxious per ODA 2014: http://www.oregon.gov/ODA/PLANT/WEEDS/lists.shtml

WETLAND INDICATOR STATUS - Western Mountains, Valleys, and Coast Region	
OBL	**Obligate Wetland** Plant – Aalmost always occurs in wetlands (hydrophyte), rarely in uplands
FACW	**Facultative Wetland** Plant - Usually occur in wetlands (hydrophyte), but may occur found in non-wetlands
FAC	**Facultative** Plant – Occurs in wetlands (hydrophyte) and uplands (nonhydrophyte)
FACU	**Facultative Upland** Plant - Usually occur in non-wetlands (non-hydrophyte), but may occur in wetlands
UPL	**Upland** Plant - Almost always occurs in uplands (non-hydrophyte), almost never occurs in wetlands
NOL	**Not Listed** - Plants that are not on the list are assumed to be UPL

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: McKay Creek Crossing City/County: North Plains / Washington Sampling Date: 8/12/2014

Applicant/Owner: Biggi Construction State: OR Sampling Point: **P1**

Investigator(s): Stacey Reed and Anthony Vingiello Section, Township, Range: Sec 1DD, T1N, R3W

Landform (hillslope, terrace, etc.): Floodplain Terrace Local relief (concave, convex, none): Concave Slope (%): 3-5

Subregion (LRR): A, Northwest Forests and Coast Lat: Long: Datum:

Soil Map Unit Name: Unit 30- McBee silty clay loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks)

Are Vegetation ,Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ,Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	No X	**Is the Sampled Area within a Wetland?** Yes No X
Hydric Soil Present?	Yes	No X	
Wetland Hydrology Present?	Yes	No X	

Precipitation prior to fieldwork: 0.04 inches day of site visit and 0.01 inches 2 weeks prior in Hillsboro.

Remarks:

Plot located upslope of backwater channel in central portion of site.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer macrophyllum*	80%	Yes	FACU
2.			
3.			
4.			
	80% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Symphoricarpos albus*	40%	Yes	FACU
2. *Corylus cornuta*	10%	No	FACU
3. *Mahonia nervosa*	10%	No	FACU
4. *Oemleria cerasiformis*	5%	No	FACU
5.			
	65% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Polystichum munitum*	15%	Yes	FACU
2. *Geum macrophyllum*	15%	Yes	FAC
3. *Geranium molle*	10%	Yes	NOL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	40% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 60%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	15	x 3 =	45
FACU species	80	x 4 =	320
UPL species	10	x 5 =	50
Column Totals:	105 (A)		415 (B)

Prevalence Index = B/A = 3.95

Hydrophytic Vegetation Indicators:

- 1 - Rapid Test for Hydrophytic Vegetation
- 2 - Dominance Test is >50%
- 3 - Prevalence Index is ≤3.0[1]
- 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- 5 - Wetland Non-Vascular Plants[1]
- Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes No X

Remarks:

Entered by: AJV QC by: SAR

SOIL

Sampling Point: **P1**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12+	10YR3/2	100					SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** X

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes ___	No X	Depth (inches): >12
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): >12

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Entered by: AJV QC by: SAR

Soils were very dry throughout. No secondary hydrology indicators.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: McKay Creek Crossing City/County: North Plains / Washington Sampling Date: 8/12/2014

Applicant/Owner: Biggi Construction State: OR Sampling Point: **P2**

Investigator(s): S. Reed, A. Vingiello Section, Township, Range: Sec 1DD, T1N, R3W

Landform (hillslope, terrace, etc.): Floodplain Terrace Local relief (concave, convex, none): None Slope (%): 3-5

Subregion (LRR): A, Northwest Forests and Coast Lat: Long: Datum:

Soil Map Unit Name: Unit 30- McBee silty clay loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks)

Are Vegetation ,Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ,Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes **X**	No	**Is the Sampled Area within a Wetland?** Yes ___ No **X**
Hydric Soil Present?	Yes	No **X**	
Wetland Hydrology Present?	Yes	No **X**	

Precipitation prior to fieldwork: 0.04 inches day of site visit and 0.01 inches 2 weeks prior in Hillsboro.

Remarks:

Plot located in somewhat flat area above OHWM of creek.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fraxinus latifolia*	30%	Yes	FACW
2. *Rhamnus purshiana*	10%	No	FAC
3. *Acer macrophyllum*	10%	No	FACU
4.			
	50%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Physocarpus capitatus*	30%	Yes	FACW
2. *Sambucus racemosa*	20%	Yes	FACU
3. *Holodiscus discolor*	10%	No	FACU
4. *Acer circinatum*	10%	No	FAC
5. *Oemlaria cerasiformis*	10%	No	FACU
	80%	= Total Cover	
Herb Stratum (Plot size: 5' r)			
1. *Geum macrophyllum*	10%	Yes	FAC
2. *Polystichum munitum*	5%	Yes	FACU
3. *Hedera helix*	3%	No	FACU
4. *Geranium molle*	2%	No	NOL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	20%	= Total Cover	
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0%	= Total Cover	

% Bare Ground in Herb Stratum 80%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	120
FAC species	30	x 3 =	90
FACU species	58	x 4 =	232
UPL species	2	x 5 =	10
Column Totals:	150 (A)		452 (B)

Prevalence Index = B/A = 3.01

Hydrophytic Vegetation Indicators:

- 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- 3 - Prevalence Index is ≤3.0[1]
- 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- 5 - Wetland Non-Vascular Plants[1]
- Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes **X** No

Remarks:

Entered by: AJV QC by: SAR

SOIL

Sampling Point: **P2**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16+	10YR 3/2	100					SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** ___ **No** X

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___	
Water Table Present?	Yes ___	No X	Depth (inches): >16	**Wetland Hydrology Present?**
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): >16	**Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Entered by: AJV QC by: SAR

Soils very dry throuhgout. No secondary hydrology indicators.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: McKay Creek Crossing City/County: North Plains / Washington Sampling Date: 8/12/2014

Applicant/Owner: Biggi Construction State: OR Sampling Point: **P3**

Investigator(s): Stacey Reed and Anthony Vingiello Section, Township, Range: Sec 1DD, T1N, R3W

Landform (hillslope, terrace, etc.): Floodplain Terrace Local relief (concave, convex, none): Concave Slope (%): <3

Subregion (LRR): A, Northwest Forests and Coast Lat: Long: Datum:

Soil Map Unit Name: Unit 30- McBee silty clay loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks)

Are Vegetation ,Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ,Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes **X**	No	**Is the Sampled Area within a Wetland?** Yes ___ No **X**
Hydric Soil Present?	Yes	No **X**	
Wetland Hydrology Present?	Yes	No **X**	

Precipitation prior to fieldwork: 0.04 inches day of site visit and 0.01 inches 2 weeks prior in Hillsboro.

Remarks:

Plot located upslope of small backwater channel in northern portion of site.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Alnus rubra*	80%	Yes	FAC
2.			
3.			
4.			
	80% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Acer circinatum*	30%	Yes	FAC
2. *Sambucus racemosa*	20%	Yes	FACU
3. *Frangula purshiana*	10%	No	FAC
4. *Symphoricarpos albus*	10%	No	FACU
5. *Oemleria cerasiformis*	5%	No	FACU
	75% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Geum macrophyllum*	20%	Yes	FAC
2. *Maianthemum racemosum*	10%	Yes	FAC
3. *Hedera helix*	10%	Yes	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	40% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1. *Rubus ursinus*	20%	Yes	FACU
2.			
	20% = Total Cover		

% Bare Ground in Herb Stratum 60%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 57% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	150	x 3 =	450
FACU species	65	x 4 =	260
UPL species	0	x 5 =	0
Column Totals:	215 (A)		710 (B)

Prevalence Index = B/A = 3.30

Hydrophytic Vegetation Indicators:

- 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- 3 - Prevalence Index is ≤3.0[1]
- 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- 5 - Wetland Non-Vascular Plants[1]
- Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes **X** No

Remarks: one ILEAQU

Entered by: AJV QC by: SAR

SOIL

Sampling Point: **P3**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16+	10YR3/2	100					Silt	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** X

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): >16
Water Table Present?	Yes ___	No X	Depth (inches): >16
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): >16

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: AJV QC by: SAR

Photo A. View south of Riparian Corridor in southern portion of site.

Photo B. View north of Riparian Corridor in southern portion of site.

Photo C. View north of side channel associated with right bank of McKay Creek.

Photo D. View north of upland conditions upslope of the side channel, as documented at Plot 1.

Photos taken by Stacey Reed, August 12, 2013

Photo E. View north of Plot 1.

Photo G. View north of good condition Riparian Corridor on western side of McKay Creek in central portion of site.

Photo F. View northwest of Plot 2.

Photo H. View west of good condition Riparian Corridor in northern portion of site.

Photos taken by Stacey Reed, August 12, 2013

Photo I. View northwest of Plot 3.

Photo K. View southeast of good condition Riparian Corridor east of McKay Creek.

Photo J. View southeast of good condition Riparian Corridor on eastern side of McKay Creek.

Photo L. View southeast of wetland conditions in southeast portion of site.

Photos taken by Stacey Reed, August 12, 2013

Preliminary Stormwater Report

McKay Creek Crossing
North Plains, Oregon

Preliminary Stormwater Report

Date: November 7, 2014

Client: Biggi Construction LLC
11605 SW Normandy Lane
Wilsonville, OR 97070

Engineering Contact: Paul Sellke, PE, GE
PaulS@aks-eng.com

Engineering Firm: AKS Engineering & Forestry, LLC.

AKS Engineering & Forestry

12965 SW Herman Road, Suite 100
Tualatin, OR 97062
P: (503) 563-6151
www.aks-eng.com

McKay Creek Crossing
North Plains, Oregon

Preliminary Stormwater Report

Date: November 7, 2014

Client: Biggi Construction LLC
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REGISTERED PROFESSIONAL ENGINEER
65688PE
OREGON
JULY 09, 2001
PAUL A. SELLKE
PRELIMINARY
RENEWAL: JUNE 30, 2016

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AKS ENGINEERING & FORESTRY, LLC
ENGINEERING / SURVEYING / PLANNING / FORESTRY
LANDSCAPE ARCHITECTURE / ARBORICULTURE

PRELIMINARY STORMWATER REPORT

MCKAY CREEK CROSSING
NORTH PLAINS, OREGON

1.0 PURPOSE OF REPORT

The purpose of this report is to analyze the effects the proposed development will have on the existing stormwater conveyance system, document the criteria, methodology, and informational sources by which the proposed stormwater system was designed, and present the results of the preliminary analysis.

2.0 PROJECT LOCATION/DESCRIPTION

The proposed residential subdivision will be located at the property identified as 9960 NW 307th Avenue, North Plains, OR 97133. The 10.90 acre parcel (Tax Lot 1601, 1N 3 01DD) is situated on the east side of NW 307th Avenue between NW Pacific Street and NW Highland Court in Washington County, Oregon.

The proposed project includes the creation of a 58 residential lot subdivision containing single-family detached homes. The site improvements include the construction of a public street, a stormwater quality swale in Tract A and partial streets improvements along the east side of NW 307th Avenue. Underground utilities which will be constructed include a stormwater collection and conveyance system.

3.0 REGULATORY DESIGN CRITERIA

3.1 STORMWATER QUANTITY

Per *Clean Water Services (CWS) Design and Construction Standards Manual for Sanitary Sewer and Surface Water Management (R&O 07-20), Section 4.03 Water Quantity Control Requirements*, on-site detention is required when any of the following conditions exist:

1. *There is an identified downstream deficiency and the District or City determines that detention rather than conveyance system enlargement is the more effective solution.*

2. *There is an identified regional detention site within the boundary of the development.*

3. *Water quantity facilities are required by District-adopted watershed management plans or adopted subbasin master plans.*

A downstream analysis has been performed (see attached HydroCAD calculations and Section 6.3 for additional information) and stormwater detention is not required per Clean Water Service's *Design and Construction for Sanitary Sewer and Surface Water Management Manual* (R&O 07-20).

3.2 STORMWATER QUALITY

Stormwater Quality management for this project will be provided by utilizing a vegetated swale which has been designed per the requirements of the Clean Water Services *Design and Construction Standards for Sanitary Sewer and Surface Water Management (R&O 07-20).*

4.0 DESIGN METHODOLOGY

The Santa Barbara Urban Hydrograph (SBUH) Method was used to analyze stormwater runoff from the site. This method utilizes the SCS Type 1A 24-hour design storm. HydroCAD computer software aided in the analysis. Representative CN numbers are obtained from the *Technical Release 55* and are included in the Appendix. Water quality flow volumes that require treatment were calculated per section 4.05.06 of *CWS R&O 07-20*.

5.0 DESIGN PARAMETERS

5.1 DESIGN STORM – ON-SITE CONVEYANCE SIZING

Private stormwater mains, inlets, laterals, and the stormwater quality swale will be sized to adequately control the stormwater for the site and will be addressed in the final stormwater report. The stormwater pipes will be sized using Manning's equation based on peak flows for the 25-year storm event.

5.2 PRE-DEVELOPED SITE CONDITIONS

5.2.1 Site Topography

Existing on-site grades generally vary from 5% to 10% with a high point at +/- 192 feet located west of the existing house and a low point of +/- 155 feet near McKay Creek. The site generally slopes west to east towards McKay Creek.

5.2.2 Land Use

The existing site consist of a single-family residential house with associated outbuildings, gravel driveway, concrete sidewalk and associated landscaping areas around the house. The remainder of the property contains an abandoned hazelnut orchard or consists of native vegetation and trees along the banks of McKay Creek.

5.3 Soil Type

The soils beneath the project site and the associated drainage basins are classified as McBee Silty Clay Loam and Woodburn Silt Loam according to the USDA Soil Survey for Washington County. The following table outlines the Hydrologic Soil Group rating for each soil type:

Table 5.3

NRCS Map Unit Identification	NRCS Soil Classification	Hydrologic Soil Group Rating
30	McBee Silty Clay Loam	C
45	Woodburn Silt Loam	C

For this project, the hydraulic analysis utilized the Hydrologic Soil Group rating of C for the soils anticipated across the project site and its associated drainage basins. Information on the soil types are included in the NRCS Soil Resource Report which is attached as an appendix at the end of this report.

5.4 POST DEVELOPED SITE CONDITIONS

5.4.1 Site Topography

The onsite slopes will be modified with cuts and fills to accommodate the construction of the public street and stormwater quality facility. Additionally, gently sloped residential building pads will be constructed adjacent to the public right-of-way.

5.4.2 Land Use

The site land-use will remain single-family residential with the construction of a new 58-lot subdivision with associated streets, sidewalks and underground utilities.

5.4.3 Post-Developed Input Parameters

See HydroCAD Analysis in the attached appendices.

5.5 DESCRIPTION OF OFF-SITE CONTRIBUTORY BASINS

No off-site contributory basins drain onto the subject site except for the street improvements along NW 307th Avenue. The existing subdivisions and the surrounding properties currently drain towards and utilize the existing storm drainage facilities within NW 307th Avenue.

6.0 CALCULATION METHODOLOGY

6.1 PROPOSED STORMWATER CONDUIT SIZING AND INLET SPACING

The proposed curb inlets have been spaced per CWS requirements to properly convey stormwater runoff. The proposed storm system pipes shall be sized to convey the 25-year storm event and will be addressed within the final stormwater report.

6.2 PROPOSED STORMWATER QUALITY CONTROL FACILTY DESIGN

Stormwater quality for the subject site is provided by a vegetated swale designed to meet water quality requirements as outlined in the *Clean Water Services Design and Construction Standards for Sanitary Sewer and Surface Water Management (R&O 07-20).* The proposed stormwater facility is treating the new impervious area proposed for the project such as streets, sidewalks, 65% of the area on each lot per City of North Plain design standards, and existing untreated

impervious area along NW 307th Avenue (See treatment area figure for specific area information).

A portion of the project improvements along 307th Avenue will be situated at grades and elevations which will not allow stormwater runoff to be directed and discharged into the proposed vegetated Water Quality swale constructed for this project. The proposed project will also direct stormwater runoff from lots 51-54 towards the west and intro the existing Highland Court stormwater system. See the treatment area figure for additional detail regarding areas which cannot collected and treated within the projects water quality facility.

To offset this area, a portion of the stormwater runoff from existing impervious pavement area along NW 307th Avenue will be intercepted, rerouted and conveyed towards the water quality facility. This area offsets the maximum impervious area calculated for lots 51-54 and a small portion of the street improvements along NW 307th Avenue.

Per Section 4.05.2 of R&O 07-20, the remaining untreated area will be addressed with payment of in-lieu fees (see Treatment Area figure for area requiring in-lieu of fees).

Stormwater runoff from project will be routed through a 2-foot wide (bottom width), 110-foot long vegetated swale located within Tract A (towards the east side of the proposed subdivision). The proposed water quality swale was designed to provide a minimum residence time of 9 minutes. Calculations for the 25-year storm event through the vegetated swale are included in the appendices.

6.3 DOWNSTREAM ANALYSIS

A downstream analysis has been performed to assess the adequacy of the downstream drainage systems. The proposed project will direct stormwater runoff towards three different downstream systems, located to the north, west and east which all eventually end up in McKay Creek. The majority of the subject site will maintain the pre-developed drainage pattern, discharging towards the east and directly into McKay Creek. A portion of the subject site's stormwater runoff will be redirected towards the west and discharge into the Highland Court subdivision storm system (and ultimately into McKay Creek). The northern portion of the street improvements along NW 307th Avenue and the bulb improvements at the intersection of Pacific Street and NW 307th Avenue will direct stormwater runoff into the NW Pacific Street water quality facility.

6.3.1 West System

The proposed project will direct stormwater runoff from lots 51-54, an approximate area of 5,200 square feet, towards the west and into the existing Highland Court stormwater system; Therefore, a downstream analysis of the Highland Court storm system is not required since the new impervious area is less than 5,280 square feet (per CWS Section 2.04.2, subsection m.3A).

A visual inspection was performed of the downstream system from the proposed storm connection to a point ¼ mile downstream. Stormwater runoff from the proposed connection point is conveyed by a series of 12-inch storm pipes towards a water quality swale located in the northeast corner of the NW Curtis Drive and NW Highland Court intersection. Swale effluent stormwater enters a ditch inlet structure conveying runoff towards the west within a closed

conduit system beneath NW Highland Court and ultimately to McKay Creek. The visual investigation of the downstream system showed no observable downstream impacts to storm structures.

6.3.2 North System

A portion of the proposed NW 307th Avenue street improvements will direct stormwater runoff from portions of NW 307th Avenue towards the existing water quality facility located to the north. Approximately 4,874 square feet (Basin 5S) of stormwater runoff will be conveyed towards an existing water quality manhole, within NW Pacific Street, and then conveyed via the existing storm drain system discharging to McKay Creek.

A downstream analysis of the Highland Court storm system is not required since the new impervious area is less than 5,280 square feet (per CWS Section 2.04.2, subsection m.3A).

A visual inspection was performed of the downstream system from the existing water quality manhole to a point ¼ mile downstream. Stormwater runoff from the existing water quality manhole is conveyed towards an existing water quality pond which discharges into McKay Creek. The visual investigation of the downstream system showed no observable downstream impacts to storm structures.

6.3.3 East System

The majority of the proposed site will maintain the pre-developed drainage pattern, discharging towards the east into McKay Creek. The post-developed stormwater runoff flow of 4.13 cfs will be directed towards the east, an increase of 2.46 cfs from pre-developed conditions.

Utilizing the *FEMA Flood Insurance Study* dated March 16, 1989, a 25-year stormwater flow of 4,600 cfs was interpolated for McKay Creek at the project site. An increase of 2.46 cfs from the proposed project results in a 0.05% flow increase within McKay Creek. Therefore, a downstream analysis is not required per CWS Section 2.04.2.

A visual inspection was performed of the downstream system from the proposed vegetated swale discharging into McKay Creek to a point ¼ mile downstream. Stormwater runoff from the proposed vegetated swale is conveyed by McKay Creek towards the south for 2/3's of mile before encountering storm culvert structures beneath Highway 26. There are no structures present between the proposed vegetated swale and Highway 26.

SCALE 1" = 500 FEET

500 0 200 300 400 500

FIGURE 1: VICINITY MAP DATE: 10-29-2014

MCKAY CREEK CROSSING

DRAWN BY: DS	CHECKED BY: PAS	DWG: VICINITY	JOB: 4094

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

SCALE 1" = 100 FEET

100 0 40 60 80 100

DATE: 11-07-2014

FIGURE 2: PRE-DEVELOPED BASIN DELINEATION

MCKAY CREEK CROSSING

DRAWN BY: DS	CHECKED BY: PAS	DWG: PRE-DEVELOPED	JOB: 4094

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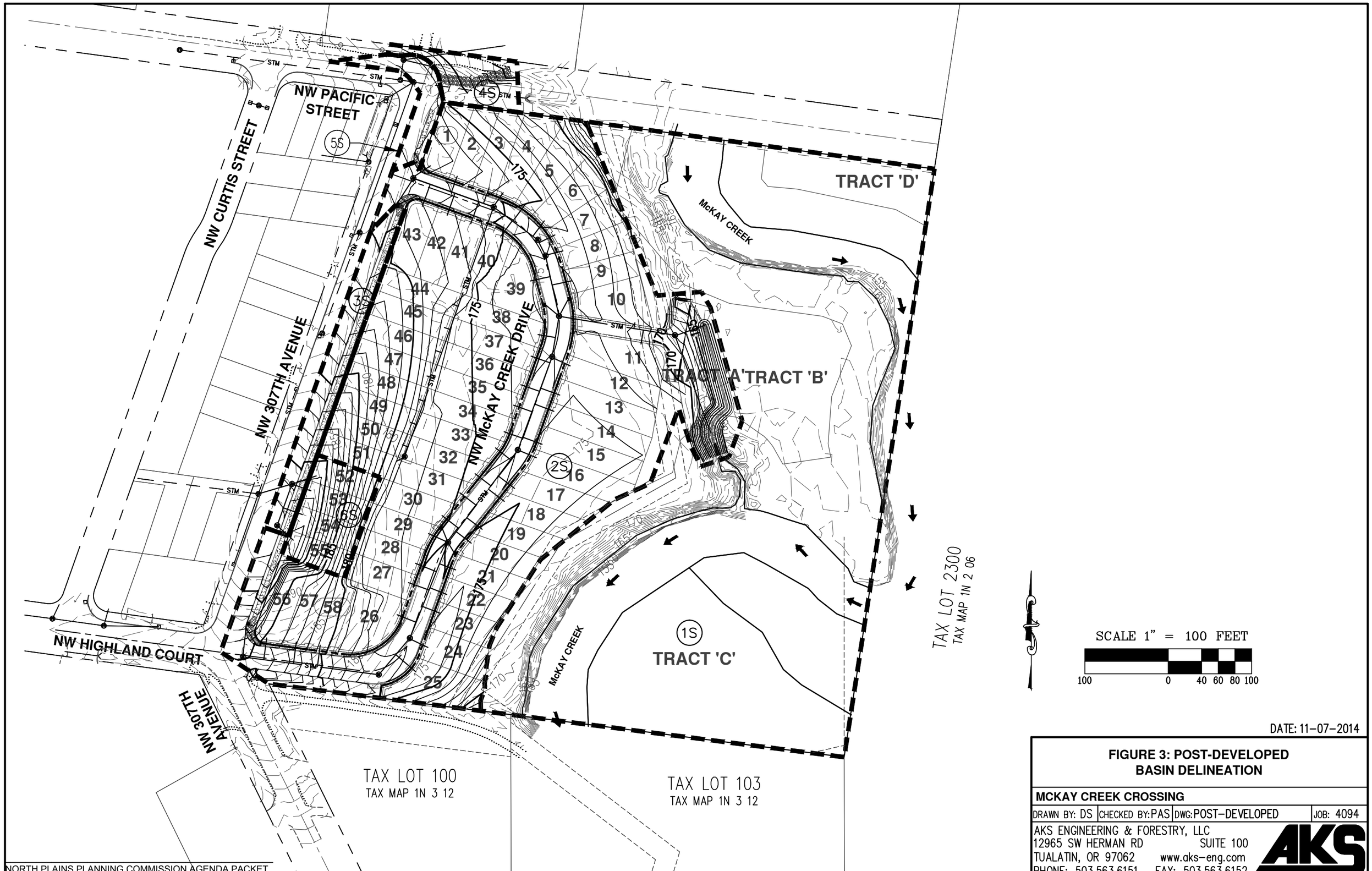
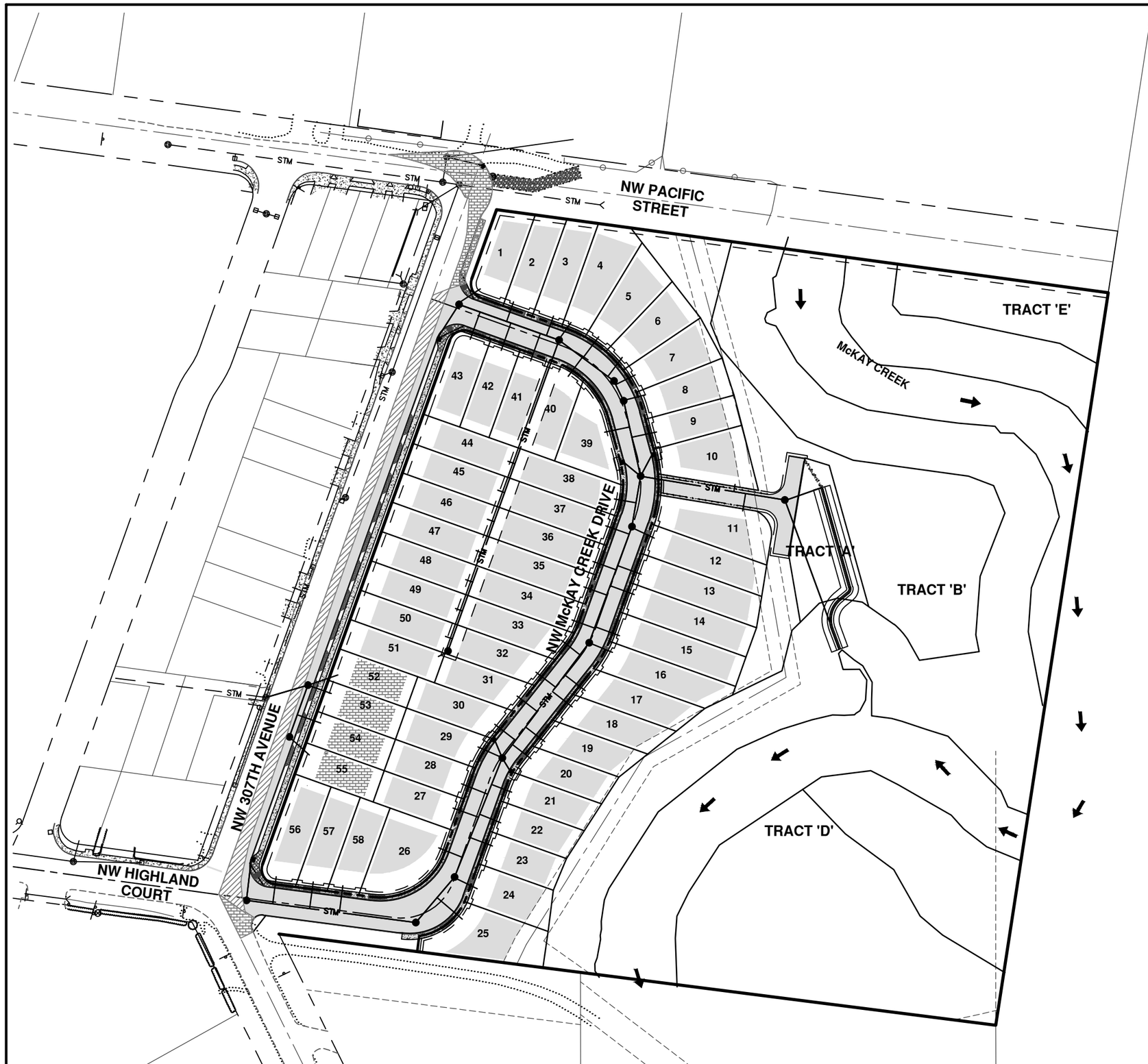
PHONE: 503.563.6151 FAX: 503.563.6152


NW PACIFIC STREET
NW CURTIS STREET
NW 307TH AVENUE
NW McKAY CREEK DRIVE
NW HIGHLAND COURT
NW 307TH AVENUE
McKAY CREEK
TRACT 'D'
TRACT 'A'
TRACT 'B'
TRACT 'C'
TAX LOT 2300
TAX MAP 1N 2 06
TAX LOT 100
TAX MAP 1N 3 12
TAX LOT 103
TAX MAP 1N 3 12
SCALE 1" = 100 FEET
100 0 40 60 80 100
DATE: 11-07-2014
FIGURE 3: POST-DEVELOPED BASIN DELINEATION
MCKAY CREEK CROSSING
DRAWN BY: DS
CHECKED BY: PAS
DWG: POST-DEVELOPED
JOB: 4094
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
AKS



POST-DEVELOPED IMPERVIOUS AREA TABLE	
PROPOSED IMPERVIOUS AREA RECEIVING TREATMENT	162,802 SF
PROPOSED UNTREATABLE IMPERVIOUS AREA	9,377 SF
EXISTING UNTREATED IMPERVIOUS AREA RECEIVING TREATMENT WITHIN PROPOSED SWALE	6,626 SF
REQUIRED IMPERVIOUS AREA TO TREAT	172,221 SF
IMPERVIOUS AREA TREATMENT PROVIDED	169,428 SF
NET TOTAL	-2,793 SF

— INDICATES PROPOSED IMPERVIOUS AREA RECEIVING TREATMENT
*AN MAXIMUM IMPERVIOUS AREA OF 65% PER LOT WAS ASSUMED

— INDICATES PROPOSED IMPERVIOUS AREA UNABLE TO BE TREATED

— INDICATES EXISTING UNTREATED IMPERVIOUS AREA TO BE TREATED WITHIN THE PROPOSED WATER QUALITY SWALE

SCALE 1" = 100 FEET

100 0 40 60 80 100

DATE: 11-07-2014

FIGURE 4: TREATMENT AREA

MCKAY CREEK CROSSING

DRAWN BY: DS | CHECKED BY: PAS | DWG: TREATMENT | JOB: 4094

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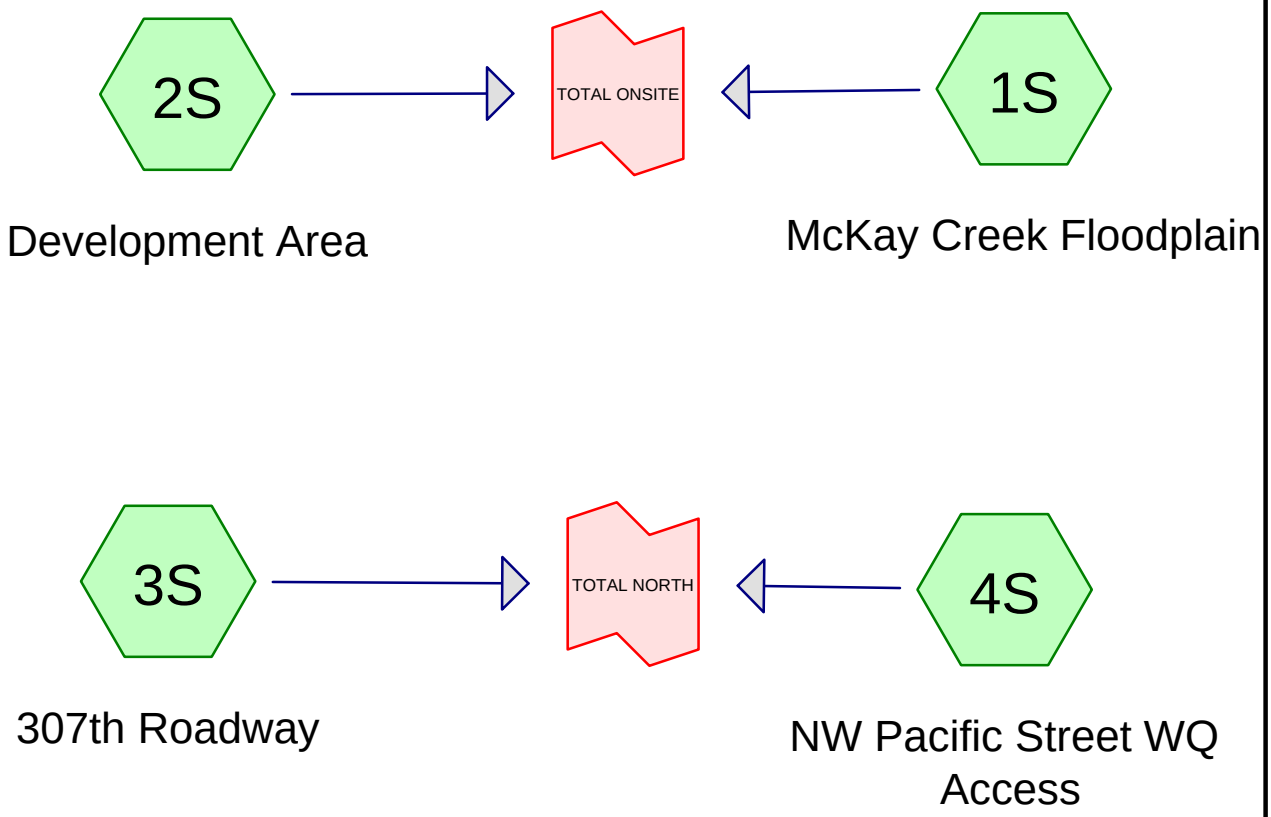
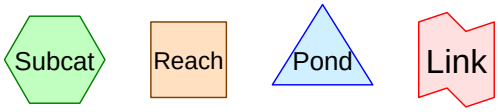
TUALATIN, OR 97062 www.aks-eng.com
PHONE: 503.563.6151 FAX: 503.563.6152

APPENDIX A

PRE-DEVELOPED SITE 25-YEAR STORM EVENT (3.90”) ANALYSIS





Drainage Diagram for 4094 PRE-DEVELOPED
Prepared by AKS, Printed 11/7/2014
HydroCAD® 8.50 s/n 005096 © 2007 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
238,200	70	Woods, Good, HSG C (1S)
234,968	72	Woods/grass comb., Good, HSG C (2S)
18,041	74	>75% Grass cover, Good, HSG C (2S,3S,4S)
3,521	89	Gravel driveway, HSG C (2S)
1,810	89	Gravel roads, HSG C (3S,4S)
9,428	98	House, Shed, NW 307th Avenue and concrete area (2S)
964	98	Paved roads w/curbs & sewers (3S)
506,932		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: McKay Creek Floodplain Runoff Area=238,200 sf 0.00% Impervious Runoff Depth>1.22"
Flow Length=350' Tc=52.7 min CN=70/0 Runoff=0.64 cfs 24,188 cf

Subcatchment 2S: Development Area Runoff Area=259,519 sf 3.63% Impervious Runoff Depth>1.44"
Flow Length=300' Slope=0.0200 '/' Tc=38.9 min CN=72/98 Runoff=1.04 cfs 31,101 cf

Subcatchment 3S: 307th Roadway Runoff Area=2,776 sf 34.73% Impervious Runoff Depth>2.40"
Tc=5.0 min CN=77/98 Runoff=0.04 cfs 555 cf

Subcatchment 4S: NW Pacific Street WQ Runoff Area=6,437 sf 0.00% Impervious Runoff Depth>1.73"
Tc=5.0 min CN=77/0 Runoff=0.06 cfs 928 cf

Link TOTAL NORTH: Inflow=0.09 cfs 1,483 cf
Primary=0.09 cfs 1,483 cf

Link TOTAL ONSITE: Inflow=1.67 cfs 55,288 cf
Primary=1.67 cfs 55,288 cf

Total Runoff Area = 506,932 sf Runoff Volume = 56,771 cf Average Runoff Depth = 1.34"
97.95% Pervious = 496,540 sf 2.05% Impervious = 10,392 sf

Summary for Subcatchment 1S: McKay Creek Floodplain

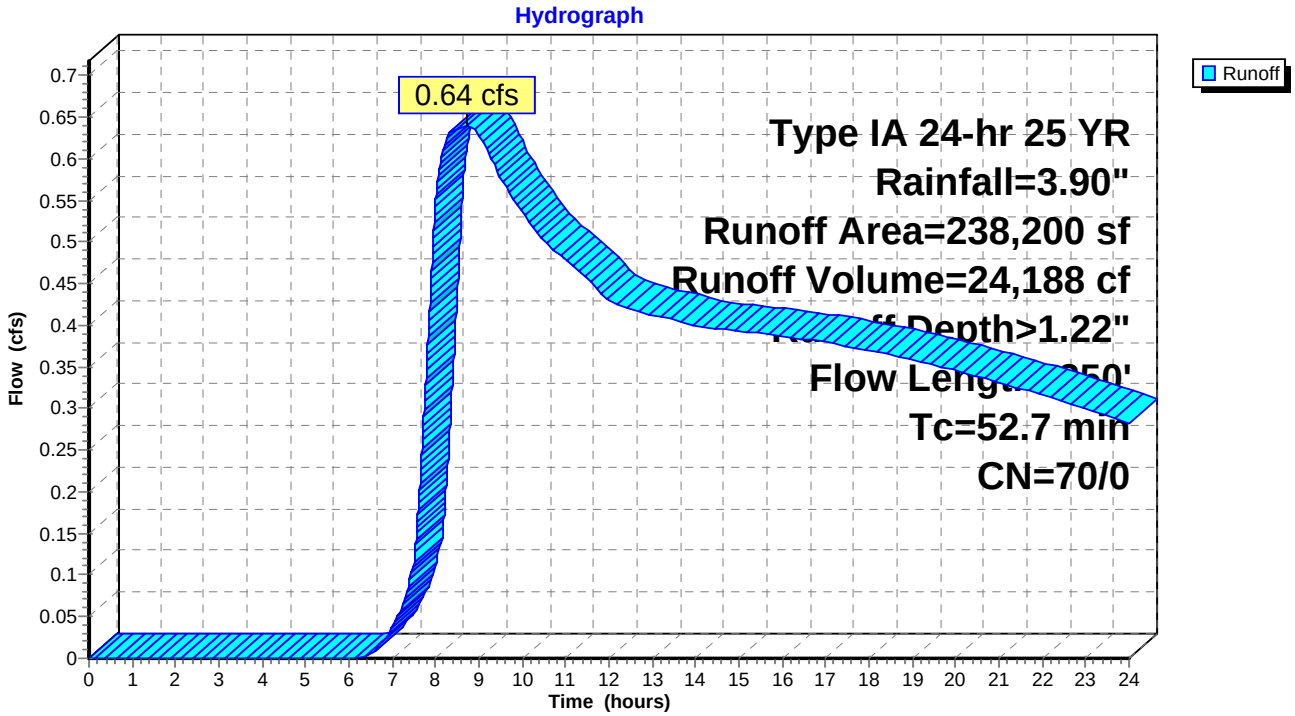
Runoff = 0.64 cfs @ 8.71 hrs, Volume= 24,188 cf, Depth> 1.22"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YR Rainfall=3.90"

Area (sf)	CN	Description
238,200	70	Woods, Good, HSG C
238,200	70	Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.7	300	0.0300	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.50"
3.0	50	0.0030	0.27		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
52.7	350	Total			

Subcatchment 1S: McKay Creek Floodplain



Summary for Subcatchment 2S: Development Area

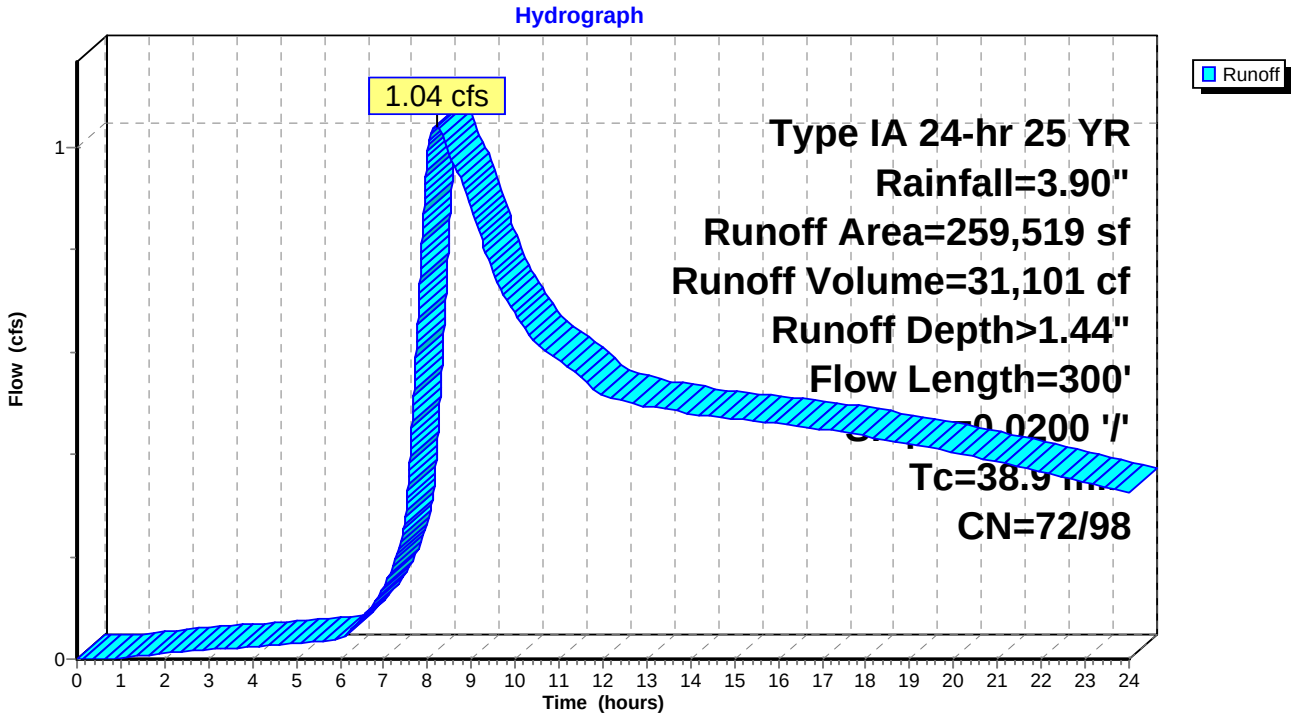
Runoff = 1.04 cfs @ 8.20 hrs, Volume= 31,101 cf, Depth> 1.44"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YR Rainfall=3.90"

	Area (sf)	CN	Description
*	9,428	98	House, Shed, NW 307th Avenue and concrete area
	234,968	72	Woods/grass comb., Good, HSG C
*	3,521	89	Gravel driveway, HSG C
	11,602	74	>75% Grass cover, Good, HSG C
	259,519	73	Weighted Average
	250,091	72	Pervious Area
	9,428	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
38.9	300	0.0200	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.50"

Subcatchment 2S: Development Area



Summary for Subcatchment 3S: 307th Roadway

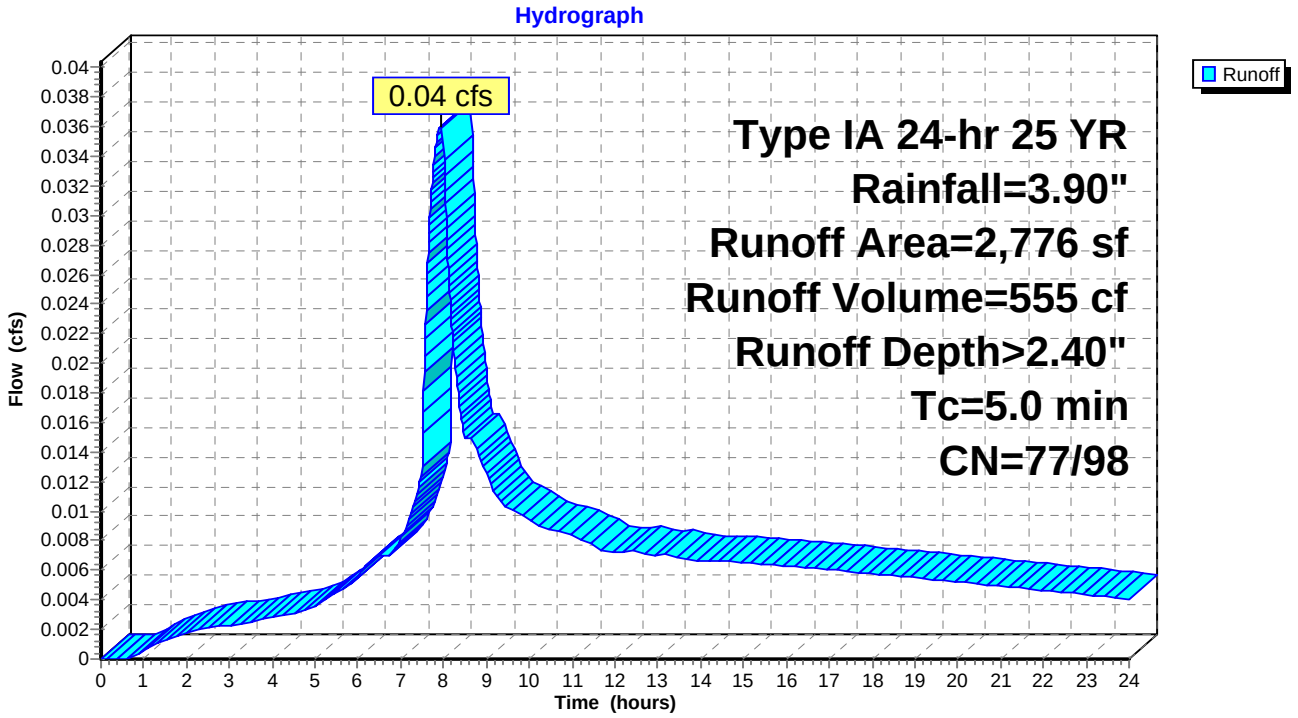
Runoff = 0.04 cfs @ 7.93 hrs, Volume= 555 cf, Depth> 2.40"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YR Rainfall=3.90"

Area (sf)	CN	Description
964	98	Paved roads w/curbs & sewers
378	89	Gravel roads, HSG C
1,434	74	>75% Grass cover, Good, HSG C
2,776	84	Weighted Average
1,812	77	Pervious Area
964	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S: 307th Roadway



Summary for Subcatchment 4S: NW Pacific Street WQ Access

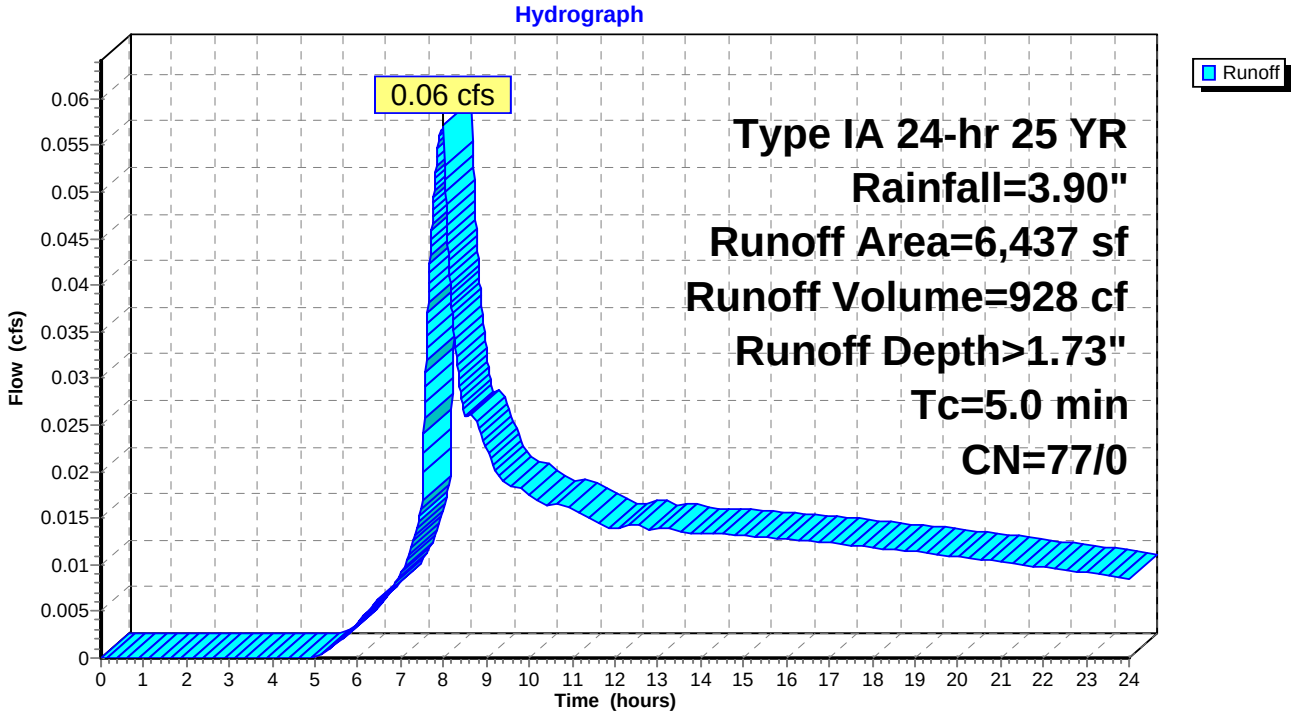
Runoff = 0.06 cfs @ 7.99 hrs, Volume= 928 cf, Depth> 1.73"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YR Rainfall=3.90"

Area (sf)	CN	Description
1,432	89	Gravel roads, HSG C
5,005	74	>75% Grass cover, Good, HSG C
6,437	77	Weighted Average
6,437	77	Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4S: NW Pacific Street WQ Access

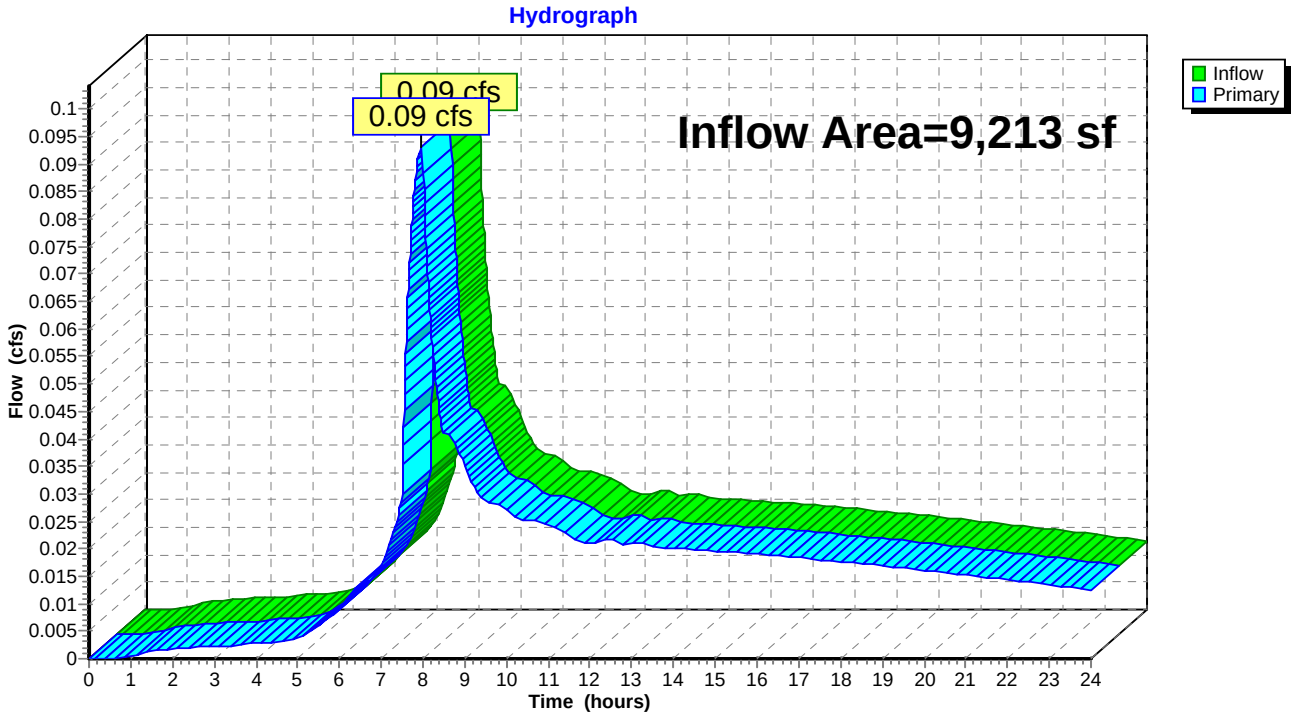


Summary for Link TOTAL NORTH:

Inflow Area = 9,213 sf, 10.46% Impervious, Inflow Depth > 1.93" for 25 YR event
Inflow = 0.09 cfs @ 7.97 hrs, Volume= 1,483 cf
Primary = 0.09 cfs @ 7.97 hrs, Volume= 1,483 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link TOTAL NORTH:

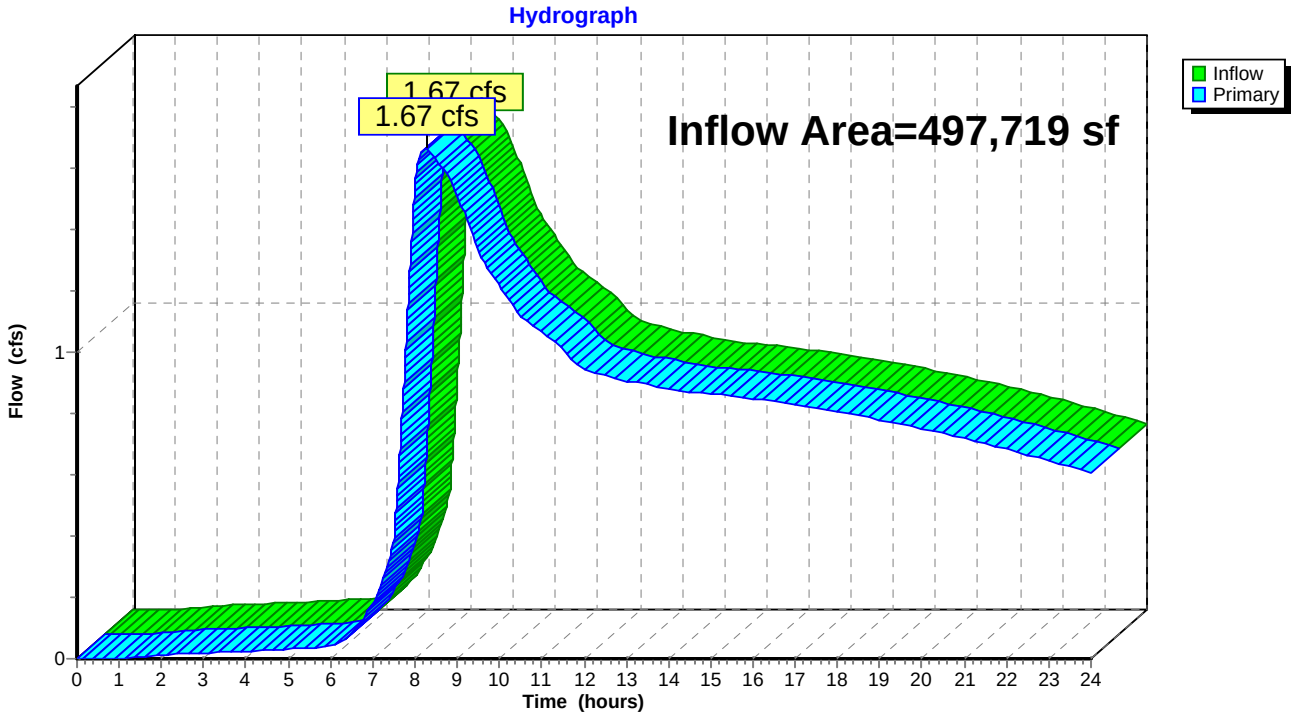


Summary for Link TOTAL ONSITE:

Inflow Area = 497,719 sf, 1.89% Impervious, Inflow Depth > 1.33" for 25 YR event
Inflow = 1.67 cfs @ 8.27 hrs, Volume= 55,288 cf
Primary = 1.67 cfs @ 8.27 hrs, Volume= 55,288 cf, Atten= 0%, Lag= 0.0 min

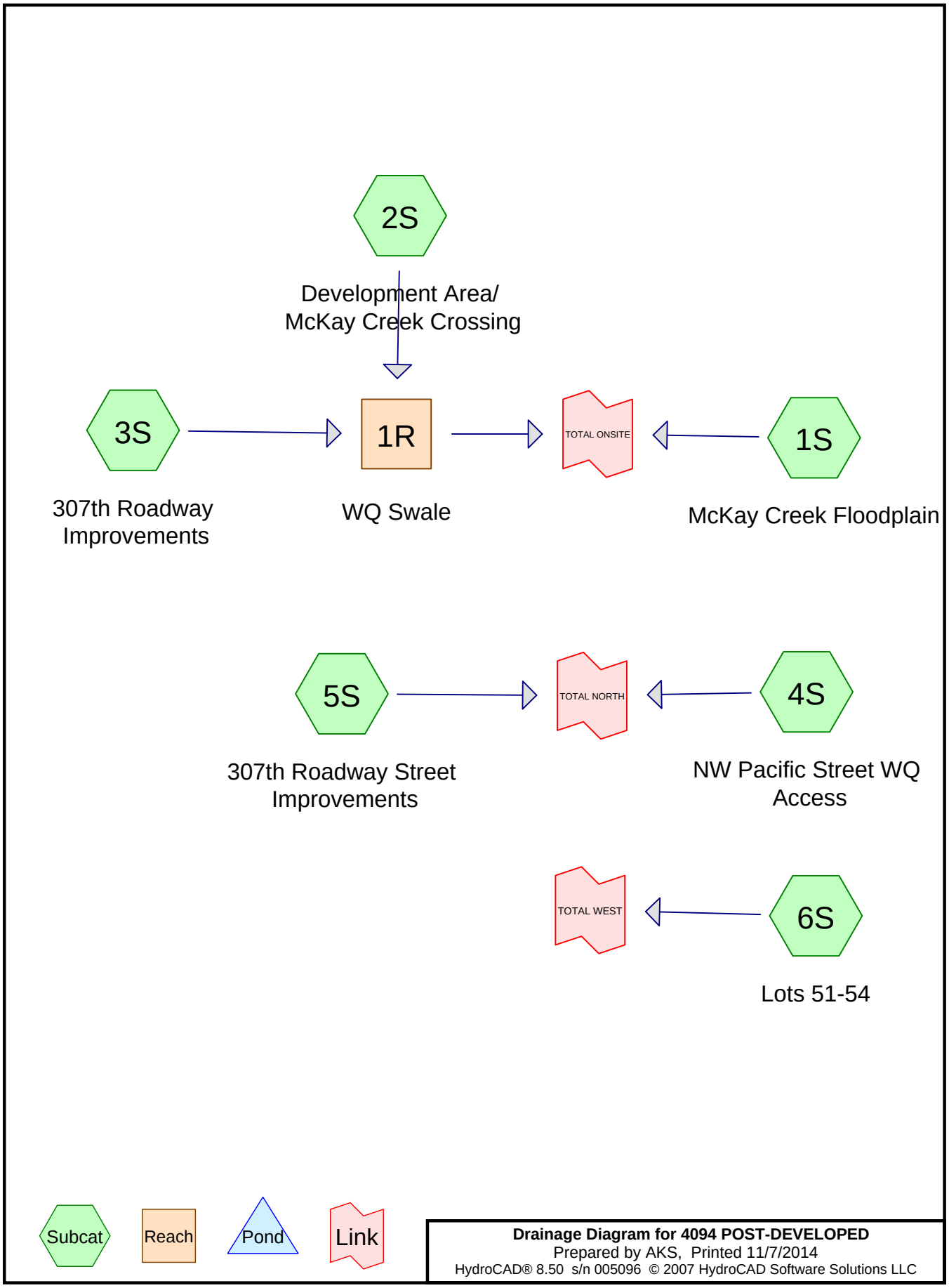
Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link TOTAL ONSITE:



APPENDIX B

POST-DEVELOPED SITE AND DOWNSTREAM 25-YEAR STORM EVENT (3.90”) ANALYSIS


2S
Development Area/
McKay Creek Crossing
3S
1R
TOTAL ONSITE
1S
307th Roadway
Improvements
WQ Swale
McKay Creek Floodplain
5S
TOTAL NORTH
4S
307th Roadway Street
Improvements
NW Pacific Street WQ
Access
TOTAL WEST
6S
Lots 51-54
Subcat
Reach
Pond
Link
Drainage Diagram for 4094 POST-DEVELOPED
Prepared by AKS, Printed 11/7/2014
HydroCAD® 8.50 s/n 005096 © 2007 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
238,200	70	Woods, Good, HSG C (1S)
84,842	74	>75% Grass cover, Good, HSG C (2S,3S,4S,5S)
2,364	89	Gravel roads, HSG C (4S)
114,238	98	65% impervious on lots (2S)
46,058	98	Paved roads w/curbs & sewers (2S)
11,083	98	Paved roads w/curbs & sidewalk (3S)
4,874	98	Paved roads w/curbs and sidewalk (5S)
5,200	98	Roof and driveway area (6S)
506,859		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: McKay Creek Floodplain Runoff Area=238,200 sf 0.00% Impervious Runoff Depth>1.22"
Flow Length=350' Tc=52.7 min CN=70/0 Runoff=0.64 cfs 24,188 cf

Subcatchment 2S: Development Area/ Runoff Area=235,545 sf 51.08% Impervious Runoff Depth>2.90"
Tc=5.0 min CN=82/98 Runoff=3.86 cfs 56,974 cf

Subcatchment 3S: 307th Roadway Runoff Area=15,925 sf 69.59% Impervious Runoff Depth>3.01"
Tc=5.0 min CN=74/98 Runoff=0.27 cfs 3,992 cf

Subcatchment 4S: NW Pacific Street WQ Runoff Area=6,437 sf 0.00% Impervious Runoff Depth>1.95"
Tc=5.0 min CN=80/0 Runoff=0.07 cfs 1,048 cf

Subcatchment 5S: 307th Roadway Street Runoff Area=5,552 sf 87.79% Impervious Runoff Depth>3.40"
Tc=5.0 min CN=74/98 Runoff=0.11 cfs 1,572 cf

Subcatchment 6S: Lots 51-54 Runoff Area=5,200 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.11 cfs 1,586 cf

Reach 1R: WQ Swale Avg. Depth=1.45' Max Vel=0.40 fps Inflow=4.13 cfs 60,966 cf
n=0.240 L=185.0' S=0.0050 '/' Capacity=14.47 cfs Outflow=4.02 cfs 60,604 cf

Link TOTAL NORTH: Inflow=0.17 cfs 2,620 cf
Primary=0.17 cfs 2,620 cf

Link TOTAL ONSITE: Inflow=4.58 cfs 84,791 cf
Primary=4.58 cfs 84,791 cf

Link TOTAL WEST: Inflow=0.11 cfs 1,586 cf
Primary=0.11 cfs 1,586 cf

Total Runoff Area = 506,859 sf Runoff Volume = 89,360 cf Average Runoff Depth = 2.12"
72.09% Pervious = 365,389 sf 27.91% Impervious = 141,470 sf

Summary for Subcatchment 1S: McKay Creek Floodplain

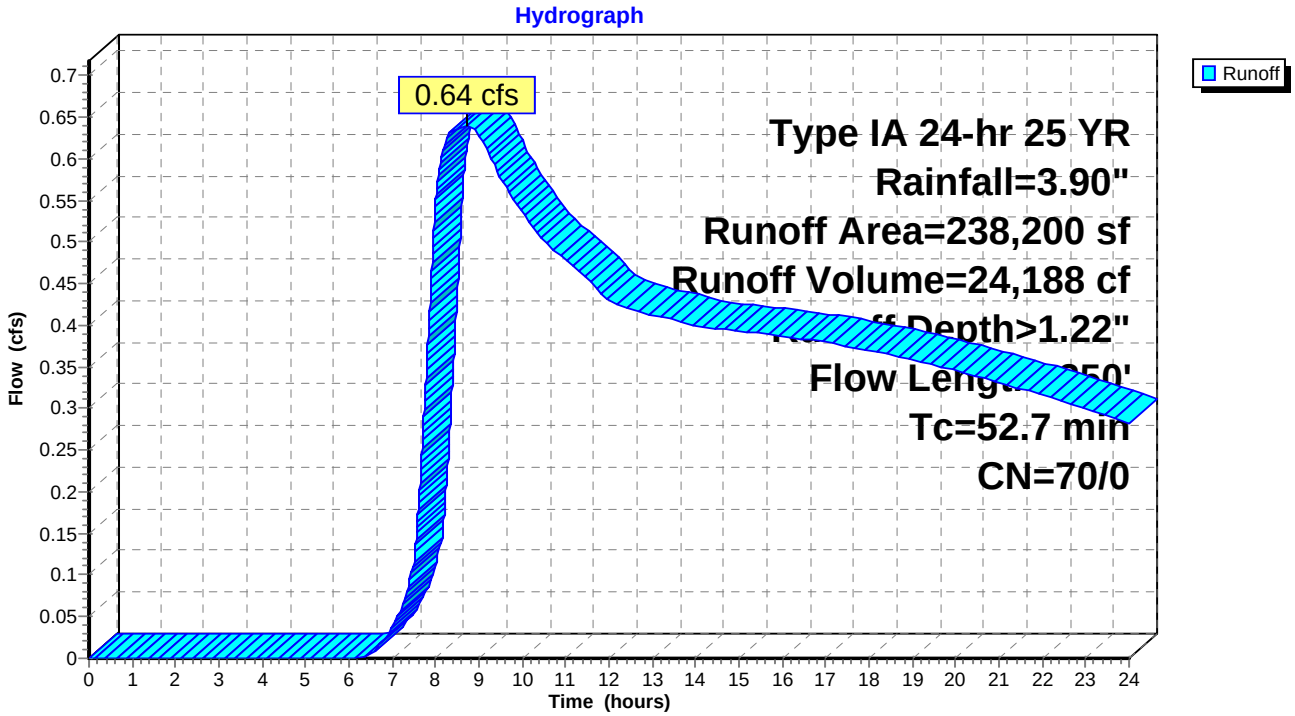
Runoff = 0.64 cfs @ 8.71 hrs, Volume= 24,188 cf, Depth> 1.22"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YR Rainfall=3.90"

Area (sf)	CN	Description
238,200	70	Woods, Good, HSG C
238,200	70	Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.7	300	0.0300	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.50"
3.0	50	0.0030	0.27		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
52.7	350	Total			

Subcatchment 1S: McKay Creek Floodplain



Summary for Subcatchment 2S: Development Area/ McKay Creek Crossing

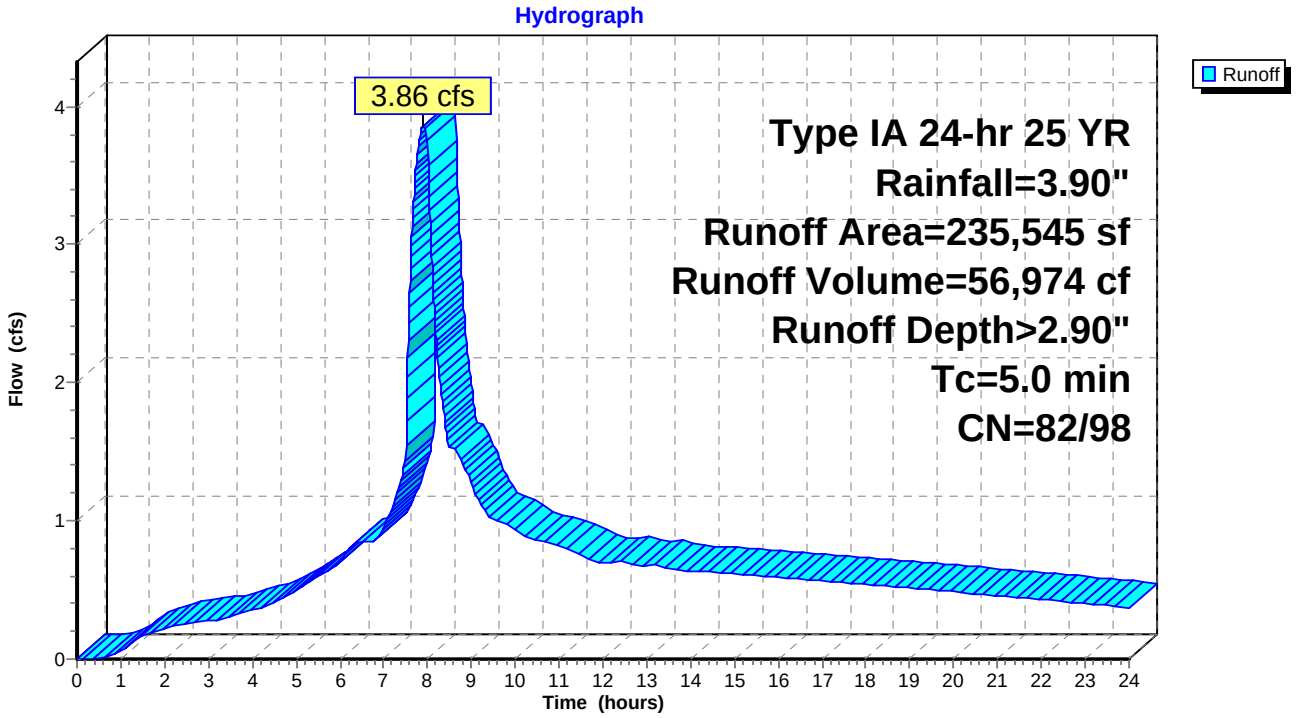
Runoff = 3.86 cfs @ 7.91 hrs, Volume= 56,974 cf, Depth> 2.90"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YR Rainfall=3.90"

	Area (sf)	CN	Description
*	114,238	98	65% impervious on lots
	46,058	98	Paved roads w/curbs & sewers
	75,249	74	>75% Grass cover, Good, HSG C
	235,545	90	Weighted Average
	115,232	82	Pervious Area
	120,313	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2S: Development Area/ McKay Creek Crossing



Summary for Subcatchment 3S: 307th Roadway Improvements

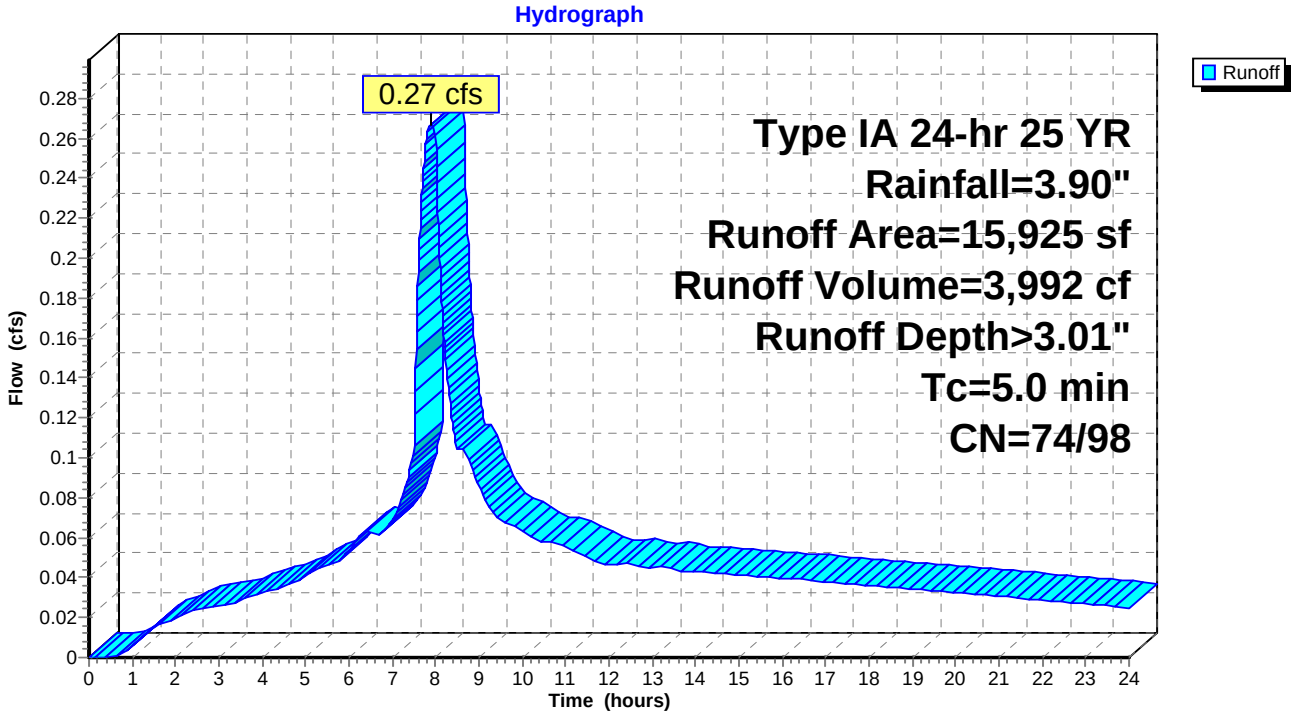
Runoff = 0.27 cfs @ 7.90 hrs, Volume= 3,992 cf, Depth> 3.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YR Rainfall=3.90"

	Area (sf)	CN	Description
*	11,083	98	Paved roads w/curbs & sidewalk
	4,842	74	>75% Grass cover, Good, HSG C
	15,925	91	Weighted Average
	4,842	74	Pervious Area
	11,083	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S: 307th Roadway Improvements



Summary for Subcatchment 4S: NW Pacific Street WQ Access

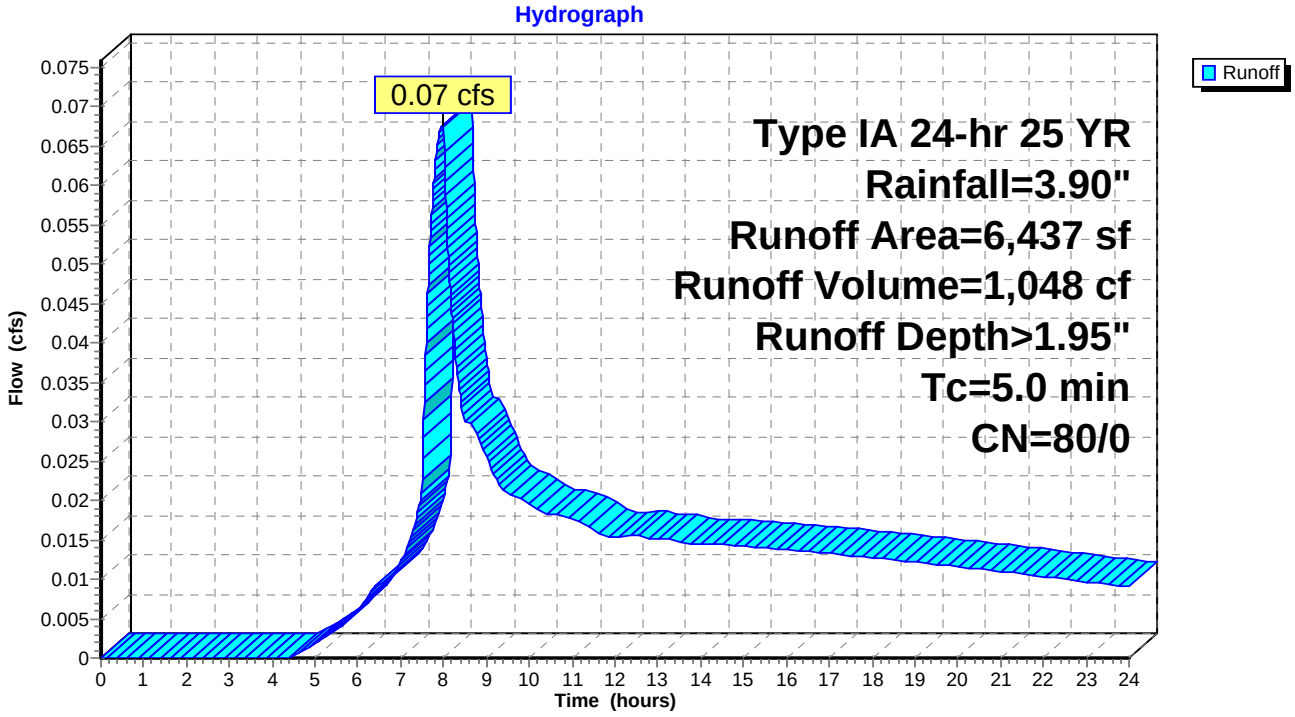
Runoff = 0.07 cfs @ 7.97 hrs, Volume= 1,048 cf, Depth> 1.95"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YR Rainfall=3.90"

Area (sf)	CN	Description
2,364	89	Gravel roads, HSG C
4,073	74	>75% Grass cover, Good, HSG C
6,437	80	Weighted Average
6,437	80	Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 4S: NW Pacific Street WQ Access



Summary for Subcatchment 5S: 307th Roadway Street Improvements

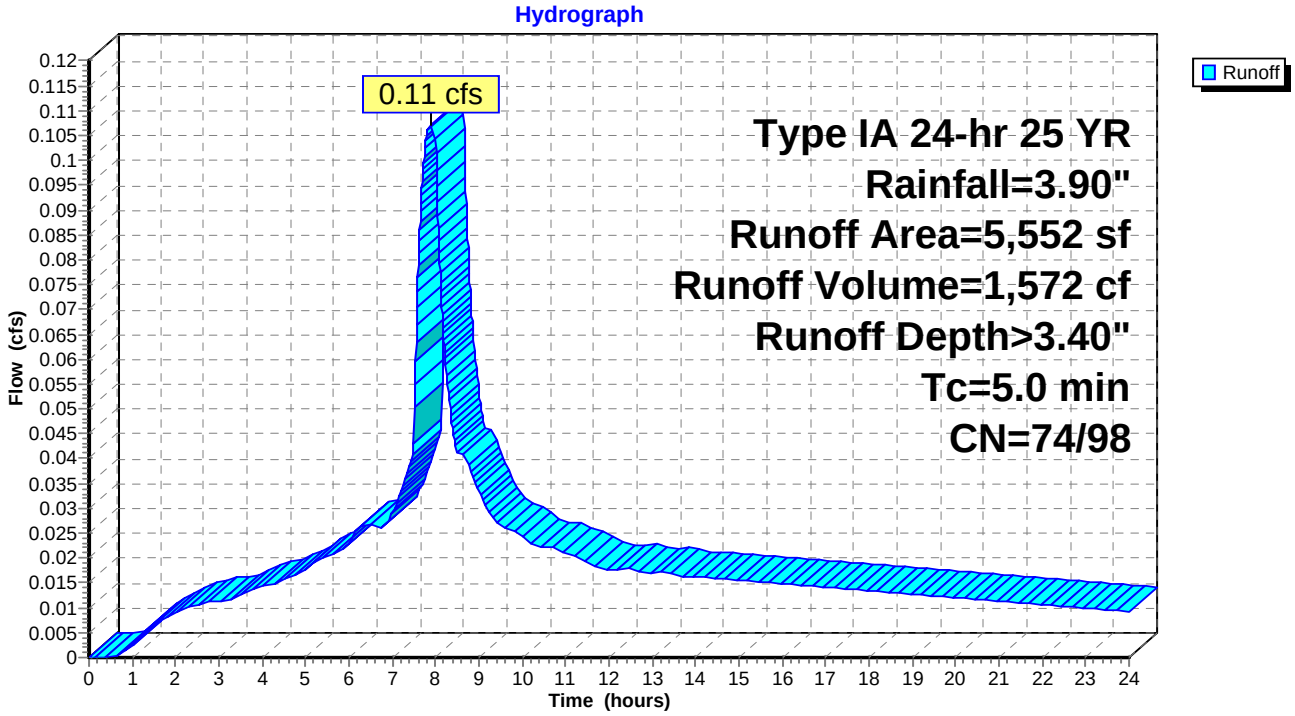
Runoff = 0.11 cfs @ 7.88 hrs, Volume= 1,572 cf, Depth> 3.40"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YR Rainfall=3.90"

	Area (sf)	CN	Description
*	4,874	98	Paved roads w/curbs and sidewalk
	678	74	>75% Grass cover, Good, HSG C
	5,552	95	Weighted Average
	678	74	Pervious Area
	4,874	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 5S: 307th Roadway Street Improvements



Summary for Subcatchment 6S: Lots 51-54

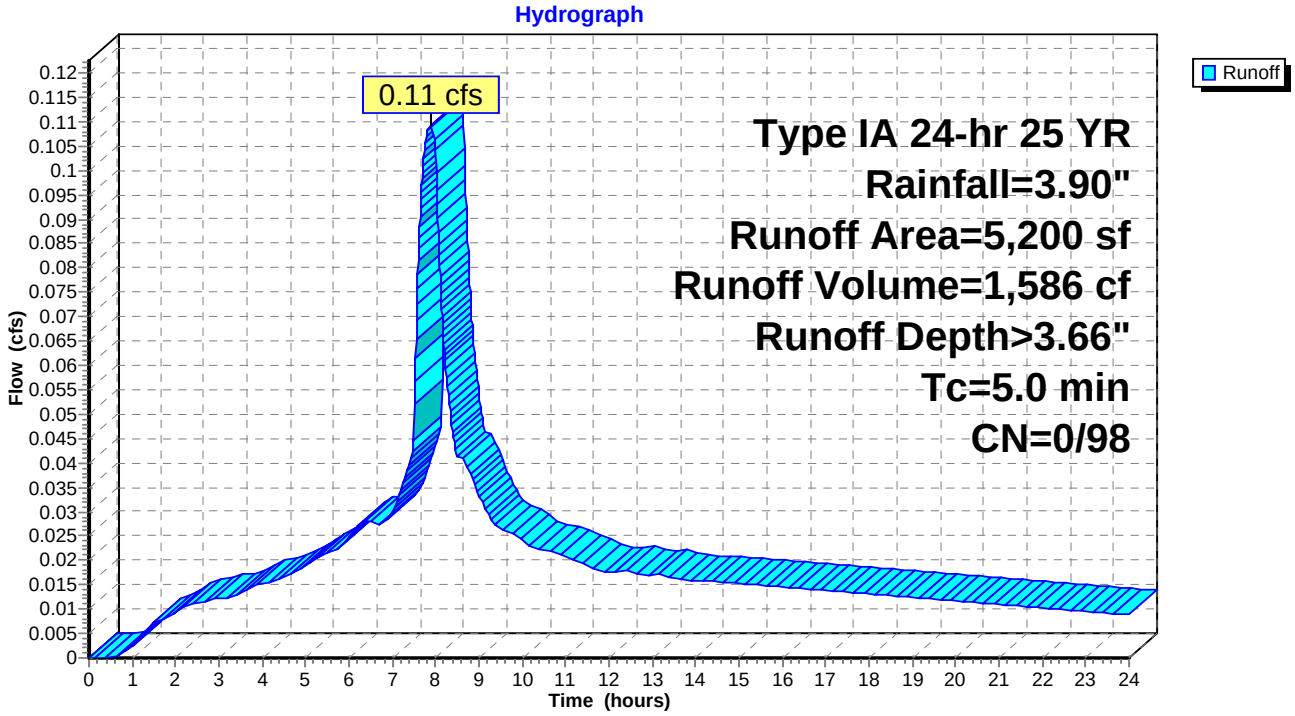
Runoff = 0.11 cfs @ 7.88 hrs, Volume= 1,586 cf, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 YR Rainfall=3.90"

	Area (sf)	CN	Description
*	5,200	98	Roof and driveway area
	5,200	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6S: Lots 51-54



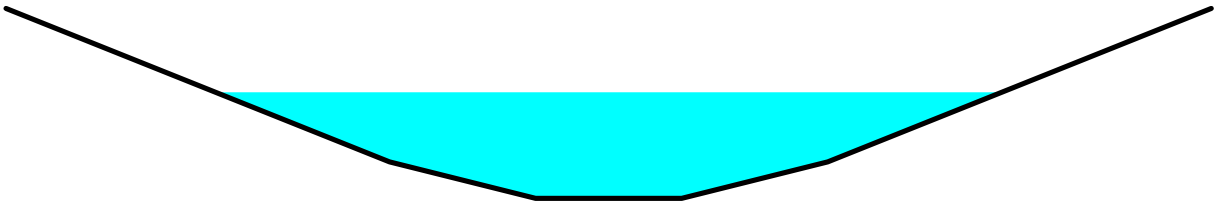
Summary for Reach 1R: WQ Swale

Inflow Area = 251,470 sf, 52.25% Impervious, Inflow Depth > 2.91" for 25 YR event
Inflow = 4.13 cfs @ 7.91 hrs, Volume= 60,966 cf
Outflow = 4.02 cfs @ 8.00 hrs, Volume= 60,604 cf, Atten= 3%, Lag= 5.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.40 fps, Min. Travel Time= 7.6 min
Avg. Velocity = 0.23 fps, Avg. Travel Time= 13.2 min

Peak Storage= 1,846 cf @ 8.00 hrs, Average Depth at Peak Storage= 1.45'
Bank-Full Depth= 2.60', Capacity at Bank-Full= 14.47 cfs

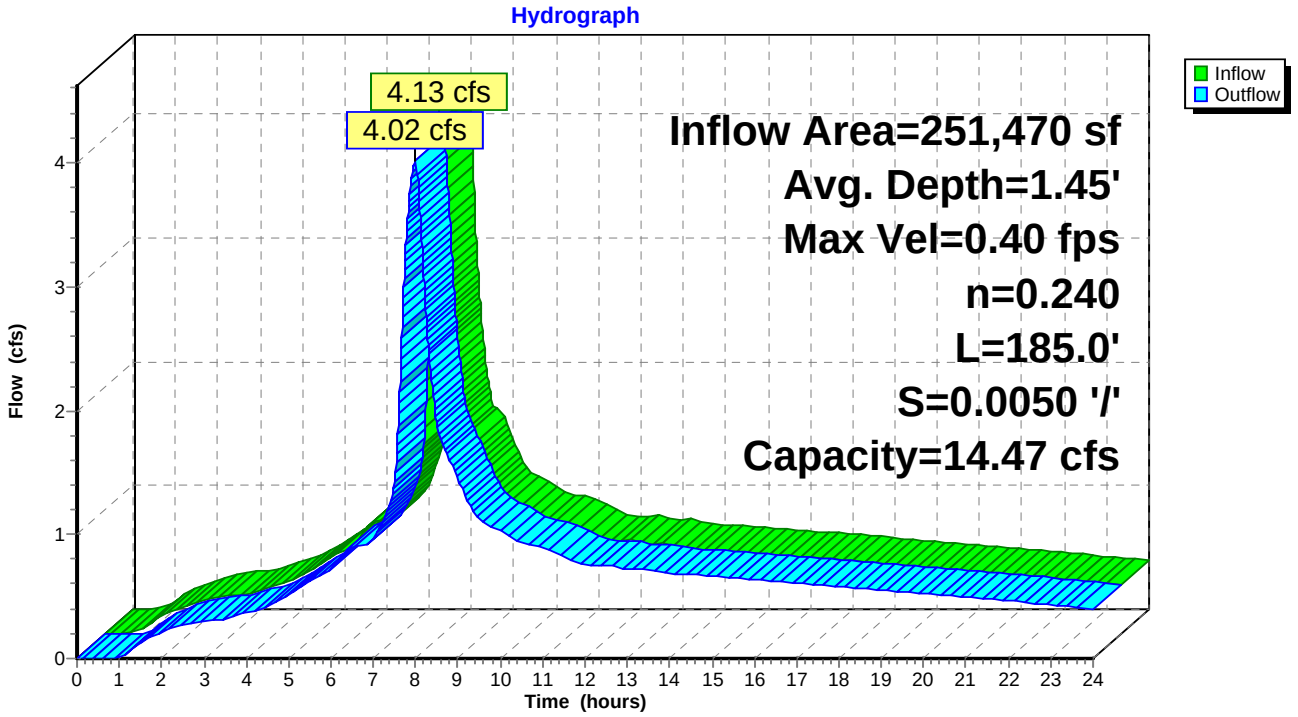
Custom cross-section, Length= 185.0' Slope= 0.0050 '/' (101 Elevation Intervals)
Constant n= 0.240
Inlet Invert= 100.00', Outlet Invert= 99.08'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)
-8.25	2.60	0.00
-3.00	0.50	2.10
-1.00	0.00	2.60
1.00	0.00	2.60
3.00	0.50	2.10
8.25	2.60	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	2.0	0	0.00
0.50	2.0	6.1	370	0.41
2.60	25.6	17.4	4,741	14.47

Reach 1R: WQ Swale

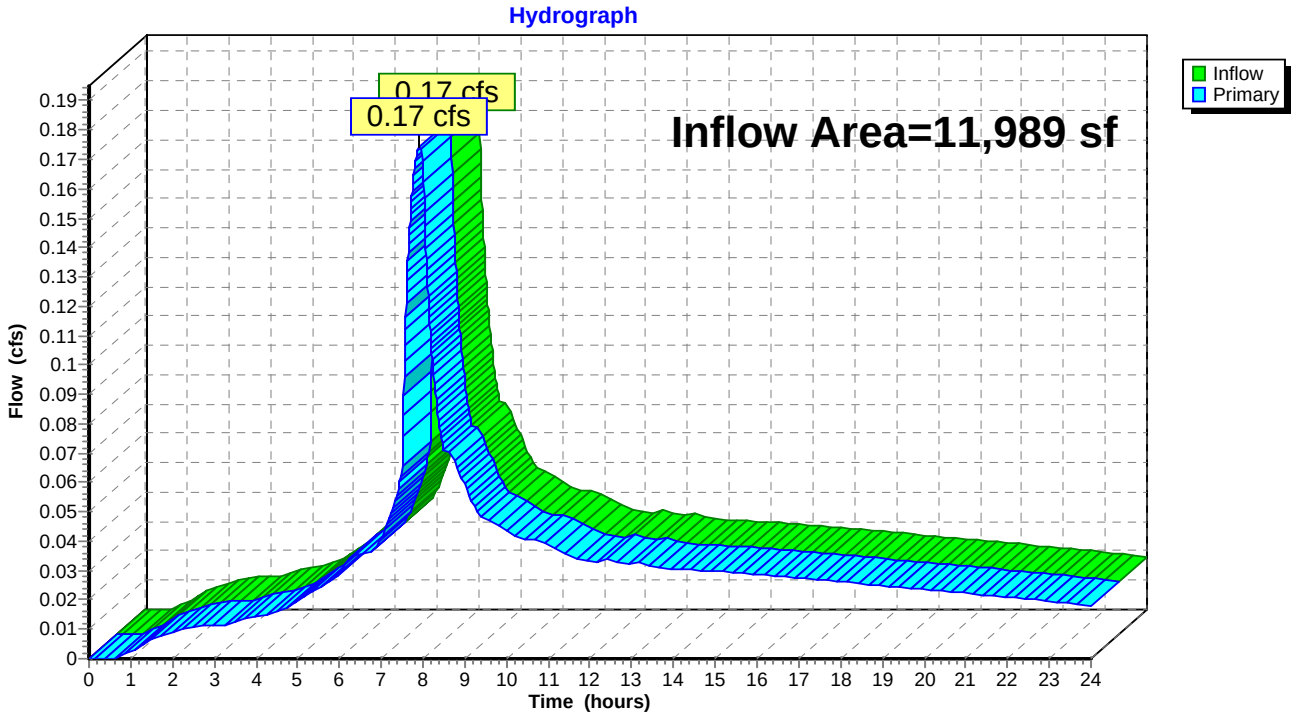


Summary for Link TOTAL NORTH:

Inflow Area = 11,989 sf, 40.65% Impervious, Inflow Depth > 2.62" for 25 YR event
Inflow = 0.17 cfs @ 7.92 hrs, Volume= 2,620 cf
Primary = 0.17 cfs @ 7.92 hrs, Volume= 2,620 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link TOTAL NORTH:

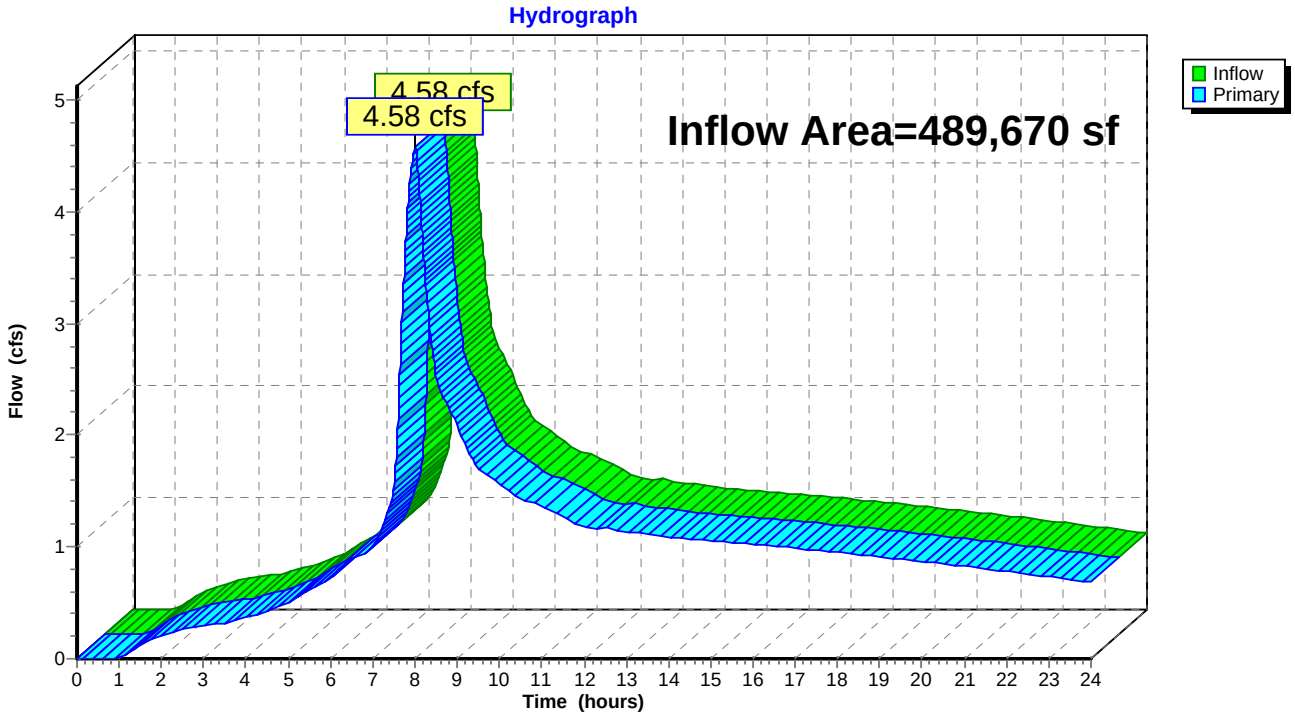


Summary for Link TOTAL ONSITE:

Inflow Area = 489,670 sf, 26.83% Impervious, Inflow Depth > 2.08" for 25 YR event
Inflow = 4.58 cfs @ 8.01 hrs, Volume= 84,791 cf
Primary = 4.58 cfs @ 8.01 hrs, Volume= 84,791 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link TOTAL ONSITE:

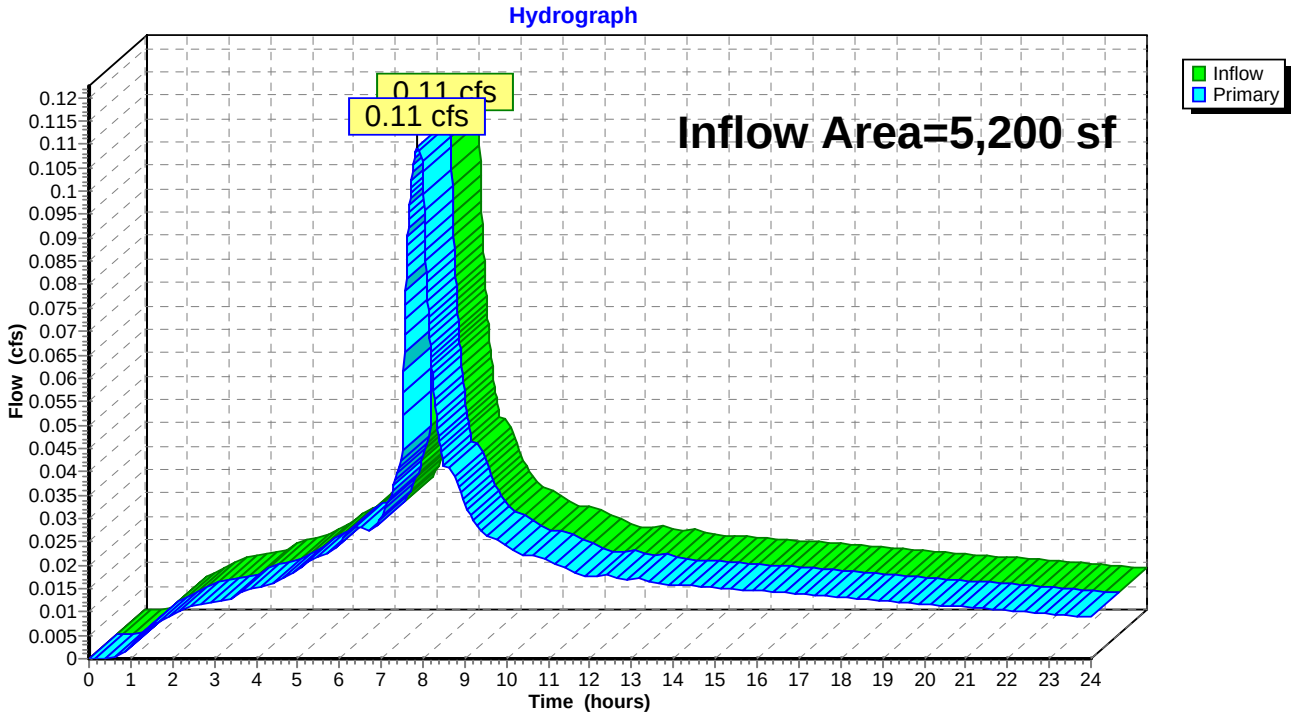


Summary for Link TOTAL WEST:

Inflow Area = 5,200 sf,100.00% Impervious, Inflow Depth > 3.66" for 25 YR event
Inflow = 0.11 cfs @ 7.88 hrs, Volume= 1,586 cf
Primary = 0.11 cfs @ 7.88 hrs, Volume= 1,586 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link TOTAL WEST:



APPENDIX C

STORMWATER QUALITY CALCULATIONS

STORMWATER QUALITY CALCULATIONS

Client:	Biggi Construction LLC
Project:	McKay Creek Crossing
AKS Job No.:	4094
Date:	November 7, 2014
Done By:	DS
Checked By:	PAS

IMPERVIOUS AREA

Total Site Area:	10.90	acres
Total Site Area:	474,939	square feet (sf)
Number of Lots:	54	
Impervious Area Per Lot:	65% of parcel area	
Total Impervious Lot Area:	114,238	sf
Road & Sidewalk Impervious Area:	55,190	sf
Total Impervious Area:	169,428	sf

WATER QUALITY VOLUME (WQV)

(Per CWS 4.05.6b - R&O 07-20)

$$WQV = \frac{0.36'' \text{ X Area (ft)}}{12'' \text{ per ft}} = \mathbf{5083} \ \textbf{cubic feet}$$

WATER QUALITY FLOW (WQF)

(Per CWS 4.05.6b - R&O 07-20)

$$WQF = \frac{\text{WQV (sf)}}{14{,}400 \text{ seconds}} = \mathbf{0.35} \ \textbf{cfs}$$

WATER QUALITY MANHOLE SUMP VOLUME CALCULATIONS

(Per CWS 4.06.1b - R&O 07-20)

CWS Criteria: Sump Volume = 20 cubic feet per 1.0 cfs of flow

Calculated 25-year Flow through WQ Manhole =	**4.13**	**cfs**	
Calculated Manhole Sump Volume =	**82.6**	**cubic feet**	
Calculated Manhole Sump Depth (60" Dia. Manhole) =	**4.2**	**ft**	< 5 feet maximum

VEGETATED SWALE, WATER QUALITY FLOW DESIGN & CALCULATIONS

Hydraulic Design Criteria (Per CWS 4.06.2 - R&O 07-20)

Design Flow: Water Quality Flow
Minimum Hydraulic Residence Time: 9 minutes
Maximum Water Design Depth: 0.5-ft
Minimum Freeboard: 1.0 foot (for facilities not protected from high flows)
Manning's "n" Value: 0.24
Maximum Velocity: 2.0 fps based on the 25-YR flow

Swale Sizing Assumptions:

Slope	Bottom Width	Manning's #	Side Slope	Depth of Swale	Length
(ft/ft)	(ft)	"n"	H:V	(ft)	(ft)
0.005	2	0.24	4	2.6	110

Water Quality Flow Hydraulic Calculations (See Flow Master Printouts):

Q	Flow Depth	Flow Area	Wp	R	Velocity
(cfs)	(ft)	(sf)	(ft)	(ft)	(fps)
0.35	0.46	1.77	5.79	0.31	0.20

25-Year Flow Hydraulic Calculations (See HydroCAD Printouts):

Q	Flow Depth	Velocity
(cfs)	(ft)	(fps)
4.13	1.45	0.40

Check Against Design Criteria:

	Calculated			CWS Criteria		Meet CWS Criteria?
Minimum Hydraulic Residence Time:	**9.2**	**minutes**	>	9	minutes	Yes
Maximum Water Quality Design Depth:	**0.46**	**feet**	<	0.5	feet	Yes
Minimum Freeboard:	**1.15**	**feet**	>	1	feet	Yes
Maximum Velocity:	**0.40**	**fps**	<	2	fps	Yes
Minimum Length:	**110**	**feet**	≥	100	feet	Yes

Water Quality Swale

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Discharge	0.35	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
-0+08	2.60
-0+03	0.50
-0+01	0.00
0+01	0.00
0+03	0.50
0+08	2.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+08, 2.60)	(0+08, 2.60)	0.240

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.46	ft
Elevation Range	0.00 to 2.60 ft	
Flow Area	1.77	ft²
Wetted Perimeter	5.79	ft
Hydraulic Radius	0.30	ft
Top Width	5.68	ft
Normal Depth	0.46	ft

Water Quality Swale

Results

Critical Depth	0.09	ft
Critical Slope	1.96996	ft/ft
Velocity	0.20	ft/s
Velocity Head	0.00	ft
Specific Energy	0.46	ft
Froude Number	0.06	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.46	ft
Critical Depth	0.09	ft
Channel Slope	0.00500	ft/ft
Critical Slope	1.96996	ft/ft

Water Quality Swale

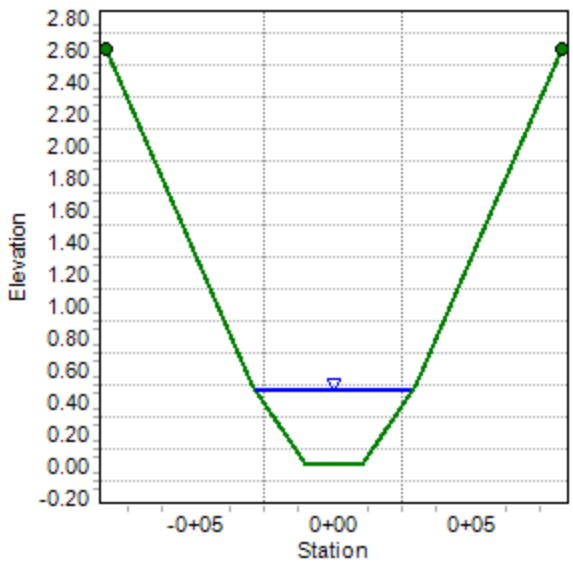
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Normal Depth	0.46	ft
Discharge	0.35	ft³/s

Cross Section Image

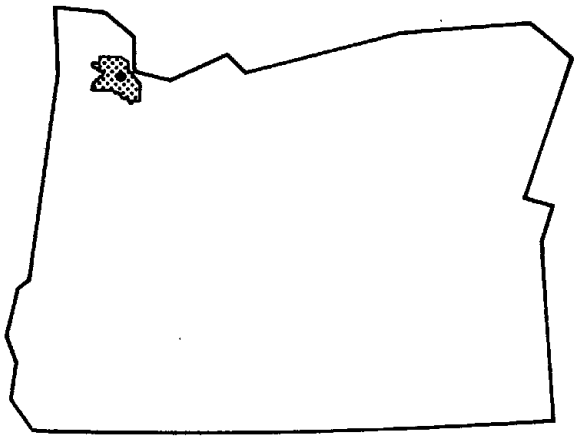


APPENDIX D

CITY OF NORTH PLAINS, FEMA FLOODPLAIN INSURANCE STUDY

FLOOD INSURANCE STUDY

CITY OF NORTH PLAINS, OREGON
WASHINGTON COUNTY



REVISED: MARCH 16, 1989

Federal Emergency Management Agency

COMMUNITY NUMBER - 410270

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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Exhibit 1 - Flood Profiles

McKay Creek	Panel 01P
Unnamed Tributary to McKay Creek	Panels 02P-03P

Exhibit 2 - Flood Insurance Rate Map

Exhibit 3 - Elevation Reference Marks

FLOOD INSURANCE STUDY
CITY OF NORTH PLAINS, WASHINGTON COUNTY, OREGON

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of North Plains, Washington County, Oregon and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

This Flood Insurance Study revises and updates a previous Flood Insurance Study/Flood Insurance Rate Map for the City of North Plains, Washington County, Oregon. This information will be used by the City of North Plains to update existing floodplain regulations as part of the Regular Phase of the NFIP. The information will also be used by local and regional planners to further promote sound land use and floodplain development.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Army Corps of Engineers (COE), Portland District, for the Federal Emergency Management Agency (FEMA), under Contract Nos. IAA-H-10-76 and No. IAA-H-10-77, Project Order Nos. 17 and 1, respectively. This work, which was completed in July 1980, covered all significant flooding sources affecting North Plains.

Revisions to the flooding along the Unnamed Tributary of McKay Creek were based on information developed by the COE, Portland District, under Interagency Agreement No. EMW-87-E-2549, Project Order No. 9A, in November 1987, as part of the Limited Map Maintenance Program.

1.3 Coordination

The initial coordination meeting was held October 22, 1976, with representatives of the FEMA, City of North Plains, and the study contractor to identify stream reaches to be studied, explain the study concepts, identify data sources, and establish communication and coordination procedures.

An intermediate coordination meeting was held in North Plains on September 12, 1980, to allow local officials to review water-surface profiles, floodway delineations, and floodplain boundaries.

The final coordination meeting was held on April 10, 1981, and was attended by city residents and representatives of the FEMA, study contractor, and city. All problems raised at the meeting were resolved.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated areas of the City of North Plains, Washington County, Oregon. The area of study is shown on the Vicinity Map (Figure 1).

The limits of detailed and approximate studies in North Plains were determined by the FEMA with community and study contractor consultation at the meeting in October 1976.

Those areas studied by detailed methods were selected with priority given to all known flood hazard areas, and with consideration given to all proposed construction and forecasted development.

McKay Creek and the Unnamed Tributary of McKay Creek were studied by detailed methods within the North Plains corporate limits. McKay Creek lies along the east boundary of the community and flows southerly. The Unnamed Tributary of McKay Creek flows southeasterly along the western corporate limits boundary of North Plains, and discharges into McKay Creek at the southeast edge of the city.

2.2 Community Description

North Plains is in north-central Washington County, in northwestern Oregon. It is approximately 20 miles west of Portland, Oregon. The city was incorporated in 1963 and grew to a population, estimated in July 1978, of 890 (Reference 1).

McKay Creek flows southerly crisscrossing the eastern corporate limits of North Plains. The drainage area of McKay Creek is 41 square miles at North Plains. The Unnamed Tributary of McKay Creek, which flows southeasterly, has a drainage area of approximately 2.5 square miles at its mouth.

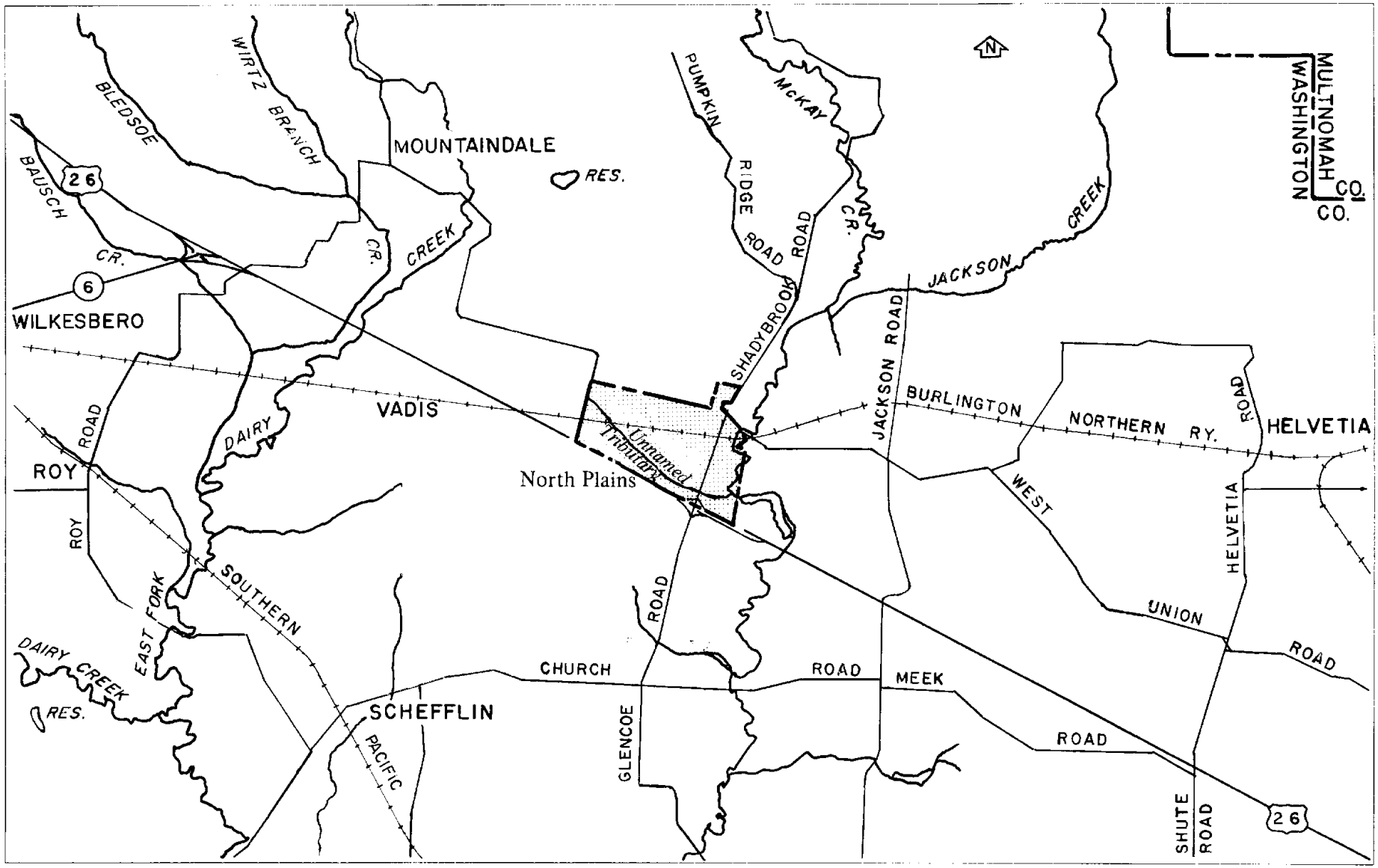

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF NORTH PLAINS, OR
(WASHINGTON CO.)

APPROXIMATE SCALE

1 0 1 2 3 MILES

VICINITY MAP

The economy of North Plains is based primarily on agriculture and forestry. Soil types in the city consist of the Woodburn, Aloha, and Willamette Associations. The area is dominated by well-drained to poorly-drained soils on nearly level to moderately steep terraces. Vegetation consists of grass, Douglas fir, oak, ash, willow, cedar, hazelbrush, maple, and rosebushes. The floodplains in the community are generally undeveloped.

The climate of North Plains is characterized in mild, wet winters, and warm, dry summers. Maritime airmasses generally dominate the area throughout the year. Mean monthly high temperatures range from 56°F, and mean monthly lows range from 17°F to 42°F (Reference 2). The mean annual precipitation is nearly 42 inches, with the majority of precipitation occurring between October and March (Reference 3).

2.3 Principal Flood Problems

Flooding in North Plains is caused by intense rainfall from massive winter storms moving inland from the Pacific Ocean. This often results in simultaneous flooding on all streams in the study area, as in the flood of December 1964. The flood season extends from late October through April. Historically, the majority of flooding has occurred in December, January, and February, as the result of heavy rains. This flooding is, at times, augmented by snowmelt. Flooding on the unnamed tributary downstream of Glencoe Road at River Mile (RM) 0.27 is greatly accentuated by coincident flooding on McKay Creek. Flooding upstream of Glencoe Road is also influenced by the backwater effect of McKay Creek. The 1.8-mile study reach has several highly constrictive culverts that cause substantial ponding. This includes the culvert crossing at Glencoe Road (RM 0.27) and the Burlington Northern Railroad (BNRR) culvert crossing at RM 1.20. At the BNRR culvert crossing, backwater from 10-year recurrence interval and greater floodflows would overflow the right bank at Gordon Road.

There are no stream gage stations on either McKay Creek or Unnamed Tributary of McKay Creek, but local officials and residents have substantial knowledge of flooding conditions through the study reach. Local officials indicate that floods rise quickly following a rainstorm and may last a full day. Coincident flooding on McKay Creek is primarily responsible for this relatively long flood duration for a small stream of 2.5 square miles drainage area. The constrictive culverts at RM 0.27 and RM 1.20 also contribute to the extended duration.

The most recent flood on January 31, 1987, closely followed this pattern of flood duration and coincident flooding on McKay Creek. Based on numerous high water marks, flood photographs, and interviews with local officials and residents, the January 31, 1987, flood was estimated to be greater than a 10-year recurrence interval. Flood damages were minor, however, consisting of numerous closed roads and isolation for several property owners. Flooding has occurred on a fairly regular basis on the Unnamed

Tributary, and that knowledge has discouraged development in the floodplain.

Figure 2 shows January 1974 flooding from McKay Creek in the vicinity of North Plains.

2.4 Flood Protection Measures

There are no structural flood protection measures existing nor proposed for reducing flood risk. However, North Plains currently enforces a floodplain ordinance regulating development in the floodplain (Reference 4). It limits fill in the floodplain and requires finished floor elevations of buildings in the floodplain to be 1 foot above the 100-year flood level. The community requires permits for all proposed construction and reviews permit applications to ensure that sites are reasonably free from flooding.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1 and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the community.

There are no stream gages on either McKay Creek or Unnamed Tributary of McKay Creek. Peak discharge-drainage area relationships for selected recurrence intervals for McKay Creek were obtained from a Myers rating curve developed using data from

Figure 2. January 1974 Flooding From McKay Creek

three gage locations on Tualatin River, and from one location each on Gales Creek and Johnson Creek.

The frequency discharges for the Unnamed Tributary of McKay Creek were developed by the regional analysis presented in "Magnitude and Frequency of Floods in Western Oregon," U.S. Geological Survey Open-File Report 79-553, dated 1979 (Reference 5). The frequency discharges developed by this procedure were checked for reasonableness of results.

Peak discharge-drainage area relationships are shown in Table 1.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of these flooding sources.

Hydraulic analyses were performed using the COE HEC-2 step-backwater computer program (Reference 6). Cross sections for McKay Creek were composites of data from the COE field surveys and topographic maps (Reference 7). Channel cross sections for the Unnamed Tributary of McKay Creek were field surveyed and an available orthophoto topographic map was used to extend the sections in the overbank areas. The map was previously developed by the COE, for the Washington County, Oregon, Flood Insurance Study in 1977, at a scale of 1 inch equals 400 feet and a contour interval of 4 feet and a contour interval of 4 feet (Reference 8). The field surveys were taken of the channel area and at least 50 feet to each side of the channel. Those field surveys were conducted in August 1987. All bridges, culverts, and weir structures were surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

Hydraulic roughness values (Manning's "n") for McKay Creek channel and overbanks were first estimated from field observation and then verified using flood photographs and high-water marks from previous floods. The final calibrated "n" values for McKay Creek in the study area varied from 0.056 to 0.057 for the channel and from 0.08 to 0.11 for the overbank. Starting water-surface elevations for the reach of McKay Creek through North Plains were based on normal-depth calculations. The model for Unnamed Tributary of McKay Creek was calibrated using engineering judgment and information about

past flooding events from local officials and residents along the Unnamed Tributary. Numerous high water marks from the recent January 31, 1987, flood were used in the model calibration for the entire 1.8-mile study reach.

The channel "n" values for the Unnamed Tributary of McKay Creek ranged from 0.045 to 0.075 and the overbank "n" values ranged from 0.070 to 0.110. Local officials indicate that floods peak coincidentally on the Unnamed Tibutary and McKay Creek, and hence greatly accentuate flood elevations on the lower reach of the Unnamed Tributary. Also, the starting water-surface elevations for the Unnamed Stream were based on McKay Creek water-surface elevations at the streams confluence (i.e., McKay Creek, at RM 9.79).

The hydraulic analysis for the Unnamed Tributary was complicated by the culvert structure crossing the BNRR at RM 1.20. Inadequate hydraulic capacity of the culvert results in 10-year recurrence interval and greater floodflows overflowing the right overbank at Gordon Road. The flood on January 31, 1987, closely followed this pattern, resulting in extensive flooding upstream of the BNRR embankment at RM 1.20. Hand calculations were used for the culvert and overbank flooding analysis, and these calculation were used to develop a rating curve for input into the HEC-2 computer model. Extensive backwater flooding also occurs at the Glencoe Road culvert crossing at RM 0.27, but upstream flood elevations do not reach major damaging flood levels.

Table 1. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs) 10-year	50-year	100-year	500-year
McKay Creek					
At North Plains	41	3,740	5,460	6,255	8,490
Unnamed Tributary to McKay Creek					
Near Mouth	2.5	178	273	318	435
Ninth Street	2.1	153	236	275	275
Gordon Road	1.8	135	208	243	330
Mountaindale Road	1.4	108	168	195	265

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study

are shown on the maps; the description of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages state and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by FEMA as the base flood for purposes of floodplain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the boundaries of the 100- and 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:4800, with a contour interval of 4 feet (References 7 and 8).

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE); and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum

standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated at selected cross sections (Table 2).

As shown on the Flood Insurance Rate Map (Exhibit 2), the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 3.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
McKay Creek								
A	10.02[1]	573	4,727	1.3	169.6	169.6	170.5	0.9
B	10.39	420/25[2]	3,603	1.7	170.2	170.2	171.1	0.9
C	10.52	200/70[2]	1,775	3.5	170.7	170.7	171.6	0.9
Unnamed Tributary of McKay Creek								
A	32[3]	142	504	0.6	169.4	169.4[4]	170.3	0.9
B	434	70	866	0.4	169.4	169.4	170.4	1.0
C	1,370	6	72	4.4	169.4	169.4	170.4	1.0
D	1,440	25	333	1.0	171.6	171.6	172.6	1.0
E	3,080	160	1,137	0.3	171.7	171.7	172.7	1.0
F	3,820	21	116	2.8	172.7	172.7	173.5	0.8
G	4,610	60	241	1.3	173.2	173.2	174.1	0.9
H	4,990	27	106	2.6	173.7	173.7	174.5	0.8
I	5,340	80	180	1.5	175.4	175.4	176.0	0.6
J	5,590	100	311	0.9	175.6	175.6	176.1	0.5
K	6,060	100	675	0.4	175.8	175.8	176.7	0.9
L	6,210	8	59	4.7	177.3	177.3	178.3	1.0
M	6,450	200	1,057	0.3	179.5	179.5	180.5	1.0
N	6,750	160	699	0.4	179.5	179.5	180.5	1.0

[1]Miles above mouth [2]Width/Width within Corporate Limits [3]Feet above mouth
[4]Elevation computed with consideration of backwater from McKay Creek due to coincident flooding

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF NORTH PLAINS, OR
(WASHINGTON, CO.)

FLOODWAY DATA

McKAY CREEK AND UNNAMED TRIBUTARY OF McKAY CREEK

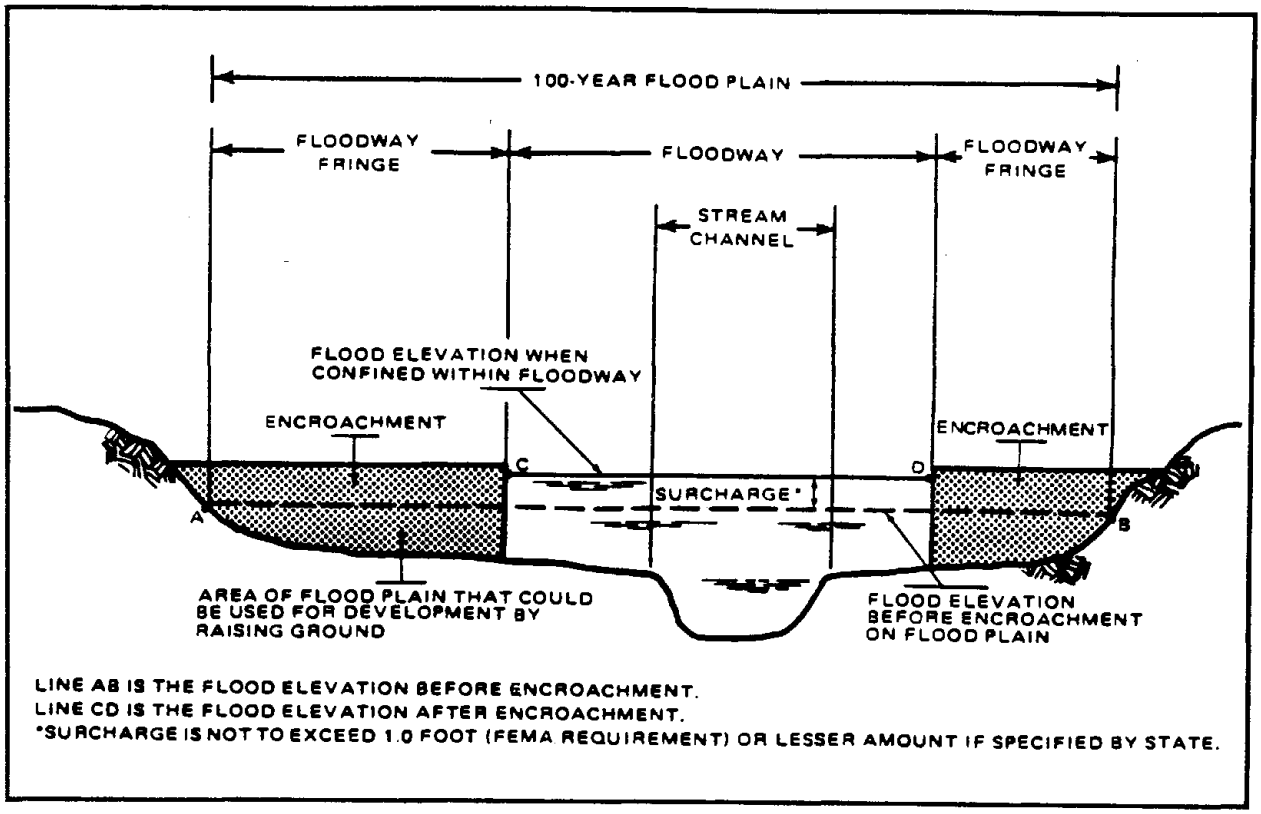

Figure 3. Floodway Schematic

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains, floodways, and locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

This report has been prepared concurrently with the Flood Insurance Study for Washington County, Oregon (Reference 9). That study shows

base flood elevations for McKay Creek adjacent to North Plains, Oregon. The elevations shown agree with elevations contained in this study.

The Washington County, Oregon, Flood Plain Information report, prepared by the COE in 1969 (Reference 10), also includes high-water profiles for McKay Creek in the vicinity of North Plains. In that report, McKay Creek 100-year flood elevations are approximately 1.5 feet higher than base flood elevations used in the present study. The difference in flood heights is attributed to the improved channel survey data and topographic maps used in this Flood Insurance Study. The North Plains Flood Insurance Study profiles are intended to supersede McKay Creek profiles in the Washington County Flood Plain Information report.

A Flood Hazard Boundary Map (Reference 11) for North Plains differs with this study due to the type and extent of analysis and to the accuracy of mapping materials used in the two studies.

This study is authoritative for the purposes of the NFIP; data presented herein either supersede or are compatible with all previous determinations.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Chief, Natural and Technological Hazards Division, FEMA, Federal Regional Center, 130 228th Street, S.W., Bothell, Washington 98021-9796.

9.0 BIBLIOGRAPHY AND REFERENCES

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11. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of North Plains, Washington County, Oregon, Scale 1:12,000, July 1976

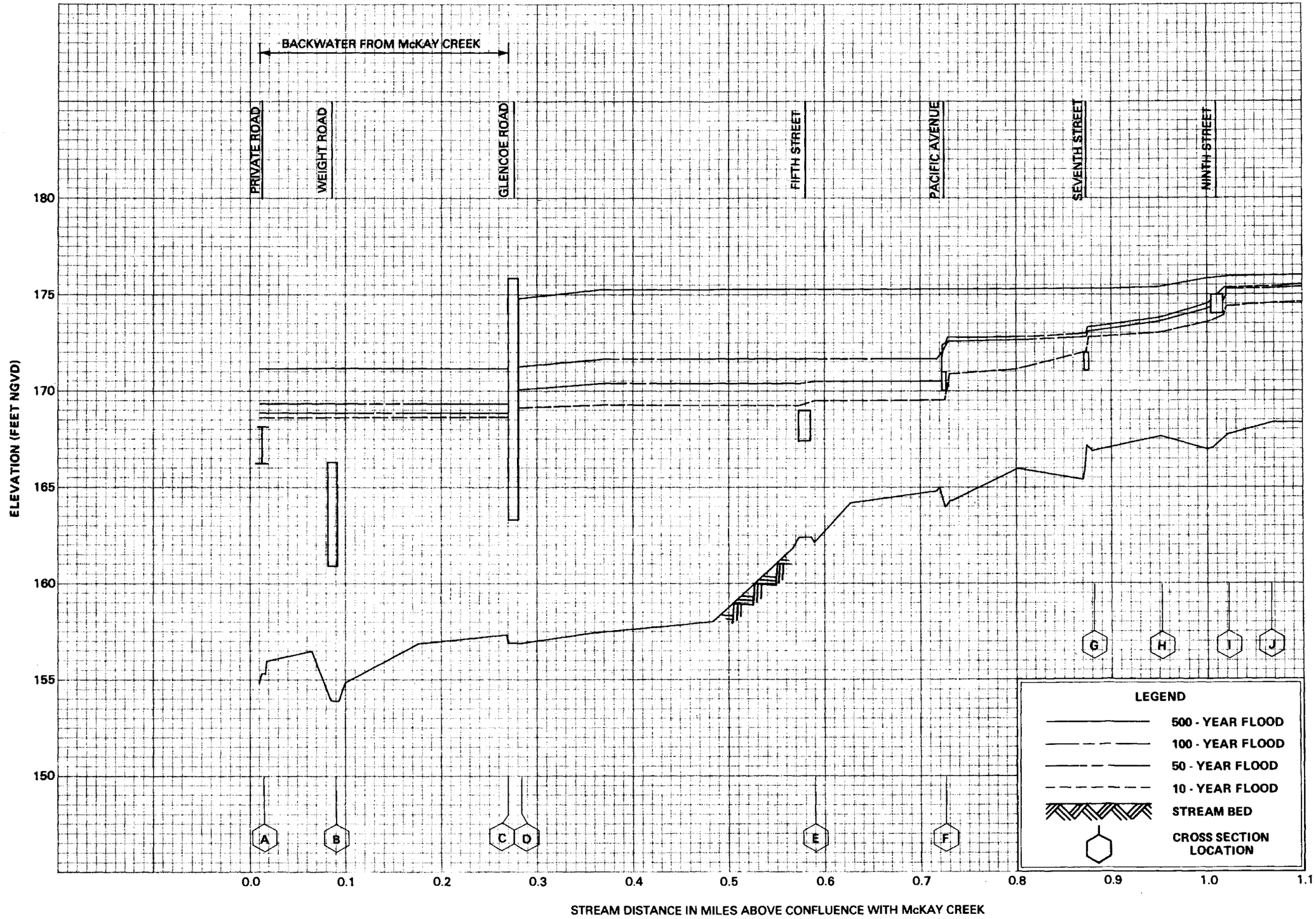
FLOOD PROFILES

McKAY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF NORTH PLAINS, OR
(WASHINGTON CO.)

01P



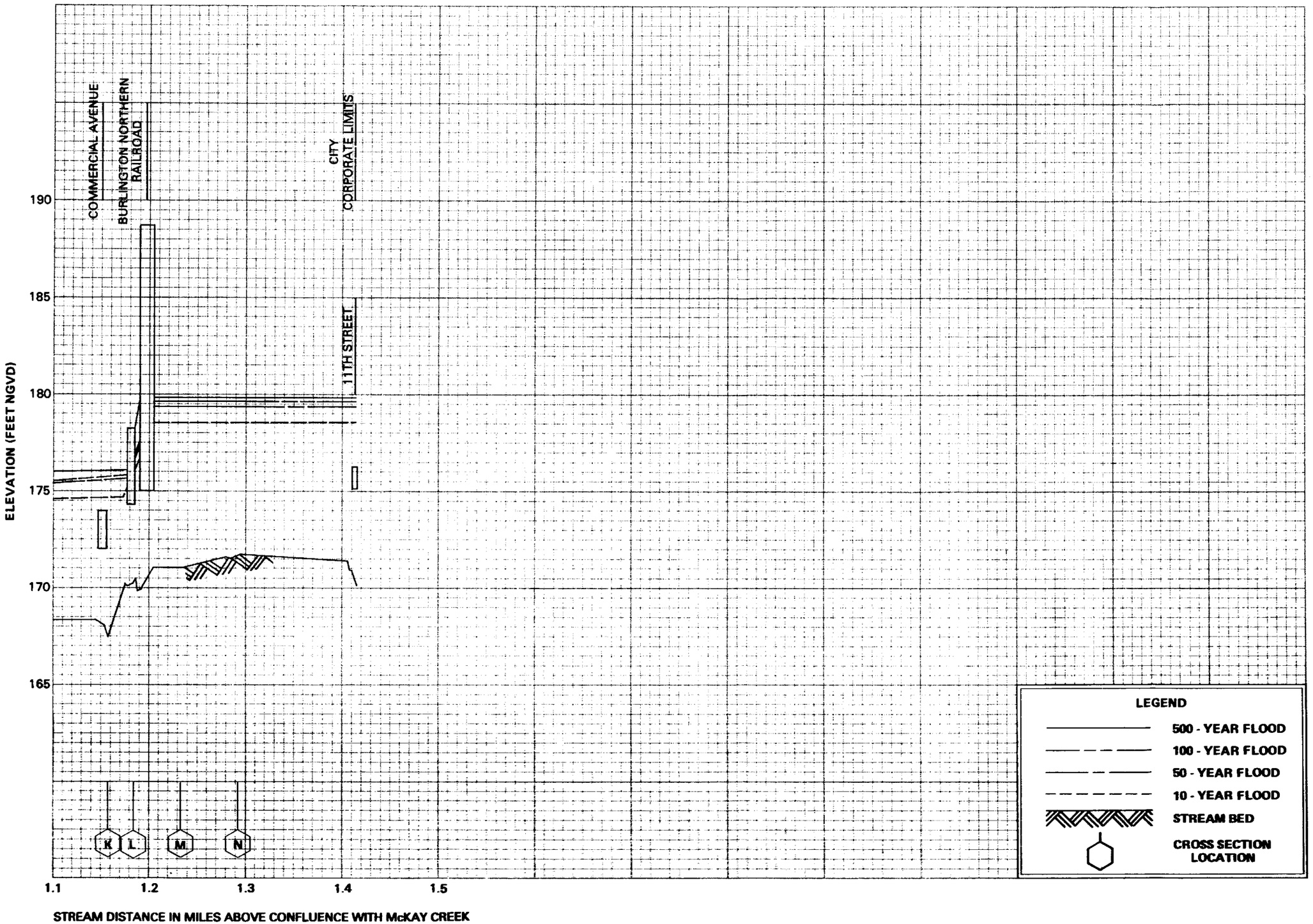
FLOOD PROFILES

UNNAMED TRIBUTARY TO McKAY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF NORTH PLAINS, OR
(WASHINGTON CO.)

02P



FLOOD PROFILES

UNNAMED TRIBUTARY TO McKAY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF NORTH PLAINS, OR
(WASHINGTON CO.)

03P

EXHIBIT 3 - ELEVATION REFERENCE MARKS
CITY OF NORTH PLAINS, OREGON

Reference Mark	Elevation (feet NGVD)	Description of Location
RM1*	192.05	Oregon State Highway Department disk stamped "M-672-1976," mark is in the southeast corner of the Glencoe Road overcrossing of Sunset Highway at milepost 57.16.
RM2*	185.6	On the Burlington Northern Railroad trestle over North Plains Road, top of a railroad spike on east end of trestle. Established by U.S. Army Corps of Engineers.
RM3	167.07	Boat spike with washer in power pole number 777, 500 feet southwest intersection of Pacific Avenue and 5th Street; 15 feet southeast of 5th Street.
RM4*	183.96	USC and GS brass disk in concrete; 50 feet northeast of intersection of Gordon Road and North Avenue. Stamped V-206 1934.

*OUTSIDE CORPORATE LIMITS

APPENDIX E

USDA-NRCS SOIL RESOURCE REPORT

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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 Washington County, Oregon

August 22, 2014

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 (http://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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means

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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 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.

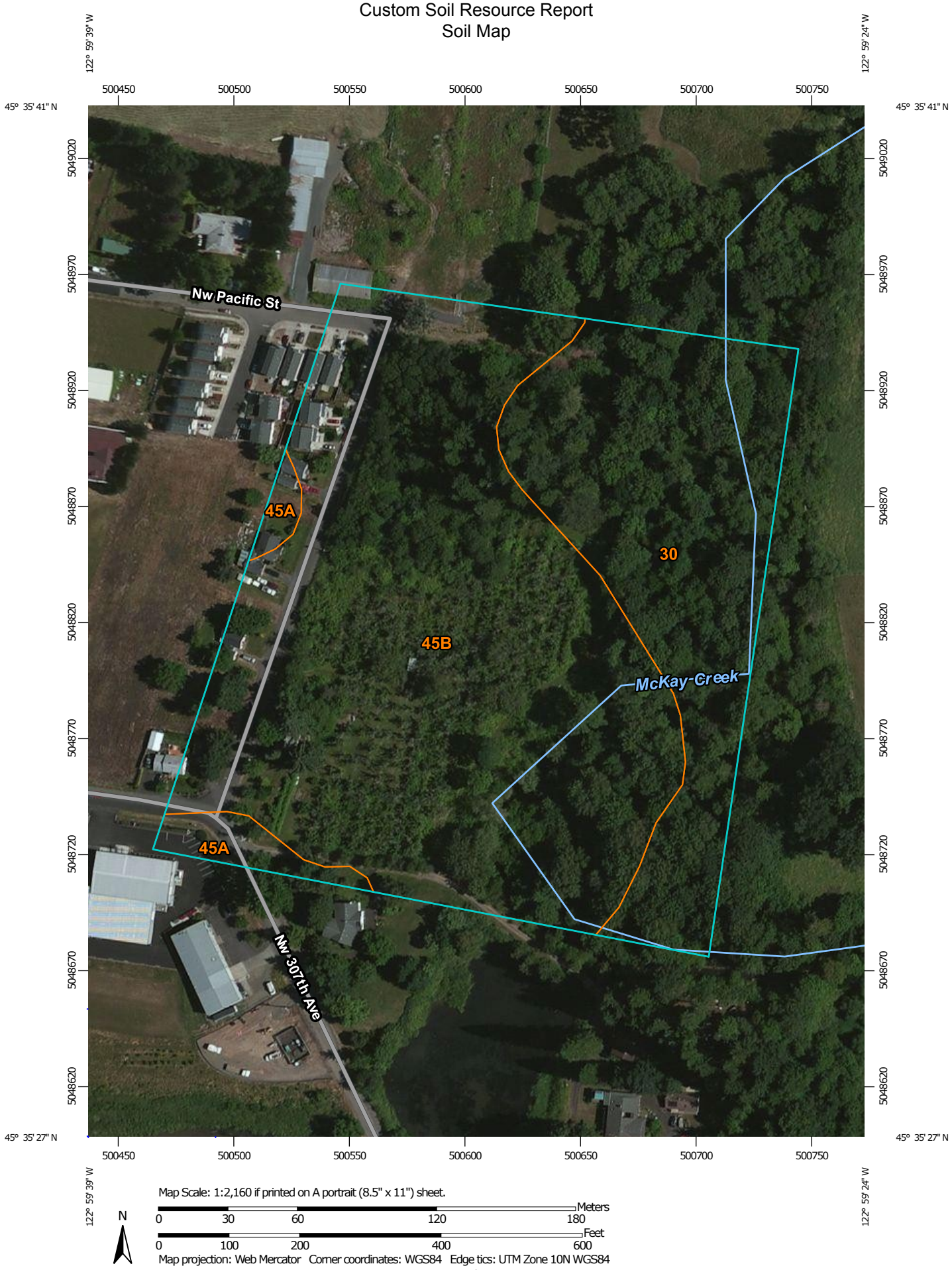
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree 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 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.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

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

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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: http://websoilsurvey.nrcs.usda.gov
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: Washington County, Oregon
Survey Area Data: Version 11, Dec 4, 2013

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

Date(s) aerial images were photographed: Jul 8, 2010—Sep 4, 2011

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

Washington County, Oregon (OR067)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
30	McBee silty clay loam	4.3	30.1%
45A	Woodburn silt loam, 0 to 3 percent slopes	0.5	3.2%
45B	Woodburn silt loam, 3 to 7 percent slopes	9.5	66.6%
Totals for Area of Interest		**14.3**	**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, 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.

Washington County, Oregon

30—McBee silty clay loam

Map Unit Setting

National map unit symbol: 21yw
Elevation: 100 to 300 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: Prime farmland if protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Mcbee and similar soils: 85 percent
Minor components: 9 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mcbee

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 11 inches: silty clay loam
H2 - 11 to 45 inches: silty clay loam
H3 - 45 to 65 inches: clay loam

Properties and qualities

Slope: 0 to 3 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 36 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: High (about 10.8 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C

Minor Components

Cove

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

Wapato

Percent of map unit: 4 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

45A—Woodburn silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2208
Elevation: 150 to 400 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Woodburn and similar soils: 85 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodburn

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old alluvium

Typical profile

H1 - 0 to 16 inches: silt loam
H2 - 16 to 31 inches: silty clay loam
H3 - 31 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 3 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 low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 25 to 32 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: C

Minor Components

Dayton

Percent of map unit: 1 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

45B—Woodburn silt loam, 3 to 7 percent slopes

Map Unit Setting

National map unit symbol: 2209
Elevation: 150 to 400 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Woodburn and similar soils: 85 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodburn

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old alluvium

Typical profile

H1 - 0 to 16 inches: silt loam
H2 - 16 to 31 inches: silty clay loam
H3 - 31 to 60 inches: silt loam

Properties and qualities

Slope: 3 to 7 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 low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 25 to 32 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C

Minor Components

Dayton

Percent of map unit: 1 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

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.

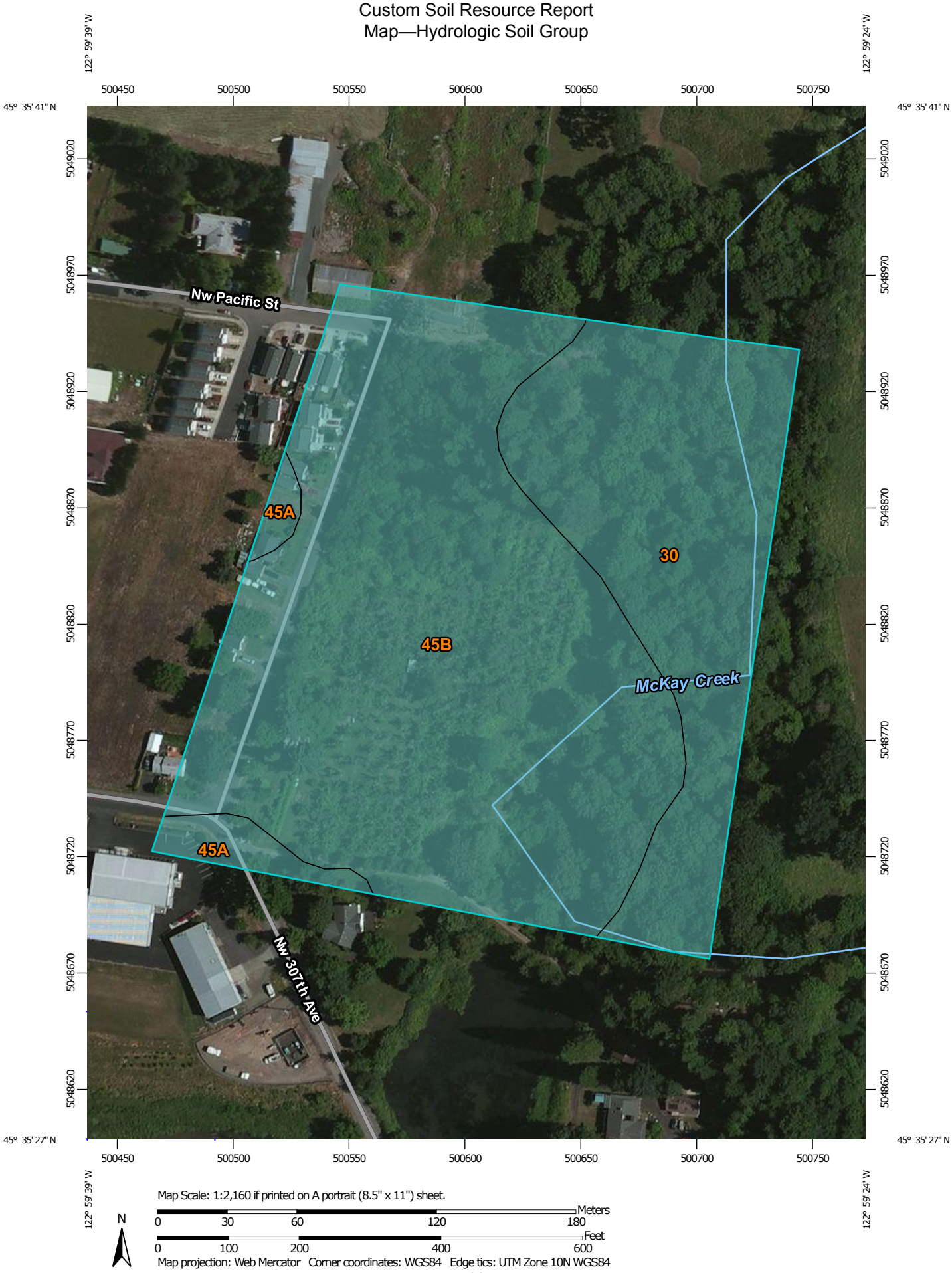
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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.

Map—Hydrologic Soil Group



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: http://websoilsurvey.nrcs.usda.gov
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: Washington County, Oregon
Survey Area Data: Version 11, Dec 4, 2013

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

Date(s) aerial images were photographed: Jul 8, 2010—Sep 4, 2011

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.

Table—Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Washington County, Oregon (OR067)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
30	McBee silty clay loam	C	4.3	30.1%
45A	Woodburn silt loam, 0 to 3 percent slopes	C	0.5	3.2%
45B	Woodburn silt loam, 3 to 7 percent slopes	C	9.5	66.6%
Totals for Area of Interest			**14.3**	**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

TR55 RUNOFF CURVE NUMBERS

TR55 RUNOFF CURVE NUMBERS

Table 2-2a Runoff curve numbers for urban areas [1]

Cover description: Cover type and hydrologic condition	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).					

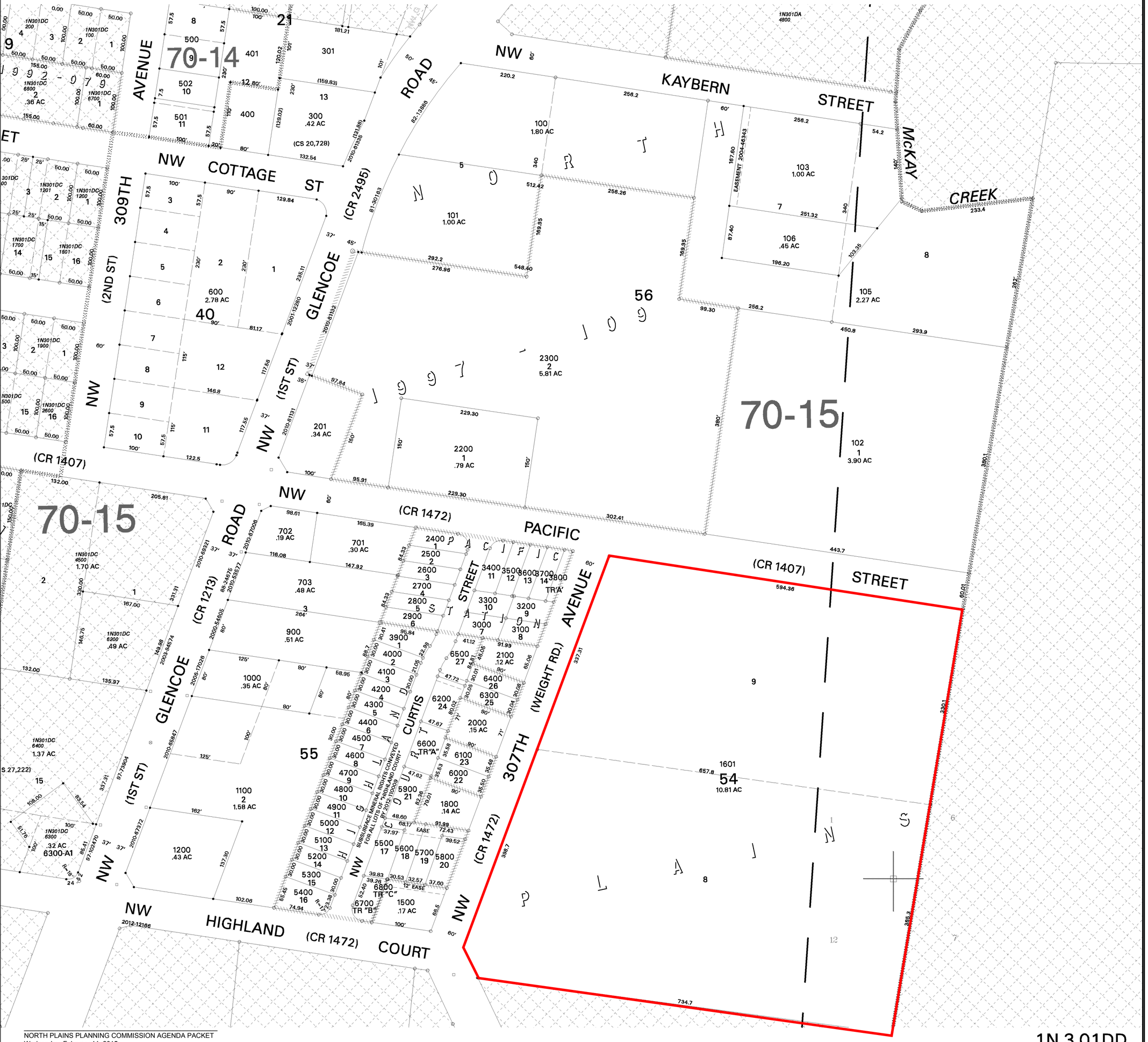
1 Average runoff condition, and $I_a = 0.2S$.
2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent 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 2-2c Runoff curve numbers for other agricultural lands [1]

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition	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.

County Assessor's Map



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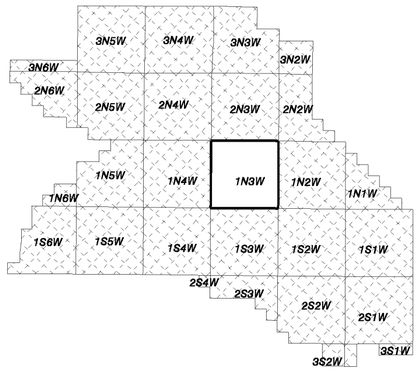
1N 3 01DD

1N 3 01DD



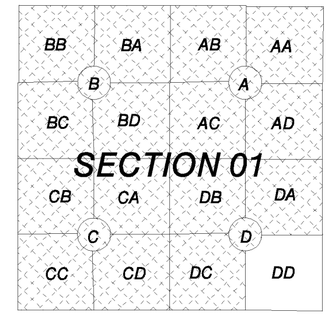
WASHINGTON COUNTY OREGON

SE1/4 SE1/4 SECTION 01 T1N R3W W.M.

SCALE 1" = 100'

36	31	32	33	34	35	36	31
1	6	5	4	3	2	1	6
12	7	8	9	10	11	12	7
13	18	17	16	15	14	13	18
24	19	20	21	22	23	24	19
25	30	29	28	27	26	25	30
36	31	32	33	34	35	36	31
1	6	5	4	3	2	1	6

FOR ADDITIONAL MAPS VISIT OUR WEBSITE AT
www.co.washington.or.us



Cancelled Taxlots For: 1N301DD
1600,104,1300,800,1700,200,700,1400-S1,1900,1400,

SCALE 1" = 100'

0 50 100 200 300

WASHINGTON COUNTY 1843 OREGON

Assessment
CARTOGRAPHY
Taxation

PLOT DATE: August 13, 2013

FOR ASSESSMENT PURPOSES ONLY - DO NOT RELY ON FOR OTHER USE

Map areas delineated by either gray shading or a cross-hatched pattern are for reference only and may not indicate the most current property boundaries. Please consult the appropriate map for the most current information.

NORTH PLAINS
1N 3 01DD

Exhibit 2

CITY OF NORTH PLAINS
NOTICE OF PUBLIC HEARING & REQUEST FOR COMMENTS

The purpose of this notice is to invite comments on:

An application requesting the approval of a preliminary plat for a 58-lot subdivision of single-family detached dwellings on a 10.90 acre lot designated R-2.5 on the City of North Plains Zoning Map. Commonly known as 9960 NW 307th Avenue, North Plains, OR-Tax lot #1N301DD1601.

The City will accept all written comments received prior to the hearing scheduled for

February 11, 2015, at 7:00 p.m.

North Plains Senior Center, 31450 NW Commercial Street, North Plains, Oregon 97133

LOT SIZE: 10.90 acres

ZONING: R-2.5

OWNER AND APPLICANT:
North Plains Acres, LLC /
Vinci Biggi Construction, LLC

DATE OF THIS NOTICE:
January 9, 2014

WHAT IS THE DECISION PROCESS? The North Plains Planning Commission will make a decision on the application for a preliminary plat for a 58-Lot single family residential subdivision after the public hearing. The Planning Commission's decision may be appealed to the City Council.

HOW CAN I REVIEW THE DOCUMENTS AND STAFF REPORT? You can review application now at http://cityofnp.org/files/8414/2076/4535/4094_20141110._FINAL_LAND_USE_PACKET.pdf and the staff report materials at City Hall, online after February 4, 2015 at www.northplains.org or request a copy by emailing martha@northplains.org

INFORMATION TO INCLUDE IN COMMENTS: Issues which may provide the basis for an appeal to the Land Use Board of Appeals shall be raised in writing prior to the expiration of the comment period. Issues shall be raised with sufficient specificity to enable the decision maker to respond to the issue. Failure of an issue to be raised in a hearing, in person, or by letter, or failure to provide statements or evidence sufficient to afford the decision maker an opportunity to respond to the issue, precludes appeal.

Application: **McKay Creek Crossing**

Name: **Mark Prince**

Organization or Business (If Any): **Washington County Fire District No. 2**

Address: **31370 NW Commercial, North Plains, OR**

Phone # (Optional): **503-681-6472**

Date: **14 January, 2015**

COMMENTS:

The planned layout looks great regarding the ingress and egress into the new subdivision. The only reminder is that per the Oregon Fire Code, fire hydrants used for suppression purposes should be no further than 600 road feet from any structure.

Please return by one of the following ways:

MAIL: 31360 NW Commercial Street, North Plains, OR 97133

IN PERSON: City Hall, 31360 NW Commercial Street, North Plains, OR

E-MAIL: martha@northplains.org

Please contact City Manager Martha DeBry at (503) 647-5555 with any questions

Thank you!

Exhibit 3

REC'D JAN 23 2015

Clean Water Services

MEMORANDUM

Date: January 20, 2015

To: Martha DeBry, City Manager, City of North Plains

From: Jackie Sue Humphreys, Clean Water Services (the District)

Subject: McKay Creek Crossing, 1N301DD01601

Please include the following comments when writing your conditions of approval:

PRIOR TO ANY WORK ON THE SITE AND PLAT RECORDING

A Clean Water Services (the District) Storm Water Connection Permit Authorization must be obtained prior to plat approval and recordation. Application for the District's Permit Authorization must be in accordance with the requirements of the Design and Construction Standards, Resolution and Order No. 07-20, (or current R&O in effect at time of Engineering plan submittal), and is to include:

a. Detailed plans prepared in accordance with Chapter 2, Section 2.04.2.b-l.

b. Detailed grading and erosion control plan. An Erosion Control Permit will be required. Area of Disturbance must be clearly identified on submitted construction plans. If site area and any offsite improvements required for this development exceed one-acre of disturbance, project will require a 1200-CN Erosion Control Permit. If site area and any offsite improvements required for this development exceed five-acres of disturbance, project will require a 1200-C Erosion Control Permit.

c. Detailed plans showing each lot within the development having direct access by gravity to public storm and sanitary sewer.

d. Provisions for water quality in accordance with the requirements of the above named design standards. Water Quality is required for all new development and redevelopment areas per R&O 07-20, Section 4.05.5, Table 4-1. Access shall be provided for maintenance of facility per R&O 07-20, Section 4.02.4.

2550 SW Hillsboro Highway • Hillsboro, Oregon 97123
Phone: (503) 681-3600 • Fax: (503) 681-3603 • cleanwaterservices.org

e. If use of an existing offsite or regional Water Quality Facility is proposed, it must be clearly identified on plans, showing its location, condition, capacity to treat this site and, any additional improvements and/or upgrades that may be needed to utilize that facility.

f. If private lot LIDA systems proposed, must comply with the current CWS Design and Construction Standards. A private maintenance agreement, for the proposed private lot LIDA systems, needs to be provided to the City for review and acceptance.

g. Show all existing and proposed easements on plans. Any required storm sewer, sanitary sewer, and water quality related easements must be granted to the City.

h. Site contains a "Sensitive Area." Applicant shall comply with the conditions as set forth in the Service Provider Letter No. 14-002673, dated November 6, 2014.

i. Developer may be required to preserve a corridor separating the sensitive area from the impact of development. The corridor must be set aside in a separate tract, not part of any buildable lot and, shall be subject to a "Storm Sewer, Surface Water, Drainage and Detention Easement over its entirety", or its equivalent.

j. Detailed plans showing the sensitive area and corridor delineated, along with restoration and enhancement of the corridor.

k. Provide DSL and Corps of Engineers permits for any work in the wetlands or creek prior to any on site work, including grading and erosion control. Include permit number on cover sheet of plans or provide concurrence with the delineation.

l. Any proposed offsite construction activities will require an update or amendment to the current Service Provider Letter for this project.

CONCLUSION

This Land Use Review does not constitute the District's approval of storm or sanitary sewer compliance to the NPDES permit held by the District. The District, prior to issuance of any connection permits, must approve final construction plans and drainage calculations.

Application: **McKay Creek Crossing**

Exhibit 4

Name: **Garth Eimers**

Organization or Business (If Any): **Planning Commission**

Address: **11045 NW Cami Place, North Plains**

Phone # (Optional): **360-317-5608**

Date: **Jan 12, 2015**

COMMENTS:

How is the applicant going to comply with Comp Plan Chapter 15.01.050-1, Architecture and Landscape design?

Please return by one of the following ways:

MAIL: 31360 NW Commercial Street, North Plains, OR 97133

IN PERSON: City Hall, 31360 NW Commercial Street, North Plains, OR

E-MAIL: martha@northplains.org

Please contact City Manager Martha DeBry at (503) 647-5555 with any questions

Thank you!

Exhibit 5

Application: **McKay Creek Crossing**

Name: **Stewart King**

Organization or Business (If Any): **City of North Plains, Planning Commission**

Address: **City Hall**

Phone # (Optional): **503-647-9340**

Date: **January 14, 2015**

COMMENTS:

This property is located along the McKay Creek Corridor. It appears to be a great opportunity for the City of North Plains to get control of a walking path along the creek corridor of this property and possibly a nature park located in the 100-year flood plan. I would appreciate input from the Park's Board.

Please return by one of the following ways:

MAIL: 31360 NW Commercial Street, North Plains, OR 97133

IN PERSON: City Hall, 31360 NW Commercial Street, North Plains, OR

E-MAIL: martha@northplains.org

Planning and Building Activity
Fiscal Year 2014-15
Applications Received

Building Activity	Review	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
New House Permit	1	0	4	11	3	34		1					
Remodel Permit	1	1	0	0			1						
Demolition	1	1	1	1									
Right of Way Permit	1		4	11	3	34							
Planning Activity	**Review**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**
Annexation	3, C	0	0	0									
Comp Plan Amendment	3, C	0	0	0									
Conditional Use	3	0	0	0									
Design Review	3	0	0	0									
Fence	1	0	0	0									
Flood Plain Development	3	0	0	0		1							
Historic Overlay	2 or 3	1	0	0									
Home Occupation	2	0	0	0									
Lot Line Adjustment	2	4	0	0									
Mobile Home Park	3	0	0	0									
Non-Conformin Use	3	0	0	0									
Partition	2	0	0	0									
Sign permit	1	0	0	0	1	1							
Similar Use	3	0	0	0									
Significant Natural Resource	3	0	0	0		1							
Street Vacation	4	0	0	0									
Subdivision	3	0	0	0		1							
Subdivision Final Plat	3	0	0	0									
Subdivision Modification	2	0	0	0									
Subdivision Modification	3	0	0	0									
Temporary Use	1	0	0	0									
Variance	1 or 2	1	0	0									
Variance	3	0	0	0		1							
Zone Change	3	0	0	0									
Zone Code Amendment	3	0	0	0									
Appeal	3	0	0	0									
Appeal	C	0	0	0									
Pre- Application Conferences		1	0	0	1	1							

Review - 1 = Administrative, 2 = City Planner, 3 = Planning Commission, C = Council