City of Tualatin
www.tualatinoregon.gov

"NECESSARY PARTIES" MARKED BELOW

NOTICE OF APPLICATION SUBMITTAL

☐ ANNEXATION ☐ CONDITIONAL USE PERMIT ☐ PLAN TEXT AMENDMENT
☒ ARCHITECTURAL REVIEW ☐ PLAN MAP AMENDMENT ☐ OTHER:

CASE/FILE: AR18-0005 (Community Development Dept.: Planning Division)

PROPOSAL	
	The applicant, Chessir Architecture, PC, proposes a 21,720 square foot addition to an existing 11,200 square foot industrial building located at the northwest corner of SW Leveton Drive and 126th Place. A new driveway approach is proposed on SW Leveton Drive. Additional parking is proposed around the building addition.

PROPERTY					
☐ n/a	**Name of Application**	Columbia Roofing Building Addition			
	Street Address	18525 SW 126th Place			
	Tax Map and Lot No(s).	2S1 21A 4200			
	Planning District	ML	**Overlays** ☐	**NRPO** ☐	**Flood Plain** ☐
	Previous Applications	AR-07-06; CU-06-02	**Additional Applications:** N/A		**CIO** Manufacturing

DATES					CONTACT	
	Receipt of application	10/09/18	**Deemed Complete**	11/07/18		**Name:** Erin Engman
	Notice of application submittal			11/08/18		**Title:** ASSOCIATE PLANNER
	Development Review meeting					**E-mail:** EENGMAN @tualatin.gov
	Comments due for staff report			11/26/18		**Phone:** 503-691-3024
	Public meeting: ☐ **ARB** ☐ **TPC** ☒ **n/a**					**Notes:** You may view the application materials through this City web page: www.tualatinoregon.gov/projects
	City Council (CC) ☒ **n/a**					

City Staff
☒ City Manager
☒ Building Official
☒ Chief of Police
☒ City Attorney
☒ City Engineer
☒ Community Development Director
☒ Community Services Director
☒ Economic Development liaison
☒ Engineering Associate*
☒ Finance Director
☒ GIS technician(s)
☒ IS Manager
☒ Operations Director*
☒ Parks and Recreation Coordinator
☒ Planning Manager
☒ Street/Sewer Supervisor
☒ Water Supervisor

Neighboring Cities
☐ Durham
☐ King City Planning Commission
☐ Lake Oswego
☐ Rivergrove PC
☐ Sherwood Planning Dept.
☐ Tigard Community Dev. Dept.
☐ Wilsonville Planning Division

Counties
☐ Clackamas County Dept. of Transportation and Development
☒ Washington County Dept. of Land Use and Transportation (ARs)
☐ Washington County Long Range Planning (LRP) (Annexations)

Regional Government
☒ Metro

School Districts
☐ Lake Oswego School Dist. 7J
☐ Sherwood SD 88J
☐ Tigard-Tualatin SD 23J (TTSD)
☐ West Linn-Wilsonville SD 3J

State Agencies
☐ Oregon Dept. of Aviation
☒ Oregon Dept. of Environmental Quality (DEQ)
☐ Oregon Dept. of Land Conservation and Development (DLCD) (via proprietary notice)
☒ Oregon Dept. of State Lands: Wetlands Program
☒ Oregon Dept. of Transportation (ODOT) Region 1
☐ ODOT Maintenance Dist. 2A
☐ ODOT Rail Division
☐ OR Dept. of Revenue

Utilities
☒ Republic Services
☒ Clean Water Services (CWS)
☒ Comcast [cable]*
☒ Frontier Communications [phone]
☒ Northwest Natural [gas]
☒ Portland General Electric (PGE)
☒ TriMet
☒ Tualatin Valley Fire & Rescue
☒ USPS (Washington; 18850 SW Teton)
☐ USPS (Clackamas)
☒ Washington County Consolidated Communications Agency

Additional Parties
☒ Tualatin Citizen Involvement Organization (CIO)

***Paper Copies**

☐ *1.032: Burden of Proof*

☒ *31.071 Architectural Review Procedure*

☒ *31.074 Architectural Review Application Review Process*

☐ *31.077 Quasi-Judicial Evidentiary Hearing Procedures*

☐ *Metro Code 3.09.045 Annexation Review Criteria*

☐ *32.030 Criteria for Review of Conditional Uses*

☐ *33.020 Conditions for Granting a Variance that is not a Sign or a Wireless Communication Facility*

☐ *33.022 Criteria for Granting a Sign Variance*

☐ *33.024 Criteria for Granting a Minor Variance*

☐ *33.025 Criteria for Granting a Variance*

☐ *34.200 Tree Cutting on Private Property without Architectural Review, Subdivision or Partition Approval, or Tree Removal Permit Prohibited*

☐ *34.210 Application for Architectural Review, Subdivision or Partition Review, or Permit*

☒ *34.230 Criteria(tree removal)*

☐ *35.060 Conditions for Granting Reinstatement of Nonconforming Use*

☐ *36.160 Subdivision Plan Approval*

☐ *36.230 Review Process (partitioning)*

☐ *36.330 Review Process*

☐ *37.030 Criteria for Review (IMP)*

☐ *40.030 Conditional Uses Permitted (RL)*

☐ *40.060 Lot Size for Conditional Uses (RL)*

☐ *40.080 Setback Requirements for Conditional Uses (RL)*

☐ *41.030 Conditional Uses Permitted (RML)*

☐ *41.050 Lot Size for Conditional Uses (RML)*

☐ *41.070 Setback Requirements for Conditional Uses (RML)*

☐ *42.030 Conditional Uses Permitted (RMH)*

☐ *42.050 Lot Size for Conditional Uses (RMH)*

☐ *42.070 Setback Requirements for Conditional Uses (RMH)*

☐ *43.030 Conditional Uses Permitted (RH)*

☐ *43.060 Lot Size for Conditional Uses (RH)*

☐ *43.090 Setback Requirements for Conditional Uses (RH)*

☐ *44.030 Conditional Uses Permitted (RH-HR)*

☐ *44.050 Lot Size for Conditional Uses (RH-HR)*

☐ *44.070 Setback Requirements for Conditional Uses (RH-HR)*

☐ *49.030 Conditional Uses (IN)*

☐ *49.040 Lot Size for Permitted and Conditional Uses (IN)*

☐ *49.060 Setback Requirements for Conditional Uses (IN)*

☐ *50.020 Permitted Uses (CO)*

☐ *50.030 Central Urban Renewal Plan – Additional Permitted Uses and Conditional Uses (CO)*

☐ *50.040 Conditional Uses (CO)*

☐ *52.030 Conditional Uses (CR)*

☐ *53.050 Conditional Uses (CC)*

☐ *53.055 Central Urban Renewal Area – Conditional Uses (CC)*

☐ *54.020 Permitted Uses (CG)*

☐ *56.030 Conditional Uses (MC)*

☐ *56.045 Lot Size for Conditional Uses (MC)*

☐ *57.030 Conditional Uses (MUCOD)*

☒ *60.040 Conditional Uses (ML)*

☒ *60.041 Restrictions on Conditional Uses (ML)*

☐ *61.030 Conditional Uses (MG)*

☐ *61.031 Restrictions on Conditional Uses (MG)*

☐ *62.030 Conditional Uses (MP)*

☐ *62.031 Restrictions on Conditional Uses (MP)*

☐ *64.030 Conditional Uses (MBP)*

☐ *64.050 Lot Size for Permitted and Conditional Uses (MBP)*

☐ *64.065 Setback Requirements for Conditional Uses (MBP)*

☐ *68.030 Criteria for Designation of a Landmark*

☐ *68.060 Demolition Criteria*

☐ *68.070 Relocation Criteria*

☐ *68.100 Alteration and New Construction Criteria*

☐ *68.110 Alteration and New Construction Approval Process*

☐ *73.130 Standards*

☒ *73.160 Standards*

☐ *73.190 Standards – Single-Family and Multi-Family Uses*

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☐ *73.227 Standards*

☒ *73.230 Landscaping Standards*

☐ *73.300 Landscape Standards – Multi-Family Uses*

☒ *73.310 Landscape Standards – Commercial, Industrial, Public and Semi-Public Uses*

☐ *73.320 Off-Street Parking Lot Landscaping Standards*

☐ *73.470 Standards*

☐ *73.500 Standards*

CITY OF TUALATIN
Community Development Department-Planning Division
Land Use Application—Type II

PROPOSAL NAME COLUMBIA ROOFING BUILDING EXPANSION

PROPOSAL SUMMARY (Brief description)
BUILD A 19800 sf CONCRETE TILT UP ADDITION TO THE EXISTING 11200 sf BUILDING AND ADD SPRINKLER SYSTEM TO NEW & EXISTING BUILDINGS.

PROPERTY INFORMATION

Location (address if available): 18525 SW 126TH PLACE TUALATIN OR

Tax Map & Lot #(s): LOT 10, TAX MAP #2S121A, TAX LOT 420 Planning District: _____

Total site size: 84070 sf, 1.93 AC ☒ Developed ☐ Undeveloped

APPLICANT/CONTACT INFORMATION

Applicant or Primary Contact Name: STAN CHESSHIR

Mailing Address: 2337 NW YORK #208

City/State: PORTLAND OR Zip: 97210

Phone: 503 228 3273 Email: stan@chesshirarchitecture.com

Applicant's Signature: [signature] Date: 9/7/18

I hereby acknowledge that I have read this application and understand the requirements for approving and denying the application, that the information provided is correct, that I am the owner or authorized agent of the owner, and that plans submitted are in compliance with the City of Tualatin Development (TDC) and Municipal (TMC) Codes.

PROPERTY OWNER/DEED HOLDER INFORMATION (Attach list if more than one)

Name: MARK CARPENTER, GRAY ALTA LLC

Mailing Address: 18525 SW 126TH PLACE

City/State: TUALATIN OR Zip: 97062

Phone: 503 684 9123 Email: markcc@reroofnow.com

Property Owner Signature: Mark McCarpenter Member Date: 10/4/18

Power of attorney or letter of authorization required if application not signed by the property owner/deed holder.

LAND USE APPLICATION TYPE

- ☒ Architectural Review (AR)
- ☐ Historic Landmark (HIST)
- ☐ Interpretation (INT)
- ☐ Minor Variance (MVAR)
- ☐ Tree Removal (TCP)
- ☐ Other_____

FOR STAFF USE ONLY

Case No.:_____
Date Received:_____
By:_____
Fee Amount $:_____
Received by:_____

CITY OF TUALATIN FACT SHEET

General

Proposed use: LIGHT MANUFACTURING, SUPPORT OFFICE, WAREHOUSE TENANT SPACES IN CONFORMANCE W/ ML ZONE	
Site area: 1.93 acres	Building footprint: 32920 sq. ft.
Development area: 1.93 acres	Paved area: 37103 sq. ft.
84071 Sq. ft.	Development area coverage: 100 %

Parking

Spaces required (see TDC 73.400) *(example: warehouse @ 0.3/1000 GFA)* OFFICE 4400 17.5 OFFICE 6480 2.7/1000 = 17.5 WHSE @ .3 /1000 GFA = 3 MFR @ 1.6 /1000 GFA = 11 WSE @ 3 /1000 GFA = 59 Total parking required: spaces ADA accessible = 3 Van pool = 3 Compact = *(max. 35% allowed)* 4 = Loading berths = 3	Spaces provided: Total parking provided: 71 spaces Standard = 61 ADA accessible = 3 Van pool = 3 Compact = 4 Loading berths = 2

Bicycles

Covered spaces required: 4	Covered spaces provided: 4 +

Landscaping

Landscaping required: 15 % of dvpt. area Square feet	Landscaping provided: 17 % of dvpt. area Square feet
Landscaped parking island area required: 2 %	Landscaped parking island area provided: 3 %

Trash and recycling facility

Minimum standard method: 190 square feet
Other method: REPUBLIC 240 + EXISTING square feet

For commercial/industrial projects only

Total building area: 37597 sq. ft. Main floor: 32920 sq. ft. Mezzanine: sq. ft.	2nd floor: 4677 sq. ft. 3rd floor: sq. ft. 4th floor: sq. ft.

For residential projects only

Number of buildings:	Total sq. ft. of buildings: sq. ft.
Building stories:	

LAND USE ARCHITECTURAL REVIEW APPLICATION

COLUMBIA ROOFING BUILDING ADDITION
18525 SW 126th Place
Tualatin OR

DATE: 10/4/18

SUBMITTED TO:
City of Tualatin
18880 SW Martinazzi Ave.
Tualatin, OR 97062-7092

APPLICANT
Chesshir Architecture pc
2337 NW York St # 208
Portland, OR 97210

PROPERTY OWNER
Gray Alfa LLC
18525 SW 126th Place
Tualatin OR 97062-7092

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Affidavit of Mailing Neighbors and Labels
Neighborhood Sign In Sheet
Neighborhood Meeting Minutes

CITY ARCHITECTURAL REVIEW (AR) APPLICATION
City Application for AR
City Intake Checklist
City Fact Sheet
City Comp Plan Map

AGENCY DOCUMENTATION
Clean Water Services
Republic Services Hauler Approval Letter
TVFD Approval Letter (*to be included)
Title Report
Site Lighting plan and Photometrics
Traffic Impact Study
Preliminary Storm Report
A/R Certification of Sign Posting

ARCHITECTURAL AND ENGINEERING PLANS
Plan Sheets

A1, A2, A3, Architectural Plans
L1 Landscape Plan
C1, C2, C3 Civil Engineering plans

PROJECT DESCRIPTION

Legal Description Lot 10, Tax Map No. 2S 1 21A, Tax lot No. 4200

The project site is located at the NW corner of the intersection of SW Leveton Drive and SW 126th Place and is within the Light Manufacturing (ML) Planning District zone of the Tualatin Community Plan. The 84,070.8 sf site currently contains an 11,200 sf footprint building on the Northern portion of the site, which is occupied by Columbia Roofing Company, 18525 SW 126th Place. The site is situated on a corner and the public sidewalks, street trees and parking strip landscaping are installed in both the developed and undeveloped portions of the site. The total site landscaping and pedestrian amenities, as proposed, will be 17% of the site. The Project Scoping meeting was held on 2/7/18 and was attended by the applicant and the contractor, TS Gray Construction, as well as the representatives from the City agencies and TVFR. The plans that were submitted for this meeting were deemed to be adequate and in compliance and qualified for the pre-application meeting also, simultaneously, with further development of the landscaping and parking needed. The Neighborhood/Developer notices were mailed, and signage posted, in accordance with requirements. The meeting was held on 4/18/18.

The existing building use is divided into a warehouse area, a sheet metal fabrication area and a 2 story sf support office area. The existing building is constructed of tilt up concrete exterior walls, aluminum windows and wood framed interior walls and floor system. The proposed 21,720 sf addition will be built with the same construction systems and appearance. The area adjacent to the south of the existing building will be occupied by an expanded sheet metal shop for Columbia Roofing and portion of office area expansion. The remaining space on the South portion of the addition will be lease tenant space restricted to uses allowed within the ML zone, with individual storefront type entrances facing Leveton Drive. The entire building will be protected with a new fire sprinkler system. The flow test for the water supply is provided in the exhibits, as requested by the Fire Marshal in the pre-application meeting.

The site currently has 2 access drives on the east side of the site (SW 126th Place), a new drive is proposed near the SW corner of the site on SW Leveton Drive. The new drive location was reviewed by the City Engineer in the Scoping and Pre-Application meeting and found to be in-compliance, relative to the property access across the street and the intersecting road to the South (SW 128th Place). The plans submitted currently vary from the Pre-application plans in that 10 feet of the south portion of the building was removed to provide adequate drive aisle and the offset in the addition on the center of the east portion was reduced to 1 foot from 30', which resulted in very close to the same footprint square footage. A traffic impact study was conducted and included in this submittal.

As suggested in the Pre-application meeting, the number of parking spaces proposed meets the "worst case" scenario of allowed uses on site, even though the current uses have a lower occupancy than could be possible for the site, planning for the possibility of change of usage in the future having adequate parking. 71 total spaces are proposed.

The proposed on-site underground water retention and quality facilities have been designed to work in conjunction with the existing water quality swale on the SW corner of the site, with roof and site runoff connected. Civil Engineering design plan and report are included in this submittal. The area of the proposed addition was prepared with compacted engineered fill when the current building was constructed. The testing records are available, if requested.

The existing electrical service and power transformer equipment on the north side of the building is screened and deemed adequate for the building expansion. The new trash receptacle facility, screen walls and location for access are in accordance with Republic Services standards and the review approval letter is attached. The existing trash facility will remain for the existing building use also.

PROJECT TEAM/CONTACTS

Applicant/Architect:
Chesshir Architecture, PC
2337 NW York St. #208
Portland OR 97210
Contact: Stan Chesshir
503 228 3273
stan@chesshirarchitecture.com

Property Owner:
Gray Alfa LLC
18525 SW 126th Place
Tualatin OR 97062
Contact: Mark Carpenter
503 684 9123
markc@reroofnow.com

Contractor:
TS Gray Construction
PO Box 1000
Sherwood OR 97140
Contact: AJ Michaud
503 692 4675
ajmichaud@tsgrayconstruction.com

Consultants:
Structural Engineering
Hayden Structural Engineering
12480 SW 68th Ave.
Tigard OR 97223
Contact: Darron Hayden
503 968 9994
dhayden@hayden-engineers.com

Civil Engineering
Sisul Engineering
375 Portland Ave.
Gladstone, OR 97027
Contact: Jimmy Fox
503 657 0188
jimmy@sisulengineering.com

Landscape Architecture
Christopher Freshley Landscape Architect
3944 SW 36th Place
Portland OR 97221
Contact: Chris Freshley
503 222 9881
chris@freshleylandscapearchitect.com

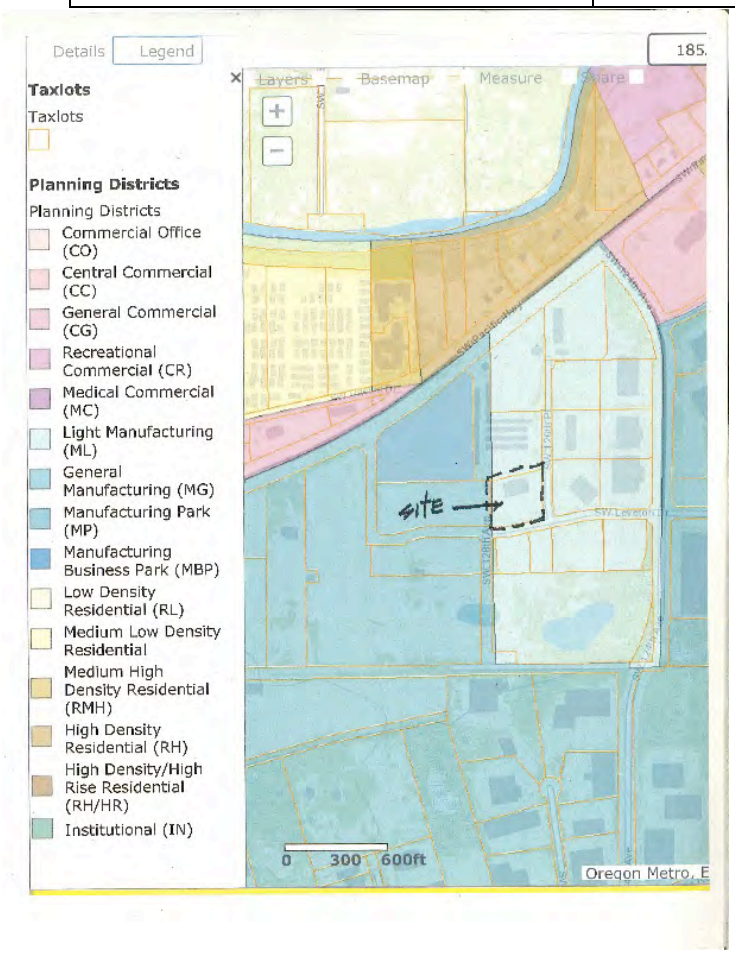
Traffic Engineering
Ard Engineering
21370 Langer Farms Parkway, Suite 142
Sherwood OR 97140
Contact: Mike Ard
503 537 8511
mike@ardengr.com

NARRATIVE RESONSES TO TUALATIN DEVELOPMENT CODE (TDC)

TDC Chapter 31: General Provisions

Section 31.020 Classification of Planning District.
In order to carry out the objectives of the Tualatin Community Plan, land within the City is divided into planning districts. The established planning districts shall be designated on the Plan Map, and the planning district designations shall be as follows:

Planning District	Abbreviated Designation
Light Manufacturing	ML



Section 31.030 Compliance with Planning District Standards.

(1) No building, structure, or land shall hereafter be used, possessed or occupied, and no building, structure, or any part thereof shall hereafter be erected, constructed, reconstructed, moved, or structurally altered contrary to the provisions of Chapters 31-74 of the City of Tualatin Community Development Code. Any use of land or existing structures which is not in conformity with the provisions of the applicable Planning District Standards at the time of the adoption of the City of Tualatin Community Development Code shall be nonconforming uses and structures subject to the provisions herein described by TDC Chapter 35.

Response: The site is located in the ML Planning District. The existing and proposed building addition uses are compliant with the ML Zone and provisions of Tualatin Development Code and do not require nonconforming use permission.

Section 31.063 Neighborhood/ Developer Meetings.

(1) This section applies to the following types of Land Use applications: Annexations; Architectural Reviews, except Level I (Clear and Objective) Single-family Architectural Review; Conditional Uses; Historic Landmark actions, including designation, removal of designation, demolition, relocation, or alteration or new construction: Industrial Master Plans; Partitions; Plan Map Amendments for a specific property; Plan Text Amendments for a specific property; Subdivisions; Tree Removal Permit; Transitional Use Permit; and Variances, except for variances to existing single family residences.

(2) Prior to the submittal of an application listed in TDC 31.063(1) and following a pre-application meeting held with the City, the developer shall host a meeting for the surrounding property owners located within the mailing area designated in TDC 31.064(1)(c). Notice of the meeting shall be provided to Recognized Neighborhood Associations within the Notice Area of TDC 31.064(1)(c) and to designated representatives of recognized Citizen Involvement Organizations. The purpose of this meeting is to provide a means for the applicant and surrounding property owners to meet to review a development proposal and identify issues regarding the proposal so they can be considered prior to the application submittal. The meeting is intended to allow the developer and neighbors to share information and concerns regarding the project. The applicant may consider whether to incorporate solutions to these issues prior to application submittal.

(3) The Neighborhood/Developer Meeting shall be held on a weekday evening, or weekend no earlier than 10:00 a.m. and no later than 6:00 p.m., at a location within the City of Tualatin.

(4) The applicant shall at least 14 calendar days and no more than 28 calendar days prior to the meeting mail notice of the meeting pursuant to TDC 31.064(1) stating the date, time and location of the meeting and briefly discussing the nature and location of the proposal:

(5) Failure of a property owner to receive notice shall not invalidate the Neighborhood/Developer Meeting proceedings.

(6) The applicant shall, at least 14 calendar days before the meeting, post a sign pursuant to TDC 31.064(2). If the sign disappears prior to the meeting date, the applicant shall replace it within forty-eight (48) hours. The applicant shall remove the sign no later than fourteen (14) days after the meeting date.

(7) The applicant shall prepare meeting notes identifying the persons attending and the major points that were discussed and expressed.

(8) The applicant is required to hold one meeting prior to submitting an application for a specific site, but may hold additional meetings if desired.

(9) If an applicant fails to hold a neighborhood meeting, the application shall be deemed incomplete.

(10) The application shall include the following materials related to the Neighborhood/Developer meeting:

(a) the mailing list for the notice;

(b) a copy of the notice;

(c) an affidavit of the mailing and posting;

(d) the original sign-in sheet of participants;

(e) the meeting notes described in TDC 31.063(7).

(11) Applications shall be submitted to the City within 180 days of the Neighborhood/Developer meeting. If an application is not submitted in this time frame, the Developer shall be required to hold a new Neighborhood/Developer meeting. [Ord. 1149-03, 10/13/03; Ord. 1260-08 §1, 05/12/08; Ord. 1304-10 §2, 05/14/10; Ord. 1338-12 §2, 01/23/12]

Response: The Neighborhood/Developer meeting notice was posted on site on 3/28/18 and the notices mailed on 3/26/18, the meeting was held on 4/18/18. Copies of these documents are included in the exhibits.

Section 31.064 Land Use Applications.

This section applies to the following types of Land Use applications: Annexations; Architectural Reviews, except Level I (Clear and Objective) Single-family Architectural Review; Conditional Uses; Historic Landmark actions, including designation, removal of designation, demolition, relocation, or alteration or new construction: Industrial Master Plans; Partitions; Plan Map Amendments for a specific property; Plan Text Amendments for a specific property; Subdivisions; Tree Removal Permit; Transitional Use Permit; and Variances, except for variances to existing single family residences.

(1) Mail: An applicant shall mail notice of a Neighborhood/Developer Meeting and the City shall mail notice of application submittal as follows:
(a) Recipients: The mailing recipients shall be the applicant, the owners of the subject property, owners of property within the Mailing Area of TDC 31.064(1)(c) recognized neighborhood associations as defined in TDC 31.060 recognized through TDC 31.065 and within the Mailing Area of TDC 31.064(1)(c), and designated representatives of recognized Citizen Involvement Organizations as established in TMC Chapter 11-9.

(b) Recipient Identification: The City shall use the names and addresses of the owner or owners of record as shown in the current, or within thirty (30) days of a completed application, computer roll of the County Assessor. The applicant shall be responsible for having one of the following prepare the list: a land title company; a land use planning consultant authorized by the State of Oregon to conduct business in the state; a registered architect, landscape architect, engineer, surveyor, or attorney; or where the City is the applicant, the Community Development Director or when applicable the City Engineer. The applicant shall update the list of property owners no less than every ninety (90) days until a final land use decision is rendered. The applicant shall provide a copy of the list of recipients and their current mailing addresses as part of the land use application.

(c) Mailing Area, Buffer, or Distance: The mailing area shall extend 1,000 feet from the boundaries of the subject property. If the 1,000-foot area includes lots within a platted residential subdivision, the notice area shall extend to include the entire subdivision of which the lots are part, and the applicant shall identify these subdivisions for staff as part of the mailing notification list. If the residential subdivision is one of two or more individually platted phases sharing a single subdivision name, the notice area need not include the additional phases.

(d) ARB: The notice of application submittal for an Architectural Review application subject to review by the Architectural Review Board (ARB) shall have the minimum information pursuant to TDC 31.074(3)

(2) Sign Posting: The applicant shall as follows both provide and post on the subject property a sign that conforms to the standard design established by the City for signs notifying the public of land use actions:

(a) Minimum Design Requirements: The sign shall be waterproof, and the face size shall be eighteen (18) by twenty-four (24) inches (18 x 24) with text being at least two (2) inches tall.

(b) On-site Placement: Prior to land use application submittal, the applicant shall place a sign along the public street frontage of the subject property or, if there is no public street frontage, along the public right-of-way (ROW) of the street nearest the subject property. A subject property having more than one public street frontage shall have at least one posted sign per frontage with each frontage having one sign.

(c) Proof of Posting: The applicant shall submit as part of the land use application submittal an affidavit of posting to the Community Development Director or when applicable the City Engineer.

(d) Removal: If the sign disappears prior to the final decision date of the subject land use application, the applicant shall replace it within forty-eight (48) hours. The applicant shall remove the sign no later than fourteen (14) days after the City makes a final decision on the subject land use application. [Ord. 1304-10 §29, 05/14/10; Ord. 1338-12 §4, 01/23/12]

Response: The required notice mailing and sign posting for the Neighborhood/Developer meeting was executed in conformance with this criteria and will be done in conformance for this AR. Mailing labels are included, as required for this AR submittal.

TDC Chapter 60: Light Manufacturing (ML) Zone

Section 60.100 – Purpose.

The purpose of this zone is to provide areas of the City that are suitable for industrial uses and compatible with adjacent commercial and residential uses. The zone serves to buffer heavy manufacturing uses from commercial and residential areas. Industrial uses that are environmentally adverse or pose a hazard to life and safety are prohibited. The zone is suitable for warehousing, wholesaling, and light manufacturing processes that are not hazardous and do not create undue amounts of noise, dust, odor, vibration, or smoke. The purpose is also to allow a limited amount of commercial uses and services and other support uses, including office uses in limited locations in close proximity to the Commercial Office (CO) district. Commercial uses are not permitted in the Limited Commercial Setback.

Section 60.200 – Use Categories.

(1) **Use Categories.** Table 60-1 lists use categories Permitted Outright (P) or Conditionally Permitted (C) in the ML zone. Use categories may also be designated as Limited (L) and subject to the limitations listed in Table 60-1 and restrictions identified in TDC 60.210. Limitations may restrict the specific type of use, location, size, or other characteristics of the use category. Use categories which are not listed are prohibited within the zone, except for uses which are found by the City Manager or appointee to be of a similar character and to meet the purpose of this zone, as provided in TDC 31.070.

Table 60-1 Use Categories in the ML Zone

Response: The intended use is Light manufacturing, warehouse, and portion of supporting office and all comply with Table 60-1. Any additional uses by tenant spaces will conform with the allowed uses in Table 60-1.

Section 60.210 – Additional Limitations on Uses.

(1) **Sale of Goods Produced On-Site.** The retail sale of goods produced on-site is permitted, provided that the retail sale area, including the showroom area, is no greater than 5 percent of the gross floor area of the building and does not exceed 1,500 square feet.

(2) **Limited Commercial Uses.** Commercial uses permitted as limited uses, as specified in Table 60-1, must be located on the same site as a permitted industrial use. The site must be used substantially for industrial purposes and the commercial use is subject to the following limitations. The office, retail, and service uses may be located in a stand-alone building or combined in a building with other permitted uses.

(a) **Offices.** Office uses must not exceed 25 percent of the total gross floor area of all buildings on the site.

(b) **Retail Sales and Services, Eating and Drinking Establishments, or Other Educational and Vocational Services.** Permitted uses in these categories, as specified in Table 60-1, are subject to the following additional standards.

(i) **Maximum Size.** The use must not exceed 5,000 square feet for any individual use or a total of 20,000 square feet of all retail or service uses on the site.

(ii) **Spacing Standard.** Uses must not be located within 80 feet from any Residential Planning District and from the right-of-way of SW Tualatin-Sherwood Road.

(iii) **Access Standard.** If located in a standalone building, the uses must not have direct access onto any arterial or collector street.

(3) **Size Limitation on Commercial Uses.** Commercial uses permitted outright or as a Conditional Use as the primary use of a site, as specified in Table 60-1, are subject to the following size limitations.

(a) **Employment Areas or Corridors.** Commercial uses on land designated as an Employment Area (EA) or Corridor (CO) Design Type on Map 9-4 must not exceed 60,000 square feet of gross floor area per building or business.

(b) **Industrial Areas.** Commercial uses on land designated as an Industrial Area Design Type on Map 9-4 must not exceed 5,000 square feet for any individual use or a total of 20,000 square feet of all commercial uses on the site. Commercial uses permitted in the Limited Commercial Setback are exempt from this requirement.

(4) **Limited Commercial Setback.** The purpose of the Limited Commercial Setback is to restrict commercial uses from locating within 300 feet from the centerline of SW Tualatin Sherwood Road and SW 124th Avenue and 350 feet from the centerline of SW Pacific Highway 99W west of Cipole Road, as depicted in Map 9-5.

(a) **Restriction on Commercial Uses.** No commercial uses, including parking or outdoor storage and display areas, are permitted outright in the Limited Commercial Setback.

(b) **Conditional Uses.** Quick Vehicle Service uses and the sale and service of manufactured dwellings are permitted as Conditional Uses in the Limited Commercial Setback.

Response: The existing office area and proposed expansion totals 6480 sf, which is less than 10% of the total building area, conforms with the criteria that it shall not exceed 25%. The tenant commercial areas of the expansion will not exceed the 5000 sf limitation for individual tenants nor the 20,000 sf maximum for the overall building. The uses do not have direct access to the adjacent streets. The site is not located within the Limited Commercial Setback restriction area defined by Map 9-5.

Section 60.300 Development Standards

Minimum Lot Size 20,000 sf

Minimum Lot width 100 feet

Minimum Setbacks Front 30 feet, Side 0-50 feet, Rear 0-50 feet, Parking and Circulation Areas 5 feet

Structure height – Maximum 50 feet

Response: The lot size is 84,017 sf, lot width is over 300 feet, setbacks have been reviewed in the Scoping meeting and are approved, structure height is approx. 30 feet.

Section 60.310 – Additional Development Standards.

(1) **Outdoor Uses.** All uses must be conducted wholly within a completely enclosed building, except off-street parking and loading, Basic Utilities, Wireless Communication Facilities and outdoor play areas of child day care centers as required by state day care certification standards.

(2) **Spur Rail Tracks.** Spur rail tracks are not permitted within 200 feet of an adjacent residential district.

(3) **Sound Barrier Construction.** Sound barrier construction is required to mitigate the impact of noise associated with overhead doors and building mechanical equipment, including but not limited to heating, cooling and ventilation equipment, compressors, waste evacuation systems, electrical transformers, and other motorized or powered machinery located on the exterior of a building. Sound barrier construction must conform to the following standards:

(a) **Applicability.** New construction, including additions or changes to existing facilities, must comply with the provisions of this section. When additions or changes to existing facilities are proposed, existing structures on the property may be required to comply with the provisions of this section, as determined through the Architectural Review process. Where buildings or outdoor use areas located on more than one parcel are all part of a single use as determined through the Architectural Review process, all of the parcels may be required to comply with the provisions of this section.

(b) **Distance from Residential Use.** Sound barriers must be used to intercept all straight-line (a direct line between two points) lateral paths of 450 feet or less between a residential property within a residential planning district and:

(i) Any side edge of an overhead door or other doorway larger than 64 square feet, at a minimum height of eight feet above the floor elevation of the doorway; or

(ii) Any building mechanical device at a minimum height equal to the height of the mechanical object to be screened.

(c) **Exemption for Existing Structures.** Where existing structures (on or off site) are located such that they will reflect sound away from residential areas and will function as a sound barrier, on-site sound barrier construction is not required, except that at the time such structures are removed, sound barrier construction is required.

(d) **Design.** Sound barriers must consist of masonry walls or earth berms located so as to reflect sound away from, rather than toward, noise sensitive properties. This may include masonry "wing walls" attached to a building, detached masonry walls (such as at the perimeter of the site), earth berms, or combinations of the three. Wing walls must be at least as tall as the tallest overhead door they are designed to screen at the point where they meet the building. The height of the wall may be reduced along a maximum incline formed by a horizontal distance twice the vertical change in height, or 26.5 degrees from horizontal.

(e) **Definitions.** "Wing wall" mean a wall that is attached to a building on one side and meets the screening requirements of (1) and (2) of this section.

(4) **Setback Reduction for Developments Adjacent to Greenways and Natural Areas.** To preserve natural areas and habitat for fish and wildlife, the decision-authority may provide a front, side, or rear yard setback reduction for developments that are adjacent to Greenways or Natural Areas that dedicate land for conservation or public recreational purposes, in accordance with the following standards:

Response: Uses are contained within enclosed building and other provisions not applicable since Site is not located in a sound sensitive area and no railroad spurs are present or proposed. The site is not adjacent to a Greenway or Natural Area, so no setback adjustments are needed.

Chapter 73 Community Design Standards

ARCHITECTURAL REVIEW APPROVAL
Section 73.040 Architectural Review Plan Approval Required.

(1) Except for an addition or alteration to an existing single-family dwelling when it results in less than a 35% expansion of the structure's existing footprint or less than a 35% alteration of an existing wall plane or only affects the wall plane of the side of the dwelling located in a side yard where the side yard of the dwelling abuts the side yard of an adjacent dwelling, as permitted by these standards, no new building, condominium, townhouse, single family dwelling, addition or alteration to an existing single-family dwelling when it results in a 35% or more expansion of the structure's existing footprint or a new second or higher story or a 35% or more alteration of an existing wall plane (except for the wall plane of a side of the dwelling located in a side yard where the side yard of the dwelling abuts the side yard of an adjacent dwelling), manufactured dwelling park, small-lot subdivision, landscape improvement (excluding greenways, parks and other Parks and Recreation Department road side improvements), parking lot improvement or expansion, above ground public utility facility (sewer or water pump stations, pressure reading stations and water reservoir), electrical substation, above ground natural gas pumping station, installation of decorative lighting (e.g. neon), exterior painting, awnings, murals, wireless communication facility, attached wireless communication facility or exterior major remodeling shall occur until the architectural review plan required under TDC 31.071 has been reviewed and approved by the Community Development Director and City Engineer or their designees, or by the Architectural Review Board or City Council for conformity with applicable standards or criteria.

Response: The Architectural Review and Community Design Standards do apply to this project. The required narrative and documents are submitted here, as required to demonstrate conformity to the applicable standards and criteria.

Section 73.050 Criteria and Standards.

(1) In exercising or performing his or her powers, duties, or functions, the Community Development Director shall determine whether there is compliance with the following:

(a) The proposed site development, including the site plan, architecture, landscaping, parking and graphic design, is in conformance with the standards of this and other applicable City ordinances insofar as the location, height, and appearance of the proposed development are involved;

(b) The proposed design of the development is compatible with the design of other developments in the general vicinity; and

(c) The location, design, size, color and materials of the exterior of all structures are compatible with the proposed development and appropriate to the design character of other developments in the vicinity.

(2) In making his or her determination of compliance with the above requirements, the Community Development Director shall be guided by the objectives and standards set forth in this chapter. If the architectural review plan includes utility facilities or public utility facilities, then the City Engineer shall determine whether those aspects of the proposed plan comply with applicable standards.

(3) In determining compliance with the requirements set forth, the Community Development Director shall consider the effect of his or her action on the availability and cost of needed housing. The Community Development Director shall not use the requirements of this section to exclude needed housing types. However, consideration of these factors shall not prevent the Community Development Director from imposing conditions of approval necessary to meet the requirements of this section. The costs of such conditions shall not unduly increase the cost of housing beyond the minimum necessary to

achieve the purposes of this Code. As part of the Architectural Review process, the Community Development Director has no authority to reduce dwelling unit densities.

(4) As part of Architectural Review, the property owner may apply for approval to remove trees, in addition to those exemptions allowed in TDC 34.200(3), by submitting information concerning proposed tree removal, pursuant to TDC 34.210(1). The granting or denial of a tree removal permit shall be based on the criteria in TDC 34.230.

Section 73.140 Site Planning - Commercial, Industrial, Public and Semi-Public Uses.

Section 73.150 Objectives.
All commercial, industrial, public and semi-public projects should strive to meet the following objectives to the maximum extent practicable. Architects and developers should consider these elements in designing new projects. In the Central Design District, the Design Guidelines of TDC 73.610 shall be considered. In the case of conflicts between objectives, the proposal shall provide a desirable balance between the objectives. Site elements shall be placed and designed, to the maximum extent practicable, to:

(1) Provide convenient walkways and crosswalks which separate pedestrians from vehicles and link primary building entries to parking areas, other on-site buildings and the public right-of-way.

Response: The existing building site provides a pedestrian link from the sidewalk to the front entry. The building addition site will have a similar pedestrian link from the east sidewalk and across the South side of the building containing the entrances to the tenant spaces.

(2) Avoid barriers to disabled individuals,

Response: The existing and proposed site path of travel, building access and interiors are ADA compliant.

(3) Locate and design drive-through facilities in a manner which does not conflict with pedestrian routes or other vehicular circulation and minimizes adverse impacts on adjacent properties.

Response: N/A no drive through facilities planned.

(4) Break up parking areas with landscaping (trees, shrubs and walkways) and buildings to lessen the overall impact of large paved areas.

Response: The parking area is broken up with, trees, shrubs and walkways in accordance with TDC Landscaping standards. See the Landscape plan included in the Exhibits.

(5) Utilize landscaping in parking areas to direct and control vehicular movement patterns, screen headlights from adjacent properties and streets, and lessen the visual dominance of pavement coverage.

Response: The site perimeter is landscaped with trees and shrubs to screen cars and headlights and paved areas, landscaping reinforces the vehicular circulation. Planting Islands are included with trees and landscape in conformance with the TDC.

(6) Provide vehicular connections to adjoining sites.

Response: N/A

(2) Emphasize entry drives into commercial complexes and industrial park developments with special design features, such as landscaped medians, water features and sculptures.

Response: The site access drives are identified with landscaping and islands as per the TDC.

(3) Locate, within parking lots, pedestrian amenities and/or landscaping in areas which are not used for vehicle maneuvering and parking.

Response: Sidewalks are provided to the building entries. Landscaping is added in the parking islands and perimeter of site. The West and North sides of the building are designated primarily for vehicular maneuvering and parking and loading therefor the landscaping required in Section

(4) Encourage outdoor seating areas which provide shade during summer and sun during winter, trash receptacles and other features for pedestrian use. Plantings with a variety of textures and color are encouraged.

Response: A covered outdoor seating area is provided in addition to the existing entry plaza. The Landscaping plan implements an interesting variety of plant materials that add color and varies seasonally.

(5) Create opportunities for, or areas of, visual and aesthetic interest for occupants and visitors to the site.

Response: The existing building has an inviting spacious entry space and outdoor area. Windows have been placed in the existing and new portion have been added to help break up the mass of the industrial building. Canopies are being added at the building entrances. The painting scheme for the new addition is to be fresh colors and the existing building will be painted to match. The building mass has offsets to help reduce the mass impact. Landscaping is added to create a pleasant outdoor environment.

(6) Conserve, protect and restore fish and wildlife habitat areas, and maintain or create visual and physical corridors to adjacent fish and wildlife habitat areas.

Response: N/A

(7) Provide safe pathways for pedestrians to move from parking areas to building entrances.

Response: Clearly identified walkways are added from sidewalks to building entrances.

(8) Design the location of buildings and the orientation of building entrances for commercial, public and semi-public uses such as churches, schools and hospitals to provide adequate pedestrian circulation between buildings and to provide preferential access for pedestrians to existing or planned transit stops and transit stations.

Response: N/A

(9) Provide accessways between commercial, public and semi-public development and publicly-owned land intended for general public use; arterial and collector streets where a transit stop and/or a bike lane is provided or designated; and abutting residential, commercial and semi-public property.

Response: N/A

(10) Provide accessways between industrial development and abutting greenways where a bikeway or pedestrian path is provided or designated.

Response: Existing sidewalks are installed in conformance with City standards.

(11) Accessways should be designed and located in a manner which does not restrict or inhibit opportunities for developers of adjacent properties to connect with an accessway, and provide continuity from property to property for pedestrians and bicyclists to use the accessway.

Response: Access continuity is provided.

(12) Provide preferential parking for carpool and vanpools to encourage employees to participate in carpools and vanpools.

Response: Carpool spaces are provided per standards.

(13) Screen elements such as mechanical and electrical equipment, above ground sewer or water pump stations, pressure reading stations and water reservoirs from view.

Response: The existing electrical transformer is screened and none of the other equipment exists on site.

(14) Parking structure exteriors and underground parking should be designed to be harmonious with surrounding buildings and architecturally compatible with the treatment of buildings they serve.

Response: N/A

(15) When a fish and wildlife habitat area abuts or is on the subject property the applicant and decision authority for a development application should consider locating buildings farther away from the fish and wildlife habitat area.

Response: N/A

Section 73.160 Standards.

The following standards are minimum requirements for commercial, industrial, public and semi-public development, and it is expected that development proposals shall meet or exceed these minimum requirements.

(1) Pedestrian and Bicycle Circulation.

(a) For commercial, public and semi-public uses: N/A

(b) For Industrial Uses:

(i) a walkway shall be provided from the main building entrance to sidewalks in the public right-of-way and other on-site buildings and accessways. The walkway shall be a minimum of 5 feet wide and constructed of concrete, asphalt, or a pervious surface such as pavers or grasscrete, but not gravel or woody material, and be ADA compliant, if applicable.

(ii) Walkways through parking areas, drive aisles and loading areas shall have a different appearance than the adjacent paved vehicular areas.

(iii) Accessways shall be provided as a connection between the development's walkway and bikeway circulation system and an adjacent bike lane;

(iv) Accessways may be gated for security purposes;

(v) Outdoor Recreation Access Routes shall be provided between the development's walkway and bikeway circulation system and parks, bikeways and greenways where a bike or pedestrian path is designated.

Response: The existing concrete walkways are installed to contrast with the asphalt paving, the new ones will also be concrete to contrast. Bicycle access is provided, although no designated bikeway is present in the street system.

(c) Curb ramps shall be provided wherever a walkway or accessway crosses a curb.

Response: Curb ramps are already installed on site.

(d) Accessways shall be a minimum of 8 feet wide and constructed in accordance with the Public Works Construction Code if they are public accessways, and if they are private access-ways they shall be constructed of asphalt, concrete or a pervious surface such as pervious asphalt or concrete, pavers or grasscrete, but not gravel or woody mate-rial, and be ADA compliant, if applicable.

Response: Current accessways are 36 feet wide and the new accessway is 36 feet also.

(e) Accessways to undeveloped parcels or undeveloped transit facilities need not be constructed at the time the subject property is developed. In such cases the applicant for development of a parcel adjacent to an undeveloped parcel shall enter into a written agreement with the City guaranteeing future performance by the applicant and any successors in interest of the property being developed to construct an accessway when the adjacent undeveloped parcel is developed. The agreement shall be subject to the City's re-view and approval.

Response: N/A

(f) Where a bridge or culvert would be necessary to span a designated greenway or wetland to provide a connection to a bike or pedestrian path, the City may limit the number and location of accessways to reduce the impact on the greenway or wetland.

Response: N/A

(g) Accessways shall be constructed, owned and maintained by the property owner.

Response: Understood.

(2) Drive-up Uses. N/A

(3) Safety and Security.

(a) Locate windows and provide lighting in a manner which enables tenants, employees and police to watch over pedestrian, parking and loading areas.

(b) In commercial, public and semi-public development and where possible in industrial development, locate windows and provide lighting in a manner which enables surveillance of interior activity from the public right-of-way.

Response: Windows are provided to allow for surveillance of pedestrian and parking area and vice versa.

(c) Locate, orient and select on-site lighting to facilitate surveillance of on-site activities from the public right-of-way without shining into public rights-of-way or fish and wildlife habitat areas.

Response: Lighting is provided to highlight entrances and to provide safety in the parking areas. See Exhibit

(d) Provide an identification system which clearly locates buildings and their entries for patrons and emergency services.

Response: Identification system will be provided to all individual spaces.

(e) Shrubs in parking areas must not exceed 30 inches in height. Tree canopies must not extend below 8 feet measured from grade.

Response: Trees and shrubs will conform to these dimensional standards. See Exhibit

(f) Above ground sewer or water pumping stations, pressure reading stations, water reservoirs, electrical substations, and above ground natural gas pumping stations shall provide a minimum 6' tall security fence or wall.

Response: N/A

(4) Service, Delivery and Screening.

(a) On and above grade electrical and mechanical equipment such as transformers, heat pumps and air conditioners shall be screened with sight obscuring fences, walls or landscaping.

Response: Landscape screening is provided for this existing equipment, no additional on grade or above grade electrical and mechanical equipment is planned.

(b) Outdoor storage, excluding mixed solid waste and source separated recyclables storage areas listed under TDC 73.227, shall be screened with a sight obscuring fence, wall, berm or dense evergreen landscaping.

Response: The solid waste facility has been designed to conform with the standard that Republic Services has provided, reviewed and endorsed. The block wall surround will have landscaping to help obscure that also.

(c) Above ground pumping stations, pressure reading stations, water reservoirs; electrical substations, and above ground natural gas pumping stations shall be screened with sight-obscuring fences or walls and landscaping. **N/A**

(5) The Federal Americans with Disabilities Act (ADA) applies to development in the City of Tualatin. Although TDC, Chapter 73 does not include the Oregon Structural Specialty Code' s (OSSC) accessibility standards as requirements to be reviewed during the Architectural Review process, compliance with the OSSC is a requirement at the Building Permit step. It is strongly recommended all materials submitted for Architectural Review show compliance with the OSSC.

Response: 3 accessible spaces required for 51-75 total parking in lot, 1 van accessible. Two accessible spaces are currently provided on site (one is van accessible) and one additional accessible space will be added to the new parking area adjacent to the building on the SE corner.

(6) (a) All industrial, institutional, retail and office development on a transit street designated in TDC Chapter 11 (Figure 11-5) shall provide either a transit stop pad on-site, or an on-site or public sidewalk connection to a transit stop along the subject property's frontage on the transit street. **N/A**

(b) In addition to (a) above, new retail, office and institutional uses abutting major transit stops as designated in TDC Chapter 11 (Figure 11-5) shall: **N/A**

Section 73.200 Structure Design - Commercial, Industrial, Public and Semi-Public Uses.

Purpose.

The purpose of commercial, industrial, public and semi-public building design objectives and standards is to implement the purpose and objectives of TDC 73.020(2) and are intended to promote functional, safe, innovative and attractive buildings which are compatible with the surrounding environment. This concerns the building form including the articulation of walls and roof design, materials, colors, placement of elements such as windows, doors, mechanical equipment and identification features. [Ord. 705-86, §6, 9/8/86]

Section 73.210 Objectives.

All commercial, industrial, public and semi-public projects should strive to meet the following objectives to the maximum extent practicable. Architects and developers should consider these elements in designing new projects. In the Central Design District, the Design Guidelines of TDC 73.610 shall be considered. In case of conflicts between objectives, the proposal shall provide a desirable balance between the objectives. Buildings shall be designed, to the maximum extent practicable, to:

(1) Minimize disruption of natural site features such as topography, trees and water features.

(2) Provide a composition of building elements which is cohesive and responds to use needs, site context, land form, a sense of place and identity, safety, accessibility and climatic factors. Utilize functional building elements such as arcades, awnings, entries, windows, doors, lighting, reveals, accent features and roof forms, whenever possible, to accomplish these objectives.

(3) Where possible, locate loading and service areas so that impacts upon surrounding areas are minimized. In industrial development loading docks should be oriented inward to face other buildings or other loading docks. In commercial areas loading docks should face outward towards the public right-of-way or perimeter of the site or both.

(4) Enhance energy efficiency in commercial and industrial development through the use of landscape and architectural elements such as arcades, sunscreens, lattice, trellises, roof overhangs and window orientation.

(5) Locate and design entries and loading/service areas in consideration of climatic conditions such as prevailing winds, sun and driving rains.

(6) Give consideration to organization, design and placement of windows as viewed on each elevation having windows. Surveillance over parking areas from the inside, as well as visual surveillance from the outside in, should be considered in window placement.

(7) Select building materials which contribute to the project's identity, form and function, as well as to the surrounding environment.

(8) Select colors in consideration of lighting conditions and the context under which the structure is viewed, the ability of the material to absorb, reflect or transmit light and the color's functional role (e.g., to identify and attract business, aesthetic reasons, image-building).

(9) Where possible, locate windows and provide lighting in a manner which enables tenants, employees and police to watch over pedestrian, parking and loading areas.

(10) Where practicable locate windows and provide lighting in a manner which enables surveillance of interior activity from the public right-of-way or other public areas. [Ord. 904-93, §51, 9/13/93; Ord. 1097-02, 2/11/02]

Response: The development does not disturb natural features and the proposed addition steps down at the midpoint to correspond to the site slope. The addition to the existing building uses the same materials and reflects the mass and scale which are also compatible with the buildings that are located within the surrounding development. Additional windows are placed on the upper levels, offsets in building planes, and color articulation help break down the mass and add architectural features to, what can be, a utilitarian building type. Canopies are added over the South facing storefront glazing to bring identity to the entrances and to help control solar heat gain. Ground level glazing will provide the desired visual surveillance out of, and also, into the building. Landscape elements will add shading and screening to the parking and drive lanes. An outdoor covered seating area will be provided for the building occupants usage and to add an architectural feature to the large East facing wall.

Section 73.220 Standards.
The following standards are minimum requirements for commercial, industrial, public and semi-public development and it is expected that development proposals shall meet or exceed these minimum requirements.

(1) Safety and Security.

(a) Locate, orient and select on-site lighting to facilitate surveillance of on-site activities from the public right-of-way or other public areas without shining into public rights-of-way or fish and wildlife habitat areas.

(b) Provide an identification system which clearly identifies and locates buildings and their entries.

(c) Shrubs in parking areas shall not exceed 30 inches in height, and tree canopies must not extend below 8 feet measured from grade, except for parking structures and underground parking where this provision shall not apply. [Ord. 904-93, §52, 9/13/93; Ord. 20-94, §18, 4/11/94; Ord. 1224-06 §24, 11/13/06]

Response: The onsite lighting will provide adequate light levels, while avoiding glare beyond the site boundaries. Photometric plotting of the light pattern is included in the Exhibits. An identification system will clearly identify the individual entries. Trees and shrubs will be planted to conform with the height and clearance standards.

Section 73.225 Mixed Solid Waste and Source Separated Recyclables Storage Areas for New or Expanded Multi-Unit Residential, Including Townhouses, Commercial, Industrial, Public and Semi-Public Development.

Purpose.The purpose of mixed solid waste and source separated recyclables storage areas objectives and standards is to implement the purposes and objectives of TDC 73.020(2). The objectives and standards are intended to be flexible, easy and efficient to administer, and allow creativity. [Ord. 898-93, §6, 6/14/93. Ord. 1025-99, §39, 7/26/99; Ord. 1097-02, 2/11/02]

Section 73.226 Objectives.
All new or expanded multi-family, including townhouses, commercial, industrial, public and semi-public projects should strive to meet the following objectives to the maximum extent practicable. Architects and developers should consider these elements in designing new projects. In the Central Design District, the Design Guidelines of TDC 73.610 shall be considered. In the case of conflicts between objectives, the proposal shall provide a desirable balance between the objectives. Townhouses may necessitate a different balancing than multi-family developments such as apartments. Mixed solid waste and source separated recyclable storage areas shall be designed to the maximum extent practicable, to:

(1) Screen elements such as garbage and recycling containers from view.

(2) Ensure storage areas are centrally located and easy to use.

(3) Meet dimensional and access requirements for haulers.

(4) Designed to mitigate the visual impacts of storage areas.

(5) Provide adequate storage for mixed solid waste and source separated recyclables.

(6) Improve the efficiency of collection of mixed solid waste and source separated recyclables. [Ord. 898-93, §7, 6/14/93. Ord. 1025-99, §40, 7/26/99; Ord. 1097-02, 2/11/02]

Section 73.227 Standards.
The following standards are minimum requirements for mixed solid waste and source separated recyclables storage areas. To provide for flexibility in designing functional storage areas, this section provides four different methods to meet the objectives of providing adequate storage for mixed solid waste and source separated recyclables and improving the efficiency of collection. An applicant shall choose and implement one of the following four methods to demonstrate compliance: 1) minimum standards; 2) waste assessment; 3) comprehensive recycling plan; or 4) franchised hauler review, as more fully described in subsections (2), (3), (4) and (5) of this section.

(1) The mixed solid waste and source separated recyclables storage standards shall apply to all new or expanded multi-family residential developments containing five or more units and to new or expanded commercial, industrial, public and semi-public development.

(2) Minimum Standards Method. This method specifies a minimum storage area requirement based on the size and general use category of the new or expanded development. This method is most appropriate when specific use of a new or expanded development is not known. It provides specific dimensional standards for the minimum size of storage areas by general use category.

(a) The size and location of the storage area(s) shall be indicated on the site plan. Compliance with the requirements set forth below are reviewed through the Architectural Review process.

(i) The storage area requirement is based on the area encompassed by predominant use(s) of the building (e.g., residential, office, retail, wholesale/warehouse/manufacturing, educational/institutional or other) as well as the area encompassed by other distinct uses. If a building has more than one use and that use occupies 20 percent or less of the gross leasable area (GLA) of the building, the GLA occupied by that use shall be counted toward the floor area of the predominant use(s). If a building has more than one use and that use occupies more than 20 percent of the GLA of the building, then the storage area requirement for the whole building shall be the sum of the area of each use.

(ii) Storage areas for multiple uses on a single site may be combined and shared.

(iii) The specific requirements are based on an assumed storage area height of 4 feet for mixed solid waste and source separated recyclables. Vertical storage higher than 4 feet, but no higher than 7 feet may be used to accommodate the same volume of storage in a reduced floor space (potential reduction of 43 percent of specific requirements). Where vertical or stacked storage is proposed, submitted plans shall include drawings to illustrate the layout of the storage area and dimensions for containers.

(iv) Multi-family residential developments containing 5-10 units shall provide a minimum storage area of 50 square feet. Multi-family residential developments containing more than 10 units shall provide 50 square feet plus an additional 5 square feet per unit for each unit above 10.

(v) Commercial, industrial, public and semi-public developments shall provide a minimum storage area of 10 square feet plus: Office - 4 square feet/1000 square feet gross leasable area (GLA); Retail - 10 square feet/1000 square feet GLA; Wholesale/ Warehouse/ Manufacturing - 6 square feet/1000 square feet GLA; Educational and institutional - 4 square feet/1000 square feet GLA; and other - 4 square feet/1000 square feet GLA.

(5) Franchised Hauler Review Method. The franchised hauler review method provides for a coordinated review of the pro-posed site plan by the franchised hauler serving the subject property. This method can be used when there are unique conditions associated with the site, use, or waste stream that make compliance with any of the three other methods impracticable. The objective of this method is to match a specific hauler program (types of equipment, frequency of collection, etc.) to the unique characteristic(s) of the site or development. The applicant shall coordinate with the franchised hauler to develop a plan for storage and collection of mixed solid waste and source separated recyclables to be generated. A narrative describing how the proposed site meets one or more unique conditions, plus site plan and architectural drawings showing the size and location of storage area(s) required to accommodate anticipated volumes shall be submitted for Architectural Review. Additionally, a letter from the franchised hauler shall be submitted with the application that de-scribes the level of service to be provided by the hauler, including any special equipment and collection frequency, which will keep the storage area from exceeding its capacity. For purposes of this subsection the following constitute unique conditions:

(6) Location, Design and Access Standards for Storage Areas. The following location, design and access standards are applicable for storage areas:

(a) Location Standards

(i) To encourage its use, the storage area for source separated recyclables may be co-located with the storage area for mixed solid waste.

(ii) Indoor and outdoor storage areas shall comply with Building and Fire Code requirements.

(iii) Storage area space requirements can be satisfied with a single location or multiple locations, and can combine both interior and exterior locations.

(iv) Exterior storage areas shall not be located within a required front yard setback or in a yard adjacent to a public or private street.

(v) Exterior storage areas shall be located in central and visible locations on the site to enhance security for users.

(vi) Exterior storage areas can be located in a parking area, if the proposed use provides parking spaces required through the Architectural Review process. Storage areas shall be appropriately screened according to TDC 73.227(6)(b)(iii).

(vii) Storage areas shall be accessible for collection vehicles and located so that the storage area will not obstruct pedestrian or vehicle traffic movement on site or on public streets adjacent to the site.

(b) Design Standards

(i) The dimensions of the storage area shall accommodate containers consistent with current methods of local collection at the time of Architectural Review approval.

(ii) Storage containers shall meet Fire Code standards and be made and covered with water proof materials or situated in a covered area.

(iii) Exterior storage areas shall be enclosed by a sight obscuring fence or wall at least 6 feet in height. In multi-family, commercial, public and semi-public developments evergreen plants shall be placed around the enclosure walls, excluding the gate or entrance openings. Gate openings for haulers shall be a minimum of 10 feet wide and shall be capable of being secured in a closed and open position. A separate pedestrian access shall also be provided in multi-family, commercial, public and semi-public developments.

(iv) Exterior storage areas shall have either a concrete or asphalt floor surface.

(v) Storage areas and containers shall be clearly labeled to indicate the type of material accepted.

(c) Access Standards

(i) Access to storage areas can be limited for security reasons. However, the storage areas shall be accessible to users at convenient times of the day, and to hauler personnel on the day and approximate time they are scheduled to provide hauler service.

(ii) Storage areas shall be designed to be easily accessible to hauler trucks and equipment, considering paving, grade, gate clearance and vehicle access. A minimum of 10 feet horizontal clearance and 8 feet vertical clearance is required if the storage area is covered.

(iii) Storage areas shall be accessible to collection vehicles without requiring backing out of a driveway onto a public street. If only a single access point is available to the storage area, adequate turning radius shall be provided to allow vehicles to safely exit the site in a forward motion. [Ord. 898-93, §8, 6/4/93]

Response: The solid waste facility design, size and location on site has been reviewed by the refuse hauler, Republic Services and conforms with their requirements and in conformance with the TDC. Min 10 sf plus 4 sf/100 GLA Offices (26 sf), 6 sf/1000 GLA Wholesale, Warehouse, Manufacturing (164 sf) = 190 sf req'd. New Provided 240 sf per Republic specs, plus existing area.

LANDSCAPING

Section 73.230 Landscaping Standards.
Purpose.

The purpose of this section is to establish standards for landscaping within Tualatin in order to enhance the environmental and aesthetic quality of the City:

(1) By encouraging the retention and protection of existing trees and requiring the planting of trees in new developments;

(2) By using trees and other landscaping materials to temper the effects of the sun, wind, noise, and air pollution.

(3) By using trees and other landscaping materials to define spaces and the uses of specific areas; and

(4) Through the use of trees and other landscaping materials as a unifying element within the urban environment. [Ord. 705-86, §6, Sept. 8, 1986]

Section 73.240 Landscaping General Provisions.

(3) The minimum area requirement for landscaping for uses in CO, CR, CC, CG, ML and MG Planning Districts shall be fifteen (15) percent of the total land area to be developed

(11) Any required landscaped area shall be designed, constructed, installed, and maintained so that within three years the ground shall be covered by living grass or other plant materials. (The foliage crown of trees shall not be used to meet this requirement.) A maximum of 10% of the landscaped area may be covered with un-vegetated areas of bark chips, rock or stone. Disturbed soils are encouraged to be amended to an original or higher level of porosity to regain infiltration and stormwater storage capacity.

Response: The site area is 84,070.8 sf. 15% of that area equals 12,610 sf required. The proposed and existing landscape islands and perimeter landscape area covers 10,838 sf. The building front landscape areas and pedestrian site amenities total 3210 sf. The combined area of 14,048 sf equals 17% percent of the site. A sketch is included in the exhibits to illustrate the calculation of the landscape coverage areas.

All ground area in the planting areas with have ground cover vegetation, no bark chips or rock cover is proposed. An irrigation system will be installed and, as evidenced by the healthy existing landscaping, the plant materials will be maintained and cared for, to achieve a fully maturity.

Section 73.250 Tree Preservation.

(1) Trees and other plant materials to be retained shall be identified on the landscape plan and grading plan.

(2) During the construction process:

(a) The owner or the owner's agents shall provide above and below ground protection for existing trees and plant materials identified to remain.

(b) Trees and plant materials identified for preservation shall be protected by chain link or other sturdy fencing placed around the tree at the drip line.

Response: The existing landscape elements to remain will be protected and preserved during construction.

Section 73.260 Tree and Plant Specifications.

(1) The following specifications are minimum standards for trees and plants:

(a) Deciduous Trees: Deciduous shade and ornamental trees shall be a minimum one and one-half inch (1 1/2") caliper measured six inches (6") above ground, balled and burlapped. Bare root trees will be acceptable to plant during their dormant season. Trees shall be characteristically shaped specimens.

(b) Coniferous Trees. Coniferous trees shall be a minimum five feet (5') in height above ground, balled and burlapped. Bare root trees will be acceptable to plant during their dormant season. Trees shall be well branched and characteristically shaped specimens.

(c) Evergreen and Deciduous Shrubs. Evergreen and deciduous shrubs shall be at least one (1) to five (5) gallon size. Shrubs shall be characteristically branched. Side of shrub with best foliage shall be oriented to public view.

(d) Groundcovers. Groundcovers shall be fully rooted and shall be well branched or leafed. English ivy (Hedera helix) is considered a high maintenance material which is detrimental to other landscape materials and buildings and is therefore prohibited.

(e) Lawns. Lawns shall consist of grasses, including sod, or seeds of acceptable mix within the local landscape industry. Lawns shall be 100 percent coverage and weed free.

(2) Landscaping shall be installed in accordance with the provisions of Sunset New Western Garden Book (latest edition), Lane Publishing Company, Menlo Park, California or the American Nurserymen Association Standards (latest edition).

(3) The following guidelines are suggested to ensure the longevity and continued vigor of plant materials:

(a) Select and site permanent landscape materials in such a manner as to produce a hardy and drought-resistant landscaped area.

(b) Consider soil type and depth, spacing, exposure to sun and wind, slope and contours of the site, building walls and overhangs, and compatibility with existing native vegetation preserved on the site or in the vicinity.

(4) All trees and plant materials shall be healthy, disease-free, damage-free, well-branched stock, characteristic of the species.

(5) All plant growth in landscaped areas of developments shall be controlled by pruning, trimming or otherwise so that:

(a) It will not interfere with designated pedestrian or vehicular access; and

(b) It will not constitute a traffic hazard because of reduced visibility. [Ord. 904-93, §57, 9/13/93]

Section 73.270 Grading.

(1) After completion of site grading, top-soil is to be restored to exposed cut and fill areas to provide a suitable base for seeding and planting.

(2) All planting areas shall be graded to provide positive drainage.

(3) Neither soil, water, plant materials nor mulching materials shall be allowed to wash across roadways or walkways.

(4) Impervious surface drainage shall be directed away from pedestrian walkways, dwelling units, buildings, outdoor private and shared areas and landscape areas except where the landscape area is a water quality facility.

Section 73.280 Irrigation System Required.

Except for townhouse lots, landscaped areas shall be irrigated with an automatic underground or drip irrigation system. [Ord. 1025-99, §42, 7/26/99]

Section 73.310 Landscape Standards - Commercial, Industrial, Public and Semi-Public Uses.

(1) A minimum 5-foot-wide landscaped area must be located along all building perimeters which are viewable by the general public from parking lots or the public right-of-way, excluding loading areas, bicycle parking areas and pedestrian egress/ingress locations. Pedestrian amenities such as landscaped plazas and arcades may be substituted for this requirement. This requirement shall not apply where the distance along a wall between two vehicle or pedestrian access openings (such as entry doors, garage doors, carports and pedestrian corridors) is less than 8 feet.

(2) Areas exclusively for pedestrian use that are developed with pavers, bricks, etc., and contain pedestrian amenities, such as benches, tables with umbrellas, children's play areas, shade trees, canopies, etc., may be included as part of the site landscape area requirement.

(3) All areas not occupied by buildings, parking spaces, driveways, drive aisles, pedestrian areas or undisturbed natural areas shall be landscaped. [Ord. 882-92, §16, 12/14/92; Ord. 904-93, §58, 9/13/93]

Response: Plant materials, as specified on the Landscape Plan are in accordance to provisions stated. Planting will be installed in accordance with the size requirements and the provisions of the Sunset New Western Garden Book and maintained accordingly. The West and North areas are used primarily for parking, vehicular circulation and loading. These areas are not facing the streets and are screened by site perimeter landscaping and fencing, therefore the 5 foot wide landscaped area requirement is not applicable. The South wall entrances are served by a pedestrian sidewalk access, so no landscaping is located in that area. The existing entrance on the East wall contains a landscaped plaza area and the adjacent new walls have a combination of landscaping and covered and landscaped site amenities in areas not occupied by the garage door and service door.

OFF-STREET PARKING LOT LANDSCAPING

Section 73.320 Off-Street Parking Lot Landscaping Standards.

(1) General Provisions. In addition to the goals stated in TDC 73.110 and 73.140, the goals of the off-street parking lot standards are to create shaded areas in parking lots, to reduce glare and heat buildup, provide visual relief within paved parking areas, emphasize circulation patterns, reduce the total number of spaces, reduce the impervious surface area and stormwater runoff and enhance the visual environment. The design of the off-street parking area shall be the responsibility of the developer and should consider visibility of signage, traffic circulation, comfortable pedestrian access, and aesthetics. Trees shall not be cited as a reason for applying for or granting a variance on placement of signs.

(2) Application. Off-street parking lot landscaping standards shall apply to any surface vehicle parking or circulation area. [Ord. 904-93, §59, 9/13/93; Ord. 1224-06 §28, 11/13/06]

Section 73.340 Off-Street Parking Lot and Loading Area Landscaping - Commercial, Industrial, Public and Semi-Public Uses, and Residential and Mixed Use Residential Uses within the Central Design District.

(1) A clear zone shall be provided for the driver at ends of on-site drive aisles and at driveway entrances, vertically between a maximum of 30 inches and a minimum of 8 feet as measured from the ground level, except for parking structures and underground parking where this provision shall not apply.

(2) Perimeter site landscaping of at least 5 feet in width shall be provided in all off-street parking and vehicular circulation areas (including loading areas). For conditional uses in multifamily residential planning districts the landscape width shall be at least 10 feet except for uses allowed by TDC 40.030(3), 40.030(5)(j), 40.030(5)(m), 40.030(5)(n) and 41.030(2).

(a) The landscape area shall contain:

(i) Deciduous trees an average of not more than 30 feet on center. The trees shall meet the requirements of TDC 73.360(7).

(ii) Plantings which reach a mature height of 30 inches in three years which provide screening of vehicular headlights year round.

(iii) Shrubs or ground cover, planted so as to achieve 90 percent coverage within three years.

(iv) Native trees and shrubs are encouraged.

(b) Where off-street parking areas on separate lots are adjacent to one another and are connected by vehicular access, the landscaped strips required in subsection (2) of this section are not required. [Ord. 882-92, §18, 12/14/92; Ord. 904-93, § 61, 9/13/93; Ord. 920-94, §19, 4/11/94; Ord. 1224-06 §30, 11/13/06]

Response: The Landscape plan addresses the intentions of the off-street parking standards regarding the desired shading, screening, scale, visual relief and interest and the planting spacing and sizes conform with the requirements also.

Section 73.360 Off-Street Parking Lot Landscape Islands - Commercial, Industrial, Public, and Semi-Public Uses.

(1) A minimum of 25 square feet per parking stall shall be improved with landscape island areas. They may be lower than the surrounding parking surface to allow them to receive storm water run-off and function as water quality facilities as well as parking lot landscaping. They shall be protected from vehicles by curbs, but the curbs may have spaces to allow drainage into the islands. They shall be dispersed throughout the parking area [see TDC 73.380(3)]. They shall be planted with groundcover or shrubs that will completely cover the island area within 3 years. They shall be planted with deciduous shade trees when needed to meet the parking lot shade tree requirements. Native plant materials are encouraged. Landscape square footage requirements shall not apply to parking structures and underground parking.

Response: The site includes 71 parking spaces, at 25 sf /stall, 1775 sf of landscape islands is required. 2408 sf is provided.

(2) Landscaped island areas with deciduous parking lot shade trees shall be a minimum of 5 feet in width (from inside of curb to curb).

Response: The landscape islands will be 5 feet wide inside dimension.

(3) A minimum of one deciduous shade tree shall be provided for every four (4) parking spaces to lessen the adverse impacts of glare, reduce heat from paved surfaces, and to emphasize circulation patterns. Required shade trees shall be uniformly distributed throughout the parking lot (see TDC 73.380(3)), except that within the Central Design District landscape islands and shade trees may be placed to frame views of the Tualatin Commons water feature or identified architectural focal elements. The trees shall meet the requirements of TDC 73.360(7). Parking lot shade tree requirements shall not apply to parking structures and underground parking.

Response: With the 71 parking spaces provided, 18 shade trees are required. 18 shade trees are being added to the 27 existing trees on the northern portion of site.

(4) Landscape islands shall be utilized at aisle ends to protect parked vehicles from moving vehicles and emphasize vehicular circulation patterns. Landscape island location requirements shall not apply to parking structures and under-ground parking.

Response: Landscape islands are provided at the existing and new parking aisle ends and at the entry points.

(5) Required plant material in landscape islands shall achieve 90 percent coverage within three years. Native shrubs and trees are encouraged.

Response: The 2" tree caliper and other plant material specifications and correct maintenance will help to assure required coverage and maturity.

(6) (a) Except as in (b) below, site access from the public street shall be defined with a landscape area not less than 5 feet in width on each side and extend 25 feet back from the property line for commercial, public, and semi-public development with 12 or more parking spaces and extend 30 feet back from the property line for industrial development, except for parking structures and under-ground parking which shall be determined through the Architectural Review process.

Response: The parking islands adjacent to the entry drives extend 30 feet from the property line.

(7) Deciduous shade trees shall meet the following criteria:

(a) Reach a mature height of 30 feet or more;

(b) Cast moderate to dense shade in summer;

(c) Long lived, i.e., over 60 years;

(d) Do well in an urban environment:

(i) Pollution tolerant.

(ii) Tolerant of direct and reflected heat.

(e) Require little maintenance:

(i) Mechanically strong.

(ii) Insect- and disease-resistant.

(iii) Require little pruning.

(f) Be resistant to drought conditions;

(g) Be barren of fruit production.

Response: Plantings specified on Landscape plan meet these criteria.

Section 73.370 Off-Street Parking and Loading.

(1) General Provisions.

(a) At the time of establishment of a new structure or use, or change in use, or change in use of an existing structure, within any planning district of the City, off-street parking spaces, off-street vanpool and carpool parking spaces for commercial, institutional and industrial uses, off-street bicycle parking, and off-street loading berths shall be as provided in this and following sections, unless greater requirements are otherwise established by the conditional use permit or the Architectural Review process, based upon clear findings that a greater number of spaces are necessary at that location for protection of public health, safety and welfare or that a lesser number of vehicle parking spaces will be sufficient to carry out the objectives of this section. In the Central Design District, the Design Guidelines of TDC 73.610 shall be considered. In case of conflicts between guidelines or objectives in TDC Chapter 73, the proposal shall provide a balance.

(b) At the time of enlargement of an existing multi-family residential, commercial, institutional or industrial structure or use, TDC 73.370 shall apply to the existing and enlarged structure or use.

(c) Except where otherwise specified, the floor area measured shall be the gross floor area of the building primary to the function of the particular use of the property other than space devoted to off-street parking or loading.

(d) Where employees are specified, the term shall apply to all persons, including proprietors, working on the premises during the peak shift.

(e) Calculations to determine the number of required parking spaces and loading berths shall be rounded to the nearest whole number.

(f) If the use of a property changes, thereby increasing off-street parking or loading requirements, the increased parking/loading area shall be provided prior to commencement of the new use.

(g) Parking and loading requirements for structures not specifically listed herein shall be determined by the Community Development Director, based upon requirements of comparable uses listed.

(h) When several uses occupy a single structure, the total requirements for off-street parking may be the sum of the requirements of the several uses computed separately or be computed in accordance with TDC 73.370(1)(m), Joint Use Parking.

(i) Off-street parking spaces for dwellings shall be located on the same lot with the dwelling. Other required parking spaces may be located on a separate parcel, provided the parcel is not greater than five hundred (500) feet from the entrance to the building to be served, measured along the shortest pedestrian route to the building. The applicant must prove that the parking located on another parcel is functionally located and that there is safe vehicular and pedestrian access to and from the site. The parcel upon which parking facilities are located shall be in the same ownership as the structure.

(j) Required parking spaces shall be available for the parking of operable passenger automobiles of residents, customers, patrons and employees and shall not be used for storage of vehicles or materials or for the parking of trucks used in conducting the business.

(k) Institution of on-street parking, where none is previously provided, shall not be done solely for the purpose of relieving crowded parking lots in commercial or industrial planning districts.

(n) Bicycle parking facilities shall include long-term parking that consists of covered, secure stationary racks, lockable enclosures, or rooms (indoor or outdoor) in which the bicycle is stored and short-term parking provided by secure stationary racks (covered or not covered), which accommodate a bicyclist's lock securing the frame and both wheels. The Community Development Director, their designee, or the Architectural Review Board may approve a form of bicycle parking not specified in these provisions but that meets the needs of long-term and/or short-term parking pursuant to Section 73.370.

(o) Each bicycle parking space shall be at least 6 feet long and 2 feet wide, and overhead clearance in covered areas shall be at least 7 feet, unless a lower height is approved through the Architectural Review process.

(p) A 5-foot-wide bicycle maneuvering area shall be provided beside or between each row of bicycle parking. It shall be constructed of concrete, asphalt or a pervious surface such as pavers or grasscrete, but not gravel or woody material, and be maintained.

(q) Access to bicycle parking shall be provided by an area at least 3 feet in width. It shall be constructed of concrete, asphalt or a pervious surface such as pavers or grasscrete, but not gravel or woody material, and be maintained.

(r) Required bicycle parking shall be located in convenient, secure, and well-lighted locations approved through the Architectural Review process. Lighting, which may be provided, shall be deflected to not shine or create glare into street rights-of-way or fish and wildlife habitat areas.

(s) Long-term bicycle parking facilities may be provided inside a building in suitable secure and accessible locations.

(t) Bicycle parking may be provided within the public right-of-way in the Core Area Parking District subject to approval of the City Engineer and provided it meets the other requirements for bicycle parking.

(u) Bicycle parking areas and facilities shall be identified with appropriate signing as specified in the Manual on Uniform Traffic Control Devices (MUTCD) (latest edition). At a minimum, bicycle parking signs shall be located at the main entrance and at the location of the bicycle parking facilities.

(v) Required bicycle parking spaces shall be provided at no cost to the bicyclist, or with only a nominal charge for key deposits, etc. This shall not preclude the operation of private for-profit bicycle parking businesses.

(x) Required vanpool and carpool parking shall meet the 9-foot parking stall standards in Figure 73-1 and be identified with appropriate signage.

(2) Off-Street Parking Provisions.

(a) The following are the minimum and maximum requirements for off-street motor vehicle parking in the City, except for minimum parking requirements for the uses in TDC 73.370(2)(a) (Residential Uses: iii, iv, v, vi, vii; Places of Public Assembly: I, ii, iv; Commercial Amusements: I, ii; and Commercial: I, ii, xi, xii, xiv) within the Core Area Parking District (CAPD). Minimum standards for off-street motor vehicle parking for the uses in 73.370(2) (a) Residential Uses: iii, iv, v, vi, vii; Places of Public Assembly: I, ii, iv; Commercial Amusements: I, ii; and Commercial: I, ii, xi, xii, xiv in the CAPD are in TDC 73.370(2)(b). The maximum requirements are divided into Zone A and Zone B, as shown on the Tualatin Parking Zone Map, **Figure 73-3**. The following are exempt from calculation of maximum parking requirements: parking structures; fleet parking; parking for vehicles for sale, lease or rent; car/vanpool parking; dedicated valet parking; and user-paid parking.

USE	MINIMUM MOTOR VEHICLE PARKING REQUIREMENT	MAXIMUM MOTOR VEHICLE PARKING REQUIREMENT	BICYCLE PARKING REQUIREMENT	PERCENTAGE OF BICYCLE PARKING TO BE COVERED
Industrial				
(i) Manufacturing	1.60 spaces per 1,000 sq. ft. of gross floor area	None	2, or 0.10 spaces per 1,000 gross sq. ft., whichever is greater	First 5 spaces or 30%, whichever is greater
(ii) Warehousing	0.30 spaces per 1,000 sq. ft. of gross floor area	Zone A: 0.4 spaces per 1,000 sq. ft. gross floor area Zone B: 0.5 spaces per 1,000 sq. ft. gross floor area	2, or 0.10 spaces per 1,000 gross sq. ft., whichever is greater	First 5 spaces or 30%, whichever is greater
(iii) Wholesale establishment	3.00 spaces per 1,000 sq. ft. of gross floor area	None	2, or 0.50 spaces per 1,000 gross sq. ft., whichever is greater	First 5 spaces or 30%, whichever is greater

3) Off-Street Vanpool and Carpool Parking Provisions.

The minimum number of off-street Vanpool and Carpool parking for commercial, institutional and industrial uses is as follows:

Number of Required Parking Spaces	Number of Vanpool or Carpool Spaces
0 to 10	1
10 to 25	2
26 and greater	1 for each 25 spaces

Response: The proposed parking spaces are, as suggested in the Pre-Application meeting, calculated to assume the most restrictive "worst case" or the highest uses allowed on the site. The calculation was based upon Office 6480 sf @2.7/1000sf (17.5), Warehouse 8800 sf @ .3/1000 sf (3), Manufacturing 7000 sf @ 1.6/1000 sf (11), Wholesale 12900 sf @ 3/1000 sf (39). Total 71 spaces. Since the current and intended use of the building does not include Wholesale and is likely to contain more of the light manufacturing uses, using the conservative approach is better for the long use and potential changes of uses in the future. 3 van/carpool spaces are provided. The existing building provides 3 secure bicycle parking spaces. 2 additional outdoor bike parking spaces will be provided under cover and each tenant space will provide secured spaces, which will exceed the number required.

Section 73.380 Off-Street Parking Lots.
A parking lot, whether an accessory or principal use, intended for the parking of automobiles or trucks, shall comply with the following:

(1) Off-street parking lot design shall comply with the dimensional standards set forth in Figure 73-1 of this section, except for parking structures and underground parking where stall length and width requirements for a standard size stall shall be reduced by .5 feet and vehicular access at the entrance if gated shall be a minimum of 18 feet in width.

Response: Parking stalls are designed at 9' wide x 18' long and drive lanes are 22', in accordance with Figure 73-1.

(2) Parking stalls for sub-compact vehicles shall not exceed 35 percent of the total parking stalls required by TDC 73.370(2). Stalls in excess of the number required by TDC 73.370(2) can be sub-compact stalls.

Response: The current parking lot has 4 subcompact stalls, no more are planned.

(3) Off-street parking stalls shall not exceed eight continuous spaces in a row without a landscape separation, except for parking structures and underground parking. For parking lots within the Central Design District that are designed to frame views of the central water feature or identified architectural focal elements as provided in TDC 73.350(3), this requirement shall not apply and the location of parking lot landscape islands shall be determined through the Architectural Review process.

Response: Landscape separation islands are place to no exceed eight continuous stalls.

(4) Parking lot drive aisles shall be constructed of asphalt or concrete, including pervious concrete. Parking stalls shall be constructed of asphalt or concrete, or a pervious surface such as pavers or grasscrete, but not gravel or woody material. Drive aisles and parking stalls shall be maintained adequately for all-weather use and drained to avoid water flow across sidewalks. Pervious surfaces such as pervious concrete, pavers and grasscrete, but not gravel or woody material, are encouraged for parking stalls in or abutting the Natural Resource Protection Overlay District, Other Natural Areas identified in Figure 3-4 of the Parks and Recreation Master Plan, or in a Clean Water Services Vegetated Corridor.Parking lot landscaping shall be provided pursuant to the requirements of TDC 73.350 and TDC 73.360. Walkways in parking lots shall be provided pursuant to TDC 73.160.

Response: The existing and proposed parking lot is asphalt and drained to perform in accordance with correct storm water controls. See the Civil Engineering report and plans in the exhibits.

(5) Except for parking to serve residential uses, parking areas adjacent to or within residential planning districts or adjacent to residential uses shall be designed to minimize disturbance of residents.

Response: N/A

(6) Artificial lighting, which may be pro-vided, shall be deflected to not shine or create glare in a residential planning district, an adjacent dwelling, street right-of-way in such a manner as to impair the use of such way or a Natural

Resource Protection Overlay District, Other Natural Areas identified in Figure 3-4 of the Parks and Recreation Master Plan, or a Clean Water Services Vegetated Corridor.

Response: N/A

(7) Groups of more than 4 parking spaces shall be so located and served by driveways that their use will require no backing movements or other maneuvering within a street right-of-way other than an alley.

Response: All parking spaces are located to be served by driveways and no street right of way maneuvering is required.

(8) Service drives to off-street parking areas shall be designed and constructed to facilitate the flow of traffic, provide maximum safety of traffic access and egress, and maximum safety of pedestrians and vehicular traffic on the site.

Response: These conditions are met with the layout of the parking lot access and egress.

(9) Parking bumpers or wheel stops or curbing shall be provided to prevent cars from encroaching on the street right-of-way, adjacent landscaped areas, or adjacent pedestrian walkways.

Response: Stops will be provided to satisfy the encroachment prevention.

(10) Disability parking spaces and accessibility shall be provided in accordance with applicable federal and state requirements.

Response: 3 accessible parking spaces are required and 3 provided. The current and new spaces will meet ADA standards.

(11) On-site drive aisles without parking spaces, which provide access to parking areas with regular spaces or with a mix of regular and sub-compact spaces, shall have a minimum width of 22 feet for two-way traffic and 12 feet for one-way traffic. On-site drive aisles without parking spaces, which provide access to parking areas with only sub-compact spaces, shall have a minimum width of 20 feet for two-way traffic and 12 feet for one-way traffic. [Ord. 882-92, §22, 12/14/92; Ord. 904-93, §68, 69 and 70, 9/13/93; Ord. 920-94, §22, 4/11/94; Ord. 956-96, §38, 1/8/96; Ord. 1224-06 §34, 11/13/06; Ord. 1354-13 §14, 02/25/13]

Response: Drive aisles are planned to be 22’ min wide and the access aisles to be 20’ min wide.

Section 73.390 Off-Street Loading Facilities.

(1) The minimum number of off-street loading berths for commercial, industrial, public and semi-public uses is as follows:

Square Feet of Floor Area	Number of Berths
Less than 5,000	0
5,000 - 25,000	1
25,000 - 60,000	2
60,000 and over	3

(2) Loading berths shall conform to the following minimum size specifications.

(a) Commercial, public and semi-public uses of 5,000 to 25,000 square feet shall be 12' x 25' and uses greater than 25,000 shall be 12' x 35'

(b) Industrial uses - 12' x 60'

(c) Berths shall have an unobstructed height of 14'

(d) Loading berths shall not use the public right-of-way as part of the required off-street loading area.

(3) Required loading areas shall be screened from public view from public streets and adjacent properties by means of sight-obscuring landscaping, walls or other means, as approved through the Architectural Review process.

(4) Required loading facilities shall be installed prior to final building inspection and shall be permanently maintained as a condition of use.

(5) A driveway designed for continuous forward flow of passenger vehicles for the purpose of loading and unloading children shall be located on the site of a school or child day care center having a capacity greater than 25 students.

(6) The off-street loading facilities shall in all cases be on the same lot or parcel as the structure they are intended to serve. In no case shall the required off-street loading spaces be part of the area used to satisfy the off-street parking requirements.

Response: 2 loading berths are required and 2 provided- see site plan in exhibit.

Section 73.400 Access.

(1) The provision and maintenance of vehicular and pedestrian ingress and egress from private property to the public streets as stipulated in this Code are continuing requirements for the use of any structure or parcel of real property in the City of Tualatin. Access management and spacing standards are provided in this section of the TDC and TDC Chapter 75. No building or other permit shall be issued until scale plans are presented that show how the ingress and egress requirement is to be fulfilled. If the owner or occupant of a lot or building changes the use to which the lot or building is put, thereby increasing ingress and egress requirements, it shall be unlawful and a violation of this code to begin or maintain such altered use until the required increase in ingress and egress is provided.

5) Lots that front on more than one street may be required to locate motor vehicle accesses on the street with the lower functional classification as determined by the City Engineer.

(6) Except as provided in TDC 53.100, all ingress and egress shall connect directly with public streets. [Ord. 882-92, § 24,12/14/92]

(8) To afford safe pedestrian access and egress for properties within the City, a sidewalk shall be constructed along all street frontage, prior to use or occupancy of the building or structure proposed for said property. The sidewalks required by this section shall be constructed to City standards, except in the case of streets with inadequate right-of-way width or where the final street design and grade have not been established, in which case the sidewalks shall be constructed to a design and in a manner approved by the City Engineer. Sidewalks approved by the City Engineer may include temporary sidewalks and sidewalks constructed on private property; provided, however, that such sidewalks shall provide continuity with sidewalks of adjoining commercial developments existing or proposed. When a sidewalk is to adjoin a future street improvement, the sidewalk construction shall include construction of the curb and gutter section to grades and alignment established by the City Engineer.

Response: The City Engineer reviewed and approved the ingress and egress drive locations at the Pre-Application meeting. The existing sidewalks are installed per City standards.

(12) Minimum Access Requirements for Industrial Uses.
Ingress and egress for industrial uses shall not be less than the following:

Required Parking Spaces	**Minimum Number Required**	**Minimum Pavement Width**	**Minimum Pavement Walkways, Etc.**
1-250	1	36 feet for first 50' from ROW, 24' thereafter	No curbs or walkway required

Response: Two 36’ ingress and egress drives exist on site and one more will be added,

(15) Distance between Driveways and Intersections.

Except for single-family dwellings, the minimum distance between driveways and intersections shall be as provided below. Distances listed shall be measured from the stop bar at the intersection.

(a) At the intersection of collector or arterial streets, driveways shall be located a minimum of 150 feet from the intersection.

(b) At the intersection of two local streets, driveways shall be located a minimum of 30 feet from the intersection.

(c) If the subject property is not of sufficient width to allow for the separation between driveway and intersection as provided, the driveway shall be constructed as far from the intersection as possible, while still maintaining the 5-foot setback between the driveway and property line as required by TDC 73.400(14)(b).

Response: The two existing driveways and the proposed new drives are located to meet these dimensional requirements and were reviewed by City Engineer.

(16) Vision Clearance Area.

(a) Local Streets - A vision clearance area for all local street intersections, local street and driveway intersections, and local street or driveway and railroad intersections shall be that triangular area formed by the right-of-way lines along such lots and a straight line joining the right-of-way lines at points which are 10 feet from the intersection point of the right-of-way lines, as measured along such lines (see Figure 73-2for illustration).

(c) Vertical Height Restriction - Except for items associated with utilities or publicly owned structures such as poles and signs and existing street trees, no vehicular parking, hedge, planting, fence, wall structure, or temporary or permanent physical obstruction shall be permitted between 30 inches and 8 feet above the established height of the curb in the clear vision area (see Figure 73-2 for illustration).

Response: The vision clearances are illustrated on the Landscape Plan and comply with provisions.

Section 73.410 Street Tree Plan.
A person who desires to plant a street tree shall comply with TDC 74.765, which comprises the street tree plan. [Ord. 1279-09, §2, 3/23/09]

Response: The street trees were installed in the first phase of this development.

Summary conclusion
The proposed development/addition and the related parking and landscaping meets or exceeds the minimum standards. The building is designed to be an attractive addition to the Industrial development area and fits within the scale and design aesthetic of the area and the Community Design Standards of the TDC.x

SEWER REGULATIONS

3-2-020 Application, Permit and *Inspection* Procedure.

(1) No person shall connect to any part of the sanitary sewer system without first making an application and securing a permit from the City for such connection, nor may any person substantially increase the flow, or alter the character of sewage, without first obtaining an additional permit and paying such charges therefore as may be fixed by the City, including such charges as inspection charges, connection charges and monthly service charges**.** ***A permit will be made to allow connection to the City's sanitary sewer system.***

3-2-030 Materials and Manner of Construction.

(1) All building sewers, side sewers and connections to the main sewer shall be so constructed as to conform to the requirements of the Oregon State Plumbing Laws and rules and regulations and specifications for sewerage construction of the City. ***A sanitary sewer service lateral was installed to the site as a part of the Leveton Common No. 2 subdivision. Extension or modification of that sewer lateral to the City will be done performed under Oregon State Plumbing Laws.***

(2) Old building sewer may be used in connection with new buildings only when they are found, upon examination and test by the City inspector, to meet all requirements of the city. ***Sanitary sewer service lateral was extended to existing building 2008 under previous development. Lateral to be modified under Oregon State Pluming Law to server new building addition. Testing to meet city requirements.***

3-2-060 Use of Public Sewers Required.

(1) No person shall discharge to a natural outlet within the City of Tualatin, or in an area under the jurisdiction of the City, any sewage or polluted waters, except where suitable treatment has been provided in accordance with this ordinance. ***Sewer connection will be made to the sanitary sewer****.*

WATER SERVICE

3-3-030 Application for Service.

(1) No water service will be provided without a signed application containing the following information**:** ***A proper application to modify existing water service will be made****.*

3-3-040 Separate Services Required.

(2) For nonresidential uses, separate meters shall be provided for each structure. Separate meters shall also be provided to each buildable lot or parcel on which water service is or will be provided. ***The proposed industrial site development will be a single building at this time a single City meter is proposed, with the possibility that private sub-metering will be done at the building.***

3-3-50 Regular Service.

(1) Upon the application for water service, and payment of all charges, the City will install a service connection and meter of such size and location as approved by the City Engineer. Service connection and meters larger than two inches may be installed by the property owner after approval from the City Engineer***. A proper application to modify existing water service will be made. If connection larger than two inches contractor will coordinate installations with City Engineer.***

3-3-080 Fire Protection Service.

Fire protection facilities will be allowed under the following conditions:

(1) The owner of a fire protection system shall furnish and install a service meter approved by the City. ***Noted.***

(2) When a building has a fire protection service which is separate from the regular water service to the building, an appropriate backflow device, but not less than a double check detector check, approved by the Operations Director, shall be used in place of a service meter. Water supplied through this service shall not be used for any purpose except for suppressing a fire or testing of the fire protection system. If registration of regular water usage is recorded on the detector check meter, the City may require installation of a service meter or removal of the fire protection service. ***A separate fire line will be installed if required to meet Fire Code requirements along with the installation of an acceptable backflow device per State and City requirements.***

3-3-100 Meters.

(1) Meters up to and including two inches will be furnished by the City. Meters larger than two inches may be furnished by the customer upon approval of the Operations Director. ***At this time it is not anticipated that a meter larger than 2 inch will be needed.***

3-3-110 Construction Standards.

All water line construction and installation of services and equipment shall be in conformance with the City of Tualatin Public Works Construction Code. In addition, whenever a property owner extends a water line, which upon completion, is intended to be dedicated to the City as part of the public water system, said extension shall be carried to the opposite property line or to such other point as determined by the City Engineer. Water line size shall be determined by the City Engineer in accordance with the City's Development Code or implementing ordinances and the Public Works Construction Code. ***As an 8 inch water line has been installed by the developer of the Leveton Commons No. 2 subdivision, to the parcel it is anticipated that no public sewer extension will be required.***

3-3-120 Backflow Prevention Devices and Cross Connections.

(1) Except where this ordinance provides more stringent requirements, the definitions, standards, requirements and regulations set forth in the Oregon Administrative Rules pertaining to public water supply systems and specifically OAR 333 Division 61 in effect on the date this ordinance becomes effective are hereby adopted and incorporated by reference. ***A backflow appropriate for the domestic***

water use inside the building and a double check backflow device for the fire line service will be installed accordingly.

3-3-130 Control Valves.
The customer shall install a suitable valve, as close to the meter location as practical, the operation of which will control the entire water supply from the service. The operation by the customer of the curb stop in the meter box is prohibited. ***A control valve will be installed on the building side of the domestic water meter.***

EROSION CONTROL

3-5-040 Erosion Prohibited.
Visible or measurable erosion which enters, or is likely to enter, the public storm and surface water system or leaves the property on which it originates, is prohibited, and is a violation of this ordinance. The owner of the property from which erosion originates and any person whose activity on the property causes such erosion, shall be deemed responsible for causing such erosion and shall be responsible to stop erosion, cleanup past erosion, and prevent erosion from occurring in the future. ***Erosion and Sediment Control measures will be a part of the construction documents and construction management of the site.***

3-5-050 Erosion Control Permits.

(1) Except as noted in subsection (3) of this section, no person shall cause any change to improved or unimproved real property that causes, will cause, or is likely to cause a temporary or permanent increase in the rate of soil erosion from the site without first obtaining a permit from the City and paying prescribed fees. Such changes to land shall include, but are not limited to, grading, excavating, filling, working of land, or stripping of soil or vegetation from land. ***Proper permitting as required will be obtained prior to site work beginning on the site.***

(2) No construction, land development, grading, excavation, fill, or the clearing of land is allowed until the City has issued an Erosion Control Permit covering such work, or the City has determined that no such permit is required. No public agency or body shall undertake any public works project without first obtaining from the City an Erosion Control Permit covering such work, or receiving a determination from the City that none is required. ***Proper permitting for a 1200-CN permit as required will be obtain prior to site work beginning on the site.***

3-5-060 Permit Process.

(1) Applications for an Erosion Control Permit. Application for an Erosion Control Permit shall include an Erosion Control Plan which contains methods and interim facilities to be constructed or used concurrently and to be operated during construction to control erosion. ***The required EC permit, will be applied for meeting the specific requirements for submitting such*****. If disturbance area exceeds 1 acres a 1200 CN permit will be applied for.**

3-5-070 Maintenance.
The property owner or holder of an erosion control permit shall maintain the facilities and techniques contained in the approved Erosion Control Plan so as to continue to be effective during the construction or other permitted activity. If the facilities and techniques approved in an Erosion Control Plan are not effective or sufficient as determined by the City site inspection, the permittee shall submit a revised plan within three days, (excluding Saturday, Sunday and holidays) of written notification either by personal delivery or regular mail, from the City. Upon approval of the revised plan by the City, the permittee shall immediately implement the additional or revised facilities and techniques of the revised plan. In cases where erosion is occurring, the City may require the applicant to install interim control measures prior to submittal of the revised Erosion Control Plan. In no event will the City be responsible for the success or failure of any approved Erosion Control Plan**.** ***Noted.***

3-5-080 Inspection.
All erosion control measures shall be installed prior to the start of any work requiring an erosion control permit and shall be maintained until after the work is complete and until no further potential of erosion exists. The permittee shall call the City prior to the foundation inspection of a building for an inspection of the erosion control measures for that property. ***Noted.***

3-5-090 Physical Erosion.
No person shall drag, drop, track or otherwise place or deposit, or allow to be placed or deposited mud, dirt, rock or other debris upon a public street or into any part of a public storm and surface water system, or into any part of a private storm and surface water system which drains or connects to the public storm and surface water system. Any such deposit of material shall be immediately removed using hand labor or mechanical means. No material shall be washed or flushed into any part of the storm and surface water system without approved erosion control measures first being installed to the satisfaction of the City***.*** ***Noted.***

3-5-110 Air Pollution - Dust, Fumes, Smoke and Odors.

(1) Dust shall be minimized to the extent practicable, utilizing all measures necessary, including, ***Noted.***

3-5-140 Control of Noise Levels.
Construction noise shall be minimized by the use of proper engine mufflers, protective sound reducing enclosures, and other sound barriers. Construction activities producing excessive noise that cannot be reduced by mechanical means shall be restricted to locations where their sound impact is reduced to a minimum at the edge of work area. ***Noted.***

3-5-150 Natural Vegetation.

(1) As far as is practicable, the natural vegetation shall be protected and left in place. Work areas shall be carefully located and marked to reduce potential damage. Trees shall not be used as anchors for stabilizing working equipment. ***Noted.***

(2) During clearing operations, trees shall not be permitted to fall outside the work area. In areas designated for selective cutting or clearing, care in falling and

removing trees and brush shall be taken to avoid injuring trees and shrubs to be left in place. ***Noted.***

(3) Where natural vegetation has been removed, or the original land contours disturbed, the site shall be re-vegetated, and the vegetation established, as soon as practicable after construction has commenced, except where construction of sewers will be followed by paving. ***Noted.***

3-5-180 Contaminated Soils.

If the construction process reveals soils contaminated with hazardous materials or chemicals the contractor shall stop work immediately, ensure no contaminated material is hauled from the site, remove the contractor's work force from the immediate area of the contaminated area, leaving all machinery and equipment, and secure the area from access by the public until such time as a mitigation team has relieved them of that responsibility. Contractor shall notify the City and an emergency response team (911) of the situation upon its discovery. No employees who may have come in contact with the contaminated material shall be allowed to leave the site until such time as the emergency response team releases them. ***Noted.***

ADDITIONAL SURFACE WATER MANAGEMENT STANDARDS

3-5-200 Downstream Protection Requirement.

Each new development is responsible for mitigating the impacts of that development upon the public storm water quantity system. The development may satisfy this requirement through the use of any of the following techniques, subject to the limitations and requirements in TMC 3-5-210:

(1) Construction of permanent on-site stormwater quantity detention facilities designed in accordance with this title; ***On-site stormwater quantity detention facilities will be a part of the design of the improvements.***

3-5-210 Review of Downstream System.

For new development other than the construction of a single family house or duplex, plans shall document review by the design engineer of the downstream capacity of any existing storm drainage facilities impacted by the proposed development. That review shall extend downstream to a point where the impacts to the water surface elevation from the development will be insignificant, or to a point where the conveyance system has adequate capacity, as determined by the City Engineer.

To determine the point at which the downstream impacts are insignificant or the drainage system has adequate capacity, the design engineer shall submit an analysis using the following guidelines:

(1) evaluate the downstream drainage system for at least ¼ mile;

(2) evaluate the downstream drainage system to a point at which the runoff from the development in a build out condition is less than 10 percent of the total runoff of the basin in its current development status. Developments in the basin that have been

approved may be considered in place and their conditions of approval to exist if the work has started on those projects;

(3) evaluate the downstream drainage system throughout the following range of storms: 2, 5, 10, 25 year;

(4) The City Engineer may modify items 1, 2, 3 to require additional information to determine the impacts of the development or to delete the provision of unnecessary information.

If the increase in surface waters leaving a development will cause or contribute to damage from flooding, then the identified capacity deficiency shall be corrected prior to development or the development must construct onsite detention. To determine if the runoff from the development will cause or contribute to damage from flooding the City Engineer will consider the following factors:

(1) The potential for or extent of flooding or other adverse impacts from the run-off of the development on downstream properties;

(2) The potential for or extent of possibility of inverse condemnation claims;

(3) Incremental impacts of runoff from the subject and other developments in the basin; and

(4) Other factors that may be relevant to the particular situation.

The purpose of the City Engineer's review is to protect the City and its inhabitants from the impacts or damage caused by runoff from development while recognizing all appropriate limitations on exactions from the development. ***The subdivision for which this parcel is a part of, would have run drainage calculations for downstream impacts. This site will have storm drain facilities, detaining runoff through the 25 year event.***

3-5-220 Criteria for Requiring On-Site Detention to be Constructed.
The City shall determine whether the onsite facility shall be constructed. If the onsite facility is constructed, the development shall be eligible for a credit against Storm and Surface Water System Development Charges, as provided in City ordinance.

On-site facilities shall be constructed when any of the following conditions exist:

(1) There is an identified downstream deficiency, as defined in TMC 3-5-210, and detention rather than conveyance system enlargement is determined to be the more effective solution.

(2) There is an identified regional detention site within the boundary of the development.

(3) There is a site within the boundary of the development which would qualify as a regional detention site under criteria or capital plan adopted by the Unified Sewerage Agency.

(4) The site is located in the Hedges Creek Subbasin as identified in the Tualatin Drainage Plan and surface water runoff from the site flows directly or indirectly into the Wetland Protected Area (WPA) as defined in TDC 71.020. Properties located within the Wetland Protection District as described in TDC 71.010, or within the portion of the subbasin east of SW Tualatin Road are excepted from the on-site detention facility requirement. ***An on-site storm drain detention facility will be constructed.***

3-5-230 On-Site Detention Design Criteria.

(1) Unless designed to meet the requirements of an identified downstream deficiency as defined in TMC 3-5.210, stormwater quantity onsite detention facilities shall be designed to capture run-off so the run-off rates from the site after development do not exceed predevelopment conditions, based upon a 25-year, 24-hour return storm.

(2) When designed to meet the requirements of an identified downstream deficiency as defined in TMC 3-5.210, stormwater quantity on-site detention facilities shall be designed such that the peak runoff rates will not exceed predevelopment rates for the 2 through 100 year storms, as required by the determined downstream deficiency.

(3) Construction of on-site detention shall not be allowed as an option if such a detention facility would have an adverse effect upon receiving waters in the basin or subbasin in the event of flooding, or would increase the likelihood or severity of flooding problems downstream of the site. ***As there are no known downstream deficiencies run-off rates through the 25 year event will be matched via on-site detention facilities.***

3-5-240 On-Site Detention Design Method.

(1) The procedure for determining the detention quantities is set forth in Section 4.4 Retention/Detention Facility Analysis and Design, King County, Washington, Surface Water Design Manual, January 1990, except subchapters 4.4.5 Tanks, 4.4.6 Vaults and Figure 4.4.4G Permanent Surface Water Control Pond Sign. This reference shall be used for procedure only. The design criteria shall be as noted herein. Engineers desiring to utilize a procedure other than that set forth herein shall obtain City approval prior to submitting calculations utilizing the proposed procedure.

(2) For single family and duplex residential subdivisions, stormwater quantity detention facilities shall be sized for the impervious areas to be created by the subdivision, including all residences on individual lots at a rate of 2640 square feet of impervious surface area per dwelling unit, plus all roads which are assessed a surface water management monthly fee under Unified Sewerage Agency rules. Such facilities shall be constructed as a part of the subdivision public improvements. Construction of a single family or duplex residence on an existing lot of record is not required to construct stormwater quantity detention facilities.

(3) All developments other than single family and duplex, whether residential, multi-family, commercial, industrial, or other uses, the sizing of stormwater quantity detention facilities shall be based on the impervious area to be created by the development, including structures and all roads and impervious areas which are assessed a surface water management monthly fee under Unified Sewerage Agency

rules. Impervious surfaces shall be determined based upon building permits, construction plans, site visits or other appropriate methods deemed reliable by City. ***Acceptable methodology for design will be followed.***

PERMANENT ON-SITE WATER QUALITY FACILITIES

3-5-340 Facilities Required.

For new development, subject to the exemptions of TMC 3-5-310, no permit for construction, or land development, or plat or site plan shall be approved unless the conditions of the plat, plan or permit approval require permanent stormwater quality control facilities in accordance with this Title III. ***Stormwater quality control facilities will be a part of the site improvements.***

3-5-350 Phosphorous Removal Standard.

The stormwater quality control facilities shall be designed to remove 65 percent of the phosphorous from the runoff from 100 percent of the newly constructed impervious surfaces. Impervious surfaces shall include pavement, buildings, public and private roadways, and all other surfaces with similar runoff characteristics. ***This standard will be met.***

3-5-360 Design Storm.

The stormwater quality control facilities shall be designed to meet the removal efficiency of TMC 3-5-350 for a mean summertime storm event totaling 0.36 inches of precipitation falling in four hours with an average return period of 96 hours. ***This storm event will be used for the water quality design.***

STANDARD SPECIFICATIONS FOR BUILDING AND SIDE SEWERS

3-5-450 Building Sewers.

Design will be in accordance with the requirements stated under this section.

CHAPTER 74

Section 74.110 Phasing of Improvements.

The applicant may build the development in phases. If the development is to be phased the applicant shall submit a phasing plan to the City Engineer for approval with the development application. The timing and extent or scope of public improvements and the conditions of development shall be determined by the City Council on subdivision applications and by the City Engineer on other development applications. ***Redevelopment of existing property phasing not applicable.***

Section 74.120 Public Improvements.

(1) Except as specially provided, all public improvements shall be installed at the expense of the applicant. All public improvements installed by the applicant shall be constructed and guaranteed as to workmanship and material as required by the Public Works Construction Code prior to acceptance by the City. No work shall be undertaken on any public improvement until after the construction plans have been approved by the City Engineer and a Public Works Permit issued and the required fees paid. ***Such is noted.***

(2) In accordance with the Tualatin Basin Program for fish and wildlife habitat the City intends to minimize or eliminate the negative affects of public streets by modifying right-of-way widths and street improvements when appropriate. The City Engineer is authorized to modify right-of-way widths and street improvements to address the negative affects on fish and wildlife habitat. ***No dedications for right-of-way or additional easements are expected.***

Section 74.130 Private Improvements.

All private improvements shall be in-stalled at the expense of the applicant. The property owner shall retain maintenance responsibilities over all private improvements. ***Such is noted.***

Section 74.140 Construction Timing.

(1) All the public improvements required under this chapter shall be completed and accepted by the City prior to the issuance of a Certificate of Occupancy; or, for subdivision and partition applications, in accordance with the requirements of the Subdivision regulations. ***Such is noted.***

(2) All private improvements required under this chapter shall be approved by the City prior to the issuance of a Certificate of Occupancy; or for subdivision and partition applications, in accordance with the requirements of the Subdivision regulations. ***Such is noted.***

RIGHT-OF-WAY

Section 74.210 Minimum Street Right-of-Way Widths.
The width of streets in feet shall not be less than the width required to accommodate a street improvement needed to mitigate the impact of a proposed development. In cases where a street is required to be improved according to the standards of the TDC, the width of the right-of-way shall not be less than the minimums indicated in TDC Chapter 74, Public Improvement Requirements, Figures 74-2A through 74-2G. ***The street from curb to curb was fully developed at the time of the Leveton Commons No. 2 in 2005. Full right-of-way width was also dedicated at that time as well. Sidewalk installed with previous land use for lot.***

(1) For subdivision and partition applications, wherever existing or future streets adjacent to property proposed for development are of inadequate right-of-way width the additional right-of-way necessary to comply with TDC Chapter 74, Public Improvement Requirements, Figures 74-2A through 74-2G shall be shown on the final subdivision or partition plat prior to approval of the plat by the City. This right-of-way dedication shall be for the full width of the property abutting the roadway and, if required by the City Engineer, additional dedications shall be provided for slope and utility easements if deemed necessary. ***A subdivision or partition is not proposed.***

(2) For development applications other than subdivisions and partitions, wherever existing or future streets adjacent to property proposed for development are of inadequate right-of-way width, the additional right-of-way necessary to comply with TDC Chapter 74, Public Improvement Requirements, Figures 74-2A through 74-2G of the Tualatin Community Plan shall be dedicated to the City for use by the public prior to issuance of any building permit for the proposed development. This right-of-way dedication shall be for the full width of the property abutting the roadway and, if required by the City Engineer, additional dedications shall be provided for slope and utility easements if deemed necessary. ***No dedications for right-of-way or additional easements are expected.***

(3) For development applications that will impact existing streets not adjacent to the applicant's property, and to construct necessary street improvements to mitigate those impacts would require additional right-of-way, the applicant shall be responsible for obtaining the necessary right-of-way from the property owner. A right-of-way dedication deed form shall be obtained from the City Engineer and upon completion returned to the City Engineer for acceptance by the City. On subdivision and partition plats the right-of-way dedication shall be accepted by the City prior to acceptance of the final plat by the City. On other development applications the right-of-way dedication shall be accepted by the City prior to issuance of building permits. The City may elect to exercise eminent domain and condemn necessary off-site right-of-way at

the applicant's request and expense. The City Council shall determine when condemnation proceedings are to be used. ***There is not expected to be any additional impacts to streets not adjacent to the site that would require any upgrades and thus this code section is not applicable.***

(4) If the City Engineer deems that it is impractical to acquire the additional right-of-way as required in subsections (1)-(3) of this section from both sides of the center-line in equal amounts, the City Engineer may require that the right-of-way be dedicated in a manner that would result in unequal dedication from each side of the road. This requirement will also apply to slope and utility easements as discussed in TDC 74.320 and 74.330. The City Engineer's recommendation shall be presented to the City Council in the preliminary plat approval for subdivisions and partitions, and in the recommended decision on all other development applications, prior to finalization of the right-of-way dedication requirements. ***No additional dedication is expected to be required.***

(5) Whenever a proposed development is bisected by an existing or future road or street that is of inadequate right-of-way width according to TDC Chapter 74, Public Improvement Requirements, Figures 74-2A through 74-2G, additional right-of-way shall be dedicated from both sides or from one side only as determined by the City Engineer to bring the road right-of-way in compliance with this section. ***This is not applicable.***

(6) When a proposed development is adjacent to or bisected by a street proposed in TDC Chapter 11, Transportation Plan (Figure 11-3) and no street right-of-way exists at the time the development is proposed, the entire right-of-way as shown in TDC Chapter 74, Public Improvement Requirements,Figures 74-2A through 74-2G shall be dedicated by the applicant. The dedication of right-of-way required in this subsection shall be along the route of the road as determined by the City. ***This is not applicable.***

TRANSPORTATION

Section 74.410 Future Street Extensions.

(1) Streets shall be extended to the proposed development site boundary where necessary to: ***No street extensions are needed.***

(a) give access to, or permit future development of adjoining land;

(b) provide additional access for emergency vehicles;

(c) provide for additional direct and convenient pedestrian, bicycle and vehicle circulation;

(d) eliminate the use of cul-de-sacs except where topography, barriers such as railroads or freeways, existing development, or environmental constraints such as major streams and rivers prevent street extension.

(e) eliminate circuitous routes. The resulting dead end streets may be approved without a turnaround. A reserve strip may be required to preserve the objectives of future street extensions.

(2) Proposed streets shall comply with the general location, orientation and spacing identified in the Functional Classification Plan (Figure 11-1), Local Streets Plan (TDC 11.630 and Figure 11-3) and the Street Design Standards (Figures 74-2A through 74-2G). ***No new streets are proposed.***

(a) Streets and major driveways, as defined in TDC 31.060, proposed as part of new residential or mixed residential/commercial developments shall comply with the following standards: ***This section is not applicable.***

(b) Streets proposed as part of new industrial or commercial development shall comply with TDC 11.630, Figure 11-1, and Figures 74-2A through 74-2G. ***No new streets are proposed.***

(3) During the development application process, the location, width, and grade of streets shall be considered in 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. The arrangement of streets in a subdivision shall either: ***A subdivision is not proposed and thus this code section is not applicable.***

(4) The City Engineer may require the applicant to submit a street plan showing all existing, proposed, and future streets in the area of the proposed development. ***The applicant has not been asked to provide such.***

(5) The City Engineer may require the applicant to participate in the funding of future off-site street extensions when the traffic impacts of the applicant's development warrant such a condition. ***No such request is expected.***

Section 74.420 Street Improvements.

When an applicant proposes to develop land adjacent to an existing or proposed street, including land which has been excluded under TDC 74.220, the applicant should be responsible for the improvements to the adjacent existing or proposed street that will bring the improvement of the street into conformance with the Transportation Plan (TDC Chapter 11), TDC 74.425 (Street Design Standards), and the City' s Public Works Construction Code, subject to the following provisions:

(1) For any development proposed within the City, roadway facilities within the right-of-way described in TDC 74.210 shall be improved to standards as set out in the Public Works Construction Code. ***Public driveway and ADA accessibility will be a part of the development improvements.***

(2) The required improvements may include the rebuilding or the reconstruction of any existing facilities located within the right-of-way adjacent to the proposed development to bring the facilities into compliance with the Public Works Construction Code. ***This is noted.***

(3) The required improvements may include the construction or rebuilding of off-site improvements which are identified to mitigate the impact of the development. ***No off-site improvements are expected to be required to due impacts of the proposed development.***

(4) Where development abuts an existing street, the improvement required shall apply only to that portion of the street right-of-way located between the property line of the parcel proposed for development and the centerline of the right-of-way, plus any additional pavement beyond the centerline deemed necessary by the City Engineer to ensure a smooth transition between a new improvement and the existing roadway (half-street improvement). Additional right-of-way and street improvements and off-site right-of-way and street improvements may be required by the City to mitigate the impact of the development. The new pavement shall connect to the existing pavement at the ends of the section being improved by tapering in accordance with the Public Works Construction Code. ***It is noted.***

(5) If additional improvements are required as part of the Access Management Plan of the City, TDC Chapter 75, the improvements shall be required in the same manner as the half-street improvement requirements. ***We are not aware of any additional improvements that would be required.***

(6) All required street improvements shall include curbs, sidewalks with appropriate buffering, storm drainage, street lights, street signs, street trees, and, where designated, bikeways and transit facilities. ***Improvements as will be required will be improved, with development of driveway improvements***

(7) For subdivision and partition applications, the street improvements required by TDC Chapter 74 shall be completed and accepted by the City prior to signing the final subdivision or partition plat, or prior to releasing the security pro-vided by the applicant to assure completion of such improvements or as otherwise specified in the development application approval. ***A subdivision or partition is not a part of this request.***

(8) For development applications other than subdivisions and partitions, all street improvements required by this section shall be completed and accepted by the City prior to the issuance of a Certificate of Occupancy. ***It is understood for occupancy of building extension.***

(9) In addition to land adjacent to an existing or proposed street, the requirements of this section shall apply to land separated from such a street only by a railroad right-of-way. ***This is not applicable to this site.***

(10) Streets within, or partially within, a proposed development site shall be graded for the entire right-of-way width and constructed and surfaced in accordance with the Public Works Construction Code. ***This is not applicable to this site.***

(11) Existing streets which abut the pro-posed development site shall be graded, constructed, reconstructed, surfaced or repaired as necessary in accordance with the Public Works Construction Code and TDC Chapter 11, Transportation Plan, and TDC 74.425 (Street Design Standards). ***This is noted.***

(12) Sidewalks with appropriate buffering shall be constructed along both sides of each internal street and at a minimum along the development side of each external street in accordance with the Public Works Construction Code. ***A sidewalk exists along the external street. Section damaged through construction will be replaced.***

(13) The applicant shall comply with the requirements of the Oregon Department of Transportation (ODOT), Tri-Met, Washington County and Clackamas County when a proposed development site is adjacent to a roadway under any of their jurisdictions, in addition to the requirements of this chapter. ***This is not applicable to this site.***

(14) The applicant shall construct any required street improvements adjacent to parcels excluded from development, as set forth in TDC 74.220 of this chapter. ***This is not applicable to this site.***

(15) Except as provided in TDC 74.430, whenever an applicant proposes to develop land with frontage on certain arterial streets and, due to the access management provisions of TDC Chapter 75, is not allowed direct access onto the arterial, but instead must take access from another existing or future public street thereby providing an alternate to direct arterial access, the applicant shall be required to construct and place at a minimum street signage, a sidewalk, street trees and street lights along that portion of the arterial street adjacent to the applicant's property. The three certain arterial streets are S.W. Tualatin-Sherwood Road, S.W. Pacific Highway (99W) and S.W. 124th Avenue. In addition, the applicant may be required to construct and place on the arterial at the intersection of the arterial and an existing or future

public non-arterial street warranted traffic control devices (in accordance with the Manual on Uniform Traffic Control Devices, latest edition), pavement markings, street tapers and turning lanes, in accordance with the Public Works Construction Code. ***Leveton Drive is not an arterial and thus this is not applicable.***

(16) The City Engineer may determine that, although concurrent construction and placement of the improvements in (14) and (15) of this section, either individually or collectively, are impractical at the time of development, the improvements will be necessary at some future date. In such a case, the applicant shall sign a written agreement guaranteeing future performance by the applicant and any successors in interest of the property being developed. The agreement shall be subject to the City's approval. ***Neither sections 14 or 15 are applicable to this site and thus the section is not applicable either.***

(17) Intersections should be improved to operate at a level of service of at least D and E for signalized and unsignalized intersections, respectively. ***All intersections will operate at adequate levels of service after development of the subject site as proposed.***

(18) Pursuant to requirements for off-site improvements as conditions of development approval in TDC 73.055(2)(e) and TDC 36.160(8), proposed multi-family residential, commercial, or institutional uses that are adjacent to a major transit stop will be required to comply with the City's Mid-Block Crossing Policy. ***This is not applicable to this site, as the improvement are tied to an industrial use and there are not transit stops along Leveton Drive.***

Section 74.425 Street Design Standards.

(1) Street design standards are based on the functional and operational characteristics of streets such as travel volume, capacity, operating speed, and safety. They are necessary to ensure that the system of streets, as it develops, will be capable of safely and efficiently serving the traveling public while also accommodating the orderly development of adjacent lands. ***It is noted.***

(2) The proposed street design standards are shown in Figures 72A through 72G. The typical roadway cross sections comprise the following elements: right-of-way, number of travel lanes, bicycle and pedestrian facilities, and other amenities such as landscape strips. These figures are intended for planning purposes for new road construction, as well as for those locations where it is physically and economically feasible to improve existing streets. ***What exists matches the standard for a Connector street per Tualatin's standard.***

(3) In accordance with the Tualatin Basin Program for fish and wildlife habitat it is the intent of Figures 74-2A through 74-2G to allow for modifications to the standards when deemed appropriate by the City Engineer to address fish and wildlife habitat. ***This is not applicable to this site.***

(4) All streets shall be designed and constructed according to the preferred standard. The City Engineer may reduce the requirements of the preferred standard based on specific site conditions, but in no event will the requirement be less than the minimum standard. The City Engineer shall take into consideration the following factors when deciding whether the site conditions warrant a reduction of the preferred standard:

(c) Local Streets:

(i) Local streets proposed within areas which have environmental constraints and/or sensitive areas and will not have direct residential access may utilize the minimum design standard. When the minimum design standard is allowed, the City Engineer may determine that no parking signs are required on one or both sides of the street. ***The local street was developed in accordance with the requirements at the time the industrial subdivision "Leveton Commons No. 2" was constructed.***

Section 74.430 Streets, Modifications of Requirements in Cases of Unusual Conditions.

(1) When, in the opinion of the City Engineer, the construction of street improvements in accordance with TDC 74.420 would result in the creation of a hazard, or would be impractical, or would be detrimental to the City, the City Engineer may modify the scope of the required improvement to eliminate such hazardous, impractical, or detrimental results. Examples of conditions requiring modifications to improvement requirements include but are not limited to horizontal alignment, vertical alignment, significant stands of trees, fish and wildlife habitat areas, the amount of traffic generated by the proposed development, timing of the development or other conditions creating hazards for pedestrian, bicycle or motor vehicle traffic. The City Engineer may determine that, although an improvement may be impractical at the time of development, it will be necessary at some future date. In such cases, a written agreement guaranteeing future performance by the applicant in installing the required improvements must be signed by the applicant and approved by the City. ***No modification is requested.***

(2) When the City Engineer determines that modification of the street improvement requirements in TDC 74.420 is warranted pursuant to subsection (1) of this section, the City Engineer shall prepare written findings of modification. The City Engineer shall forward a copy of said findings and description of modification to the applicant, or his authorized agent, as part of the Utility Facilities Review for the proposed development, as provided by TDC 31.072. The decision of the City Engineer may be

appealed to the City Council in accordance with TDC 31.076 and 31.077. ***It is noted.***

(3) To accommodate bicyclists on streets prior to those streets being upgraded to the full standards, an interim standard may be implemented by the City. These interim standards include reduction in motor vehicle lane width to 10 feet [the minimum specified in AASHTO's A Policy on Geo-metric Design of Highways and Streets (1990)], a reduction of bike lane width to 4-feet (as measured from the longitudinal gutter joint to the centerline of the bike lane stripe), and a paint-striped separation 2 to 4 feet wide in lieu of a center turn lane. Where available roadway width does not provide for these minimums, the roadway can be signed for shared use by bicycle and motor vehicle travel. When width constraints occur at an intersection, bike lanes should terminate 50 feet from the intersection with appropriate signing. ***Street upgrades are not expected to be required.***

Section 74.440 Streets, Traffic Study Required.

(1) The City Engineer may require a traffic study to be provided by the applicant and furnished to the City as part of the development approval process as provided by this Code, when the City Engineer determines that such a study is necessary in connection with a proposed development project in order to: ***A traffic analysis was requested by the City Engineering staff and submitted with the application.***

(4) The applicant shall implement all or a portion of the improvements called for in the traffic study as determined by the City Engineer. ***No improvements were called for in the traffic analysis.***

Section 74.450 Bikeways and Pedestrian Paths.

(1) Where proposed development abuts or contains an existing or proposed bikeway, pedestrian path, or multi-use path, as set forth in TDC Chapter 11, Transportation Figure 11-4, the City may require that a bikeway, pedestrian path, or multi-use path be constructed, and an easement or dedication provided to the City. ***This is not applicable to this site.***

Section 74.470 Street Lights.

(1) Street light poles and luminaries shall be installed in accordance with the public Works Construction Code. ***Not applicable, street lights already installed on Leveton Drive and 126th Place.***

(2) The applicant shall submit a street lighting plan for all interior and exterior streets on the proposed development site prior to issuance of a Public Works Permit. ***It is noted.***

Section 74.485 Street Trees.

(1) Prior to approval of a residential subdivision or partition final plat, the applicant shall pay the City a non-refundable fee equal to the cost of the purchase and installation of street trees. The location, placement, and cost of the trees shall be determined by the City. This sum shall be calculated on the interior and exterior streets as indicated on the final subdivision or partition plat. ***This is not applicable to this site as it is not a partition or subdivision.***

(2) In nonresidential subdivisions and partitions street trees shall be planted by the owners of the individual lots as development occurs. ***There are existing street trees along this site's frontage.***

(3) The Street Tree Ordinance specifies the species of tree which is to be planted and the spacing between trees. ***It is noted.***

UTILITIES

Section 74.610 Water Service.

(1) Water lines shall be installed to serve each property in accordance with the Public Works Construction Code. Water line construction plans shall be submitted to the City Engineer for review and approval prior to construction. ***Water service was stubbed into the property, during the subdivision development, for use by the proposed development.***

(2) If there are undeveloped properties adjacent to the subject site, public water lines shall be extended by the applicant to the common boundary line of these properties. The lines shall be sized to provide service to future development, in accordance with the City's Water System Master Plan,TDC Chapter 12. ***This is not applicable to the site.***

(3) As set forth is TDC Chapter 12, Water Service, the City has three water service levels. All development applicants shall be required to connect the proposed development site to the service level in which the development site is located. If the development site is located on a boundary line between two service levels the applicant shall be required to connect to the service level with the higher reservoir elevation. The applicant may also be required to install or provide pressure reducing valves to supply appropriate water pressure to the properties in the proposed development site. ***This is not applicable to this site.***

Section 74.620 Sanitary Sewer Service.

(1) Sanitary sewer lines shall be installed to serve each property in accordance with the Public Works Construction Code. Sanitary sewer construction plans and

calculations shall be submitted to the City Engineer for review and approval prior to construction. ***A sanitary sewer service lateral has been stubbed into the property as a part of the subdivision development.***

Section 74.630 Storm Drainage System.

(1) Storm drainage lines shall be installed to serve each property in accordance with City standards. Storm drainage construction plans and calculations shall be submitted to the City Engineer for review and approval prior to construction. ***A storm drain line has been stubbed to the southwest corner of the site to serve as a storm drain lateral for the site. Storm drainage construction plans and calculations will be submitted to the City Engineer for review and approval as a part of the construction permitting.***

(2) The storm drainage calculations shall confirm that adequate capacity exists to serve the site. The discharge from the development shall be analyzed in accordance with the City's Storm and Surface Water Regulations. ***On-site stormwater detention will be provided, as development of the industrial subdivision that is parcel was created from, should have studied downstream facilities and upsized such if such was required.***

(3) If there are undeveloped properties adjacent to the proposed development site which can be served by the storm drainage system on the proposed development site, the applicant shall extend storm drainage lines to the common boundary line with these properties. The lines shall be sized to convey expected flows to include all future development from all up stream areas that will drain through the lines on the site, in accordance with the Tualatin Drainage Plan in TDC Chapter 14. ***This is not applicable to this site.***

Section 74.640 Grading.

(1) Development sites shall be graded to minimize the impact of storm water runoff onto adjacent properties and to allow adjacent properties to drain as they did before the new development. ***All improvement areas within the site will be graded so as the runoff is collected by the on-site drainage facilities. Only some landscape areas along boundary of the site may drain off-site, but overall the total overland flow across the parcel's boundaries will be greatly reduced.***

(2) A development applicant shall submit a grading plan showing that all lots in all portions of the development will be served by gravity drainage from the building crawl spaces; and that this development will not affect the drainage on adjacent properties. The City Engineer may require the applicant to remove all excess material from the development site. ***All drainage will be via gravity drainage, no building crawl spaces will be created.***

Section 74.650 Water Quality, Storm Water Detention and Erosion Control.
The applicant shall comply with the water quality, storm water detention and erosion control requirements in the Surface Water Management Ordinance. If required:

(1) On subdivision and partition development applications, prior to approval of the final plat, the applicant shall arrange to construct a permanent on-site water quality facility and storm water detention facility and submit a design and calculations indicating that the requirements of the Surface Water Management Ordinance will be satisfied and obtain a Stormwater Connection Permit from Clean Water Services; or ***This is not a subdivision or a partition, so this section is not applicable.***

(2) On all other development applications, prior to issuance of any building permit, the applicant shall arrange to construct a permanent on-site water quality facility and storm water detention facility and submit a design and calculations indicating that the requirements of the Surface Water Management Ordinance will be met and obtain a Stormwater Connection Permit from Clean Water Services. ***Storm drainage design and calculations will be submitted.***

(3) For on-site private and regional non-residential public facilities, the applicant shall submit a stormwater facility agreement, which will include an operation and maintenance plan provided by the City, for the water quality facility for the City's review and approval. The applicant shall submit an erosion control plan prior to issuance of a Public Works Permit. No construction or disturbing of the site shall occur until the erosion control plan is approved by the City and the required measures are in place and approved by the City. ***This is noted.***

Section 74.660 Underground.

(1) All utility lines including, but not limited to, those required for gas, electric, communication, lighting and cable television services and related facilities shall be placed underground. Surface-mounted transformers, surface-mounted connection boxes and meter cabinets may be placed above ground. Temporary utility service facilities, high capacity electric and communication feeder lines, and utility transmission lines operating at 50,000 volts or above may be placed above ground. The applicant shall make all necessary arrangements with all utility companies to provide the underground services. The City reserves the right to approve the location of all surface-mounted transformers**.** ***Utility lines will be placed underground within the site. There will be some surface mounted connection boxes, transformers and meter boxes.***

(2) Any existing overhead utilities may not be upgraded to serve any proposed development. If existing overhead utilities are not adequate to serve the proposed development, the applicant shall, at their own expense, provide an underground

system. The applicant shall be responsible for obtaining any off-site deeds and/or easements necessary to provide utility service to this site; the deeds and/or easements shall be submitted to the City Engineer for acceptance by the City prior to issuance of the Public Works Permit. ***No overhead utility lines currently exist within the boundaries of the site and none will be required.***

Section 74.670 Existing Structure.

(1) Any existing structures requested to be retained by the applicant on a proposed development site shall be connected to all available City utilities at the expense of the applicant. ***This is noted.***

(2) The applicant shall convert any existing overhead utilities serving existing structures to underground utilities, at the expense of the applicant. ***This is noted. Existing utilities are underground.***

(3) The applicant shall be responsible for continuing all required street improvements adjacent to the existing structure, within the boundaries of the proposed development site. ***No new street improvements are required.***

Section 74.700 Removal, Destruction or Injury of Trees.

It is unlawful for a person, without a written permit from the Operation Director, to remove, destroy, break or injure a tree, plant or shrub, that is planted or growing in or upon a public right-of-way within the City, or cause, authorize or procure a person to do so, authorize or procure a person to injure, misuse or remove a device set for the protection of an tree, in or upon a public right-of-way. ***This is noted.***

Section 74.706 Street Tree Fees.

A person who applies to remove a street tree under TDC 74.705 shall pay all costs incurred by the City as reflected in the applicable fees listed in the city of Tualatin Fee Schedule. City actions and associated fees include but are not limited to inspection of a street tree requested from removal, removal of a street tree, removal of a stump, planting of a street tree, and inspections(s) to determine if the applicant has fulfilled permit requirements. ***This is noted.***

Section 74.720 Protection of Tree During Construction.

(1) During the erection, repair, alteration or removal of a building or structure, it is unlawful for the person in charge of such erection, repair, or alteration or to leave a tree in or upon a public right-of-way in the vicinity of the building or structure without a good and sufficient guard or protectors to prevent injury to the tree arising out of or by reason of such erection, repair, alteration or removal. ***Tree protection will be provided as necessary***

(2) Excavations and driveways shall not be placed within six feet of a tree in or upon a public right-of-way without written permission from the City Engineer. During excavation or construction, the person shall guard the tree within six feet and all building material or other debris shall be kept at least four feet from any tree. ***This is noted. Proposed driveway may be within 6 feet of an existing street tree.***

Section 74.765 Street Tree Species and Planting Locations.
All trees, plants or shrubs planted in the right-of-way of the City shall conform in species and location and in accordance with the street tree plan in Schedule A. If the Operations Director determines that none of the species in Schedule A is appropriate or finds appropriate a species not listed, the Director may substitute an unlisted species. ***This is noted.***

Chapter 75

Section 75.030 Freeways and Arterials Defined.
This section shall apply to all City, County and State public streets, roads and highways within the City and to all properties that abut these streets, roads and highways.

(1) Access shall be in conformance with TDC Chapter 73 unless otherwise noted below. ***Noted.***

(2) Freeways and Arterials Designated.
For the purposes of this chapter the following are freeways and arterials:

(n) Leveton Drive from 108th Avenue to 124th Avenue; ***This site lies on Leveton Drive west of SW 124th and thus its frontage is <u>not</u> an arterial street.***

(3) Applicability

(a) This chapter applies to all developments, permit approvals, land use approvals, partitions, subdivisions, or any other actions taken by the City Council or any administrative officer of the City pertaining to property abutting any road or street listed in TDC 75.030. In addition, any parcel not abutted by a road or street listed in TDC 75.030, but having access to an arterial by any easement or prescriptive right, shall be treated as if it did abut the arterial and this chapter applies. This chapter shall take precedence over any other TDC chapter and over any other ordinance of the City when considering any development, land use approval or other proposal for property abutting an arterial or any property having an access right to an arterial. ***This is not applicable.***

Section 75.060 Existing Driveways and Street Intersections.

(1) Existing driveways with access onto arterials on the date this chapter was originally adopted shall be allowed to remain. If additional development occurs on properties with existing driveways with access onto arterials then this chapter applies and the entire site shall be made to conform with the requirements of this chapter. ***This is not applicable to this site.***

(2) The City Engineer may restrict existing driveways and street intersections to right-in and right-out by construction of raised median barriers or other means. ***Such is noted.***

Section 75.070 New Intersections.
Except as shown in <u>TDC Chapter 11</u>, Transportation, (<u>Figures 11-1</u> and <u>11-3</u>), all new intersections with arterials shall have a minimum spacing of ½ mile between intersections. ***This is not applicable to this site.***

Section 75.080 Alternate Access.
Except as provided in 75.090 all properties which abut two roadways shall have access on the lowest classification road-way, preferable on a local street. ***This project has an existing driveway access to 126th. Project is proposing for a second driveway with access to Levton Drive. Both streets are classified as local commercial industrial.***

Section 75.090 Interim Access.
When a property abuts a freeway or arterial and a future street shown in TDC Chapter 11, Transportation, (Figures 11-1 and 11-3), or abuts or bisects the property, the City Engineer may approve an interim access on the arterial subject to the following conditions: ***This is not applicable to this site.***

Section 75.100 Exceptions.
If the City Engineer finds that it is physically impossible for a property to receive access from any other street or road than an arterial as defined in TDC 75.030 and that the property cannot physically be served by any new street as shown in TDC Chapter 11, Transportation, (Figures 11-1 and 11-3), or any logical extension of or addition thereto, the City Engineer may grant a permanent access directly to an arterial. In doing so the City Engineer may impose conditions on the construction of said access including, but not limited to: ***This is not applicable to this site.***

Section 75.120 Existing Streets.
The following list describes in detail the freeways and arterials as defined in TDC 75.030 with respect to access. Recommendations are made for future changes in accesses and location of future accesses. These recommendations are examples of possible solutions and shall not be construed as limiting the City' s authority to change or impose different conditions if additional studies result in different recommendations from those listed below.

(15) LEVETON DRIVE

(a) 108th Avenue to 118th Avenue:
On the north side of Leveton Drive, JAE (2S122B 200) shall align a driveway across from 118th Avenue and be permitted a second driveway approximately 50 feet from their east property line. Novellus (2S122AA 500 and 2S122AB 100) shall be permitted three driveways located approximately 25 feet and 950 feet from the west property line for Tax Lot 100 and 600 feet west of 108th Avenue for Tax Lot 500.

On the south side, Phight Inc. (2S122 300) shall be allowed a driveway aligned with the west Novellus (2S122AB 100) driveway and a driveway adjacent to their east property line. Fujimi (2S122 400) shall be allowed a driveway adjacent to their west property line and east property line. Tofle (2S122AD 400) shall be allowed a driveway aligning across from the Novellus (2S122AA 500) driveway and a second driveway approximately 260 feet west of 108th Avenue.

(b) 118th Avenue to 124th Avenue:
The existing driveways will be allowed to remain. No new driveways will be permitted.

The site lies outside these portions of Leveton Drive and thus this code section is not applicable.

Section 75.130 Joint Accesses Required.
When the City Engineer determines that joint accesses are required by properties undergoing development or redevelopment, an overall access plan shall be prescribed by the City Engineer and all properties shall adhere to this. Interim accesses may be allowed in accordance with TDC 75.090 of this chapter to provide for the eventual implementation of the overall access plan. ***A joint access is not proposed for this development***

Section 75.140 Collector Streets.

(a) Major Collectors. Direct access from newly constructed single-family homes, duplexes or triplexes shall not be permitted. As major collectors in residential areas are fully improved, or adjacent land redevelops, direct access should be relocated to the nearest local street where feasible. ***This is not applicable as the proposed development is industrial, residential.***

(b) Minor Collectors. Residential, commercial and industrial driveways where the frontage is greater or equal to 70 feet are permitted. Minimum spacing at 100 feet. Uses with less than 50 feet of frontage shall use a common (joint) access where available. ***The portion of Leveton Drive along the site's frontage is classified as local commercial industrial street and thus this is code section is not applicable.***

(c) If access is not able to be relocated to the nearest local street, the City Engineer may allow interim access in accordance with 75.090 of this chapter to provide for the eventual implementation of the overall access plan. ***This is not applicable.***

PROPOSED PROJECT SCOPE AND CODE SUMMARY

LOT 10, TAX MAP NO. 2S 1 21A, TAX LOT NO. 4200

Total Site Area: 84,070.8 sf
Proposal to build a 20,040 footprint (21,720 net) sf concrete tilt up addition to the existing 11,200 sf building and to add a sprinkler system to the new and existing buildings.
City of Tualatin Zoning: ML Light Manufacturing
Occupancy Groups: B (Offices), F1 (Auto), F2 (Metal Products), S-1 (Roofing Materials and tools).
Construction Type (current building): III B Concrete tilt up exterior walls, wood frame interior wall, upper floor, roof framing.

Allowable Building Areas (**III B)** by Table 503 :
B: 19,000 sf, 3 story
F-1: 12,000 sf, 2 story
F-2: 18,000 sf, 3 story
S-1: 17,500 sf, 2 story

Allowable Building Area w/ Area Modifications:
Frontage Increase calculation
If = (F/P - 0.25) (W/30)
If = (460/840 -.25) (30/30)
If = (.55 - .25) (1) = .30 OR 30% increase allowed

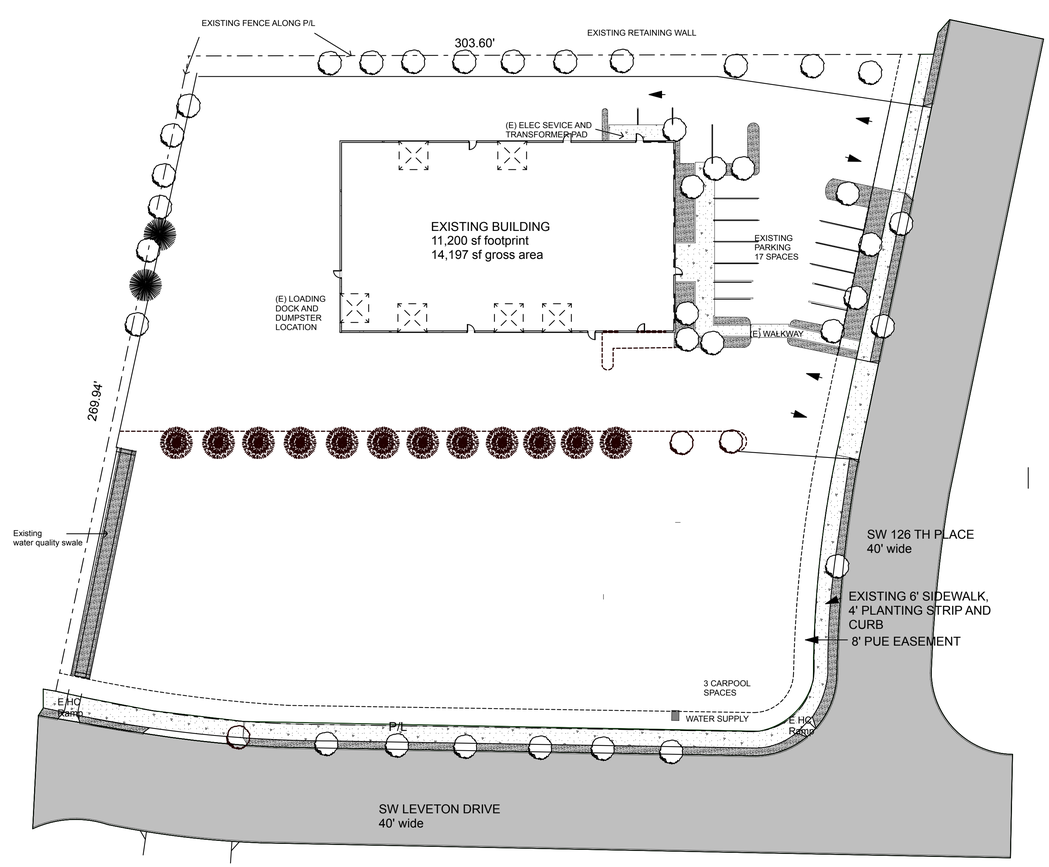
IIIB Construction Type
12000 sf (using most restrictive) x .30 = 3600 sf
12000 + 3600 = 15600 sf allowed per story
Sprinkler increase = 31200 sf total allowed > 31240 sf proposed (actual F-1 space is considerably lower than allowable)

Building Height Allowed Max: 50', proposed 30'

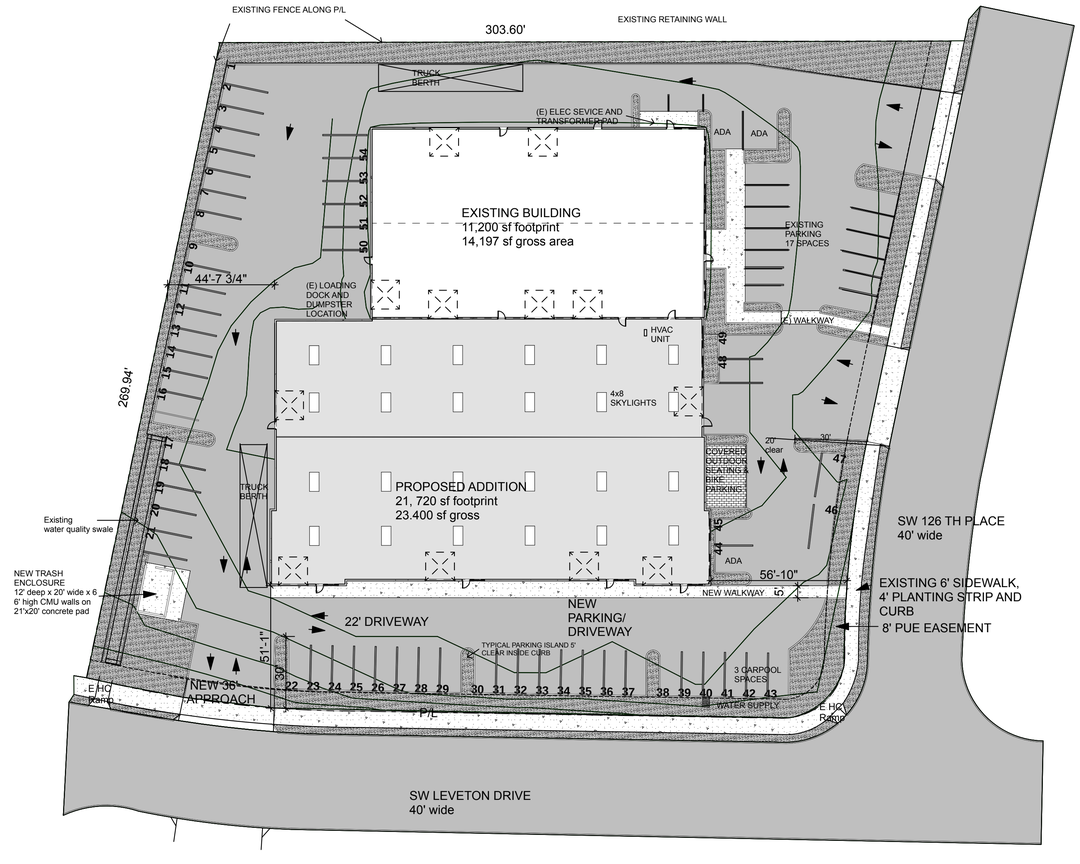
PARKING
Most restrictive required: 71 based on: Office 6480 sf @2.7/1000 (17.5), Warehouse 8800 sf @ .3/1000 (3), Manuf. 7000 @1.6/1000 (11), 12900 @3/1000 (39)
Existing spaces: 22 (17 net with revisions)
New spaces: 54 (71 total net) carpool 1/25 spaces req'd - 3 provided
HC spaces: 3
Loading Berths: 2
Bicycle Parking: Spaces required: .10 / 1000 gross SF = 4 req'd.
Spaces provided: 4

LANDSCAPE
Total Landscape required: 15% of site area 84070.8 sf x .15 = 12510 sf
Total area proposed: 12535 sf based upon: 7570 perimeter area, 4965 Parking lot landscape + approx 2500 sf amenities (not included in calculation)
Parking island area req'd: 25 sf/ parking stall = 1775 sf reqd, 1800+ sf provided
Paving area:
Tree count required: 1 deciduous shade tree per 4 stalls (18 req'd)
Tree count proposed: 18 New, plus approx 27 existing

SOLID WASTE: Min 10 sf plus 4 sf/1000 GLA Offices (26 sf), 6 sf/1000 GLA Wholesale, Whse, Manuf. (164 sf) = 190 sf req'd, New provided: 240 sf plus existing area



2 EXISTING SITE / LANDSCAPE PLAN
SCALE: 1" = 30'



1 REVISED SITE PLAN
SCALE: 1" = 30'

Chesshir Architecture pc

2337 NW York St. #208
Portland OR 97210
503 228 3273

Columbia Roofing
Building Addition
18525 SW 126th Place
Tualatin OR 97062

MARK	DATE	DESCRIPTION

PROJECT NO:
MODEL FILE:
Columbia Roofing Addition AR model updated.pln
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SHEET TITLE

SITE PLAN

ARCHITECTURAL
REVIEW SUBMITTAL
10/4/18

A1

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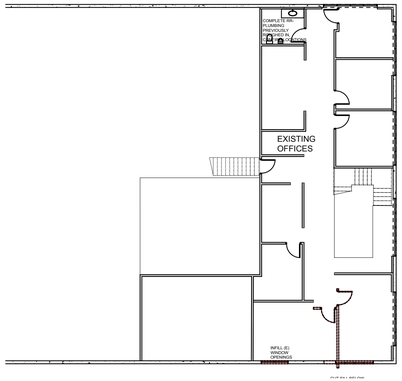
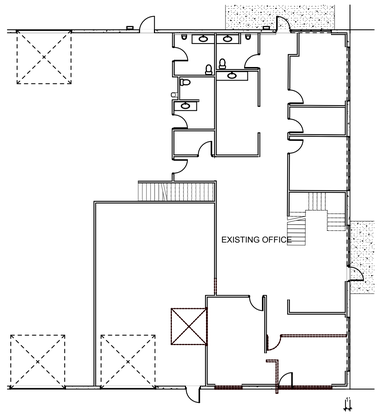


6 2nd FLOOR OFFICE DEMO
SCALE: 1/16" = 1'-0"



5 1st FLOOR OFFICE DEMO
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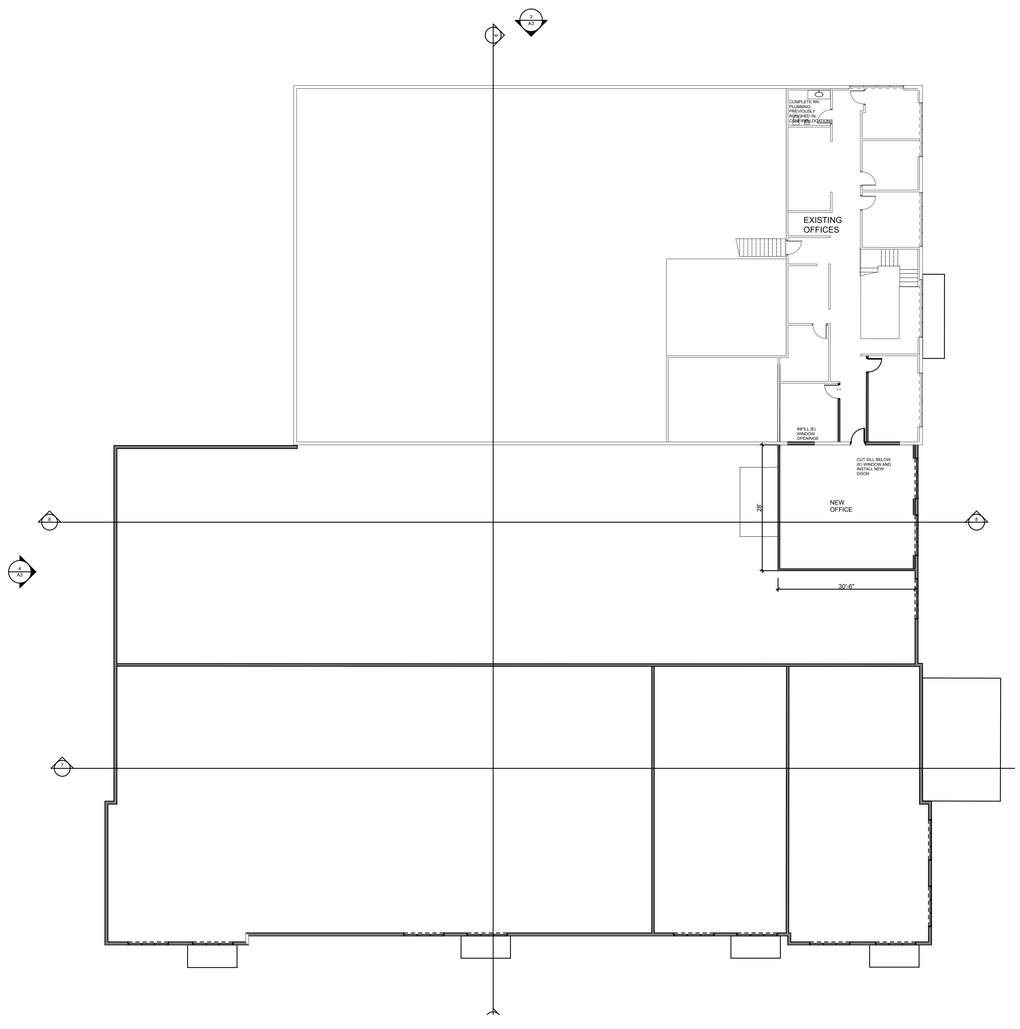
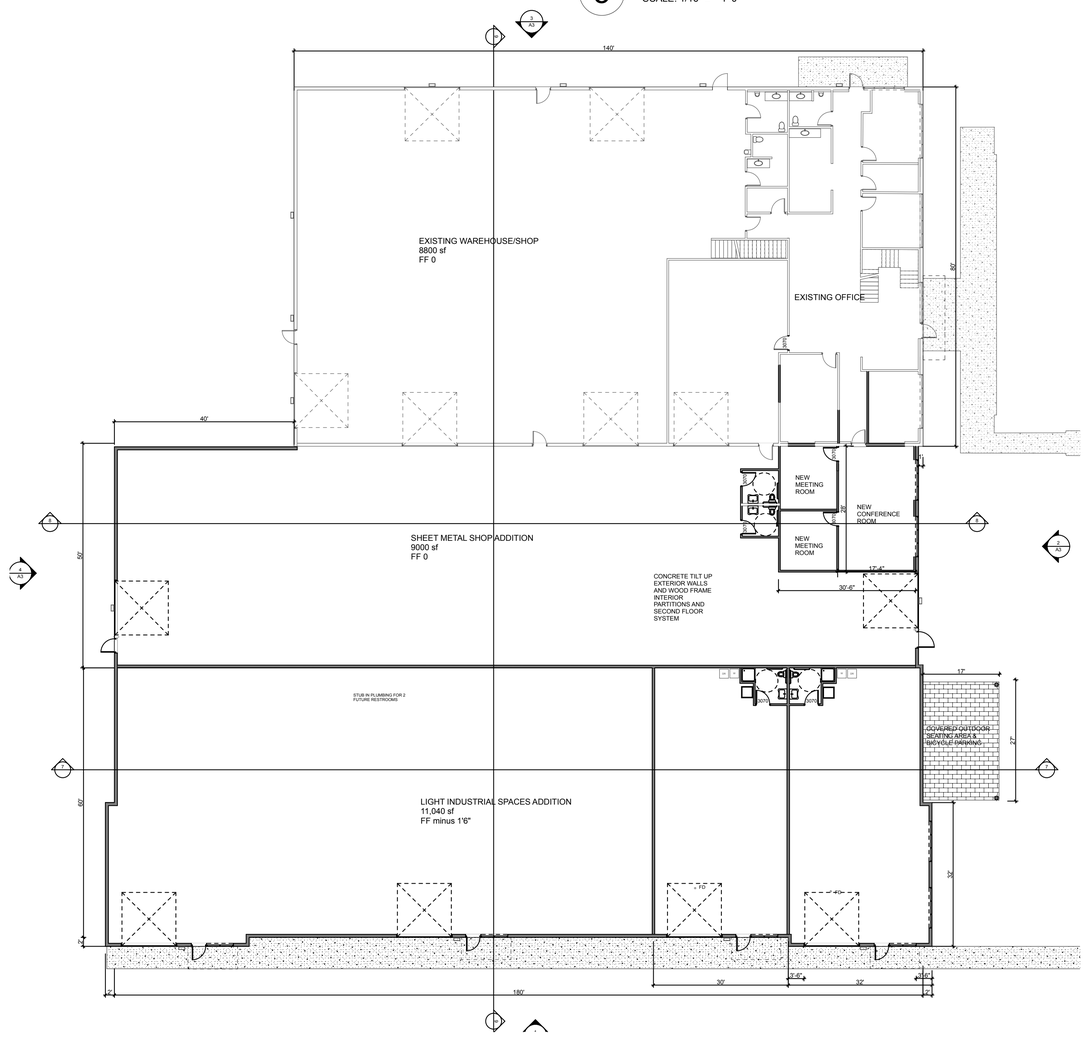


4 2nd FLOOR
SCALE: 1/16" = 1'-0"



3 1st FLOOR (2)
SCALE: 1/16" = 1'-0"

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Portland OR 97210
503 228 3273

Columbia Roofing
Building Addition
18525 SW 126th Place
Tualatin OR 97062

MARK	DATE	DESCRIPTION

PROJECT NO:
MODEL FILE:
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SHEET TITLE

FLOOR PLANS

ARCHITECTURAL
REVIEW SUBMITTAL
10/4/18

A-2

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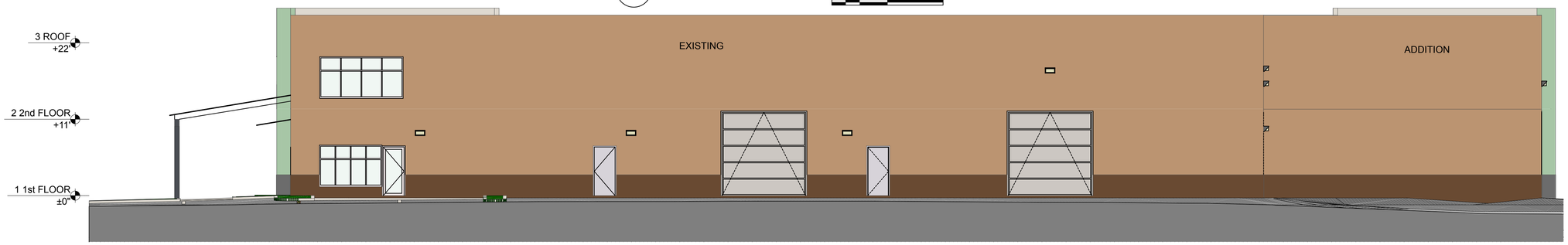
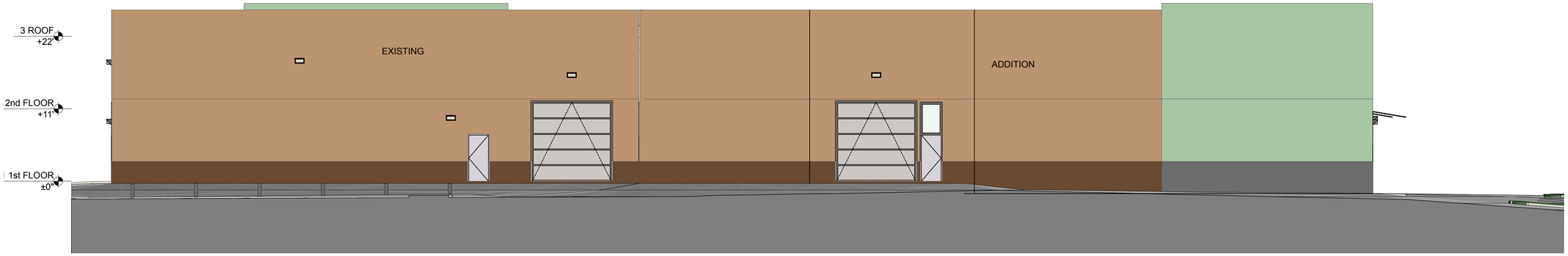
2 EAST ELEVATION
SCALE: 1/8" = 1'-0"



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



4 WEST ELEVATION
SCALE: 1/8" = 1'-0"

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

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2337 NW York St. #208
Portland OR 97210
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Columbia Roofing
Building Addition
18525 SW 126th Place
Tualatin OR 97062

MARK	DATE	DESCRIPTION

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SHEET TITLE

ELEVATIONS

Architectural Review
Submittal
10/4/18

A3

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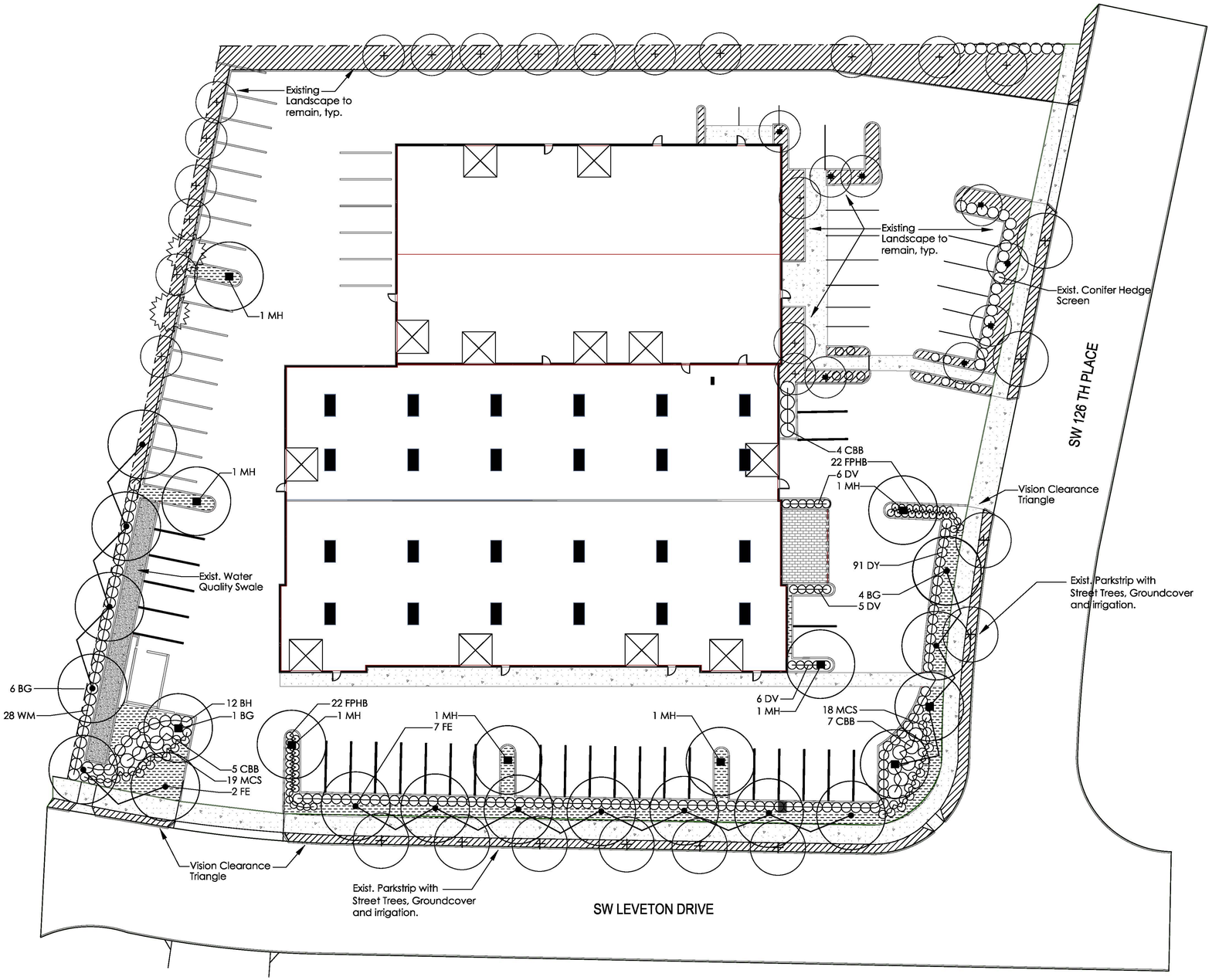

LANDSCAPE LEGEND

SYMBOL	COMMON NAME / BOTANICAL NAME	SIZE/COND.	SPACING
TREES			
BG	Black Gum Nyssa sylvatica	2" Cal.	30' o.c.
FE	Frontier Elm Ulmus 'Frontier'	2" Cal.	30' o.c.
MH	Magnifica Hackberry Celtis 'Magnifica'	2" Cal.	as shown
SHRUBS			
BH	Blue Girl Holly Ilex meserveae 'Blue Girl'	24"-30"	4' o.c.
CBB	Cherry Bomb Barberry Berberis thunbergii 'Monomb'	5 Gal.	5' o.c.
DV	David Viburnum Viburnum davidii	3 Gal.	3' o.c.
DY	Dense Yew Taxus densiformis	24"-30"	3.5' o.c.
FPHB	Firepower Heavenly Bamboo Nandina domestica 'Firepower'	3 Gal.	2.5' o.c.
MCS	Magic Carpet Spirea Spirea bumalda 'Magic Carpet'	3 Gal.	3' o.c.
WM	Wax Myrtle Myrica californica	24"-30"	4' o.c.
GROUNDCOVER			
	Kinnikinnick Arctostylos uva-ursi 'Emerald Carpet'	1 Gal.	24" o.c.

LANDSCAPE SYMBOLS LEGEND

- Existing Deciduous Tree to Remain
To be protected during construction
- Existing Conifer Tree to Remain
To be protected during construction
- Existing Shrubs to Remain
To be protected during construction
- Parking Lot Tree (NEW)
71 stalls divided by 4 = 18 trees required
18 trees provided
- Parking Lot Tree (EXISTING)
- Perimeter Parking Lot Buffer Tree
1 tree per 30 l.f.
- Existing Landscape To Remain

NOTES

1. Installation must fully comply with all landscape code requirements and any City of Tualatin conditions of approval.
2. Irrigation to be provided by a fully automatic underground irrigation system, plans to be submitted at Building Permit.
3. Existing on site topsoil will be reused for landscape. Soil will be tested by a soils laboratory and amended as per their recommendations to produce topsoil for healthy viable plant growth. 18" of topsoil will be placed over a crossripped/rototilled subgrade.
4. All landscape plantings are guaranteed for one year. All landscape plantings will be maintained by a professional landscape maintenance company for a viable healthy landscape. Plantings will be monitored on a weekly basis during the growing season.

1 LANDSCAPE PLAN
SCALE: 1" = 20'

NORTH

REGISTERED 74 CHRISTOPHER J. FRESHLEY OREGON LANDSCAPE ARCHITECT

Chesshir Architecture pc
2337 NW York St. #208
Portland OR 97210
503 228 3273

Columbia Roofing Building Addition
18525 SW 126th Place
Tualatin OR 97062

PROJECT NO:
MODEL FILE: Columbia Roofing Addition AR model updated.pln
DRAWN BY CF
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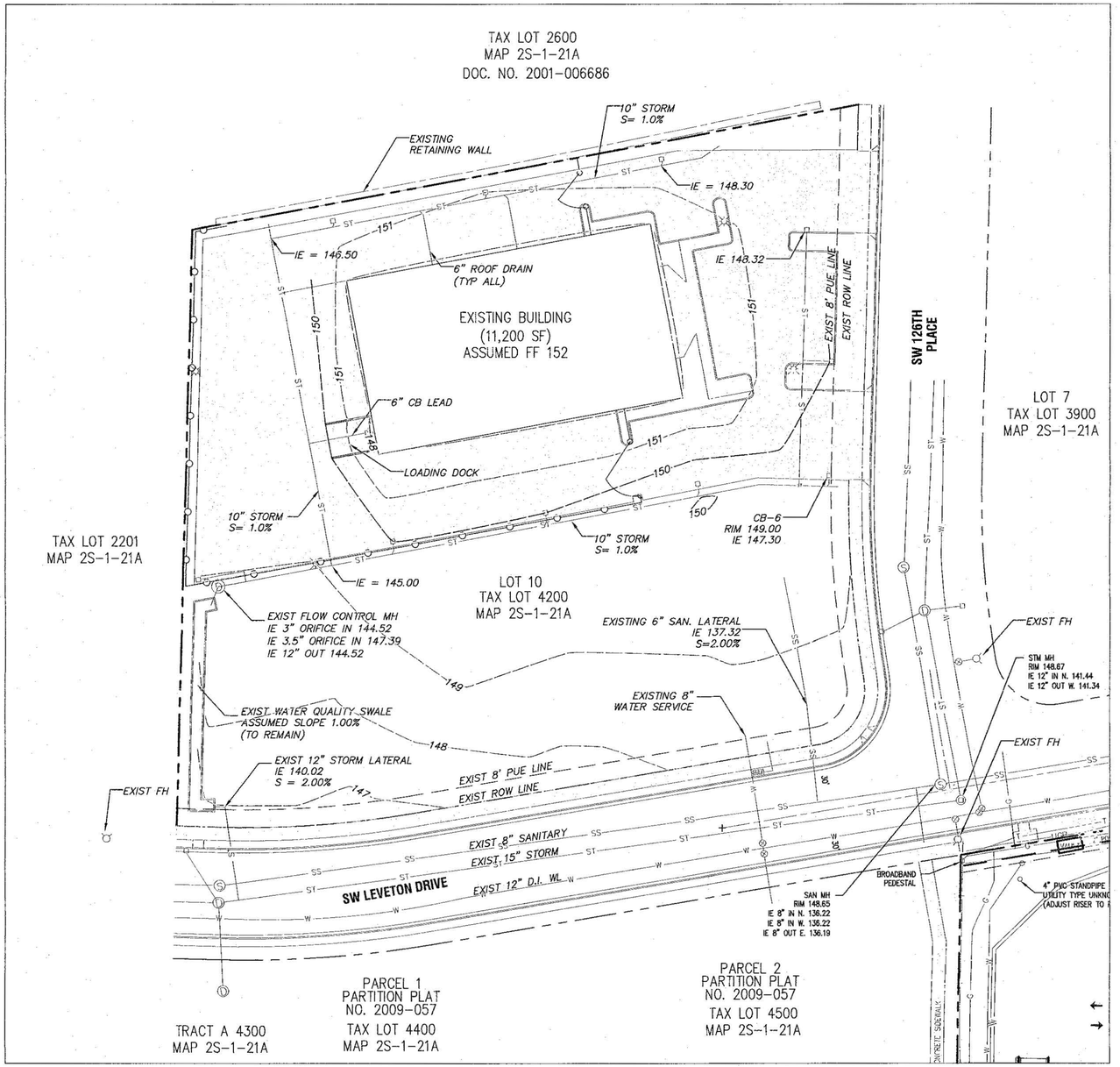
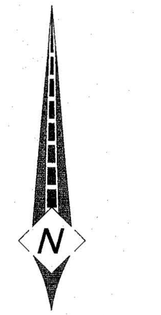
SHEET TITLE
Oct. 4, 2018
LANDSCAPE PLAN

SHEET 1 OF 1
L1

CHRISTOPHER FRESHLEY
LANDSCAPE ARCHITECT
3944 S.W. 58TH PLACE • PORTLAND, OREGON 97221 • 503/292-9681
(E-MAIL): CHRIS@FRESHLEYLANDSCAPEARCHITECT.COM

/Users/stanchesshir/Dropbox/current projects/mark carpenter/columbia DD phase/Columbia Roofing Addition AR model updated.pln





GRAPHIC SCALE

30 0 15 30 60

(IN FEET)
1 INCH = 30 FT.

Legend:

G — GAS LINE	FIRE HYDRANT
SS — SANITARY SEWER LINE	LIGHT POLE
ST — STORM SEWER LINE	WATER METER
UGP — UNDERGROUND POWER LINE	WATER VALVE
T — UNDERGROUND PHONE LINE	
TV — UNDERGROUND CABLE TV LINE	
W — WATER LINE	

Notes:

1. UTILITY AND SITE INFORMATION SHOWN ON THIS MAP IS BASED UPON INFORMATION DERIVED FROM LEVETON COMMONS PHASE 2 RECORD DRAWINGS, DOCUMENTS PROVIDED BY COLUMBIA ROOFING, AND FIELD VERIFICATION FROM TS GRAY. NO WARRANTIES ARE MADE WITH REGARDS TO THE ACCURACY OR COMPLETENESS OF THE INFORMATION SHOWN. ADDITIONAL UTILITIES MAY EXIST. INTERESTED PARTIES ARE HEREBY ADVISED THAT ALL UTILITY LOCATIONS SHOULD BE VERIFIED PRIOR TO DESIGN OR CONSTRUCTION OF ANY CRITICAL ITEMS. CONTACT UTILITY OWNERS AND LOCATORS REGARDING PUBLIC UTILITY LINES ON THIS PROJECT:
PGE (503-255-4634)
COMCAST CABLE (801-364-1063)
FRONTIER COMMUNICATIONS (800-778-9140)
NW NATURAL GAS (503-220-2415)
CITY OF TUALATIN (503-691-3091)
WASHINGTON COUNTY LUT (503-846-7950)

2. VERTICAL DATUM: ASSUMED FF OF EXISTING BUILDING 152

3. ASSUMED CONTOUR INTERVALS: ARE SHOWN AT 1' INTERVALS

REGISTERED PROFESSIONAL ENGINEER
72761PE
OREGON
JUNE 2, 2010
JAMES M. FOX

EXPIRES: 12/31/2019
6/06/18

REVISIONS	BY

Columbia Roofing Bldg. Addition

Columbia Roofing

Existing Conditions Plan

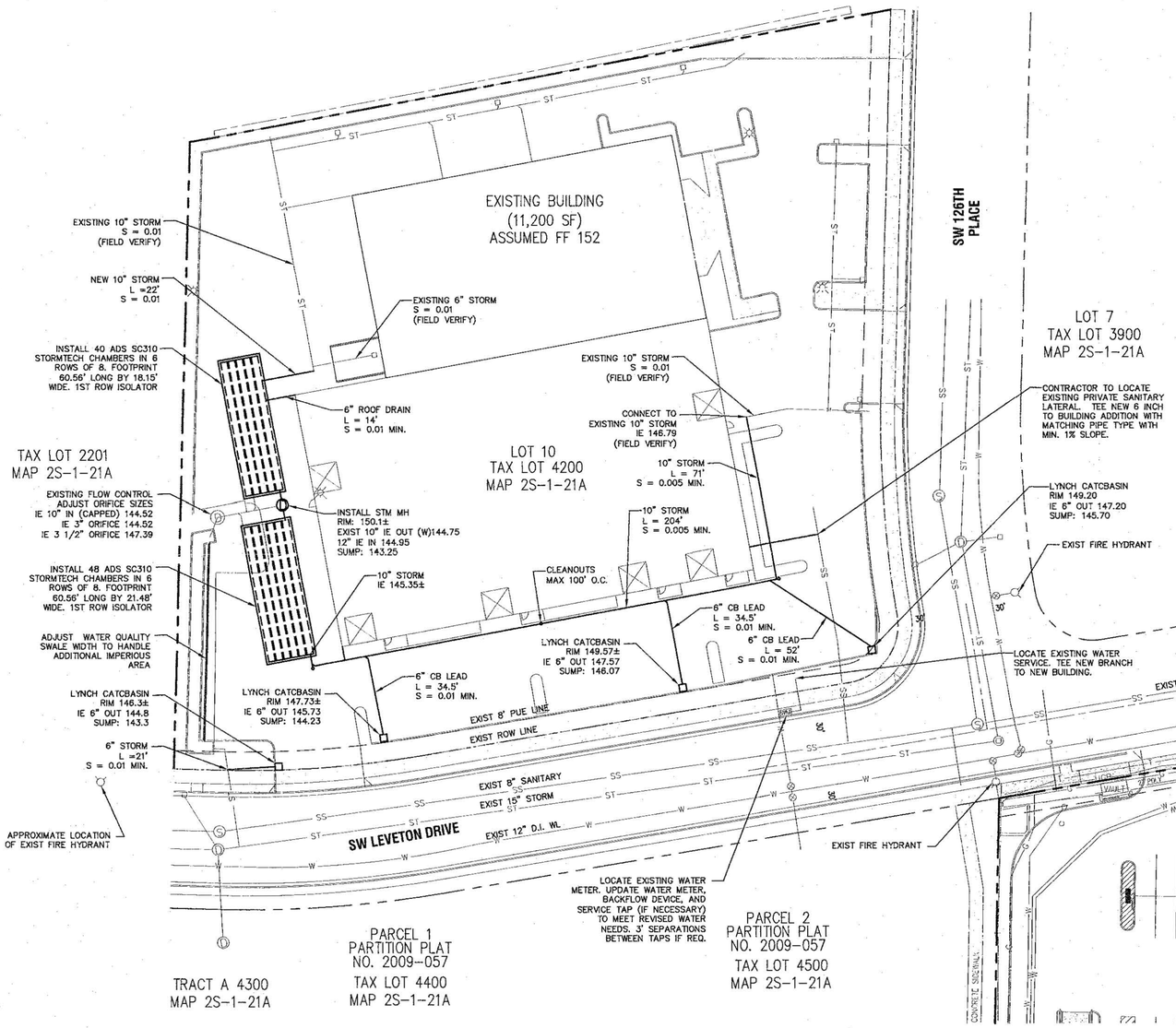
SISUL ENGINEERING
375 PORTLAND AVENUE
GLADSTONE, OREGON 97027
(503) 657-0188

DRAWING SISUL 18-046-existing condition.DWG

DATE	JUNE 2018
SCALE	AS NOTED
DRAWN	JMF
JOB	18-046
SHEET	C1
OF	3 SHEETS

ATTENTION: OREGON LAW REQUIRES YOU TO FOLLOW THE RULES ADOPTED BY THE OREGON UTILITY NOTIFICATION CENTER. THOSE RULES ARE SET FORTH IN OAR-952-001-0010 THROUGH OAR-952-001-0090. YOU MAY OBTAIN COPIES OF THE RULES BY CALLING THE CENTER. (NOTE: THE NUMBER FOR THE OREGON UTILITY NOTIFICATION CENTER IS (503) 232-1987).

NOTE: THE EXISTING UNDERGROUND UTILITIES SHOWN ON THESE PLANS ARE FROM UTILITY LOCATE PAINT MARKS AND AS BUILT PLANS. ACTUAL LOCATION AND DEPTH SHALL BE FIELD VERIFIED PRIOR TO CONSTRUCTION AND CONNECTION TO THE EXISTING UTILITIES. CONTACT CIVIL ENGINEER IF PLAN MODIFICATION ARE REQUIRED.



PUBLIC WATERLINE NOTES:

1. ALL 2" DOMESTIC WATER SERVICE LINES MUST BE TYPE "K" RIGID COPPER.
2. ALL DOMESTIC OR FIRE SUPPLY SERVICE LINES LARGER THAN 2" MUST BE DUCTILE IRON PIPE CONFORMING TO AWWA C151 CLASS 52.
3. ALL MECHANICAL JOINTS ARE TO BE RESTRAINED WITH EBAA MEGALUG SERIES 1100 OR ROMAC GRIPRING.

TRENCH BACKFILL NOTES:

1. TRENCH BEDDING AND PIPE ZONE MATERIAL SHALL CONSIST OF A CLEAN CRUSHED AGGREGATE CONTAINING LESS THAN 5 PERCENT FINE MATERIALS PASSING THE U.S. STANDARD NO. 200 SIEVE. BEDDING MATERIALS SHOULD BE PLACED BENEATH PIPES TO ENSURE NO POINT OR CONCENTRATED LOADING OCCURS.
2. IN STRUCTURAL AREAS, TRENCH BACKFILL ABOVE THE PIPE ZONE SHALL CONSIST OF A WELL GRADED, ANGULAR CRUSHED AGGREGATE CONTAINING LESS THAN 7 PERCENT FINE MATERIALS PASSING THE NO. 200 SIEVE. ALL GRANULAR TRENCH BACKFILL ABOVE THE PIPE ZONE AND WITHIN STRUCTURAL AREAS SHALL BE PLACED IN LIFTS AND COMPACTED BY MECHANICAL MEANS TO A MINIMUM 92 PERCENT OF THE MAXIMUM DRY DENSITY DETERMINED IN ACCORDANCE WITH ASTM D1557 (MODIFIED PROCTOR). TRENCH BACKFILL WITHIN STRUCTURAL AREAS WILL NEED TO BE TESTED BY THE GEOTECHNICAL ENGINEER.
3. TRENCH BACKFILL ABOVE THE PIPE ZONE IN NON-STRUCTURAL AREAS CAN BE NATIVE MATERIAL COMPACTED TO 85% OF THE MAXIMUM DRY DENSITY OF THE SURROUNDING SOIL.
4. CONSTRUCTION OF ANY HARDSCAPE, SUCH AS SIDEWALKS OR PAVEMENTS, OVER A TRENCHLINE SHALL NOT OCCUR UNTIL A MINIMUM ONE WEEK AFTER BACKFILLING.
5. SHORING OF UTILITY TRENCHES WILL BE REQUIRED FOR DEPTHS GREATER THAN 4 FEET OR WHERE GROUNDWATER SEEPAGE OR SLOUGHING OCCURS.

N

GRAPHIC SCALE

30 0 15 30 60

(IN FEET)
1 INCH = 30 FT.

PRIVATE WATER AND FIRE SUPPLY NOTES:

1. WATERLINE FACILITIES BEHIND THE METER OR BACKFLOW PREVENTOR ARE PRIVATE IMPROVEMENTS. FACILITIES LOCATED IN FRONT OF THE WATER METER OR BACKFLOW PREVENTOR ARE PUBLIC FACILITIES.
2. DOMESTIC WATER SERVICE LINES BEING 2" OR SMALLER SHALL BE COPPER PIPE, TYPE "K", HARD DRAWN OR SOFT ANNEALED, PVC SCHEDULE 40 OR OTHER TYPE OF PIPE ACCEPTABLE UNDER THE OREGON STATE PLUMBING SPECIALTY CODE. ALL 4" AND LARGER PRIVATE WATERLINE SHALL BE PVC C-900 PIPE CONFORMING TO AWWA C151 CLASS 52. WHERE THE FIRE LINE ENTERS THE BUILDING AND WITHIN 2-FEET OF THE BUILDING THE FIRE WATERLINE SHALL BE DUCTILE IRON PIPE CONFORMING TO AWWA C151 CLASS 52. ALL JOINTS TO BE PUSH-ON JOINTS. FITTINGS SHALL BE DUCTILE IRON AND HAVE MECHANICAL JOINT ENDS.
3. ALL 3" AND SMALLER WATER LINES SHALL BE A MINIMUM OF 18" BELOW FINISH GRADE SURFACE ELEVATION. ALL 4" AND LARGER WATER LINES SHALL BE A MINIMUM OF 36" BELOW FINISH GRADE SURFACE ELEVATION.
4. ALL PIPE SHALL BE BEDDED WITH CRUSHED AGGREGATE BACKFILL (3/4-0"). BACKFILL IN PAVED AREAS SHALL BE GRANULAR BACKFILL COMPACTED TO 95% OF MAXIMUM DRY DENSITY PER AASHTO T-99 TEST METHOD. BACKFILL IN UNPAVED AREAS MAY BE NATIVE MATERIAL AND SHALL BE COMPACTED TO 85% OF THE IN PLACE DRY DENSITY OF THE SURROUNDING SOIL.
5. GATE VALVES SHALL BE DUCTILE IRON DOUBLE DISC TYPE CONFORMING TO AWWA C500. VALVE BOXES SHALL BE CAST IRON, TWO PIECE SLIP TYPE AND SHALL HAVE THE WORD "WATER" CAST IN THE LID.
6. WATERLINE AND APPURTENANCES ARE TO CONFORM TO MATERIALS, INSTALLATION AND TESTING REQUIREMENTS OF THE CURRENT OREGON STATE PLUMBING SPECIALTY CODE, THE CLACKAMAS COUNTY BUILDING DEPARTMENT AND THE OREGON HEALTH DIVISION ADMINISTRATIVE RULES, CHAPTER 333.
7. THRUST BLOCKS ARE TO BE PROVIDED AT ALL CHANGES IN DIRECTION AND BRANCHES ON THE MAINS. THRUST BLOCK CONCRETE STRENGTH IS TO BE 2,000 PSI. POUR THRUST BLOCKS AGAINST UNDISTURBED EARTH. WHERE NOTED ON THE PLANS, RESTRAINED JOINTS ARE TO HAVE FIELD LOCK GASKETS AND RESTRAINED MECHANICAL JOINTS SUCH AS "MEGA-LUG" JOINTS OR APPROVED EQUALS.
8. CHECK MECHANICAL PLANS FOR WATER CONNECTION POINTS.

PRIVATE SANITARY SEWER NOTES:

1. SANITARY SEWER PIPE LOCATED MORE THAN (5) FIVE FEET FROM ANY STRUCTURE MAY BE PVC PIPE CONFORMING TO ASTM D3034-SDR 35 WITH JOINTS BEING ELASTOMERIC GASKET CONFORMING TO ASTM 3212. OTHERWISE SANITARY SEWER PIPE SHALL BE ABS PIPING. ALL SANITARY SEWER LATERALS SHALL ENTER IN THROUGH A WYE FITTING.
2. CLEANOUT PIPE, FITTINGS AND JOINTS SHALL BE THE SAME SPECIFICATIONS AS FOR PIPE. CLEANOUTS SHALL MEET THE REQUIREMENTS OF SECTION 707.0 OF THE 2014 OREGON STATE PLUMBING SPECIALTY CODE. CLEANOUTS IN PAVED AREAS ARE TO HAVE AN IRON FRAME AND COVER.
3. ALL PIPE SHALL BE BEDDED AND BACKFILLED TO SURFACE WITH CRUSHED AGGREGATE BACKFILL (3/4-0"). CRUSHED AGGREGATE BACKFILL SHALL BE COMPACTED TO 95% OF MAXIMUM DRY DENSITY PER ASTM D-1557 TEST METHOD.
4. TESTING ON THE SANITARY SEWER SYSTEM MAY BE REQUIRED AT THE DISCRETION OF THE ENGINEER. TESTING SHALL CONFORM WITH SECTION 712.0 OF THE 2014 OREGON STATE PLUMBING SPECIALTY CODE.
5. ALL MATERIALS, INSTALLATION, TESTS AND INSPECTIONS TO BE MADE IN STRICT ACCORDANCE WITH THE 2014 OREGON STATE PLUMBING SPECIALTY CODE AND THE CITY OF TUALATIN BUILDING DEPARTMENT.
6. CHECK MECHANICAL PLANS FOR SANITARY CONNECTION POINT.

PRIVATE CATCH BASIN NOTES:

1. STEEL-PLATE CATCHBASINS SHALL NOT BE LESS THAN 10 GAUGE WITH WELDED SEAMS WITH SLEEVES ATTACHED FOR CONNECTING THE STORM DRAIN LINES.
2. STEEL CATCHBASINS SHALL BE ASPHALT COATED INSIDE & OUT. CONCRETE CATCHBASINS SHALL HAVE A WALL THICKNESS OF 4" & BE REINFORCED WITH #4 BARS @ 6" O.C.
3. GRATE TO BE WELDED STEEL DROP IN GRATE (ASTM A36). END BARS 1/2"X2"; CROSS BARS 1/2"X2" @ 2" O.C.; BIKE STRAPS 1/8"X1"; 16,000 LB> UNIFORM LOAD CAPACITY.

PRIVATE STORM DRAIN NOTES:

1. STORM DRAIN PIPE INSTALLED MORE THAN (5) FIVE FEET FROM ANY BUILDING, SHALL BE PVC PIPE CONFORMING TO ASTM D3034-SDR 35. PIPE INSTALLED WITHIN (5) FIVE FEET OF ANY BUILDING SHALL BE SCHEDULE 40 PVC DWV PIPE OR SCHEDULE 40 ABS DWV PIPE. DUCTILE IRON PIPE SHALL BE SHALL BE CLASS 52, CEMENT-MORTAR LINED AND SEAL COATED AND SHALL CONFORM WITH ASTM 536, AWWA C151, AWWA C104, AND AWWA C111.
2. CATCHBASINS MAY BE PRE-FABRICATED CATCHBASINS. CATCHBASINS ARE TO BE "LYNCH" TYPE WITH SUMPS (SEE CATCHBASIN SPECIFICATIONS BELOW). ROOF DRAINS MUST BE PIPED DIRECTLY INTO THE STORM DRAIN PIPING.
3. CLEANOUT PIPE, FITTINGS AND JOINTS SHALL BE THE SAME SPECIFICATIONS AS FOR PIPE. CLEANOUTS SHALL MEET THE REQUIREMENTS OF SECTION 707.0 OF THE OREGON STATE PLUMBING SPECIALTY CODE. CLEANOUTS IN PAVED AREAS ARE TO HAVE AN IRON FRAME AND COVER.
4. PIPE BACKFILL IN ALL PIPE ZONE AREAS IS TO BE 3/4"-0" CRUSHED ROCK. ALL TRENCH BACKFILL SHALL BE GRANULAR BACKFILL AND SHALL BE COMPACTED TO 95% MAXIMUM DRY DENSITY PER ASTM D-1557 TEST METHOD.
5. ALL MATERIALS, INSTALLATION, TESTS AND INSPECTIONS TO BE MADE IN STRICT ACCORDANCE WITH THE 2014 OREGON PLUMBING SPECIALTY CODE AND THE CITY OF TUALATIN BUILDING DEPARTMENT.

REGISTERED PROFESSIONAL ENGINEER
72761PE
OREGON
JAME 2, 2010
JAMES M. FOX

EXPIRES: 12/31/2019
6/18/18

REVISIONS	BY

Columbia Roofing Bldg. Addition

Columbia Roofing

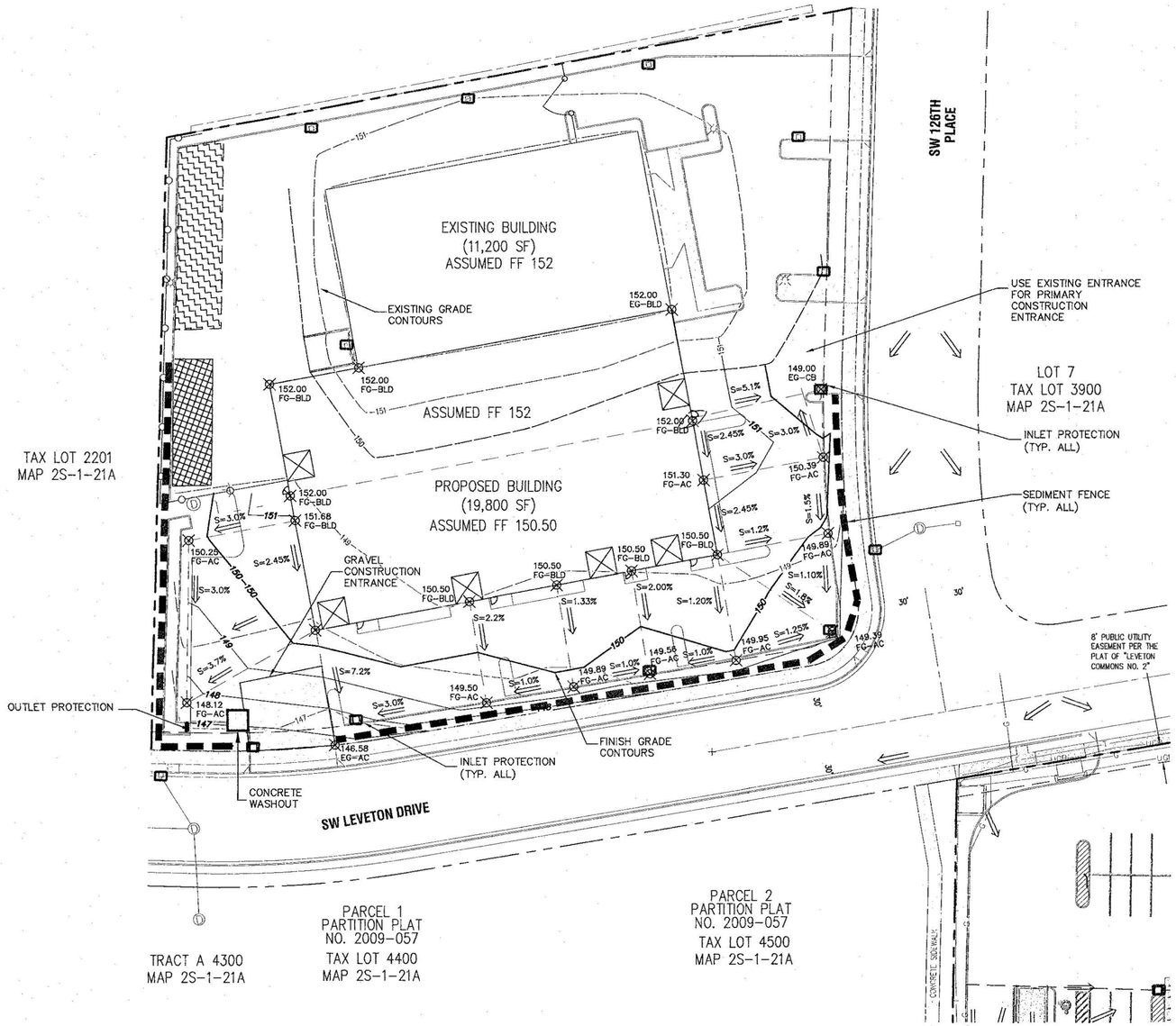
Preliminary

Utility Plan

SISUL ENGINEERING
375 PORTLAND AVENUE
GLADSTONE, OREGON 97027
(503) 657-0188

DRAWING: SGL - 16 - 075 - UTILITIES.DWG

DATE	JUNE 2018
SCALE	AS NOTED
DRAWN	JMF
JOB	18-046
SHEET	C2
OF 3	SHEETS



LEGEND

- EXISTING GRADE CONTOUR — 199
- FINISHED GRADE CONTOUR — 200
- SEDIMENT FENCE (PERIMETER)
- CONSTRUCTION ENTRANCE
- INLET PROTECTION (SEE CWS DWGS 915 AND 920, SHEET ESC4)
- TEMPORARY STORAGE AREA
- TEMPORARY STOCKPILE AREA
- TREE PROTECTION FENCE
- DRAINAGE FLOW DIRECTION

EROSION CONTROL NOTE:
EROSION CONTROL SHOWN IS BASED UPON 1200C PERMIT. CONTRACTOR IS RESPONSIBLE FOR MEETING REQUIREMENTS OF LEVETON COMMONS 1200C PLAN SET. ADDITIONAL NOTES AND REQUIREMENTS MAY EXIST ON THE 1200C PLAN SET.

WET WEATHER NOTE:
THE BMP'S SHOWN ARE A MINIMUM REQUIREMENT BASED UPON DRY WEATHER CONDITIONS. ADDITIONAL BMP'S MAY BE REQUIRED FOR WET WEATHER CONDITIONS. THE ADDITIONAL WET WEATHER BMPS MAY INCLUDE ITEMS SUCH STRAW COVER, COMPOST BERMS, COMPOST SOCKS, FIBER ROLLS ,ETC. ALL PLAN MODIFICATIONS REQUIRE DEQ APPROVAL AND AN UPDATE EROSION CONTROL PLAN. "WET WEATHER" CONSTRUCTION MEASURES NEED TO BE APPLIED BETWEEN OCTOBER 1ST AND MAY 31ST.

N

GRAPHIC SCALE
30 0 15 30 60
(IN FEET)
1 INCH = 20 FT.

REGISTERED PROFESSIONAL ENGINEER
72781PE
OREGON
JUNE 2, 2010
JAMES M. FOX
EXPIRES: 12/31/2019
4/08/19

REVISIONS	BY
LAYOUT REVISION DATE 7/20/17	JMF
7/29/18 PGE REQ. TRANSFORMER REL	JMF

Columbia Roofing Bldg. Addition

Columbia Roofing

Grading Plan

SISUL ENGINEERING
375 PORTLAND AVENUE
GLADSTONE, OREGON 97027
(503) 657-0188

DRAWING: SGL 16-075-Grading.DWG

DATE	JUNE 2018
SCALE	AS NOTED
DRAWN	JMF
JOB	18-046
SHEET	C3
OF 3	SHEETS

EXISTING VEHICLE STORAGE AND PARKING YARD

EXISTING BUILDING
11,200 sf footprint
14,197 sf gross area

EXISTING PARKING

Existing Light poles to remain

47'-1 3/4"

269.94'

3070

TRASH ENCLOSURE

PROPOSED ADDITION
19, 800 sf footprint

COVERED OUTDOOR SEATING & BIKE PARKING

Existing water quality swale

56'-10"

ING

22' DRIVEWAY

NEW PARKING/ DRIVEWAY

SW 126 TH PLACE
40' wide

EXISTING 6' SIDEWALK, 4' PLANTING STRIP AND CURB

49'-6"

E HC Ramp

PROPOSED NEW 36' APPROACH

8' PUE EASEMENT

P/L

WATER SUPPLY

E HC Ramp

SW LEVETON DRIVE
40' wide

MARK	DATE	DESCR

PROJECT NO:

MODEL FILE:
Columbia Roofing Addition DD Phase.p

DRAWN BY

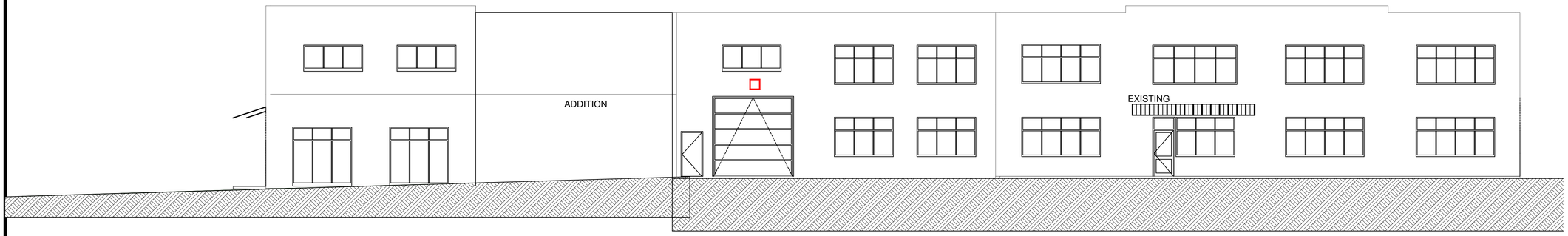
COPYRIGHT:

SHEET TITLE

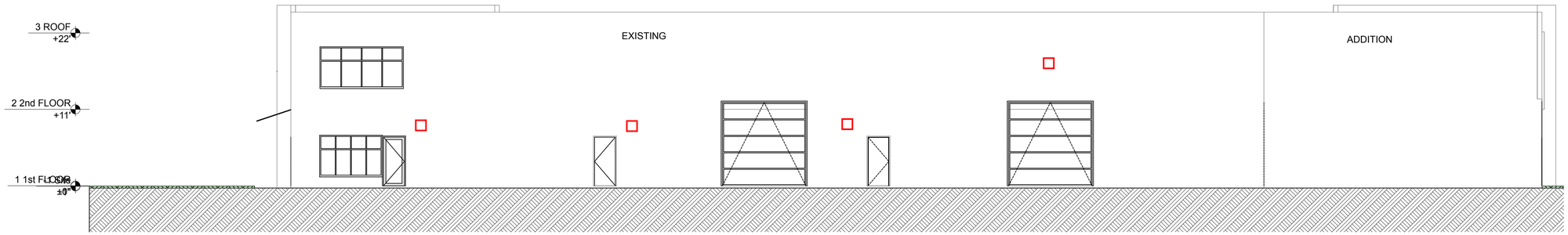
SITE P

REVISED DE
~~4/2/18~~ 7/6

1



2 EAST ELEVATION
SCALE: 1/8" = 1'-0"
0 4' 8' 16'



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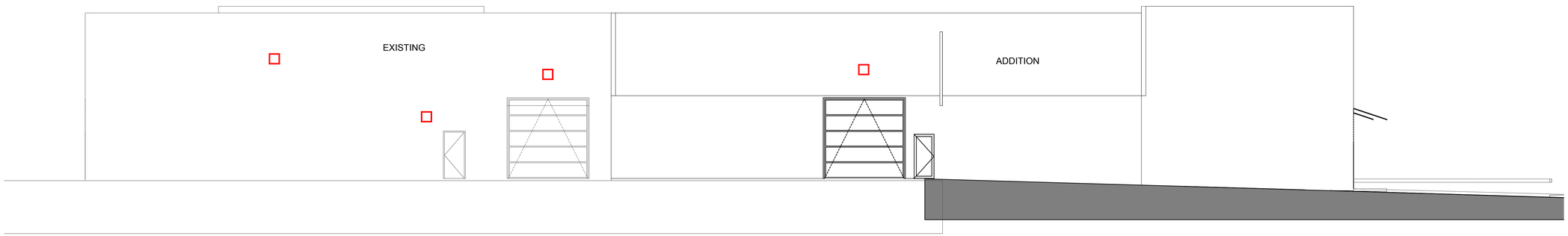
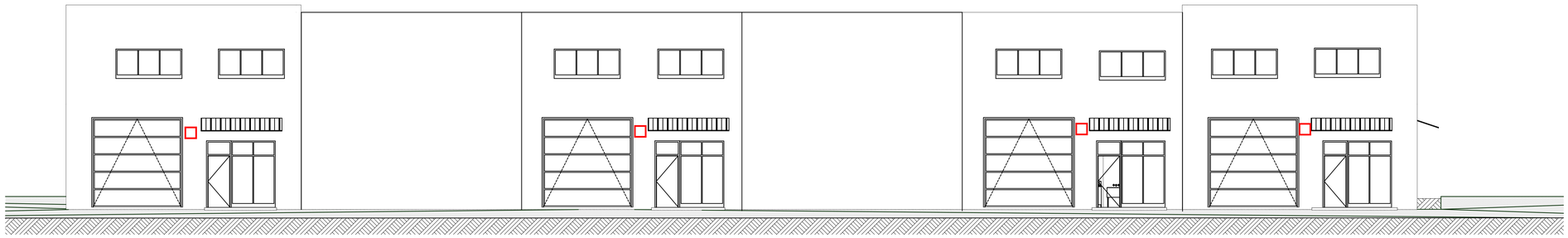


4 WEST ELEVATION
SCALE: 1/8" = 1'-0"
0 4' 8' 16'



1 SOUTH ELEVATION
SCALE: 1/8" = 1'-0"
0 4' 8' 16'

Chesshir Architecture pc
2337 NW York St. #208
Portland OR 97210
503 228 3273

Columbia Roofing Building Addition

18525 SW 126th Place
Tualatin OR 97062

MARK	DATE	DESCRIPTION

PROJECT NO:
MODEL FILE:
Columbia Roofing Addition DD Phase.pln
DRAWN BY
COPYRIGHT:

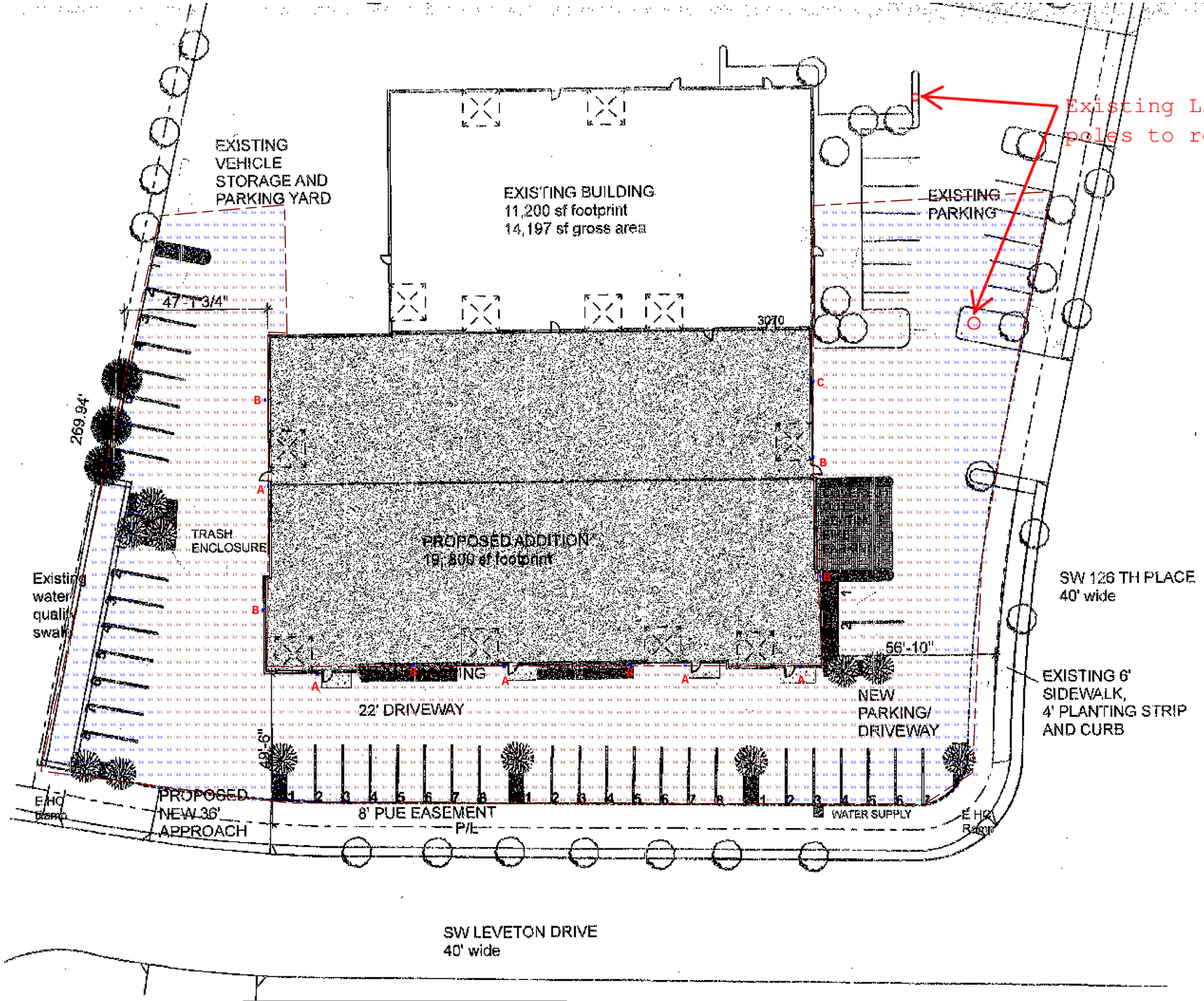
SHEET TITLE

ELEVATIONS

REVISED DESIGN
4/2/18

3

/Users/stanchesshir/Dropbox/current projects/mark carpenter/columbia DD phase/Columbia Roofing Addition DD Phase.pln



Schedule											
Symbol	Label	Quantity	Manufacturer	Catalog Number	Description	Lamp	Number Lamps	Filename	Lumens Per Lamp	Light Loss Factor	Wattage
	A	5	Lithonia Lighting	WST LED P1 40K VW HVOLT VG	WST LED, Performance package 1, 4000 K, visual comfort wide, HVOLT, vandal guard	LED	1	WST_LED_P1_40K_VW_HVOLT_VG.ies	1527	0.9	14
	B	1	Lithonia Lighting	WST LED P3 40K VF MVOLT	WST LED, Performance package 3, 4000 K, visual comfort forward throw, MVOLT	LED	1	WST_LED_P3_40K_VF_MVOLT.ies	6609	0.9	50
	C	6	Lithonia Lighting	WST LED P2 40K VW MVOLT	WST LED, Performance package 2, 4000 K, visual comfort wide, MVOLT	LED	1	WST_LED_P2_40K_VW_MVOLT.ies	3511	0.9	25

Plan View
Scale - 1" = 12ft

MARK	DATE	DESCR

PROJECT NO:
MODEL FILE:
Columbia Roofing Addition DD Phase.r
DRAWN BY
COPYRIGHT

SHEET TITLE
SITE P
REVISED DES
7/

Designer
Date
8/9/2018
Scale
Not to Scale
Drawing No.
Summary

TWR2 LED
LED Wall Luminaire

Catalog Number

Notes

Type

Hit the Tab key or mouse over the page to see all interactive elements.

Introduction

The popular TWR2 luminaire is now available with long-lasting, energy-efficient LED technology. Featuring a classic dayform, the TWR2 LED offers a traditional appearance and is powered by advanced LEDs.

The TWR2 LED luminaire is powerful yet energy efficient, capable of replacing up to a 400W metal halide luminaire while saving up to 82% in energy costs. Offering an expected service life of more than 20 years, the TWR2 LED eliminates frequent lamp and ballast replacements associated with traditional technologies.

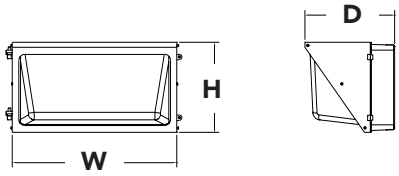
Specifications

Width: 17″ *(43.2 cm)*

Height: 9″ *(22.9 cm)*

Depth: 9-5/16″ *(23.6 cm)*

Weight: 17.2 lbs *(7.8 kg)*



Ordering Information

EXAMPLE: TWR2 LED 1 50K MVOLT DDB

TWR2 LED				
Series	**Performance Package**	**Color Temperature**	**Voltage**	**Finish**
TWR2 LED	1 6,979 lumens	50K 5000 K [1]	MVOLT [2]	DDB Dark bronze

NOTES

1 Correlated color temperature (CCT) shown is nominal per ANSI C78, 377-2008.

2 MVOLT driver operates on any line voltage from 120-277V (50/60 Hz).

FEATURES & SPECIFICATIONS

INTENDED USE
The TWR2 LED combines traditional wall pack design with high-output LEDs to provide an energy-efficient, low maintenance LED wall pack suitable for replacing up to 400W MH fixtures. The traditional shape helps maintain building aesthetics when replacing only a portion of your building's wall packs. TWR2 LED is ideal for outdoor applications such as carports, loading areas, driveways and parking areas.

CONSTRUCTION
Rugged cast-aluminum housing with bronze polyester powder paint for lasting durability. Door is hinged on the side so door swings out of the way during installation and service. Castings are sealed with a one-piece gasket to inhibit the entrance of external contaminants. MVOLT driver operates on any line voltage from 120-277V (50/60Hz). 10kV surge protection included. Rated for outdoor installations, -40°C minimum ambient.

OPTICS
High-performance LEDs maintain up to 86% of light output at 100,000 hours of service life (L86/100,000 hours). Prismatic glass lens designed for superior lighting distribution, uniformity and fixture spacing. See Lighting Facts label and photometry reports for specific fixture performance.

INSTALLATION
Designed for wall mounting above four feet from ground. Housing is configured for mounting directly over a standard 4″ outlet box (by others) or for surface wiring via any of three convenient 1/2″ threaded conduit entry hubs.

LISTINGS
UL Listed to U.S. and Canadian safety standards for wet locations. Tested in accordance with IESNA LM-79 and LM-80 standards.

DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org to confirm which versions are qualified. **Note:** TWR1 LED 1 40K/50K MVOLT qualified only for 120V applications.

WARRANTY
Five-year limited warranty. Full warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx.

Note: Actual performance may differ as a result of end-user environment and application. All values are design or typical values, measured under laboratory conditions at 25 °C. Specifications subject to change without notice.

LITHONIA LIGHTING

One Lithonia Way • Conyers, Georgia 30012 • Phone: 800.279.8041 • Fax: 770.918.1209 • www.lithonia.com

Performance Data

Lumen Output

Lumen values are from photometric tests performed in accordance with IESNA LM-79-08. Data is considered to be representative of the configurations shown, within the tolerances allowed by Lighting Facts.

Performance Package	Drive Current (mA)	CCT	System Watts	50K (5000 K, 67 CRI)				
				Lumens	B	U	G	LPW
1	530	5000 K	79W	6,979	2	3	4	89

Lumen Ambient Temperature (LAT) Multipliers

Use these factors to determine relative lumen output for average ambient temperatures from 0-40°C (32-104°F).

Ambient		Lumen Multiplier
0°C	32°F	1.03
10°C	50°F	1.01
20°C	68°F	1.00
25°C	**77°F**	**1.00**
30°C	86°F	0.99
40°C	104°F	0.98

Electrical Load

Fixture Model No.	Drive Current (mA)	System Watts	Current (A)			
			120V	208V	240V	277V
TWR2 LED 1 50K MVOLT	530 mA	79W	0.75	0.43	0.38	0.33

Projected LED Lumen Maintenance

Data references the extrapolated performance projections in a **40°C ambient**, based on 10,000 hours of LED testing (tested per IESNA LM-80-08 and projected per IESNA TM-21-11).

To calculate LLF, use the lumen maintenance factor that corresponds to the desired number of operating hours below. For other lumen maintenance values, contact factory.

Operating Hours	0	25,000	50,000	60,000	100,000
LM Factor TWR2 LED 1	1.0	.95	.92	.90	.86

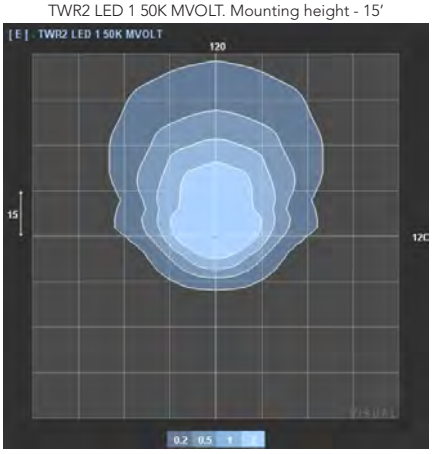
Photometric Diagrams

To see complete photometric reports or download .ies files for this product, visit the Lithonia Lighting TWR2 LED homepage. Tested in accordance with IESNA LM-79 and LM-80 standards

TWR2 LED 1 50K MVOLT. Mounting height - 15'

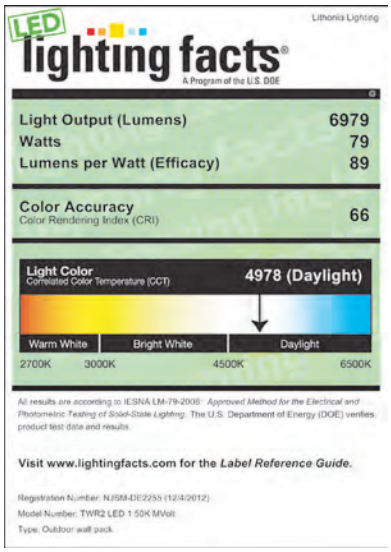
LEGEND

- 0.2 fc
- 0.5 fc
- 1.0 fc
- 2.0 fc



Test No. LTL22699 tested in accordance with IESNA LM-79-08.

Lighting Facts Labels



PERIMETER
2760
800
1360
880
1760
220
1350
8430 SF

270'

270
1350

200'

9×300=2700

10×80=800

EX.
11200 footprint

NEW
21720 footprint

16×70=1120

10×80=560

5×60=300

100

18×25=450

100

110×6=660

7×120=840
5×120 600 > 1440

40×8=320

6×220=1160

11200
21720
32920 SF TOTAL FOOTPRINT
14648 SF LANDSCAPE
46968
84071 SITE AREA
-46968
37103 PAVING AREA

LANDSCAPE AREAS

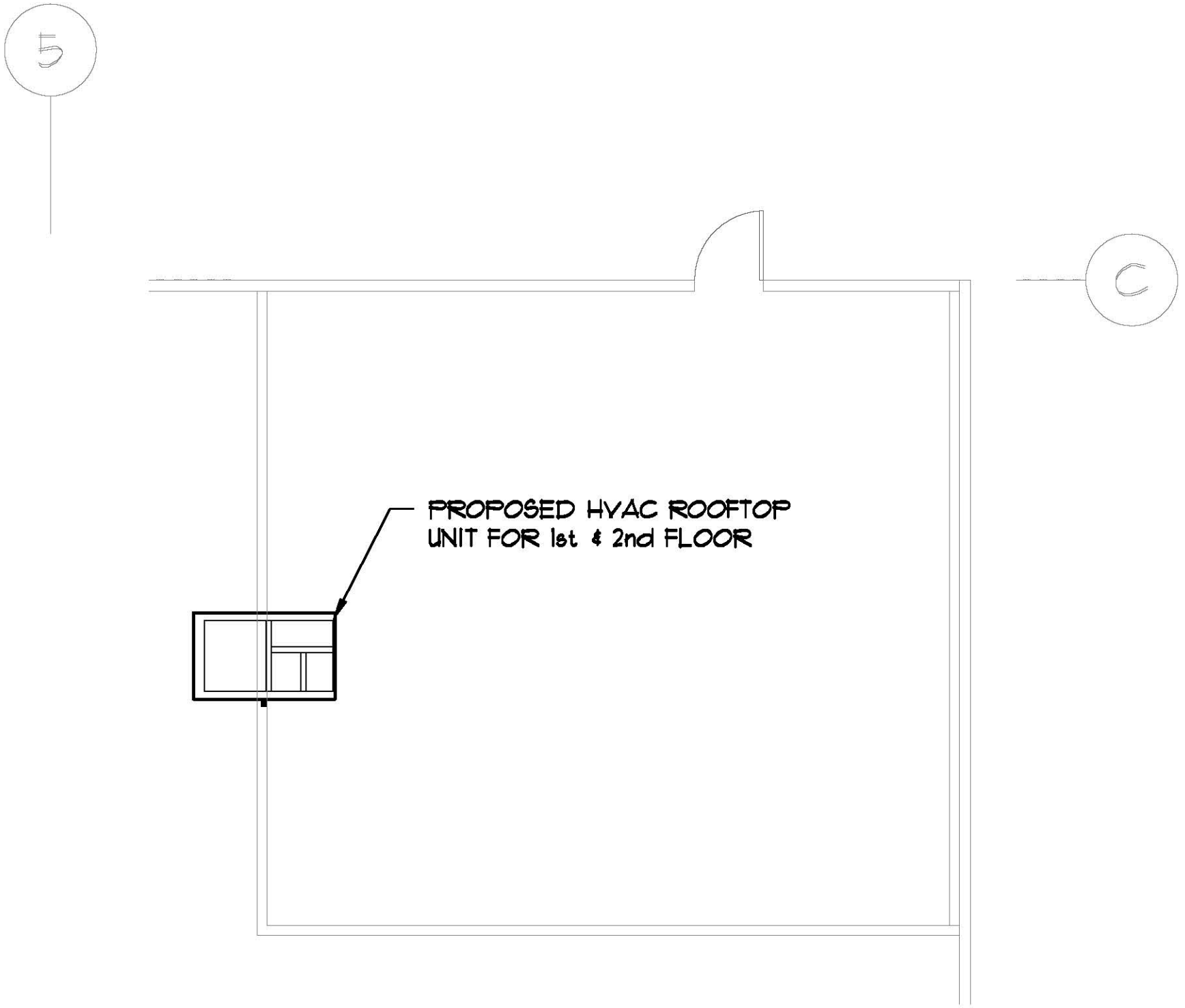
ISLANDS 14@100(AVE) = 1400 SF
1@ 25×30 = 720
1@ 12×24 = 288
2408 SF

PERIMETER 8430 SF

PEDESTRIAN AMENITY + BLDG EDGE LANDSCAPE
1440
1120
45°
1320
3240 SF

TOTAL 14048 SF
17% OF SITE

2408
8430
10838


5
C
PROPOSED HVAC ROOFTOP
UNIT FOR 1st & 2nd FLOOR

West Coast Fire Systems

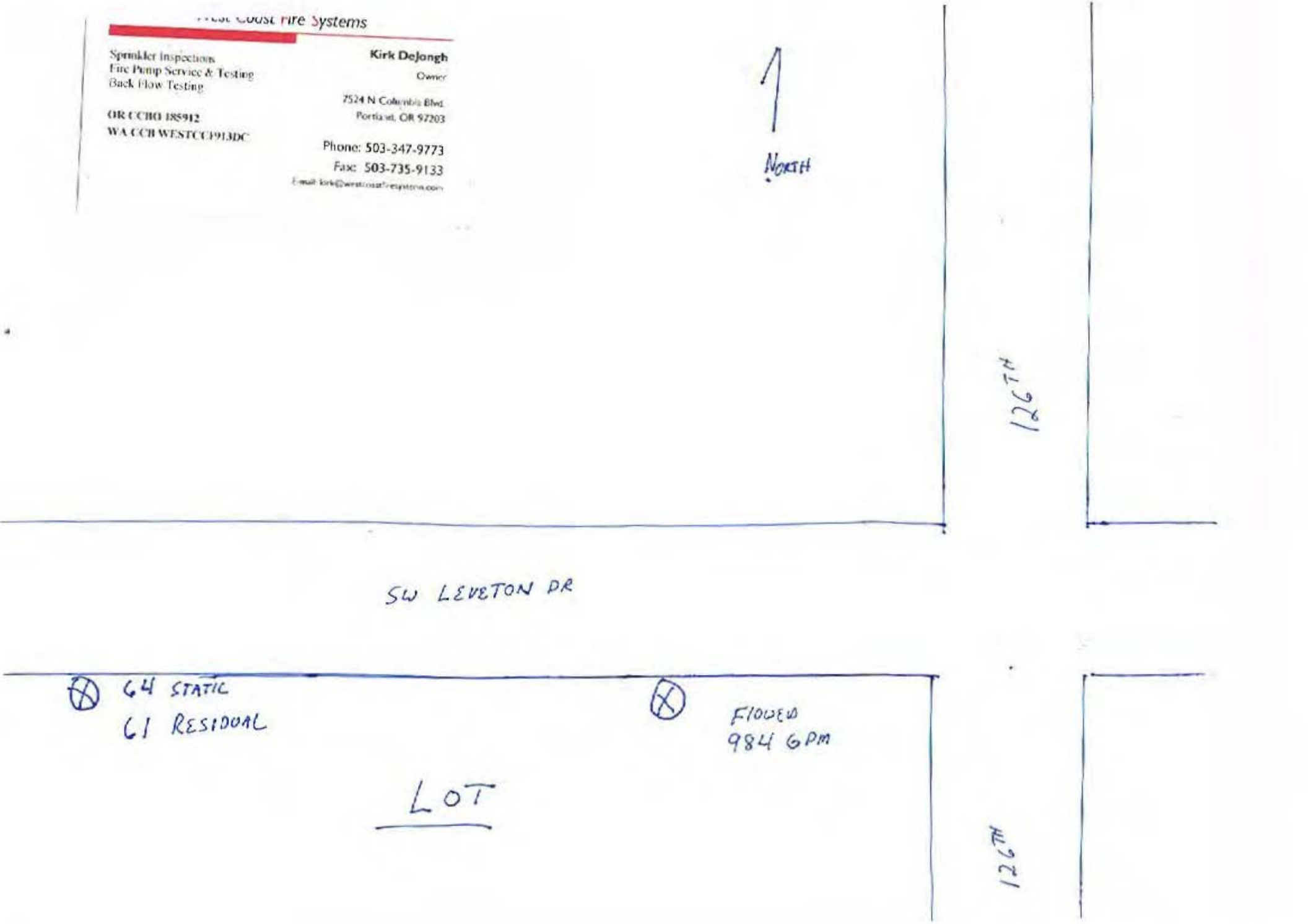
Sprinkler Inspections
Fire Pump Service & Testing
Back Flow Testing

OR CCB# 185912
WA CCB# WESTCCF913DC

Kirk DeJongh
Owner

7524 N Columbia Blvd.
Portland, OR 97203

Phone: 503-347-9773
Fax: 503-735-9133
E-mail: kirk@westcoastfiresystems.com



TERAGAN & ASSOCIATES, INC.
ARBORICULTURAL CONSULTANTS

MEMORANDUM

DATE: November 6, 2018

TO: Stan Chesshir (Chesshir Architecture)

FROM: Todd Prager, RCA #597, ISA Board Certified Master Arborist

RE: Tree Removal and Protection Plan for Columbia Roofing

Summary
This report includes tree removal and protection recommendations for construction of an addition at Columbia Roofing in Tualatin.

Background
Columbia Roofing is proposing to construct an addition to their existing building at 18525 SW 126th Place in Tualatin. The proposed site plan with existing tree locations is provided in Attachment 1.

The purpose of this report is to:

1. Provide tree removal findings and recommendations based on the proposed site plan; and
2. Provide recommendations for adequately protecting the trees to be retained during construction.

Tree Assessment
On November 6, 2018, I completed an inventory and assessment of the trees at the project site. Most of the trees were less than 8-inches in trunk diameter (DBH). The species and size ranges of these trees are provided on the site plan in Attachment 1.

Eight (8) of the 20 Douglas-firs (*Pseudotsuga menziesii*) at the site were over 8-inch DBH. The complete inventory data for the 20 Douglas-firs is provided in the tree inventory spreadsheet in Attachment 2. The data collected for each Douglas-fir includes the tree number, species (common and scientific names), DBH, tree health condition, tree structural condition, pertinent comments, and treatment (remove/retain). The tree numbers in the tree inventory in Attachment 2 correspond to the tree numbers on the site plan in Attachment 1. The trees over 8-inch DBH were also tagged with their corresponding numbers in the field.

Teragan & Associates, Inc.
3145 Westview Circle • Lake Oswego, OR 97034
Phone: 971.295.4835 • Fax: 503.697.1976
Email: todd@teragan.com • Website: teragan.com

Proposed Tree Removal
Attachment 1 shows the proposed construction impacts in relation to the trees. Twenty (20) of the trees are within the footprint of the building addition and one (1) of the trees is within the new driveway approach at SW Leveton Drive. Of these trees, six (6) are over 8-inch DBH. The removal of these trees meets the tree removal criteria in section 34.230.1(c) of the Tualatin Code because their removal is required "to construct proposed improvements".

Protection recommendations for the trees to be retained are provided in the next section of this report.

Tree Protection Recommendations
The following tree protection measures will be necessary to protect the trees during construction:

- *Tree Protection Fencing*: Erect metal tree protection fencing in the locations shown in Attachment 1 to protect the trees and surrounding landscaping to remain from construction.
- *Retain Curbs and Sidewalks Adjacent to Trees to Remain*: The curbs and sidewalks adjacent to the trees to be retained shall remain as noted in Attachment 1 to provide additional root protection for the trees to be retained.
- *Protect Tree Crowns*: The crowns of the trees to be retained will extend beyond the location of the tree protection fencing. Care will need to be taken to not contact or otherwise damage the crowns of the trees during construction.

Additional tree protection recommendations that are consistent with City of Tualatin standards are provided in Attachment 3.

Conclusion

Twenty-one (21) trees are recommended for removal with construction. Of these trees, six (6) are over 8-inch DBH. The trees to be retained will be adequately protected during construction by adhering to the recommendations in this report. Any change to the tree protection plan should be completed by the project arborist to ensure that the trees to be retained are properly protected.

Please contact me if you have questions, concerns, or need any additional information.

Sincerely,

Todd Prager

Todd Prager
ASCA Registered Consulting Arborist #597
ISA Board Certified Master Arborist, WE-6723B
ISA Qualified Tree Risk Assessor
AICP, American Planning Association

Enclosures: Attachment 1 – Site Plan with Tree Removal and Protection
Attachment 2 – Douglas-fir Tree Inventory
Attachment 3 – Tree Protection Recommendations
Attachment 4 – Assumptions and Limiting Conditions

PROPOSED PROJECT SCOPE AND CODE SUMMARY

LOT 10, TAX MAP NO. 2S 1 21A, TAX LOT NO. 4200

Total Site Area: 84,070.8 sf
Proposal to build a 20,040 footprint (21,720 net) sf concrete tilt up addition to the existing 11,200 sf building and to add a sprinkler system to the new and existing buildings.
City of Tualatin Zoning: ML Light Manufacturing
Occupancy Groups: B (Offices), F1 (Auto), F2 (Metal Products), S-1 (Roofing Materials and tools).
Construction Type (current building): III B Concrete tilt up exterior walls, wood frame interior wall, upper floor, roof framing.

Allowable Building Areas (**III B)** by Table 503 :
B: 19,000 sf, 3 story
F-1: 12,000 sf, 2 story
F-2: 18,000 sf, 3 story
S-1: 17,500 sf, 2 story

Allowable Building Area w/ Area Modifications:
Frontage Increase calculation
If = (F/P - 0.25) (W/30)
If = (460/840 -.25) (30/30)
If = (.55 - .25) (1) = .30 OR 30% increase allowed

IIIB Construction Type
12000 sf (using most restrictive) x .30 = 3600 sf
12000 + 3600 = 15600 sf allowed per story
Sprinkler increase = 31200 sf total allowed > 31240 sf proposed (actual F-1 space is considerably lower than allowable)

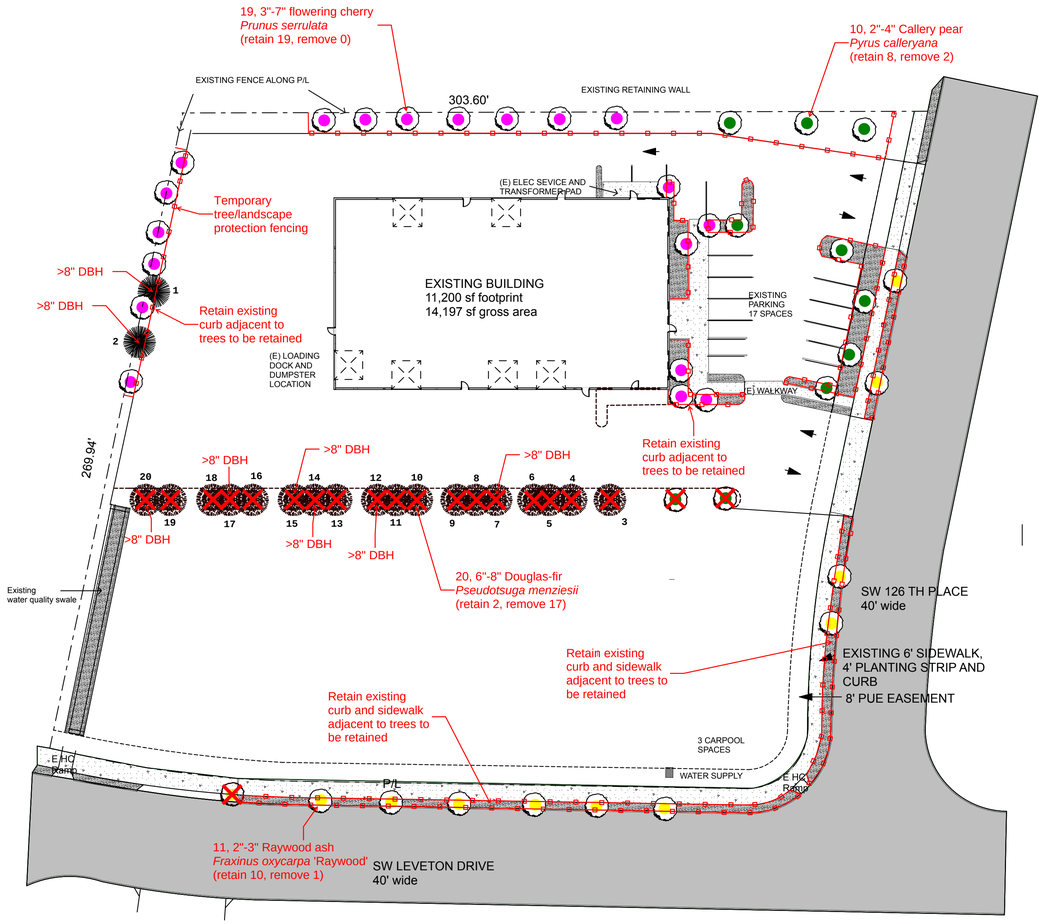
Building Height Allowed Max: 50', proposed 30'

PARKING
Most restrictive required: 71 based on: Office 6480 sf @2.7/1000 (17.5), Warehouse 8800 sf @ .3/1000 (3), Manuf. 7000 @1.6/1000 (11), 12900 @3/1000 (39)
Existing spaces: 22 (17 net with revisions)
New spaces: 54 (71 total net) carpool 1/25 spaces req'd - 3 provided
HC spaces: 3
Loading Berths: 2
Bicycle Parking: Spaces required: .10 / 1000 gross SF = 4 req'd.
Spaces provided: 4

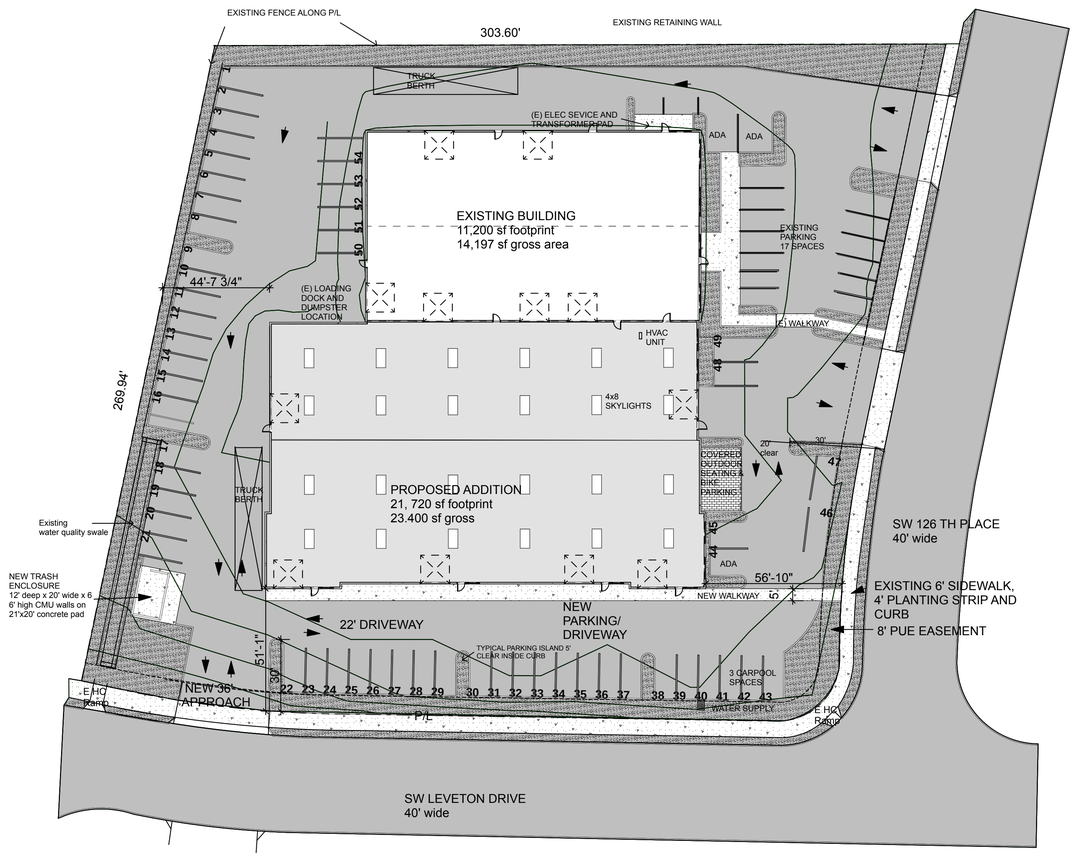
LANDSCAPE
Total Landscape required: 15% of site area 84070.8 sf x .15 = 12510 sf
Total area proposed: 12535 sf based upon: 7570 perimeter area, 4965 Parking lot landscape + approx 2500 sf amenities (not included in calculation)
Parking island area req'd: 25 sf/ parking stall = 1775 sf reqd, 1800+ sf provided
Paving area:
Tree count required: 1 deciduous shade tree per 4 stalls (18 req'd)
Tree count proposed: 18 New, plus approx 27 existing

SOLID WASTE: Min 10 sf plus 4 sf/1000 GLA Offices (26 sf), 6 sf/1000 GLA Wholesale, Whse, Manuf. (164 sf) = 190 sf req'd, New provided: 240 sf plus existing area

Attachment 1



2 EXISTING SITE / LANDSCAPE PLAN
SCALE: 1" = 30'



1 REVISED SITE PLAN
SCALE: 1" = 30'

Chesshir Architecture pc

2337 NW York St. #208
Portland OR 97210
503 228 3273

Columbia Roofing
Building Addition
18525 SW 126th Place
Tualatin OR 97062

MARK	DATE	DESCRIPTION

PROJECT NO:
MODEL FILE:
Columbia Roofing Addition AR model updated.pln
DRAWN BY
COPYRIGHT:

SHEET TITLE

SITE PLAN

ARCHITECTURAL
REVIEW SUBMITTAL
10/4/18

A1

/Users/stanchesshir/Dropbox/current projects/mark carpenter/columbia DD phase/Columbia Roofing Addition AR model updated.pln

Attachment 2

TREE NO.	COMMON NAME	SCIENTIFIC NAME	DBH[1]	CONDITION[2]	STRUCTURE[2]	COMMENTS	TREATMENT
1	Douglas-fir	*Pseudotsuga menziesii*	8	good	good		retain
2	Douglas-fir	*Pseudotsuga menziesii*	8	good	good		retain
3	Douglas-fir	*Pseudotsuga menziesii*	7	good	fair	competing leaders at 4' above ground	remove
4	Douglas-fir	*Pseudotsuga menziesii*	6	good	good		remove
5	Douglas-fir	*Pseudotsuga menziesii*	6	good	good		remove
6	Douglas-fir	*Pseudotsuga menziesii*	6	good	good		remove
7	Douglas-fir	*Pseudotsuga menziesii*	8	good	good		remove
8	Douglas-fir	*Pseudotsuga menziesii*	5	good	good		remove
9	Douglas-fir	*Pseudotsuga menziesii*	6	good	good		remove
10	Douglas-fir	*Pseudotsuga menziesii*	7	good	good		remove
11	Douglas-fir	*Pseudotsuga menziesii*	7	good	good		remove
12	Douglas-fir	*Pseudotsuga menziesii*	8	good	good		remove
13	Douglas-fir	*Pseudotsuga menziesii*	7	good	good		remove
14	Douglas-fir	*Pseudotsuga menziesii*	8	good	good		remove
15	Douglas-fir	*Pseudotsuga menziesii*	8	good	good		remove
16	Douglas-fir	*Pseudotsuga menziesii*	6	good	good		remove
17	Douglas-fir	*Pseudotsuga menziesii*	8	good	good		remove
18	Douglas-fir	*Pseudotsuga menziesii*	6	good	good		remove
19	Douglas-fir	*Pseudotsuga menziesii*	6	good	good		remove
20	Douglas-fir	*Pseudotsuga menziesii*	8	good	good		remove

[1]**DBH** is the trunk diameter in inches measured per International Society of Arboriculture (ISA) standards.

[2]**Condition** and **Structure** ratings range from very poor, poor, fair, to good.

Attachment 3
Tree Protection Recommendations

The following recommendations will help to ensure that the trees to be retained are adequately protected:

Before Construction Begins

1. Notify all contractors of tree protection procedures. For successful tree protection on a construction site, all contractors must know and understand the goals of tree protection.
    a. Hold a tree protection meeting with all contractors to explain the goals of tree protection.
    b. Have all contractors sign memoranda of understanding regarding the goals of tree protection. The memoranda should include a penalty for violating the tree protection plan. The penalty should equal the resulting fines issued by the local jurisdiction plus the appraised value of the tree(s) within the violated tree protection zone per the current Trunk Formula Method as outlined in the current edition of the ***Guide for Plant Appraisal*** by the Council of Tree & Landscape Appraisers. The penalty should be paid to the owner of the property.
2. Fencing
    a. Trees to remain on site will be protected by installation of tree protection fencing as shown in Attachment 1.
    b. The fencing should be put in place before the ground is cleared in order to protect the trees and the soil around the trees from disturbances.
    c. Fencing should be established by the project arborist based on the needs of the trees to be protected and to facilitate construction.
    d. Fencing should consist of steel fencing on concrete blocks or metal fencing secured to the ground with metal posts to prevent it from being moved by contractors, sagging, or falling down.
    e. Fencing should remain in the position that is established by the project arborist and not be moved without approval from the project arborist until final project approval.
3. Signage
    a. All tree protection fencing should have signage as follows so that all contractors understand the purpose of the fencing:

> **TREE PROTECTION ZONE**
>
> **DO NOT REMOVE OR ADJUST THE LOCATION OF THIS TREE PROTECTION FENCING**
> **UNAUTHORIZED ENCROACHMENT MAY RESULT IN FINES**
>
> Please contact the project arborist if alterations to the location of the tree protection fencing are necessary.
>
> Todd Prager, Project Arborist, Teragan & Associates, 971-295-4835

    b. Signage should be placed every 75-feet or less.

During Construction

1. Protection Guidelines Within the Tree Protection Zones:
    a. No new buildings; grade change or cut and fill, during or after construction; new impervious surfaces; or utility or drainage field placement should be allowed within the tree protection zones.
    b. No traffic should be allowed within the tree protection zones. This includes but is not limited to vehicle, heavy equipment, or even repeated foot traffic.
    c. No storage of materials including but not limiting to soil, construction material, or waste from the site should be permitted within the tree protection zones. Waste includes but is not limited to concrete wash out, gasoline, diesel, paint, cleaner, thinners, etc.
    d. Construction trailers should not to be parked/placed within the tree protection zones.
    e. No vehicles should be allowed to park within the tree protection zones.
    f. No other activities should be allowed that will cause soil compaction within the tree protection zones.
2. The trees should be protected from any cutting, skinning or breaking of branches, trunks or woody roots.
3. The project arborist should be notified prior to the cutting of woody roots from trees that are to be retained to evaluate and oversee the proper cutting of roots with sharp cutting tools. Cut roots should be immediately covered with soil or mulch to prevent them from drying out.
4. Trees that have woody roots cut should be provided supplemental water during the summer months.
5. Any necessary passage of utilities through the tree protection zones should be by means of tunneling under woody roots by hand digging or boring with oversight by the project arborist.
6. Any deviation from the recommendations in this section should receive prior approval from the project arborist.

After Construction

1. Carefully landscape the areas within the tree protection zones. Do not allow trenching for irrigation or other utilities within the tree protection zones.
2. Carefully plant new plants within the tree protection zones. Avoid cutting the woody roots of trees that are retained.
3. Do not install permanent irrigation within the tree protection zones unless it is drip irrigation to support a specific planting or the irrigation is approved by the project arborist.
4. Provide adequate drainage within the tree protection zones and do not alter soil hydrology significantly from existing conditions for the trees to be retained.
5. Provide for the ongoing inspection and treatment of insect and disease populations that are capable of damaging the retained trees and plants.
6. The retained trees may need to be fertilized if recommended by the project arborist.
7. Any deviation from the recommendations in this section should receive prior approval from the project arborist.

Attachment 4
Assumptions and Limiting Conditions

1. Any legal description provided to the consultant is assumed to be correct. The site plans and construction information provided by Chesshir Architecture was the basis of the information provided in this report.
2. It is assumed that this property is not in violation of any codes, statutes, ordinances, or other governmental regulations.
3. The consultant is not responsible for information gathered from others involved in various activities pertaining to this project. Care has been taken to obtain information from reliable sources.
4. Loss or alteration of any part of this delivered report invalidates the entire report.
5. Drawings and information contained in this report may not be to scale and are intended to be used as display points of reference only.
6. The consultant's role is only to make recommendations. Inaction on the part of those receiving the report is not the responsibility of the consultant.
7. The purpose of this report is to:
   - Provide tree removal findings and recommendations based on the proposed site plan; and
   - Provide recommendations for adequately protecting the trees to be retained during construction.

LandAmerica Lawyers Title

Washington County, Oregon 2006-093045
08/03/2006 03:41:14 PM
D-DW Cnt=1 Stn=7 K GRUNEWALD
$10.00 $6.00 $11.00 $591.00 - Total = $618.00

00991118200600930450020023

I, Richard Hobernicht, Director of Assessment and Taxation and Ex-Officio County Clerk for Washington County, Oregon, do hereby certify that the within instrument of writing was received and recorded in the book of records of said county.

Richard W. Hobernicht, Director of Assessment and Taxation, Ex-Officio County Clerk

After Recording, Return to:
Gray Alfa, LLC
28395 SW Boberg Rd., Ste B
Wilsonville, Oregon 97070

Until a change is requested, tax statements shall be sent to the following address:

Same as above

STATUTORY WARRANTY DEED

(Corporation/Partnership)

(Above Space Reserved for Recorder's Use)

Henriksen Properties, LLC, an Oregon limited liability company

conveys and warrants to
Gray Alfa, LLC

the following described real property in the State of Oregon and County of Washington **free of encumbrances, except as specifically set forth herein:**

Lot 10, Leveton Commons No. 2, in the City of Tualatin, County of Washington and State of Oregon.

WASHINGTON COUNTY
REAL PROPERTY TRANSFER TAX
$591.00 FEE PAID 8-3-06 DATE

Tax Account Number(s): R2141837

This property is free of encumbrances, EXCEPT:

1. 2005-06 taxes, a lien in an amount to be determined, but not yet payable.
(Continued)

The true consideration for this conveyance is $591,000.00
Which is paid to an accommodator pursuant to an IRC 1031 exchange.

BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON TRANSFERRING FEE TITLE SHOULD INQUIRE ABOUT THE PERSON'S RIGHTS, IF ANY UNDER CHAPTER 1, OREGON LAWS 2005 (BALLOT MEASURE 37 (2004)). THIS INSTRUMENT WILL NOT ALLOW USE OF THE PROPERTY DESCRIBED IN THIS INSTRUMENT IN VIOLATION OF APPLICABLE LAND USE LAWS AND REGULATIONS. BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON ACQUIRING FEE TITLE TO THE PROPERTY SHOULD CHECK WITH THE APPROPRIATE CITY OR COUNTY PLANNING DEPARTMENT TO VERIFY APPROVED USES AND TO DETERMINE ANY LIMITS ON LAWSUITS AGAINST FARMING OR FOREST PRACTICES AS DEFINED IN ORS 30.930, AND TO INQUIRE ABOUT THE RIGHTS OF NEIGHBORING PROPERTY OWNERS, IF ANY UNDER CHAPTER 1, OREGON LAWS 2005 (BALLOT MEASURE 37 (2004)).

DATED this 31 day of July, 2006.

Henriksen Properties, LLC

By: _____
Lynn Henriksen
Managing Member

STATE OF OREGON, COUNTY OF Clackamas) ss.
The foregoing instrument was acknowledged before me this 31 day of July, 2006, by Lynn Henriksen, as Managing Member, of Henriksen Properties, LLC, an Oregon limited liability company.

_____
Notary Public for Oregon
My Commission Expires: 1-2-08

OFFICIAL SEAL
GREGORY S BRAY
NOTARY PUBLIC-OREGON
COMMISSION NO. 375254
MY COMMISSION EXPIRES JAN. 2, 2008

Order No.: 87g0891384w

ENCUMBRANCES (Continued) Order No.: 87g0891384

2. Covenants, conditions, restrictions, easements and/or setbacks, imposed by instrument, including the terms and provisions thereof,
   Recorded : September 8, 1948
   Book/Volume : 289
   Page : 292
   NOTE: This exception omits from said instrument any covenant, condition or restriction based on race, color, religion, sex, handicap, familial status or national origin as provided in 42 USC 3604, unless and only to the extent that the covenant (a) is not in violation of state or federal law, (b) is exempt under 42 USC 3607, or (c) relates to a handicap, but does not discriminate against handicapped people.

3. Covenants, conditions, restrictions, easements and/or setbacks, imposed by instrument, including the terms and provisions thereof,
   Recorded : September 20, 1951
   Book/Volume : 325
   Page : 57
   NOTE: This exception omits from said instrument any covenant, condition or restriction based on race, color, religion, sex, handicap, familial status or national origin as provided in 42 USC 3604, unless and only to the extent that the covenant (a) is not in violation of state or federal law, (b) is exempt under 42 USC 3607, or (c) relates to a handicap, but does not discriminate against handicapped people.

4. The subject property was incorporated into a neighborhood development project by instruments, including the terms and provisions thereof, and all amendments and modifications thereof,
   Recorded : September 24, 1985
   Recorder's Fee No. : 85037690
   Project : Leveton Tax Increment Plan City of Tualatin Ordinance No. 674-85

5. Conditions, restrictions and/or setbacks, as shown on the recorded plat of Leveton Commons No. 2.

6. Easements as delineated on the recorded plat,
   For : public utilities

Clean Water Services

Clean Water Services File Number
18-000475

Sensitive Area Pre-Screening Site Assessment

1. **Jurisdiction:** Tualatin

2. **Property Information** *(example 1S234AB01400)*
Tax lot ID(s): 2S121A004200
Site Address: 12635 SW LEVETON DR
City, State, Zip: Tualatin , OR, 97062
Nearest Cross Street: SW Leveton Dr and SW 126th Pl

3. **Owner Information**
Name: Mark Carpenter
Company:
Address: 12635 SW Leveton Dr
City, State, Zip: Tualaitn, OR, 97062
Phone/Fax:
E-Mail: greyalfa@hotmail.com

4. **Development Activity** *(check **all** that apply)*
- ☐ Addition to Single Family Residence (rooms, deck, garage)
- ☐ Lot Line Adjustment
- ☐ Minor Land Partition
- ☐ Residential Condominium
- ☐ Commercial Condominium
- ☐ Residential Subdivision
- ☐ Commercial Subdivision
- ☒ Single Lot Commercial
- ☐ Multi Lot Commercial

Other

5. **Applicant Information**
Name: AJ Michaud
Company: TS Gray Construction
Address: PO Box 1000
City, State, Zip: Sherwood, OR, 97140
Phone/Fax: 503-692-4675
E-Mail: ajmichaud@tsgrayconstruction.com

6. **Will the project involve any off-site work?** ☐ Yes ☒ No ☐ Unknown
Location and description of off-site work

7. **Additional comments or information that may be needed to understand your project**
New 19,200 SF addition to existing building. Parking layout being finalized now after meeting with City of Tualatin.

This application does NOT replace Grading and Erosion Control Permits, Connection Permits, Building Permits, Site Development Permits, DEQ 1200-C Permit or other permits as issued by the Department of Environmental Quality, Department of State Lands and/or Department of the Army COE. All required permits and approvals must be obtained and completed under applicable local, state, and federal law.

By signing this form, the Owner or Owner's authorized agent or representative, acknowledges and agrees that employees of Clean Water Services have authority to enter the project site at all reasonable times for the purpose of inspecting project site conditions and gathering information related to the project site. I certify that I am familiar with the information contained in this document, and to the best of my knowledge and belief, this information is true, complete, and accurate.

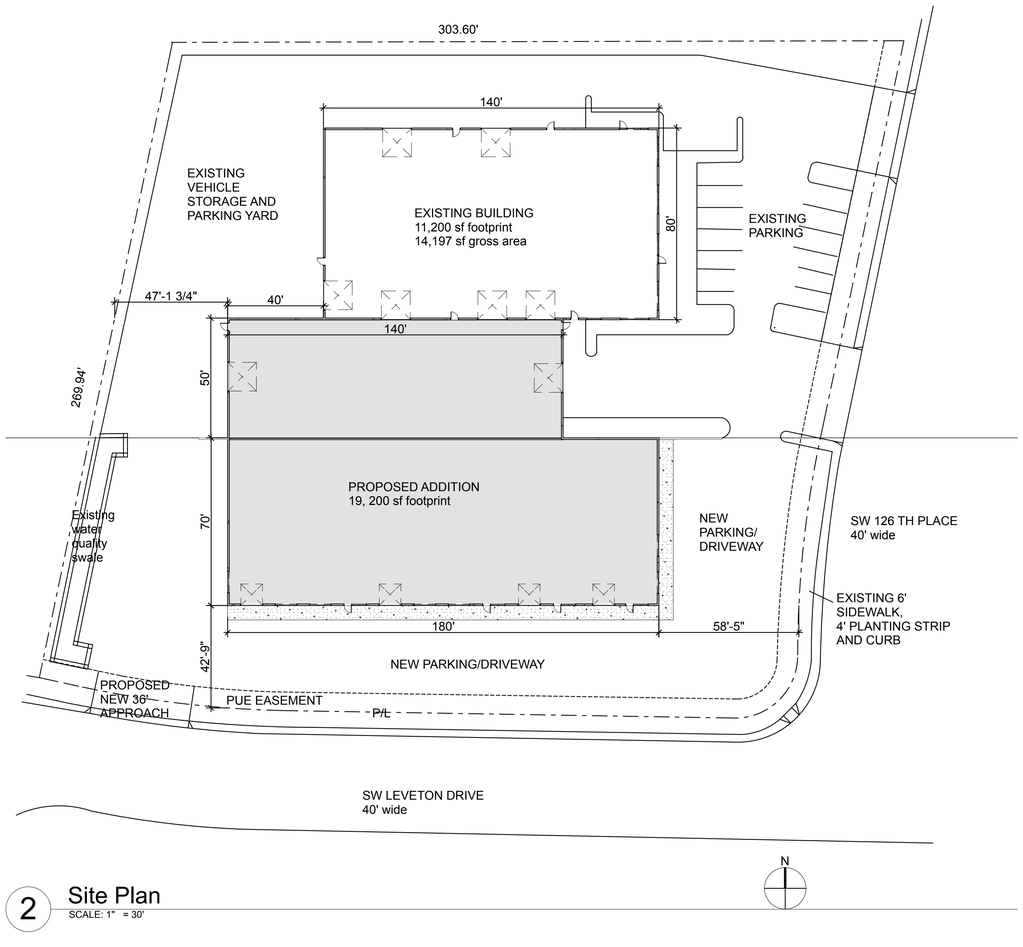
Print/Type Name AJ Michaud **Print/Type Title** Project Manager

ONLINE SUBMITTAL **Date** 2/8/2018

FOR DISTRICT USE ONLY

- ☐ Sensitive areas potentially exist on site or within 200' of the site. THE APPLICANT MUST PERFORM A SITE ASSESSMENT PRIOR TO ISSUANCE OF A SERVICE PROVIDER LETTER. If Sensitive Areas exist on the site or within 200 feet on adjacent properties, a Natural Resources Assessment Report may also be required.
- ☐ Based on review of the submitted materials and best available information Sensitive areas do not appear to exist on site or within 200' of the site. This Sensitive Area Pre-Screening Site Assessment does NOT eliminate the need to evaluate and protect water quality sensitive areas if they are subsequently discovered. This document will serve as your Service Provider letter as required by Resolution and Order 17-05, Section 3.02.1. All required permits and approvals must be obtained and completed under applicable local, State, and federal law.
- ☐ Based on review of the submitted materials and best available information the above referenced project will not significantly impact the existing or potentially sensitive area(s) found near the site. This Sensitive Area Pre-Screening Site Assessment does NOT eliminate the need to evaluate and protect additional water quality sensitive areas if they are subsequently discovered. This document will serve as your Service Provider letter as required by Resolution and Order 07-20, Section 3.02.1. All required permits and approvals must be obtained and completed under applicable local, state and federal law.
- ☐ This Service Provider Letter is not valid unless _____ CWS approved site plan(s) are attached.
- ☒ The proposed activity does not meet the definition of development or the lot was platted after 9/9/95 ORS 92.040(2). NO SITE ASSESSMENT OR SERVICE PROVIDER LETTER IS REQUIRED. SEE LEVETON COMMONS NO.2 PLAT

Reviewed by Chuck Berkbuhler Date 2/12/18



2 Site Plan
SCALE: 1" = 30'

PROPOSED PROJECT SCOPE AND CODE SUMMARY
LOT 10, TAX MAP NO. 2S 1 21A, TAX LOT NO. 4200

Proposal to build a 19,200 sf concrete tilt up addition to the existing 11,200 sf building and to add a sprinkler system to the new and existing buildings.

City of Tualatin Zoning: ML Light Manufacturing

Occupancy Groups: B (Offices), F1 (Auto), F2 (Metal Products), S-1 (Roofing Materials and tools).

Construction Type (current building): V-B Concrete tilt up exterior walls, wood frame interior wall, upper floor, roof framing.

Allowable Building Areas (V-B) by Table 503 :
B: 9000 sf, 2 story
F-1: 8500 sf, 1 story
F-2: 13,000 sf, 2 story
S-1: 9000 sf, 1 story

Allowable Building Area w/ Area Modifications:
Frontage Increase calculation
If = (F/P - 0.25) (W/30)
If = (460/840 -.25) (30/30)
If = (.55 - .25) (1) = .30 OR 30% increase allowed

Option 1. Scenario with current building V-B Construction Type classification
8500 sf (most restrictive) x .30 = 2550 sf increase
8500 + 2550 = 11050sf allowed
Add Sprinkler system 200% increase allowed = 22100 total allowed < 30400 proposed

Option 2. Scenario with Type V-A classification
14000 sf (most restrictive) x .30 = 4200 sf increase
14000 + 4200 = 18200 sf allowed
Sprinkler increase = 36400 sf total allowed > 30400 proposed

Option 3. Scenario with IIIB Construction Type
12000 sf (most restrictive) x .30 = 3600 sf
12000 + 3600 = 15600 sf allowed
Sprinkler increase = 31200 sf total allowed > 30400 proposed

Construction cost evaluation needed to determine the impact of the Construction Type variables and fire resistance ratings of components.

Chesshir Architecture pc
2337 NW York St. #208
Portland OR 97210
503 228 3273

Columbia Roofing Building Addition
18525 SW 126th Place
Tualatin OR 97062

MARK	DATE	DESCRIPTION

PROJECT NO:
MODEL FILE:
Columbia Roofing Addition.pln
DRAWN BY
COPYRIGHT:

SHEET TITLE
Site Plan
PRELIMINARY DESIGN
1/24/18

1

/Users/stanchesshir/Dropbox/current projects/mark carpenter/Columbia Roofing Addition.pln

REPUBLIC SERVICES

10295 SW Ridder Road, Wilsonville, OR 97070
O: 503.570.[illegible] F: 503.682.9307 fedva@republicservices.com

July 31, 2018

AJ Michaud
TS Gray Construction

Re: Columbia Roofing Enclosure

Dear AJ;

Thank you, for sending me your updated site plans and enclosure designs for the additional building developments on in Tualatin.

My Company: Republic Services of Clackamas & Washington Counties has the franchise agreement to service this area with the City of Tualatin. We will provide complete commercial waste removal and recycling services as needed on a weekly basis for this location.

It looks like the location of the enclosure is fine for us to service. I do not see any issue for access for my vehicles. We should be able to circle around the buildings for entering and exiting. The size of the enclosure is good to hold two containers for trash and recycling. Please remember to have the gates open at least 120 degrees as your enclosure specs show. This enclosure will be fine for our services.

Thank you AJ; for your help and concerns for our services prior to this project being developed.

Sincerely,

Frank J. Lonergan

Frank J. Lonergan
Operations Manager
Republic Services Inc.
Flonergan@republicservices.com

COLUMBIA ROOFING EXPANSION
TRAFFIC IMPACT STUDY

TUALATIN, OREGON

21370 SW Langer Farms Parkway, Suite 142, Sherwood, OR 97140 – (503)862-6960

COLUMBIA ROOFING BUILDING EXPANSION
TRAFFIC IMPACT STUDY

TUALATIN, OREGON

PREPARED FOR:
TS Gray Construction

PREPARED BY:
Michael Ard, PE
Ard Engineering

DATE:
June 11, 2018

21370 SW Langer Farms Parkway, Suite 142, Sherwood, OR 97140 - (503)862-6960

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EXECUTIVE SUMMARY

1. An existing 14,197 square foot building that currently serves as the home for Columbia Roofing & Sheet Metal located at 18525 SW 126th Place in Tualatin, Oregon is proposed for expansion with new building area on the south side of the existing facility. The expansion will have a footprint of up to 19,200 square feet and will serve industrial-related uses similar to the existing facility. The site currently takes access via two driveways on SW 126th Place. The proposed expansion will also include construction of a third driveway onto SW Leveton Drive.

2. The proposed development is projected to generate a net increase of 17 site trips during the morning peak hour and 16 site trips during the evening peak hour.

3. Based on the operational analysis, all study area intersections are projected to operate acceptably per City of Tualatin, Washington County and ODOT standards through 2020 either with or without the addition of site trips from the proposed building expansion. No operational mitigations are necessary or recommended.

4. Based on the queuing analysis, the existing turn-lane storage lengths provided at the study intersections are adequate to safely accommodate the projected queues. No queuing-related mitigation is necessary or recommended.

5. Crash data for the most recent five years shows no significant crash trends that may be indicative of design deficiencies. No crash mitigations are recommended.

6. Intersection sight distance is adequate at the proposed new site access driveway location on SW Leveton Drive. No sight distance mitigations are recommended.

7. Based on the warrant analysis, no new traffic signals or left-turn lanes are recommended.

PROJECT DESCRIPTION & LOCATION

INTRODUCTION

An expansion is proposed for the existing Columbia Roofing & Sheet Metal building located at 18525 SW 126th Place in Tualatin, Oregon. The existing building has a gross floor area of 14,197 square feet and the proposed expansion will have a footprint of 19,200 square feet. The existing development takes access via two driveways on SW 126th Avenue. However, a third driveway on SW Leveton Drive is proposed in conjunction with the proposed building expansion. The new driveway will be located near the west property line, directly opposite an existing driveway on the south side of SW Leveton Drive.

This report addresses the impacts of the proposed development on the surrounding street system. Based on correspondence with City of Tualatin staff, an operational and safety analysis was conducted for the three site access driveways as well as the nearby intersections of SW Leveton Drive at SW 126th Avenue, SW Leveton Drive at SW 124th Avenue, and Highway 99W at SW 124th Avenue.

The purpose of this analysis is to determine whether the surrounding transportation system is capable of safely and efficiently supporting the proposed use and to identify any necessary improvements and mitigations.

SITE LOCATION AND STUDY AREA DESCRIPTION

The project site has an area of approximately 1.96 acres and is zoned for Light Manufacturing (ML). It is located in the northwest corner of the intersection of SW Leveton Drive and SW 126th Place. The subject property is currently developed with a single industrial building with a gross floor area of 14,197 square feet. It is surrounded primarily by a mixture of industrial and manufacturing-related uses. A mini-storage facility is located immediately to the north, and a bus barn is located to the northwest. The property immediately to the west is currently undeveloped.

Two existing driveways currently serve the subject property. Both are located on SW 126th Place and are centered approximately 160 feet and 265 feet north of the centerline of SW Leveton Drive, respectively. A third driveway is proposed to be added onto SW Leveton Drive near the west side of the subject property, directly opposite an existing driveway on the south side of SW Leveton Drive.

The major roadways included in the analysis are Oregon Highway 99W, SW 124th Avenue, SW Leveton Drive and SW 126th Place.

Oregon Highway 99W is classified by the Oregon Department of Transportation as a Statewide Highway and a Freight Route. It is classified by the City of Tualatin as a Major Arterial. The roadway generally has two through lanes in each direction in the site vicinity, with a wide landscaped median. Turn lanes are added at intersections. Highway 99W has a posted speed limit of 55 mph west of SW 124th Avenue and 45 mph east of SW 124th Avenue. Bicycle lanes are in place on both sides of the highway. Partial sidewalks are also in place along the frontages of more recently developed properties, principally at and east of SW 124th Avenue.

SW 124th Avenue is classified by the City of Tualatin as a Major Arterial and has a posted speed limit of 45 mph. It generally has two through lanes in each direction, along with a raised and landscaped center median that separates vehicles traveling in opposite directions and allows space for turn lanes to be added at intersections. Continuous sidewalks are provided on both sides of the roadway, and bike lanes are provided in each direction except in the immediate vicinity of SW Herman Road.

SW Leveton Drive is classified by the City of Tualatin as a Commercial/Industrial Connector between SW 130th Avenue and SW 124th Avenue. East of SW 124th Avenue it is classified as a Major Arterial. The roadway has a three-lane cross-section, with one through lane in each direction and a center two-way left-turn lane. It has a posted speed limit of 35 mph. Continuous sidewalks are in place along the north side of the roadway. Sidewalks are also provided along the south side except between SW 126th Place and SW 124th Avenue where the adjacent property is undeveloped. Bike lanes are provided on both sides of the roadway east of SW 124th Avenue.

SW 126th Place is classified by the City of Tualatin as a Commercial/Industrial Connector. It has a three-lane cross-section including a center two-way left-turn lane along the site frontage but narrows to two lanes without centerline striping north of the proposed development. Existing sidewalks are also in place on both sides of the roadway extending approximately 600 feet north of the centerline of SW Leveton Drive.

EXISTING CONDITIONS

The intersection of Oregon Highway 99W at SW 124th Avenue is a T-intersection controlled by a traffic signal. The northbound approach has two left-turn lanes and two right-turn lanes. The eastbound approach has a single, shared lane for through and right-turn movements. The westbound approach has two left-turn lanes and two through lanes. The eastbound approach has two through lanes and a right-turn lane. All left-turn movements operate with protected signal phasing. The northbound right-turn movement prohibits right turns on red, but operates using overlap phasing with the westbound left-turn movement. Crosswalks with pedestrian signals are provided crossing the south and east legs of the intersection.

The intersection of SW 124th Avenue at SW Leveton Drive is also controlled by a traffic signal. The northbound and southbound approaches each have a left-turn lane, a through lane and a shared through/right lane. The left-turn movements operate with flashing yellow arrow displays. The eastbound and westbound approaches each have a left-turn lane operating with protected signal phasing and a shared through/right lane. Crosswalks with pedestrian signals are provided crossing all four legs of the intersection.

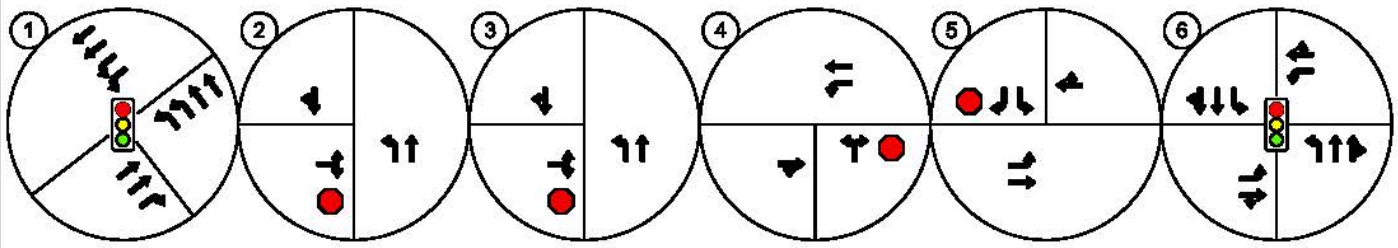
The intersection of SW Leveton Drive at SW 126th Place is a T-intersection controlled by a stop sign on the southbound SW 126th Place approach. Through traffic traveling along SW Leveton Drive does not stop. The eastbound approach has a left-turn lane and a through lane. The westbound approach has a single, shared through/right lane. The southbound approach has a left-turn lane and a right-turn lane.

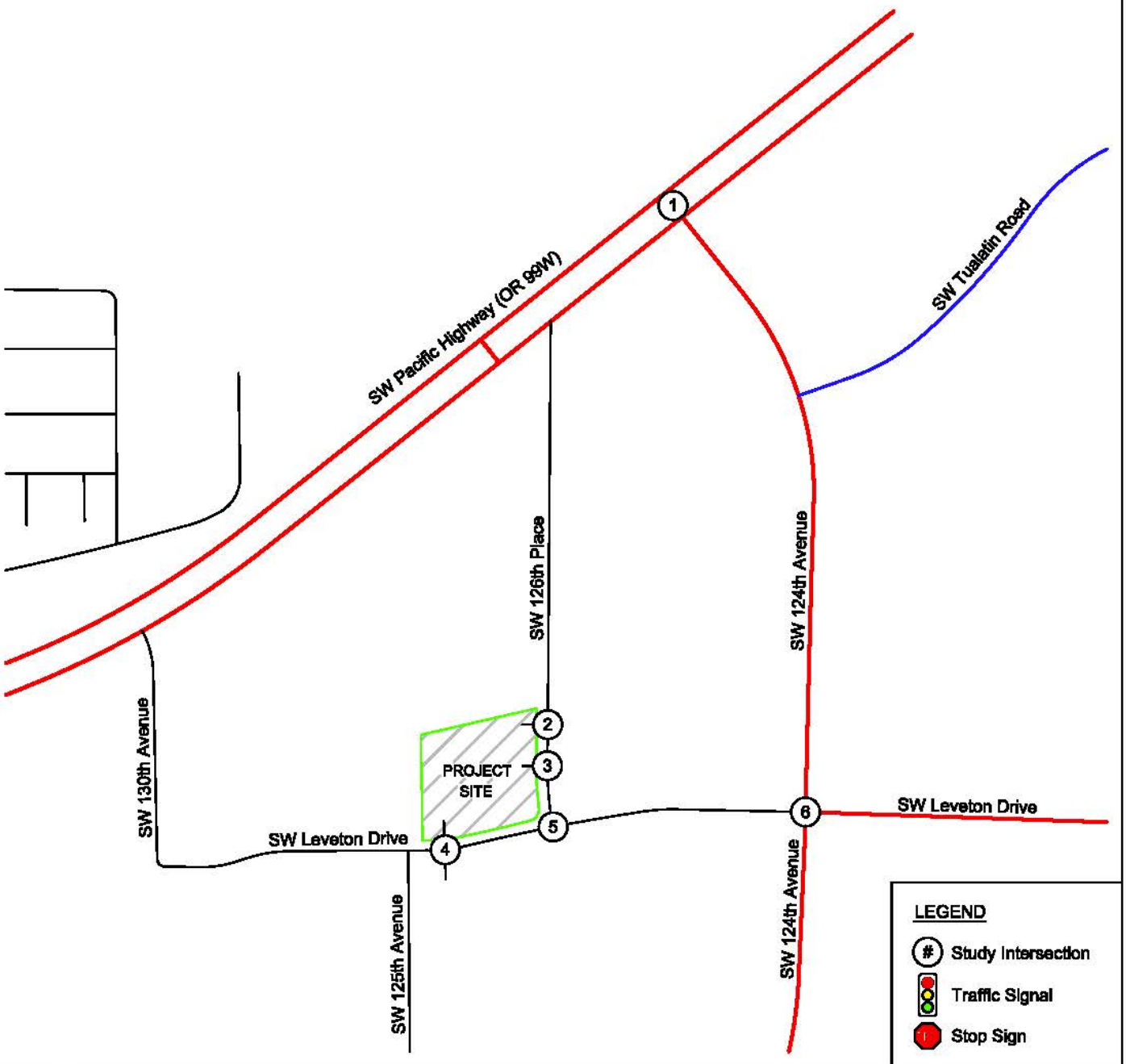
A vicinity map displaying the project site, vicinity streets, and the study intersections with their associated lane configurations is provided in Figure 1 on page 7.

TRAFFIC COUNT DATA

Traffic counts were conducted at the study intersections on Wednesday April 25th, 2018 from 7:00 to 9:00 AM and from 4:00 PM to 6:00 PM. Data was used from the highest-volume hour during each analysis period for each intersection.

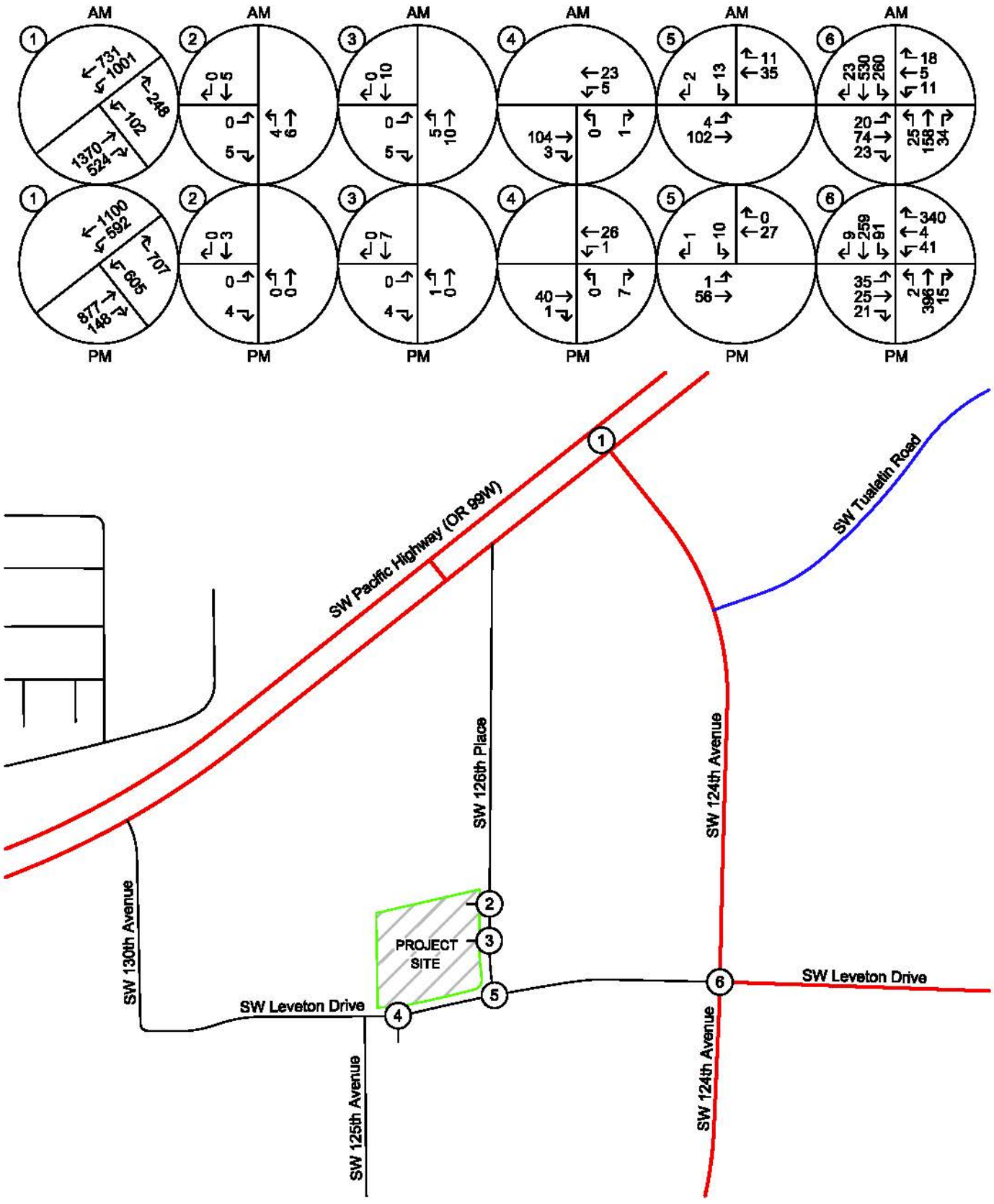
Figure 2 on page 8 shows the existing 2018 traffic volumes for the morning and evening peak hours at the study intersections.





VICINITY MAP
Study Area Intersections
Lane Configurations and Traffic Control Devices

FIGURE 1



TURNING MOVEMENT VOLUMES
2018 Existing Conditions
Morning and Evening Peak Hours

FIGURE 2

OPERATIONAL ANALYSIS

An operational analysis was conducted for the study intersections using Synchro 10 software. The analysis was conducted for the weekday morning and evening peak hours, since these commute periods generally correspond to the highest-volume hours of the day.

The purpose of the existing conditions analysis is to establish how the study area intersections operate currently and allow for calibration of the operational analysis if required.

The results of the operational analysis are reported based on delay, Level of Service (LOS), and volume-to-capacity ratio (v/c). Delays are reported in seconds. Level of service is reported as a letter grade and can range from A to F, with level of service A representing nearly free-flow conditions and level of service F representing high delays and severe congestion. A report of level of service D generally indicates moderately high but tolerable delays, and typically occurs prior to reaching intersection capacity. For the unsignalized intersections, the v/c represents the portion of the available intersection capacity that is being utilized on the worst intersection approach. A v/c ratio of 1.0 would indicate that the approach is operating at capacity. The City of Tualatin requires that intersections operate at level of service E or better during the peak hours. The Oregon Department of Transportation and Washington County also require intersections under their jurisdiction to operate with a v/c ratio of 0.99 or less during the peak hours.

A summary of the existing conditions operational analysis is provided in Table 1 below. The reported delays and levels-of-service for the signalized intersections represent the average delays for the entire intersection. For the unsignalized intersections, the reported delays, levels of service and volume-to-capacity ratios represent the approach lane which experiences the highest delays.

Based on the analysis, all study intersections are currently operating acceptably during the morning and evening peak hours. Detailed capacity analysis worksheets are provided in the technical appendix.

Table 1 - Operational Analysis Summary: 2018 Existing Conditions

Intersection	AM Peak Hour			PM Peak Hour		
	Delay	LOS	v/c	Delay	LOS	v/c
Highway 99W at SW 124th Ave.	35.3	D	0.86	28.9	C	0.74
SW 126th Pl. at North Site Access	8.4	A	0.01	8.4	A	0.01
SW 126th Pl. at South Site Access	8.4	A	0.01	8.4	A	0.01
SW Leveton Drive at West Site Access	9.1	A	0.01	8.7	A	0.01
SW Leveton Dr. at SW 126th Pl.	9.5	A	0.01	9.3	A	0.01
SW 124th Ave. at SW Leveton Dr.	13.1	B	0.37	32.2	C	0.26

SITE TRIPS

The proposed development will expand the existing 14,197 square foot industrial building within an added building footprint of 19,200 square feet. Since the footprint will include some second-floor space, the trip generation was conservatively calculated assuming that the addition may have a gross floor area of up to 25,000 square feet. Based on this assumption, the future total building area would be 39,197 square feet. To estimate the number of trips that will be generated by the proposed development, trip rates from the *TRIP GENERATION MANUAL, 10th EDITION* were used. Data from land-use code 110, *General Light* Industrial, 130, *Industrial Park,* and 140, *Manufacturing* were considered for the trip projections. Since land use code 110, *General Light Industrial* matches the site use description and results in the highest trip volumes of the three land use types, it was conservatively used for the analysis.

Based on the trip generation analysis, the proposed building expansion is projected to generate 17 net new trips during the morning peak hour and 16 net new site trips during the evening peak hour. A summary of the trip generation calculations is provided in Table 2 below. A detailed trip generation worksheet is also included in the technical appendix.

Table 2 - Site Trip Generation Summary

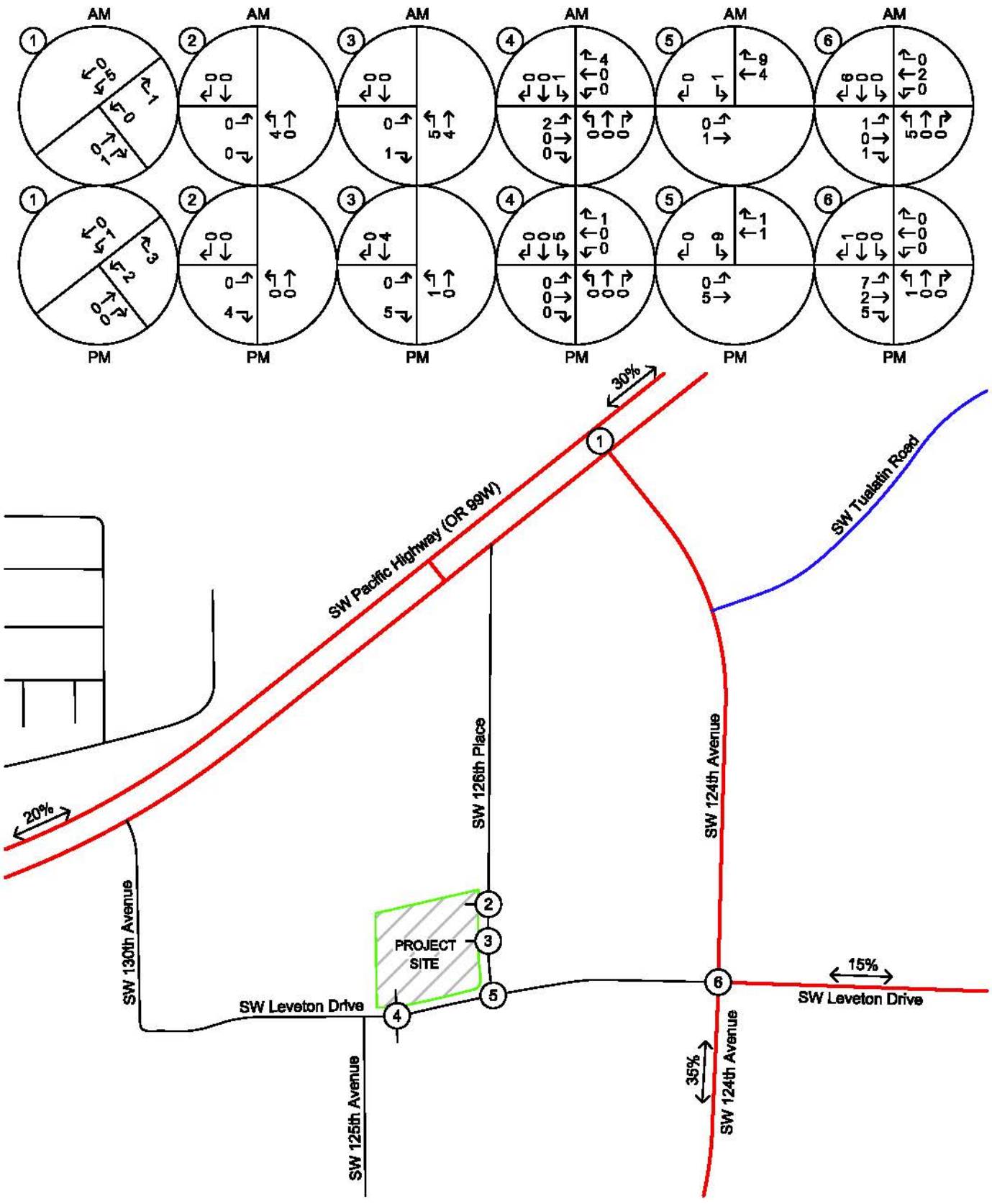
	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
14,197 sf General Light Industrial (existing)	9	1	10	1	8	9
39,197 sf General Light Industrial (proposed)	24	3	27	3	22	25
Net New Site Trips	**15**	**2**	**17**	**2**	**14**	**16**

TRIP DISTRIBUTION

The directional distribution of primary site trips to and from the project site was estimated based the existing travel patterns in the site vicinity as well as the locations of major transportation facilities.

Approximately half of the projected site trips are projected to utilized Oregon Highway 99W, with 30 percent traveling to and from the east and 20 percent traveling to and from the west. Another 35 percent of site trips are projected to travel to and from the south on SW 124th Avenue. The remaining 15 percent of site trips are projected to travel to and from the east on SW Leveton Drive.

The trip distribution percentages and trip assignment for the projected new site trips are shown in Figure 3 on page 12.



TRAFFIC VOLUMES
Site Trip Distribution and Assignment
Morning and Evening Peak Hours

FIGURE 3

FUTURE CONDITIONS ANALYSIS

BACKGROUND VOLUMES

In order to determine the expected impact of site trips on the study area intersections, it is necessary to compare traffic conditions both with and without the addition of the projected traffic from the proposed mixed-use development. Since the building cannot be constructed and occupied immediately, the comparison is made for future traffic conditions at the time of expected project completion. It is anticipated that the proposed use can be completed and occupied within two years. Accordingly, the analysis was conducted for year 2020 traffic conditions.

Prior to adding the projected site trips to the study intersections, the existing traffic volumes were adjusted to account for background traffic growth over time. Background growth is expected to occur regardless of whether or not the proposed mixed-use development is constructed, and accounts for other developments both within and outside the City of Tualatin.

To account for anticipated traffic growth along Highway 99W, data from ODOT's 2036 Future Volume Tables was utilized to derive a linear growth rate of 1.18 percent per year. This growth was applied over a period of two years to determine the year 2020 traffic volumes along Highway 99W. For all other turning movements, a conservative compounded background growth rate of two percent per year was applied for two years to derive the year 2020 background traffic volumes.

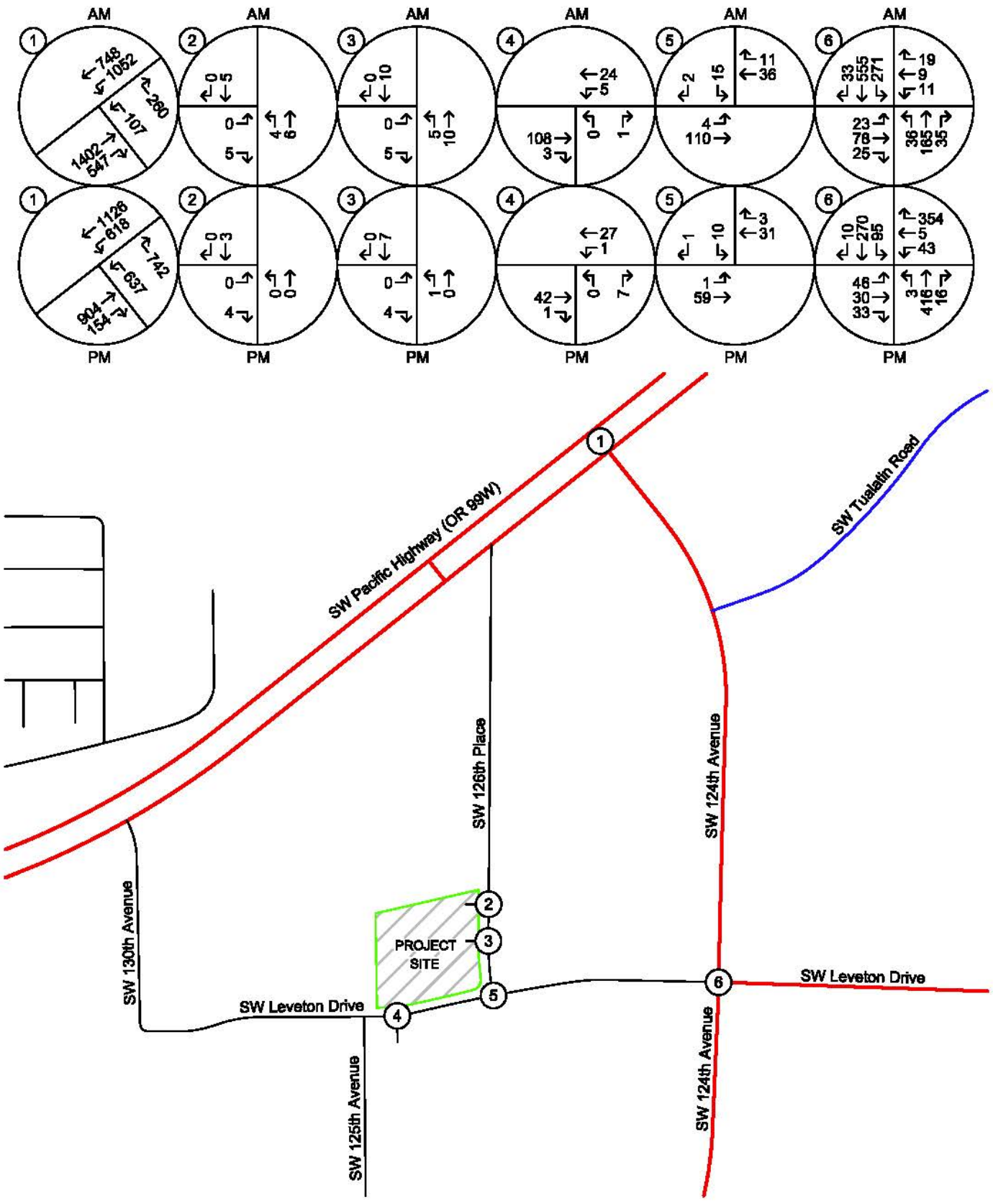
In addition to background growth, site trips associated with previously-approved developments in the site vicinity that have not yet been constructed were added to the study area intersections. These in-process developments included the Leveton Industrial Building currently under construction on the south side of SW Leveton Drive east of the subject property and the Ruth T LLC Building 6 / Suburban Door project located on the north side of SW Herman Road east of SW 124th Avenue. A diagram showing the in-process trips added to the study intersections is provided in the technical appendix.

Figure 4 on page 14 shows the projected year 2020 background traffic volumes at the study intersections during the morning and evening peak hours.

BACKGROUND VOLUMES PLUS SITE TRIPS

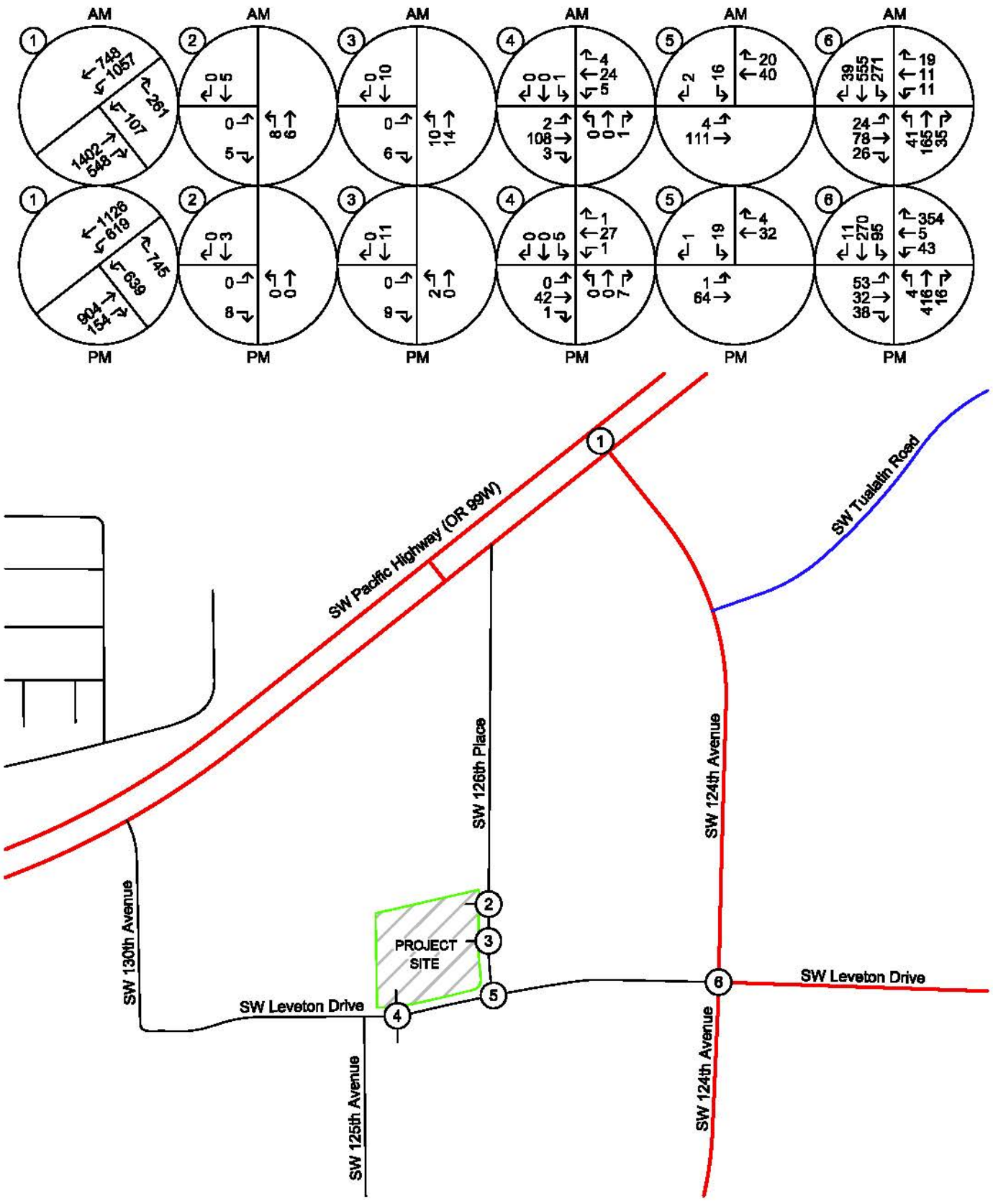
Peak hour trips calculated to be generated by the proposed development were added to the projected year 2020 background traffic volumes to obtain the year 2020 total traffic volumes following completion of the proposed building expansion.

Figure 5 on page 15 shows the projected year 2020 peak hour volumes including background growth, in-process trips from previously-approved development, and site trips from the proposed development during the morning and evening peak hours.



TRAFFIC VOLUMES
2020 Background Conditions
Morning and Evening Peak Hours

FIGURE 4



TRAFFIC VOLUMES
2020 Backround Plus Site Trips Conditions
Morning and Evening Peak Hours

FIGURE 5

OPERATIONAL ANALYSIS

The future conditions operational analysis was again conducted using Synchro 10 software. The analysis was prepared for each intersection's respective morning and evening peak hour.

The results of the future conditions operational analysis are summarized in Table 3 below. Detailed analysis worksheets are included in the technical appendix.

Table 3 - Operational Analysis Summary: Year 2020 Future Conditions

Intersection	AM Peak Hour			PM Peak Hour		
	Delay	LOS	v/c	Delay	LOS	v/c
Highway 99W at SW 124th Avenue						
2020 Background Conditions	37.9	D	0.89	29.6	C	0.77
2020 Background plus Site	38.2	D	0.89	29.6	C	0.77
SW 126th Place at North Site Access						
2020 Background Conditions	8.4	A	0.01	8.4	A	0.01
2020 Background plus Site	8.4	A	0.01	8.4	A	0.01
SW 126th Place at South Site Access						
2020 Background Conditions	8.4	A	0.01	8.4	A	0.01
2020 Background plus Site	8.4	A	0.01	8.5	A	0.01
SW Leveton Drive at West Site Access						
2020 Background Conditions	9.1	A	0.01	8.8	A	0.01
2020 Background plus Site	9.6	A	0.01	9.1	A	0.01
SW Leveton Drive at SW 126th Place						
2020 Background Conditions	9.6	A	0.02	9.3	A	0.01
2020 Background plus Site	9.7	A	0.02	9.4	A	0.03
SW Leveton Drive at SW 124th Avenue						
2020 Background Conditions	13.6	B	0.39	33.7	C	0.31
2020 Background plus Site	13.8	B	0.39	34.0	C	0.32

Based on the results of the operational analysis, all intersections are projected to operate acceptably through year 2020 either with or without the addition of site trips from the proposed development.

QUEUING ANALYSIS

A queuing analysis was also conducted for the study area intersections. The queue lengths were determined using a Synchro/SimTraffic simulation and reflect the 95th percentile queue lengths. This means that the queue lengths will be less than or equal to the reported values during 95 percent of the peak hours.

The projected queue lengths for the public-street intersections are reported in the table on the following page. Queue lengths at the driveway intersections were determined to be negligible for all analysis scenarios. Detailed queuing analysis worksheets are included in the technical appendix.

Table 4 - Queuing Analysis Results

Intersection and Turning Movement	Existing Storage Length	2018 Existing Conditions		2020 Background Conditions		2020 Background + Proposed Trips	
		AM	PM	AM	PM	AM	PM
Highway 99W at SW 124th Ave.							
Northwest-Bound Left-Turn Lane	310'	101'	280'	136'	287'	136'	303'
Northwest-Bound Right-Turn Lane	310'	54'	241'	198'	231'	196'	252'
Northeast-Bound Right-Turn Lane	250'	**275'**	200'	**325'**	204'	**326'**	225'
Southwest-Bound Left-Turn Lane	700'	633'	336'	688'	352'	668'	366'
SW Leveton Dr. at SW 126th Pl.							
Eastbound Left-Turn Lane	140'	0'	0'	6'	0'	4'	0'
Southbound Left-Turn Lane	100'	32'	31'	31'	32'	35'	46'
Southbound Right-Turn Lane	100'	10'	6'	12'	5'	13'	9'
SW 124th Ave. at SW Leveton Dr.							
Eastbound Left-Turn Lane	110'	75'	72'	88'	86'	82'	95'
Westbound Left-Turn Lane	160'	40'	99'	43'	97'	55'	88'
Northbound Left-Turn Lane	210'	45'	9'	51'	12'	61'	15'
Southbound Left-Turn Lane	240'	115'	66'	130'	78'	130'	72'

Queue lengths in excess of the available storage are shown in **bold**.

Based on the queuing analysis, the intersections of SW Leveton Drive at SW 126th Place and SW Leveton Drive at SW 124th Avenue are projected to operate with queues less than the available storage lengths under all analysis scenarios. The intersection of Highway 99W at SW 124th Avenue is projected to operate with northeast-bound right-turn queues that exceed the available storage length during the morning peak hour under all analysis scenarios. Under existing conditions, the 95th percentile queue length exceeds the storage length by approximately one vehicle. Under year 2020 traffic conditions, the 95th percentile queue length is projected to exceed the available storage length by approximately three vehicles either with or without the addition of site trips from the proposed building expansion. However, since the queues in the adjacent northeast-bound through lanes are in excess of the projected right-turn queue lengths, the additional right-turning vehicles can safely share the through lane while waiting to maneuver into the right-turn lane. Accordingly, no queuing-related mitigation is necessary or recommended.

SAFETY ANALYSIS

CRASH DATA ANALYSIS

Using data obtained from the Oregon Department of Transportation, a review of the five most recent years of available crash history (from January 2012 to December 2016) was performed for the study intersections. The crash data was evaluated based on the number, type, and severity of collisions, as well as the intersection crash rate. Crash rates allow comparison of relative safety risks at intersections with different lane configurations, volumes, and traffic control devices by accounting for both the number of crashes that occur during the study period and the number of vehicles that traveled through the intersection during that period. Crash rates are calculated using the standard assumption that evening peak hour volumes are approximately 10 percent of the average daily traffic volume at an intersection. The crash rates were compared to statewide crash rates for similar intersection types in order to identify any locations with crash rates in excess of the 90th percentile.

The intersection of Oregon Highway 99W at SW 124th Avenue had eight reported crashes during the five-year analysis period. These included five rear-end collisions and three turning-movement collisions. The crashes resulted in no serious injuries or fatalities, but there were seven reports of a "possible injury/complaint of pain". The crash rate for the intersection was calculated to be 0.109 crashes per million entering vehicles. This is well below the 90th percentile crash rate of 0.509 crashes per million entering vehicles for urban signalized T-intersections in the state of Oregon.

The intersection of SW Leveton Drive at SW 126th Place had no reported crashes during the five-year analysis period.

The intersection of SW Leveton Drive at SW 124th Avenue had one reported crash during the five-year analysis period. It was a turning-movement collision in which a southbound driver turning left onto SW Leveton Drive failed to yield to oncoming traffic and was struck by a northbound vehicle. The crash resulted in a report of a "possible injury/complaint of pain". The crash rate for the intersection was calculated to be 0.044 crashes per million entering vehicles. This is well below the 90th percentile crash rate of 0.86 crashes per million entering vehicles for urban signalized four-way intersections in the state of Oregon.

Based on the crash data, no significant safety hazards were identified, and no specific safety mitigations are recommended.

SIGHT DISTANCE

Intersection sight distance was examined for the proposed new site access driveway on SW Leveton Drive. In accord with the procedures described in *A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS*, published by the American Association of State Highway and Transportation Officials (AASHTO), intersection sight distance was measured from a position 15 feet behind the edge of the traveled way at an elevation of 3.5 feet above the driveway surface to a point within the oncoming travel lanes 3.5 feet above the roadway surface. Based on the posted 35 mph speed limit, the minimum required intersection sight distance for efficient operation of the driveway is 390 feet in each direction.

Intersection sight distance for the proposed driveway at the southwest corner of the subject property onto SW Leveton Drive was measured to be in excess of 500 feet in each direction. Adequate sight lines are available for safe and efficient operation of the proposed driveway. No sight distance mitigations are necessary or recommended.

SAFETY FOR ALL MODES

Existing sidewalks are in place along the site frontages on SW Leveton Drive and on SW 126th Avenue. Continuous sidewalks also extend along the north side of SW Leveton Drive, on both sides of SW 124th Avenue, and along most roadways in the site vicinity.

Dedicated bike lanes are in place along both sides of Highway 99W, SW 124th Avenue, and SW Leveton Drive east of SW 124th Avenue in the site vicinity. SW 126th Avenue carries very low volumes of traffic at relatively low speeds and can safely accommodate both motor vehicle and bicycle traffic. SW Leveton Drive west of SW 124th Avenue can also operate as a shared roadway, or cyclists can choose to use the sidewalks to avoid traveling in the roadway.

Transit service is available at two locations within one half mile of the project site. The nearest stops are located along Highway 99W at SW 124th Avenue and at SW 130th Avenue. The stops serve TriMet lines 93, *Tigard/Sherwood*, and 94, *Pacific Highway/Sherwood*. Transit service is available from approximately 4:30 AM to 1:15 AM with typical headways of 15 minutes or less during peak weekday commute periods and off-peak headways of 60 minutes or less. Continuous sidewalks are available between the project site and the bus stop locations, and Highway 99W can be crossed safely within a signalized crosswalk at SW 124th Avenue.

Based on the detailed examination of facilities provided for alternative travel modes, the existing facilities are capable of safely supporting the proposed building expansion in addition to the existing uses in the site vicinity. No mitigations are necessary or recommended in conjunction with the proposed development.

WARRANT ANALYSIS

Warrants for installation of a left-turn lane on the major-street approach to an unsignalized intersection are primarily based on safety. Installation of a left-turn lane allows turning vehicles to move out of the through travel lane, reducing the risk of rear-end collisions and allowing time to select a safe gap in the opposing traffic stream. Left-turn lanes are already in place on the major-street approaches to the stop-controlled intersections. Accordingly, left-turn lane warrants are not applicable at the study intersections. No new left-turn lanes are recommended in conjunction with the proposed development.

Traffic signal warrants were also examined for the unsignalized study intersections to determine whether the installation of any new traffic signals will be warranted upon completion of the proposed development. By inspection, traffic volumes at the unsignalized intersection of SW Leveton Drive as well as the unsignalized driveway intersections are insufficient to warrant signalization. Accordingly, no new traffic signals are recommended in conjunction with the propose development.

CONCLUSIONS

Based on the operational analysis, all study area intersections are projected to operate acceptably per City of Tualatin, Washington County and ODOT standards through 2020 either with or without the addition of site trips from the proposed building expansion. No operational mitigations are necessary or recommended.

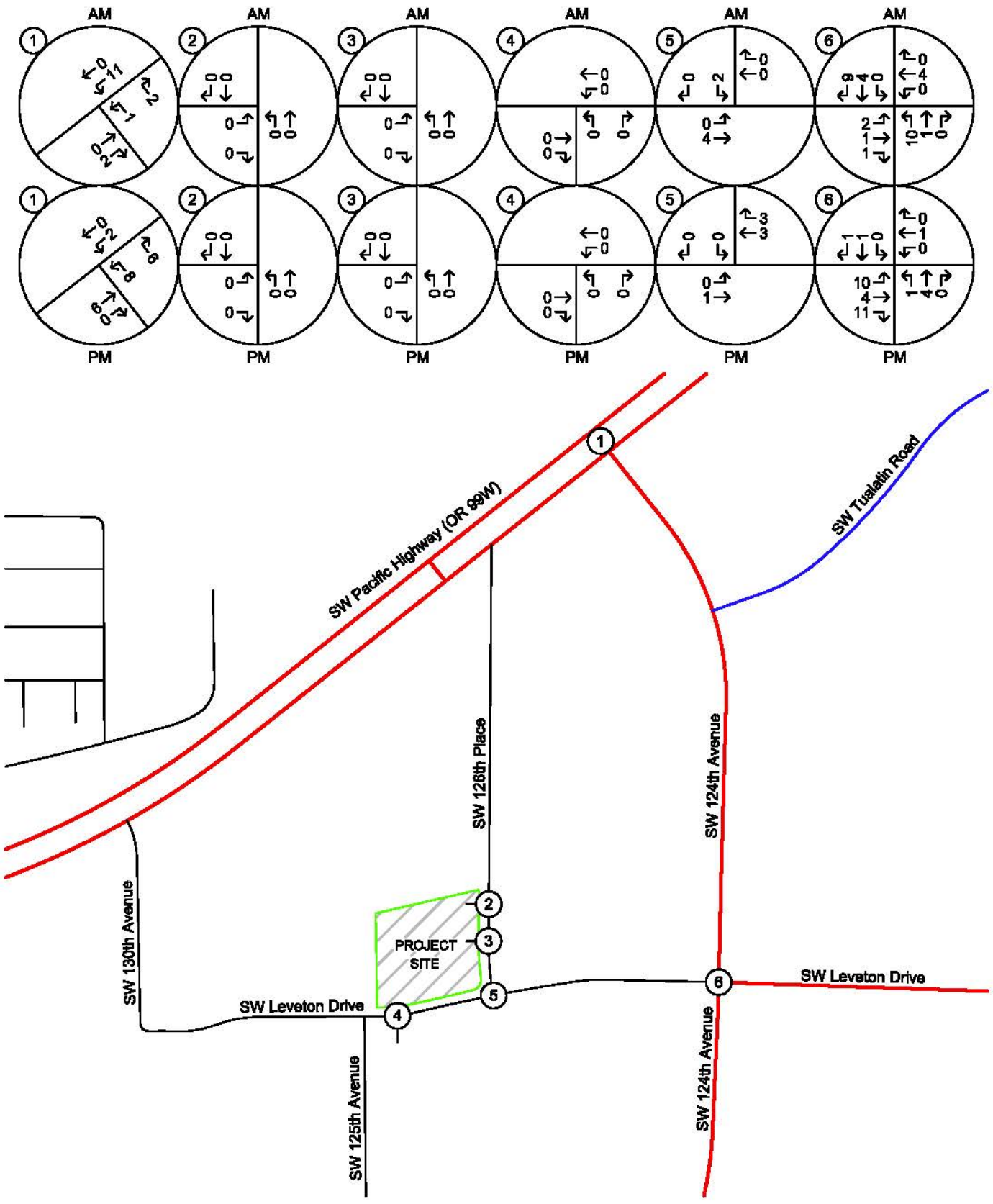
Based on the queuing analysis, the existing turn-lane storage lengths provided at the study intersections are adequate to safely accommodate the projected queues. No queuing-related mitigation is necessary or recommended.

Crash data for the most recent five years shows no significant crash trends that may be indicative of design deficiencies. No crash mitigations are recommended.

Intersection sight distance is adequate at the proposed new site access driveway location on SW Leveton Drive. No sight distance mitigations are recommended.

Based on the warrant analysis, no new traffic signals or left-turn lanes are recommended.

APPENDIX



TRAFFIC VOLUMES
In-Process Trips from Approved Developments
Morning and Evening Peak Hours

FIGURE 6

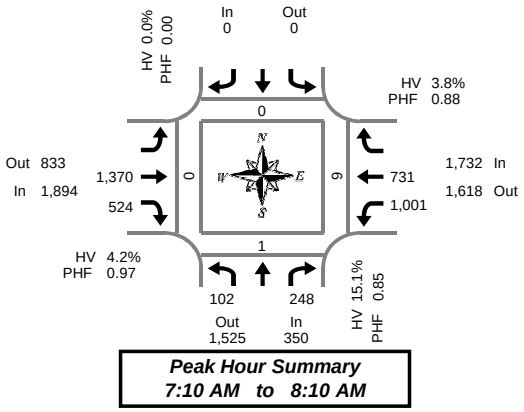
APP 1

Total Vehicle Summary

Clay Carney
(503) 833-2740

SW 124th Ave & Hwy 99

Wednesday, April 25, 2018
7:00 AM to 9:00 AM



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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound Hwy 99				Westbound Hwy 99				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes	T	R	Bikes	L	T		Bikes		North	South	East	West
7:00 AM	5		12	0				0	134	38	0	63	45		0	297	0	0	0	0
7:05 AM	10		16	0				0	96	32	0	52	60		0	266	0	0	1	0
7:10 AM	6		22	0				0	149	34	0	49	43		0	303	0	0	0	0
7:15 AM	7		25	0				0	100	25	0	81	58		0	296	0	0	3	0
7:20 AM	11		19	0				0	113	43	0	84	69		0	339	0	0	0	0
7:25 AM	10		15	0				0	129	37	0	91	84		0	366	0	1	4	0
7:30 AM	8		24	0				0	108	50	0	91	64		0	345	0	0	0	0
7:35 AM	9		18	0				0	112	34	0	80	60		0	313	0	0	0	0
7:40 AM	12		17	0				0	107	52	0	85	62		0	335	0	0	1	0
7:45 AM	8		20	0				0	106	55	0	104	60		0	353	0	0	0	0
7:50 AM	12		18	0				0	100	50	0	95	53		0	328	0	0	0	0
7:55 AM	7		29	0				0	97	48	0	98	80		0	359	0	0	1	0
8:00 AM	7		30	0				0	108	43	0	100	53		0	341	0	0	0	0
8:05 AM	5		11	0				0	141	53	0	43	45		0	298	0	0	0	0
8:10 AM	9		25	0				0	84	25	0	65	42		0	250	0	0	0	0
8:15 AM	10		31	0				0	83	35	0	56	42		0	257	0	0	2	0
8:20 AM	8		22	0				0	86	37	0	49	42		0	244	0	0	0	0
8:25 AM	10		24	0				0	88	26	0	51	48		0	247	0	0	0	0
8:30 AM	8		14	0				0	97	22	0	37	71		0	249	0	0	0	0
8:35 AM	14		19	0				0	75	25	0	44	50		0	227	0	0	0	0
8:40 AM	15		18	0				0	110	32	0	34	47		0	256	0	0	0	0
8:45 AM	11		17	0				0	90	18	0	34	51		0	221	0	0	2	0
8:50 AM	18		29	0				0	61	18	0	57	47		0	230	0	0	1	0
8:55 AM	20		23	0				0	84	21	0	27	54		0	229	0	0	0	0
Total Survey	240		498	0				0	2,458	853	0	1,570	1,330		0	6,949	0	1	15	0

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound Hwy 99				Westbound Hwy 99				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes	T	R	Bikes	L	T		Bikes		North	South	East	West
7:00 AM	21		50	0				0	379	104	0	164	148		0	866	0	0	1	0
7:15 AM	28		59	0				0	342	105	0	256	211		0	1,001	0	1	7	0
7:30 AM	29		59	0				0	327	136	0	256	186		0	993	0	0	1	0
7:45 AM	27		67	0				0	303	153	0	297	193		0	1,040	0	0	1	0
8:00 AM	21		66	0				0	333	121	0	208	140		0	889	0	0	0	0
8:15 AM	28		77	0				0	257	98	0	156	132		0	748	0	0	2	0
8:30 AM	37		51	0				0	282	79	0	115	168		0	732	0	0	0	0
8:45 AM	49		69	0				0	235	57	0	118	152		0	680	0	0	3	0
Total Survey	240		498	0				0	2,458	853	0	1,570	1,330		0	6,949	0	1	15	0

Peak Hour Summary
7:10 AM to 8:10 AM

By Approach	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound Hwy 99				Westbound Hwy 99				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	350	1,525	1,875	0	0	0	0	0	1,894	833	2,727	0	1,732	1,618	3,350	0	3,976	0	1	9	0
%HV	15.1%				0.0%				4.2%				3.8%				5.0%				
PHF	0.85				0.00				0.97				0.88				0.95				

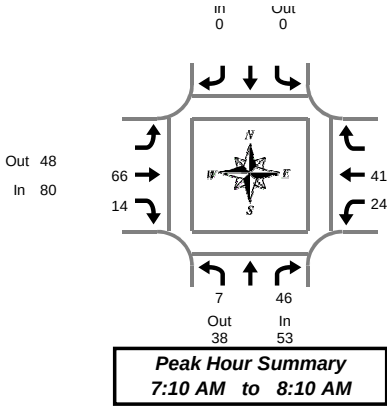
By Movement	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound Hwy 99				Westbound Hwy 99				Total
	L		R	Total				Total		T	R	Total	L	T		Total	
Volume	102		248	350				0		1,370	524	1,894	1,001	731		1,732	3,976
%HV	6.9%	NA	18.5%	15.1%	NA	NA	NA	0.0%	NA	4.8%	2.7%	4.2%	2.4%	5.6%	NA	3.8%	5.0%
PHF	0.80		0.81	0.85				0.00		0.95	0.83	0.97	0.84	0.84		0.88	0.95

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound Hwy 99				Westbound Hwy 99				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes	T	R	Bikes	L	T		Bikes		North	South	East	West
7:00 AM	105		235	0				0	1,351	498	0	973	738		0	3,900	0	1	10	0
7:15 AM	105		251	0				0	1,305	515	0	1,017	730		0	3,923	0	1	9	0
7:30 AM	105		269	0				0	1,220	508	0	917	651		0	3,670	0	0	4	0
7:45 AM	113		261	0				0	1,175	451	0	776	633		0	3,409	0	0	3	0
8:00 AM	135		263	0				0	1,107	355	0	597	592		0	3,049	0	0	5	0

Heavy Vehicle Summary

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



SW 124th Ave & Hwy 99

Wednesday, April 25, 2018
7:00 AM to 9:00 AM

Peak Hour Summary
7:10 AM to 8:10 AM

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound Hwy 99				Westbound Hwy 99				Interval Total
	L		R	Total				Total	T	R	Total		L	T		Total	
7:00 AM	0		1	1				0	5	1	6		6	2		8	15
7:05 AM	0		4	4				0	5	1	6		3	0		3	13
7:10 AM	1		3	4				0	4	3	7		0	1		1	12
7:15 AM	1		8	9				0	10	1	11		2	2		4	24
7:20 AM	1		5	6				0	4	0	4		3	7		10	20
7:25 AM	1		5	6				0	11	2	13		1	7		8	27
7:30 AM	0		3	3				0	6	1	7		3	4		7	17
7:35 AM	0		4	4				0	8	0	8		1	4		5	17
7:40 AM	0		2	2				0	0	1	1		3	1		4	7
7:45 AM	1		1	2				0	1	1	2		1	4		5	9
7:50 AM	1		4	5				0	7	3	10		2	3		5	20
7:55 AM	1		8	9				0	3	1	4		3	4		7	20
8:00 AM	0		1	1				0	4	1	5		4	2		6	12
8:05 AM	0		2	2				0	8	0	8		1	2		3	13
8:10 AM	0		4	4				0	4	0	4		2	2		4	12
8:15 AM	1		5	6				0	2	0	2		3	2		5	13
8:20 AM	2		3	5				0	4	1	5		5	4		9	19
8:25 AM	0		4	4				0	1	0	1		1	4		5	10
8:30 AM	0		2	2				0	6	4	10		2	4		6	18
8:35 AM	1		1	2				0	1	0	1		3	4		7	10
8:40 AM	1		2	3				0	7	2	9		1	3		4	16
8:45 AM	3		3	6				0	1	0	1		1	3		4	11
8:50 AM	4		8	12				0	2	2	4		3	4		7	23
8:55 AM	9		6	15				0	6	0	6		0	4		4	25
Total Survey	28		89	117				0	110	25	135		54	77		131	383

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound Hwy 99				Westbound Hwy 99				Interval Total
	L		R	Total				Total	T	R	Total		L	T		Total	
7:00 AM	1		8	9				0	14	5	19		9	3		12	40
7:15 AM	3		18	21				0	25	3	28		6	16		22	71
7:30 AM	0		9	9				0	14	2	16		7	9		16	41
7:45 AM	3		13	16				0	11	5	16		6	11		17	49
8:00 AM	0		7	7				0	16	1	17		7	6		13	37
8:15 AM	3		12	15				0	7	1	8		9	10		19	42
8:30 AM	2		5	7				0	14	6	20		6	11		17	44
8:45 AM	16		17	33				0	9	2	11		4	11		15	59
Total Survey	28		89	117				0	110	25	135		54	77		131	383

Heavy Vehicle Peak Hour Summary
7:10 AM to 8:10 AM

By Approach	Northbound SW 124th Ave			Southbound SW 124th Ave			Eastbound Hwy 99			Westbound Hwy 99			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	53	38	91	0	0	0	80	48	128	65	112	177	198
PHF	0.63			0.00			0.71			0.65			0.70

By Movement	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound Hwy 99				Westbound Hwy 99				Total
	L		R	Total				Total	T	R	Total		L	T		Total	
Volume	7		46	53				0	66	14	80		24	41		65	198
PHF	0.58		0.64	0.63				0.00	0.66	0.70	0.71		0.67	0.57		0.65	0.70

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

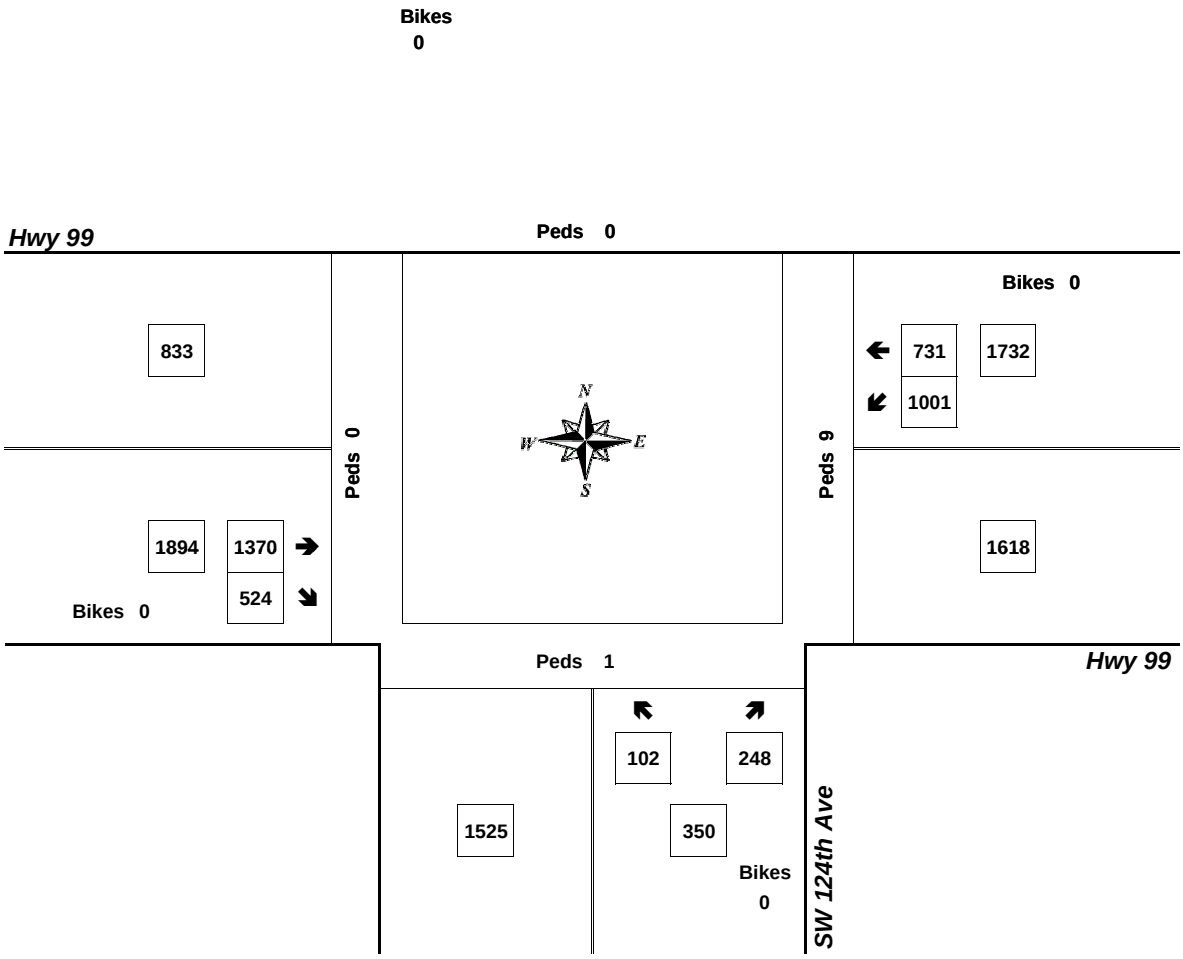
Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound Hwy 99				Westbound Hwy 99				Interval Total
	L		R	Total				Total	T	R	Total		L	T		Total	
7:00 AM	7		48	55				0	64	15	79		28	39		67	201
7:15 AM	6		47	53				0	66	11	77		26	42		68	198
7:30 AM	6		41	47				0	48	9	57		29	36		65	169
7:45 AM	8		37	45				0	48	13	61		28	38		66	172
8:00 AM	21		41	62				0	46	10	56		26	38		64	182

Peak Hour Summary

Clay Carney
(503) 833-2740

SW 124th Ave & Hwy 99

7:10 AM to 8:10 AM
Wednesday, April 25, 2018

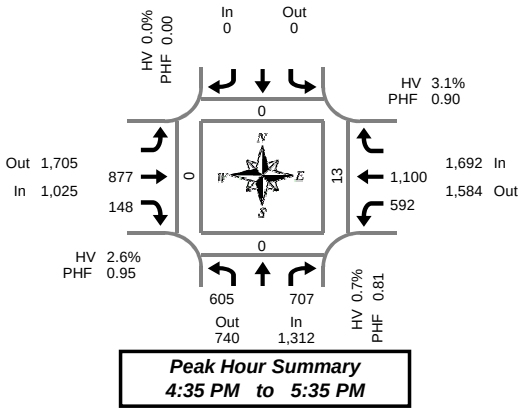


Approach	PHF	HV%	Volume
EB	0.97	4.2%	1,894
WB	0.88	3.8%	1,732
NB	0.85	15.1%	350
SB	0.00	0.0%	0
Intersection	0.95	5.0%	3,976

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

Total Vehicle Summary

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



SW 124th Ave & Hwy 99

Wednesday, April 25, 2018
4:00 PM to 6:00 PM

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound Hwy 99				Westbound Hwy 99				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes	T	R	Bikes	L	T		Bikes		North	South	East	West
4:00 PM	29		30	0				0	81	14	0	32	101		0	287	0	0	0	0
4:05 PM	65		60	0				0	68	8	1	34	93		0	328	0	0	1	0
4:10 PM	30		67	0				0	67	10	1	35	95		0	304	0	0	0	0
4:15 PM	46		52	0				0	67	10	0	49	133		0	357	0	0	0	0
4:20 PM	49		40	0				0	74	16	0	48	76		0	303	0	0	0	0
4:25 PM	40		58	0				0	80	6	0	32	121		0	337	0	0	0	0
4:30 PM	47		51	0				0	82	0	0	35	62		0	277	0	0	0	0
4:35 PM	54		63	0				0	73	10	0	40	98		0	338	0	0	0	0
4:40 PM	28		51	0				0	80	15	0	46	92		0	312	0	0	1	0
4:45 PM	62		61	0				0	69	13	0	38	63		0	306	0	0	1	0
4:50 PM	51		50	0				0	54	16	0	48	87		0	306	0	0	0	0
4:55 PM	30		37	1				0	91	13	0	45	111		0	327	0	0	1	0
5:00 PM	41		52	0				0	74	12	0	52	82		0	313	0	0	1	0
5:05 PM	79		95	0				0	69	11	0	52	89		0	395	0	0	4	0
5:10 PM	44		63	0				0	81	10	0	72	97		0	367	0	0	0	0
5:15 PM	55		69	0				0	52	11	0	55	99		1	341	0	0	3	0
5:20 PM	59		63	1				0	55	10	0	45	104		0	336	0	0	0	0
5:25 PM	55		55	0				0	92	15	0	40	120		0	377	0	0	2	0
5:30 PM	47		48	1				0	87	12	0	59	58		0	311	0	0	0	0
5:35 PM	38		43	0				0	74	11	0	45	82		0	293	0	0	0	0
5:40 PM	48		56	0				0	63	21	0	45	56		0	289	0	0	2	0
5:45 PM	36		38	1				0	84	24	0	33	73		0	288	0	0	1	0
5:50 PM	31		56	0				0	78	15	0	52	69		0	301	0	0	0	0
5:55 PM	27		42	0				0	72	7	0	37	52		0	237	0	0	0	0
Total Survey	1,091		1,300	4				0	1,767	290	2	1,069	2,113		1	7,630	0	0	17	0

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound Hwy 99				Westbound Hwy 99				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes	T	R	Bikes	L	T		Bikes		North	South	East	West
4:00 PM	124		157	0				0	216	32	2	101	289		0	919	0	0	1	0
4:15 PM	135		150	0				0	221	32	0	129	330		0	997	0	0	0	0
4:30 PM	129		165	0				0	235	25	0	121	252		0	927	0	0	1	0
4:45 PM	143		148	1				0	214	42	0	131	261		0	939	0	0	2	0
5:00 PM	164		210	0				0	224	33	0	176	268		0	1,075	0	0	5	0
5:15 PM	169		187	1				0	199	36	0	140	323		1	1,054	0	0	5	0
5:30 PM	133		147	1				0	224	44	0	149	196		0	893	0	0	2	0
5:45 PM	94		136	1				0	234	46	0	122	194		0	826	0	0	1	0
Total Survey	1,091		1,300	4				0	1,767	290	2	1,069	2,113		1	7,630	0	0	17	0

Peak Hour Summary
4:35 PM to 5:35 PM

By Approach	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound Hwy 99				Westbound Hwy 99				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	1,312	740	2,052	3	0	0	0	0	1,025	1,705	2,730	0	1,692	1,584	3,276	1	4,029	0	0	13	0
%HV	0.7%				0.0%				2.6%				3.1%				2.2%				
PHF	0.81				0.00				0.95				0.90				0.91				

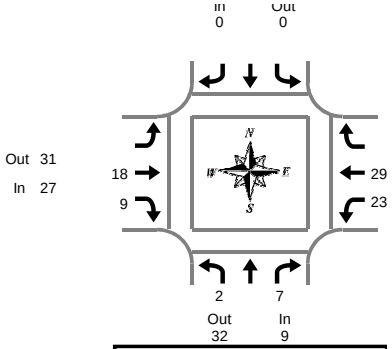
By Movement	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound Hwy 99				Westbound Hwy 99				Total
	L		R	Total				Total		T	R	Total	L	T		Total	
Volume	605		707	1,312				0		877	148	1,025	592	1,100		1,692	4,029
%HV	0.3%	NA	1.0%	0.7%	NA	NA	NA	0.0%	NA	2.1%	6.1%	2.6%	3.9%	2.6%	NA	3.1%	2.2%
PHF	0.85		0.78	0.81				0.00		0.94	0.84	0.95	0.83	0.85		0.90	0.91

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound Hwy 99				Westbound Hwy 99				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes	T	R	Bikes	L	T		Bikes		North	South	East	West
4:00 PM	531		620	1				0	886	131	2	482	1,132		0	3,782	0	0	4	0
4:15 PM	571		673	1				0	894	132	0	557	1,111		0	3,938	0	0	8	0
4:30 PM	605		710	2				0	872	136	0	568	1,104		1	3,995	0	0	13	0
4:45 PM	609		692	3				0	861	155	0	596	1,048		1	3,961	0	0	14	0
5:00 PM	560		680	3				0	881	159	0	587	981		1	3,848	0	0	13	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:35 PM to 5:35 PM

SW 124th Ave & Hwy 99

Wednesday, April 25, 2018
4:00 PM to 6:00 PM

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound Hwy 99				Westbound Hwy 99				Interval Total
	L		R	Total				Total	T	R	Total		L	T		Total	
4:00 PM	0		0	0				0	3	1	4		4	7		11	15
4:05 PM	0		1	1				0	6	1	7		1	6		7	15
4:10 PM	1		2	3				0	4	0	4		1	2		3	10
4:15 PM	0		2	2				0	0	2	2		2	4		6	10
4:20 PM	3		1	4				0	2	0	2		1	2		3	9
4:25 PM	2		3	5				0	5	0	5		0	3		3	13
4:30 PM	0		1	1				0	2	0	2		1	4		5	8
4:35 PM	0		0	0				0	1	1	2		2	2		4	6
4:40 PM	0		1	1				0	1	1	2		2	1		3	6
4:45 PM	1		0	1				0	2	1	3		0	1		1	5
4:50 PM	0		1	1				0	0	0	0		1	3		4	5
4:55 PM	1		0	1				0	0	2	2		1	1		2	5
5:00 PM	0		0	0				0	1	0	1		1	1		2	3
5:05 PM	0		2	2				0	4	1	5		2	3		5	12
5:10 PM	0		0	0				0	1	0	1		7	6		13	14
5:15 PM	0		0	0				0	2	0	2		3	2		5	7
5:20 PM	0		1	1				0	1	0	1		0	2		2	4
5:25 PM	0		2	2				0	4	3	7		2	5		7	16
5:30 PM	0		0	0				0	1	0	1		2	2		4	5
5:35 PM	0		1	1				0	1	3	4		2	3		5	10
5:40 PM	0		0	0				0	3	2	5		4	2		6	11
5:45 PM	0		1	1				0	3	3	6		1	3		4	11
5:50 PM	1		2	3				0	1	1	2		2	3		5	10
5:55 PM	0		0	0				0	1	0	1		0	0		0	1
Total Survey	9		21	30				0	49	22	71		42	68		110	211

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound Hwy 99				Westbound Hwy 99				Interval Total
	L		R	Total				Total	T	R	Total		L	T		Total	
4:00 PM	1		3	4				0	13	2	15		6	15		21	40
4:15 PM	5		6	11				0	7	2	9		3	9		12	32
4:30 PM	0		2	2				0	4	2	6		5	7		12	20
4:45 PM	2		1	3				0	2	3	5		2	5		7	15
5:00 PM	0		2	2				0	6	1	7		10	10		20	29
5:15 PM	0		3	3				0	7	3	10		5	9		14	27
5:30 PM	0		1	1				0	5	5	10		8	7		15	26
5:45 PM	1		3	4				0	5	4	9		3	6		9	22
Total Survey	9		21	30				0	49	22	71		42	68		110	211

Heavy Vehicle Peak Hour Summary
4:35 PM to 5:35 PM

By Approach	Northbound SW 124th Ave			Southbound SW 124th Ave			Eastbound Hwy 99			Westbound Hwy 99			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	9	32	41	0	0	0	27	31	58	52	25	77	88
PHF	0.75			0.00			0.68			0.57			0.67

By Movement	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound Hwy 99				Westbound Hwy 99				Total
	L		R	Total				Total	T	R	Total		L	T		Total	
Volume	2		7	9				0	18	9	27		23	29		52	88
PHF	0.25		0.58	0.75				0.00	0.64	0.75	0.68		0.48	0.66		0.57	0.67

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

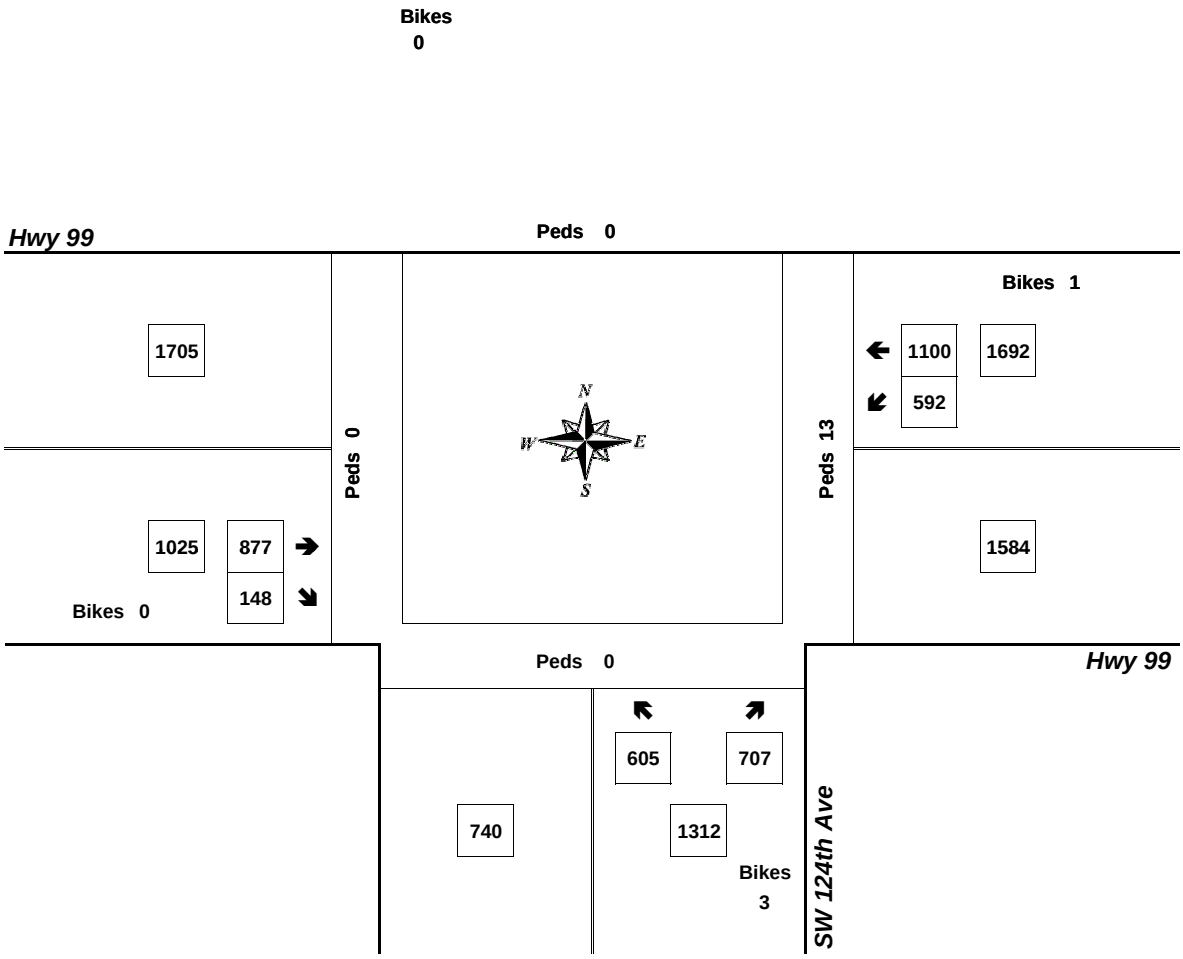
Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound Hwy 99				Westbound Hwy 99				Interval Total
	L		R	Total				Total	T	R	Total		L	T		Total	
4:00 PM	8		12	20				0	26	9	35		16	36		52	107
4:15 PM	7		11	18				0	19	8	27		20	31		51	96
4:30 PM	2		8	10				0	19	9	28		22	31		53	91
4:45 PM	2		7	9				0	20	12	32		25	31		56	97
5:00 PM	1		9	10				0	23	13	36		26	32		58	104

Peak Hour Summary

Clay Carney
(503) 833-2740

SW 124th Ave & Hwy 99

4:35 PM to 5:35 PM
Wednesday, April 25, 2018

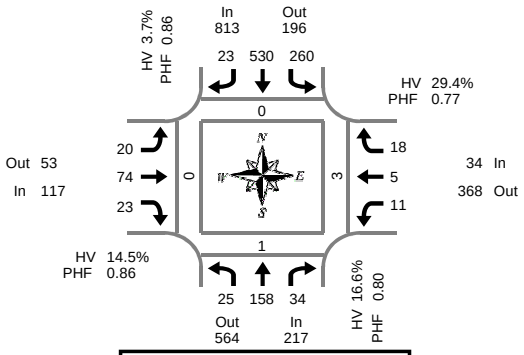


Approach	PHF	HV%	Volume
EB	0.95	2.6%	1,025
WB	0.90	3.1%	1,692
NB	0.81	0.7%	1,312
SB	0.00	0.0%	0
Intersection	0.91	2.2%	4,029

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

Total Vehicle Summary

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



Peak Hour Summary
7:10 AM to 8:10 AM

SW 124th Ave & SW Leveton Dr

Wednesday, April 25, 2018
7:00 AM to 9:00 AM

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				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	2	4	0	0	8	49	4	0	3	5	2	0	2	0	1	0	80	0	0	0	0
7:05 AM	2	15	3	0	12	21	2	0	1	1	2	0	1	0	2	0	62	0	0	0	0
7:10 AM	0	14	3	0	14	32	0	0	2	4	3	0	0	2	2	0	76	0	0	0	0
7:15 AM	5	14	2	0	16	34	1	0	4	3	0	0	1	0	0	0	80	0	0	0	0
7:20 AM	2	11	1	0	22	57	2	0	2	5	3	0	1	1	2	0	109	0	0	0	0
7:25 AM	1	8	3	0	18	42	2	0	4	6	2	0	1	0	4	0	91	0	0	0	0
7:30 AM	2	13	0	1	21	68	4	0	2	7	0	0	0	0	1	0	118	0	0	1	0
7:35 AM	2	14	4	0	13	52	1	0	1	8	4	0	0	0	2	0	101	0	0	0	0
7:40 AM	2	10	7	0	21	49	2	0	1	5	1	0	1	1	0	0	100	0	1	1	0
7:45 AM	1	14	4	0	27	50	4	0	1	5	2	0	1	0	1	0	110	0	0	1	0
7:50 AM	2	10	0	0	20	50	2	0	0	8	2	0	0	0	3	0	97	0	0	0	0
7:55 AM	4	18	3	0	37	34	0	0	1	12	1	0	3	0	0	0	113	0	0	0	0
8:00 AM	1	17	6	0	20	43	3	0	1	6	2	0	1	1	3	0	104	0	0	0	0
8:05 AM	3	15	1	0	31	19	2	0	1	5	3	0	2	0	0	0	82	0	0	0	0
8:10 AM	2	14	2	0	17	23	1	0	3	4	2	0	0	0	1	0	69	0	0	1	0
8:15 AM	3	20	2	0	24	26	1	0	1	6	0	0	1	0	3	0	87	0	0	0	0
8:20 AM	1	14	1	0	22	22	1	0	1	8	0	0	1	0	3	0	74	0	0	0	0
8:25 AM	2	12	2	0	16	21	1	0	1	1	0	0	0	0	3	0	59	0	0	0	0
8:30 AM	0	14	2	0	16	27	3	0	0	3	0	0	0	0	0	0	65	0	0	0	0
8:35 AM	1	15	4	0	22	20	2	0	0	2	0	0	0	0	1	0	67	0	0	0	0
8:40 AM	0	16	3	0	18	18	3	0	4	1	2	0	1	0	1	0	67	0	0	0	0
8:45 AM	3	16	2	0	11	15	1	0	0	5	1	0	1	0	1	0	56	0	0	0	0
8:50 AM	1	20	1	0	17	20	1	0	0	4	1	0	1	1	2	0	69	0	0	0	0
8:55 AM	1	13	3	0	9	13	0	0	1	3	2	0	1	0	5	0	51	0	0	2	0
Total Survey	43	331	59	1	452	805	43	0	35	117	35	0	20	6	41	0	1,987	0	1	6	0

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				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	4	33	6	0	34	102	6	0	6	10	7	0	3	2	5	0	218	0	0	0	0
7:15 AM	8	33	6	0	56	133	5	0	10	14	5	0	3	1	6	0	280	0	0	0	0
7:30 AM	6	37	11	1	55	169	7	0	4	20	5	0	1	1	3	0	319	0	1	2	0
7:45 AM	7	42	7	0	84	134	6	0	2	25	5	0	4	0	4	0	320	0	0	1	0
8:00 AM	6	46	9	0	68	85	6	0	5	15	7	0	3	1	4	0	255	0	0	1	0
8:15 AM	6	46	5	0	62	69	3	0	3	15	0	0	2	0	9	0	220	0	0	0	0
8:30 AM	1	45	9	0	56	65	8	0	4	6	2	0	1	0	2	0	199	0	0	0	0
8:45 AM	5	49	6	0	37	48	2	0	1	12	4	0	3	1	8	0	176	0	0	2	0
Total Survey	43	331	59	1	452	805	43	0	35	117	35	0	20	6	41	0	1,987	0	1	6	0

Peak Hour Summary
7:10 AM to 8:10 AM

By Approach	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	217	564	781	1	813	196	1,009	0	117	53	170	0	34	368	402	0	1,181	0	1	3	0
%HV	16.6%				3.7%				14.5%				29.4%				7.9%				
PHF	0.80				0.86				0.86				0.77				0.92				

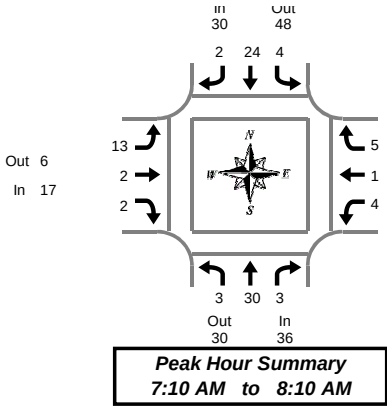
By Movement	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	25	158	34	217	260	530	23	813	20	74	23	117	11	5	18	34	1,181
%HV	12.0%	19.0%	8.8%	16.6%	1.5%	4.5%	8.7%	3.7%	65.0%	2.7%	8.7%	14.5%	36.4%	20.0%	27.8%	29.4%	7.9%
PHF	0.78	0.79	0.57	0.80	0.74	0.78	0.72	0.86	0.50	0.71	0.82	0.86	0.46	0.42	0.64	0.77	0.92

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				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	25	145	30	1	229	538	24	0	22	69	22	0	11	4	18	0	1,137	0	1	3	0
7:15 AM	27	158	33	1	263	521	24	0	21	74	22	0	11	3	17	0	1,174	0	1	4	0
7:30 AM	25	171	32	1	269	457	22	0	14	75	17	0	10	2	20	0	1,114	0	1	4	0
7:45 AM	20	179	30	0	270	353	23	0	14	61	14	0	10	1	19	0	994	0	0	2	0
8:00 AM	18	186	29	0	223	267	19	0	13	48	13	0	9	2	23	0	850	0	0	3	0

Heavy Vehicle Summary

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



SW 124th Ave & SW Leveton Dr

Wednesday, April 25, 2018
7:00 AM to 9:00 AM

Peak Hour Summary
7:10 AM to 8:10 AM

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	0	0	0	0	1	7	1	9	1	0	0	1	1	0	0	1	11
7:05 AM	0	4	2	6	0	2	1	3	0	1	1	2	1	0	0	1	12
7:10 AM	0	2	1	3	2	3	0	5	1	1	1	3	0	0	1	1	12
7:15 AM	1	5	0	6	1	1	0	2	3	0	0	3	1	0	0	1	12
7:20 AM	0	4	0	4	0	2	0	2	2	0	0	2	1	0	1	2	10
7:25 AM	0	2	1	3	1	1	0	2	3	1	0	4	0	0	1	1	10
7:30 AM	1	0	0	1	0	3	0	3	1	0	0	1	0	0	0	0	5
7:35 AM	0	2	0	2	0	0	0	0	1	0	1	2	0	0	0	0	4
7:40 AM	0	0	1	1	0	3	0	3	1	0	0	1	0	0	0	0	5
7:45 AM	0	2	0	2	0	1	1	2	0	0	0	0	0	0	0	0	4
7:50 AM	0	4	0	4	0	4	0	4	0	0	0	0	0	0	2	2	10
7:55 AM	0	6	0	6	0	2	0	2	1	0	0	1	1	0	0	1	10
8:00 AM	1	0	0	1	0	3	1	4	0	0	0	0	0	1	0	1	6
8:05 AM	0	3	0	3	0	1	0	1	0	0	0	0	1	0	0	1	5
8:10 AM	1	3	0	4	0	2	0	2	2	0	1	3	0	0	0	0	9
8:15 AM	1	3	0	4	0	2	1	3	0	0	0	0	0	0	0	0	7
8:20 AM	0	2	1	3	0	3	0	3	1	0	0	1	0	0	0	0	7
8:25 AM	0	3	0	3	1	2	0	3	0	0	0	0	0	0	0	0	6
8:30 AM	0	2	0	2	1	1	0	2	0	0	0	0	0	0	0	0	4
8:35 AM	0	2	1	3	0	5	0	5	0	0	0	0	0	0	0	0	8
8:40 AM	0	3	1	4	0	1	0	1	0	0	0	0	1	0	0	1	6
8:45 AM	1	6	0	7	0	1	0	1	0	0	0	0	0	0	0	0	8
8:50 AM	1	6	0	7	1	2	0	3	0	0	0	0	0	1	0	1	11
8:55 AM	1	6	0	7	0	0	0	0	1	1	0	2	0	0	1	1	10
Total Survey	8	70	8	86	8	52	5	65	18	4	4	26	7	2	6	15	192

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	0	6	3	9	3	12	2	17	2	2	2	6	2	0	1	3	35
7:15 AM	1	11	1	13	2	4	0	6	8	1	0	9	2	0	2	4	32
7:30 AM	1	2	1	4	0	6	0	6	3	0	1	4	0	0	0	0	14
7:45 AM	0	12	0	12	0	7	1	8	1	0	0	1	1	0	2	3	24
8:00 AM	2	6	0	8	0	6	1	7	2	0	1	3	1	1	0	2	20
8:15 AM	1	8	1	10	1	7	1	9	1	0	0	1	0	0	0	0	20
8:30 AM	0	7	2	9	1	7	0	8	0	0	0	0	1	0	0	1	18
8:45 AM	3	18	0	21	1	3	0	4	1	1	0	2	0	1	1	2	29
Total Survey	8	70	8	86	8	52	5	65	18	4	4	26	7	2	6	15	192

Heavy Vehicle Peak Hour Summary
7:10 AM to 8:10 AM

By Approach	Northbound SW 124th Ave			Southbound SW 124th Ave			Eastbound SW Leveton Dr			Westbound SW Leveton Dr			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	36	30	66	30	48	78	17	6	23	10	9	19	93
PHF	0.69			0.75			0.47			0.63			0.68

By Movement	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	3	30	3	36	4	24	2	30	13	2	2	17	4	1	5	10	93
PHF	0.75	0.63	0.75	0.69	0.33	0.67	0.50	0.75	0.41	0.50	0.50	0.47	0.50	0.25	0.63	0.63	0.68

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

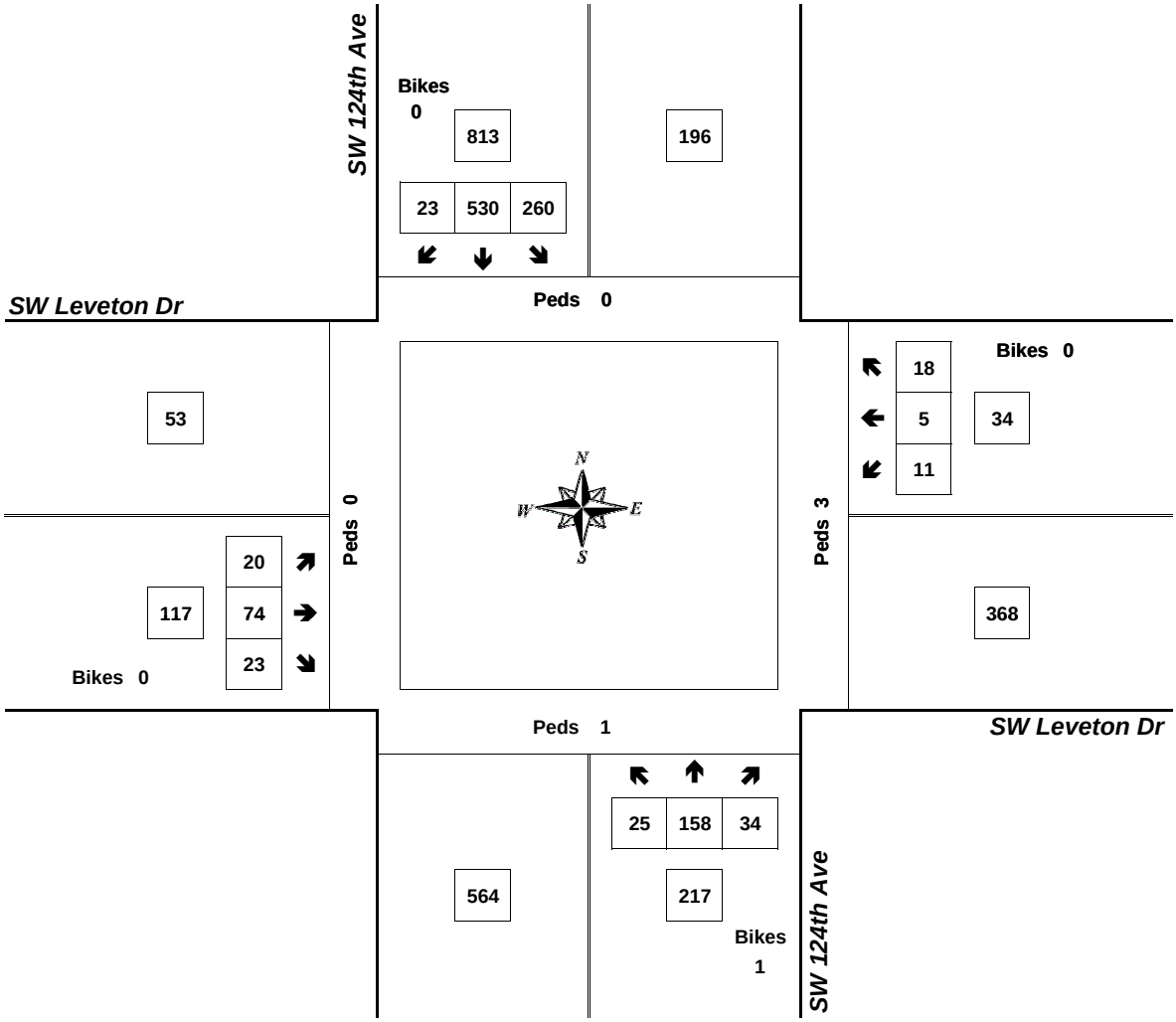
Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	2	31	5	38	5	29	3	37	14	3	3	20	5	0	5	10	105
7:15 AM	4	31	2	37	2	23	2	27	14	1	2	17	4	1	4	9	90
7:30 AM	4	28	2	34	1	26	3	30	7	0	2	9	2	1	2	5	78
7:45 AM	3	33	3	39	2	27	3	32	4	0	1	5	3	1	2	6	82
8:00 AM	6	39	3	48	3	23	2	28	4	1	1	6	2	2	1	5	87

Peak Hour Summary

Clay Carney
(503) 833-2740

SW 124th Ave & SW Leveton Dr

7:10 AM to 8:10 AM
Wednesday, April 25, 2018

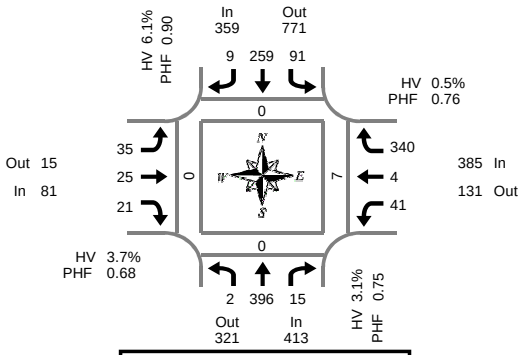


Approach	PHF	HV%	Volume
EB	0.86	14.5%	117
WB	0.77	29.4%	34
NB	0.80	16.6%	217
SB	0.86	3.7%	813
Intersection	0.92	7.9%	1,181

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

Total Vehicle Summary

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



Peak Hour Summary
4:35 PM to 5:35 PM

SW 124th Ave & SW Leveton Dr

Wednesday, April 25, 2018
4:00 PM to 6:00 PM

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				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	33	1	0	1	11	2	0	4	2	3	0	0	1	17	0	76	0	0	0	0
4:05 PM	0	37	0	0	2	18	2	0	2	0	6	0	3	0	24	1	94	0	0	0	0
4:10 PM	1	41	1	0	1	17	3	0	1	2	2	0	1	0	20	0	90	0	1	0	0
4:15 PM	3	31	3	0	0	17	1	0	1	3	2	0	2	0	12	0	75	0	0	0	0
4:20 PM	1	31	4	0	7	30	2	0	2	3	4	0	2	2	15	0	103	0	0	0	0
4:25 PM	2	28	0	0	4	23	1	0	0	7	5	0	3	1	18	0	92	0	0	1	0
4:30 PM	1	35	2	0	2	15	0	0	5	2	4	0	5	0	23	0	94	0	0	0	0
4:35 PM	0	43	3	0	8	23	2	0	1	2	5	0	3	1	31	0	122	0	0	1	0
4:40 PM	0	28	1	0	7	18	0	0	8	5	2	0	3	1	30	0	103	0	0	0	0
4:45 PM	0	37	2	0	9	15	1	0	1	3	2	0	0	0	17	0	87	0	0	2	0
4:50 PM	0	22	3	1	14	17	0	0	0	6	3	0	4	0	18	0	87	0	0	0	0
4:55 PM	0	26	2	1	10	14	0	0	1	4	0	0	0	1	14	0	72	0	0	0	0
5:00 PM	0	42	0	0	8	34	1	0	8	0	2	0	6	0	28	0	129	0	0	0	0
5:05 PM	0	43	1	0	10	21	2	0	3	1	1	0	3	0	35	0	120	0	0	1	0
5:10 PM	2	50	0	0	4	16	2	0	2	2	0	0	5	0	30	0	113	0	0	1	0
5:15 PM	0	31	1	0	3	33	0	0	1	0	5	0	6	0	29	0	109	0	0	0	0
5:20 PM	0	23	0	0	5	22	0	0	2	0	0	0	2	0	38	0	92	0	0	0	0
5:25 PM	0	28	1	0	6	13	0	0	5	1	1	0	7	0	45	0	107	0	0	2	0
5:30 PM	0	23	1	0	7	33	1	0	3	1	0	0	2	1	25	0	97	0	0	0	0
5:35 PM	0	22	1	0	3	22	0	0	3	0	0	0	2	0	21	0	74	0	0	0	0
5:40 PM	0	29	0	0	5	26	3	0	0	0	0	0	4	0	27	0	94	0	0	0	0
5:45 PM	0	21	0	0	3	22	0	0	2	2	0	0	4	0	14	0	68	0	0	0	0
5:50 PM	1	29	0	0	3	18	0	0	0	0	0	0	3	0	19	0	73	0	0	0	0
5:55 PM	1	20	2	0	7	11	1	0	0	2	0	0	1	0	12	0	57	0	0	0	0
Total Survey	13	753	29	2	129	489	24	0	55	48	47	0	71	8	562	1	2,228	0	1	8	0

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				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	2	111	2	0	4	46	7	0	7	4	11	0	4	1	61	1	260	0	1	0	0
4:15 PM	6	90	7	0	11	70	4	0	3	13	11	0	7	3	45	0	270	0	0	1	0
4:30 PM	1	106	6	0	17	56	2	0	14	9	11	0	11	2	84	0	319	0	0	1	0
4:45 PM	0	85	7	2	33	46	1	0	2	13	5	0	4	1	49	0	246	0	0	2	0
5:00 PM	2	135	1	0	22	71	5	0	13	3	3	0	14	0	93	0	362	0	0	2	0
5:15 PM	0	82	2	0	14	68	0	0	8	1	6	0	15	0	112	0	308	0	0	2	0
5:30 PM	0	74	2	0	15	81	4	0	6	1	0	0	8	1	73	0	265	0	0	0	0
5:45 PM	2	70	2	0	13	51	1	0	2	4	0	0	8	0	45	0	198	0	0	0	0
Total Survey	13	753	29	2	129	489	24	0	55	48	47	0	71	8	562	1	2,228	0	1	8	0

Peak Hour Summary
4:35 PM to 5:35 PM

By Approach	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	413	321	734	2	359	771	1,130	0	81	15	96	0	385	131	516	0	1,238	0	0	7	0
%HV	3.1%				6.1%				3.7%				0.5%				3.2%				
PHF	0.75				0.90				0.68				0.76				0.85				

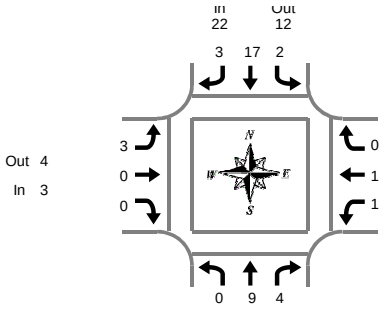
By Movement	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	2	396	15	413	91	259	9	359	35	25	21	81	41	4	340	385	1,238
%HV	0.0%	2.3%	26.7%	3.1%	2.2%	6.6%	33.3%	6.1%	8.6%	0.0%	0.0%	3.7%	2.4%	25.0%	0.0%	0.5%	3.2%
PHF	0.25	0.73	0.54	0.75	0.69	0.91	0.45	0.90	0.67	0.45	0.58	0.68	0.68	0.50	0.76	0.76	0.85

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				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	9	392	22	2	65	218	14	0	26	39	38	0	26	7	239	1	1,095	0	1	4	0
4:15 PM	9	416	21	2	83	243	12	0	32	38	30	0	36	6	271	0	1,197	0	0	6	0
4:30 PM	3	408	16	2	86	241	8	0	37	26	25	0	44	3	338	0	1,235	0	0	7	0
4:45 PM	2	376	12	2	84	266	10	0	29	18	14	0	41	2	327	0	1,181	0	0	6	0
5:00 PM	4	361	7	0	64	271	10	0	29	9	9	0	45	1	323	0	1,133	0	0	4	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



SW 124th Ave & SW Leveton Dr

Wednesday, April 25, 2018
4:00 PM to 6:00 PM

Peak Hour Summary
4:35 PM to 5:35 PM

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				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	2	2	4	0	0	0	0	0	1	1	2	7
4:05 PM	0	1	0	1	0	0	1	1	1	0	2	3	0	0	0	0	5
4:10 PM	1	4	1	6	0	0	2	2	0	0	0	0	0	0	0	0	8
4:15 PM	3	0	1	4	0	0	0	0	0	0	1	1	0	0	0	0	5
4:20 PM	1	4	1	6	0	1	2	3	0	0	0	0	0	2	0	2	11
4:25 PM	2	3	0	5	0	0	0	0	0	2	0	2	0	1	0	1	8
4:30 PM	1	3	0	4	0	1	0	1	0	1	0	1	1	0	0	1	7
4:35 PM	0	2	0	2	0	2	1	3	0	0	0	0	0	1	0	1	6
4:40 PM	0	4	0	4	0	1	0	1	1	0	0	1	0	0	0	0	6
4:45 PM	0	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0	2
4:50 PM	0	1	0	1	0	2	0	2	0	0	0	0	0	0	0	0	3
4:55 PM	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	2
5:00 PM	0	1	0	1	0	2	0	2	0	0	0	0	0	0	0	0	3
5:05 PM	0	1	1	2	2	1	0	3	1	0	0	1	1	0	0	1	7
5:10 PM	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	2
5:15 PM	0	0	1	1	0	1	0	1	1	0	0	1	0	0	0	0	3
5:20 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
5:25 PM	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	2
5:30 PM	0	0	1	1	0	1	1	2	0	0	0	0	0	0	0	0	3
5:35 PM	0	1	0	1	0	3	0	3	0	0	0	0	0	0	0	0	4
5:40 PM	0	0	0	0	0	2	2	4	0	0	0	0	0	0	1	1	5
5:45 PM	0	0	0	0	0	3	0	3	0	1	0	1	0	0	0	0	4
5:50 PM	0	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	2
5:55 PM	1	0	1	2	0	0	1	1	0	0	0	0	0	0	0	0	3
Total Survey	9	27	8	44	3	29	13	45	4	4	3	11	2	5	2	9	109

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

Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	1	6	1	8	0	2	5	7	1	0	2	3	0	1	1	2	20
4:15 PM	6	7	2	15	0	1	2	3	0	2	1	3	0	3	0	3	24
4:30 PM	1	9	0	10	0	4	1	5	1	1	0	2	1	1	0	2	19
4:45 PM	0	1	1	2	0	5	0	5	0	0	0	0	0	0	0	0	7
5:00 PM	0	2	1	3	2	4	1	7	1	0	0	1	1	0	0	1	12
5:15 PM	0	0	1	1	0	4	0	4	1	0	0	1	0	0	0	0	6
5:30 PM	0	1	1	2	0	6	3	9	0	0	0	0	0	0	1	1	12
5:45 PM	1	1	1	3	1	3	1	5	0	1	0	1	0	0	0	0	9
Total Survey	9	27	8	44	3	29	13	45	4	4	3	11	2	5	2	9	109

Heavy Vehicle Peak Hour Summary
4:35 PM to 5:35 PM

By Approach	Northbound SW 124th Ave			Southbound SW 124th Ave			Eastbound SW Leveton Dr			Westbound SW Leveton Dr			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	13	18	31	22	12	34	3	4	7	2	6	8	40
PHF	0.46			0.79			0.38			0.50			0.71

By Movement	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	0	9	4	13	2	17	3	22	3	0	0	3	1	1	0	2	40
PHF	0.00	0.38	0.50	0.46	0.25	0.71	0.75	0.79	0.38	0.00	0.00	0.38	0.25	0.25	0.00	0.50	0.71

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

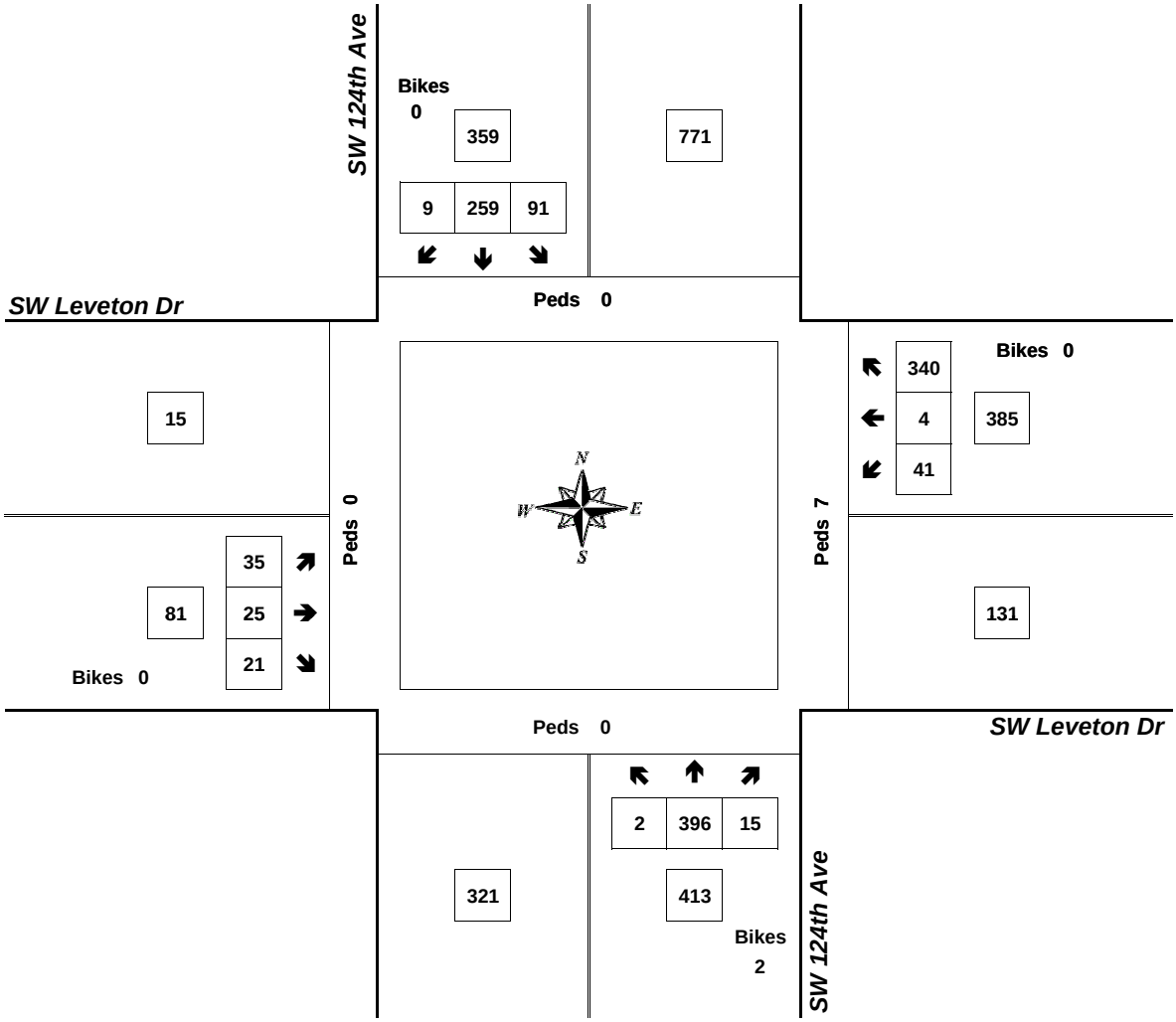
Interval Start Time	Northbound SW 124th Ave				Southbound SW 124th Ave				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	8	23	4	35	0	12	8	20	2	3	3	8	1	5	1	7	70
4:15 PM	7	19	4	30	2	14	4	20	2	3	1	6	2	4	0	6	62
4:30 PM	1	12	3	16	2	17	2	21	3	1	0	4	2	1	0	3	44
4:45 PM	0	4	4	8	2	19	4	25	2	0	0	2	1	0	1	2	37
5:00 PM	1	4	4	9	3	17	5	25	2	1	0	3	1	0	1	2	39

Peak Hour Summary

Clay Carney
(503) 833-2740

SW 124th Ave & SW Leveton Dr

4:35 PM to 5:35 PM
Wednesday, April 25, 2018

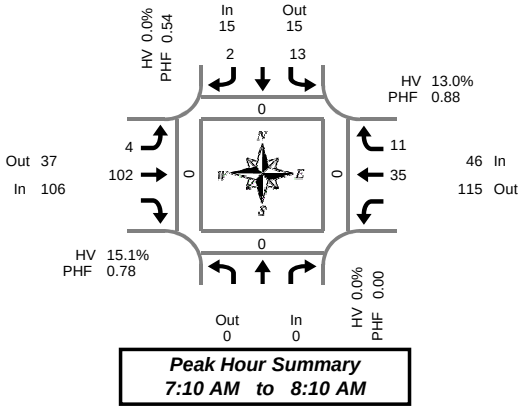


Approach	PHF	HV%	Volume
EB	0.68	3.7%	81
WB	0.76	0.5%	385
NB	0.75	3.1%	413
SB	0.90	6.1%	359
Intersection	0.85	3.2%	1,238

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

Total Vehicle Summary

Clay Carney
(503) 833-2740



SW 126th Pl & SW Leveton Dr

Wednesday, April 25, 2018
7:00 AM to 9:00 AM

Peak Hour Summary
7:10 AM to 8:10 AM

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

Interval Start Time	Northbound SW 126th Pl				Southbound SW 126th Pl				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Interval Total	Pedestrians Crosswalk			
				Bikes	L		R	Bikes	L	T		Bikes		T	R	Bikes		North	South	East	West
7:00 AM				0	0		0	0	0	4		0		2	0	0	6	0	0	0	0
7:05 AM				0	2		0	0	1	6		0		1	2	0	12	0	0	0	0
7:10 AM				0	1		0	0	0	7		0		3	1	0	12	0	0	0	0
7:15 AM				0	0		1	0	0	6		0		2	2	0	11	0	0	0	0
7:20 AM				0	2		0	0	1	7		0		2	0	0	12	0	0	0	0
7:25 AM				0	1		0	0	0	9		0		4	1	0	15	0	0	0	0
7:30 AM				0	0		0	0	0	6		0		3	0	0	9	0	0	0	0
7:35 AM				0	2		0	0	0	9		0		2	2	0	15	0	0	0	0
7:40 AM				0	3		0	0	1	6		0		3	1	0	14	0	0	0	0
7:45 AM				0	2		0	0	1	10		0		4	1	0	18	0	0	0	0
7:50 AM				0	0		0	0	1	10		0		3	1	0	15	0	0	0	0
7:55 AM				0	1		0	0	0	12		0		4	0	0	17	0	0	0	0
8:00 AM				0	0		1	0	0	9		0		2	2	0	14	0	0	0	0
8:05 AM				0	1		0	0	0	11		0		3	0	0	15	0	0	0	0
8:10 AM				0	0		0	0	1	7		0		3	1	0	12	0	0	0	0
8:15 AM				0	2		0	0	0	1		0		2	0	0	5	0	0	0	0
8:20 AM				0	2		0	0	0	6		0		0	1	0	9	0	0	0	0
8:25 AM				0	1		0	0	1	4		0		2	0	0	8	0	0	0	0
8:30 AM				0	0		0	0	0	7		0		3	1	0	11	0	0	0	0
8:35 AM				0	0		0	0	0	2		0		1	1	0	4	0	0	0	0
8:40 AM				0	1		0	0	1	3		0		5	1	0	11	0	0	0	0
8:45 AM				0	0		0	0	0	9		0		3	0	0	12	0	0	0	0
8:50 AM				0	0		2	0	0	7		0		1	2	0	12	0	0	0	0
8:55 AM				0	0		0	0	1	4		0		2	0	0	7	0	0	0	0
Total Survey				0	21		4	0	9	162		0		60	20	0	276	0	0	0	0

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

Interval Start Time	Northbound SW 126th Pl				Southbound SW 126th Pl				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Interval Total	Pedestrians Crosswalk			
				Bikes	L		R	Bikes	L	T		Bikes		T	R	Bikes		North	South	East	West
7:00 AM				0	3		0	0	1	17		0		6	3	0	30	0	0	0	0
7:15 AM				0	3		1	0	1	22		0		8	3	0	38	0	0	0	0
7:30 AM				0	5		0	0	1	21		0		8	3	0	38	0	0	0	0
7:45 AM				0	3		0	0	2	32		0		11	2	0	50	0	0	0	0
8:00 AM				0	1		1	0	1	27		0		8	3	0	41	0	0	0	0
8:15 AM				0	5		0	0	1	11		0		4	1	0	22	0	0	0	0
8:30 AM				0	1		0	0	1	12		0		9	3	0	26	0	0	0	0
8:45 AM				0	0		2	0	1	20		0		6	2	0	31	0	0	0	0
Total Survey				0	21		4	0	9	162		0		60	20	0	276	0	0	0	0

Peak Hour Summary
7:10 AM to 8:10 AM

By Approach	Northbound SW 126th Pl				Southbound SW 126th Pl				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	0	0	0	0	15	15	30	0	106	37	143	0	46	115	161	0	167	0	0	0	0
%HV	0.0%				0.0%				15.1%				13.0%				13.2%				
PHF	0.00				0.54				0.78				0.88				0.84				

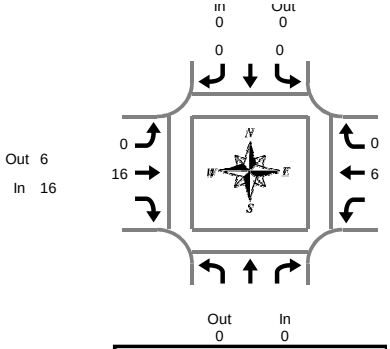
By Movement	Northbound SW 126th Pl				Southbound SW 126th Pl				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Total
				Total	L		R	Total	L	T		Total		T	R	Total	
Volume				0	13		2	15	4	102		106		35	11	46	167
%HV	NA	NA	NA	0.0%	0.0%	NA	0.0%	0.0%	0.0%	15.7%	NA	15.1%	NA	17.1%	0.0%	13.0%	13.2%
PHF				0.00	0.46		0.50	0.54	0.33	0.80		0.78		0.80	0.69	0.88	0.84

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

Interval Start Time	Northbound SW 126th Pl				Southbound SW 126th Pl				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Interval Total	Pedestrians Crosswalk			
				Bikes	L		R	Bikes	L	T		Bikes		T	R	Bikes		North	South	East	West
7:00 AM				0	14		1	0	5	92		0		33	11	0	156	0	0	0	0
7:15 AM				0	12		2	0	5	102		0		35	11	0	167	0	0	0	0
7:30 AM				0	14		1	0	5	91		0		31	9	0	151	0	0	0	0
7:45 AM				0	10		1	0	5	82		0		32	9	0	139	0	0	0	0
8:00 AM				0	7		3	0	4	70		0		27	9	0	120	0	0	0	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



SW 126th Pl & SW Leveton Dr

Wednesday, April 25, 2018
7:00 AM to 9:00 AM

Peak Hour Summary
7:10 AM to 8:10 AM

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

Interval Start Time	Northbound SW 126th Pl				Southbound SW 126th Pl				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Interval Total
				Total	L		R	Total	L	T		Total		T	R	Total	
7:00 AM				0	0		0	0	0	2		2		0	0	0	2
7:05 AM				0	0		0	0	0	2		2		1	0	1	3
7:10 AM				0	0		0	0	0	2		2		1	0	1	3
7:15 AM				0	0		0	0	0	2		2		0	0	0	2
7:20 AM				0	0		0	0	0	1		1		1	0	1	2
7:25 AM				0	0		0	0	0	4		4		0	0	0	4
7:30 AM				0	0		0	0	0	1		1		1	0	1	2
7:35 AM				0	0		0	0	0	2		2		0	0	0	2
7:40 AM				0	0		0	0	0	1		1		0	0	0	1
7:45 AM				0	0		0	0	0	0		0		0	0	0	0
7:50 AM				0	0		0	0	0	1		1		1	0	1	2
7:55 AM				0	0		0	0	0	0		0		0	0	0	0
8:00 AM				0	0		0	0	0	1		1		0	0	0	1
8:05 AM				0	0		0	0	0	1		1		2	0	2	3
8:10 AM				0	0		0	0	0	1		1		1	0	1	2
8:15 AM				0	0		0	0	0	1		1		1	0	1	2
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	1		1		0	0	0	1
8:35 AM				0	0		0	0	0	0		0		0	0	0	0
8:40 AM				0	0		0	0	0	0		0		1	0	1	1
8:45 AM				0	0		0	0	0	2		2		1	0	1	3
8:50 AM				0	0		0	0	0	1		1		1	0	1	2
8:55 AM				0	0		0	0	0	0		0		1	0	1	1
Total Survey				0	0		0	0	0	26		26		13	0	13	39

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

Interval Start Time	Northbound SW 126th Pl				Southbound SW 126th Pl				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Interval Total
				Total	L		R	Total	L	T		Total		T	R	Total	
7:00 AM				0	0		0	0	0	6		6		2	0	2	8
7:15 AM				0	0		0	0	0	7		7		1	0	1	8
7:30 AM				0	0		0	0	0	4		4		1	0	1	5
7:45 AM				0	0		0	0	0	1		1		1	0	1	2
8:00 AM				0	0		0	0	0	3		3		3	0	3	6
8:15 AM				0	0		0	0	0	1		1		1	0	1	2
8:30 AM				0	0		0	0	0	1		1		1	0	1	2
8:45 AM				0	0		0	0	0	3		3		3	0	3	6
Total Survey				0	0		0	0	0	26		26		13	0	13	39

Heavy Vehicle Peak Hour Summary
7:10 AM to 8:10 AM

By Approach	Northbound SW 126th Pl			Southbound SW 126th Pl			Eastbound SW Leveton Dr			Westbound SW Leveton Dr			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	0	0	0	0	0	0	16	6	22	6	16	22	22
PHF	0.00			0.00			0.57			0.75			0.69

By Movement	Northbound SW 126th Pl				Southbound SW 126th Pl				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Total
				Total	L		R	Total	L	T		Total		T	R	Total	
Volume				0	0		0	0	0	16		16		6	0	6	22
PHF				0.00	0.00		0.00	0.00	0.00	0.57		0.57		0.75	0.00	0.75	0.69

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

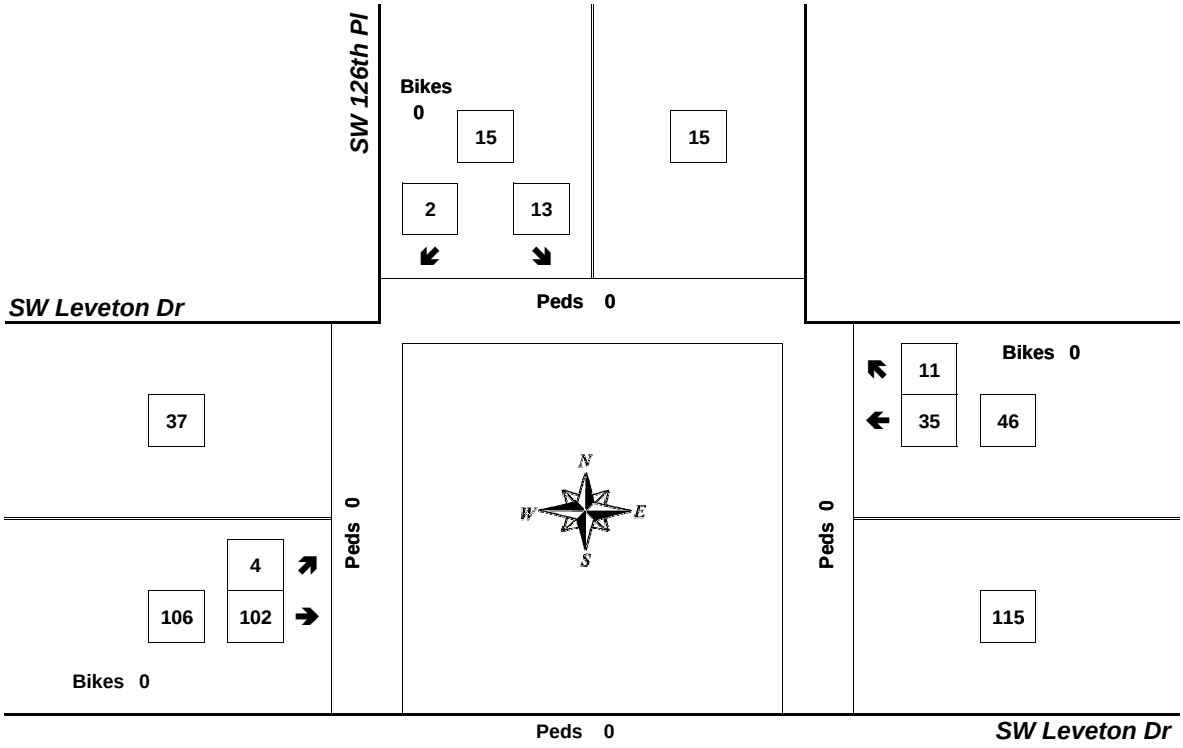
Interval Start Time	Northbound SW 126th Pl				Southbound SW 126th Pl				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Interval Total
				Total	L		R	Total	L	T		Total		T	R	Total	
7:00 AM				0	0		0	0	0	18		18		5	0	5	23
7:15 AM				0	0		0	0	0	15		15		6	0	6	21
7:30 AM				0	0		0	0	0	9		9		6	0	6	15
7:45 AM				0	0		0	0	0	6		6		6	0	6	12
8:00 AM				0	0		0	0	0	8		8		8	0	8	16

Peak Hour Summary

Clay Carney
(503) 833-2740

SW 126th Pl & SW Leveton Dr

7:10 AM to 8:10 AM
Wednesday, April 25, 2018



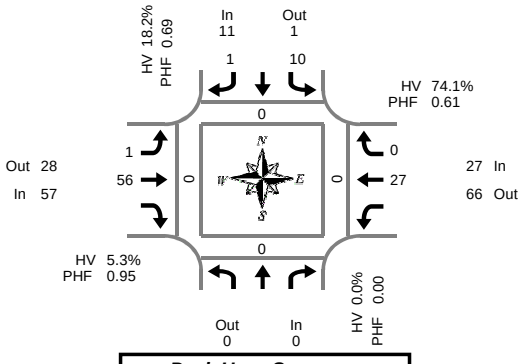
Bikes
0

Approach	PHF	HV%	Volume
EB	0.78	15.1%	106
WB	0.88	13.0%	46
NB	0.00	0.0%	0
SB	0.54	0.0%	15
Intersection	0.84	13.2%	167

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

Total Vehicle Summary

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



Peak Hour Summary
4:00 PM to 5:00 PM

SW 126th Pl & SW Leveton Dr

Wednesday, April 25, 2018
4:00 PM to 6:00 PM

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

Interval Start Time	Northbound SW 126th Pl				Southbound SW 126th Pl				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Interval Total	Pedestrians Crosswalk			
				Bikes	L		R	Bikes	L	T		Bikes		T	R	Bikes		North	South	East	West
4:00 PM				0	1		0	0	0	4		0		4	0	0	9	0	0	0	0
4:05 PM				0	2		0	0	1	2		0		2	0	0	7	0	0	0	0
4:10 PM				0	1		0	0	0	5		0		3	0	0	9	0	0	0	0
4:15 PM				0	1		0	0	0	5		0		3	0	0	9	0	0	0	0
4:20 PM				0	0		0	0	0	5		0		5	0	0	10	0	0	0	0
4:25 PM				0	2		0	0	0	5		0		3	0	0	10	0	0	0	0
4:30 PM				0	2		0	0	0	3		0		2	0	0	7	0	0	0	0
4:35 PM				0	0		0	0	0	7		0		3	0	0	10	0	0	0	0
4:40 PM				0	1		0	0	0	5		0		1	0	0	7	0	0	0	0
4:45 PM				0	0		0	0	0	3		0		0	0	0	3	0	0	0	0
4:50 PM				0	0		0	0	0	7		0		0	0	0	7	0	0	0	0
4:55 PM				0	0		1	0	0	5		0		1	0	0	7	0	0	0	0
5:00 PM				0	2		0	0	0	0		0		0	0	0	2	0	0	0	0
5:05 PM				0	0		0	0	0	3		0		1	0	0	4	0	0	0	0
5:10 PM				0	0		0	0	0	1		0		1	2	0	4	0	0	0	0
5:15 PM				0	2		0	0	0	1		0		1	0	0	4	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	2		0	0	0	1		0		0	0	0	3	0	0	0	0
5:30 PM				0	1		0	0	0	0		0		2	0	0	3	0	0	0	0
5:35 PM				0	0		0	0	0	1		0		0	1	0	2	0	0	0	0
5:40 PM				0	0		0	0	0	0		0		3	0	0	3	0	0	0	0
5:45 PM				0	0		0	0	0	3		0		0	0	0	3	0	0	0	0
5:50 PM				0	0		0	0	0	0		0		1	0	0	1	0	0	0	0
5:55 PM				0	0		0	0	0	2		0		2	0	0	4	0	0	0	0
Total Survey				0	17		1	0	1	68		0		38	3	0	128	0	0	0	0

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

Interval Start Time	Northbound SW 126th Pl				Southbound SW 126th Pl				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Interval Total	Pedestrians Crosswalk			
				Bikes	L		R	Bikes	L	T		Bikes		T	R	Bikes		North	South	East	West
4:00 PM				0	4		0	0	1	11		0		9	0	0	25	0	0	0	0
4:15 PM				0	3		0	0	0	15		0		11	0	0	29	0	0	0	0
4:30 PM				0	3		0	0	0	15		0		6	0	0	24	0	0	0	0
4:45 PM				0	0		1	0	0	15		0		1	0	0	17	0	0	0	0
5:00 PM				0	2		0	0	0	4		0		2	2	0	10	0	0	0	0
5:15 PM				0	4		0	0	0	2		0		1	0	0	7	0	0	0	0
5:30 PM				0	1		0	0	0	1		0		5	1	0	8	0	0	0	0
5:45 PM				0	0		0	0	0	5		0		3	0	0	8	0	0	0	0
Total Survey				0	17		1	0	1	68		0		38	3	0	128	0	0	0	0

Peak Hour Summary
4:00 PM to 5:00 PM

By Approach	Northbound SW 126th Pl				Southbound SW 126th Pl				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	0	0	0	0	11	1	12	0	57	28	85	0	27	66	93	0	95	0	0	0	0
%HV	0.0%				18.2%				5.3%				74.1%				26.3%				
PHF	0.00				0.69				0.95				0.61				0.82				

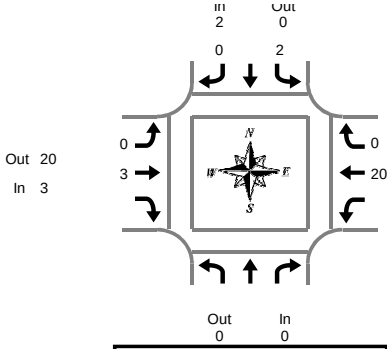
By Movement	Northbound SW 126th Pl				Southbound SW 126th Pl				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Total
				Total	L		R	Total	L	T		Total		T	R	Total	
Volume				0	10		1	11	1	56		57		27	0	27	95
%HV	NA	NA	NA	0.0%	20.0%	NA	0.0%	18.2%	0.0%	5.4%	NA	5.3%	NA	74.1%	0.0%	74.1%	26.3%
PHF				0.00	0.63		0.25	0.69	0.25	0.93		0.95		0.61	0.00	0.61	0.82

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

Interval Start Time	Northbound SW 126th Pl				Southbound SW 126th Pl				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Interval Total	Pedestrians Crosswalk			
				Bikes	L		R	Bikes	L	T		Bikes		T	R	Bikes		North	South	East	West
4:00 PM				0	10		1	0	1	56		0		27	0	0	95	0	0	0	0
4:15 PM				0	8		1	0	0	49		0		20	2	0	80	0	0	0	0
4:30 PM				0	9		1	0	0	36		0		10	2	0	58	0	0	0	0
4:45 PM				0	7		1	0	0	22		0		9	3	0	42	0	0	0	0
5:00 PM				0	7		0	0	0	12		0		11	3	0	33	0	0	0	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



SW 126th Pl & SW Leveton Dr

Wednesday, April 25, 2018
4:00 PM to 6:00 PM

Peak Hour Summary
4:00 PM to 5:00 PM

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

Interval Start Time	Northbound SW 126th Pl				Southbound SW 126th Pl				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Interval Total
				Total	L		R	Total	L	T		Total		T	R	Total	
4:00 PM				0	0		0	0	0	0		0		3	0	3	3
4:05 PM				0	0		0	0	0	0		0		1	0	1	1
4:10 PM				0	1		0	1	0	1		1		3	0	3	5
4:15 PM				0	1		0	1	0	1		1		3	0	3	5
4:20 PM				0	0		0	0	0	0		0		4	0	4	4
4:25 PM				0	0		0	0	0	0		0		2	0	2	2
4:30 PM				0	0		0	0	0	1		1		2	0	2	3
4:35 PM				0	0		0	0	0	0		0		2	0	2	2
4:40 PM				0	0		0	0	0	0		0		0	0	0	0
4:45 PM				0	0		0	0	0	0		0		0	0	0	0
4:50 PM				0	0		0	0	0	0		0		0	0	0	0
4:55 PM				0	0		0	0	0	0		0		0	0	0	0
5:00 PM				0	0		0	0	0	0		0		0	0	0	0
5:05 PM				0	0		0	0	0	1		1		0	0	0	1
5:10 PM				0	0		0	0	0	0		0		1	1	2	2
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		1	0	1	1
5:35 PM				0	0		0	0	0	0		0		0	0	0	0
5:40 PM				0	0		0	0	0	0		0		2	0	2	2
5:45 PM				0	0		0	0	0	1		1		0	0	0	1
5:50 PM				0	0		0	0	0	0		0		0	0	0	0
5:55 PM				0	0		0	0	0	0		0		2	0	2	2
Total Survey				0	2		0	2	0	5		5		26	1	27	34

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

Interval Start Time	Northbound SW 126th Pl				Southbound SW 126th Pl				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Interval Total
				Total	L		R	Total	L	T		Total		T	R	Total	
4:00 PM				0	1		0	1	0	1		1		7	0	7	9
4:15 PM				0	1		0	1	0	1		1		9	0	9	11
4:30 PM				0	0		0	0	0	1		1		4	0	4	5
4:45 PM				0	0		0	0	0	0		0		0	0	0	0
5:00 PM				0	0		0	0	0	1		1		1	1	2	3
5:15 PM				0	0		0	0	0	0		0		0	0	0	0
5:30 PM				0	0		0	0	0	0		0		3	0	3	3
5:45 PM				0	0		0	0	0	1		1		2	0	2	3
Total Survey				0	2		0	2	0	5		5		26	1	27	34

Heavy Vehicle Peak Hour Summary
4:00 PM to 5:00 PM

By Approach	Northbound SW 126th Pl			Southbound SW 126th Pl			Eastbound SW Leveton Dr			Westbound SW Leveton Dr			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	0	0	0	2	0	2	3	20	23	20	5	25	25
PHF	0.00			0.25			0.38			0.50			0.45

By Movement	Northbound SW 126th Pl				Southbound SW 126th Pl				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Total
				Total	L		R	Total	L	T		Total		T	R	Total	
Volume				0	2		0	2	0	3		3		20	0	20	25
PHF				0.00	0.25		0.00	0.25	0.00	0.38		0.38		0.50	0.00	0.50	0.45

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

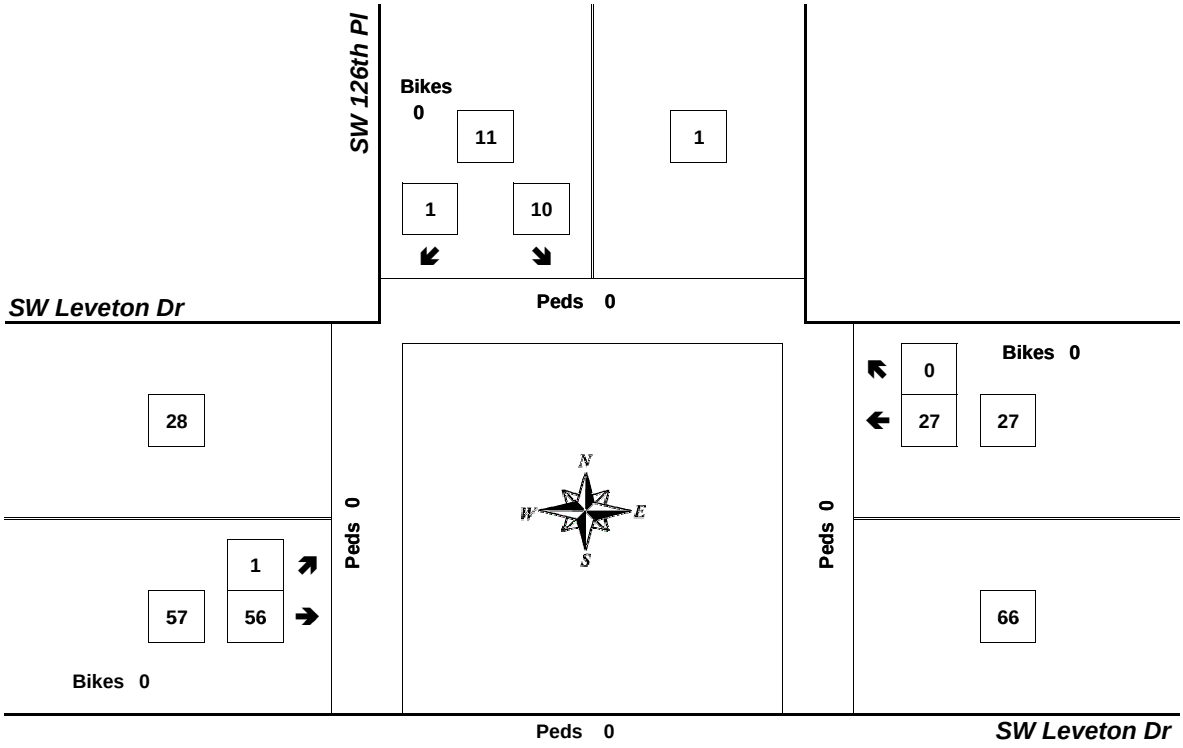
Interval Start Time	Northbound SW 126th Pl				Southbound SW 126th Pl				Eastbound SW Leveton Dr				Westbound SW Leveton Dr				Interval Total
				Total	L		R	Total	L	T		Total		T	R	Total	
4:00 PM				0	2		0	2	0	3		3		20	0	20	25
4:15 PM				0	1		0	1	0	3		3		14	1	15	19
4:30 PM				0	0		0	0	0	2		2		5	1	6	8
4:45 PM				0	0		0	0	0	1		1		4	1	5	6
5:00 PM				0	0		0	0	0	2		2		6	1	7	9

Peak Hour Summary

Clay Carney
(503) 833-2740

SW 126th Pl & SW Leveton Dr

4:00 PM to 5:00 PM
Wednesday, April 25, 2018



Bikes
0

Approach	PHF	HV%	Volume
EB	0.95	5.3%	57
WB	0.61	74.1%	27
NB	0.00	0.0%	0
SB	0.69	18.2%	11
Intersection	0.82	26.3%	95

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

Trip Generation Calculation Worksheet

Land Use Description: General Light Industrial
ITE Land Use Code: 110
Independent Variable: Gross Floor Area
Quantity: 14.197 Thousand Square Feet

Summary of ITE Trip Generation Data

AM Peak Hour of Adjacent Street Traffic
Trip Rate: 0.70 trips per ksf
Directional Distribution: 88% Entering 12% Exiting

PM Peak Hour of Adjacent Street Traffic
Trip Rate: 0.63 trips per ksf
Directional Distribution: 13% Entering 87% Exiting

Total Weekday Traffic
Trip Rate: 4.96 trips per ksf
Directional Distribution: 50% Entering 50% Exiting

Site Trip Generation Calculations

14.2 ksf General Light Industrial

	Entering	Exiting	Total
AM Peak Hour	9	1	10
PM Peak Hour	1	8	9
Weekday	35	35	70

Data Source: *Trip Generation Manual, 10th Edition* , Institute of Transportation Engineers, 2017

Trip Generation Calculation Worksheet

Land Use Description: General Light Industrial
ITE Land Use Code: 110
Independent Variable: Gross Floor Area
Quantity: 39.197 Thousand Square Feet

Summary of ITE Trip Generation Data

AM Peak Hour of Adjacent Street Traffic
Trip Rate: 0.70 trips per ksf
Directional Distribution: 88% Entering 12% Exiting

PM Peak Hour of Adjacent Street Traffic
Trip Rate: 0.63 trips per ksf
Directional Distribution: 13% Entering 87% Exiting

Total Weekday Traffic
Trip Rate: 4.96 trips per ksf
Directional Distribution: 50% Entering 50% Exiting

Site Trip Generation Calculations

39.2 ksf General Light Industrial

	Entering	Exiting	Total
AM Peak Hour	24	3	27
PM Peak Hour	3	22	25
Weekday	97	97	194

Data Source: *Trip Generation Manual, 10th Edition* , Institute of Transportation Engineers, 2017

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	102	248	1370	524	1001	731
Future Volume (vph)	102	248	1370	524	1001	731
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.97	0.88	0.95	1.00	0.97	0.95
Frpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3045	2472	3471	1531	3367	3471
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3045	2472	3471	1531	3367	3471
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	107	261	1442	552	1054	769
RTOR Reduction (vph)	0	0	0	205	0	0
Lane Group Flow (vph)	107	261	1442	347	1054	769
Confl. Peds. (#/hr)		9		1		
Heavy Vehicles (%)	15%	15%	4%	4%	4%	4%
Turn Type	Prot	pt+ov	NA	Perm	Prot	NA
Protected Phases	7	7 1	2		1	6
Permitted Phases				2		
Actuated Green, G (s)	12.6	59.3	51.7	51.7	42.2	98.4
Effective Green, g (s)	12.6	59.3	51.7	51.7	42.2	98.4
Actuated g/C Ratio	0.10	0.49	0.43	0.43	0.35	0.82
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	319	1221	1495	659	1184	2846
v/s Ratio Prot	c0.04	0.11	c0.42		c0.31	0.22
v/s Ratio Perm				0.23		
v/c Ratio	0.34	0.21	0.96	0.53	0.89	0.27
Uniform Delay, d1	49.8	17.2	33.3	25.1	36.7	2.5
Progression Factor	1.00	1.25	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.1	16.2	3.0	8.6	0.2
Delay (s)	50.2	21.6	49.5	28.1	45.4	2.7
Level of Service	D	C	D	C	D	A
Approach Delay (s)	29.9		43.6			27.4
Approach LOS	C		D			C

Intersection Summary			
HCM 2000 Control Delay	35.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	84.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	5	4	6	5	0
Future Vol, veh/h	0	5	4	6	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	6	5	7	6	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	23	6	6	0	-	0
Stage 1	6	-	-	-	-	-
Stage 2	17	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	993	1077	1615	-	-	-
Stage 1	1017	-	-	-	-	-
Stage 2	1006	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	990	1077	1615	-	-	-
Mov Cap-2 Maneuver	990	-	-	-	-	-
Stage 1	1014	-	-	-	-	-
Stage 2	1006	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.4	2.9	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1615	-	1077	-	-
HCM Lane V/C Ratio	0.003	-	0.006	-	-
HCM Control Delay (s)	7.2	-	8.4	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	5	5	10	10	0
Future Vol, veh/h	0	5	5	10	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	25	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	6	6	12	12	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	36	12	12	0	-	0
Stage 1	12	-	-	-	-	-
Stage 2	24	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	977	1069	1607	-	-	-
Stage 1	1011	-	-	-	-	-
Stage 2	999	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	973	1069	1607	-	-	-
Mov Cap-2 Maneuver	973	-	-	-	-	-
Stage 1	1007	-	-	-	-	-
Stage 2	999	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.4	2.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1607	-	1069	-	-
HCM Lane V/C Ratio	0.004	-	0.006	-	-
HCM Control Delay (s)	7.2	-	8.4	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	104	3	5	23	0	1
Future Vol, veh/h	104	3	5	23	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	75	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	15	15	13	13	20	20
Mvmt Flow	124	4	6	27	0	1

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	128	0	165	126
Stage 1	-	-	-	-	126	-
Stage 2	-	-	-	-	39	-
Critical Hdwy	-	-	4.23	-	6.6	6.4
Critical Hdwy Stg 1	-	-	-	-	5.6	-
Critical Hdwy Stg 2	-	-	-	-	5.6	-
Follow-up Hdwy	-	-	2.317	-	3.68	3.48
Pot Cap-1 Maneuver	-	-	1393	-	786	878
Stage 1	-	-	-	-	857	-
Stage 2	-	-	-	-	939	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1393	-	783	878
Mov Cap-2 Maneuver	-	-	-	-	783	-
Stage 1	-	-	-	-	854	-
Stage 2	-	-	-	-	939	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.4	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	878	-	-	1393	-
HCM Lane V/C Ratio	0.001	-	-	0.004	-
HCM Control Delay (s)	9.1	-	-	7.6	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

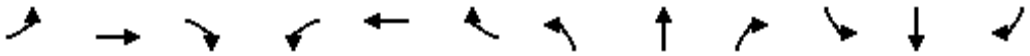
Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	102	35	11	13	2
Future Vol, veh/h	4	102	35	11	13	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	95	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	15	15	13	13	2	2
Mvmt Flow	5	121	42	13	15	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	55	0	-	0	180	49
Stage 1	-	-	-	-	49	-
Stage 2	-	-	-	-	131	-
Critical Hdwy	4.25	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.335	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1471	-	-	-	810	1020
Stage 1	-	-	-	-	973	-
Stage 2	-	-	-	-	895	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1471	-	-	-	808	1020
Mov Cap-2 Maneuver	-	-	-	-	808	-
Stage 1	-	-	-	-	970	-
Stage 2	-	-	-	-	895	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1471	-	-	-	808	1020
HCM Lane V/C Ratio	0.003	-	-	-	0.019	0.002
HCM Control Delay (s)	7.5	-	-	-	9.5	8.5
HCM Lane LOS	A	-	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0



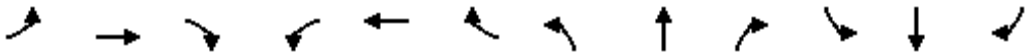
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	74	23	11	5	18	25	158	34	260	530	23
Future Volume (veh/h)	20	74	23	11	5	18	25	158	34	260	530	23
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1678	1678	1678	1470	1470	1470	1648	1648	1648	1841	1841	1841
Adj Flow Rate, veh/h	22	80	25	12	5	20	27	172	37	283	576	25
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	15	15	15	29	29	29	17	17	17	4	4	4
Cap, veh/h	35	102	32	19	19	78	584	1764	371	943	2486	108
Arrive On Green	0.02	0.08	0.08	0.01	0.08	0.08	0.02	0.69	0.69	0.07	0.73	0.73
Sat Flow, veh/h	1598	1226	383	1400	257	1028	1570	2575	542	1753	3415	148
Grp Volume(v), veh/h	22	0	105	12	0	25	27	103	106	283	295	306
Grp Sat Flow(s),veh/h/ln	1598	0	1609	1400	0	1285	1570	1566	1551	1753	1749	1814
Q Serve(g_s), s	1.6	0.0	7.7	1.0	0.0	2.2	0.6	2.7	2.8	5.3	6.6	6.6
Cycle Q Clear(g_c), s	1.6	0.0	7.7	1.0	0.0	2.2	0.6	2.7	2.8	5.3	6.6	6.6
Prop In Lane	1.00		0.24	1.00		0.80	1.00		0.35	1.00		0.08
Lane Grp Cap(c), veh/h	35	0	134	19	0	97	584	1073	1062	943	1273	1321
V/C Ratio(X)	0.64	0.00	0.78	0.62	0.00	0.26	0.05	0.10	0.10	0.30	0.23	0.23
Avail Cap(c_a), veh/h	153	0	355	111	0	262	656	1073	1062	1343	1273	1321
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	58.2	0.0	53.9	58.9	0.0	52.3	5.2	6.4	6.4	3.9	5.3	5.3
Incr Delay (d2), s/veh	17.7	0.0	9.4	28.7	0.0	1.4	0.0	0.2	0.2	0.2	0.4	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	3.4	0.5	0.0	0.7	0.2	0.8	0.8	1.4	2.1	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.9	0.0	63.3	87.5	0.0	53.7	5.2	6.6	6.6	4.1	5.8	5.8
LnGrp LOS	E	A	E	F	A	D	A	A	A	A	A	A
Approach Vol, veh/h		127			37			236			884	
Approach Delay, s/veh		65.5			64.7			6.4			5.2	
Approach LOS		E			E			A			A	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	12.6	86.7	6.1	14.5	7.5	91.9	7.1	13.6
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	35.5	30.5	9.5	26.5	8.5	57.5	11.5	24.5
Max Q Clear Time (g_c+I1), s	7.3	4.8	3.0	9.7	2.6	8.6	3.6	4.2
Green Ext Time (p_c), s	0.8	1.0	0.0	0.4	0.0	3.6	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	13.1
HCM 6th LOS	B

HCM Signalized Intersection Capacity Analysis
6: SW 124th Ave & SW Leveton Dr

05/07/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	74	23	11	5	18	25	158	34	260	530	23
Future Volume (vph)	20	74	23	11	5	18	25	158	34	260	530	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.96		1.00	0.88		1.00	0.97		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1570	1593		1399	1296		1543	3004		1736	3449	
Flt Permitted	0.95	1.00		0.95	1.00		0.42	1.00		0.59	1.00	
Satd. Flow (perm)	1570	1593		1399	1296		690	3004		1069	3449	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	80	25	12	5	20	27	172	37	283	576	25
RTOR Reduction (vph)	0	11	0	0	18	0	0	8	0	0	2	0
Lane Group Flow (vph)	22	94	0	12	7	0	27	201	0	283	599	0
Heavy Vehicles (%)	15%	15%	15%	29%	29%	29%	17%	17%	17%	4%	4%	4%
Turn Type	Prot	NA		Prot	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases							2			6		
Actuated Green, G (s)	5.0	13.3		3.2	11.5		77.9	74.0		90.0	81.6	
Effective Green, g (s)	5.0	13.3		3.2	11.5		77.9	74.0		90.0	81.6	
Actuated g/C Ratio	0.04	0.11		0.03	0.10		0.65	0.62		0.75	0.68	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	65	176		37	124		475	1852		865	2345	
v/s Ratio Prot	c0.01	c0.06		0.01	0.01		0.00	0.07		c0.03	0.17	
v/s Ratio Perm							0.04			c0.21		
v/c Ratio	0.34	0.54		0.32	0.06		0.06	0.11		0.33	0.26	
Uniform Delay, d1	55.9	50.4		57.3	49.3		7.5	9.5		4.6	7.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.65	0.59	
Incremental Delay, d2	3.1	3.1		5.1	0.2		0.1	0.1		0.1	0.1	
Delay (s)	59.0	53.6		62.4	49.5		7.6	9.6		3.1	4.5	
Level of Service	E	D		E	D		A	A		A	A	
Approach Delay (s)		54.5			53.7			9.3			4.1	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	38.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	605	707	877	148	592	1100
Future Volume (vph)	605	707	877	148	592	1100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.97	0.88	0.95	1.00	0.97	0.95
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	2787	3505	1568	3400	3505
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	2787	3505	1568	3400	3505
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	665	777	964	163	651	1209
RTOR Reduction (vph)	0	0	0	90	0	0
Lane Group Flow (vph)	665	777	964	73	651	1209
Confl. Peds. (#/hr)		13				
Heavy Vehicles (%)	2%	2%	3%	3%	3%	3%
Turn Type	Prot	pt+ov	NA	Perm	Prot	NA
Protected Phases	7	7 1	2		1	6
Permitted Phases				2		
Actuated Green, G (s)	29.6	62.9	48.1	48.1	28.8	81.4
Effective Green, g (s)	29.6	62.9	48.1	48.1	28.8	81.4
Actuated g/C Ratio	0.25	0.52	0.40	0.40	0.24	0.68
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	846	1460	1404	628	816	2377
v/s Ratio Prot	c0.19	0.28	c0.28		c0.19	0.34
v/s Ratio Perm				0.05		
v/c Ratio	0.79	0.53	0.69	0.12	0.80	0.51
Uniform Delay, d1	42.2	18.8	29.7	22.6	42.9	9.5
Progression Factor	1.00	1.21	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.8	0.4	2.8	0.4	5.5	0.8
Delay (s)	46.8	23.2	32.5	23.0	48.3	10.3
Level of Service	D	C	C	C	D	B
Approach Delay (s)	34.1		31.1			23.6
Approach LOS	C		C			C

Intersection Summary			
HCM 2000 Control Delay	28.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	4	0	0	3	0
Future Vol, veh/h	0	4	0	0	3	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	10	10	18	18	18	18
Mvmt Flow	0	5	0	0	4	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	4	4	4	0	-	0
Stage 1	4	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.28	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.362	-	-	-
Pot Cap-1 Maneuver	998	1057	1519	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	998	1057	1519	-	-	-
Mov Cap-2 Maneuver	998	-	-	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1519	-	1057	-	-
HCM Lane V/C Ratio	-	-	0.005	-	-
HCM Control Delay (s)	0	-	8.4	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	4	1	0	7	0
Future Vol, veh/h	0	4	1	0	7	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	25	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	10	10	18	18	18	18
Mvmt Flow	0	5	1	0	9	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	11	9	9	0	-	0
Stage 1	9	-	-	-	-	-
Stage 2	2	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.28	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.362	-	-	-
Pot Cap-1 Maneuver	988	1050	1512	-	-	-
Stage 1	994	-	-	-	-	-
Stage 2	1001	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	987	1050	1512	-	-	-
Mov Cap-2 Maneuver	987	-	-	-	-	-
Stage 1	993	-	-	-	-	-
Stage 2	1001	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.4	7.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1512	-	1050	-	-
HCM Lane V/C Ratio	0.001	-	0.005	-	-
HCM Control Delay (s)	7.4	-	8.4	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	40	1	1	26	0	7
Future Vol, veh/h	40	1	1	26	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	75	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	5	5	74	74	20	20
Mvmt Flow	49	1	1	32	0	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	50	0	84	50
Stage 1	-	-	-	-	50	-
Stage 2	-	-	-	-	34	-
Critical Hdwy	-	-	4.84	-	6.6	6.4
Critical Hdwy Stg 1	-	-	-	-	5.6	-
Critical Hdwy Stg 2	-	-	-	-	5.6	-
Follow-up Hdwy	-	-	2.866	-	3.68	3.48
Pot Cap-1 Maneuver	-	-	1198	-	875	970
Stage 1	-	-	-	-	928	-
Stage 2	-	-	-	-	944	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1198	-	874	970
Mov Cap-2 Maneuver	-	-	-	-	874	-
Stage 1	-	-	-	-	927	-
Stage 2	-	-	-	-	944	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	8.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	970	-	-	1198	-
HCM Lane V/C Ratio	0.009	-	-	0.001	-
HCM Control Delay (s)	8.7	-	-	8	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

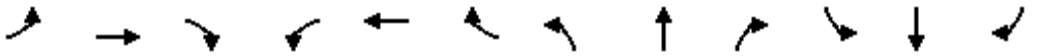
Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	56	27	0	10	1
Future Vol, veh/h	1	56	27	0	10	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	95	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	5	5	74	74	18	18
Mvmt Flow	1	68	33	0	12	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	33	0	-	0	103	33
Stage 1	-	-	-	-	33	-
Stage 2	-	-	-	-	70	-
Critical Hdwy	4.15	-	-	-	6.58	6.38
Critical Hdwy Stg 1	-	-	-	-	5.58	-
Critical Hdwy Stg 2	-	-	-	-	5.58	-
Follow-up Hdwy	2.245	-	-	-	3.662	3.462
Pot Cap-1 Maneuver	1560	-	-	-	858	996
Stage 1	-	-	-	-	950	-
Stage 2	-	-	-	-	914	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1560	-	-	-	857	996
Mov Cap-2 Maneuver	-	-	-	-	857	-
Stage 1	-	-	-	-	949	-
Stage 2	-	-	-	-	914	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	9.2
HCM LOS			A

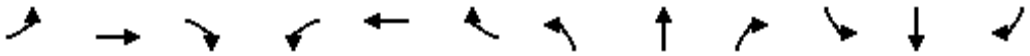
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1560	-	-	-	857	996
HCM Lane V/C Ratio	0.001	-	-	-	0.014	0.001
HCM Control Delay (s)	7.3	-	-	-	9.3	8.6
HCM Lane LOS	A	-	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	-	0	0



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	25	21	41	4	340	2	396	15	91	259	9
Future Volume (veh/h)	35	25	21	41	4	340	2	396	15	91	259	9
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1870	1870	1870	1856	1856	1856	1811	1811	1811
Adj Flow Rate, veh/h	41	29	25	48	5	400	2	466	18	107	305	11
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	4	4	4	2	2	2	3	3	3	6	6	6
Cap, veh/h	54	252	218	62	5	440	582	1703	66	504	1816	65
Arrive On Green	0.03	0.28	0.28	0.03	0.28	0.28	0.00	0.49	0.49	0.05	0.54	0.54
Sat Flow, veh/h	1753	912	787	1781	20	1568	1767	3456	133	1725	3388	122
Grp Volume(v), veh/h	41	0	54	48	0	405	2	237	247	107	154	162
Grp Sat Flow(s),veh/h/ln	1753	0	1699	1781	0	1588	1767	1763	1827	1725	1721	1789
Q Serve(g_s), s	2.8	0.0	2.8	3.2	0.0	29.6	0.1	9.5	9.5	3.5	5.5	5.5
Cycle Q Clear(g_c), s	2.8	0.0	2.8	3.2	0.0	29.6	0.1	9.5	9.5	3.5	5.5	5.5
Prop In Lane	1.00		0.46	1.00		0.99	1.00		0.07	1.00		0.07
Lane Grp Cap(c), veh/h	54	0	470	62	0	445	582	869	900	504	922	959
V/C Ratio(X)	0.75	0.00	0.11	0.77	0.00	0.91	0.00	0.27	0.27	0.21	0.17	0.17
Avail Cap(c_a), veh/h	153	0	588	186	0	576	673	869	900	619	922	959
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	57.7	0.0	32.4	57.4	0.0	41.7	15.3	17.8	17.8	13.3	14.2	14.2
Incr Delay (d2), s/veh	18.7	0.0	0.1	18.1	0.0	15.7	0.0	0.8	0.8	0.2	0.4	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	1.2	1.7	0.0	13.3	0.0	3.8	4.0	1.3	2.1	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	76.4	0.0	32.5	75.5	0.0	57.4	15.3	18.6	18.6	13.5	14.6	14.6
LnGrp LOS	E	A	C	E	A	E	B	B	B	B	B	B
Approach Vol, veh/h		95			453			486			423	
Approach Delay, s/veh		51.5			59.3			18.6			14.3	
Approach LOS		D			E			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.0	63.6	8.7	37.7	4.8	68.8	8.2	38.1
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	13.5	34.5	12.5	41.5	6.5	41.5	10.5	43.5
Max Q Clear Time (g_c+I1), s	5.5	11.5	5.2	4.8	2.1	7.5	4.8	31.6
Green Ext Time (p_c), s	0.1	2.5	0.0	0.3	0.0	1.7	0.0	2.1

Intersection Summary	
HCM 6th Ctrl Delay	32.2
HCM 6th LOS	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	25	21	41	4	340	2	396	15	91	259	9
Future Volume (vph)	35	25	21	41	4	340	2	396	15	91	259	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.85		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	1700		1770	1587		1752	3480		1703	3388	
Flt Permitted	0.95	1.00		0.95	1.00		0.56	1.00		0.43	1.00	
Satd. Flow (perm)	1736	1700		1770	1587		1033	3480		775	3388	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	41	29	25	48	5	400	2	466	18	107	305	11
RTOR Reduction (vph)	0	23	0	0	339	0	0	1	0	0	1	0
Lane Group Flow (vph)	41	31	0	48	66	0	2	483	0	107	315	0
Confl. Peds. (#/hr)									7			
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	3%	3%	3%	6%	6%	6%
Turn Type	Prot	NA		Prot	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases							2			6		
Actuated Green, G (s)	7.0	11.0		7.6	11.6		76.7	75.5		87.9	82.2	
Effective Green, g (s)	7.0	11.0		7.6	11.6		76.7	75.5		87.9	82.2	
Actuated g/C Ratio	0.06	0.09		0.06	0.10		0.64	0.63		0.73	0.69	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	101	155		112	153		667	2189		628	2320	
v/s Ratio Prot	0.02	0.02		c0.03	c0.04		0.00	c0.14		c0.01	0.09	
v/s Ratio Perm							0.00			0.11		
v/c Ratio	0.41	0.20		0.43	0.43		0.00	0.22		0.17	0.14	
Uniform Delay, d1	54.5	50.4		54.1	51.1		7.8	9.6		4.8	6.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.22	0.20	
Incremental Delay, d2	2.7	0.6		2.6	2.0		0.0	0.2		0.1	0.1	
Delay (s)	57.1	51.1		56.7	53.1		7.8	9.8		1.2	1.4	
Level of Service	E	D		E	D		A	A		A	A	
Approach Delay (s)		53.7			53.5			9.8			1.4	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	23.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	107	260	1402	547	1052	748
Future Volume (vph)	107	260	1402	547	1052	748
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.97	0.88	0.95	1.00	0.97	0.95
Frpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3045	2472	3471	1531	3367	3471
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3045	2472	3471	1531	3367	3471
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	113	274	1476	576	1107	787
RTOR Reduction (vph)	0	0	0	157	0	0
Lane Group Flow (vph)	113	274	1476	419	1107	787
Confl. Peds. (#/hr)		9		1		
Heavy Vehicles (%)	15%	15%	4%	4%	4%	4%
Turn Type	Prot	pt+ov	NA	Perm	Prot	NA
Protected Phases	7	7 1	2		1	6
Permitted Phases				2		
Actuated Green, G (s)	12.3	57.8	53.2	53.2	41.0	98.7
Effective Green, g (s)	12.3	57.8	53.2	53.2	41.0	98.7
Actuated g/C Ratio	0.10	0.48	0.44	0.44	0.34	0.82
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	312	1190	1538	678	1150	2854
v/s Ratio Prot	c0.04	0.11	c0.43		c0.33	0.23
v/s Ratio Perm				0.27		
v/c Ratio	0.36	0.23	0.96	0.62	0.96	0.28
Uniform Delay, d1	50.2	18.1	32.4	25.6	38.7	2.4
Progression Factor	0.99	1.22	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	0.1	15.2	4.2	18.1	0.2
Delay (s)	50.3	22.3	47.5	29.8	56.9	2.7
Level of Service	D	C	D	C	E	A
Approach Delay (s)	30.5		42.6			34.4
Approach LOS	C		D			C

Intersection Summary			
HCM 2000 Control Delay	37.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	87.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	5	4	6	5	0
Future Vol, veh/h	0	5	4	6	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	6	5	7	6	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	23	6	6	0	-	0
Stage 1	6	-	-	-	-	-
Stage 2	17	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	993	1077	1615	-	-	-
Stage 1	1017	-	-	-	-	-
Stage 2	1006	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	990	1077	1615	-	-	-
Mov Cap-2 Maneuver	990	-	-	-	-	-
Stage 1	1014	-	-	-	-	-
Stage 2	1006	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.4	2.9	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1615	-	1077	-	-
HCM Lane V/C Ratio	0.003	-	0.006	-	-
HCM Control Delay (s)	7.2	-	8.4	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	5	5	10	10	0
Future Vol, veh/h	0	5	5	10	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	25	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	6	6	12	12	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	36	12	12	0	-	0
Stage 1	12	-	-	-	-	-
Stage 2	24	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	977	1069	1607	-	-	-
Stage 1	1011	-	-	-	-	-
Stage 2	999	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	973	1069	1607	-	-	-
Mov Cap-2 Maneuver	973	-	-	-	-	-
Stage 1	1007	-	-	-	-	-
Stage 2	999	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.4	2.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1607	-	1069	-	-
HCM Lane V/C Ratio	0.004	-	0.006	-	-
HCM Control Delay (s)	7.2	-	8.4	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	108	3	5	24	0	1
Future Vol, veh/h	108	3	5	24	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	75	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	15	15	13	13	20	20
Mvmt Flow	129	4	6	29	0	1

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	133	0	172	131
Stage 1	-	-	-	-	131	-
Stage 2	-	-	-	-	41	-
Critical Hdwy	-	-	4.23	-	6.6	6.4
Critical Hdwy Stg 1	-	-	-	-	5.6	-
Critical Hdwy Stg 2	-	-	-	-	5.6	-
Follow-up Hdwy	-	-	2.317	-	3.68	3.48
Pot Cap-1 Maneuver	-	-	1387	-	778	873
Stage 1	-	-	-	-	853	-
Stage 2	-	-	-	-	937	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1387	-	775	873
Mov Cap-2 Maneuver	-	-	-	-	775	-
Stage 1	-	-	-	-	850	-
Stage 2	-	-	-	-	937	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.3	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	873	-	-	1387	-
HCM Lane V/C Ratio	0.001	-	-	0.004	-
HCM Control Delay (s)	9.1	-	-	7.6	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

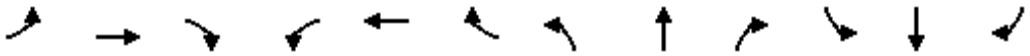
Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	110	36	11	15	2
Future Vol, veh/h	4	110	36	11	15	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	95	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	15	15	13	13	2	2
Mvmt Flow	5	131	43	13	18	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	56	0	-	0	191	50
Stage 1	-	-	-	-	50	-
Stage 2	-	-	-	-	141	-
Critical Hdwy	4.25	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.335	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1469	-	-	-	798	1018
Stage 1	-	-	-	-	972	-
Stage 2	-	-	-	-	886	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1469	-	-	-	796	1018
Mov Cap-2 Maneuver	-	-	-	-	796	-
Stage 1	-	-	-	-	969	-
Stage 2	-	-	-	-	886	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	9.5
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1469	-	-	-	796	1018
HCM Lane V/C Ratio	0.003	-	-	-	0.022	0.002
HCM Control Delay (s)	7.5	-	-	-	9.6	8.5
HCM Lane LOS	A	-	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0



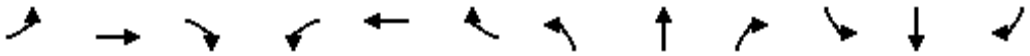
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	78	25	11	9	19	36	165	35	271	555	33
Future Volume (veh/h)	23	78	25	11	9	19	36	165	35	271	555	33
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1678	1678	1678	1470	1470	1470	1648	1648	1648	1841	1841	1841
Adj Flow Rate, veh/h	25	85	27	12	10	21	39	179	38	295	603	36
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	15	15	15	29	29	29	17	17	17	4	4	4
Cap, veh/h	38	108	34	19	33	70	564	1746	363	932	2406	143
Arrive On Green	0.02	0.09	0.09	0.01	0.08	0.08	0.03	0.68	0.68	0.07	0.72	0.72
Sat Flow, veh/h	1598	1220	388	1400	423	888	1570	2581	536	1753	3353	200
Grp Volume(v), veh/h	25	0	112	12	0	31	39	107	110	295	314	325
Grp Sat Flow(s),veh/h/ln	1598	0	1608	1400	0	1310	1570	1566	1552	1753	1749	1805
Q Serve(g_s), s	1.9	0.0	8.2	1.0	0.0	2.7	0.9	2.8	3.0	5.7	7.4	7.4
Cycle Q Clear(g_c), s	1.9	0.0	8.2	1.0	0.0	2.7	0.9	2.8	3.0	5.7	7.4	7.4
Prop In Lane	1.00		0.24	1.00		0.68	1.00		0.35	1.00		0.11
Lane Grp Cap(c), veh/h	38	0	142	19	0	103	564	1059	1050	932	1255	1295
V/C Ratio(X)	0.66	0.00	0.79	0.62	0.00	0.30	0.07	0.10	0.10	0.32	0.25	0.25
Avail Cap(c_a), veh/h	153	0	368	99	0	268	653	1059	1050	1326	1255	1295
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	58.1	0.0	53.6	58.9	0.0	52.2	5.3	6.7	6.8	4.1	5.8	5.8
Incr Delay (d2), s/veh	18.2	0.0	9.3	28.7	0.0	1.6	0.1	0.2	0.2	0.2	0.5	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.0	3.6	0.5	0.0	0.9	0.3	0.9	0.9	1.6	2.4	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	76.3	0.0	62.9	87.5	0.0	53.8	5.4	6.9	7.0	4.3	6.3	6.3
LnGrp LOS	E	A	E	F	A	D	A	A	A	A	A	A
Approach Vol, veh/h		137			43			256			934	
Approach Delay, s/veh		65.3			63.2			6.7			5.7	
Approach LOS		E			E			A			A	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.0	85.7	6.1	15.1	8.1	90.6	7.3	13.9
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	35.5	30.5	8.5	27.5	10.5	55.5	11.5	24.5
Max Q Clear Time (g_c+I1), s	7.7	5.0	3.0	10.2	2.9	9.4	3.9	4.7
Green Ext Time (p_c), s	0.8	1.1	0.0	0.5	0.0	3.8	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	13.6
HCM 6th LOS	B

HCM Signalized Intersection Capacity Analysis
6: SW 124th Ave & SW Leveton Dr

05/08/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	78	25	11	9	19	36	165	35	271	555	33
Future Volume (vph)	23	78	25	11	9	19	36	165	35	271	555	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.96		1.00	0.90		1.00	0.97		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1570	1592		1399	1323		1543	3004		1736	3442	
Flt Permitted	0.95	1.00		0.95	1.00		0.41	1.00		0.58	1.00	
Satd. Flow (perm)	1570	1592		1399	1323		665	3004		1060	3442	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	25	85	27	12	10	21	39	179	38	295	603	36
RTOR Reduction (vph)	0	11	0	0	19	0	0	8	0	0	2	0
Lane Group Flow (vph)	25	101	0	12	12	0	39	209	0	295	637	0
Heavy Vehicles (%)	15%	15%	15%	29%	29%	29%	17%	17%	17%	4%	4%	4%
Turn Type	Prot	NA		Prot	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases							2			6		
Actuated Green, G (s)	5.1	13.9		3.2	12.0		77.2	73.0		89.4	80.7	
Effective Green, g (s)	5.1	13.9		3.2	12.0		77.2	73.0		89.4	80.7	
Actuated g/C Ratio	0.04	0.12		0.03	0.10		0.64	0.61		0.75	0.67	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	66	184		37	132		458	1827		856	2314	
v/s Ratio Prot	c0.02	c0.06		0.01	0.01		0.00	0.07		c0.03	0.18	
v/s Ratio Perm							0.05			c0.22		
v/c Ratio	0.38	0.55		0.32	0.09		0.09	0.11		0.34	0.28	
Uniform Delay, d1	55.9	50.1		57.3	49.0		7.8	9.9		4.8	7.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.70	0.64	
Incremental Delay, d2	3.6	3.5		5.1	0.3		0.1	0.1		0.1	0.1	
Delay (s)	59.5	53.6		62.4	49.4		7.9	10.0		3.5	5.2	
Level of Service	E	D		E	D		A	B		A	A	
Approach Delay (s)		54.7			53.0			9.7			4.7	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	637	742	904	154	618	1126
Future Volume (vph)	637	742	904	154	618	1126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.97	0.88	0.95	1.00	0.97	0.95
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	2787	3505	1568	3400	3505
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	2787	3505	1568	3400	3505
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	700	815	993	169	679	1237
RTOR Reduction (vph)	0	0	0	93	0	0
Lane Group Flow (vph)	700	815	993	76	679	1237
Confl. Peds. (#/hr)		13				
Heavy Vehicles (%)	2%	2%	3%	3%	3%	3%
Turn Type	Prot	pt+ov	NA	Perm	Prot	NA
Protected Phases	7	7 1	2		1	6
Permitted Phases				2		
Actuated Green, G (s)	30.2	64.2	46.8	46.8	29.5	80.8
Effective Green, g (s)	30.2	64.2	46.8	46.8	29.5	80.8
Actuated g/C Ratio	0.25	0.54	0.39	0.39	0.25	0.67
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	863	1491	1366	611	835	2360
v/s Ratio Prot	c0.20	0.29	c0.28		c0.20	0.35
v/s Ratio Perm				0.05		
v/c Ratio	0.81	0.55	0.73	0.12	0.81	0.52
Uniform Delay, d1	42.2	18.3	31.2	23.5	42.7	9.9
Progression Factor	0.98	1.18	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.7	0.4	3.4	0.4	6.1	0.8
Delay (s)	47.3	22.0	34.6	23.9	48.7	10.7
Level of Service	D	C	C	C	D	B
Approach Delay (s)	33.7		33.0			24.2
Approach LOS	C		C			C

Intersection Summary			
HCM 2000 Control Delay	29.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	72.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	4	0	0	3	0
Future Vol, veh/h	0	4	0	0	3	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	10	10	18	18	18	18
Mvmt Flow	0	5	0	0	4	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	4	4	4	0	-	0
Stage 1	4	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.28	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.362	-	-	-
Pot Cap-1 Maneuver	998	1057	1519	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	998	1057	1519	-	-	-
Mov Cap-2 Maneuver	998	-	-	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1519	-	1057	-	-
HCM Lane V/C Ratio	-	-	0.005	-	-
HCM Control Delay (s)	0	-	8.4	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	4	1	0	7	0
Future Vol, veh/h	0	4	1	0	7	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	25	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	10	10	18	18	18	18
Mvmt Flow	0	5	1	0	9	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	11	9	9	0	-	0
Stage 1	9	-	-	-	-	-
Stage 2	2	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.28	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.362	-	-	-
Pot Cap-1 Maneuver	988	1050	1512	-	-	-
Stage 1	994	-	-	-	-	-
Stage 2	1001	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	987	1050	1512	-	-	-
Mov Cap-2 Maneuver	987	-	-	-	-	-
Stage 1	993	-	-	-	-	-
Stage 2	1001	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.4	7.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1512	-	1050	-	-
HCM Lane V/C Ratio	0.001	-	0.005	-	-
HCM Control Delay (s)	7.4	-	8.4	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	42	1	1	27	0	7
Future Vol, veh/h	42	1	1	27	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	75	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	5	5	74	74	20	20
Mvmt Flow	51	1	1	33	0	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	52	0	87	52
Stage 1	-	-	-	-	52	-
Stage 2	-	-	-	-	35	-
Critical Hdwy	-	-	4.84	-	6.6	6.4
Critical Hdwy Stg 1	-	-	-	-	5.6	-
Critical Hdwy Stg 2	-	-	-	-	5.6	-
Follow-up Hdwy	-	-	2.866	-	3.68	3.48
Pot Cap-1 Maneuver	-	-	1196	-	872	967
Stage 1	-	-	-	-	926	-
Stage 2	-	-	-	-	943	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1196	-	871	967
Mov Cap-2 Maneuver	-	-	-	-	871	-
Stage 1	-	-	-	-	925	-
Stage 2	-	-	-	-	943	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	967	-	-	1196	-
HCM Lane V/C Ratio	0.009	-	-	0.001	-
HCM Control Delay (s)	8.8	-	-	8	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

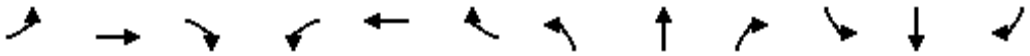
Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	59	31	3	10	1
Future Vol, veh/h	1	59	31	3	10	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	95	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	5	5	74	74	18	18
Mvmt Flow	1	72	38	4	12	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	42	0	-	0	114	40
Stage 1	-	-	-	-	40	-
Stage 2	-	-	-	-	74	-
Critical Hdwy	4.15	-	-	-	6.58	6.38
Critical Hdwy Stg 1	-	-	-	-	5.58	-
Critical Hdwy Stg 2	-	-	-	-	5.58	-
Follow-up Hdwy	2.245	-	-	-	3.662	3.462
Pot Cap-1 Maneuver	1548	-	-	-	845	987
Stage 1	-	-	-	-	943	-
Stage 2	-	-	-	-	910	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1548	-	-	-	844	987
Mov Cap-2 Maneuver	-	-	-	-	844	-
Stage 1	-	-	-	-	942	-
Stage 2	-	-	-	-	910	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	9.2
HCM LOS			A

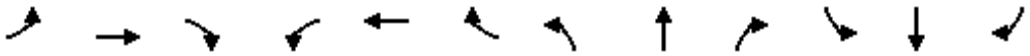
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1548	-	-	-	844	987
HCM Lane V/C Ratio	0.001	-	-	-	0.014	0.001
HCM Control Delay (s)	7.3	-	-	-	9.3	8.7
HCM Lane LOS	A	-	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	-	0	0



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	46	30	33	43	5	354	3	416	16	95	270	10
Future Volume (veh/h)	46	30	33	43	5	354	3	416	16	95	270	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1870	1870	1870	1856	1856	1856	1811	1811	1811
Adj Flow Rate, veh/h	54	35	39	51	6	416	4	489	19	112	318	12
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	4	4	4	2	2	2	3	3	3	6	6	6
Cap, veh/h	69	232	259	66	7	454	554	1631	63	476	1743	66
Arrive On Green	0.04	0.29	0.29	0.04	0.29	0.29	0.01	0.47	0.47	0.05	0.52	0.52
Sat Flow, veh/h	1753	795	886	1781	23	1566	1767	3455	134	1725	3381	127
Grp Volume(v), veh/h	54	0	74	51	0	422	4	249	259	112	161	169
Grp Sat Flow(s),veh/h/ln	1753	0	1681	1781	0	1588	1767	1763	1827	1725	1721	1788
Q Serve(g_s), s	3.7	0.0	3.9	3.4	0.0	30.8	0.1	10.4	10.5	3.9	6.0	6.1
Cycle Q Clear(g_c), s	3.7	0.0	3.9	3.4	0.0	30.8	0.1	10.4	10.5	3.9	6.0	6.1
Prop In Lane	1.00		0.53	1.00		0.99	1.00		0.07	1.00		0.07
Lane Grp Cap(c), veh/h	69	0	491	66	0	460	554	832	862	476	887	922
V/C Ratio(X)	0.78	0.00	0.15	0.77	0.00	0.92	0.01	0.30	0.30	0.24	0.18	0.18
Avail Cap(c_a), veh/h	168	0	595	171	0	563	625	832	862	572	887	922
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	57.1	0.0	31.4	57.3	0.0	41.2	16.4	19.5	19.5	14.5	15.5	15.6
Incr Delay (d2), s/veh	16.7	0.0	0.1	17.2	0.0	17.8	0.0	0.9	0.9	0.3	0.5	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.0	1.6	1.8	0.0	14.1	0.1	4.3	4.4	1.4	2.3	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	73.8	0.0	31.6	74.4	0.0	59.0	16.4	20.4	20.4	14.7	16.0	16.0
LnGrp LOS	E	A	C	E	A	E	B	C	C	B	B	B
Approach Vol, veh/h		128			473			512			442	
Approach Delay, s/veh		49.4			60.7			20.4			15.7	
Approach LOS		D			E			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.3	61.1	8.9	39.6	5.1	66.4	9.3	39.3
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	12.5	35.5	11.5	42.5	5.5	42.5	11.5	42.5
Max Q Clear Time (g_c+I1), s	5.9	12.5	5.4	5.9	2.1	8.1	5.7	32.8
Green Ext Time (p_c), s	0.1	2.7	0.0	0.4	0.0	1.8	0.0	1.9

Intersection Summary	
HCM 6th Ctrl Delay	33.7
HCM 6th LOS	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	46	30	33	43	5	354	3	416	16	95	270	10
Future Volume (vph)	46	30	33	43	5	354	3	416	16	95	270	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92		1.00	0.85		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	1682		1770	1587		1752	3479		1703	3387	
Flt Permitted	0.95	1.00		0.95	1.00		0.55	1.00		0.41	1.00	
Satd. Flow (perm)	1736	1682		1770	1587		1019	3479		740	3387	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	54	35	39	51	6	416	4	489	19	112	318	12
RTOR Reduction (vph)	0	34	0	0	302	0	0	1	0	0	1	0
Lane Group Flow (vph)	54	40	0	51	120	0	4	507	0	112	329	0
Confl. Peds. (#/hr)									7			
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	3%	3%	3%	6%	6%	6%
Turn Type	Prot	NA		Prot	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases							2			6		
Actuated Green, G (s)	7.8	14.7		7.6	14.5		72.5	71.3		84.2	78.5	
Effective Green, g (s)	7.8	14.7		7.6	14.5		72.5	71.3		84.2	78.5	
Actuated g/C Ratio	0.06	0.12		0.06	0.12		0.60	0.59		0.70	0.65	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	112	206		112	191		622	2067		586	2215	
v/s Ratio Prot	c0.03	0.02		0.03	c0.08		0.00	c0.15		c0.01	0.10	
v/s Ratio Perm							0.00			0.12		
v/c Ratio	0.48	0.19		0.46	0.63		0.01	0.25		0.19	0.15	
Uniform Delay, d1	54.2	47.3		54.2	50.2		9.4	11.6		6.1	7.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.20	0.18	
Incremental Delay, d2	3.2	0.5		2.9	6.6		0.0	0.3		0.1	0.1	
Delay (s)	57.4	47.8		57.1	56.8		9.4	11.8		1.3	1.6	
Level of Service	E	D		E	E		A	B		A	A	
Approach Delay (s)		51.8			56.9			11.8			1.5	
Approach LOS		D			E			B			A	

Intersection Summary			
HCM 2000 Control Delay	25.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	107	261	1402	548	1057	748
Future Volume (vph)	107	261	1402	548	1057	748
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.97	0.88	0.95	1.00	0.97	0.95
Frpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3045	2472	3471	1531	3367	3471
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3045	2472	3471	1531	3367	3471
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	113	275	1476	577	1113	787
RTOR Reduction (vph)	0	0	0	157	0	0
Lane Group Flow (vph)	113	275	1476	420	1113	787
Confl. Peds. (#/hr)		9		1		
Heavy Vehicles (%)	15%	15%	4%	4%	4%	4%
Turn Type	Prot	pt+ov	NA	Perm	Prot	NA
Protected Phases	7	7 1	2		1	6
Permitted Phases				2		
Actuated Green, G (s)	12.3	58.0	53.0	53.0	41.2	98.7
Effective Green, g (s)	12.3	58.0	53.0	53.0	41.2	98.7
Actuated g/C Ratio	0.10	0.48	0.44	0.44	0.34	0.82
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	312	1194	1533	676	1156	2854
v/s Ratio Prot	c0.04	0.11	c0.43		c0.33	0.23
v/s Ratio Perm				0.27		
v/c Ratio	0.36	0.23	0.96	0.62	0.96	0.28
Uniform Delay, d1	50.2	18.0	32.5	25.8	38.6	2.4
Progression Factor	1.00	1.22	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	0.1	15.7	4.3	18.1	0.2
Delay (s)	50.8	22.1	48.2	30.0	56.8	2.7
Level of Service	D	C	D	C	E	A
Approach Delay (s)	30.5		43.1			34.4
Approach LOS	C		D			C

Intersection Summary			
HCM 2000 Control Delay	38.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	87.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	5	8	6	5	0
Future Vol, veh/h	0	5	8	6	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	6	10	7	6	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	33	6	6	0	-	0
Stage 1	6	-	-	-	-	-
Stage 2	27	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	980	1077	1615	-	-	-
Stage 1	1017	-	-	-	-	-
Stage 2	996	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	974	1077	1615	-	-	-
Mov Cap-2 Maneuver	974	-	-	-	-	-
Stage 1	1011	-	-	-	-	-
Stage 2	996	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.4	4.1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1615	-	1077	-	-
HCM Lane V/C Ratio	0.006	-	0.006	-	-
HCM Control Delay (s)	7.2	-	8.4	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	6	10	14	10	0
Future Vol, veh/h	0	6	10	14	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	25	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	7	12	17	12	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	53	12	12	0	-	0
Stage 1	12	-	-	-	-	-
Stage 2	41	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	955	1069	1607	-	-	-
Stage 1	1011	-	-	-	-	-
Stage 2	981	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	948	1069	1607	-	-	-
Mov Cap-2 Maneuver	948	-	-	-	-	-
Stage 1	1004	-	-	-	-	-
Stage 2	981	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.4	3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1607	-	1069	-	-
HCM Lane V/C Ratio	0.007	-	0.007	-	-
HCM Control Delay (s)	7.3	-	8.4	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	108	3	5	24	4	0	0	1	1	0	0
Future Vol, veh/h	2	108	3	5	24	4	0	0	1	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	25	-	-	75	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	84	84	84	84	92	84	92	84	92	92	92
Heavy Vehicles, %	2	15	15	13	13	2	20	2	20	2	2	2
Mvmt Flow	2	129	4	6	29	4	0	0	1	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	33	0	0	133	0	0	178	180	131	179	180	31
Stage 1	-	-	-	-	-	-	135	135	-	43	43	-
Stage 2	-	-	-	-	-	-	43	45	-	136	137	-
Critical Hdwy	4.12	-	-	4.23	-	-	7.3	6.52	6.4	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.3	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.3	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.317	-	-	3.68	4.018	3.48	3.518	4.018	3.318
Pot Cap-1 Maneuver	1579	-	-	1387	-	-	746	714	873	783	714	1043
Stage 1	-	-	-	-	-	-	827	785	-	971	859	-
Stage 2	-	-	-	-	-	-	927	857	-	867	783	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1579	-	-	1387	-	-	743	710	873	778	710	1043
Mov Cap-2 Maneuver	-	-	-	-	-	-	743	710	-	778	710	-
Stage 1	-	-	-	-	-	-	826	784	-	970	856	-
Stage 2	-	-	-	-	-	-	923	854	-	865	782	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	1.2	9.1	9.6
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	873	1579	-	-	1387	-	-	778
HCM Lane V/C Ratio	0.001	0.001	-	-	0.004	-	-	0.001
HCM Control Delay (s)	9.1	7.3	-	-	7.6	-	-	9.6
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	111	40	20	16	2
Future Vol, veh/h	4	111	40	20	16	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	95	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	15	15	13	13	2	2
Mvmt Flow	5	132	48	24	19	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	72	0	-	0	202	60
Stage 1	-	-	-	-	60	-
Stage 2	-	-	-	-	142	-
Critical Hdwy	4.25	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.335	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1449	-	-	-	787	1005
Stage 1	-	-	-	-	963	-
Stage 2	-	-	-	-	885	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1449	-	-	-	785	1005
Mov Cap-2 Maneuver	-	-	-	-	785	-
Stage 1	-	-	-	-	960	-
Stage 2	-	-	-	-	885	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	9.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1449	-	-	-	785	1005
HCM Lane V/C Ratio	0.003	-	-	-	0.024	0.002
HCM Control Delay (s)	7.5	-	-	-	9.7	8.6
HCM Lane LOS	A	-	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0

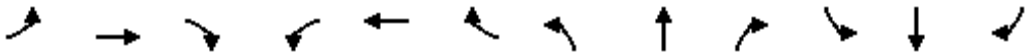
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	78	26	11	11	19	41	165	35	271	555	39
Future Volume (veh/h)	24	78	26	11	11	19	41	165	35	271	555	39
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1678	1678	1678	1470	1470	1470	1648	1648	1648	1841	1841	1841
Adj Flow Rate, veh/h	26	85	28	12	12	21	45	179	38	295	603	42
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	15	15	15	29	29	29	17	17	17	4	4	4
Cap, veh/h	39	108	35	19	38	66	561	1744	362	931	2371	165
Arrive On Green	0.02	0.09	0.09	0.01	0.08	0.08	0.03	0.68	0.68	0.07	0.71	0.71
Sat Flow, veh/h	1598	1208	398	1400	480	839	1570	2581	536	1753	3317	231
Grp Volume(v), veh/h	26	0	113	12	0	33	45	107	110	295	317	328
Grp Sat Flow(s),veh/h/ln	1598	0	1606	1400	0	1319	1570	1566	1552	1753	1749	1799
Q Serve(g_s), s	1.9	0.0	8.3	1.0	0.0	2.8	1.0	2.9	3.0	5.7	7.6	7.6
Cycle Q Clear(g_c), s	1.9	0.0	8.3	1.0	0.0	2.8	1.0	2.9	3.0	5.7	7.6	7.6
Prop In Lane	1.00		0.25	1.00		0.64	1.00		0.35	1.00		0.13
Lane Grp Cap(c), veh/h	39	0	143	19	0	104	561	1058	1048	931	1250	1286
V/C Ratio(X)	0.67	0.00	0.79	0.62	0.00	0.32	0.08	0.10	0.10	0.32	0.25	0.25
Avail Cap(c_a), veh/h	153	0	368	99	0	269	661	1058	1048	1324	1250	1286
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	58.1	0.0	53.5	58.9	0.0	52.2	5.3	6.8	6.8	4.2	6.0	6.0
Incr Delay (d2), s/veh	18.5	0.0	9.3	28.7	0.0	1.7	0.1	0.2	0.2	0.2	0.5	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	3.7	0.5	0.0	1.0	0.3	0.9	0.9	1.6	2.5	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	76.6	0.0	62.8	87.5	0.0	54.0	5.4	7.0	7.0	4.4	6.5	6.4
LnGrp LOS	E	A	E	F	A	D	A	A	A	A	A	A
Approach Vol, veh/h		139			45			262			940	
Approach Delay, s/veh		65.4			62.9			6.7			5.8	
Approach LOS		E			E			A			A	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.1	85.6	6.1	15.2	8.4	90.3	7.4	13.9
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	8.5	30.5	8.5	27.5	11.5	54.5	11.5	24.5
Max Q Clear Time (g_c+I1), s	10.3	5.0	3.0	10.3	3.0	9.6	3.9	4.8
Green Ext Time (p_c), s	0.8	1.1	0.0	0.5	0.0	3.9	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	13.8
HCM 6th LOS	B

HCM Signalized Intersection Capacity Analysis
6: SW 124th Ave & SW Leveton Dr

05/08/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	78	26	11	11	19	41	165	35	271	555	39
Future Volume (vph)	24	78	26	11	11	19	41	165	35	271	555	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.96		1.00	0.90		1.00	0.97		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1570	1591		1399	1332		1543	3004		1736	3437	
Flt Permitted	0.95	1.00		0.95	1.00		0.41	1.00		0.58	1.00	
Satd. Flow (perm)	1570	1591		1399	1332		661	3004		1060	3437	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	85	28	12	12	21	45	179	38	295	603	42
RTOR Reduction (vph)	0	11	0	0	19	0	0	8	0	0	3	0
Lane Group Flow (vph)	26	102	0	12	14	0	45	209	0	295	642	0
Heavy Vehicles (%)	15%	15%	15%	29%	29%	29%	17%	17%	17%	4%	4%	4%
Turn Type	Prot	NA		Prot	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases							2			6		
Actuated Green, G (s)	5.2	13.9		3.2	11.9		78.4	73.0		89.4	79.5	
Effective Green, g (s)	5.2	13.9		3.2	11.9		78.4	73.0		89.4	79.5	
Actuated g/C Ratio	0.04	0.12		0.03	0.10		0.65	0.61		0.75	0.66	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	68	184		37	132		471	1827		856	2277	
v/s Ratio Prot	c0.02	c0.06		0.01	0.01		0.00	0.07		c0.03	0.19	
v/s Ratio Perm							0.06			c0.22		
v/c Ratio	0.38	0.55		0.32	0.11		0.10	0.11		0.34	0.28	
Uniform Delay, d1	55.8	50.1		57.3	49.2		7.4	9.9		4.8	8.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.70	0.64	
Incremental Delay, d2	3.6	3.5		5.1	0.4		0.1	0.1		0.1	0.1	
Delay (s)	59.4	53.7		62.4	49.6		7.5	10.0		3.5	5.5	
Level of Service	E	D		E	D		A	B		A	A	
Approach Delay (s)		54.7			53.0			9.6			4.9	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	12.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	40.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	639	745	904	154	619	1126
Future Volume (vph)	639	745	904	154	619	1126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.97	0.88	0.95	1.00	0.97	0.95
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	2787	3505	1568	3400	3505
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	2787	3505	1568	3400	3505
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	702	819	993	169	680	1237
RTOR Reduction (vph)	0	0	0	93	0	0
Lane Group Flow (vph)	702	819	993	76	680	1237
Confl. Peds. (#/hr)		13				
Heavy Vehicles (%)	2%	2%	3%	3%	3%	3%
Turn Type	Prot	pt+ov	NA	Perm	Prot	NA
Protected Phases	7	7 1	2		1	6
Permitted Phases				2		
Actuated Green, G (s)	30.2	64.2	46.8	46.8	29.5	80.8
Effective Green, g (s)	30.2	64.2	46.8	46.8	29.5	80.8
Actuated g/C Ratio	0.25	0.54	0.39	0.39	0.25	0.67
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	863	1491	1366	611	835	2360
v/s Ratio Prot	c0.20	0.29	c0.28		c0.20	0.35
v/s Ratio Perm				0.05		
v/c Ratio	0.81	0.55	0.73	0.12	0.81	0.52
Uniform Delay, d1	42.2	18.4	31.2	23.5	42.7	9.9
Progression Factor	0.98	1.17	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.8	0.4	3.4	0.4	6.1	0.8
Delay (s)	47.3	21.9	34.6	23.9	48.8	10.7
Level of Service	D	C	C	C	D	B
Approach Delay (s)	33.6		33.0			24.2
Approach LOS	C		C			C

Intersection Summary			
HCM 2000 Control Delay	29.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	6.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	8	0	0	3	0
Future Vol, veh/h	0	8	0	0	3	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	50	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	10	10	18	18	18	18
Mvmt Flow	0	10	0	0	4	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	4	4	4	0	-	0
Stage 1	4	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.28	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.362	-	-	-
Pot Cap-1 Maneuver	998	1057	1519	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	998	1057	1519	-	-	-
Mov Cap-2 Maneuver	998	-	-	-	-	-
Stage 1	999	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1519	-	1057	-	-
HCM Lane V/C Ratio	-	-	0.009	-	-
HCM Control Delay (s)	0	-	8.4	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	9	2	0	11	0
Future Vol, veh/h	0	9	2	0	11	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	25	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	10	10	18	18	18	18
Mvmt Flow	0	11	2	0	13	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	17	13	13	0	-	0
Stage 1	13	-	-	-	-	-
Stage 2	4	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.28	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.362	-	-	-
Pot Cap-1 Maneuver	981	1044	1507	-	-	-
Stage 1	989	-	-	-	-	-
Stage 2	999	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	980	1044	1507	-	-	-
Mov Cap-2 Maneuver	980	-	-	-	-	-
Stage 1	988	-	-	-	-	-
Stage 2	999	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.5	7.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1507	-	1044	-	-
HCM Lane V/C Ratio	0.002	-	0.011	-	-
HCM Control Delay (s)	7.4	-	8.5	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	42	1	1	27	1	0	0	7	5	0	0
Future Vol, veh/h	0	42	1	1	27	1	0	0	7	5	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	25	-	-	75	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	82	82	82	82	92	82	92	82	92	92	92
Heavy Vehicles, %	2	5	5	74	74	2	20	2	20	2	2	2
Mvmt Flow	0	51	1	1	33	1	0	0	9	5	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	34	0	0	52	0	0	88	88	52	92	88	34
Stage 1	-	-	-	-	-	-	52	52	-	36	36	-
Stage 2	-	-	-	-	-	-	36	36	-	56	52	-
Critical Hdwy	4.12	-	-	4.84	-	-	7.3	6.52	6.4	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.3	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.3	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.866	-	-	3.68	4.018	3.48	3.518	4.018	3.318
Pot Cap-1 Maneuver	1578	-	-	1196	-	-	856	802	967	892	802	1039
Stage 1	-	-	-	-	-	-	917	852	-	980	865	-
Stage 2	-	-	-	-	-	-	936	865	-	956	852	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1578	-	-	1196	-	-	855	801	967	884	801	1039
Mov Cap-2 Maneuver	-	-	-	-	-	-	855	801	-	884	801	-
Stage 1	-	-	-	-	-	-	917	852	-	980	864	-
Stage 2	-	-	-	-	-	-	935	864	-	948	852	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.3	8.8	9.1
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	967	1578	-	-	1196	-	-	884
HCM Lane V/C Ratio	0.009	-	-	-	0.001	-	-	0.006
HCM Control Delay (s)	8.8	0	-	-	8	-	-	9.1
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	64	32	4	19	1
Future Vol, veh/h	1	64	32	4	19	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	95	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	5	5	74	74	18	18
Mvmt Flow	1	78	39	5	23	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	44	0	-	0	122	42
Stage 1	-	-	-	-	42	-
Stage 2	-	-	-	-	80	-
Critical Hdwy	4.15	-	-	-	6.58	6.38
Critical Hdwy Stg 1	-	-	-	-	5.58	-
Critical Hdwy Stg 2	-	-	-	-	5.58	-
Follow-up Hdwy	2.245	-	-	-	3.662	3.462
Pot Cap-1 Maneuver	1545	-	-	-	836	985
Stage 1	-	-	-	-	941	-
Stage 2	-	-	-	-	904	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1545	-	-	-	835	985
Mov Cap-2 Maneuver	-	-	-	-	835	-
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	904	-

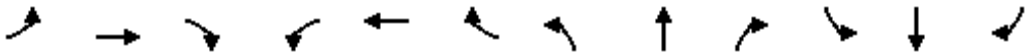
Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1545	-	-	-	835	985
HCM Lane V/C Ratio	0.001	-	-	-	0.028	0.001
HCM Control Delay (s)	7.3	-	-	-	9.4	8.7
HCM Lane LOS	A	-	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	53	32	38	43	5	354	4	416	16	95	270	11
Future Volume (veh/h)	53	32	38	43	5	354	4	416	16	95	270	11
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1870	1870	1870	1856	1856	1856	1811	1811	1811
Adj Flow Rate, veh/h	62	38	45	51	6	416	5	489	19	112	318	13
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	4	4	4	2	2	2	3	3	3	6	6	6
Cap, veh/h	80	229	271	66	7	454	547	1610	62	470	1713	70
Arrive On Green	0.05	0.30	0.30	0.04	0.29	0.29	0.01	0.47	0.47	0.05	0.51	0.51
Sat Flow, veh/h	1753	768	909	1781	23	1566	1767	3455	134	1725	3370	137
Grp Volume(v), veh/h	62	0	83	51	0	422	5	249	259	112	162	169
Grp Sat Flow(s),veh/h/ln	1753	0	1677	1781	0	1588	1767	1763	1827	1725	1721	1786
Q Serve(g_s), s	4.2	0.0	4.4	3.4	0.0	30.8	0.2	10.5	10.6	3.9	6.1	6.2
Cycle Q Clear(g_c), s	4.2	0.0	4.4	3.4	0.0	30.8	0.2	10.5	10.6	3.9	6.1	6.2
Prop In Lane	1.00		0.54	1.00		0.99	1.00		0.07	1.00		0.08
Lane Grp Cap(c), veh/h	80	0	500	66	0	460	547	821	851	470	875	908
V/C Ratio(X)	0.78	0.00	0.17	0.77	0.00	0.92	0.01	0.30	0.30	0.24	0.19	0.19
Avail Cap(c_a), veh/h	183	0	608	171	0	563	617	821	851	565	875	908
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	56.7	0.0	31.1	57.3	0.0	41.2	16.8	19.9	20.0	14.8	16.0	16.0
Incr Delay (d2), s/veh	14.9	0.0	0.2	17.2	0.0	17.8	0.0	1.0	0.9	0.3	0.5	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	0.0	1.8	1.8	0.0	14.1	0.1	4.4	4.5	1.5	2.4	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	71.5	0.0	31.2	74.4	0.0	59.0	16.8	20.9	20.9	15.1	16.5	16.5
LnGrp LOS	E	A	C	E	A	E	B	C	C	B	B	B
Approach Vol, veh/h		145			473			513			443	
Approach Delay, s/veh		48.5			60.7			20.8			16.1	
Approach LOS		D			E			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.4	60.4	8.9	40.3	5.3	65.5	10.0	39.3
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	12.5	34.5	11.5	43.5	5.5	41.5	12.5	42.5
Max Q Clear Time (g_c+I1), s	5.9	12.6	5.4	6.4	2.2	8.2	6.2	32.8
Green Ext Time (p_c), s	0.1	2.7	0.0	0.4	0.0	1.8	0.0	1.9

Intersection Summary	
HCM 6th Ctrl Delay	34.0
HCM 6th LOS	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	53	32	38	43	5	354	4	416	16	95	270	11
Future Volume (vph)	53	32	38	43	5	354	4	416	16	95	270	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92		1.00	0.85		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	1678		1770	1587		1752	3479		1703	3386	
Flt Permitted	0.95	1.00		0.95	1.00		0.55	1.00		0.41	1.00	
Satd. Flow (perm)	1736	1678		1770	1587		1018	3479		737	3386	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	62	38	45	51	6	416	5	489	19	112	318	13
RTOR Reduction (vph)	0	39	0	0	296	0	0	1	0	0	1	0
Lane Group Flow (vph)	62	44	0	51	126	0	5	507	0	112	330	0
Confl. Peds. (#/hr)									7			
Confl. Bikes (#/hr)									2			
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	3%	3%	3%	6%	6%	6%
Turn Type	Prot	NA		Prot	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases							2			6		
Actuated Green, G (s)	8.3	15.6		7.6	14.9		71.6	70.4		83.3	77.6	
Effective Green, g (s)	8.3	15.6		7.6	14.9		71.6	70.4		83.3	77.6	
Actuated g/C Ratio	0.07	0.13		0.06	0.12		0.60	0.59		0.69	0.65	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	120	218		112	197		614	2041		579	2189	
v/s Ratio Prot	c0.04	0.03		0.03	c0.08		0.00	c0.15		c0.01	0.10	
v/s Ratio Perm							0.00			0.12		
v/c Ratio	0.52	0.20		0.46	0.64		0.01	0.25		0.19	0.15	
Uniform Delay, d1	53.9	46.6		54.2	50.0		9.8	12.0		6.4	8.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.22	0.20	
Incremental Delay, d2	3.7	0.5		2.9	6.7		0.0	0.3		0.1	0.1	
Delay (s)	57.6	47.1		57.1	56.7		9.8	12.3		1.5	1.7	
Level of Service	E	D		E	E		A	B		A	A	
Approach Delay (s)		51.6			56.7			12.3			1.7	
Approach LOS		D			E			B			A	

Intersection Summary			
HCM 2000 Control Delay	26.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Intersection: 1: Highway 99W & SW 124th Ave

Movement	NW	NW	NW	NW	NE	NE	NE	SW	SW	SW	SW
Directions Served	L	L	R	R	T	T	R	L	L	T	T
Maximum Queue (ft)	117	95	97	43	1122	1197	250	611	624	721	135
Average Queue (ft)	50	29	7	1	671	703	247	387	428	123	59
95th Queue (ft)	101	74	54	25	1070	1118	275	598	633	511	118
Link Distance (ft)	498	498			1432	1432				706	706
Upstream Blk Time (%)						0				3	
Queuing Penalty (veh)						0				0	
Storage Bay Dist (ft)			300	300			225	600	600		
Storage Blk Time (%)						39	8	0	4	0	
Queuing Penalty (veh)						203	56	1	14	0	

Intersection: 2: SW 126th Pl & North Site Access

Movement	EB
Directions Served	LR
Maximum Queue (ft)	29
Average Queue (ft)	5
95th Queue (ft)	24
Link Distance (ft)	103
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: SW 126th Pl & South Site Access

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	30	5
Average Queue (ft)	5	0
95th Queue (ft)	22	4
Link Distance (ft)	86	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		25
Storage Blk Time (%)		0
Queuing Penalty (veh)		0

Intersection: 4: West Site Access & SW Leveton Dr

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	5	25
Average Queue (ft)	0	1
95th Queue (ft)	4	9
Link Distance (ft)		193
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	75	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: SW Leveton Dr & SW 126th Pl

Movement	SB	SB
Directions Served	L	R
Maximum Queue (ft)	28	20
Average Queue (ft)	11	1
95th Queue (ft)	32	10
Link Distance (ft)		99
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	95	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: SW 124th Ave & SW Leveton Dr

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	B16
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR	T
Maximum Queue (ft)	120	191	47	86	66	51	101	144	86	102	7
Average Queue (ft)	25	86	13	22	14	9	32	58	27	49	0
95th Queue (ft)	75	163	40	63	45	35	81	115	72	97	5
Link Distance (ft)		586		760		524	524		1047	1047	498
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	120		160		190			190			
Storage Blk Time (%)	0	6						0			
Queuing Penalty (veh)	0	1						0			

Network Summary

Network wide Queuing Penalty: 275

Intersection: 1: Highway 99W & SW 124th Ave

Movement	NW	NW	NW	NW	NE	NE	NE	SW	SW	SW	SW
Directions Served	L	L	R	R	T	T	R	L	L	T	T
Maximum Queue (ft)	309	306	284	218	350	333	250	340	382	230	268
Average Queue (ft)	188	174	100	77	241	221	78	194	239	117	134
95th Queue (ft)	280	270	241	210	322	304	200	293	336	197	223
Link Distance (ft)	498	498			1432	1432				706	706
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)			300	300			225	600	600		
Storage Blk Time (%)		0	0			5	0				
Queuing Penalty (veh)		2	0			7	0				

Intersection: 2: SW 126th Pl & North Site Access

Movement	EB
Directions Served	LR
Maximum Queue (ft)	28
Average Queue (ft)	2
95th Queue (ft)	16
Link Distance (ft)	103
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: SW 126th Pl & South Site Access

Movement	EB
Directions Served	LR
Maximum Queue (ft)	40
Average Queue (ft)	3
95th Queue (ft)	22
Link Distance (ft)	86
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: West Site Access & SW Leveton Dr

Movement	NB
Directions Served	LR
Maximum Queue (ft)	43
Average Queue (ft)	8
95th Queue (ft)	31
Link Distance (ft)	193
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: SW Leveton Dr & SW 126th Pl

Movement	SB	SB
Directions Served	L	R
Maximum Queue (ft)	46	12
Average Queue (ft)	8	0
95th Queue (ft)	31	6
Link Distance (ft)		99
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	95	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: SW 124th Ave & SW Leveton Dr

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	89	104	141	260	12	111	173	84	34	65
Average Queue (ft)	31	38	42	97	1	31	50	28	3	17
95th Queue (ft)	72	80	99	188	9	82	125	66	20	50
Link Distance (ft)		586		760		524	524		1047	1047
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	120		160		190			190		
Storage Blk Time (%)	0	0		3						
Queuing Penalty (veh)	0	0		1						

Network Summary

Network wide Queuing Penalty: 11

Intersection: 1: Highway 99W & SW 124th Ave

Movement	NW	NW	NW	NW	NE	NE	NE	SW	SW	SW	SW
Directions Served	L	L	R	R	T	T	R	L	L	T	T
Maximum Queue (ft)	152	131	232	210	762	808	250	612	625	751	686
Average Queue (ft)	75	53	64	39	374	387	215	595	613	674	107
95th Queue (ft)	136	117	198	157	642	686	325	687	688	981	442
Link Distance (ft)	498	498			1432	1432				706	706
Upstream Blk Time (%)										48	0
Queuing Penalty (veh)										0	0
Storage Bay Dist (ft)			300	300			225	600	600		
Storage Blk Time (%)						17	6	7	46	1	
Queuing Penalty (veh)						92	43	26	172	11	

Intersection: 2: SW 126th Pl & North Site Access

Movement	EB
Directions Served	LR
Maximum Queue (ft)	29
Average Queue (ft)	5
95th Queue (ft)	23
Link Distance (ft)	103
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: SW 126th Pl & South Site Access

Movement	EB
Directions Served	LR
Maximum Queue (ft)	34
Average Queue (ft)	5
95th Queue (ft)	23
Link Distance (ft)	86
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: West Site Access & SW Leveton Dr

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	19	15
Average Queue (ft)	1	1
95th Queue (ft)	8	9
Link Distance (ft)		193
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	75	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: SW Leveton Dr & SW 126th Pl

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	8	32	21
Average Queue (ft)	0	10	2
95th Queue (ft)	6	31	12
Link Distance (ft)			99
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	150	95	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: SW 124th Ave & SW Leveton Dr

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	117	208	59	84	67	68	115	156	104	124
Average Queue (ft)	32	84	13	24	19	13	38	66	30	50
95th Queue (ft)	88	167	43	67	51	47	90	130	81	107
Link Distance (ft)		586		760		524	524		1047	1047
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	120		160		190			190		
Storage Blk Time (%)	1	6		0						
Queuing Penalty (veh)	1	1		0						

Network Summary

Network wide Queuing Penalty: 346

Intersection: 1: Highway 99W & SW 124th Ave

Movement	NW	NW	NW	NW	NE	NE	NE	SW	SW	SW	SW
Directions Served	L	L	R	R	T	T	R	L	L	T	T
Maximum Queue (ft)	293	289	264	248	375	364	250	365	393	242	248
Average Queue (ft)	200	190	93	86	247	226	82	205	249	124	141
95th Queue (ft)	287	281	231	229	337	323	204	311	352	210	232
Link Distance (ft)	498	498			1432	1432				706	706
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)			300	300			225	600	600		
Storage Blk Time (%)		0	0			6	0				
Queuing Penalty (veh)		1	0			9	0				

Intersection: 2: SW 126th Pl & North Site Access

Movement	EB
Directions Served	LR
Maximum Queue (ft)	29
Average Queue (ft)	5
95th Queue (ft)	22
Link Distance (ft)	103
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: SW 126th Pl & South Site Access

Movement	EB
Directions Served	LR
Maximum Queue (ft)	35
Average Queue (ft)	4
95th Queue (ft)	22
Link Distance (ft)	86
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: West Site Access & SW Leveton Dr

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	9	48
Average Queue (ft)	0	10
95th Queue (ft)	7	38
Link Distance (ft)		193
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	75	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: SW Leveton Dr & SW 126th Pl

Movement	SB	SB
Directions Served	L	R
Maximum Queue (ft)	47	8
Average Queue (ft)	8	0
95th Queue (ft)	32	5
Link Distance (ft)		99
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	95	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: SW 124th Ave & SW Leveton Dr

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	103	122	151	296	27	161	181	107	44	68
Average Queue (ft)	43	49	41	109	2	41	61	32	4	16
95th Queue (ft)	86	100	97	209	12	106	135	78	24	49
Link Distance (ft)		586		760		524	524		1047	1047
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	120		160		190			190		
Storage Blk Time (%)	1	1		4		0				
Queuing Penalty (veh)	0	0		2		0				

Network Summary

Network wide Queuing Penalty: 12

Intersection: 1: Highway 99W & SW 124th Ave

Movement	NW	NW	NW	NW	NE	NE	NE	SW	SW	SW	SW
Directions Served	L	L	R	R	T	T	R	L	L	T	T
Maximum Queue (ft)	163	149	236	226	767	801	250	612	625	763	687
Average Queue (ft)	70	51	60	46	406	426	213	599	617	681	95
95th Queue (ft)	136	118	196	171	707	738	326	667	668	979	406
Link Distance (ft)	498	498			1432	1432				706	706
Upstream Blk Time (%)										47	0
Queuing Penalty (veh)										0	0
Storage Bay Dist (ft)			300	300			225	600	600		
Storage Blk Time (%)						19	6	6	45	2	
Queuing Penalty (veh)						106	41	22	168	19	

Intersection: 2: SW 126th Pl & North Site Access

Movement	EB
Directions Served	LR
Maximum Queue (ft)	29
Average Queue (ft)	5
95th Queue (ft)	24
Link Distance (ft)	103
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: SW 126th Pl & South Site Access

Movement	EB
Directions Served	LR
Maximum Queue (ft)	30
Average Queue (ft)	5
95th Queue (ft)	23
Link Distance (ft)	86
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: West Site Access/West Site Acces & SW Leveton Dr

Movement	WB	NB	SB
Directions Served	L	LTR	LTR
Maximum Queue (ft)	5	19	19
Average Queue (ft)	0	1	1
95th Queue (ft)	4	9	10
Link Distance (ft)		192	138
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	75		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: SW Leveton Dr & SW 126th Pl

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	5	32	21
Average Queue (ft)	0	12	2
95th Queue (ft)	4	35	13
Link Distance (ft)			99
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	150	95	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: SW 124th Ave & SW Leveton Dr

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	122	226	76	96	81	79	155	148	116	141
Average Queue (ft)	30	95	17	30	23	16	39	65	38	57
95th Queue (ft)	82	178	55	73	61	57	96	130	94	115
Link Distance (ft)		586		760		524	524		1047	1047
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	120		160		190			190		
Storage Blk Time (%)	0	8						0		
Queuing Penalty (veh)	0	2						0		

Network Summary

Network wide Queuing Penalty: 358

Intersection: 1: Highway 99W & SW 124th Ave

Movement	NW	NW	NW	NW	NE	NE	NE	SW	SW	SW	SW
Directions Served	L	L	R	R	T	T	R	L	L	T	T
Maximum Queue (ft)	306	321	320	232	365	348	250	351	416	228	261
Average Queue (ft)	204	196	104	83	252	233	87	215	259	120	147
95th Queue (ft)	303	301	252	219	339	325	225	319	366	206	229
Link Distance (ft)	498	498			1432	1432				706	706
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)			300	300			225	600	600		
Storage Blk Time (%)		1	0	0		6	0				
Queuing Penalty (veh)		6	0	0		9	0				

Intersection: 2: SW 126th Pl & North Site Access

Movement	EB
Directions Served	LR
Maximum Queue (ft)	48
Average Queue (ft)	9
95th Queue (ft)	35
Link Distance (ft)	103
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: SW 126th Pl & South Site Access

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	47	10
Average Queue (ft)	7	0
95th Queue (ft)	29	6
Link Distance (ft)	86	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		25
Storage Blk Time (%)		0
Queuing Penalty (veh)		0

Intersection: 4: West Site Access & SW Leveton Dr

Movement	WB	NB	SB
Directions Served	L	LTR	LTR
Maximum Queue (ft)	17	52	30
Average Queue (ft)	1	7	5
95th Queue (ft)	10	31	24
Link Distance (ft)		192	128
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	75		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: SW Leveton Dr & SW 126th Pl

Movement	SB	SB
Directions Served	L	R
Maximum Queue (ft)	62	17
Average Queue (ft)	16	1
95th Queue (ft)	46	9
Link Distance (ft)		99
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	95	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: SW 124th Ave & SW Leveton Dr

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	126	116	126	236	23	132	162	88	40	57
Average Queue (ft)	48	45	41	98	2	37	52	33	3	18
95th Queue (ft)	95	93	88	182	15	88	119	72	20	50
Link Distance (ft)		586		760		524	524		1047	1047
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	120		160		190			190		
Storage Blk Time (%)	1	0	0	3		0				
Queuing Penalty (veh)	0	0	0	1		0				

Network Summary

Network wide Queuing Penalty: 18

CITY OF TUALATIN, WASHINGTON COUNTY **124TH AVE at PACIFIC HY 99W, City of Tualatin, Washington County, 01/01/2012 to 12/31/2016**

1 - 4 of 8 Crash records shown.

SER# / INVEST / RD DPT / UNLOC?	S P E D A L C G S H L R W K	DATE / DAY / TIME / LAT	CLASS / DIST / FROM / LONG	CITY STREET / FIRST STREET / SECOND STREET / LRS	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	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT	EVENT	CAUSE
02767	N N N N N	05/29/2012	14	SW PACIFIC HY 99W	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											07
CITY		TU		SW 124TH AVE	NE		TRF SIGNAL	N	DRY	REAR		PRVTE	SW-NE									000		00
N		1P			05	1		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	56	F	OR-Y		043,026	000		07
N		45 23 20.8212558	-122 48 19.6650966	009100200S00															OR<25					
											02	NONE 0	STOP											
												PRVTE	SW-NE									011		00
												PSNGR CAR		01	DRVR	INJC	65	M	OR-Y		000	000		00
																			OR<25					
											02	NONE 0	STOP											
												PRVTE	SW-NE									011		00
												PSNGR CAR		02	PSNG	INJC	61	F			000	000		00
07063	N N N N N	11/22/2014	14	SW PACIFIC HY 99W	INTER	3-LEG	N	N	CLD	S-1STOP	01	NONE 0	STRGHT											07
CITY		SA		SW 124TH AVE	NE		TRF SIGNAL	N	WET	REAR		PRVTE	NE-SW									000		00
N		4P			06	1		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	84	M	OR-Y		043,026	000		07
N		45 23 20.82	-122 48 19.67	009100200S00															OR<25					
											02	NONE 0	STOP											
												PRVTE	NE-SW									011		00
												PSNGR CAR		01	DRVR	INJC	54	F	OR-Y		000	000		00
																			OR<25					
02236	N N N	05/02/2013	16	SW PACIFIC HY 99W	INTER	3-LEG	N	N	CLR	S-1STOP	01	NONE 0	STRGHT										099	07
NO RPT		TH	0	SW 124TH AVE	SE		TRF SIGNAL	N	DRY	REAR		PRVTE	SE-NW									000		00
N		4P			06	1		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	24	F	OR-Y		026	000	099	07
N		45 23 20.8212359	-122 48 19.665072																OR<25					
											02	NONE 0	STOP											
												PRVTE	SE-NW									011		00
												PSNGR CAR		01	DRVR	NONE	59	M	OR-Y		000	000		00
																			OR<25					
00041	N N N	01/03/2013	14	SW PACIFIC HY 99W	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											07
NONE		TH		SW 124TH AVE	SW		TRF SIGNAL	N	DRY	REAR		PRVTE	SW-NE									000		00
N		12P			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	27	F	OR-Y		026	000		07
N		45 23 20.8205519	-122 48 19.6663679	009100200S00															OR<25					
											02	NONE 0	STOP											
												PRVTE	SW-NE									011		00
												PSNGR CAR		01	DRVR	NONE	52	M	OR-Y		000	000		00
																			OR<25					
											02	NONE 0	STOP											
												PRVTE	SW-NE									011		00
												PSNGR CAR		02	PSNG	INJC	65	F			000	000		00

CITY OF TUALATIN, WASHINGTON COUNTY **124TH AVE at PACIFIC HY 99W, City of Tualatin, Washington County, 01/01/2012 to 12/31/2016**

5 - 8 of 8 Crash records shown.

SER# / INVEST / RD DPT / UNLOC?	S P E D	A L C	R U G S	S C H L	W O R K	DATE / DAY / TIME / LAT	CLASS / DIST / FROM / LONG	CITY STREET / FIRST STREET / SECOND STREET / LRS	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	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT EVENT	CAUSE
02734	N	N	N	N	N	05/14/2014	14	SW PACIFIC HY 99W	INTER	3-LEG	N	N	CLR	S-1STOP	01	NONE 0	STRGHT										32,16,29
CITY			WE					SW 124TH AVE	SW		TRF SIGNAL	N	DRY	REAR		PRVTE	SW-NE									000	00
N			5P						06	1		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	21	M	OR-Y		052,026	025	32,16,29
N			45 23 20.82				-122 48 19.67	009100200S00															OR<25				
															02	NONE 0	STOP										
																PRVTE	SW-NE									011	00
																PSNGR CAR		01	DRVR	INJC	47	M	OR-Y		000	000	00
																							OR<25				
00035	N	N	N	N	N	01/04/2012	14	SW PACIFIC HY 99W	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT										02
CITY			WE					SW 124TH AVE	CN		TRF SIGNAL	N	DRY	TURN		PRVTE	SW-NE									000	00
N			8A						02	1		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	24	F	OR-Y		000	000	00
N			45 23 20.8212558				-122 48 19.6650966	009100200S00															OR<25				
															02	NONE 0	TURN-L										
																PRVTE	SE-SW									016	00
																PSNGR CAR		01	DRVR	NONE	16	M	OR-Y		028	000	02
																							OR<25				
04773	N	N	N	N	N	09/10/2012	14	SW PACIFIC HY 99W	INTER	CROSS	N	N	CLR	O-1 L-TURN	01	NONE 0	STRGHT										04
CITY			MO					SW 124TH AVE	CN		TRF SIGNAL	N	DRY	TURN		PRVTE	SW-NE									000	00
N			10P						04	0		N	DLIT	INJ		PSNGR CAR		01	DRVR	INJC	18	M	OR-Y		020	000	04
N			45 23 20.8212558				-122 48 19.6650966	009100200S00															OR<25				
															02	NONE 0	TURN-L										
																PRVTE	NE-SE									000	00
																PSNGR CAR		01	DRVR	NONE	25	M	OR-Y		000	000	00
																							OR<25				
															03	NONE 0	TURN-L										
																PRVTE	NE-SE									022	00
																PSNGR CAR		01	DRVR	NONE	40	M	OR-Y		000	000	00
																							OR<25				
02885	N	N	N	N	N	05/03/2016	14	SW PACIFIC HY 99W	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT										04
CITY			TU					SW 124TH AVE	CN		L-GRN-SIG	N	DRY	TURN		PRVTE	NE-SW									000	00
N			2P						03	1		N	DAY	INJ		PSNGR CAR		01	DRVR	INJC	78	M	OTH-Y		020	000	04
N			45 23 20.82				-122 48 19.67	009100200S00															N-RES				
															02	NONE 0	TURN-L										
																PRVTE	SE-SW									000	00
																PSNGR CAR		01	DRVR	NONE	69	M	OR-Y		000	000	00
																							OR<25				

CITY OF TUALATIN, WASHINGTON COUNTY **124TH AVE at LEVETON DR, City of Tualatin, Washington County, 01/01/2012 to 12/31/2016**

1 - 1 of 1 Crash records shown.

SER# / INVEST / RD DPT / UNLOC?	S P E D	A L C	R U G S	S C H L	W O R K	DATE / DAY / TIME / LAT	CLASS / DIST / FROM / LONG	CITY STREET / FIRST STREET / SECOND STREET / LRS	RD CHAR / DIRECT / LOCTN	INT-TYPE (MEDIAN) / LEGS (#LANES) / CROSS	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
06999	N	N	N	N	N	11/19/2015	16	SW LEVETON DR	INTER	CROSS	N	N	RAIN	O-1 L-TURN	01	NONE 0	STRGHT										02
CITY						TH	0	124TH AVE	CN		TRF SIGNAL	N	WET	TURN		PRVTE	S -N									000	00
N						7A			04	0		N	DAY	INJ		PSNGR CAR		01	DRVR	INJC	45	F	OR-Y		000	000	00
N						45 23 5.63	-122 48 14.95																OR<25				
															02	NONE 0	TURN-L										
																PRVTE	N -E									000	00
																PSNGR CAR		01	DRVR	NONE	58	M	OR-Y		004,028	000	02
																							OR<25				

STORM WATER ANALYSIS AND QUALITY FACILITY DESIGN

FOR

COLUMBIA ROOFING AND SHEET METAL

18525 SW 126TH PLACE
TUALATIN, OREGON 97062

J.O. SGL 18-026

June 07, 2018

SISUL ENGINEERING
A Division of Sisul Enterprises, Inc.
375 Portland Avenue
Gladstone, OR 97027
phone: (503) 657-0188
fax: (503) 657-5779

Narrative:

The goal of this storm report is to demonstrate that stormwater treatment and detention can be provided per the current Clean Water Services (CWS) rules and regulations.

Our project site is lot 10 of Leveton Commons, 2nd phase. The site is located at the northwest corner of the intersection of SW 126th Place and SW Leveton Drive and is a previously developed commercial lot 1.96 acre in size. The previous development used 1.16 acres of the site, with improvements in the northern 2/3rds of site. A 11,200-sf building with loading docks and drive aisles was previously constructed.

For this phase of the project we are going to add a 19,800-sf building to the southern portion of the lot, reroute the drive aisle, and add additional parking.

Upstream Analysis:

Per Clean Water Services drainage reports must including an upstream drainage analysis. The upstream analysis must meet the requirements of Section 2.04.2.m and section 5.05.03. This upstream analysis will examine the neighboring properties and public streets to determine if any neighboring properties are contributing stormwater runoff across our project site.

Lot 10 of Leveton Commons is bordered by SW 126th Place on the east side and by SW Leveton Drive on the south side. Based upon the Leveton Commons construction plans and the final water quality and conveyance calculation the public right of way of both streets are designed to drain to an existing public stormwater facility. Neither street's right of way will be contributing any additional stormwater runoff to our site.

On the west side of our project is vacant lot. This lot is at a lower elevation than our site and is sloping to the south towards SW Leveton Drive. The vacant lot isn't capable of contributing stormwater runoff to our site.

The property bordering our site to the north is a developed commercial lot that's higher in elevation. Along the joint property line is an existing structural retaining wall. Its assumed the wall has a drain picking up stormwater runoff from the northern lot and the site was developed to meet older CWS requirements. The northern lot may present some stormwater runoff, but it is assumed negligible and will not be addressed further.

This upstream analysis covered the properties on all sides of our project site. None of the surrounding parcel or public right of way appear to be contributing any significant stormwater runoff to our site.

Detention Calculations:

In current developed state detention for our site is upstream of the flow control manhole. The current design provides detention for a 2-year event by flooding in the existing private storm lines and catchbasin leads. Detention for the 25-year event uses a greater portion of the existing storm system and floods the existing depressed loading dock.

Our building addition will intersect and reroute the existing storm drain system. For the proposed state ADS Stormtech 310 chambers are proposed to provide in-line detention for the site upstream of the water quality manhole in addition to the private storm lines.

We will begin by determining the sites pre-and post-developed flow rate for a 2 through 25-year storm event.

Area:

Existing Area Breakdown:

Pervious area	= 85,491 sf - 1.96 acres
Impervious area	= 0,000 sf - 0.90 acres
Total area	= 85,491 sf - 1.96 acres

Post Developed Area Breakdown:

Pervious area	= 11,126 sf - 0.26 acres
Undetained Impervious area	= 2,300 sf - 0.05 acres
Detained Impervious area	= 72,069 sf - 1.65 acres
Total area	= 85,491 sf - 1.96 acres

Runoff Curve Numbers:

Geotechnical inspection reports from the original construction indicate our site was filled. Fill material noted ranges from ground concrete to native materials. For this report we assume the underlain soil is still native.

NRCS soils indicates our site is mostly comprised of pits and Hillsboro Loam. Per the NRCS datum Hillsboro Loam falls in Hydrologic Soil group 'B'.

Impervious Surfaces	Hydrologic Group 'B' => 98
Pervious Surface grass	Hydrologic Group 'B' => 79

Rainfall Distribution: (See attached CWS Drawing No. 1280)

2 yr, 24-hour storm event	Total depth = 2.50 inches
5 yr, 24-hour storm event	Total depth = 3.10 inches
10 yr, 24-hour storm event	Total depth = 3.45 inches
25 yr, 24-hour storm event	Total depth = 3.90 inches

Pre-developed Time of Concentration:

With the site partially developed and in a fill state it's difficult to determine the initial existing time of concentrations. For these calculations we will assume a straight slope from the high end of the developed portion of the site to Levton Drive. We will also assume the original conditions were a grass field prior to construction. Nicoli Engineering's original stormwater calculations used a time of concentration of 5 minutes, but I don't feel that was accurate for a site of this size.

Sites flow path = 315 feet (western side)
Site slope = (150.2 - 146.58) / 315 = 0.0115

Sheet Flow1: $T_1 = \frac{0.42\,(n_s L)^{0.8}}{(P_2)^{0.5} * (s_o)^{0.4}}$

$L = 50.0$ ft.
$P_2 = 2.5$ in.
$S_o = 0.115$ ft./ft.
$n_s = 0.15$ short grass

$T_1 = 7.94$ min.

Sheet flow limited to 50 feet per CWS subsection 5.05.2.f

Shallow Concentrated Flow: $T_2 = \frac{L}{60 * k_s * (S_o)^{0.5}} =$

$L = 265$ ft. (315 ft -50 ft= 265 ft)
$S_o = 0.0115$
$K_s = 11$ (Short grass)

$T_2 = 3.74$ min.

$T_c = T_1 + T_2 = 7.94 + 3.74 =$ **11.68 min**

The existing T_c Covers the assumed drainage path leading from the north to the south on the western half of the site.

Post-developed Time of Concentration:

$T_c =$ **5.0 min**

Hydrographs:
The predeveloped and post development hydrograph will be generated using the Santa Barbara Urban Hydrograph (SBUH) Method. (KING COUNTY DEPARTMENT OF PUBLIC WORKS Surface Water Management Division, HYDROGRAPH PROGRAMS Version 4.20)

2-year Runoff Rate – Pre-Development

```
                KING COUNTY DEPARTMENT OF PUBLIC WORKS
                     Surface Water Management Division

                          HYDROGRAPH PROGRAMS
                              Version 4.20

                          1 - INFO ON THIS PROGRAM
                          2 - SBUHYD
                          3 - ROUTE
                          4 - ROUTE2
                          5 - ADDHYD
                          6 - BASEFLOW
                          7 - PLOTHYD
                          8 - DATA
                          9 - RDFAC
                         10 - RETURN TO DOS

ENTER OPTION: 2

SBUH/SCS METHOD FOR COMPUTING RUNOFF HYDROGRAPH

STORM OPTIONS:

1 - S.C.S. TYPE-1A
2 - 7-DAY DESIGN STORM
3 - STORM DATA FILE

SPECIFY STORM OPTION:1

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
2,24,2.5
------------------------------------------------------------------------
******************** S.C.S. TYPE-1A DISTRIBUTION ********************
*********   2-YEAR  24-HOUR STORM  ****  2.50" TOTAL PRECIP. *********

------------------------------------------------------------------------
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO.  1
1.96,79,0,98,11.68

DATA PRINT-OUT:

  AREA(ACRES)     PERVIOUS     IMPERVIOUS    TC(MINUTES)
                  A     CN     A     CN
       2.0        2.0  79.0    .0  98.0         11.7

  PEAK-Q(CFS)    T-PEAK(HRS)     VOL(CU-FT)
       .30           7.83           5949

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846e2.dev
```

2-year Runoff Rate – Post-Development

```
                KING COUNTY DEPARTMENT OF PUBLIC WORKS
                  Surface Water Management Division

                        HYDROGRAPH PROGRAMS
                            Version 4.20

                      1 - INFO ON THIS PROGRAM
                      2 - SBUHYD
                      3 - ROUTE
                      4 - ROUTE2
                      5 - ADDHYD
                      6 - BASEFLOW
                      7 - PLOTHYD
                      8 - DATA
                      9 - RDTAC
                     10 - RETURN TO DOS

ENTER OPTION:
2

SBUH/SCS METHOD FOR COMPUTING RUNOFF HYDROGRAPH

STORM OPTIONS:

1 - S.C.S. TYPE-1A
2 - 7-DAY DESIGN STORM
3 - STORM DATA FILE

SPECIFY STORM OPTION:
1

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
2,24,2.5
------------------------------------------------------------------------------
******************** S.C.S. TYPE-1A DISTRIBUTION ********************
*********   2-YEAR  24-HOUR STORM  ****  2.50" TOTAL PRECIP. *********

------------------------------------------------------------------------------
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO.  1
0.26,79,1.65,98,5

DATA PRINT-OUT:

  AREA(ACRES)     PERVIOUS     IMPERVIOUS    TC(MINUTES)
                  A     CN      A     CN
       1.9        .3  79.0     1.6    98.0        5.0

  PEAK-Q(CFS)    T-PEAK(HRS)     VOL(CU-FT)
      1.10           7.67           14930

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
184dd2.dev
```

5-year Runoff Rate – Pre-Development

```
                    KING COUNTY DEPARTMENT OF PUBLIC WORKS
                      Surface Water Management Division

                              HYDROGRAPH PROGRAMS
                                  Version 4.20

                            1 - INFO ON THIS PROGRAM
                            2 - SBUHYD
                            3 - ROUTE
                            4 - ROUTE2
                            5 - ADDHYD
                            6 - BASEFLOW
                            7 - PLOTHYD
                            8 - DATA
                            9 - RDFAC
                           10 - RETURN TO DOS

ENTER OPTION:
2

SBUH/SCS METHOD FOR COMPUTING RUNOFF HYDROGRAPH

STORM OPTIONS:

1 - S.C.S. TYPE-1A
2 - 7-DAY DESIGN STORM
3 - STORM DATA FILE

SPECIFY STORM OPTION:
1

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
5,24,3.1
------------------------------------------------------------------------
******************** S.C.S. TYPE-1A DISTRIBUTION ********************
*********   5-YEAR  24-HOUR STORM  ****  3.10" TOTAL PRECIP. *********

------------------------------------------------------------------------
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO.  1
1.96,79,0,98,11.68

DATA PRINT-OUT:

  AREA(ACRES)     PERVIOUS     IMPERVIOUS    TC(MINUTES)
                   A     CN      A     CN
       2.0        2.0  79.0      .0  98.0         11.7

  PEAK-Q(CFS)    T-PEAK(HRS)     VOL(CU-FT)
       .51           7.83           8967

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846e5.dev
```

5-year Runoff Rate – Post-Development

```
                    KING COUNTY DEPARTMENT OF PUBLIC WORKS
                      Surface Water Management Division

                              HYDROGRAPH PROGRAMS
                                  Version 4.20

                          1 - INFO ON THIS PROGRAM
                          2 - SBUHYD
                          3 - ROUTE
                          4 - ROUTE2
                          5 - ADDHYD
                          6 - BASEFLOW
                          7 - PLOTHYD
                          8 - DATA
                          9 - RDFAC
                         10 - RETURN TO DOS

ENTER OPTION:
2

SBUH/SCS METHOD FOR COMPUTING RUNOFF HYDROGRAPH

STORM OPTIONS:

1 - S.C.S. TYPE-1A
2 - 7-DAY DESIGN STORM
3 - STORM DATA FILE

SPECIFY STORM OPTION:
1

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
5,24,3.1
------------------------------------------------------------------------------
******************** S.C.S. TYPE-1A DISTRIBUTION ********************
*********   5-YEAR  24-HOUR STORM  ****  3.10" TOTAL PRECIP. *********

------------------------------------------------------------------------------
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO.  1
0.26,79,1.65,98,5

DATA PRINT-OUT:

  AREA(ACRES)     PERVIOUS     IMPERVIOUS    TC(MINUTES)
                   A     CN      A     CN
       1.9        0.3   79.0     1.6   98.0       5.0

  PEAK-Q(CFS)    T-PEAK(HRS)     VOL(CU-FT)
       1.40          7.67          18368

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846d5.dev
```

10-year Runoff Rate – Pre-Development

```
                    KING COUNTY DEPARTMENT OF PUBLIC WORKS
                      Surface Water Management Division

                              HYDROGRAPH PROGRAMS
                                  Version 4.20

                             1 - INFO ON THIS PROGRAM
                             2 - SBUHYD
                             3 - ROUTE
                             4 - ROUTE2
                             5 - ADDHYD
                             6 - BASEFLOW
                             7 - PLOTHYD
                             8 - DATA
                             9 - RDFAC
                            10 - RETURN TO DOS
ENTER OPTION:
2

SBUH/SCS METHOD FOR COMPUTING RUNOFF HYDROGRAPH

STORM OPTIONS:

1 - S.C.S. TYPE-1A
2 - 7-DAY DESIGN STORM
3 - STORM DATA FILE

SPECIFY STORM OPTION:
1

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
10,24,3.45

------------------------------------------------------------------------
********** S.C.S. TYPE-1A DISTRIBUTION **********
*********  10-YEAR  24-HOUR STORM  ****  3.45" TOTAL PRECIP. *********

------------------------------------------------------------------------
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO.  1
1.96,79,0,98,11.68

DATA PRINT-OUT:

  AREA(ACRES)     PERVIOUS     IMPERVIOUS    TC(MINUTES)
                  A     CN     A     CN
       2.0        2.0  79.0      .0  98.0         11.7

  PEAK-Q(CFS)    T-PEAK(HRS)     VOL(CU-FT)
      0.65           7.83           10851

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846e10.dev
```

10-year Runoff Rate – Post-Development

```
                    KING COUNTY DEPARTMENT OF PUBLIC WORKS
                      Surface Water Management Division

                            HYDROGRAPH PROGRAMS
                                Version 4.20

                             1 - INFO ON THIS PROGRAM
                             2 - SBUHYD
                             3 - ROUTE
                             4 - ROUTE2
                             5 - ADDHYD
                             6 - BASEFLOW
                             7 - PLOTHYD
                             8 - DATA
                             9 - RDFAC
                            10 - RETURN TO DOS
ENTER OPTION:
2

SBUH/SCS METHOD FOR COMPUTING RUNOFF HYDROGRAPH

STORM OPTIONS:

1 - S.C.S. TYPE-1A
2 - 7-DAY DESIGN STORM
3 - STORM DATA FILE

SPECIFY STORM OPTION:
1

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
10,24,3.45

------------------------------------------------------------------------
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO.  2
0.26,79,1.65,98,5

DATA PRINT-OUT:

  AREA(ACRES)     PERVIOUS     IMPERVIOUS    TC(MINUTES)
                  A     CN     A     CN
       1.9        .3   79.0    1.6   98.0         5.0

  PEAK-Q(CFS)    T-PEAK(HRS)     VOL(CU-FT)
      1.58           7.67          20707

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846d10.dev
```

25-year Runoff Rate – Pre-Development

```
                    KING COUNTY DEPARTMENT OF PUBLIC WORKS
                      Surface Water Management Division

                              HYDROGRAPH PROGRAMS
                                  Version 4.20

                              1 - INFO ON THIS PROGRAM
                              2 - SBUHYD
                              3 - ROUTE
                              4 - ROUTE2
                              5 - ADDHYD
                              6 - BASEFLOW
                              7 - PLOTHYD
                              8 - DATA
                              9 - RDFAC
                             10 - RETURN TO DOS
ENTER OPTION:
2

SBUH/SCS METHOD FOR COMPUTING RUNOFF HYDROGRAPH

STORM OPTIONS:

1 - S.C.S. TYPE-1A
2 - 7-DAY DESIGN STORM
3 - STORM DATA FILE

SPECIFY STORM OPTION:
1

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
25,24,3.9

------------------------------------------------------------------------
******************** S.C.S. TYPE-1A DISTRIBUTION ********************
*********  25-YEAR  24-HOUR STORM  ****  3.90" TOTAL PRECIP. *********

------------------------------------------------------------------------
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO.  1
1.96,79,0,98,11.68

DATA PRINT-OUT:

  AREA(ACRES)     PERVIOUS     IMPERVIOUS    TC(MINUTES)
                  A     CN     A     CN
       2.0        2.0  79.0      .0  98.0         11.68

  PEAK-Q(CFS)    T-PEAK(HRS)     VOL(CU-FT)
      0.83           7.83           13377

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846e25.dev
```

25-year Runoff Rate – Post-Development

```
                    KING COUNTY DEPARTMENT OF PUBLIC WORKS
                      Surface Water Management Division

                            HYDROGRAPH PROGRAMS
                                Version 4.20

                          1 - INFO ON THIS PROGRAM
                          2 - SBUHYD
                          3 - ROUTE
                          4 - ROUTE2
                          5 - ADDHYD
                          6 - BASEFLOW
                          7 - PLOTHYD
                          8 - DATA
                          9 - RDFAC
                         10 - RETURN TO DOS
ENTER OPTION:
2

SBUH/SCS METHOD FOR COMPUTING RUNOFF HYDROGRAPH

STORM OPTIONS:

1 - S.C.S. TYPE-1A
2 - 7-DAY DESIGN STORM
3 - STORM DATA FILE

SPECIFY STORM OPTION:
1

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
25,24,3.9

-------------------------------------------------------------------------
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO.  2
0.26,79,1.65,98,5

DATA PRINT-OUT:

  AREA(ACRES)     PERVIOUS     IMPERVIOUS    TC(MINUTES)
                  A     CN      A     CN
       1.9         .3  79.0    1.6  98.0         5.0

  PEAK-Q(CFS)   T-PEAK(HRS)     VOL(CU-FT)
      1.81          7.67          23730

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846d25.dev
```

The additional flow added by this development is the difference between post developed condition and pre-developed conditions. The table below shows the existing, developed, and target flow rates.

Sites Release Rate Table

Storm Event	Predeveloped Flow Rate (CFS)	Post developed Flow Rate (CFS)	Target Release Rate (CFS)
2	0.30	1.10	0.30
5	0.51	1.40	0.51
10	0.65	1.58	0.65
25	0.83	1.81	0.83

Detention Routing Data

This previously development performed detention for the site upstream of the water quality device. Detention storage was accomplished backing up stormwater in the existing storm system / loading docks. Our development will intersect the existing detention system with the proposed building eliminating around 256 feet of 10-inch storm pipe and a few catch basins leads.

For the proposed detention we will reroute the storm system and add inline Stormtech SC-310 chambers. Detention volumes shown on the next page were accomplished by determining the storage volume of each pipe segment and stormtech chamber on an elevation basis. The volume per elevation of the pipe segments and chambers were combined to create a total facility volume. See routing data for further information. Detention volumes shown don't account for 6-inch catchbasin leads. Actual storage volume is greater than shown and the final release rates and peak elevation will be lower.

Hydrographs:

The routing data will be generated using the Santa Barbara Urban Hydrograph (SBUH) Method. (KING COUNTY DEPARTMENT OF PUBLIC WORKS Surface Water Management Division, HYDROGRAPH PROGRAMS Version 4.20)

Detention Routing Data Printouts

```
                    KING COUNTY DEPARTMENT OF PUBLIC WORKS
                      Surface Water Management Division

                              HYDROGRAPH PROGRAMS
                                  Version 4.20

                              1 - INFO ON THIS PROGRAM
                              2 - SBUHYD
                              3 - ROUTE
                              4 - ROUTE2
                              5 - ADDHYD
                              6 - BASEFLOW
                              7 - PLOTHYD
                              8 - DATA
ENTER OPTION:
3

RESERVOIR ROUTING INFLOW/OUTFLOW ROUTINE

SPECIFY [d:][path]filename[.ext] OF ROUTING DATA
1846r.det

DISPLAY ROUTING DATA (Y or N)? y

ROUTING DATA:

STAGE(FT)    DISCHARGE(CFS)    STORAGE(CU-FT)    PERM-AREA(SQ-FT)
    .00              .00               .0                .0
    .23              .10              3.8                .0
    .43              .14              9.1                .0
    .50              .15             81.3                .0
    .75              .19            331.9                .0
    .93              .21            513.5                .0
   1.01              .22            673.9                .0
   1.26              .24           1146.3                .0
   1.51              .26           1604.7                .0
   1.76              .28           2028.1                .0
   2.01              .30           2396.0                .0
   2.26              .44           2681.4                .0
   2.51              .51           2962.9                .0
   2.76              .57           3255.2                .0
   2.87              .59           3391.0                .0
   3.01              .62           3547.7                .0
   3.25              .66           3556.5                .0
   3.50              .70           3570.9                .0
   3.75              .74           3661.4                .0
   4.00              .77           3766.2                .0
   4.25              .81           3901.6                .0
   4.50              .84           4039.6                .0
   4.75              .87           4173.0                .0
   5.00              .90           4282.2                .0
   5.25              .93           4395.9                .0

AVERAGE PERM-RATE:     .0 MINUTES/INCH
```

Routing Data – 2-Year Event

```
ENTER [d:][path]filename[.ext] OF COMPUTED HYDROGRAPH:
184dd2

INFLOW/OUTFLOW ANALYSIS:

  PEAK-INFLOW(CFS)    PEAK-OUTFLOW(CFS)    OUTFLOW-VOL(CU-FT)
        1.10                 .30                  14388

  INITIAL-STAGE(FT)   TIME-OF-PEAK(HRS)    PEAK-STAGE-ELEV(FT)
         .00                 8.67                  1.91

  PEAK STORAGE:      2240 CU-FT

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846r2
```

Routing Data – 5-Year Event

```
ENTER [d:][path]filename[.ext] OF COMPUTED HYDROGRAPH:
1846d5

INFLOW/OUTFLOW ANALYSIS:

  PEAK-INFLOW(CFS)    PEAK-OUTFLOW(CFS)    OUTFLOW-VOL(CU-FT)
        1.40                 .51                  18412

  INITIAL-STAGE(FT)   TIME-OF-PEAK(HRS)    PEAK-STAGE-ELEV(FT)
         .00                 8.17                  2.51

  PEAK STORAGE:      2960 CU-FT

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846r5
```

Routing Data – 10-Year Event

```
ENTER [d:][path]filename[.ext] OF COMPUTED HYDROGRAPH:
1846d10

INFLOW/OUTFLOW ANALYSIS:

  PEAK-INFLOW(CFS)    PEAK-OUTFLOW(CFS)    OUTFLOW-VOL(CU-FT)
        1.58                 0.60                 20652

  INITIAL-STAGE(FT)   TIME-OF-PEAK(HRS)    PEAK-STAGE-ELEV(FT)
         .00                 8.17                  2.94

  PEAK STORAGE:      3470 CU-FT

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846r10
```

Routing Data – 25-Year Event

```
ENTER [d:][path]filename[.ext] OF COMPUTED HYDROGRAPH:
1846d25

INFLOW/OUTFLOW ANALYSIS:

  PEAK-INFLOW(CFS)    PEAK-OUTFLOW(CFS)    OUTFLOW-VOL(CU-FT)
       1.81                 0.82                 23701

  INITIAL-STAGE(FT)  TIME-OF-PEAK(HRS)    PEAK-STAGE-ELEV(FT)
        .00                 8.00                 4.37
  PEAK STORAGE:      3960 CU-FT

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846r25
```

Routed Release Rate Table

Storm Event	Predeveloped Flow Rate (CFS)	Post developed Flow Rate (CFS)	Actual Release Rate
2	0.30	1.10	0.30
5	0.51	1.40	0.51
10	0.65	1.58	0.60
25	0.83	1.81	0.82

Detention Summary

The post developed storm events will be detained and released at or below preexisting flow rates. For detention 88 ADS SC-310 Stomtech chamber are proposed. The chamber will drain into an existing flow control manhole that will have two orifice inlets. The first orifice will be 2 13/16 inches designed to activate at the initial stage (outfall elevation 144.52) of the stormwater facility. The second orifice will be 3 inches set at 2.01 feet above the initial stage (elevation 146.53) of the stormwater facility. See the attached facility routing data sheet for storm facility volume and orifice calculations.

Water Quality Calculations

The existing development on our site was designed to meet older version of CWS requirements by Nicoli Engineering. A water quality swale was used to provide water quality treatment for the previous developed area of 50,653 sf (1.16 acres).

Current developed Area:

Existing Impervious area:	= 40,788 sf
Existing Pervious area:	= 9,865 sf
Total Site developed area:	= 50,653 sf

The previous calculation only covered the develop portion of the site and didn't include undeveloped area. Below is area that was not accounted for.

Unaccounted Pervious area:	= 30,842 sf
Total Area including developed:	= 85,495 sf

For the redeveloped scenario we are proposing to expand the width of the existing water quality swale to account for the increased impervious area. A small portion of the site's south western corner is too low in elevation to drain into the water quality swale. The low area will be graded to drain into a Lynch catchbasin with asphalt trap.

Proposed Area:

Proposed Development Area:

Water Quality Swale Impervious Area:	= 72,069 s.f. (1.65 acres)
Untreated Impervious Area	= 2,300 sf
New Pervious Area:	= 11,126 s.f.
Total Area:	= 85,495 s.f

Water Quality Swale Volume (WQV):

Per CWS, the water quality storm event is 0.36 inches in 4 hours.

$$WQV = \frac{0.36\text{ (in.)} \times \text{Area (s.f.)}}{12\text{ (in/ft)}} = \frac{0.36\text{ (in.)} \times 72{,}069\text{ (s.f.)}}{12\text{ (in/ft)}} = 2162\text{ cu. ft.}$$

Water Quality Flow (WQF):

$$WQF = \frac{WQV\text{ (cu. ft)}}{4\text{ (hours)}} = \frac{2162\text{ (cu. ft.)}}{14{,}400\text{ (s)}} = 0.15\text{ cfs}$$

Haestad Methods FlowMaster I version 3.13

Trapezoidal - Columbia Roofing

Comment: WQ Swale - Depth water quality event

Solve For.....Depth

Bottom Width...	4.00 ft	Velocity.....	0.18 fps
Lt Side Slope..	4.00:1 (H:V)	Flow Area.....	0.84 sf
Rt Side Slope..	4.00:1 (H:V)	Flow Top Width..	5.43 ft
Manning's n....	0.240	Wetted Perimeter	5.47 ft
Channel Slope..	0.0100 ft/ft	Critical Depth..	0.03 ft
Depth.....	**0.18 ft**	Critical Slope..	2.6080 ft/ft
Discharge.....	0.15 cfs	Froude Number...	0.08

Residence time = Swale Length = 100 feet * 1 min = **9.26 min**
Velocity 0.18 fps 60 sec

25-year Check:

Per detention calculations the 25-year release rate is 0.82 cfs. The swale capacity will be checked based upon the 25-year release rate. 25-year calculations will be modeled based upon swale section above water quality portion.

Haestad Methods FlowMaster I version 3.13

Trapezoidal - Columbia Roofing

Comment: WQ Swale - Depth 25-year event

Solve For.....Depth

Bottom Width...	5.50 ft	Velocity.....	0.31 fps
Lt Side Slope..	2.50:1 (H:V)	Flow Area.....	2.68 sf
Rt Side Slope..	2.50:1 (H:V)	Flow Top Width..	7.55 ft
Manning's n....	0.240	Wetted Perimeter	7.71 ft
Channel Slope..	0.0100 ft/ft	Critical Depth..	0.09 ft
Depth.....	**0.41 ft**	Critical Slope..	1.9324 ft/ft
Discharge.....	0.82 cfs	Froude Number...	0.09

The following list shows that the vegetated swale requirements in section 4.06.2 a & b, R&O 07-20 have been met.

CWS Requirements	Actual Swale Values	
Minimum residence time = 9 min.	Actual res. time = 9.26 min	.O.K.
Maximum design depth = 0.5'	Actual water depth = 0.14'	.O.K
Minimum length = 100'	Actual length = 100'	.O.K
Minimum slope = 0.5%	Actual slope = 1.00%	.O.K
Minimum bottom width = 2'	Actual bottom width = 4'	.O.K
Maximum treatment depth = 0.5'	Actual treat. depth = 0.18'	.O.K
Maximum 4:1 side slopes	Actual side slopes = 4:1	.O.K
Minimum Freeboard = 1.0'	Actual Freeboard = 1.00'	.O.K

Vegetated WQ Swale Summary:

The water depth during the water quality storm is 0.18', which is less than the 0.5' required. The residence time is 9.26 minutes, which is greater than the 9 minutes required. All other requirements can be met as shown above

Increasing the water quality bottom width to 4 feet will allow a pollution control event to fit in the swale with 4:1 side slopes of the water quality event. A 25-year event can be fit into the upper portion of the swale with 2.5:1 side slopes

Lynch Catchbasin Water Quality Sizing / Sumary:

Lynch CB Water Quality Volume (WQV):

Per CWS, the water quality storm event is 0.36 inches in 4 hours.

$$WQV = \frac{0.36 \text{ (in.)} \times \text{Area (s.f.)}}{12 \text{ (in/ft)}} = \frac{0.36 \text{ (in.)} \times 2{,}300 \text{ (s.f.)}}{12 \text{ (in/ft)}} = 69 \text{ cu. ft.}$$

Water Quality Flow (WQF):

$$WQF = \frac{WQV \text{ (cu. ft)}}{4 \text{ (hours)}} = \frac{69 \text{ (cu. ft.)}}{14{,}400 \text{ (s)}} = 0.005 \text{ cfs}$$

We are proposing that 2,300 feet of impervious area be allowed to leave the site through a lynch catchbasin with an asphalt trap. The amount of untreated runoff is 69 cubic feet or a flow rate 0.005 cfs.

Flow Control Manhole Sizing Calculations:

A flow control manhole is required upstream of the water quality manhole. Per CWS Standard Drawing No. 250, the sump volume requirements are:

20 cf / 1.0 cfs of inflow

Per the detention calculations the post developed runoff from a the 25-year storm event is 1.86 cfs. The sump volume requirements are calculated below:

1.81 cfs* (20 cf /1.0 cfs) = 36.2 cubic feet

The required sump volume for the water quality manhole is 36.2 cubic feet.

Per CWS Standard Drawing No. 250, the minimum sump volume is 58.9 cubic feet. Therefore, the minimum sump volume of 58.9 cubic feet will be used.

Before the water quality swale is an existing flow control manhole. For preliminary calculations we assume the flow control manhole has a minimum sump volume of 58.9 cubic feet. This will be verified during the design phase.

The increased impervious area does not increase the required sump volume to exceed 58.9 cubic feet. Thus, the existing water quality manhole should still meets the sump volume defined in current version of CWS standard drawing No. 250.

Pipe Flow Capacity:

For this phase of calculations, we will check the flow capacity of the onsite pipes. For this site, we have two private, 10-inch storm lines, conveying stormwater to the flow control manhole. Both storm lines combine into a single 10-inch pipe with a 1% slope. Flow capacity will be check at the most critical point of last pipe segment. See attached flow capacity calculations.

Pipe Flow Capacity Summary

The attached conveyance calculations demonstrate our pipes will have adequate capacity to convey a 25-year storm event but reach maximum capacity in the last segment.

Downstream Analysis Calculations:

Per section 2.04.2.m.3 of CWS R&0 17-05 each development constructing new impervious surface of greater than 5,280 square feet, or collecting and discharging greater than 5,280 square feet of impervious area, except for the construction of a detached single family dwelling the design engineer shall perform a capacity and condition analysis of the existing downstream storm facilities and conveyance elements receiving flow from the proposed development

CWS subsection 2.04.2.m.3 notes the downstream analysis shall extend downstream to a point in the drainage system where the additional flow from proposed development site constitutes 10 percent or less of the total tributary. Once we are less than 10 percent of the total tributary we must carry the downstream analysis ¼ mile or until the additional flow constitutes less than 5 percent of the total tributary drainage flow.

Our site drains through an existing storm lateral that flows into an existing 15" storm line located in Leveton Drive. After 10 -15 feet the public storm main reaches a manhole and heads south through an existing 18-inch ductile iron pipe. The pipe discharge into an existing dry basin, designed with Leveton Commons phase 2, after about 220 feet. From the extended dry basin stormwater is released into the existing wetland.

Our site is not generating any significant increased flow because of the onsite detention and water quality aspect. The piped area down stream of our site will still be able to handle a 25-year storm event.

SUPPLEMENTAL DATA

Facility ROUTING DATA COLUMBIA ROOFING:

SGL 18-046

Given:	Pipe Diameter:	10.0	inches	
	Pipe Inv. Elev:	0.00	feet	
	Orifice #1 Diameter:	2 13/16	inches	
	Orifice #1 Elevation:	0.00	feet	Plan elevation 144.52
	Orifice #2 Diameter:	3	inches	
	Orifice #2 Elevation:	2.01	feet	Plan elevation 147.39

	B	C	F	G	H	I	J	K
	Stage	Elevation (ft)	Storage Volume (cu.ft.)	Max Capacity (cfs)	Pipe Capacity (cfs)	Orifice #1 Discharge (cfs)	Orifice #2 Discharge (cfs)	Actual Discharge (cfs)
	1	0.00	0.00	2.21	0.206	0.000		0.000
Detention -	2	0.23	3.82	3.21	0.653	0.103		0.103
Storage	3	0.43	9.09	3.54	0.847	0.141		0.141
Pond	4	0.50	81.28	5.00	1.570	0.152		0.152
	5	0.75	331.94	5.00	1.750	0.186		0.186
	6	0.93	513.52	5.00	1.823	0.207		0.207
	6	1.01	673.88	5.00	2.036	0.216		0.216
	7	1.26	1146.30	5.00	2.229	0.241		0.241
	8	1.51	1604.70	5.00	2.407	0.264		0.264
	9	1.76	2028.09	5.00	2.572	0.285		0.285
	10	2.01	2395.96	5.00	2.727	0.304	0.000	0.304
	11	2.26	2681.37	5.00	2.874	0.323	0.122	0.445
	12	2.51	2962.89	5.00	3.014	0.340	0.173	0.513
	13	2.76	3255.19	5.00	3.073	0.357	0.212	0.568
	14	2.87	3390.97	5.00	3.147	0.364	0.226	0.590
	15	3.01	3547.74	5.00	3.271	0.372	0.244	0.617
	16	3.25	3556.47	5.00	3.394	0.387	0.272	0.659
	17	3.50	3570.88			0.402	0.298	0.700
	18	3.75	3661.44			0.416	0.322	0.738
	19	4.00	3766.16			0.429	0.345	0.774
	20	4.25	3901.65			0.443	0.366	0.808
	21	4.50	4039.59			0.455	0.385	0.841
	22	4.75	4173.05			0.468	0.404	0.872
	23	5.00	4282.21			0.480	0.422	0.902
	24	5.25	4395.86			0.492	0.440	0.931

B Stage Number

C Water Surface Elevation.

D Manufactures Chamber Storage Volume per stage

E Number of Chambers

F Storage Volume = Chamber Storage Volume + Pipe storage

ORIFCE $Q = 0.62 \times (\text{area}) \times (2 \times g \times h)^{1/2}$

H Capacity of Discharge Pipe

I Q = Orifice Eq.

J Q = Orifice Eq.

K Less of => columns H or columns I + J

Initial stage: elevation 0.00 = plan elevation 144.52

Facility ROUTING VOLUME COLUMBIA ROOFING:

SGL 18-046

Segment # 1 -Existing Pipe and Manhole

Pipe Inside Diameter =	9.9	inches	(10" pipe)
Pipe Length =	22.82	feet	
*Pipe Slope =	0.0100	ft/ft	
Inv. Elevation =	0.00	ft	

Head (ft)	Stage Elevation (ft)	Downstream Average Area (sq.ft.)	Upstream Average Area (sq.ft.)	Pipe Storage (cu.ft.)	Manhole Storage (cu.ft.)	Total Storage (cu.ft.)
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.23	0.23	0.12	0.00	0.93	2.89	3.82
0.43	0.43	0.28	0.10	3.68	5.40	9.09
0.50	0.50	0.34	0.15	4.91	9.17	14.08
0.75	0.75	0.51	0.36	9.30	15.45	24.75
0.93	0.93	0.53	0.48	11.44	21.73	33.17
1.01	1.01	0.53	0.52	12.04	28.01	40.04
1.26	1.26	0.53	0.53	12.20	34.29	46.49
1.51	1.51	0.53	0.53	12.20	40.57	52.77
1.76	1.76	0.53	0.53	12.20	46.85	59.05
2.01	2.01	0.53	0.53	12.20	53.13	65.33
2.26	2.26	0.53	0.53	12.20	59.41	71.61
2.51	2.51	0.53	0.53	12.20	65.69	77.89
2.76	2.76	0.53	0.53	12.20	71.97	84.17
2.87	2.87	0.53	0.53	12.20	78.25	90.45
3.01	3.01	0.53	0.53	12.20	78.25	90.45

A	Head
B	Water Surface Elevation
C	Downstream Water Surface Area @ Given Elevation
D	Upstream Water Surface Area @ Given Elevation
E	Pipe Storage Volume = [(Average Area) x (d Elevation)] + Previous Volume
F	Manhole Storage Volume = (Head) + [(3.14 x (Manhole Radius)^2) x (Stage Interval)]
G	Total Storage = Pipe Storage Volume + Manhole Storage Volume

Segment # 2 - SC 310 chambers (North and South)

Head (ft)	Stage Elevation (ft)	Chamber Storage (sq.ft.)	Number of Chambers (sq.ft.)	Chamber Storage (cu.ft.)	Storm Facility Footprint (sq ft)	Facity Total Volume (cu. Ft)	Ajusted Rock Volume (sq.ft.)	Rock Void Ratio per ADS	Rock Storage (sq.ft.)	Total Facility Storage (sq.ft.)
0.43	0.43	0.00	88.00	0.00	2399.91	0.00	0.00	0.40	0.00	0.00
0.50	0.50	0.00	88.00	0.00	2399.91	167.99	167.99	0.40	67.20	67.20
0.75	0.75	0.00	88.00	0.00	2399.91	767.97	767.97	0.40	307.19	307.19
0.93	0.93	0.00	88.00	0.00	2399.91	1199.96	1199.96	0.40	479.98	479.98
1.01	1.01	1.43	88.00	125.84	2399.91	1391.95	1266.11	0.40	506.44	632.28
1.26	1.26	5.51	88.00	484.88	2399.91	1991.93	1507.05	0.40	602.82	1087.70
1.51	1.51	9.15	88.00	805.20	2399.91	2591.90	1786.70	0.40	714.68	1519.88
1.76	1.76	12.17	88.00	1070.96	2399.91	3191.88	2120.92	0.40	848.37	1919.33
2.01	2.01	14.22	88.00	1251.36	2399.91	3791.86	2540.50	0.40	1016.20	2267.56
2.26	2.26	14.70	88.00	1293.60	2399.91	4391.84	3098.24	0.40	1239.29	2532.89
2.51	2.51	14.70	88.00	1293.60	2399.91	4991.81	3698.21	0.40	1479.29	2772.89
2.76	2.76	14.70	88.00	1293.60	2399.91	5591.79	4298.19	0.40	1719.28	3012.88
2.87	2.87	14.70	88.00	1293.60	2399.91	5855.78	4562.18	0.40	1824.87	3118.47
3.01	3.01	14.70	88.00	1293.60	2399.91	6191.77	4898.17	0.40	1959.27	3252.87

A	Head
B	Water Surface Elevation
C	ADS chamber storage
D	Total number of chambers
E	Facility foot pring (Length X width)
F	Faciolty Volume if empty (foot print x height)
G	Adjust Rock Volume = Facility Volume - Chamber volume
H	ADS stone porsity value
i	Rock Storage = Ajusted Rock x Void Ratio
J	Total Storage = Rock + Chamber storage

Segment # 3 - Existing Pipe Volume North

Pipe Inside Diameter =	9.9	inches	(10" pipe)
Pipe Length =	314	feet	
*Pipe Slope =	0.0100	ft/ft	
Inv. Elevation =	0.83	ft	

Head (ft)	Stage Elevation (ft)	Downstream Average Area (sq.ft.)	Upstream Average Area (sq.ft.)	Pipe Storage (cu.ft.)
0.00	0.83	0.00	0.00	0.00
0.10	0.93	0.04	0.00	0.12
0.18	1.01	0.09	0.00	0.52
0.43	1.26	0.28	0.00	4.04
0.68	1.51	0.47	0.00	10.68
0.93	1.76	0.53	0.00	16.57
1.18	2.01	0.53	0.00	21.03
1.43	2.26	0.53	0.00	25.48
1.68	2.51	0.53	0.00	29.94
1.93	2.76	0.53	0.00	34.39
2.04	2.87	0.53	0.00	36.35
2.18	3.01	0.53	0.00	38.84
2.42	3.25	0.53	0.00	43.12
2.67	3.50	0.53	0.00	47.58
2.92	3.75	0.53	0.00	52.03
3.17	4.00	0.53	0.01	57.25
3.42	4.25	0.53	0.16	89.42
3.67	4.50	0.53	0.36	131.92
3.92	4.75	0.53	0.52	165.47
4.17	5.00	0.53	0.53	167.85
4.42	5.25	0.53	0.53	167.85

A	Head
B	Water Surface Elevation
C	Downstream Water Surface Area @ Given Elevation
D	Upstream Water Surface Area @ Given Elevation
E	Pipe Storage Volume = [(Average Area) x (d Elevation)] + Previous Volume
F	Manhole Storage Volume = (Head) + [(3.14 x (Manhole Radius)^2) x (Stage Interval)]
G	Total Storage = Pipe Storage Volume + Manhole Storage Volume

Segment # 4 - New Pipe - South side to Existing

Pipe Inside Diameter =	9.9	inches	(10" pipe)
Pipe Lengtl	278	feet	
*Pipe Slope =	0.0050	ft/ft	
Inv. Elevation =	0.83	ft	

Head (ft)	Stage Elevation (ft)	Downstream Average Area (sq.ft.)	Upstream Average Area (sq.ft.)	Pipe Storage (cu.ft.)
0.00	0.83	0.00	0.00	0.00
0.10	0.93	0.04	0.00	0.25
0.18	1.01	0.09	0.00	1.03
0.43	1.26	0.28	0.00	8.08
0.68	1.51	0.47	0.00	21.37
0.93	1.76	0.53	0.00	33.14
1.18	2.01	0.53	0.00	42.05
1.43	2.26	0.53	0.01	51.39
1.68	2.51	0.53	0.17	81.04
1.93	2.76	0.53	0.37	118.11
2.04	2.87	0.53	0.45	132.94
2.18	3.01	0.53	0.53	147.76
2.42	3.25	0.53	0.53	147.76
2.67	3.50	0.53	0.53	147.76
2.92	3.75	0.53	0.53	147.76
3.17	4.00	0.53	0.53	147.76
3.42	4.25	0.53	0.53	147.76
3.67	4.50	0.53	0.53	147.76
3.92	4.75	0.53	0.53	147.76
4.17	5.00	0.53	0.53	147.76
4.42	5.25	0.53	0.53	147.76

A	Head
B	Water Surface Elevation
C	Downstream Water Surface Area @ Given Elevation
D	Upstream Water Surface Area @ Given Elevation
E	Pipe Storage Volume = [(Average Area) x (d Elevation)] + Previous Volume
F	Manhole Storage Volume = (Head) + [(3.14 x (Manhole Radius)^2) x (Stage Interval)]
G	Total Storage = Pipe Storage Volume + Manhole Storage Volume

Segment #5 - Existing Pipe East side

Pipe Inside Diameter =	9.9	inches	(10" pipe)
Pipe Length =	150	feet	
*Pipe Slope =	0.0100	ft/ft	
Inv. Elevation =	2.25	ft	

Head (ft)	Stage Elevation (ft)	Downstream Average Area (sq.ft.)	Upstream Average Area (sq.ft.)	Pipe Storage (cu.ft.)
0.00	2.25	0.00	0.00	0.00
0.26	2.51	0.14	0.00	1.14
0.51	2.76	0.34	0.00	5.65
0.62	2.87	0.51	0.00	12.76
0.76	3.01	0.53	0.00	17.82
1.00	3.25	0.53	0.00	22.27
1.25	3.50	0.53	0.00	26.73
1.50	3.75	0.53	0.14	40.41
1.75	4.00	0.53	0.34	60.62
2.00	4.25	0.53	0.51	77.77
2.25	4.50	0.53	0.53	80.18
2.50	4.75	0.53	0.53	80.18
2.75	5.00	0.53	0.53	80.18
3.00	5.25	0.53	0.53	80.18

A	Head
B	Water Surface Elevation
C	Downstream Water Surface Area @ Given Elevation
D	Upstream Water Surface Area @ Given Elevation
E	Pipe Storage Volume = [(Average Area) x (d Elevation)] + Previous Volume
F	Manhole Storage Volume = (Head) + [(3.14 x (Manhole Radius)^2) x (Stage Interval)]
G	Total Storage = Pipe Storage Volume + Manhole Storage Volume

Segment #6 - Loading Dock

Width =	18.25	feet	
Length =	15	feet	
Dock Slope	0.1660	ft/ft	
Dock Elev=	148.00	ft	(148.02-144.52 = 3.50)

Head (ft)	Stage Elevation (ft)	Loading Dock Area (sq ft)	Loading Dock sloped Area (sq.ft.)	Total Storage Area sq ft)
0.00	3.48	0.00	0.00	0.00
0.02	3.50	5.48	0.02	5.50
0.27	3.75	73.91	4.01	77.92
0.52	4.00	142.35	14.86	157.21
0.77	4.25	210.79	32.59	243.38
1.02	4.50	279.23	57.19	336.42
1.27	4.75	347.66	88.66	436.32
1.52	5.00	416.10	127.00	543.10
1.77	5.25	484.54	172.22	656.75

A	Head
B	Initial Dock Flooding Stage
C	Loading Dock Flat Area x Head
D	Ramp Storage Volume = 1/2 [(head / Slope) * Height * Width]
E	Total Storage = Loading Dock area + Sloped Ramp Area

Project: Columbia Roofing - Lot 10 Leveton Commons
Project: Stormwater Conveyance Calculation Check
Date: 6/6/2018
Calc'd By: JMF

% Pipe Capacity Used
0-82 Acceptable
83 + Upsize if City's
83 + Awareness for Private

Pipe Information and Calculations

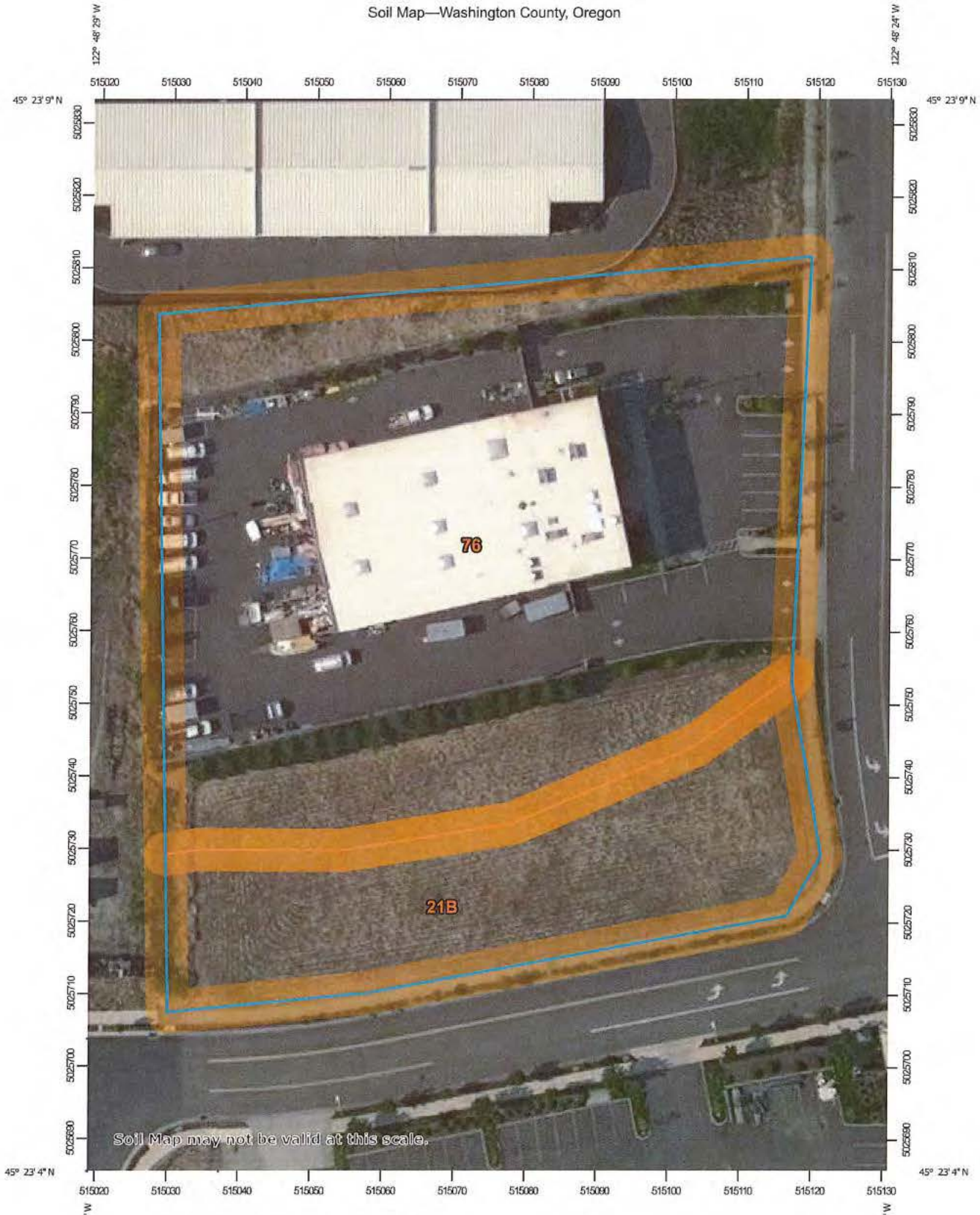
Design Section	Q (Calc'd) "Q"	Pipe Dia. (inch) "D"	Pipe Dia. (ft) "D"	Manning's number "n"	Slope "S" %	Slope "S"	Area Full (Calc'd) "Af"	Wetted Perimeter (Calc'd) "WPf"	Hydraulic Radius (Calc'd) "Rf"	Velocity Full (Calc'd) "Vf"	Flow Rate Full (Calc'd) "Qf"	% Pipe Capacity Used (Calc'd) "Q/Qf"	Velocity @ Q/Qf (Calc'd) "V"	Acceptable or Redesign Necessary
Last pipe														
10" Strom	1.86	10	0.83	0.013	0.50	0.0100	0.545	2.618	0.208	4.028	2.197	84.7%	3.41	Check Design

D. Rainfall

The SCS method requires use of the standard SCS Type 1A rainfall distribution (hyetograph) and total storm depth corresponding to the critical storm duration to calculate runoff quantities. The hyetograph distributes the total rainfall volume for select storm frequencies and durations. Select a total rainfall depth from Table 6.10 Total Rainfall Depths for Various Storm Durations Recorded at the Portland International Airport (PIA) and apply the appropriate SCS Type 1A Hyetograph found in Table 6.12.

Table 6.6 SCS Method Runoff Curve Numbers for Urban Areas (Antecedent Moisture Conditions II)

Cover Type and Hydrologic Conditions	Avg. Percent Impervious [a]	A	B	C	D
Fully Developed urban area with vegetation established					
Open space (lawns, parks, golf courses, cemeteries, etc) [b]:					
Poor condition (grass cover less than 50%)		68	79	86	89
Fair conditions: grass cover < 50 to 75%		49	69	79	84
Good conditions: grass cover > 75%		39	61	74	80
Impervious Area:					
Paved parking lots, roofs, driveways (excluding right-of-way)		98	98	98	98
Paved: curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved: open ditches (excluding right-of-way)		83[c]	89	92	93
Gravel: (including right-of-way)		76	85	89	91
Dirt: (including right-of-way)		72	82	87	89
Urban Districts					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential Districts					
1/8 acres or less (e.g. townhouses)	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 acre	12	46	65	77	82
Developing Urban Areas					
Newly graded area (pervious area only, no vegetation)		77	86	91	94



Map Scale: 1:720 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 10 20 40 60

Feet: 0 35 70 140 210

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Washington County, Oregon
Survey Area Data: Version 15, Sep 19, 2017

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

Date(s) aerial images were photographed: Aug 3, 2014—Aug 23, 2014

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
21B	Hillsboro loam, 3 to 7 percent slopes	0.5	24.1%
76	Pits	1.6	75.9%
Totals for Area of Interest		**2.1**	**100.0%**

Washington County, Oregon

21B—Hillsboro loam, 3 to 7 percent slopes

Map Unit Setting

National map unit symbol: 21y6
Elevation: 160 to 240 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Hillsboro and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hillsboro

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty and loamy old alluvium

Typical profile

H1 - 0 to 15 inches: loam
H2 - 15 to 48 inches: loam
H3 - 48 to 57 inches: fine sandy loam
H4 - 57 to 81 inches: fine sand

Properties and qualities

Slope: 3 to 7 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B

Hydric soil rating: No

Data Source Information

Soil Survey Area: Washington County, Oregon
Survey Area Data: Version 15, Sep 19, 2017

Washington County, Oregon

76—Pits

Map Unit Composition

Pits: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pits

Properties and qualities

Slope: 0 to 90 percent

Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

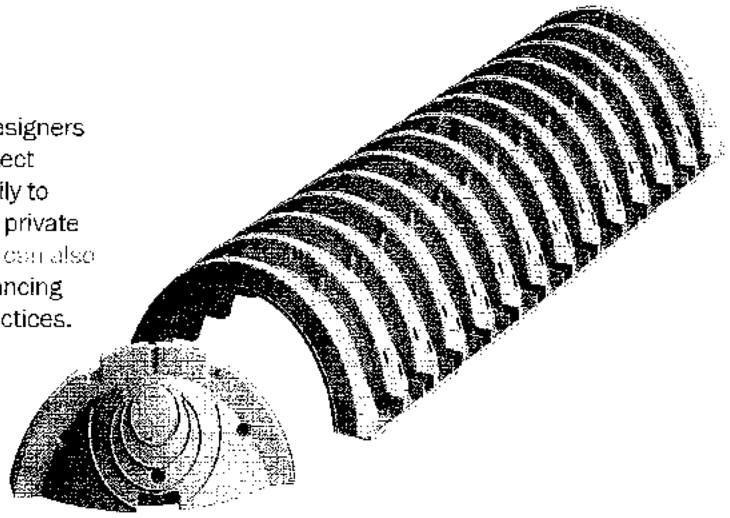
Hydric soil rating: No

Data Source Information

Soil Survey Area: Washington County, Oregon
Survey Area Data: Version 15, Sep 19, 2017

SC-310 CHAMBER

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.



STORMTECH SC-310 CHAMBER
(not to scale)

Nominal Chamber Specifications

Size (L x W x H)
85.4" x 34.0" x 16.0"
2,170 mm x 864 mm x 406 mm

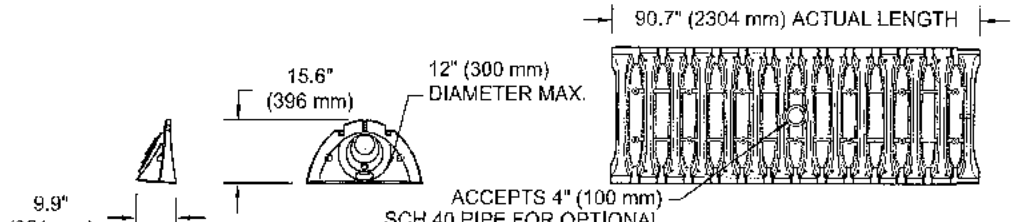
Chamber Storage
14.7 ft³ (0.42 m³)

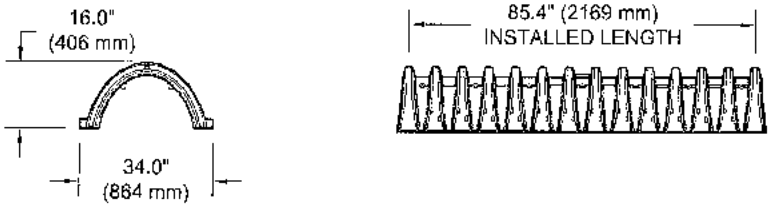
Min. Installed Storage*
31.0 ft³ (0.88 m³)

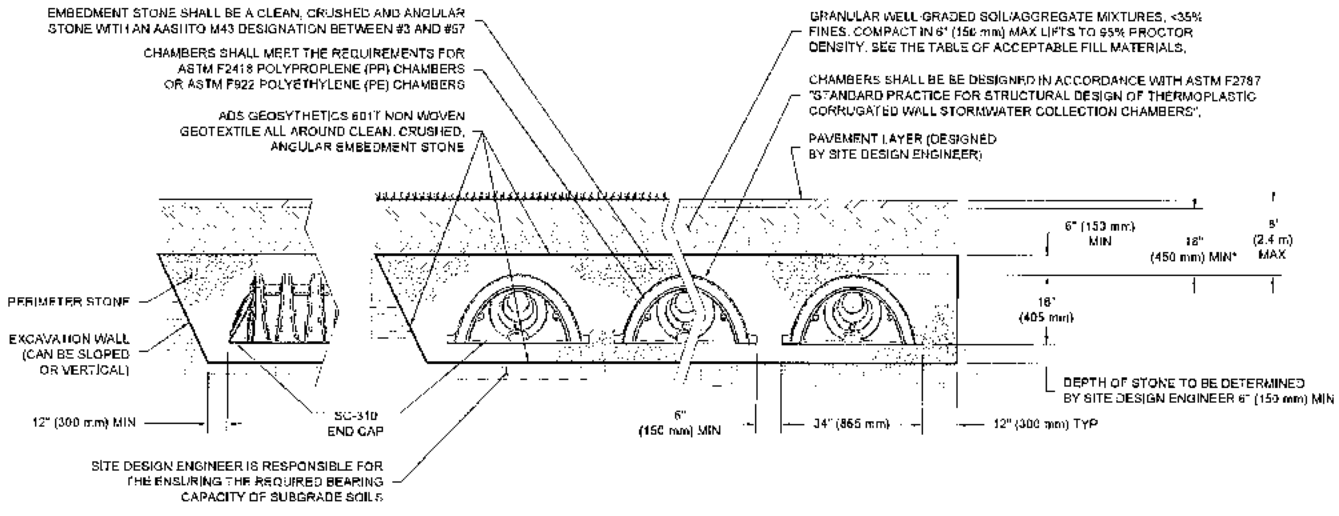
Weight
37.0 lbs (16.8 kg)

Shipping
41 chambers/pallet
108 end caps/pallet
18 pallets/truck

*Assumes 6" (150 mm) stone above and below chambers and 40% stone porosity.







*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

StormTech®

ADS®

SC-310 CUMULATIVE STORAGE VOLUMES PER CHAMBER

Assumes 40% Stone Porosity. Calculations are Based Upon a 6" (150 mm) Stone Base Under Chambers.

28 (711)		14.70 (0.416)	31.00 (0.878)
27 (686)		14.70 (0.416)	30.21 (0.855)
26 (660)	Stone	14.70 (0.416)	29.42 (0.833)
25 (610)	Cover	14.70 (0.416)	28.63 (0.811)
24 (609)		14.70 (0.416)	27.84 (0.788)
23 (584)		14.70 (0.416)	27.05 (0.766)
22 (559)		14.70 (0.416)	26.26 (0.748)
21 (533)		14.64 (0.415)	25.43 (0.720)
20 (508)		14.49 (0.410)	24.54 (0.695)
19 (483)		14.22 (0.403)	23.58 (0.668)
18 (457)		13.68 (0.387)	22.47 (0.636)
17 (432)		12.99 (0.368)	21.25 (0.602)
16 (406)		12.17 (0.345)	19.97 (0.566)
15 (381)		11.25 (0.319)	18.62 (0.528)
14 (356)		10.23 (0.290)	17.22 (0.488)
13 (330)		9.15 (0.260)	15.78 (0.447)
12 (305)		7.99 (0.227)	14.29 (0.425)
11 (279)		6.78 (0.192)	12.77 (0.362)
10 (254)		5.51 (0.156)	11.22 (0.318)
9 (229)		4.19 (0.119)	9.64 (0.278)
8 (203)		2.83 (0.081)	8.03 (0.227)
7 (178)		1.43 (0.041)	6.40 (0.181)
6 (152)		0	4.74 (0.134)
5 (127)		0	3.95 (0.112)
4(102)	Stone Foundation	0	3.16 (0.090)
3 (76)		0	2.37 (0.067)
2 (51)		0	1.58 (0.046)
1 (25)		0	0.79 (0.022)

Note: Add 0.79 ft³ (0.022 m³) of storage for each additional inch. (25 mm) of stone foundation.

STORAGE VOLUME PER CHAMBER FT³ (M³)

StormTech SC-310	14.7 (0.4)	31.0 (0.9)	35.7 (1.0)	40.4 (1.1)

Note: Assumes 6" (150 mm) of stone above chambers, 6" (150 mm) row spacing and 40% stone porosity.

AMOUNT OF STONE PER CHAMBER

StormTech SC-310	2.1 (1.5 yd³)	2.7 (1.9 yd³)	3.4 (2.4 yd³)
StormTech SC-310	1830 (1.1 m³)	2490 (1.5 m³)	2990 (1.8 m³)

Note: Assumes 6" (150 mm) of stone above, and between chambers.

VOLUME EXCAVATION PER CHAMBER YD³ (M³)

StormTech SC-310	2.9 (2.2)	3.4 (2.6)	3.8 (2.9)

Note: Assumes 6" (150 mm) of row separation and 18" (450 mm) of cover. The volume of excavation will vary as the depth of the cover increases.

ADS StormTech DESIGN TOOL

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Visit us at www.stormtech.com
and utilize the StormTech Design Tool

For more information on the StormTech SC-310 Chamber and other ADS products, please contact our Customer Service Representatives at 1-800-821-6710

THE MOST ADVANCED NAME IN WATER MANAGEMENT SOLUTIONS™

Advanced Drainage Systems, Inc.
4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

2-year Predevelopment

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                    KING COUNTY DEPARTMENT OF PUBLIC WORKS
                      Surface Water Management Division

                            HYDROGRAPH PROGRAMS
                                Version 4.20

                          1 - INFO ON THIS PROGRAM
                          2 - SBUHYD
                          3 - ROUTE
                          4 - ROUTE2
                          5 - ADDHYD
                          6 - BASEFLOW
                          7 - PLOTHYD
                          8 - DATA
                          9 - RDFAC
                         10 - RETURN TO DOS

ENTER OPTION:
2

SBUH/SCS METHOD FOR COMPUTING RUNOFF HYDROGRAPH

STORM OPTIONS:

1 - S.C.S. TYPE-1A
2 - 7-DAY DESIGN STORM
3 - STORM DATA FILE

SPECIFY STORM OPTION:
1

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
2,24,2.5
------------------------------------------------------------------------------
******************** S.C.S. TYPE-1A DISTRIBUTION ********************
*********   2-YEAR  24-HOUR STORM  ****  2.50" TOTAL PRECIP. *********

------------------------------------------------------------------------------
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO.  1
1.96,79,0,98,11.68

DATA PRINT-OUT:

  AREA(ACRES)     PERVIOUS     IMPERVIOUS    TC(MINUTES)
                  A     CN     A     CN
       2.0        2.0  79.0      .0  98.0        11.7

  PEAK-Q(CFS)   T-PEAK(HRS)     VOL(CU-FT)
       .30          7.83           5949

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846e2
FILE ALREADY EXIST; OVERWRITE (Y or N) ?
y

SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S - STOP
p
```

HYDROGRAPH DATA PRINT-OUT:

T(HRS)	Q(CFS)	T(HRS)	Q(CFS)	T(HRS)	Q(CFS)	T(HRS)	Q(CFS)
.00	.00	6.33	.01	12.67	.10	19.00	.07
.17	.00	6.50	.01	12.83	.10	19.17	.07
.33	.00	6.67	.02	13.00	.09	19.33	.07
.50	.00	6.83	.03	13.17	.09	19.50	.07
.67	.00	7.00	.04	13.33	.09	19.67	.07
.83	.00	7.17	.06	13.50	.09	19.83	.07
1.00	.00	7.33	.07	13.67	.09	20.00	.07
1.17	.00	7.50	.12	13.83	.09	20.17	.08
1.33	.00	7.67	.24	14.00	.09	20.33	.08
1.50	.00	7.83	.30	14.17	.09	20.50	.08
1.67	.00	8.00	.25	14.33	.09	20.67	.08
1.83	.00	8.17	.20	14.50	.09	20.83	.08
2.00	.00	8.33	.16	14.67	.09	21.00	.08
2.17	.00	8.50	.15	14.83	.09	21.17	.08
2.33	.00	8.67	.14	15.00	.09	21.33	.08
2.50	.00	8.83	.12	15.17	.09	21.50	.08
2.67	.00	9.00	.11	15.33	.09	21.67	.08
2.83	.00	9.17	.11	15.50	.09	21.83	.08
3.00	.00	9.33	.11	15.67	.09	22.00	.08
3.17	.00	9.50	.11	15.83	.09	22.17	.08
3.33	.00	9.67	.11	16.00	.09	22.33	.08
3.50	.00	9.83	.11	16.17	.09	22.50	.08
3.67	.00	10.00	.11	16.33	.09	22.67	.08
3.83	.00	10.17	.12	16.50	.09	22.83	.08
4.00	.00	10.33	.12	16.67	.08	23.00	.08
4.17	.00	10.50	.12	16.83	.08	23.17	.08
4.33	.00	10.67	.11	17.00	.07	23.33	.08
4.50	.00	10.83	.11	17.17	.07	23.50	.08
4.67	.00	11.00	.10	17.33	.07	23.67	.08
4.83	.00	11.17	.10	17.50	.07	23.83	.08
5.00	.00	11.33	.10	17.67	.07	24.00	.06
5.17	.00	11.50	.11	17.83	.07	24.17	.02
5.33	.00	11.67	.11	18.00	.07	24.33	.00
5.50	.00	11.83	.11	18.17	.07	24.50	.00
5.67	.00	12.00	.11	18.33	.07	24.67	.00
5.83	.00	12.17	.11	18.50	.07	24.83	.00
6.00	.00	12.33	.11	18.67	.07	25.00	.00
6.17	.00	12.50	.11	18.83	.07	25.17	.00

SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S - STOP
c

2-year Post development

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO. 2
0.26,79,1.65,98,5

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS A	PERVIOUS CN	IMPERVIOUS A	IMPERVIOUS CN	TC(MINUTES)
1.9	.3	79.0	1.6	98.0	5.0

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
1.10	7.67	14390

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846d2

SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S - STOP
p

HYDROGRAPH DATA PRINT-OUT:

T(HRS)	Q(CFS)	T(HRS)	Q(CFS)	T(HRS)	Q(CFS)	T(HRS)	Q(CFS)
.00	.00	6.33	.22	12.67	.17	19.00	.11
.17	.00	6.50	.22	12.83	.15	19.17	.11
.33	.00	6.67	.27	13.00	.15	19.33	.11
.50	.00	6.83	.32	13.17	.15	19.50	.11
.67	.00	7.00	.32	13.33	.15	19.67	.11
.83	.01	7.17	.38	13.50	.15	19.83	.11
1.00	.02	7.33	.44	13.67	.15	20.00	.11
1.17	.02	7.50	.64	13.83	.15	20.17	.11
1.33	.03	7.67	1.10	14.00	.15	20.33	.11
1.50	.03	7.83	1.02	14.17	.15	20.50	.11
1.67	.05	8.00	.58	14.33	.15	20.67	.11
1.83	.06	8.17	.40	14.50	.15	20.83	.11
2.00	.06	8.33	.35	14.67	.14	21.00	.11
2.17	.07	8.50	.35	14.83	.13	21.17	.11
2.33	.07	8.67	.29	15.00	.13	21.33	.11
2.50	.08	8.83	.23	15.17	.13	21.50	.11
2.67	.09	9.00	.23	15.33	.13	21.67	.11
2.83	.10	9.17	.23	15.50	.14	21.83	.11
3.00	.10	9.33	.23	15.67	.14	22.00	.11
3.17	.11	9.50	.23	15.83	.14	22.17	.11
3.33	.11	9.67	.23	16.00	.14	22.33	.11
3.50	.11	9.83	.23	16.17	.14	22.50	.11
3.67	.13	10.00	.23	16.33	.14	22.67	.11
3.83	.14	10.17	.23	16.50	.14	22.83	.11
4.00	.14	10.33	.23	16.67	.12	23.00	.11
4.17	.14	10.50	.23	16.83	.11	23.17	.11
4.33	.15	10.67	.21	17.00	.11	23.33	.11
4.50	.15	10.83	.19	17.17	.11	23.50	.11
4.67	.16	11.00	.19	17.33	.11	23.67	.11
4.83	.18	11.17	.19	17.50	.11	23.83	.11
5.00	.18	11.33	.19	17.67	.11	24.00	.05
5.17	.18	11.50	.19	17.83	.11	24.17	.00
5.33	.18	11.67	.19	18.00	.11	24.33	.00
5.50	.18	11.83	.19	18.17	.11	24.50	.00
5.67	.20	12.00	.19	18.33	.11	24.67	.00
5.83	.22	12.17	.19	18.50	.11	24.83	.00
6.00	.22	12.33	.19	18.67	.11	25.00	.00
6.17	.22	12.50	.19	18.83	.11	25.17	.00

SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S STOP

5-year Predevelopment

```
KING COUNTY DEPARTMENT OF PUBLIC WORKS
                    Surface Water Management Division

                          HYDROGRAPH PROGRAMS
                              Version 4.20

                        1 - INFO ON THIS PROGRAM
                        2 - SBUHYD
                        3 - ROUTE
                        4 - ROUTE2
                        5 - ADDHYD
                        6 - BASEFLOW
                        7 - PLOTHYD
                        8 - DATA
                        9 - RDFAC
                       10 - RETURN TO DOS

ENTER OPTION:
2

SBUH/SCS METHOD FOR COMPUTING RUNOFF HYDROGRAPH

STORM OPTIONS:

1 - S.C.S. TYPE-1A
2 - 7-DAY DESIGN STORM
3 - STORM DATA FILE

SPECIFY STORM OPTION:
1

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
5,24,3.1
--------------------------------------------------------------------------------
******************** S.C.S. TYPE-1A DISTRIBUTION ********************
*********   5-YEAR  24-HOUR STORM  ****  3.10" TOTAL PRECIP. *********

--------------------------------------------------------------------------------
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO.  1
1.96,79,0,98,11.68

DATA PRINT-OUT:

  AREA(ACRES)     PERVIOUS     IMPERVIOUS    TC(MINUTES)
                  A     CN     A     CN
       2.0        2.0  79.0     .0  98.0        11.7

  PEAK-Q(CFS)   T-PEAK(HRS)     VOL(CU-FT)
       .91          7.83           8967

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846e5
FILE ALREADY EXIST; OVERWRITE (Y or N) ?
y

SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S - STOP
P

HYDROGRAPH DATA PRINT-OUT:
```

T(HRS)	Q(CFS)	T(HRS)	Q(CFS)	T(HRS)	Q(CFS)	T(HRS)	Q(CFS)
.00	.00	6.33	.04	12.67	.15	19.00	.10
.17	.00	6.50	.05	12.83	.14	19.17	.10
.33	.00	6.67	.06	13.00	.13	19.33	.10
.50	.00	6.83	.08	13.17	.13	19.50	.10
.67	.00	7.00	.10	13.33	.13	19.67	.10
.83	.00	7.17	.12	13.50	.13	19.83	.10
1.00	.00	7.33	.15	13.67	.13	20.00	.10
1.17	.00	7.50	.23	13.83	.13	20.17	.10
1.33	.00	7.67	.43	14.00	.13	20.33	.10
1.50	.00	7.83	.51	14.17	.13	20.50	.10
1.67	.00	8.00	.41	14.33	.13	20.67	.10
1.83	.00	8.17	.32	14.50	.14	20.83	.11
2.00	.00	8.33	.26	14.67	.13	21.00	.11
2.17	.00	8.50	.24	14.83	.12	21.17	.11
2.33	.00	8.67	.21	15.00	.12	21.33	.11
2.50	.00	8.83	.18	15.17	.12	21.50	.11
2.67	.00	9.00	.17	15.33	.12	21.67	.11
2.83	.00	9.17	.16	15.50	.12	21.83	.11
3.00	.00	9.33	.16	15.67	.12	22.00	.11
3.17	.00	9.50	.17	15.83	.12	22.17	.11
3.33	.00	9.67	.17	16.00	.12	22.33	.11
3.50	.00	9.83	.17	16.17	.12	22.50	.11
3.67	.00	10.00	.17	16.33	.12	22.67	.11
3.83	.00	10.17	.17	16.50	.12	22.83	.11
4.00	.00	10.33	.18	16.67	.12	23.00	.11
4.17	.00	10.50	.18	16.83	.11	23.17	.11
4.33	.00	10.67	.17	17.00	.10	23.33	.11
4.50	.00	10.83	.16	17.17	.10	23.50	.11
4.67	.00	11.00	.15	17.33	.10	23.67	.11
4.83	.00	11.17	.15	17.50	.10	23.83	.11
5.00	.00	11.33	.15	17.67	.10	24.00	.08
5.17	.00	11.50	.15	17.83	.10	24.17	.03
5.33	.00	11.67	.16	18.00	.10	24.33	.00
5.50	.01	11.83	.16	18.17	.10	24.50	.00
5.67	.01	12.00	.16	18.33	.10	24.67	.00
5.83	.02	12.17	.16	18.50	.10	24.83	.00
6.00	.03	12.33	.16	18.67	.10	25.00	.00
6.17	.04	12.50	.16	18.83	.10	25.17	.00

```
SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S - STOP
C
```

5-year Post development

```
-------------------------------------------------------------------------------
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO.  3
0.26,79,1.65,98,5

DATA PRINT-OUT:

  AREA(ACRES)     PERVIOUS     IMPERVIOUS    TC(MINUTES)
                  A     CN     A     CN
       1.9         .3  79.0     1.6  98.0         5.0

  PEAK-Q(CFS)   T-PEAK(HRS)     VOL(CU-FT)
      1.40          7.67           18368

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846d5
```

SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S - STOP
P

HYDROGRAPH DATA PRINT-OUT:

T(HRS)	Q(CFS)	T(HRS)	Q(CFS)	T(HRS)	Q(CFS)	T(HRS)	Q(CFS)
.00	.00	6.33	.28	12.67	.22	19.00	.14
.17	.00	6.50	.29	12.83	.19	19.17	.14
.33	.00	6.67	.35	13.00	.19	19.33	.14
.50	.00	6.83	.41	13.17	.19	19.50	.14
.67	.01	7.00	.41	13.33	.19	19.67	.14
.83	.02	7.17	.49	13.50	.19	19.83	.14
1.00	.03	7.33	.56	13.67	.19	20.00	.14
1.17	.04	7.50	.82	13.83	.19	20.17	.14
1.33	.05	7.67	1.40	14.00	.19	20.33	.14
1.50	.06	7.83	1.30	14.17	.19	20.50	.14
1.67	.07	8.00	.73	14.33	.19	20.67	.14
1.83	.08	8.17	.51	14.50	.19	20.83	.14
2.00	.09	8.33	.44	14.67	.18	21.00	.14
2.17	.10	8.50	.44	14.83	.17	21.17	.14
2.33	.10	8.67	.36	15.00	.17	21.33	.14
2.50	.11	8.83	.29	15.17	.17	21.50	.14
2.67	.12	9.00	.29	15.33	.17	21.67	.14
2.83	.14	9.17	.29	15.50	.17	21.83	.14
3.00	.14	9.33	.29	15.67	.17	22.00	.14
3.17	.14	9.50	.29	15.83	.17	22.17	.14
3.33	.15	9.67	.29	16.00	.17	22.33	.14
3.50	.15	9.83	.29	16.17	.17	22.50	.14
3.67	.17	10.00	.29	16.33	.17	22.67	.14
3.83	.18	10.17	.29	16.50	.17	22.83	.14
4.00	.19	10.33	.29	16.67	.15	23.00	.14
4.17	.19	10.50	.29	16.83	.14	23.17	.14
4.33	.19	10.67	.27	17.00	.14	23.33	.14
4.50	.19	10.83	.24	17.17	.14	23.50	.14
4.67	.21	11.00	.24	17.33	.14	23.67	.14
4.83	.23	11.17	.24	17.50	.14	23.83	.14
5.00	.23	11.33	.24	17.67	.14	24.00	.07
5.17	.23	11.50	.24	17.83	.14	24.17	.00
5.33	.23	11.67	.24	18.00	.14	24.33	.00
5.50	.24	11.83	.24	18.17	.14	24.50	.00
5.67	.26	12.00	.24	18.33	.14	24.67	.00
5.83	.28	12.17	.24	18.50	.14	24.83	.00
6.00	.28	12.33	.24	18.67	.14	25.00	.00
6.17	.28	12.50	.24	18.83	.14	25.17	.00

SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S - STOP

10-year Pre-development

```
                    KING COUNTY DEPARTMENT OF PUBLIC WORKS
                      Surface Water Management Division

                              HYDROGRAPH PROGRAMS
                                  Version 4.20

                            1 - INFO ON THIS PROGRAM
                            2 - SBUHYD
                            3 - ROUTE
                            4 - ROUTE2
                            5 - ADDHYD
                            6 - BASEFLOW
                            7 - PLOTHYD
                            8 - DATA
                            9 - RDFAC
                           10 - RETURN TO DOS

ENTER OPTION:
2

SBUH/SCS METHOD FOR COMPUTING RUNOFF HYDROGRAPH

STORM OPTIONS:

1 - S.C.S. TYPE-1A
2 - 7-DAY DESIGN STORM
3 - STORM DATA FILE

SPECIFY STORM OPTION:
1

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
10,24,3.45
------------------------------------------------------------------------------
******************** S.C.S. TYPE-1A DISTRIBUTION ********************
*********  10-YEAR  24-HOUR STORM  ****  3.45" TOTAL PRECIP. *********

------------------------------------------------------------------------------
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO.  1
1.96,79,0,98,11.68

DATA PRINT-OUT:

  AREA(ACRES)     PERVIOUS     IMPERVIOUS    TC(MINUTES)
                  A     CN     A     CN
       2.0        2.0  79.0     .0  98.0        11.7

  PEAK-Q(CFS)   T-PEAK(HRS)     VOL(CU-FT)
       .65          7.83          10851

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846e10
FILE ALREADY EXIST; OVERWRITE (Y or N) ?
y

SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S - STOP
p

HYDROGRAPH DATA PRINT-OUT:
```

T(HRS)	Q(CFS)	T(HRS)	Q(CFS)	T(HRS)	Q(CFS)	T(HRS)	Q(CFS)
.00	.00	6.33	.07	12.67	.18	19.00	.12
.17	.00	6.50	.07	12.83	.16	19.17	.12
.33	.00	6.67	.09	13.00	.16	19.33	.12
.50	.00	6.83	.12	13.17	.16	19.50	.12
.67	.00	7.00	.13	13.33	.16	19.67	.12
.83	.00	7.17	.16	13.50	.16	19.83	.12
1.00	.00	7.33	.20	13.67	.16	20.00	.12
1.17	.00	7.50	.30	13.83	.16	20.17	.12
1.33	.00	7.67	.55	14.00	.16	20.33	.12
1.50	.00	7.83	.65	14.17	.16	20.50	.12
1.67	.00	8.00	.52	14.33	.16	20.67	.12
1.83	.00	8.17	.40	14.50	.16	20.83	.12
2.00	.00	8.33	.32	14.67	.15	21.00	.12
2.17	.00	8.50	.30	14.83	.15	21.17	.12
2.33	.00	8.67	.26	15.00	.14	21.33	.12
2.50	.00	8.83	.22	15.17	.14	21.50	.12
2.67	.00	9.00	.21	15.33	.14	21.67	.12
2.83	.00	9.17	.20	15.50	.14	21.83	.12
3.00	.00	9.33	.20	15.67	.14	22.00	.12
3.17	.00	9.50	.20	15.83	.14	22.17	.12
3.33	.00	9.67	.20	16.00	.14	22.33	.12
3.50	.00	9.83	.21	16.17	.14	22.50	.12
3.67	.00	10.00	.21	16.33	.14	22.67	.12
3.83	.00	10.17	.21	16.50	.15	22.83	.13
4.00	.00	10.33	.21	16.67	.14	23.00	.13
4.17	.00	10.50	.21	16.83	.13	23.17	.13
4.33	.00	10.67	.20	17.00	.12	23.33	.13
4.50	.00	10.83	.19	17.17	.12	23.50	.13
4.67	.00	11.00	.18	17.33	.12	23.67	.13
4.83	.00	11.17	.18	17.50	.12	23.83	.13
5.00	.01	11.33	.18	17.67	.12	24.00	.09
5.17	.01	11.50	.18	17.83	.12	24.17	.04
5.33	.02	11.67	.19	18.00	.12	24.33	.00
5.50	.02	11.83	.19	18.17	.12	24.50	.00
5.67	.03	12.00	.19	18.33	.12	24.67	.00
5.83	.04	12.17	.19	18.50	.12	24.83	.00
6.00	.05	12.33	.19	18.67	.12	25.00	.00
6.17	.06	12.50	.19	18.83	.12	25.17	.00

```
SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S - STOP
c
```

10-year Post development

```
--------------------------------------------------------------------------------
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO.  2
0.26,79,1.65,98,5

DATA PRINT-OUT:

  AREA(ACRES)     PERVIOUS     IMPERVIOUS    TC(MINUTES)
                  A     CN     A     CN
       1.9         .3  79.0     1.6  98.0         5.0

  PEAK-Q(CFS)   T-PEAK(HRS)     VOL(CU-FT)
      1.58          7.67          20707

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846d10
```

SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S - STOP
p

HYDROGRAPH DATA PRINT-OUT:

T(HRS)	Q(CFS)	T(HRS)	Q(CFS)	T(HRS)	Q(CFS)	T(HRS)	Q(CFS)
.00	.00	6.33	.32	12.67	.24	19.00	.15
.17	.00	6.50	.32	12.83	.22	19.17	.15
.33	.00	6.67	.39	13.00	.22	19.33	.15
.50	.00	6.83	.46	13.17	.22	19.50	.15
.67	.02	7.00	.47	13.33	.22	19.67	.15
.83	.03	7.17	.55	13.50	.22	19.83	.15
1.00	.04	7.33	.63	13.67	.22	20.00	.15
1.17	.05	7.50	.92	13.83	.22	20.17	.15
1.33	.06	7.67	1.58	14.00	.22	20.33	.15
1.50	.07	7.83	1.47	14.17	.22	20.50	.15
1.67	.08	8.00	.82	14.33	.22	20.67	.15
1.83	.10	8.17	.58	14.50	.22	20.83	.15
2.00	.11	8.33	.49	14.67	.20	21.00	.15
2.17	.11	8.50	.49	14.83	.19	21.17	.15
2.33	.12	8.67	.41	15.00	.19	21.33	.15
2.50	.12	8.83	.33	15.17	.19	21.50	.15
2.67	.14	9.00	.33	15.33	.19	21.67	.15
2.83	.16	9.17	.33	15.50	.19	21.83	.15
3.00	.16	9.33	.33	15.67	.19	22.00	.15
3.17	.17	9.50	.33	15.83	.19	22.17	.15
3.33	.17	9.67	.33	16.00	.19	22.33	.15
3.50	.17	9.83	.33	16.17	.19	22.50	.15
3.67	.19	10.00	.33	16.33	.19	22.67	.15
3.83	.21	10.17	.33	16.50	.19	22.83	.15
4.00	.21	10.33	.33	16.67	.17	23.00	.15
4.17	.21	10.50	.33	16.83	.15	23.17	.15
4.33	.22	10.67	.30	17.00	.15	23.33	.15
4.50	.22	10.83	.27	17.17	.15	23.50	.15
4.67	.24	11.00	.27	17.33	.15	23.67	.15
4.83	.26	11.17	.27	17.50	.15	23.83	.15
5.00	.26	11.33	.27	17.67	.15	24.00	.08
5.17	.26	11.50	.27	17.83	.15	24.17	.00
5.33	.27	11.67	.27	18.00	.15	24.33	.00
5.50	.27	11.83	.27	18.17	.15	24.50	.00
5.67	.29	12.00	.27	18.33	.15	24.67	.00
5.83	.32	12.17	.27	18.50	.15	24.83	.00
6.00	.32	12.33	.27	18.67	.15	25.00	.00
6.17	.32	12.50	.27	18.83	.15	25.17	.00

SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S - STOP

25-year Pre-development

```
                    KING COUNTY DEPARTMENT OF PUBLIC WORKS
                    Surface Water Management Division

                          HYDROGRAPH PROGRAMS
                              Version 4.20

                       1 - INFO ON THIS PROGRAM
                       2 - SBUHYD
                       3 - ROUTE
                       4 - ROUTE2
                       5 - ADDHYD
                       6 - BASEFLOW
                       7 - PLOTHYD
                       8 - DATA
                       9 - RDFAC
                      10 - RETURN TO DOS

ENTER OPTION:
2

SBUH/SCS METHOD FOR COMPUTING RUNOFF HYDROGRAPH

STORM OPTIONS:

1 - S.C.S. TYPE-1A
2 - 7-DAY DESIGN STORM
3 - STORM DATA FILE

SPECIFY STORM OPTION:
1

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
25,24,3.9
------------------------------------------------------------------------
******************** S.C.S. TYPE-1A DISTRIBUTION ********************
*********  25-YEAR  24-HOUR STORM  ****  3.90" TOTAL PRECIP. *********

------------------------------------------------------------------------
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO.  1
1.96,79,0,98,11.68

DATA PRINT-OUT:

  AREA(ACRES)     PERVIOUS     IMPERVIOUS    TC(MINUTES)
                  A     CN     A     CN
       2.0        2.0  79.0      .0  98.0        11.7

  PEAK-Q(CFS)   T-PEAK(HRS)     VOL(CU-FT)
       .83          7.83          13377

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846e25

SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S - STOP
p
```

HYDROGRAPH DATA PRINT-OUT:

T(HRS)	Q(CFS)	T(HRS)	Q(CFS)	T(HRS)	Q(CFS)	T(HRS)	Q(CFS)
.00	.00	6.33	.10	12.67	.22	19.00	.14
.17	.00	6.50	.11	12.83	.20	19.17	.14
.33	.00	6.67	.13	13.00	.19	19.33	.14
.50	.00	6.83	.16	13.17	.19	19.50	.14
.67	.00	7.00	.18	13.33	.19	19.67	.14
.83	.00	7.17	.22	13.50	.19	19.83	.14
1.00	.00	7.33	.27	13.67	.19	20.00	.14
1.17	.00	7.50	.40	13.83	.19	20.17	.14
1.33	.00	7.67	.71	14.00	.19	20.33	.14
1.50	.00	7.83	.83	14.17	.19	20.50	.14
1.67	.00	8.00	.66	14.33	.19	20.67	.14
1.83	.00	8.17	.50	14.50	.19	20.83	.15
2.00	.00	8.33	.41	14.67	.18	21.00	.15
2.17	.00	8.50	.37	14.83	.18	21.17	.15
2.33	.00	8.67	.33	15.00	.17	21.33	.15
2.50	.00	8.83	.27	15.17	.17	21.50	.15
2.67	.00	9.00	.25	15.33	.17	21.67	.15
2.83	.00	9.17	.25	15.50	.17	21.83	.15
3.00	.00	9.33	.25	15.67	.17	22.00	.15
3.17	.00	9.50	.25	15.83	.17	22.17	.15
3.33	.00	9.67	.25	16.00	.17	22.33	.15
3.50	.00	9.83	.25	16.17	.17	22.50	.15
3.67	.00	10.00	.25	16.33	.17	22.67	.15
3.83	.00	10.17	.26	16.50	.17	22.83	.15
4.00	.00	10.33	.26	16.67	.16	23.00	.15
4.17	.00	10.50	.26	16.83	.15	23.17	.15
4.33	.00	10.67	.25	17.00	.14	23.33	.15
4.50	.00	10.83	.23	17.17	.14	23.50	.15
4.67	.01	11.00	.22	17.33	.14	23.67	.15
4.83	.02	11.17	.22	17.50	.14	23.83	.15
5.00	.02	11.33	.22	17.67	.14	24.00	.10
5.17	.03	11.50	.22	17.83	.14	24.17	.04
5.33	.04	11.67	.22	18.00	.14	24.33	.00
5.50	.05	11.83	.23	18.17	.14	24.50	.00
5.67	.06	12.00	.23	18.33	.14	24.67	.00
5.83	.07	12.17	.23	18.50	.14	24.83	.00
6.00	.08	12.33	.23	18.67	.14	25.00	.00
6.17	.09	12.50	.23	18.83	.14	25.17	.00

SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S - STOP

25-year Post development

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO. 2
0.26,79,1.65,98,5

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
1.9	.3	79.0	1.6	98.0	5.0

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
1.81	7.67	23730

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846d25

SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S - STOP
P

HYDROGRAPH DATA PRINT-OUT:

T(HRS)	Q(CFS)	T(HRS)	Q(CFS)	T(HRS)	Q(CFS)	T(HRS)	Q(CFS)
.00	.00	6.33	.37	12.67	.28	19.00	.17
.17	.00	6.50	.37	12.83	.25	19.17	.17
.33	.00	6.67	.45	13.00	.25	19.33	.17
.50	.01	6.83	.53	13.17	.25	19.50	.17
.67	.03	7.00	.53	13.33	.25	19.67	.17
.83	.04	7.17	.63	13.50	.25	19.83	.17
1.00	.06	7.33	.73	13.67	.25	20.00	.17
1.17	.07	7.50	1.06	13.83	.25	20.17	.17
1.33	.08	7.67	1.81	14.00	.25	20.33	.17
1.50	.09	7.83	1.68	14.17	.25	20.50	.17
1.67	.10	8.00	.94	14.33	.25	20.67	.17
1.83	.12	8.17	.66	14.50	.25	20.83	.17
2.00	.13	8.33	.56	14.67	.23	21.00	.17
2.17	.14	8.50	.56	14.83	.22	21.17	.17
2.33	.14	8.67	.47	15.00	.22	21.33	.17
2.50	.15	8.83	.37	15.17	.22	21.50	.17
2.67	.17	9.00	.37	15.33	.22	21.67	.17
2.83	.19	9.17	.37	15.50	.22	21.83	.17
3.00	.19	9.33	.37	15.67	.22	22.00	.17
3.17	.20	9.50	.37	15.83	.22	22.17	.17
3.33	.20	9.67	.37	16.00	.22	22.33	.17
3.50	.20	9.83	.37	16.17	.22	22.50	.17
3.67	.22	10.00	.37	16.33	.22	22.67	.17
3.83	.24	10.17	.37	16.50	.22	22.83	.17
4.00	.24	10.33	.37	16.67	.20	23.00	.17
4.17	.25	10.50	.38	16.83	.17	23.17	.17
4.33	.25	10.67	.34	17.00	.17	23.33	.17
4.50	.25	10.83	.31	17.17	.17	23.50	.18
4.67	.28	11.00	.31	17.33	.17	23.67	.18
4.83	.30	11.17	.31	17.50	.17	23.83	.18
5.00	.30	11.33	.31	17.67	.17	24.00	.09
5.17	.31	11.50	.31	17.83	.17	24.17	.00
5.33	.31	11.67	.31	18.00	.17	24.33	.00
5.50	.31	11.83	.31	18.17	.17	24.50	.00
5.67	.34	12.00	.31	18.33	.17	24.67	.00
5.83	.36	12.17	.31	18.50	.17	24.83	.00
6.00	.37	12.33	.31	18.67	.17	25.00	.00
6.17	.37	12.50	.31	18.83	.17	25.17	.00

SPECIFY: C - CONTINUE, N - NEWSTORM, P - PRINT, S - STOP

Routing Data

```
                    KING COUNTY DEPARTMENT OF PUBLIC WORKS
                    Surface Water Management Division

                          HYDROGRAPH PROGRAMS
                              Version 4.20

                        1 - INFO ON THIS PROGRAM
                        2 - SBUHYD
                        3 - ROUTE
                        4 - ROUTE2
                        5 - ADDHYD
                        6 - BASEFLOW
                        7 - PLOTHYD
                        8 - DATA
                        9 - RDFAC
                       10 - RETURN TO DOS

ENTER OPTION:
3

RESERVOIR ROUTING INFLOW/OUTFLOW ROUTINE

SPECIFY [d:][path]filename[.ext] OF ROUTING DATA
1846r.det
 DISPLAY ROUTING DATA (Y or N)?
y

ROUTING DATA:

STAGE(FT)    DISCHARGE(CFS)    STORAGE(CU-FT)    PERM-AREA(SQ-FT)
    .00              .00               .0                .0
    .23              .10               3.8               .0
    .43              .14               9.1               .0
    .50              .15              81.3               .0
    .75              .19             331.9               .0
    .93              .21             513.5               .0
   1.01              .22             673.9               .0
   1.26              .24            1146.3               .0
   1.51              .26            1604.7               .0
   1.76              .28            2028.1               .0
   2.01              .30            2396.0               .0
   2.26              .44            2681.4               .0
   2.51              .51            2962.9               .0
   2.76              .57            3255.2               .0
   2.87              .59            3391.0               .0
   3.01              .62            3547.7               .0
   3.25              .66            3556.5               .0
   3.50              .70            3570.9               .0
   3.75              .74            3661.4               .0
   4.00              .77            3766.2               .0
   4.25              .81            3901.6               .0
   4.50              .84            4039.6               .0
   4.75              .87            4173.0               .0
   5.00              .90            4282.2               .0
   5.25              .93            4395.9               .0

AVERAGE PERM-RATE:    .0 MINUTES/INCH
```

2-year Routing

```
ENTER [d:][path]filename[.ext] OF COMPUTED HYDROGRAPH:
1846d2

INFLOW/OUTFLOW ANALYSIS:

  PEAK-INFLOW(CFS)    PEAK-OUTFLOW(CFS)    OUTFLOW-VOL(CU-FT)
        1.10                 .30                 14388

  INITIAL-STAGE(FT)   TIME-OF-PEAK(HRS)    PEAK-STAGE-ELEV(FT)
         .00                 8.67                 1.91

  PEAK STORAGE:      2240 CU-FT

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846r2
FILE ALREADY EXIST; OVERWRITE (Y or N) ?
y

SPECIFY: C -- CONTINUE, N -- NEWJOB, P - PRINT, S - STOP, R - REVISE
p

INFLOW/OUTFLOW DATA PRINT-OUT:
```

T(HRS)	QI(CFS)	QO(CFS)	EL(FT)	T(HRS)	QI(CFS)	QO(CFS)	EL(FT)
.00	.00	.00	.00	13.00	.15	.24	1.30
.17	.00	.00	.00	13.17	.15	.24	1.27
.33	.00	.00	.00	13.33	.15	.24	1.24
.50	.00	.00	.00	13.50	.15	.24	1.21
.67	.00	.00	.00	13.67	.15	.23	1.19
.83	.01	.01	.02	13.83	.15	.23	1.16
1.00	.02	.02	.04	14.00	.15	.23	1.13
1.17	.02	.02	.05	14.17	.15	.23	1.11
1.33	.03	.03	.06	14.33	.15	.22	1.09
1.50	.03	.03	.07	14.50	.15	.22	1.06
1.67	.05	.05	.11	14.67	.14	.22	1.04
1.83	.06	.06	.14	14.83	.13	.22	1.01
2.00	.06	.06	.13	15.00	.13	.21	.99
2.17	.07	.07	.16	15.17	.13	.21	.96
2.33	.07	.07	.16	15.33	.13	.21	.94
2.50	.08	.08	.18	15.50	.14	.20	.91
2.67	.09	.09	.20	15.67	.14	.20	.87
2.83	.10	.10	.22	15.83	.14	.20	.83
3.00	.10	.10	.23	16.00	.14	.19	.80
3.17	.11	.11	.25	16.17	.14	.19	.77
3.33	.11	.11	.27	16.33	.14	.19	.74
3.50	.11	.11	.26	16.50	.14	.18	.72
3.67	.13	.12	.34	16.67	.12	.18	.69
3.83	.14	.14	.42	16.83	.11	.17	.65
4.00	.14	.14	.43	17.00	.11	.17	.62
4.17	.14	.14	.42	17.17	.11	.16	.58
4.33	.15	.14	.43	17.33	.11	.16	.55
4.50	.15	.14	.44	17.50	.11	.16	.52
4.67	.16	.14	.44	17.67	.11	.15	.50
4.83	.18	.15	.46	17.83	.11	.15	.47
5.00	.18	.15	.48	18.00	.11	.14	.45
5.17	.18	.15	.50	18.17	.11	.14	.43
5.33	.18	.15	.51	18.33	.11	.11	.26
5.50	.18	.16	.53	18.50	.11	.11	.27
5.67	.20	.16	.55	18.67	.11	.11	.27
5.83	.22	.16	.58	18.83	.11	.11	.27

6.00	.22	.17	.61	19.00	.11	.11	.27
6.17	.22	.17	.64	19.17	.11	.11	.27
6.33	.22	.17	.67	19.33	.11	.11	.27
6.50	.22	.18	.69	19.50	.11	.11	.27
6.67	.27	.18	.73	19.67	.11	.11	.27
6.83	.32	.19	.80	19.83	.11	.11	.27
7.00	.32	.20	.87	20.00	.11	.11	.27
7.17	.38	.21	.94	20.17	.11	.11	.27
7.33	.44	.22	1.00	20.33	.11	.11	.27
7.50	.64	.23	1.10	20.50	.11	.11	.27
7.67	1.10	.25	1.31	20.67	.11	.11	.27
7.83	1.02	.27	1.57	20.83	.11	.11	.27
8.00	.58	.28	1.76	21.00	.11	.11	.27
8.17	.40	.29	1.84	21.17	.11	.11	.27
8.33	.35	.29	1.88	21.33	.11	.11	.27
8.50	.35	.30	1.90	21.50	.11	.11	.27
8.67	.29	.30	1.91	21.67	.11	.11	.27
8.83	.23	.30	1.89	21.83	.11	.11	.27
9.00	.23	.29	1.87	22.00	.11	.11	.27
9.17	.23	.29	1.84	22.17	.11	.11	.27
9.33	.23	.29	1.82	22.33	.11	.11	.27
9.50	.23	.29	1.79	22.50	.11	.11	.27
9.67	.23	.29	1.77	22.67	.11	.11	.27
9.83	.23	.28	1.75	22.83	.11	.11	.27
10.00	.23	.28	1.73	23.00	.11	.11	.27
10.17	.23	.28	1.71	23.17	.11	.11	.27
10.33	.23	.28	1.69	23.33	.11	.11	.27
10.50	.23	.28	1.68	23.50	.11	.11	.27
10.67	.21	.28	1.66	23.67	.11	.11	.27
10.83	.19	.27	1.63	23.83	.11	.11	.27
11.00	.19	.27	1.60	24.00	.05	.06	.13
11.17	.19	.27	1.57	24.17	.00	.00	.00
11.33	.19	.27	1.54	24.33	.00	.00	.00
11.50	.19	.26	1.52	24.50	.00	.00	.00
11.67	.19	.26	1.49	24.67	.00	.00	.00
11.83	.19	.26	1.47	24.83	.00	.00	.00
12.00	.19	.26	1.45	25.00	.00	.00	.00
12.17	.19	.26	1.43	25.17	.00	.00	.00
12.33	.19	.25	1.40	25.33	.00	.00	.00
12.50	.19	.25	1.38	25.50	.00	.00	.00
12.67	.17	.25	1.36	25.67	.00	.00	.00
12.83	.15	.25	1.33	25.83	.00	.00	.00

```
SPECIFY: C - CONTINUE, N - NEWJOB, P - PRINT, S - STOP, R - REVISE
c
```

5-year Routing

```
ENTER [d:][path]filename[.ext] OF COMPUTED HYDROGRAPH:
1846d5

INFLOW/OUTFLOW ANALYSIS:

  PEAK-INFLOW(CFS)    PEAK-OUTFLOW(CFS)    OUTFLOW-VOL(CU-FT)
        1.40                  .51                 18412

  INITIAL-STAGE(FT)   TIME-OF-PEAK(HRS)    PEAK-STAGE-ELEV(FT)
          .00                 8.17                 2.51

  PEAK STORAGE:      2960 CU-FT

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
```

1846r5
FILE ALREADY EXIST; OVERWRITE (Y or N) ?
Y

SPECIFY: C - CONTINUE, N - NEWJOB, P - PRINT, S - STOP, R - REVISE
P

INFLOW/OUTFLOW DATA PRINT-OUT:

T(HRS)	QI(CFS)	QO(CFS)	EL(FT)	T(HRS)	QI(CFS)	QO(CFS)	EL(FT)
.00	.00	.00	.00	13.00	.19	.28	1.68
.17	.00	.00	.00	13.17	.19	.28	1.65
.33	.00	.00	.00	13.33	.19	.27	1.62
.50	.00	.00	.00	13.50	.19	.27	1.59
.67	.01	.01	.02	13.67	.19	.27	1.56
.83	.02	.02	.04	13.83	.19	.27	1.54
1.00	.03	.03	.06	14.00	.19	.26	1.51
1.17	.04	.04	.09	14.17	.19	.26	1.49
1.33	.05	.05	.11	14.33	.19	.26	1.46
1.50	.06	.06	.13	14.50	.19	.26	1.44
1.67	.07	.07	.15	14.67	.18	.26	1.42
1.83	.08	.08	.18	14.83	.17	.25	1.39
2.00	.09	.09	.20	15.00	.17	.25	1.36
2.17	.10	.10	.22	15.17	.17	.25	1.34
2.33	.10	.10	.22	15.33	.17	.25	1.31
2.50	.11	.11	.25	15.50	.17	.24	1.29
2.67	.12	.12	.31	15.67	.17	.24	1.26
2.83	.14	.13	.40	15.83	.17	.24	1.24
3.00	.14	.14	.43	16.00	.17	.24	1.22
3.17	.14	.14	.43	16.17	.17	.23	1.20
3.33	.15	.14	.43	16.33	.17	.23	1.18
3.50	.15	.14	.44	16.50	.17	.23	1.16
3.67	.17	.14	.45	16.67	.15	.23	1.14
3.83	.18	.15	.46	16.83	.14	.23	1.11
4.00	.19	.15	.49	17.00	.14	.22	1.08
4.17	.19	.15	.51	17.17	.14	.22	1.06
4.33	.19	.16	.53	17.33	.14	.22	1.03
4.50	.19	.16	.55	17.50	.14	.22	1.01
4.67	.21	.16	.57	17.67	.14	.21	.99
4.83	.23	.17	.61	17.83	.14	.21	.96
5.00	.23	.17	.64	18.00	.14	.21	.94
5.17	.23	.18	.68	18.17	.14	.21	.92
5.33	.23	.18	.71	18.33	.14	.20	.88
5.50	.24	.18	.74	18.50	.14	.20	.84
5.67	.26	.19	.78	18.67	.14	.19	.81
5.83	.28	.19	.82	18.83	.14	.19	.78
6.00	.28	.20	.87	19.00	.14	.19	.75
6.17	.28	.21	.92	19.17	.14	.18	.73
6.33	.28	.21	.95	19.33	.14	.18	.70
6.50	.29	.21	.97	19.50	.14	.18	.68
6.67	.35	.21	1.00	19.67	.14	.17	.66
6.83	.41	.22	1.05	19.83	.14	.17	.64
7.00	.41	.23	1.11	20.00	.14	.17	.62
7.17	.49	.23	1.18	20.17	.14	.17	.60
7.33	.56	.24	1.27	20.33	.14	.16	.59
7.50	.82	.26	1.42	20.50	.14	.16	.58
7.67	1.40	.28	1.71	20.67	.14	.16	.56
7.83	1.30	.38	2.15	20.83	.14	.16	.55
8.00	.73	.50	2.45	21.00	.14	.16	.54
8.17	.51	.51	2.51	21.17	.14	.16	.53
8.33	.44	.51	2.49	21.33	.14	.15	.52
8.50	.44	.50	2.46	21.50	.14	.15	.51

8.67	.36	.49	2.41	21.67	.14	.15	.50
8.83	.29	.46	2.33	21.83	.14	.15	.50
9.00	.29	.44	2.24	22.00	.14	.15	.49
9.17	.29	.40	2.18	22.17	.14	.15	.48
9.33	.29	.37	2.13	22.33	.14	.15	.48
9.50	.29	.35	2.09	22.50	.14	.15	.47
9.67	.29	.33	2.06	22.67	.14	.15	.47
9.83	.29	.32	2.04	22.83	.14	.15	.47
10.00	.29	.31	2.03	23.00	.14	.15	.46
10.17	.29	.31	2.02	23.17	.14	.15	.46
10.33	.29	.30	2.01	23.33	.14	.15	.46
10.50	.29	.30	2.00	23.50	.14	.14	.45
10.67	.27	.30	1.99	23.67	.14	.14	.45
10.83	.24	.30	1.97	23.83	.14	.14	.45
11.00	.24	.30	1.95	24.00	.07	.13	.39
11.17	.24	.30	1.93	24.17	.00	.00	.00
11.33	.24	.30	1.90	24.33	.00	.00	.00
11.50	.24	.29	1.88	24.50	.00	.00	.00
11.67	.24	.29	1.86	24.67	.00	.00	.00
11.83	.24	.29	1.84	24.83	.00	.00	.00
12.00	.24	.29	1.82	25.00	.00	.00	.00
12.17	.24	.29	1.80	25.17	.00	.00	.00
12.33	.24	.29	1.78	25.33	.00	.00	.00
12.50	.24	.28	1.76	25.50	.00	.00	.00
12.67	.22	.28	1.74	25.67	.00	.00	.00
12.83	.19	.28	1.71	25.83	.00	.00	.00

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SPECIFY: C - CONTINUE, N - NEWJOB, P - PRINT, S - STOP, R - REVISE
c
```

10-year Routing

```
ENTER [d:][path]filename[.ext] OF COMPUTED HYDROGRAPH:
1846d10

INFLOW/OUTFLOW ANALYSIS:

  PEAK-INFLOW(CFS)    PEAK-OUTFLOW(CFS)    OUTFLOW-VOL(CU-FT)
        1.58                 .60                 20652

  INITIAL-STAGE(FT)   TIME-OF-PEAK(HRS)    PEAK-STAGE-ELEV(FT)
         .00                 8.17                 2.94

  PEAK STORAGE:      3470 CU-FT

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846r10
FILE ALREADY EXIST; OVERWRITE (Y or N) ?
y

SPECIFY: C - CONTINUE, N - NEWJOB, P - PRINT, S - STOP, R - REVISE
p

INFLOW/OUTFLOW DATA PRINT-OUT:
```

T(HRS)	QI(CFS)	QO(CFS)	EL(FT)	T(HRS)	QI(CFS)	QO(CFS)	EL(FT)
.00	.00	.00	.00	13.00	.22	.29	1.84
.17	.00	.00	.00	13.17	.22	.29	1.81
.33	.00	.00	.00	13.33	.22	.29	1.78
.50	.00	.00	.00	13.50	.22	.28	1.76
.67	.02	.02	.04	13.67	.22	.28	1.73

.83	.03	.03	.07	13.83	.22	.28	1.71
1.00	.04	.04	.09	14.00	.22	.28	1.69
1.17	.05	.05	.11	14.17	.22	.28	1.67
1.33	.06	.06	.13	14.33	.22	.28	1.65
1.50	.07	.07	.16	14.50	.22	.27	1.63
1.67	.08	.08	.18	14.67	.20	.27	1.61
1.83	.10	.10	.22	14.83	.19	.27	1.58
2.00	.11	.11	.26	15.00	.19	.27	1.55
2.17	.11	.11	.27	15.17	.19	.27	1.53
2.33	.12	.12	.30	15.33	.19	.26	1.50
2.50	.12	.12	.33	15.50	.19	.26	1.48
2.67	.14	.13	.39	15.67	.19	.26	1.45
2.83	.16	.14	.44	15.83	.19	.26	1.43
3.00	.16	.14	.45	16.00	.19	.25	1.41
3.17	.17	.15	.46	16.17	.19	.25	1.39
3.33	.17	.15	.47	16.33	.19	.25	1.37
3.50	.17	.15	.48	16.50	.19	.25	1.35
3.67	.19	.15	.50	16.67	.17	.25	1.33
3.83	.21	.16	.53	16.83	.15	.24	1.30
4.00	.21	.16	.56	17.00	.15	.24	1.27
4.17	.21	.16	.59	17.17	.15	.24	1.24
4.33	.22	.17	.62	17.33	.15	.24	1.21
4.50	.22	.17	.65	17.50	.15	.23	1.18
4.67	.24	.18	.68	17.67	.15	.23	1.16
4.83	.26	.18	.72	17.83	.15	.23	1.13
5.00	.26	.19	.77	18.00	.15	.23	1.11
5.17	.26	.19	.81	18.17	.15	.22	1.09
5.33	.27	.20	.85	18.33	.15	.22	1.06
5.50	.27	.20	.89	18.50	.15	.22	1.04
5.67	.29	.21	.93	18.67	.15	.22	1.02
5.83	.32	.21	.96	18.83	.15	.21	1.00
6.00	.32	.21	.99	19.00	.15	.21	.98
6.17	.32	.22	1.03	19.17	.15	.21	.96
6.33	.32	.22	1.06	19.33	.15	.21	.94
6.50	.32	.22	1.09	19.50	.15	.21	.92
6.67	.39	.23	1.13	19.67	.15	.20	.89
6.83	.46	.23	1.19	19.83	.15	.20	.86
7.00	.47	.24	1.26	20.00	.15	.20	.83
7.17	.55	.25	1.35	20.17	.15	.19	.81
7.33	.63	.26	1.46	20.33	.15	.19	.78
7.50	.92	.27	1.64	20.50	.15	.19	.76
7.67	1.58	.30	2.01	20.67	.15	.18	.74
7.83	1.47	.53	2.59	20.83	.15	.18	.72
8.00	.82	.59	2.89	21.00	.15	.18	.70
8.17	.58	.60	2.94	21.17	.15	.18	.68
8.33	.49	.60	2.91	21.33	.15	.17	.67
8.50	.49	.59	2.85	21.50	.15	.17	.65
8.67	.41	.57	2.79	21.67	.15	.17	.64
8.83	.33	.55	2.69	21.83	.15	.17	.63
9.00	.33	.53	2.58	22.00	.15	.17	.62
9.17	.33	.51	2.49	22.17	.15	.17	.61
9.33	.33	.48	2.40	22.33	.15	.17	.60
9.50	.33	.46	2.32	22.50	.15	.16	.59
9.67	.33	.44	2.26	22.67	.15	.16	.58
9.83	.33	.41	2.21	22.83	.15	.16	.57
10.00	.33	.39	2.17	23.00	.15	.16	.57
10.17	.33	.38	2.14	23.17	.15	.16	.56
10.33	.33	.36	2.12	23.33	.15	.16	.55
10.50	.33	.36	2.10	23.50	.15	.16	.55
10.67	.30	.35	2.08	23.67	.15	.16	.54
10.83	.27	.33	2.06	23.83	.15	.16	.54
11.00	.27	.31	2.03	24.00	.08	.15	.51
11.17	.27	.30	2.01	24.17	.00	.14	.45

11.33	.27	.30	1.99	24.33	.00	.00	.00
11.50	.27	.30	1.98	24.50	.00	.00	.00
11.67	.27	.30	1.97	24.67	.00	.00	.00
11.83	.27	.30	1.96	24.83	.00	.00	.00
12.00	.27	.30	1.94	25.00	.00	.00	.00
12.17	.27	.30	1.93	25.17	.00	.00	.00
12.33	.27	.30	1.92	25.33	.00	.00	.00
12.50	.27	.30	1.91	25.50	.00	.00	.00
12.67	.24	.30	1.89	25.67	.00	.00	.00
12.83	.22	.29	1.87	25.83	.00	.00	.00

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SPECIFY: C - CONTINUE, N - NEWJOB, P - PRINT, S - STOP, R - REVISE
c
```

25-year Routing

```
ENTER [d:][path]filename[.ext] OF COMPUTED HYDROGRAPH:
1846d25

INFLOW/OUTFLOW ANALYSIS:

  PEAK-INFLOW(CFS)    PEAK-OUTFLOW(CFS)    OUTFLOW-VOL(CU-FT)
        1.81                 .82                 23701

  INITIAL-STAGE(FT)   TIME-OF-PEAK(HRS)    PEAK-STAGE-ELEV(FT)
        .00                 8.00                 4.37

  PEAK STORAGE:      3960 CU-FT

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
1846r25
FILE ALREADY EXIST; OVERWRITE (Y or N) ?
y

SPECIFY: C - CONTINUE, N - NEWJOB, P - PRINT, S - STOP, R - REVISE
p

INFLOW/OUTFLOW DATA PRINT-OUT:
```

T(HRS)	QI(CFS)	QO(CFS)	EL(FT)	T(HRS)	QI(CFS)	QO(CFS)	EL(FT)
.00	.00	.00	.00	13.00	.25	.30	1.98
.17	.00	.00	.00	13.17	.25	.30	1.96
.33	.00	.00	.00	13.33	.25	.30	1.94
.50	.01	.01	.02	13.50	.25	.30	1.92
.67	.03	.03	.06	13.67	.25	.30	1.90
.83	.04	.04	.09	13.83	.25	.29	1.88
1.00	.06	.06	.13	14.00	.25	.29	1.86
1.17	.07	.07	.16	14.17	.25	.29	1.85
1.33	.08	.08	.18	14.33	.25	.29	1.83
1.50	.09	.09	.20	14.50	.25	.29	1.81
1.67	.10	.10	.22	14.67	.23	.29	1.79
1.83	.12	.12	.29	14.83	.22	.29	1.77
2.00	.13	.13	.36	15.00	.22	.28	1.74
2.17	.14	.14	.41	15.17	.22	.28	1.72
2.33	.14	.14	.43	15.33	.22	.28	1.70
2.50	.15	.14	.43	15.50	.22	.28	1.68
2.67	.17	.14	.44	15.67	.22	.28	1.66
2.83	.19	.15	.46	15.83	.22	.27	1.64
3.00	.19	.15	.49	16.00	.22	.27	1.62
3.17	.20	.15	.51	16.17	.22	.27	1.60
3.33	.20	.16	.54	16.33	.22	.27	1.58

3.50	.20	.16	.56	16.50	.22	.27	1.57
3.67	.22	.16	.59	16.67	.20	.27	1.55
3.83	.24	.17	.63	16.83	.17	.26	1.52
4.00	.24	.18	.67	17.00	.17	.26	1.49
4.17	.25	.18	.71	17.17	.17	.26	1.46
4.33	.25	.19	.75	17.33	.17	.26	1.43
4.50	.25	.19	.79	17.50	.17	.25	1.40
4.67	.28	.20	.83	17.67	.17	.25	1.37
4.83	.30	.20	.88	17.83	.17	.25	1.35
5.00	.30	.21	.94	18.00	.17	.25	1.32
5.17	.31	.21	.96	18.17	.17	.24	1.30
5.33	.31	.21	.99	18.33	.17	.24	1.27
5.50	.31	.22	1.02	18.50	.17	.24	1.25
5.67	.34	.22	1.06	18.67	.17	.24	1.23
5.83	.36	.22	1.10	18.83	.17	.24	1.21
6.00	.37	.23	1.14	19.00	.17	.23	1.19
6.17	.37	.23	1.18	19.17	.17	.23	1.17
6.33	.37	.24	1.23	19.33	.17	.23	1.15
6.50	.37	.24	1.27	19.50	.17	.23	1.13
6.67	.45	.25	1.32	19.67	.17	.23	1.11
6.83	.53	.25	1.40	19.83	.17	.22	1.09
7.00	.53	.26	1.49	20.00	.17	.22	1.08
7.17	.63	.27	1.60	20.17	.17	.22	1.06
7.33	.73	.28	1.74	20.33	.17	.22	1.04
7.50	1.06	.30	1.99	20.50	.17	.22	1.03
7.67	1.81	.52	2.52	20.67	.17	.22	1.01
7.83	1.68	.73	3.71	20.83	.17	.21	1.00
8.00	.94	.82	4.37	21.00	.17	.21	.99
8.17	.66	.82	4.34	21.17	.17	.21	.97
8.33	.56	.79	4.13	21.33	.17	.21	.96
8.50	.56	.75	3.86	21.50	.17	.21	.95
8.67	.47	.70	3.53	21.67	.17	.21	.94
8.83	.37	.60	2.91	21.83	.17	.21	.92
9.00	.37	.58	2.80	22.00	.17	.20	.90
9.17	.37	.56	2.71	22.17	.17	.20	.88
9.33	.37	.54	2.62	22.33	.17	.20	.86
9.50	.37	.52	2.54	22.50	.17	.20	.85
9.67	.37	.50	2.46	22.67	.17	.20	.83
9.83	.37	.48	2.40	22.83	.17	.19	.82
10.00	.37	.47	2.34	23.00	.17	.19	.80
10.17	.37	.45	2.29	23.17	.17	.19	.79
10.33	.37	.44	2.25	23.33	.17	.19	.78
10.50	.38	.42	2.22	23.50	.18	.19	.77
10.67	.34	.41	2.19	23.67	.18	.19	.77
10.83	.31	.39	2.16	23.83	.18	.19	.76
11.00	.31	.37	2.12	24.00	.09	.18	.73
11.17	.31	.35	2.09	24.17	.00	.17	.65
11.33	.31	.34	2.08	24.33	.00	.16	.55
11.50	.31	.33	2.06	24.50	.00	.15	.46
11.67	.31	.33	2.05	24.67	.00	.00	.00
11.83	.31	.32	2.04	24.83	.00	.00	.00
12.00	.31	.32	2.04	25.00	.00	.00	.00
12.17	.31	.32	2.03	25.17	.00	.00	.00
12.33	.31	.32	2.03	25.33	.00	.00	.00
12.50	.31	.31	2.03	25.50	.00	.00	.00
12.67	.28	.31	2.02	25.67	.00	.00	.00
12.83	.25	.30	2.00	25.83	.00	.00	.00

SPECIFY: C - CONTINUE, N - NEWJOB, P - PRINT, S - STOP, R - REVISE

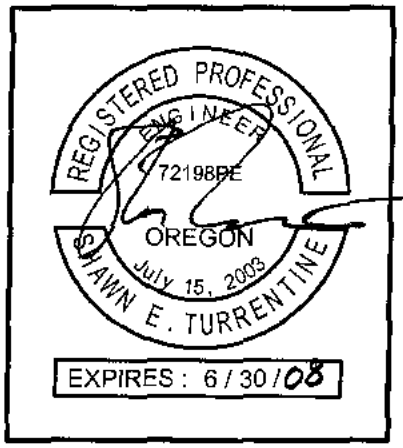
Nicoli Engineering, Inc.
PO Box 23784 Tigard, Oregon 97281 • Phone: (503) 620-2086 • Fax: (503) 684-3636

STORM WATER ANALYSIS AND QUALITY FACILITY DESIGN

FOR:

COLUMBIA ROOFING AND SHEET METAL

18525 SW 126TH PLACE
TUALATIN, OREGON 97062



CLIENT : GRAY ALFA, LLC
JOB NO.: 050824
PREPARED BY : SET
CHECKED BY : .
DATE : 3-23-07

DESIGN CRITERIA:

PROPOSED DEVELOPMENT IS 50,653 S.F. (1.16 AC). THE RATIONAL METHOD WILL BE USED FOR ON-SITE CONVEYANCE DESIGN AND DETENTION SYSTEM DESIGN.

WATER QUALITY FACILITY WILL BE DESIGNED PER CLEANWATER SERVICES DESIGN AND CONSTRUCTION STANDARDS, MARCH 2004 EDITION.

STORM DRAIN SYSTEM WILL TERMINATE AT EXISTING 12" ϕ PIPE NEAR SOUTH WEST CORNER OF SITE.

TIME OF CONCENTRATION, $T_c \leq 5$ MIN.

POST DEVELOPMENT FLOW TO NOT EXCEED PRE-DEVELOPMENT FLOW FOR 2, 10, & 25 YEAR STORMS.

RATIONAL FORMULA:

$$Q = C i A$$

$C = 0.20$ FOR PRE-DEVELOPMENT CONDITION AND NEW LANDSCAPED CONDITIONS

$C = 0.90$ FOR PAVEMENT AND ROOFS

$i = 1.90$ in/HR FOR 2 YEAR STORM

$i = 3.00$ in/HR FOR 10 YEAR STORM

$i = 3.40$ in/HR FOR 25 YEAR STORM

$A =$ AREA IN ACRES

PRE / POST DEVELOPMENT RUN-OFF:

TOTAL SITE AREA = 50,653 S.F.

POST DEVELOPMENT IMPERVIOUS AREA = 40,788 S.F.

POST DEVELOPMENT PERVIOUS AREA = 9,865 S.F.

NOTE: POST DEV. RELEASE RATES WILL BE BASED ON 2 YEAR & 25 YEAR STORMS. THE 10 YEAR STORM WILL BE RELEASED AT THE 2 YEAR STORM RATE.

2 YEAR PRE-DEVELOPMENT FLOW:

$$Q_{\substack{2\,YR\\PRE}} = (0.20)(1.90)\frac{50,653}{43,560} = \underline{0.442\ CFS}$$

2 YEAR POST-DEVELOPMENT FLOW:

WEIGHTED "C" VALUE:

$$C = \frac{40,788(0.90) + 9865(0.20)}{40,788 + 9865} = 0.76$$

$$Q_{\substack{2\,YR\\POST}} = (0.76)(1.90)\frac{50,653}{43,560} = \underline{1.679\ CFS}$$

- CONT. -

25 YEAR PRE-DEVELOPMENT FLOW:

$$Q_{\substack{25\,YR \\ PRE}} = (0.20)(3.4)\frac{50,653}{43,560} = \underline{0.791\ CFS}$$

25 YEAR POST-DEVELOPMENT FLOW:

$$Q_{\substack{25\,YR \\ POST}} = (0.76)(3.4)\frac{50,653}{43,560} = \underline{3.00\ CFS}$$

DETENTION SYSTEM DESIGN:

DETENTION TO BE ACHIEVED BY STORING RUNOFF IN STORM DRAINAGE PIPING AND ABOVE CATCH BASINS IN LOADING DOCK / PAVED AREAS. ALL DETENTION PIPING IS 10" & 6" PVC.

PIPE VOLUMES:

10" PVC - INSIDE ϕ = 9.90"
6" PVC INSIDE ϕ = 5.85"

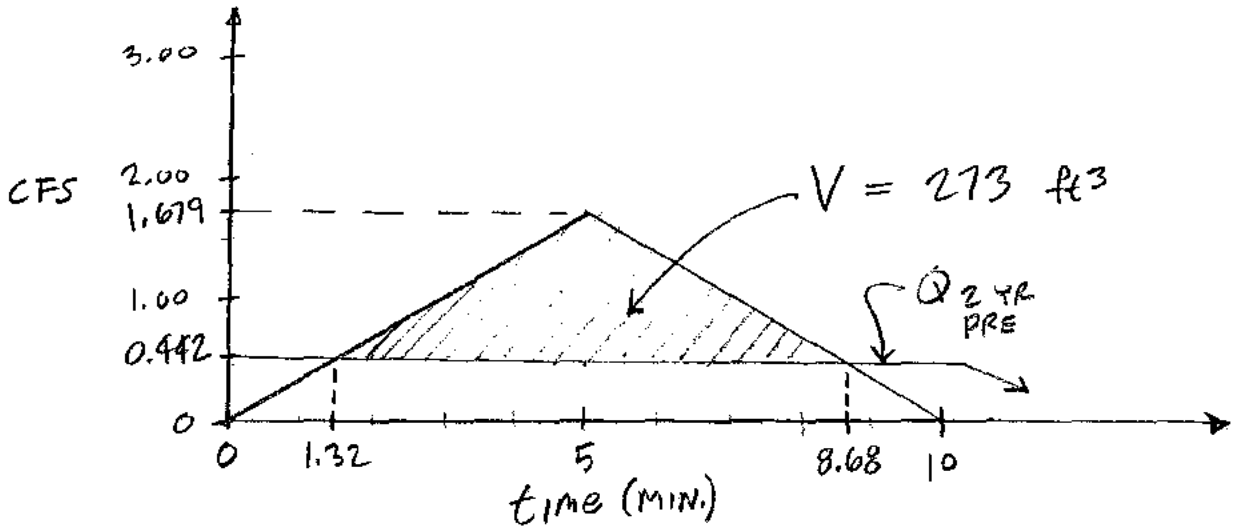
$$V_{10} = \frac{\pi\left(\frac{9.90}{12}\right)^2}{4} = 0.54\ ft^3/ft$$

$$V_6 = \frac{\pi\left(\frac{5.05}{12}\right)^2}{4} = 0.19\ ft^3/ft$$

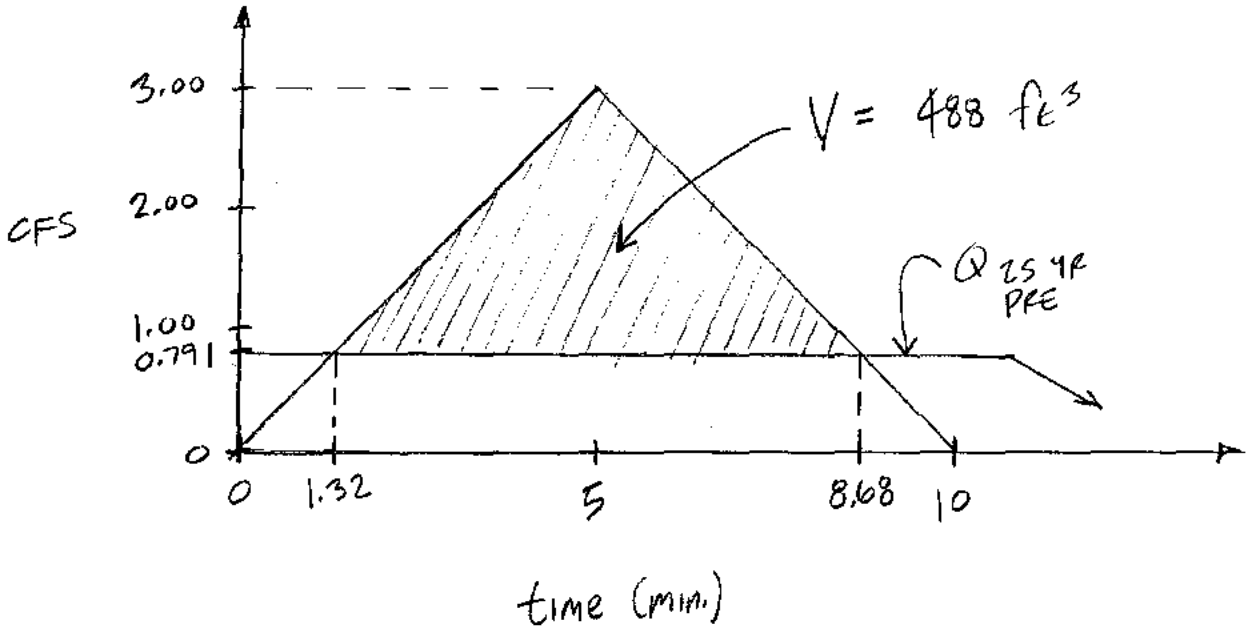
DETENTION VOLUMES:

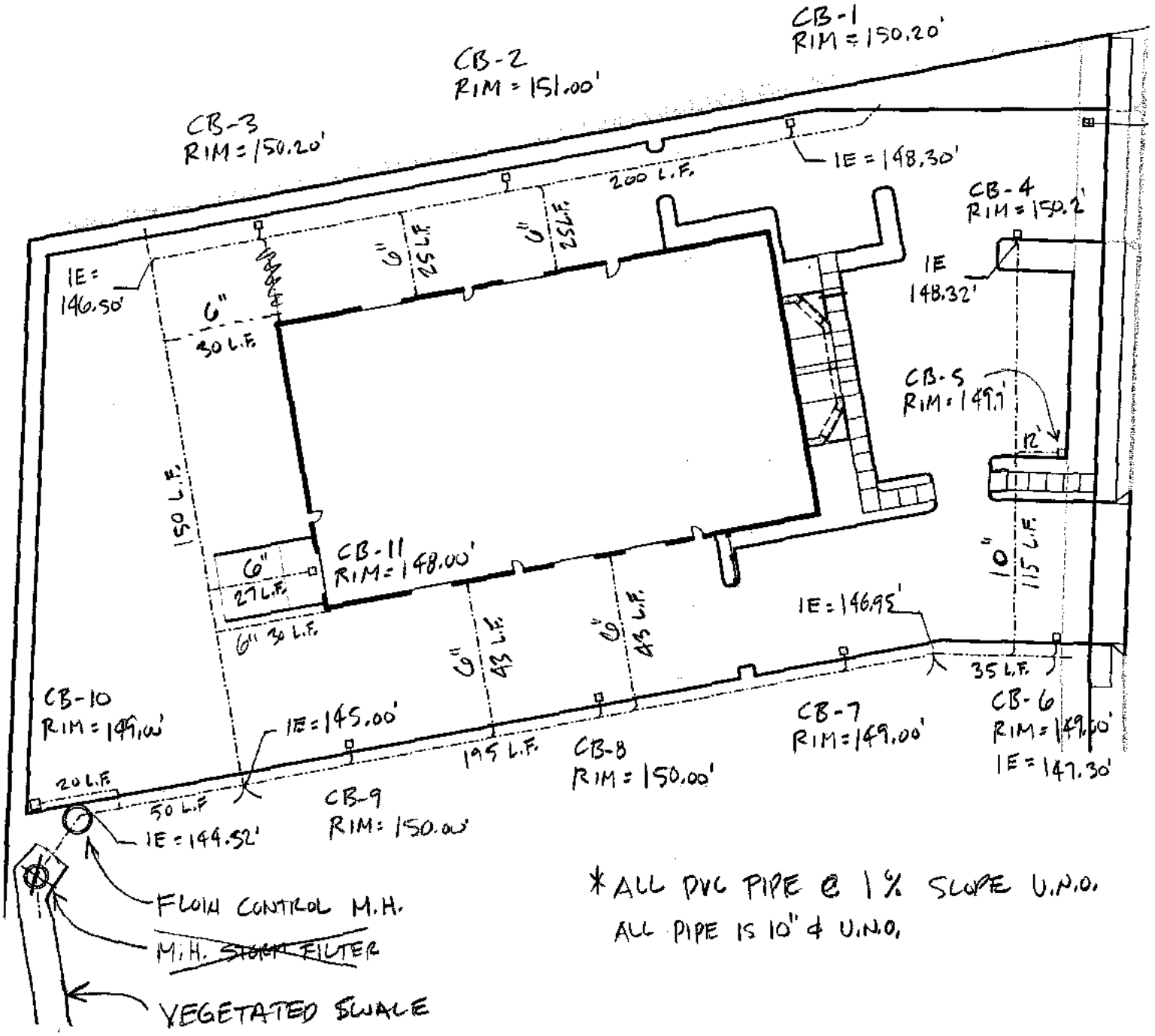
MODIFIED RATIONAL METHOD:

2 YEAR STORM:



25 YEAR STORM:



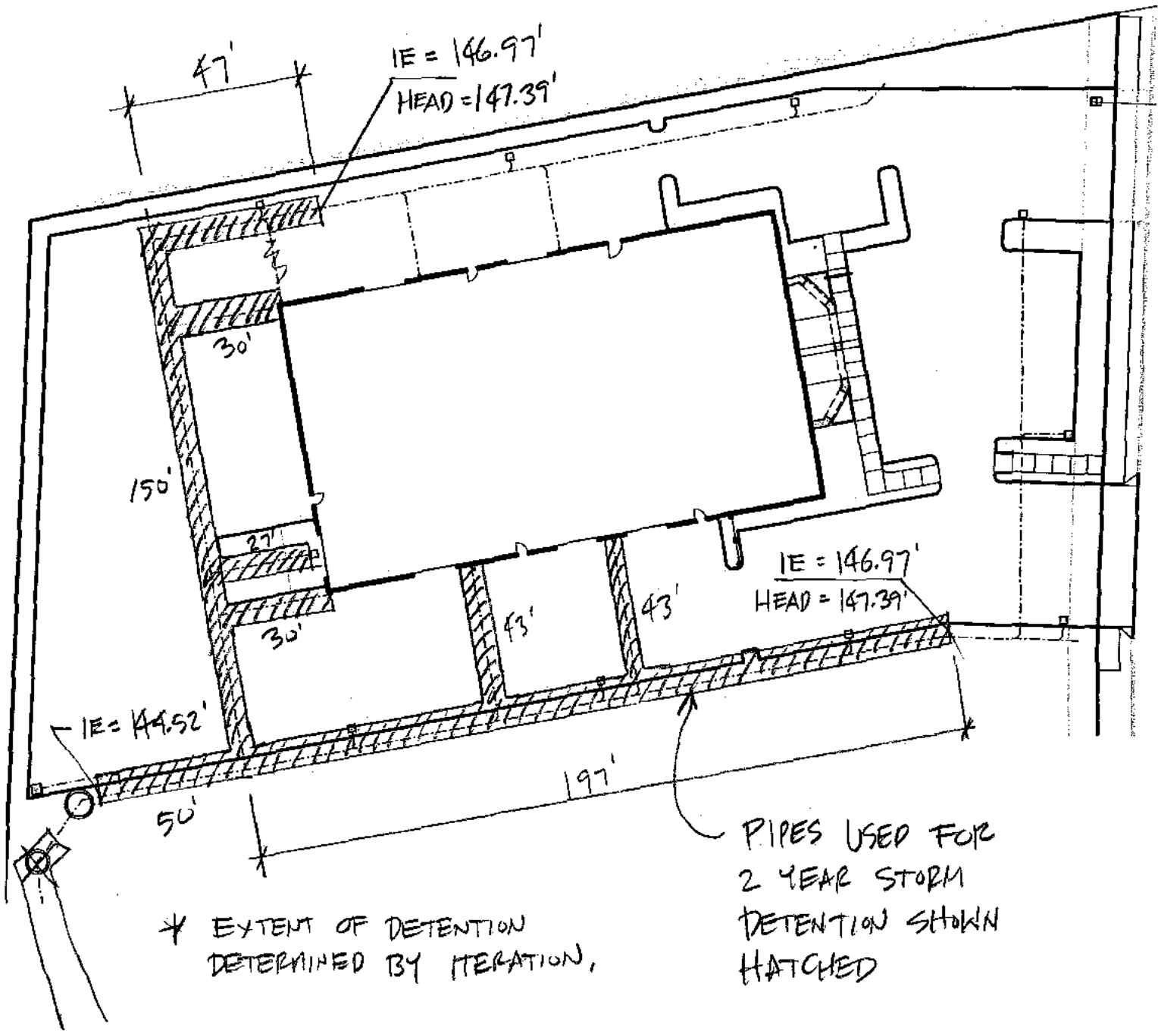


* ALL PVC PIPE @ 1% SLOPE U.N.O.
ALL PIPE IS 10" ϕ U.N.O.

PIPING PLAN

1" = 40'

2 YEAR STORM DETENTION PLAN:



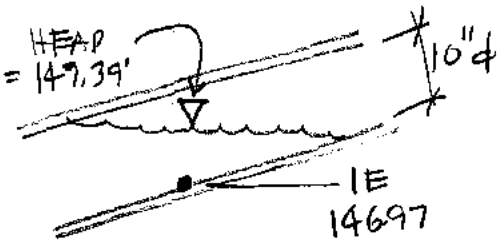
CHECK 2 YEAR DETENTION:

L.F. of 10" PIPE USED = 50 + 197 + 150 + 47
= 444 ft.

L.F. of 6" PIPE USED = 30 + 27 + 30 + 43 + 43
= 173 ft.

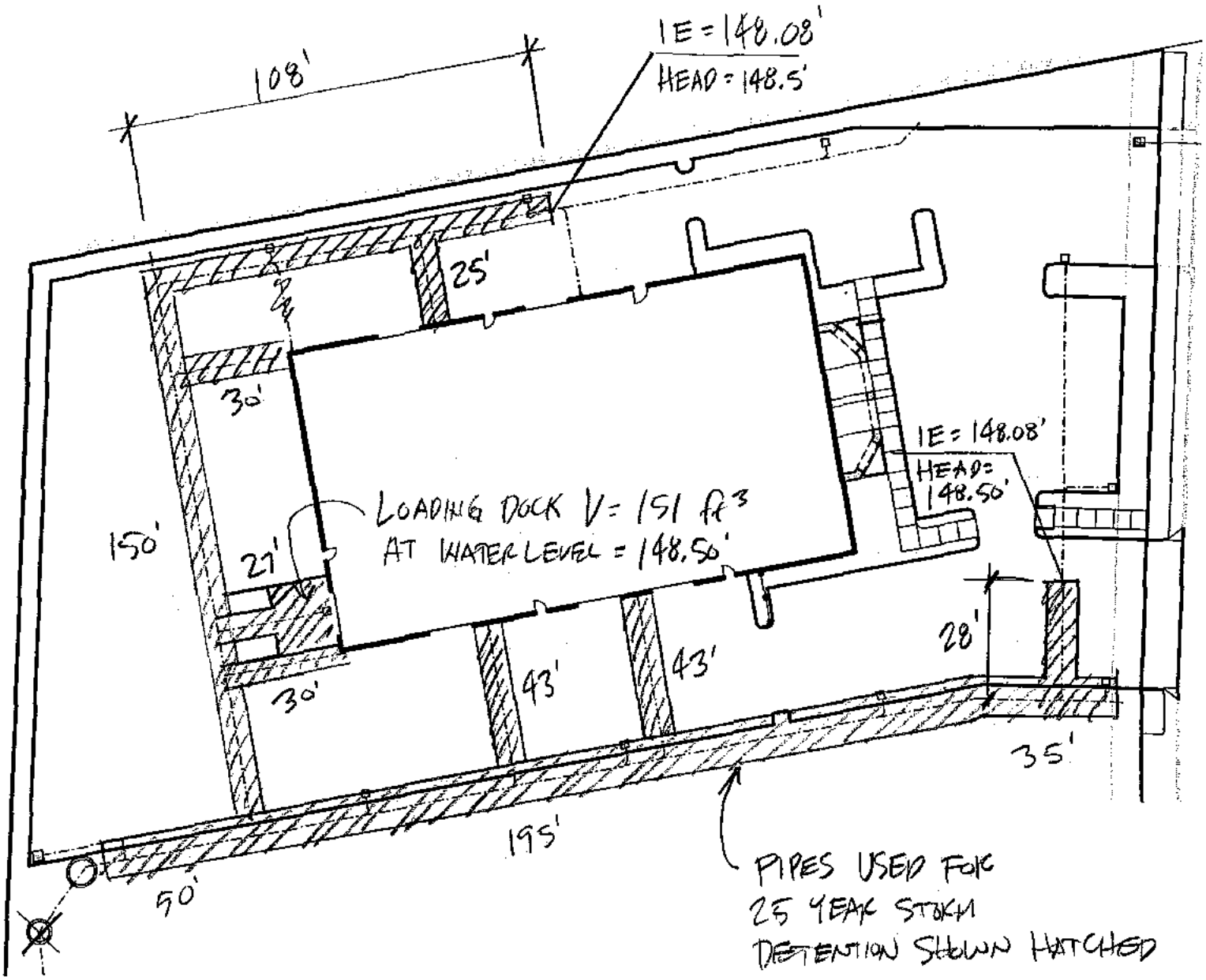
$V = (444)(0.54) + (173)(0.19) = \underline{273\ ft^3}$ OK

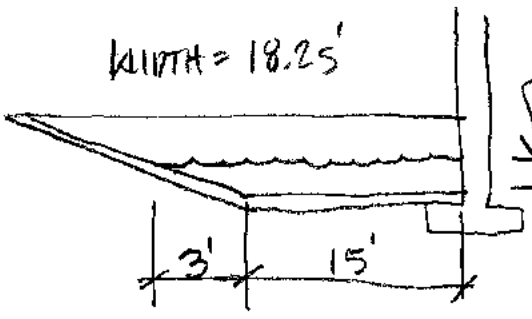
HEAD ELEVATION AT IE = 146.97'
= 146.97 + ½ 10" PIPE
= 146.97 + 0.42 = 147.39'



NOTE: BOT. OF ORIFICE FOR 25 YEAR STORM TO BE SET AT 147.39'

25 YEAR STORM DETENTION PLAN:





LOADING DOCK

$$V = \frac{15+3+15}{2}(0.5)(18.25) = 151\ ft^3$$

CHECK 25 YEAR STORM DETENTION:

L.F. OF 10" PIPE USED: 50 + 195 + 35 + 28 + 150 + 108
= 566 ft

L.F. OF 6" PIPE USED = 25 + 30 + 27 + 30 + 43 + 43
= 198 ft.

LOADING DOCK VOLUME AT HEAD = 148.50'
= 151 ft³

$V = 566(0.54) + 198(0.19) + 151 = 494\ ft^3$

$494\ ft^3 \approx 488\ ft^3$ OK

ORIFICE DESIGN:

2 YEAR ORIFICE:

HEAD = 147.39 - 144.52' = 2.87 ft

COEFICIENT OF DISCHARGE = 0.60

ORIFICE FLOW = $Q = AC\sqrt{2gh}$

OR $\frac{A}{\pi D^2} = \frac{C\sqrt{2gh}}{Q}$

$$D = 12\left(\frac{4Q}{\pi C\sqrt{2gh}}\right)^{1/2}$$

FOR $Q_{2\,YR\ PRE}$ = 0.442 CFS

$$D = 12\left(\frac{4(0.442)}{\pi\, 0.60\sqrt{(2)(32.2)(2.87)}}\right)^{1/2} = 3.15''\,\phi$$

USE 3" ϕ ORIFICE

25 YEAR ORIFICE:

HEAD = 148.50 - 147.39 = 1.11 ft.

CONCURRENT DISCHARGE FROM 2 YEAR ORIFICE =

$$Q = \frac{\pi(.025)^2}{4}(0.60)\sqrt{(2)(32.2)(148.50-144.52)}$$

(148.50 - 144.52 ← TOTAL HEAD)

$Q = 0.472$ CFS

— CONT. —

25 YEAR ORIFICE, CONT'D:

$Q_{25\,YR\ PRE} = 0.791$ CFS

$Q_{FOR\ ORIFICE} = 0.791 - 2$ YEAR ORIFICE DISCHARGE

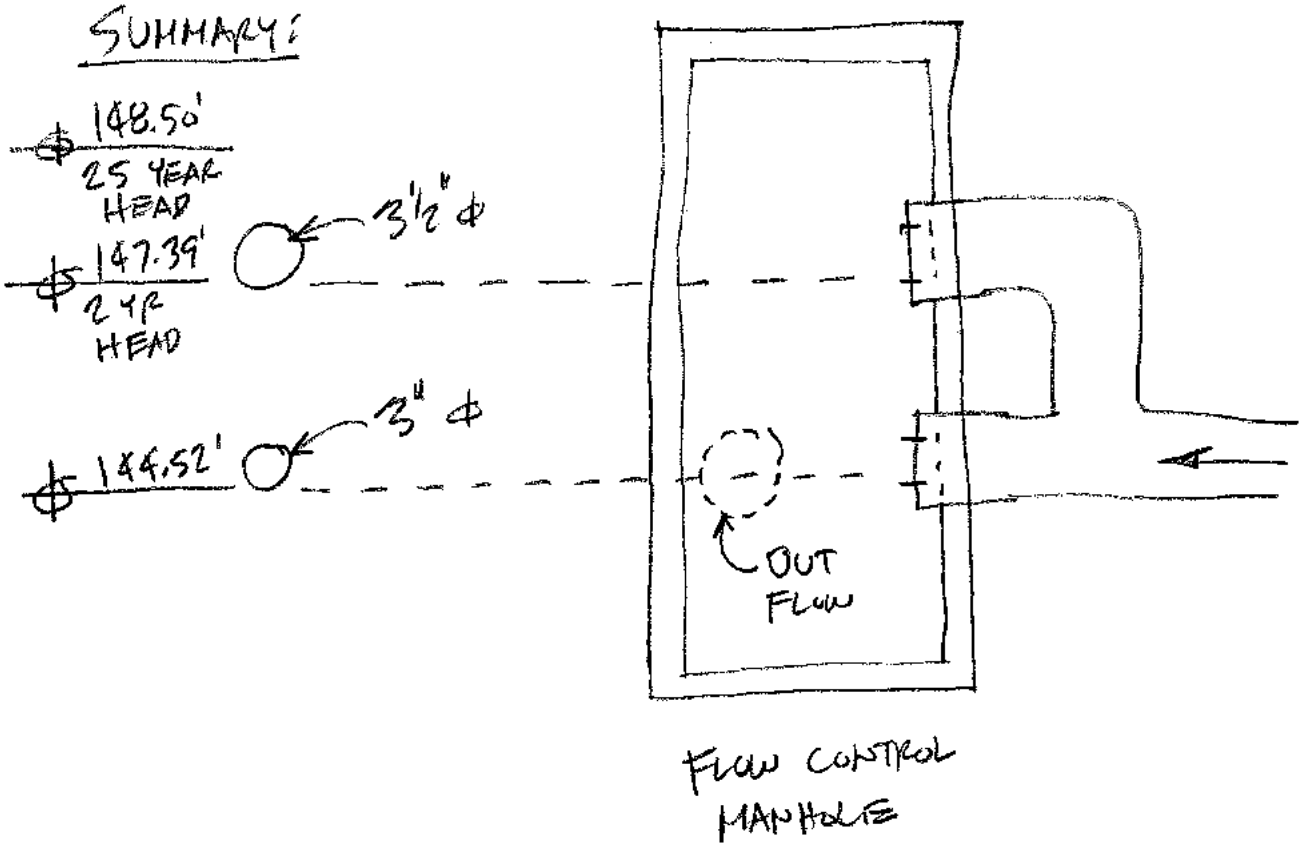
$= 0.791 - 0.472$

$= 0.319$ CFS

$$D = 12\left(\frac{4(0.319)}{\pi\, 0.60\sqrt{2(32.2)(1.11)}}\right)^{1/2} = 3.40'' \phi$$

USE 3 1/2" ϕ ORIFICE

SUMMARY:



FLOW CONTROL MANHOLE

WATER QUALITY FACILITY DESIGN:

REF: CWS APPENDIX A & B

IMPERVIOUS AREA = 40,788 S.F.

WATER QUALITY STORM:

TOTAL PRECIPITATION OF 0.36 INCHES FALLING IN 4 HOURS W/ RETURN PERIOD OF 96 HOURS.

WATER QUALITY VOLUME (WQV) =

$$\frac{(0.36\ in)(40{,}788\ ft^2)}{12\ in/ft} = 1224\ ft^3$$

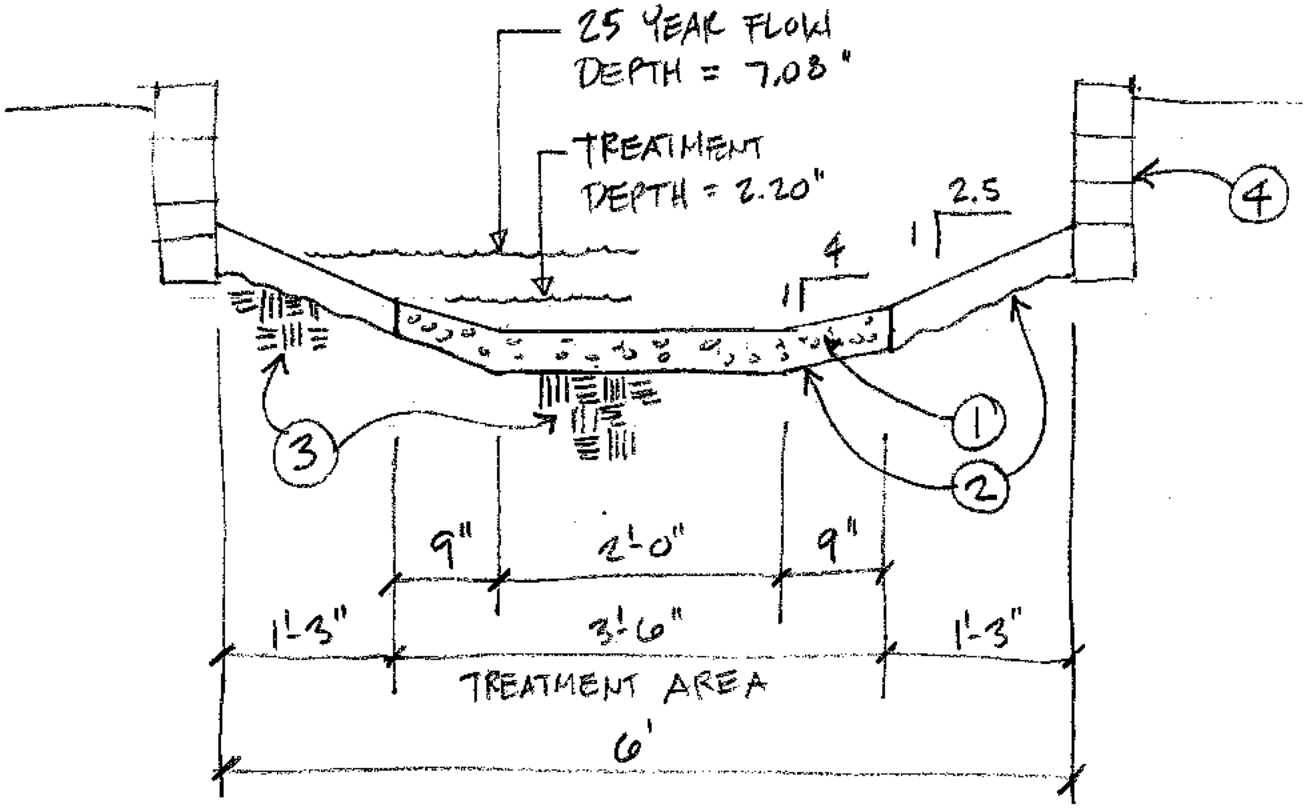
WATER QUALITY FLOW (WQF) =

$$\frac{(0.36\ in)(40{,}788\ ft^2)}{(12\ in/ft)(4\ hr)(60\ min/hr)(60\ sec/min)} = 0.085\ ft^3/sec$$

PROPOSED FACILITY: VEGETATED SWALE

DESIGN CRITERIA:

DESIGN FLOW	= WQF
MIN HYDRAULIC RESISTANCE TIME	= 9 minutes
MAX. WATER DEPTH (DESIGN)	= 6"
MANNINGS "n"	= 0.24
MAX. VELOCITY AT 25 YEAR FLOW	= 2.0 ft/sec
MIN. LENGTH	= 100 ft
MIN. SLOPE	= 0.5 %
MIN. BOTTOM WIDTH	= 2.0 ft



(1) 3/4" TO 2" RIVER RUN ROCK PLACED 2½" TO 3" DEEP

(2) HIGH DENSITY JUTE OR COCONUT MATTING

(3) 12" TOP SOIL

(4) ROCK / BLOCK WALL IF REQ'D

SWALE SECTION

VEGETATED SWALE

SWALE WITH 4:1 SIDE SLOPES
(TREATMENT AREA)

$$Q = AC\sqrt{RS}$$

Depth of water (in.):	2.200 in.	</= 6 in. OK
Width of swale bottom (ft.):	2.000 ft.	>/= 2 ft. OK
Width at water surface:	3.467 ft.	
Area (A):	0.501 s.f.	
Wetted Perimeter (P):	3.512 ft.	
Hydralic radius (R):	0.143 ft.	
n=	0.240	
C=	4.476	
S=	0.010 =1.00%	>/= 0.5% in. OK
Q=	**0.085 c.f.s.**	
V=	0.169 f.p.s.	
Length of Swale:	100 ft.	>/= 100 ft. OK
Hydraulic resistance time:	9.858 minutes	>/= 9 min. OK

25 YEAR STORM CHECK
SWALE WITH 2.5:1 SIDE SLOPES ABOVE
TREATMENT AREA

Total Depth of water (in.):	7.08 in.	
Additional depth of water above WQF:	4.88 in.	
Width of swale at top of 25 year level:	5.50 ft.	
Total Area:	2.32 s.f.	
Total Wetted perimeter:	5.70 ft.	
Total Hydralic radius (R):	0.41 ft.	
n=	0.240	
C=	5.33	
Q=	**0.791 c.f.s.**	
V=	0.340 f.p.s.	</= 2.0 fps OK

ARCHITECTURAL REVIEW
CERTIFICATION OF SIGN POSTING

18”

24”

The applicant shall provide and post a sign pursuant to Tualatin Development Code (TDC) 31.064(2). Additionally, the 18” x 24” sign must contain the application number, and the block around the word “NOTICE” must remain **primary yellow** composed of the **RGB color values Red 255, Green 255, and Blue 0.** Additionally, the potential applicant must provide a flier (or flyer) box on or near the sign and fill the box with brochures reiterating the meeting info and summarizing info about the potential project, including mention of anticipated land use application(s). Staff has a Microsoft PowerPoint 2007 template of this sign design available through the Planning Division homepage at < www.tualatinoregon.gov/planning/land-use-application-sign-templates>.

NOTE: For larger projects, the Community Development Department may require the posting of additional signs in conspicuous locations.

As the applicant for the Columbia Roofing Building Addition project, I hereby certify that on this day, 11/2/18 sign(s) was/were posted on the subject property in accordance with the requirements of the Tualatin Development Code and the Community Development Department - Planning Division.

Applicant's Name: Stan Chesshir
(PLEASE PRINT)

Applicant's Signature: Stan Chesshir

Date: 11/6/18

Chesshir Architecture P.C.

2337 NW York St #208
Portland OR 97210
503 228 3273

Columbia Roofing Building Addition

Meeting notes: City of Tualatin Pre-application meeting 2/7/18

Present: Ty Darby- Tualatin Valley Fire Marshal, Tony Doran - City of Tualatin Engineering, Erin Engman – City of Tualatin Planning, Chris Ragland – City of Tualatin Building Official, AJ Michaud – TS Gray Construction, Stan Chesshir – Chesshir Architecture

1. **Fire Marshall Review**: General Site Plan appears adequate regarding access, fire truck circulation. Water flow test required to determine adequacy for sprinkler system. Fire hydrant spacing near site to be graphically portrayed on plans- preferable to avoid private hydrants if possible. Fire Department connection to be within 100 feet from hydrant.

2. **Planning Review:** Planner provided copies of Conditional Use resolution for existing building which addresses screening requirement for materials storage areas and Architectural Review findings for existing building. Also gave packets for Neighborhood/Developer meeting and Architectural Review processes. Design review will be a staff review process which saves some time in process.

   Also made reference to the landscaping standards, tree removal and protection provisions. She provided a preliminary calculation for parking and suggested planning for the "worst case" scenario for the lease space tenant uses to avoid problems in the future for TI permits.

   It was determined that we could consider this Scoping Meeting to be classified as the Pre-Application to gain 2 or more weeks in the process, since the preliminary plans seem to adequately describe the proposed project with no major concerns at this point. The fee was paid and we can move on with the next steps.

3. **Engineering Review:** Engineer provided a link to the existing utilities mapping for reference. Form for Hydraulic Modeling was provided and it appears that the project

will not require the fee. The existing swale need to be evaluated for adequacy for new development.

The new driveway access on the SE corner should either offset from drive across street or locate directly across.

A traffic study is required and object is to try to prove that no Public Works are going to be required with this development.

Suggested submitting early permit request with City and Clean Water Services after neighborhood meeting to get this process going since it usually takes longer than building permit review.

4. **Building Official Review:** We discussed the allowable building area calculations that were submitted for this review. The question raised was why the existing building was listed as type V-B construction since it appears that the type could have been III-B. A building walkthrough is suggested to determine whether we can reclassify as III-B, which helps with the overall allowable building area.

   Geotechnical testing and report preferred.

   Reminded that plans should include deferred submittal list and special inspections company to be assigned.

   We should determine whether the southern portion is to be submitted as shell only or whether portions of TI will be submitted with this permit application.

ACTION ITEMS

1. Arrange for water flow test: GRAY/COLUMBIA
2. Arrange for Neighborhood/Developer meeting, develop required submittal. CHESSHIR
3. Arrange for Building Official walk through/ research previous records regarding building construction type. CHESSHIR/GRAY
4. Research Gray and Columbia records for swale design, engage civil engineer for that work and for the general site and utility design. GRAY/COLUMBIA
5. Research for previous traffic study and engage same firm? GRAY/COLUMBIA
6. Review previous geotech report and determine adequacy for addition. GRAY
7. Submit plan back directly to Fire Marshal when flow test completed. CHESSHIR
8. Engage Structural Engineer- CHESSHIR
9. Engage Geotech Engineer/ evaluate whether existing report is adequate- GRAY/COLUMBIA
10. Engage Landscape Architect?