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: AR15-0028 (Community Development Dept.: Planning Division) .

PROPOSAL

To build two buildings totaling 86,100 square feet on vacant property located on the southwest corner of the SW 108th Avenue/SW Leveton Drive intersection in Tualatin, Oregon

To view application materials, go to: http://www.tualatinoregon.gov/projects

PROPERTY					
☐ n/a	**Name of Application**	JACK MARTIN BUILDING @ LEVETON			
	Street Address	18625 SW 108th Ave			
	Tax Map and Lot No(s).	2S1 22AD 01 300, 400, 500			
	Planning District	Light Manufacturing (ML)	**Overlays** ☐	**NRPO** ☐	**Flood Plain** ☐
	Previous Applications	AR1403	**Additional Applications:**		**CIO**

DATES

Receipt of application	11/06/2015	**Deemed Complete**	04/06/2016
Notice of application submittal			4/6/2016
Project Status / Development Review meeting			
Comments due for staff report			4/21/2016
Public meeting: ☐ **ARB** ☐ **TPC** ☒ **n/a**			
City Council (CC) ☒ **n/a**			

CONTACT

Name: Rob Dehnert
Title: Associate Planner
E-mail: rdehnert@ci.tualatin.or.us
Phone: 503-691-3029
Notes: Other Apps: AR0721, ANN-82-08, ANN-07-01, PAR-09-03, PLA-07-10,Glenmorag Park Plat 1910

***Paper Copies**

City Staff
☒ City Manager
☒ Building Official
☒ Chief of Police
☒ City Attorney
☒ City Engineer
☒ Community Dev. Director
☒ Community Services Director
☒ Economic Dev. 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 Div.

Counties
☐ Clackamas County Dept. of Transportation and Dev.
☒ Washington County Dept. of Land Use and Transportation (AR's)
☐ Washington County 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 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 Div.
☐ 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 (TVF&R)
☐ United States Postal Service (USPS) (Washington; 18850 SW Teton Ave)
☐ USPS (Clackamas)
☒ Washington County Consolidated Communications Agency (WCCCA)

Additional Parties
☒ Tualatin Citizen Involvement Organization (CIO)
☐
☐

☒ *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 (property line adjustment)*

☐ *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)*

☐ *54.030 Conditional 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*

☒ *73.220 Standards*

☒ *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*

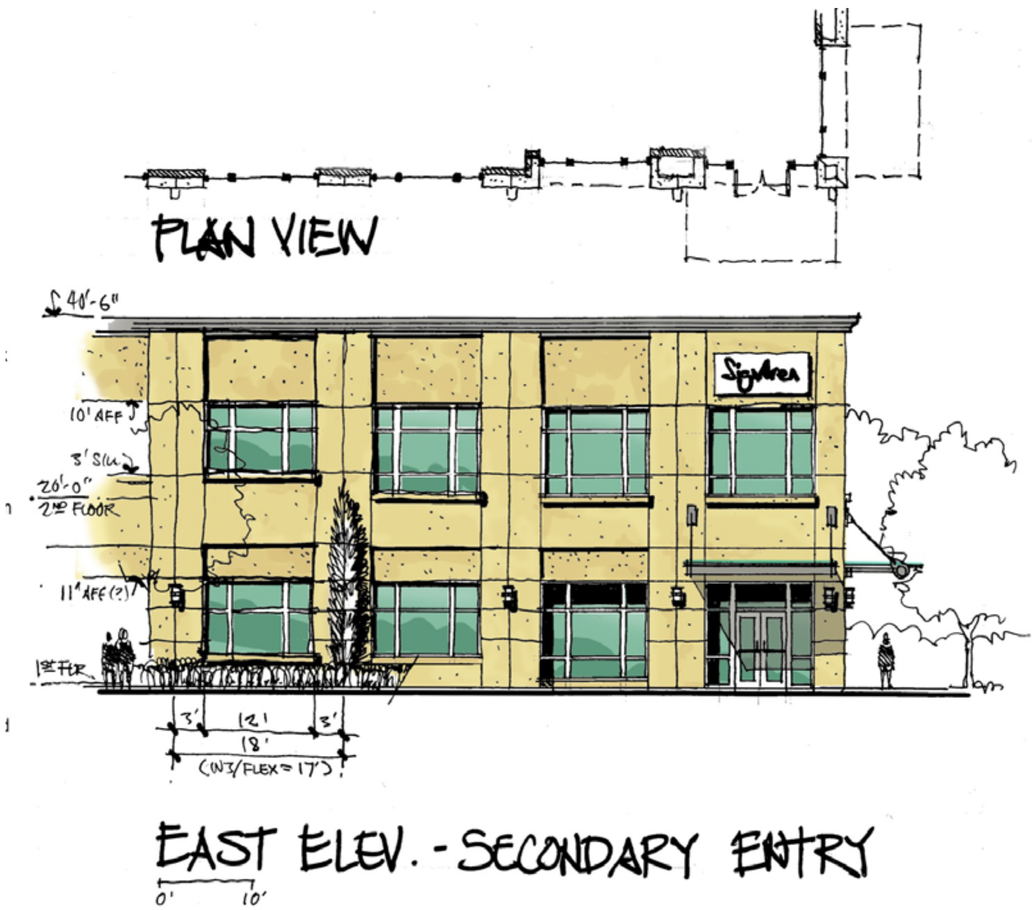
☐ *73.470 Standards*

☐ *73.500 Standards*

LANCE MUELLER & ASSOCIATES

ARCHITECTS · AIA

Architectural Review Submittal



Leveton

SW Leveton Drive at SW 180th Avenue
Tualatin, OR

October 4, 2015

Leveton SE 108th Avenue at SW Leveton Drive - Tualatin, OR 97062

Table of Contents - For AR Submittal Documents

City of Tualatin

www.tualatinoregon.gov

APPLICATION FOR ARCHITECTURAL REVIEW

Direct Communication to:			
Name: JACK MARTIN		Title:	
Company Name: LEVETON LLC			
Current address: P.O. BOX 15523			
City: SEATTLE	State: WA		ZIP Code: 98115
Phone: 206-660-8483	Fax:	Email: JACK1949@ MS.COM	
Applicant			
Name: JACK MARTIN		Company Name:	
Address: (SAME AS ABOVE)			
City:	State:		ZIP Code:
Phone:	Fax:	Email:	
Applicant's Signature:		Date: 30 OCT 2015	
Property Owner			
Name: JACK MARTIN			
Address: (SAME AS ABOVE)			
City:	State:		ZIP Code:
Phone:	Fax:	Email:	
Property Owner's Signature:		Date 30 OCT 2015	
(Note: Letter of authorization is required if not signed by owner)			
Architect			
Name: LANCE MUELLER & ASSOCIATES (CONTACT: BOB WELLS)			
Address: 130 LAKESIDE AVE. S.; SUITE 250			
City: SEATTLE	State: WA		ZIP Code: 98122
Phone: 206-325-2553	Fax: 206-328-0554	Email: BWELLS@LMUELLER.COM	
Landscape Architect			
Name: OTTEN LANDSCAPE ARCHITECTS (CONTACT: JANET OTTEN)			
Address: 3933 SW KELLY AVE. SUITE B			
City: PORTLAND	State: OR		ZIP Code: 97239
Phone: 503-972-0311	Fax:	Email: JANET@OTTENLA.COM	
Engineer			
Name: VLMK ENGINEERING & DESIGN (CONTACT: TRENT NAGLE)			
Address: 3933 SW KELLY AVENUE			
City: PORTLAND	State: OR		ZIP Code: 97239
Phone: 503-222-4453	Fax:	Email: TRENT@VLMK.COM	
Project			
Project Title: LEVETON			
Address: SW 180th AVENUE AT SW LEVETON DRIVE			
City: TUALATIN	State: OR		ZIP Code: 97062
Brief Project Description: TWO NEW 2-STORY BUILDING SHELLS AND SITE WORK ON UNDEVELOPED PROPERTY.			
Proposed Use: INDUSTRIAL (INTENDED FOR HIGH-TECH TENANTS)			

Value of Improvements: $4,470,000

AS THE PERSON RESPONSIBLE FOR THIS APPLICATION, I HEREBY ACKNOWLEDGE THAT I HAVE READ THIS APPLICATION AND STATE THAT THE INFORMATION ABOVE, ON THE FACT SHEET, AND THE SURROUNDING PERTY OWNER MAILING LIST IS CORRECT. I AGREE TO COMPLY WITH ALL APPLICABLE CITY AND COUNTY ORDINANCES AND STATE LAWS REGARDING BUILDING CONSTRUCTION AND LAND USE.	
Applicant's Signature:	Date: 30 OCT 2015

Office Use

Case No:	Date Received:		Received by:
Fee: Complete Review ($115-$5040):		Receipt No:	
Application Complete as of:		ARB hearing date (if applicable):	
Posting Verification:		6 copies of drawings (folded)	
1 reproducible 8 ½" X 11" vicinity map		1 reproducible 8 ½" X 11" site, grading, LS, Public Facilities plan	
Neighborhood/Developer meeting materials			

GENERAL INFORMATION	
Site Address:	SW LEVETON DRIVE at SW 108th AVENUE
Assessor's Map and Tax Lot #:	2S122AD01300; -1400; -1500.
Planning District:	GEN. MANUF. (MG)
Parcel Size:	233,404 SF
Property Owner:	LEVETON LLC
Applicant:	LEVETON LLC
Proposed Use:	INDUSTRIAL - OFC, STORAGE, LIGHT-MANUF.

ARCHITECTURAL REVIEW DETAILS	
☐ Residential ☐ Commercial ☒ Industrial	
Number of parking spaces:	336
Square footage of building(s):	85,163 SF
Square footage of landscaping:	56,865 SF
Square footage of paving:	~~91,296~~ 91,376 SF
Proposed density (for residential):	NA

For City Personnel to complete:

Staff contact person:

ITEM 1
CHECKLISTS

City of Tualatin

www.tualatinoregon.gov

ARCHITECTURAL REVIEW APPLICATION INSTRUCTIONS
FOR
COMMERCIAL, INDUSTRIAL, PUBLIC AND SEMI-PUBLIC DEVELOPMENT

The following information shall be submitted with each Architectural Review application. Incomplete applications will not be processed. (PLAN REQUIREMENTS ARE ITEM 13 ON PAGE 2).

✓ 1. COMPLETE APPLICATION FORM, FEE AND APPLICATION FACT SHEET

✓ 2. SIGNED AFFIDAVIT OF POSTING

N.A. 3. THREE (3) COPIES OF WETLAND DELINEATION REPORT (if applicable).

✓ 4. A CLEAN WATER SERVICES (CWS) SERVICE PROVIDER LETTER OR PRE-SCREEN FOR THE PROPOSED DEVELOPMENT.

✓ 5. FIVE (5) COPIES OF TRAFFIC ANALYSIS REPORT (if applicable).

6. NEIGHBORHOOD / DEVELOPER MEETING MATERIALS, pursuant to Tualatin Development Code (TDC) 31.063. If subject property is located in the Central Design District, submittal must include:

   ✓ a. REPORT ON NEIGHBORHOOD MEETING

   ✓ b. NARRATIVE ADDRESSING THE DESIGN GUIDELINES

✓ 7. ONE (1) COPY OF A LEGAL DESCRIPTION FOR THE SUBJECT PROPERTY AS IT APPEARS ON THE DEED.

✓ 8. ONE (1) VICINITY MAP (8½ X 11") INDICATING FRONTAGE STREET(S) AND CROSS STREET(S) within one-half mile radius. Include developments and adjacent businesses.

✓ 9. MIXED SOLID WASTE AND SOURCE SEPARATED RECYCLABLES PLAN (Please submit 2 copies) SEE A1.2

   ✓ a. A letter from the Franchise solid waste and recycling hauler reviewing the proposed solid waste and recyclables method and facility.

✓ 10. ASSESSOR'S MAPS (Please submit 1 copy)

- ASSESSORS MAPS:
  Copies of the Washington and/or Clackamas County <u>Assessor's Map(s)</u> showing the subject property and properties within 1,000 feet from the boundaries of the subject property. If the 1,000-foot area includes lots within a platted residential subdivision, the map needs 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. Draw a line indicating the 1,000-ft distance.

✓ 11. MAILING LIST (LABELS) OF PROPERTY OWNERS WITHIN 1,000 FEET (1 copy): 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.

- ADDRESS LIST/MAILING LABELS (example of required address label format):

2S124B003002
City of Tualatin
18880 SW Martinazzi Ave
Tualatin OR 97062-7092

All parties listed on the application form shall also be included on the address list/mailing labels.

Provide pre-gummed address labels listing the correct names and addresses of all owners of the subject property and of real property within 1,000-foot of the subject property. If the 1,000-foot area (Ordinance No. 1304-10 page 59 of 61) 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. The current assessor's roll shall be used. The Tax Lot number and Assessor's Map number must be included with each name and address. If there are more than 25 properties, you may provide pre-gummed address labels which are available for purchase at Washington and Clackamas Counties. Preparation of the list of property owners shall be the applicant's responsibility and shall be prepared by one of the following: a land title company, a land use planning consultant authorized by the State of Oregon to conduct business in the State, registered architect, landscape architect, engineer, surveyor, or attorney. The applicant shall update the list of property owners not less than every 90 days.

12. SIGNS:
A separate application must be submitted for signs. – ACKNOWLEDGE.

13. PLANS (COLLATED, STAPLED AND FOLDED):

8½ X 11": **ONE (1) SET** OF REPRODUCIBLE (INCLUDING BUT NOT LIMITED TO) SITE, GRADING, ELEVATIONS, LANDSCAPE & PUBLIC FACILITIES PLANS. IN BINDER

11" X 17": **NINE (9) COMPLETE SETS** OF PLANS (COLLATED, STAPLED AND FOLDED).

24" X 36": **NINE (9) COMPLETE SETS** OF PLANS (COLLATED, STAPLED, AND FOLDED).

SITE PLAN: A0.0, A1.0, A1.1, A1.2, TOPO/SURVEY FOLDED, STAPLED, NOT IN BINDER

- North arrow and scale of drawing (Scale 1":10', 1":20': 1":30', for larger developments 1":40' or 1":50'). If feasible, please *adjust the scale* accordingly on ledger (11 x 17) and letter (8.5 x 11) size copies.
- Site Data to include Planning District designation, square footage of site, square footage of development area, square footage of landscaping, square footage of parking lot landscaping, square footage of asphalt, number of parking spaces (standard, subcompact and disability), square footage of building (gross and perimeter). Information must contain existing and proposed square footage of parking spaces. Identify landscape credits available and building setback reduction.
- Correct lot area and lot line dimensions of the site. Correct location of Natural Resource Protection Overlay District, including greenways, wetland natural areas and open space natural areas, and 25' vegetated corridors adjacent to a sensitive area. Also show delineated wetland boundary, top of bank and centerline for rivers and creeks. Indicate if wetlands or greenways are proposed to be dedicated.

- Location of buildings and main building entrance, dimensions and square footage of existing and proposed development, including setback distances to property lines and setback distances between buildings. Include location of bicycle parking and covered bicycle parking.
- Location of accessways, walkways and on-site bikeways.
- Fronting street(s), right-of-way lines, driveways, sidewalks, curbs, paths, railroad right-of-way, bicycle paths, pedestrian paths, transit stop locations and easements (include dimensions).
- Parking circulation and loading areas (dimensions of spaces) and type of surface. Show entrances, exits, direction of traffic flow, maneuvering areas and setbacks. Indicate location of subcompact spaces, vanpool and car pool parking and type of curbing. Identify disability stall locations and stall dimensions.
- Location of fences, walls, trash enclosures, recycling areas, electric transformer pads, rooftop mechanical equipment and exterior light fixtures.
- ~~Future development areas and outdoor storage areas~~, if applicable. (NO FUTURE ADDITIONAL DEVELOPMENT IS PROPOSED)

GRADING PLAN: C1.0

- North arrow and scale of drawing (scale 1":10', 1":20', 1":30').
- Correct lot area ~~and lot line dimensions of the site.~~ Correct location of Natural Resource Protection ~~Overlay~~ District, including greenways, delineated wetland boundary, wetland natural areas and open space natural areas, and CWS vegetated corridors adjacent to a sensitive area. Also show top of bank and centerline for rivers and creeks. ~~Indicate if wetlands~~ or greenways are proposed to be dedicated. ← NA
- Show site contour lines and elevations (existing and proposed, referenced from mean sea level. Minimum five-foot contours).
- Location, size and species of all existing trees having a trunk diameter of 8" or greater measured at a point 4' above the ground. Indicate trees to be removed or retained. (NONE REMOVED.)
- Place a note on the plan stating that existing trees to be retained shall be fenced around the drip line with chain link or other sturdy fencing during construction. Indicate topsoil replacement in all landscape areas.
- Location, size and grading plan of water quality facility, if applicable. (SEE C2.0.)

TREE PRESERVATION PLAN: NA - NO TREES EXISTING ON SITE.

- NA Tree Preservation Site Plan (drawn to scale 1:10, 1:20, or 1:30), including a north arrow, property lines, existing and proposed topographical contour lines, structures, impervious surfaces, wells, septic systems, stormwater retention/detention facilities, utility and access locations/easements, vision clearance areas, and all trees having a trunk diameter of 8" or greater as measured at a point 4' above the ground. All trees proposed for removal and all trees proposed for preservation shall be indicated on the site plan as such by identifying symbols. For each tree illustrated, include information on size, species, and tag i.d. number.
- NA A Tree Assessment Report, prepared by a qualified arborist, including the following information: an analysis as to whether trees proposed for preservation can in fact be preserved in light of the development proposed, are healthy specimens, and do not pose an imminent hazard to persons or property if preserved; an analysis as to whether any trees proposed for removal could be reasonably preserved in light of the development proposed and health of the tree; a statement addressing the tree removal approval criteria set forth in TDC 34.230; and arborist's signature and contact information. The Tree Assessment Report shall have been prepared no more than one calendar year preceding the date the Architectural Review application is deemed complete by the City.

- NA Tagging. All trees on-site shall be physically identified and numbered in the field with an arborist-approved tagging system. The tag i.d. numbers shall correspond with the tag i.d. numbers illustrated on the Tree Preservation Site Plan.
- NA Where Clean Water Services (CWS) has approved delineation of a "sensitive area" or "vegetated corridor" on the subject property, and CWS has required dedication of an easement that prohibits encroachment into the delineated area, and the CWS-required easement boundary is clearly illustrated and identified on the site plan, then all trees located within the CWS-required easement need not be individually identified on the Tree Preservation Site Plan, need not be addressed in the Tree Assessment Report, and need not be tagged.

ELEVATIONS: A3.0 & A3.1

- ✓ Elevations of proposed structures drawn at scale of 1/16":1', 1/8":1', 1/4":1' (buildings, covered bicycle parking and mixed solid waste and source separated recyclable storage areas).
- ✓ Elevations of exterior light fixtures, electrical transformer pads, and rooftop mechanical equipment.
- ✓ An 8½ x 11" materials board sample and specifications as to materials and colors to be used in the development, including walls, roof, windows, doors, garages and trim. An accurately colored elevation with a detailed description of materials and colors to be used may be substituted for a materials board.
- ✓ Cut sheet of exterior lighting units showing down deflecting lighting pattern. Include parking lot pole-mounted lighting and wall-mounted lights. (SEE EXT. LIGHTING FIXTURE SCHEDULE & FIXTURE CUTS – SEPARATE PACKAGE)
- ✓ Plans drawn at scale of 1/16":1', 1/8":1' or 1/4":1'.

PUBLIC FACILITIES PLAN: C1.0 & C7.0

- ✓ North arrow and scale of drawing (scale of 1":10', 1":20', 1":30').
- Correct lot area and lot line dimensions of the site. ~~Correct location of Natural Resource Protection Overlay District, including greenways, wetland natural areas and open space natural areas, and 25' vegetated corridors adjacent to a sensitive area. Also show top of bank and centerline for rivers and creeks. Indicate if wetlands or greenways are proposed to be dedicated.~~ ← NA
- ✓ Street - existing and proposed. Show centerline, right-of way lines, dimensions, sidewalks, and curbs, bike lanes, accessways, walkways, landscape strips, signalized intersections and nearby transit stops.
- ✓ Water - show existing and proposed water lines, fire hydrants, meters, line sizes, easements, public or private lines.
- ✓ Sanitary Sewer - existing and proposed. Sewer lines laterals, manholes and cleanouts, line sizes, easements, public or private line.
- NA Flood Plain - If applicable, show 100-year flood plain and/or floodway boundaries.
- ✓ Storm Sewer - existing and proposed. Storm lines, catch basins, manholes, line sizes, easement, public or private line.
- ✓ Calculations supporting the water quality facility design. (SEE: AR STORM REPORT)
- ✓ Traffic Study Information - as required by City Engineer (5 copies).
- ✓ Identify greenway areas, bicycle paths and pedestrian paths.
- ✓ Location of all signs within the public right-of-way adjacent to the parcel. SEE TOPO/SURVEY

LANDSCAPE PLAN: L1.0, L2.0, & TOPO/SURVEY

- North arrow and scale of drawing (scale of 1":10', 1":20', 1":30').
- Correct lot area and lot line dimensions of the site. Correct location of Natural Resource Protection Overlay District, including greenways, wetland natural areas and open space natural areas, and 25' vegetated corridors adjacent to a sensitive area. Also show top of bank and centerline for rivers and creeks. Indicate if wetlands or greenways are proposed to be dedicated. ← NA
- Specific locations of all proposed and existing landscaping, including greenway landscaping (if applicable). Identify location of sensitive area buffer landscaping.
- Location, size and species of all existing trees having a trunk diameter of 8" or greater as measured at a point 4' above the ground. Designate trees to be removed or retained. When trees are to be retained, please put tree protection measures on both the Grading and Landscape plans.
- Take-off sheet indicating square footage of landscaping. Indicate square footage of landscape islands in parking lot.
- Plant legend which includes:
  - Total percentage and square footage of landscaped areas.
  - Square footage of parking lot landscaping.
  - Common and botanical names of plants.
  - Quantity and spacing of plants.
  - Size of plants (caliper, height or container size).
  - Landscaping materials to be used (bark dust, river rock, etc.).
  - Notation on type of irrigation system (automatic underground or drip).
  - Replacement of topsoil.
  - Location of street trees.

14. ADDITIONAL INFORMATION:

Please submit an **Electronic Digital CD** (Adobe Acrobat Reader [PDF], or Microsoft Word and Excel are the preferable file types) of the entire Architectural Review packet and supporting documentation, including drawings to the City of Tualatin Community Development Department - Planning Division.

Additional information may be required in order to complete the review process.

CITY OF TUALATIN FACT SHEET

General

Proposed use: INDUSTRIAL (HIGH-TECH FACILITY)	
Site area: 5.36 acres	Building footprint: 42 250 sq. ft.
Development area: 5.36 acres 233,404 Sq. ft.	Paved area: 132,209 sq. ft. Development area coverage: 100 %

Parking

Spaces required (see TDC 73.400) *(example: warehouse @ 0.3/1000 GFA)* 39,519 @ 1.6 /1000 GFA = 101 (MANUF) 12,675 @ 0.3 /1000 GFA = 4 (STORAGE) 8,044 @ 2.7 /1000 GFA = 23 Total parking required: 128 spaces Handicapped accessible = 8 Van pool = TBD/CODE Compact = *(max. 35% allowed)* = 49 @ 35% Loading berths = 3	Spaces provided: Total parking provided: 336 spaces Standard = 259 Handicapped accessible = 8 Van pool = TBD/CODE Compact = 69 (21% OF PROVIDED) Loading berths = 4

Bicycles

Covered spaces required: 12	Covered spaces provided: 12

Landscaping

Landscaping required: 15 % of dvpt. area 35,011 Square feet	Landscaping provided: 25.7 % of dvpt. area 58,945 Square feet
Landscaped parking island area required: 25 ~~%~~ SF/STALL 25 x 336 STALLS = 8,400 SF	Landscaped parking island area provided: ~~%~~ 11,145 SF

Trash and recycling facility

Minimum standard method:	square feet
Other method: SEE OUR DETAILED CALC'S ON A0.0	square feet

For commercial/industrial projects only

Total building area: 85 163 sq. ft. Main floor: 42,250 sq. ft. Mezzanine: – sq. ft.	2nd floor: 42,913 sq. ft. 3rd floor: – sq. ft. 4th floor: – sq. ft.

For residential projects only (NA)

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

Architectural Review (AR) Intake Check List

AR-___-____ Date Received:___________ Submittal # _______ Date Responded: _________

- [x] Project name or title that matches CRW scoping/pre-application meeting name. (Please try to be creative – having projects with all the same names can be confusing for everyone).
- [x] Evidence of completed pre-app and scoping meeting with dates if applicable (no older than 180 days from date of 1st submittal).
- [x] Narrative of correct and complete Tualatin Development and Municipal Code section responses.
- [x] Names, addresses, e-mails, and telephone numbers of:
  - ✓ Property Owner(s) ✓ Applicant ✓ Project Planner
  - ✓ Architect ✓ Engineer ✓ Landscape Architect
- [x] Property Owner(s), Applicant's Representative, Landlord, and Applicant Signatures – along with printed name and date.
- [x] ~~Street Address(s)~~, Tax Lot Number(s), and current tax map(s). (NO STREET ADDRESS ASSIGNED)
- [x] Adobe PDF(s) of application materials (direct conversions, not scans) on a CD or thumb drive.
- [x] Clean Water Services (CWS) Service Provider Letter (SPL) or Pre-Screen signed by CWS with appropriate box checked to indication that it serves as an SPL.
- [ ] N/A Wetland delineations and floodplain, if applicable (SEE CWS ↑)
- [x] Water quality and detention calculations, if applicable
- [ ] NA Fill/Removal Permit Issued by the Oregon Division of State Lands (DSL) and the U.S. Army Corps of Engineers, if applicable (SEE CWS)
- [x] Neighborhood Meeting: Mailing affidavit and Sign Posting certification on current City forms, attendance log, notes, letter, GIS buffer map, regular and CIO mailing list, and mailing labels.
- [x] Neighborhood Meeting: Is app submittal no later than 180 days after the n/d meeting?
- [x] Scaled Existing Conditions Plan that shows all structures, pavement lighting, landscaping, property lines, and easement lines on 24 x 26 paper. (SEE DRAWING 1 OF 1 - TOPO SURVEY)
- [x] Site Plans (Scale of 1":10', 1":20', or 1":30'), including landscape, preliminary grading, and civil engineering sheets showing all property lines and easements on 24 x 26 paper. Plans must show all existing property lines and easements.
- [x] All plans must give a legend for every symbol, texture, or line type used. Please direct where the legend is on each page.
- [x] Scaled Site, Architectural, Landscaping, and Existing Conditions Plans also in these sizes: ledger (11" x 17") and letter (8½" x 11").

Clean Water Services File Number

15-002078

Clean Water Services

Sensitive Area Pre-Screening Site Assessment

1. Jurisdiction: ~~Washington County~~ TUALATIN

2. Property Information *(example 1S234AB01400)*

Tax lot ID(s): Tualatin
2S-1-22AD - 1300,1400, 1500

OR **Site Address:**

City, State, Zip:

Nearest Cross Street: SW corner of SW Leveton Dr. at SW 180th Ave.

3. Owner Information

Name: Jack Martin

Company: Leveton LLC

Address: 2351 NW Westover Rd., #406

City, State, Zip: Portland, OR 97210

Phone/Fax: 206-660-8483

E-Mail: jackmartinis@earthlink.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: Bob Wells

Company: Lance Mueller & Associates / Architects

Address: 130 Lakeside Ave. S., Suite 250

City, State, Zip: Seattle, WA 98122

Phone/Fax: 206-325-2552 x120

E-Mail: BWells@LMueller.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

We are beginning the approval process for two new commercial buildings in 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 Bob Wells **Print/Type Title** Associate

Signature Bob Wells **Date** 6/29/15

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 07-20, 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 2011-024 PLAT

Reviewed by Chuck Buckallew Date 6/30/15

Once complete, email to: **SPLReview@cleanwaterservices.org** • Fax: **(503) 681-4439**

OR mail to: SPL Review, Clean Water Services, 2550 SW Hillsboro Highway, Hillsboro, Oregon 97123

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING / PLANNING
610 SW Alder Street, Suite 700, Portland, OR 97205 P 503.228.5230 F 503.273.8169

October 8, 2015 Project #: 18697

Mr. Jack Martin
Martin Real Estate Development
3955 South Trail Drive
Jackson, WY 83001

RE: Traffic Review for Leveton Industrial Site Development - Tualatin, OR

Dear Mr. Martin,

This letter was prepared to summarize our transportation review of your firm's proposal to develop a 86,100 square foot industrial office building on the vacant property located on the southwest corner of the SW 108th Avenue/SW Leveton Drive intersection in Tualatin, Oregon. Specifically, this letter addresses the design layout and expected function of the two proposed full access driveways to SW 108th Avenue, as shown in the site plan provided in Attachment "A". Our assessment is based on a review of the site access and circulation patterns of the site plan, data collected during a March 4, 2015 field visit and review of the transportation policies of the Tualatin Development Code (TDC). The following sections present our findings followed by our conclusions and recommendations.

SITE TRIP GENERATION

A trip generation estimate was prepared for the proposed site development based on information provided in the standard reference manual, *Trip Generation, 9th Edition*, published by the Institute of Transportation Engineers. Based on the proposed development plan and considering the *Light Manufacturing (ML)* zoning of the property, ITE Code 130 (Industrial Park) was selected as the appropriate land use to estimate trips. Table 1 summarizes the daily and weekday a.m. and p.m. peak hour trips expected for the proposed development (daily trips have been rounded to the nearest ten).

Table 1 – Trip Generation Estimate

Land Use	ITE LU	Size (sf)	Weekday Daily Trips	Weekday AM Peak Hour Trips			Weekday PM Peak Hour Trips		
				Total	In	Out	Total	In	Out
Industrial Park	130	42,750	290	35	29	6	36	8	28

EXISTING ROADWAY CONDITIONS

Existing roadway facilities along the proposed site development frontages are described in Table 2 with an image of existing conditions along SW 108th Avenue displayed in Exhibit 1.

Table 2 - Existing Roadway Facilities

Roadway	Functional Classification[1]	Number of Lanes	Pavement Width (feet)	Posted Speed (mph)	Sidewalks	Bicycle Lanes	On-Street Parking
SW Leveton Drive	Minor Arterial	2 Lanes	40	40	Yes	Yes	No
SW 108th Avenue	Minor Arterial	2 Lanes	40	Not Posted	Yes	Yes	No

[1] Based on the City of Tualatin *February 2013 Transportation System Plan Update*

As shown in Table 2, the features of both site frontage roadways are similar, where SW Leveton Drive and SW 108th Avenue both have pavement widths of 40 feet that facilitate two lanes of travel and bicycle lanes, with supporting sidewalk facilities.

Exhibit 1: Existing Roadway Conditions – SW 108th Avenue (looking north)

As shown in Exhibit 1, the section of SW 108th Avenue adjacent to the proposed development consists of a long flat tangent section consisting of two travel lanes, one bicycle lane in each direction, and curb-tight sidewalks on both sides of the street.

North of the site, there is a crest vertical curve is approximately 1,000 feet north of the SW 108th Avenue/SW Leveton Drive intersection. This mild downhill grade transitions to the flat tangent section approximately 200 feet north of the intersection.

South of the site, at the signalized T-shaped intersection of SW 108th Avenue/SW Herman Road, the final 135 feet of the southbound approach of SW 108th Avenue consists of one right turn lane and one left turn lane, with one receiving lane in the northbound direction. There are no bicycle lanes on the final approach to this intersection.

Proceeding just north of the SW 108th Avenue/SW Herman Road signalized intersection, the roadway striping begins a transition back into a two-lane cross-section using a set of tapering double-yellow lines. At the location of the proposed southern site access, the median area between the double-yellow striping continues to narrow and at approximately 80 feet north of the access, the width of the double-yellow taper becomes fixed and striped bicycle lanes begin.

SITE ACCESS CONDITIONS

The proposed site development will be accessible from three external driveway locations, as shown in the proposed site plan in Attachment "A". Given the majority of site parking will be on the south and west sides of the proposed building structure, it is anticipated that the southern site driveway to SW 108th Avenue will be the most actively used access. The proposed northern driveway to SW 108th Avenue will help facilitate vehicle access to the parking spaces on the east side of the building as well as improve vehicle circulation for the site. The third site access will occur from an existing internal driveway connection to the adjacent industrial building to the northwest (3CM), where there is a driveway access to SW Leveton Drive.

Left-turn movements into the north site access from SW 108th Avenue northbound will occur from the through travel lane, as there is no dedicated turn lane for this movement. Similarly, drivers turning left into the south site access should also initiate turns from the through travel lane, as there is insufficient space to negotiate a turn within the area between the two sets of double-yellow striping. More importantly, use of this area as a queuing space for left-turn vehicles is not allowed by state law. A suggested alternative to create sufficient space would be to remove the bicycle lane striping on SW 108th Avenue from its current terminus at least 75 feet to the north. This would allow for proper left-turn lane striping to be developed in the median area.

STREET IMPROVEMENT AND DESIGN STANDARDS

City of Tualatin Development code outlines the following requirements for new developments adjacent to the public right-of-way.

TDC Section 74.420 (Street Improvements) states that when an applicant proposes to develop land adjacent to an existing or proposed street, 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 74.425 (Street Design Standards), and the City' s Public Works Construction Code.

TDC 74.425 (Street Design Standards) specifies street design standards and typical roadway cross section features such as right-of-way, number of travel lanes, bicycle and pedestrian facilities, and other amenities such as landscape strips. These design standards 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.

The following section of the TDC 74.430 (Streets, Modifications of Requirements in Cases of Unusual Conditions) states that 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.

Site Plan Compatibility with Street Standards

The site development plan does not propose frontage improvements for either SW Leveton Drive or SW 108th Avenue. For SW Leveton Drive, it would be impractical to widen the roadway further just to meet the City's Street Design Standard for this roadway. Public facilities are already provided along the site frontage including two vehicle travel lanes, bicycle lanes, and sidewalks separated from the street by planter strips. In addition, the proposed site development aims to utilize the existing parking area on the property and maintain the internal connection with the industrial building on the adjacent property to the west.

For SW 108th Avenue, no street frontage improvements are proposed because any street widening to meet the City's Street Design Standard would require the removal of six mature fir trees that line the site frontage within the public right-of-way, which would result in a negative impact on "a significant stand of trees". Also, the existing street cross section of SW 108th Avenue matches the character of other roads in the immediate area, consisting of two vehicle travel lanes, bicycle lanes, and curb-tight sidewalks.

ACCESS MANAGEMENT STANDARDS

Access Spacing

City of Tualatin Development Code Chapter 73.40 specifies that site accesses must be located 150 feet from any intersection of collector or arterial streets. As shown in the site plan, the proposed northern full access driveway to SW 108th Avenue is located approximately 205 feet south of the SW Leveton Drive intersection (centerline-to-centerline). This location coincides exactly with an existing driveway apron that appears to have been built in anticipation of future development of the subject property.

The proposed southern site access driveway to SW 108th Avenue is another 295 feet south of the north site driveway. This location is approximately 40 feet north of another existing driveway apron along SW 108th Avenue that also appears to have been built in anticipation of future development of the subject site. There are several other driveways 150 to 180 feet further south of the proposed southern site access that access separate industrial businesses and properties. In addition, the signalized SW 108th Avenue/SW Herman Road intersection lies 370 feet south of the proposed southern site access driveway location.

Based on the proposed site access scheme shown in the attached site plan, the City's access spacing requirements are satisfied.

Vision Clearance

City of Tualatin Development Code Chapter 73.16b specifies that a triangular vision clearance area must be maintained. A visualization of this code section is shown in Exhibit 2 below.

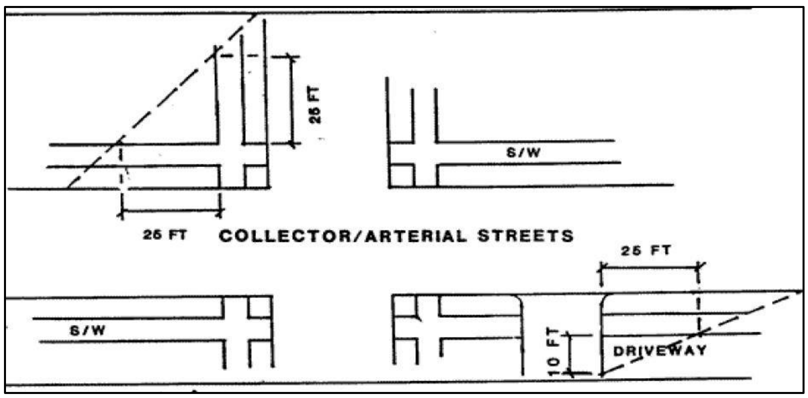
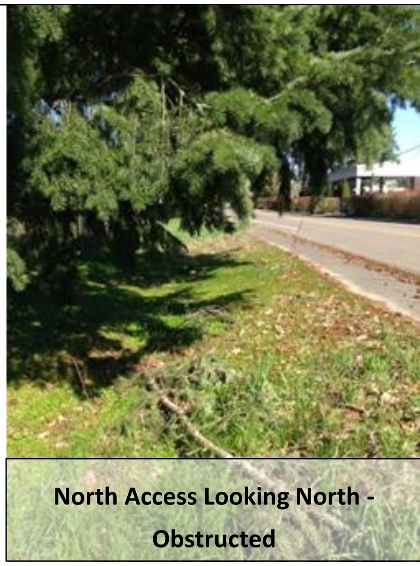
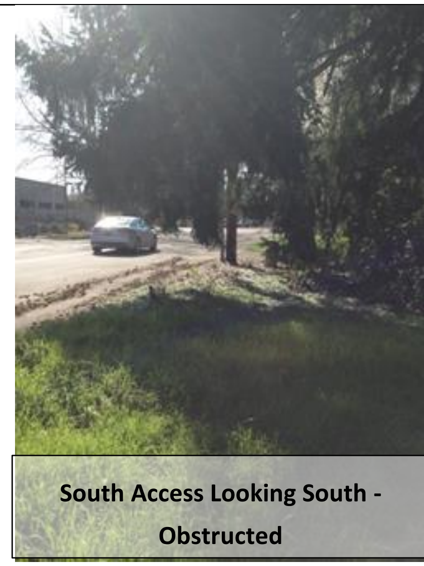


Exhibit 2: Vison Clearance Area (Figure 73-2 from Tualatin Development Code)

Based on a March, 4th 2015 field visit, vision clearances were observed to be limited at both the north and south site access driveway locations to SW 108th Avenue. The cause of the limitation is the overhanging limbs from the existing mature fir trees along the proposed site frontage. At the north driveway, this obstruction impedes drivers' sight lines looking north and at the proposed south access location sightlines are impeded for drivers looking south. Exhibit 3 displays the obstructing branches at each location. With the removal of the impeding limbs, sightlines will be restored to meet the vision clearance requirements of section 73.16(b).



North Access Looking North - Obstructed



South Access Looking South - Obstructed

Exhibit 3: Existing Obstructed Sightlines

Sight Distance

Sight distance was evaluated at both of the proposed site access locations along SW 108th Avenue during the same March, 4th 2015 field visit. Measurements were made from a driver vantage point 15 feet from the traveled way at an eye height of three and a half feet. While there is no posted speed limit on SW 108th Avenue, due to its similar cross section and adjacent land use to SW Leveton Drive, a design speed on 40 mph was used, consistent with the posted speed of that road.

Table 3 displays the results of the sight distance analysis using guidance outlined in the American Association of State Highway Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets*. As shown, with obstructing branches of the mature fir trees removed, adequate intersection sight distance can be achieved at each site driveway along SW 108th Avenue.

Table 3: Intersection Sight Distance Analysis Results

Access Location	Intersection Sight Distance Without Obstruction*	AASHTO Intersection Sight Distance Guideline
SW 108th Avenue – Proposed North Access	>445 feet (north & south directions)	445 feet
SW 108th Avenue – Proposed South Access	>445 feet (north)/ 315 feet (south)**	445 feet

*Measurements reflect removal of obstructing branches of mature fir trees near each site access.

**Sight distance to the south is 315 feet as this is the terminus of SW 108th Avenue at the signalized intersection with SW Herman Rd.

CONCLUSIONS AND RECOMMENDATIONS

Based on our review of the City of Tualatin's Development Code, existing site conditions, and the proposed site plan, the proposed site access driveways to SW 108th Avenue can achieve adequate sight distance and adequate vision clearances, and will comply with the City's access spacing standards. Left-turn movements into both site accesses from SW 108th Avenue can also be done in a safe manner. To achieve these conditions, we recommend the following actions:

- Prune overhanging branches adjacent to the proposed accesses to SW 108th Avenue to achieve adequate vision clearances and sight distances.
- Ensure regular maintenance of vegetation adjacent to the proposed site accesses to ensure vision clearance areas are maintained.
- Remove up to 75 feet of bicycle lane striping along the southern portion of the SW 108th Avenue site frontage to develop a center left-turn lane refuge in the median area for the south site access driveway.

If any additional information is needed to process this request, please call us at (503) 228-5230.

Sincerely,
KITTELSON & ASSOCIATES, INC.

Brian J. Dunn
Associate Engineer

LANCE MUELLER & ASSOCIATES
ARCHITECTS • AIA

Job: Leveton	September 2015

SW Leveton Drive at SW 180th Avenue
Tualatin, OR

Architectural Review Narrative:

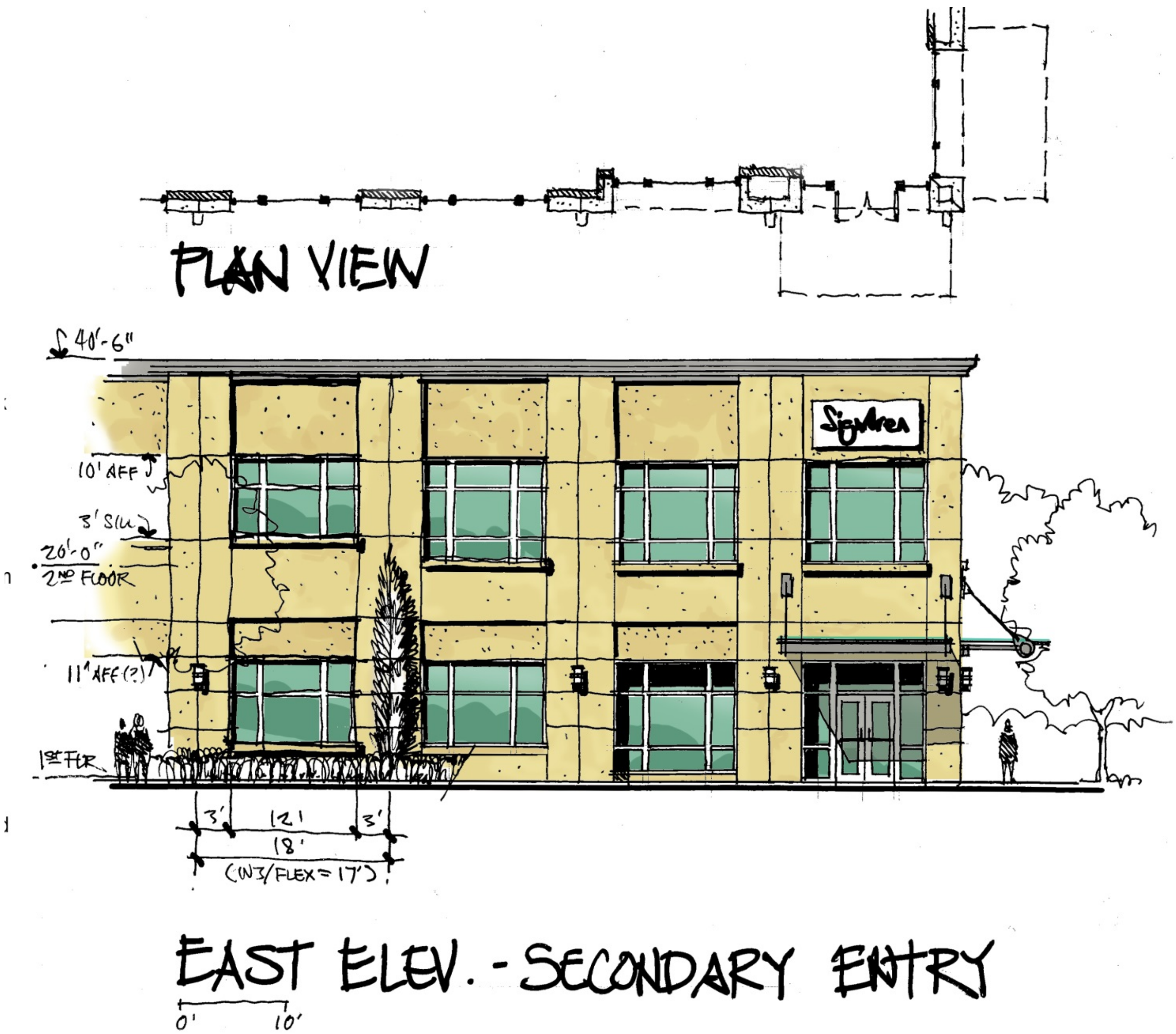
Leveton is two new two-story building "shells" intended for the high-tech market on undeveloped land in Leveton Business Park. Projected mixed uses include office, light manufacturing, and storage. Uses proposed meet current MG (General Manufacturing) zoning. Interior tenant improvements are required for the buildings to be occupied, but the exterior will be complete with utilities, parking, sidewalks, exterior lighting, and landscaping finished and ready for move-in.

The buildings are known as North Wing and South Wing, and both are two story concrete and steel structures to serve the high-tech industry. They can be occupied by separate tenants or connected on both floors for a single tenant. The building shells are sized and designed to be quality lease space with built-in flexibility to serve this industry long term. Functionally they have large capacity floor loading on the first and second floors (125psf), high clearance between floors (20' floor height at 2nd floor), extensive glass for natural light, screened service areas with truck docks and on-grade truck doors, and appropriate parking ratios. The preference is for a single high-tech tenant, but there are secondary entries to serve other tenants for flexible leasing options over time.

This 2009 example in Wilsonville is a high-tech building with similar materials, scale, and rustication as proposed at Leveton by the same development team. A visit to this building would define the aesthetic essence of the Leveton proposal. DW Fritz Precision Automation is at 27200 SW Parkway Ave., Wilsonville, OR 97070.

As the picture suggests the building exteriors are simple palettes of rusticated stained concrete, green tint high performance glazing, neutral colors for the exterior metal, and cast aluminum exterior lighting fixtures of a scale and quality appropriate for the better class-A office buildings. The site is complete with landscaped parking areas, logically located pedestrian paths, and high quality LED exterior lighting fixtures. Compared to a typical market rate development, ours will be more extensive and of a larger scale when installed. If you visit the DW Fritz building pictured you will notice the concrete walls are unusually substantial (11.25" thick) with the windows set at the back for strong shadow lines at openings, as also proposed at Leveton. The stained concrete will have deep reveals and inset transom panels reducing the scale with shadow lines and variation in thickness. All metal is painted or prefinished in medium bronze, and the storefront is painted in light metallic bronze. In short this has a simple neutral warm palette of materials that patina well over time.

A portion of the proposed building is shown in the prelim drawing below:



Section 7.040 Manufacturing Planning District Objectives.
(2) Light Manufacturing Planning District (ML).
(a) Suitable for warehousing, wholesaling and light manufacturing processes that are not hazardous and that do not create undue amounts of noise, dust, odor, vibration, or smoke. Acknowledge, this seems to describe our anticipated High-Tech uses. We anticipate no retail and there is no rail service here.
(b) The following uses within the Light Manufacturing District shall comply with the following size limits established by Metro. Retail sale, retail service and professional service uses shall be no greater than 5,000 square feet of sales or service area per outlet, or not greater than 20,000 square feet of sales or service area for multiple outlets in a single building or in multiple buildings that are part of tlhe same development project, with the following exceptions. We do not anticipate any of these uses.
(i) Application of the Industrial Business Park Overlay District (TDC Chapter 69). NA -we are not in this overlay.
(ii) The retail sale of products manufactured, assembled, packaged or wholesaled on the site is allowed provided the retail sale area, including the showroom area, is no more than 5% of the gross floor area of the building not to exceed 1,500 square feet. Acknowledge.
(iii) Within the Special Commercial Setback from arterial streets (TDC 60.035) the retail sale of home improvement materials and supplies is allowed provided it is not greater than 60,000 square feet of gross floor area per building or business and subject to the Special Commercial Setback from arterial streets as generally illustrated in Map 9-5 and specifically set forth in TDC 60.035. NA - we are not in this overlay.
(c) The purpose of this district is to provide sites for manufacturing uses that are more compatible with adjacent commercial and residential uses and would serve to buffer heavy manufacturing uses. Acknowledge.
(d) In accordance with the Industrial Business Park Overlay District, TDC Chapter 69, selected office and retail uses are allowed to provide services to businesses and employees. The purpose is also to allow certain commercial service uses in the Commercial Services Overlay shown in the specific areas illustrated on Map 9-5 and selected commercial uses subject to distance restrictions from residential areas and subject to the Special Commercial Setback from arterial streets as generally illustrated in Map 9-5 and specifically set forth in TDC 60.035. NA - we are not in this overlay.

TDC Chapter 60: Light Manufacturing Planning District (ML)
Section 60.010 Purpose The purpose of this district is to provide areas of the City that are suitable for industrial uses and compatible with adjacent commercial and residential uses. The district serves to buffer heavy manufacturing uses from commercial and residential areas. The district 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 district is also suitable for retail sale of products manufactured, assembled, packaged or wholesaled on the site provided the retail sale area, including the showroom area, is no more than 5% of the gross floor area of the building not to exceed 1,500 square feet and, with appropriate restrictions, for retail sale of products not allowed for sale in General Commercial Planning Districts, and office commercial uses where any portion of a legally created lot is within 60 feet of a CO Planning District boundary. Our listed anticipated uses for this building "shell" comply with the purpose of this zone.
The purpose is also to allow certain commercial service uses in the Commercial Services Overlay shown in the specific areas illustrated on Map 9-5 and selected commercial uses subject to distance restrictions from residential areas and subject to the Special Commercial Setback from arterial streets as generally illustrated in Map 9-5 and specifically set forth in TDC 60.035. Commercial services uses are not anticipated, and for the record we are outside Map 9-5.

Section 60.060 Lot Size. Except for lots for public utility facilities, natural gas pumping stations and a wireless communication facility which shall be established through the Subdivision, Partition or Lot Line Adjustment process, the following requirements shall apply:

> *(1) The minimum lot area shall be 20,000 square feet.* We comply.
> *(2) The minimum average lot width shall be 100 feet.* We comply.
> *(3) The minimum lot width at the street shall be 100 feet.* We comply.

Section 60.070 Setback Requirements.

> *(1) Front yard. The minimum setback is 30 feet. When the front yard is across the street from a residential or Manufacturing Park (MP) district, a front yard setback of 50 feet is required. When a fish and wildlife habitat area is placed in a Tract and dedicated to the City at the City's option, dedicated in a manner approved by the City to a non-profit conservation organization or is retained in private ownership by the developer, the minimum setback is 10 – 30*

feet, as determined in the Architectural Review process, with the exception of front yards across the street from a residential or MP District, provided the buildings are located farther away from fish and wildlife habitat areas. Our setbacks are much greater than the minimum.

(2) Side yard. The minimum setback is 0 to 50 feet, as determined in the Architectural Review process. When the side yard is adjacent to a property line or across the street from a residential or Manufacturing Park (MP) district, a side yard setback of 50 feet is required. Our setbacks are much greater than the minimum.

(3) Rear yard. The minimum setback is 0 to 50 feet, as determined in the Architectural Review process. When the rear yard is adjacent to a property line or across the street from a residential or Manufacturing Park (MP) district, a rear yard setback of 50 feet is required. Our setbacks are much greater than the minimum.

(4) Corner lot yards. The minimum setback is the maximum setback prescribed for each yard for a sufficient distance from the street intersections and driveways to provide adequate sight distance for vehicular and pedestrian traffic at intersections and driveways, as determined in the Architectural Review process. Acknowledge, we meet the standard.

(5) The minimum parking and circulation area setback is 5 feet, except when a yard is adjacent to public streets or residential or Manufacturing Park District, the minimum setback is 10 feet. We are generous with landscaping and greatly exceed the setback in all areas, except the 10' minimum at ROWs. With generous planting proposed in the ROW on Leveton and 108th (that is greater than 10'),we are choosing to place the parking at the lot line so can add to the already generous planting surrounding the building. This allows a more campus aesthetic for the project similar to the picture on page one. The owner discussed this with Planning and received informal support before we finalized the drawings.

(8) No fence shall be constructed within 10 feet of a public right-of-way. No fences proposed.

Section 60.090 Structure Height.

(1) Except as provided in TDC 60.090(2), (3) or (4), no structure shall exceed a height of 50 feet and flagpoles which display the flag of the United States of America either alone or with the State of Oregon flag shall not exceed 100 feet above grade provided that the setbacks are not less than a distance equal to one and one-half times the flagpole height. Acknowledge, we meet the standard.

(2) The maximum permitted structure height provided in TDC 60.090(1) may be increased to no more than 85 feet, provided that all yards adjacent to the structure are not less than a distance equal to one and one-half times the height of the structure. Not required.

TDC Chapter 73: Community Design Standards

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; Acknowledge this overall requirement, and yes we meet code.

(b) The proposed design of the development is compatible with the design of other developments in the general vicinity; and Acknowledge this overall requirement, and yes we are compatible. We are also a dramatic aesthetic upgrade.

(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. Yes.

(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. Acknowledge.

(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. We are removing no existing trees.

(5) Conflicting Standards. In addition to the MUCOD requirements, the requirements in TDC Chapter 73 (Community Design Standards) and other applicable Chapters apply. If TDC Chapters 57, 73 and other applicable Chapters, conflict or are different, they shall be resolved in accordance with TDC 57.200(2). [Ord. 637-84, §5, 6/11/84; Ord. 725-87, §2, 6/22/87; Ord.

743-88, §33, 3/28/88; Ord. 862-92, §51, 3/23/1992; Ord. 864-92, §14, 4/13/82; Ord. 963-96, §5, 6/24/96; Ord. 1025-99, §32, 7/26/99; Ord. 1062.00, §22, 12/11/00; Ord. 1062-00, 1/3/01; Ord. 1227-07 §12, 2/12/07] **Acknowledge.**

Section 73.150 Design Standard 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 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. Accomplished, see site plan.

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

(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. Accomplished, see landscape plan.

(6) Provide vehicular connections to adjoining sites. Accomplished, we propose to maintain the existing drive connection to the adjacent site, see site plan.

(7) Emphasize entry drives into commercial complexes and industrial park developments with special design features, such as landscaped medians, water features and sculptures. Our entry drives off SW 108th are located between large 3' and 4' diameter existing fir trees in the ROW, and these sentinels framing our entries are excellent special design features.

(8) Locate, within parking lots, pedestrian amenities and/or landscaping in areas which are not used for vehicle maneuvering and parking. Accomplished, see landscape plan.

(9) 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. (10) Create opportunities for, or areas of, visual and aesthetic interest for occupants and visitors to the site. We provide two pedestrian plazas at our building entries planned to receive these features in final design. We also provide a pocket park at the south edge of our site that will include a basketball court and other amenities to be determined.

(11) Conserve, protect and restore fish and wildlife habitat areas, and maintain or create visual and physical corridors to adjacent fish and wildlife habitat areas. Extensive landscape areas are created providing wildlife habitat.

(12) Provide safe pathways for pedestrians to move from parking areas to building entrances. Accomplished, see site plan.

(13) 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. Accomplished, our two buildings can connect on the first and second floor and they share a service dock, see site and floor plans.

(17) Provide preferential parking for carpool and vanpools to encourage employees to participate in carpools and vanpools. This will be accomplished at tenant improvement approvals with the tenant on board, currently this is a non-occupied building "shell". The important thing here is ample parking well distributed.

(18) Screen elements such as mechanical and electrical equipment, above ground sewer or water pump stations, pressure reading stations and water reservoirs from view. We are providing Electrical and Sprinkler Riser room space so much of this equipment is inside the buildings. M and E on-site equipment will be screened by landscaping. There is no roof mounted HVAC equipment in this "shell" but we accommodate the future TI roof equipment in the roof structure near the building centers where it is easiest to screen if needed.

Section 73.160 Design 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:

(i) a walkway shall be provided between the main entrance to the building and any abutting public right-of-way of an arterial or collector street where a transit stop is designated or provided. The walkway shall be a minimum of 6 feet wide and shall be 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; Accomplished, including ADA compliance - see site plan.
(iii) walkways through parking areas, drive aisles, and loading areas shall be visibly raised and of a different appearance than the adjacent paved vehicular areas; Accomplished, see site plan.
(v) fences or gates which prevent pedestrian and bike access shall not be allowed at the entrance to or exit from any accessway. No fencing is planned, see site plan.
(vii) 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. Accomplished, see site plan.
(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. ADA access is anticipated in this design, see site plan.

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. This is a flat grassy site providing us flexibility in layout, but we have located our access drives between existing trees.
(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. We believe we have accomplished these objectives in our design with a distinctive sense of place enhanced by a limited palette of timeless materials such as semi-transparent stained concrete, generous green tint glass, and strong metal cornice and canopy elements.
(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. Our service dock is inward and well screened by the buildings from public ROW. The buildings are further softened in the service area by climbing plant material on the stained concrete walls. Our goal is a very soft and green service area that is also functional.
(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. Our 11.25" concrete walls provide a thermal mass for energy efficiency as well as aesthetics. Our glass height is tall on both floors (11.5' at 1st floor and 10' at second) to bring natural light deep into the buildings.
(5) Locate and design entries and loading/service areas in consideration of climatic conditions such as prevailing winds, sun and driving rains. All portals have generous canopies for functional and aesthetic reasons.
(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. Accomplished, see drawings.
(7) Select building materials which contribute to the project's identity, form and function, as well as to the surrounding environment. Our limited palette is concrete steel and glass, and the image on the first page of this narrative is the general aesthetic we propose. It is well received by our high-tech tenants as well as their employees.
(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). We seek neutral colors in our concrete stain that go well with our green-tint glass and darker steel elements.
(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. Accomplished, see drawings.
(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. Accomplished, see drawings.

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. We propose conventional lighting fixtures with glare cut-off features limiting the light at ROWs, and we have good lighting distribution in the circulations areas.

(b) Provide an identification system which clearly identifies and locates buildings and their entries. Signing is as TI when the tenant is known, but the architectural language makes entries a natural focal point in this design.

(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. Acknowledge. We will trim the existing fir trees to the 8' limit with City permission.

Section 73.225 Mixed Solid Waste and Source Separated Recyclables 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:

(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. Our solid waste/recyclable storage areas are shown in the rear service areas on our site plan and they are thoughtfully placed to be functional and not visible to the public. Our calculations are on the site plan showing how we comply.

LANDSCAPING

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, except within the Core Area Parking District, where the minimum area requirement for landscaping shall be 10 percent. When a dedication is granted in accordance with the planning district provisions on the subject property for a fish and wildlife habitat area, the minimum area requirement for landscaping may be reduced by 2.5 percent from the minimum area requirement as determined through the AR process. We significantly exceed the 15% minimum landscaping area requirement, see site plan notes.

(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.). Acknowledge.

(13) Landscape plans for required landscaped areas that include fences should carefully integrate any fencing into the plan to guide wild animals toward animal crossings under, over, or around transportation corridors. No fencing proposed.

Section 73.290 Re-vegetation in Un-landscaped Areas. The purpose of this section is to ensure erosion protection, and in appropriate areas to encourage soil amendment, for those areas not included within the landscape percentage requirements so native plants will be established, and trees will not be lost.

(1) Where vegetation has been removed or damaged in areas not affected by the landscaping requirements and that are not to be occupied by structures or other improvements, vegetation shall be replanted. Acknowledge. Our proposal fully landscapes our site, which is currently in natural grass.

(2) Plant materials shall be watered at intervals sufficient to ensure survival and growth for a minimum of two growing seasons. Acknowledge.

(3) The use of native plant materials is encouraged to reduce irrigation and maintenance demands. Acknowledge.

(4) Disturbed soils should be amended to an original or higher level of porosity to regain infiltration and stormwater storage capacity. [Ord. 1224-06 §27, 11/13/06] Acknowledge.

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. We greatly exceed the minimum 5' landscape requirement on all building sides, except at the fire access lane on the east side of the North Wing where it is 3.5' (this is not viewable from public roads). Here we move the fire lane closer to the building to allow more landscape area (17' setback of dense planting) at the lot line to better screen the adjacent Tofle Building.
(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. We have not included our plazas with pedestrian amenities as landscape area already significantly exceeds the minimum requirement.
(3) All areas not occupied by buildings, parking spaces, driveways, drive aisles, pedestrian areas or undisturbed natural areas shall be landscaped. Accomplished, see landscape plan.

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. Accomplished, see site plan.
(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). The project greatly exceeds landscaping minimums at the owner's request, and will present itself as a heavily landscaped suburban campus from public roads. For example, in front of South Wing there is over 40' of landscaping from our parking curb to the street curb, and in addition there is another 40' of landscaping from parking curb to the building.

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 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. Accomplished, see landscape plan.
(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). Accomplished, see site plan.
(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). Accomplished, see landscape plan.
(4) Landscape islands shall be utilized at aisle ends to protect parked vehicles from moving vehicles and emphasize vehicular circulation patterns. Accomplished, see landscape plan.
(5) Required plant material in landscape islands shall achieve 90 percent coverage within three years. Native shrubs and trees are encouraged. Acknowledge. The owner is personally involved in plant selection at the nurseries on his projects, and he generally exceeds code minimum size. See the first picture in this narrative, which is an example of a similar building by the owner one year after completion.
(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. Acknowledge. Our ROW curb to interior curb landscape depth extends 60'±, which well exceeds minimum.

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 case of conflicts between guidelines or objectives in TDC Chapter 73, the proposal shall provide a balance. This project cannot be occupied without a tenant improvement permit. We propose that off-street vanpool and carpool parking spaces be established with the tenant at that time.

(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. Acknowledge.

(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. Acknowledge, see our project statistics on the site plan.

(ii) The total number of parking spaces meets the standards for the sum of the number of spaces which would be separately required for each use. Acknowledge, see our project statistics on the site plan.

(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. Accomplished, see site plan.

(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. Accomplished, see site plan.

(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. Accomplished, see site plan.

(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. Accomplished, see site plan.

(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. Acknowledge there is no cost for bike parking. The owner would like to advise Planning that in his experience the bike riders using his buildings tend towards expensive bikes that they store inside near their desks.

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

(2) Off-Street Parking Provisions.

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. Accomplished, see site plan.

(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. Acknowledge, and you can see from our calculations we are near the max for compacts allowed because cars are getting smaller.

(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. Acknowledge this rigid requirement.

(6) Artificial lighting, which may be provided, 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. Acknowledge.

(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. Accomplished, see site plan.
(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. Accomplished, see site plan.
(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. Accomplished, see site plan.

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
5,000 - 25,000 1
25,000 - 60,000 2
60,000 and over 3 To best fit our high-tech tenant's needs, we propose two (2) shared full size loading berths and two (2) smaller on-grade van berths. The owner has learned over time this building type uses the smaller van service doors much more frequently than the 12' x 60' loading berths. We also provide built-in flexibility in our architecture to easily add more on-grade van service doors in existing glass openings if needed. Flexibility to adapt is key in this design, and for aesthetics we infill our van service doors openings with glass/aluminum doors.

(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'. We provide three (2) - 12' x 25' on-grade drive-in service doors, with the ability to add more relatively easily if needed.
(b) Industrial uses - 12' x 60' We are designing to 12' x 60' loading berths on our (2) shared 4' docks.
(c) Berths shall have an unobstructed height of 14' Accomplished.
(d) Loading berths shall not use the public right-of-way as part of the required off-street loading area. Accomplished, the service area is well screened by buildings in the rear area away from Public ROWs.
(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. Accomplished, we are screened from the public roads by buildings, including the neighbors building.

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

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. Acknowledge.
(2) Owners of two or more uses, structures, or parcels of land may agree to utilize jointly the same ingress and egress when the combined ingress and egress of both uses, structures, or parcels of land satisfies their combined requirements as designated in this code; provided that satisfactory legal evidence is presented to the City Attorney in the form of deeds, easements, leases or contracts to establish joint use. Copies of said deeds, easements, leases or contracts shall be placed on permanent file with the City Recorder. Acknowledge.

(3) Joint and Cross Access.

(a) Adjacent commercial uses may be required to provide cross access drive and pedestrian access to allow circulation between sites. Acknowledge, we propose to continue with the existing easement with Tofle.

(14) Maximum Driveway Widths and Other Requirements.

(a) Unless otherwise provided in this chapter, maximum driveway widths shall not exceed 40 feet. We easily meet this requirement, see site plan.

(b) Except for townhouse lots, no driveways shall be constructed within 5 feet of an adjacent property line, except when two adjacent property owners elect to provide joint access to their respective properties, as provided by Subsection (2). We meet this requirement.

(c) There shall be a minimum distance of 40 feet between any two adjacent driveways on a single property unless a lesser distance is approved by the City Engineer. We meet this requirement.

(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.

(b) At the intersection of two local streets, driveways shall be located a minimum of 30 feet from the intersection. We easily meet this requirement, see site plan.

(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 73-2 for illustration). Acknowledge.

(b) Collector Streets - A vision clearance area for all collector/arterial street intersections, collector/arterial street and local street intersections, and collector/arterial street 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 25 feet from the intersection point of the right-of-way lines, as measured along such lines. Where a driveway intersects with a collector/arterial street, the distance measured along the driveway line for the triangular area shall be 10 feet (see Figure 73-2 for illustration). Acknowledge.

(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). Acknowledge.

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. Acknowledge, see landscape plan.

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. We are in Zone 2 per Street Tree Map 74-1, see landscape plan.

GENERAL COMMENTS:

1. Site Configuration/Parking: The buildings are placed so they work well as a single or two tenants. If two tenants they share the entry canopy with two plazas and covered service docks. If a single tenant they have the option to get a permit to relatively inexpensively enclose the entry canopy and 2nd floor bridge so the two wings are connected on both floors. Parking surrounds the buildings and is double loaded for efficiency. Service is hidden from the public streets in back screened by the buildings. Pedestrian routes to entry portals are logical and defined in concrete, and separated from vehicles.

    2. Landscaping: Landscape area is generous as the number show, and for a quick visual sense look at the photo on page 1 is an example the quality and quantity proposed. Also compare the extent of our landscaping areas with our

NW neighbor the Tofle building on our plan. We propose significantly more landscaping areas than our adjacent neighbors:

a. Frontage landscaping is unusually generous, largely because of the significant ROW setbacks from curb to add planting. We integrate our entry drives between the five large existing fir trees, and at these big firs planting is more natural in native varieties. The hornbeam street trees are lineally configured per code, and on SW 108th we have taken advantage of the width to install double rows of street trees.
b. Perimeter landscaping is typically double rows of trees in wide setbacks to screen our project from the neighbors. We also have added a private pocket park at the south lot line for our employees. We know the park will include a basketball court. We haven't determined yet if the balance of the park will be for passive activities or more active with a fitness station circuit.
c. Building landscaping is particularly generous at SW 108th and generous elsewhere. Planting is a mix of various groundcovers, shrubs, and trees. Columnar tree forms are integrated in a rhythm at the building face.

3. Entry Plazas and Entry Canopy: These are key design elements for the entry progression that are place-markers until final design is resolved. The owner's intent is high design here, with better plazas than shown on the picture on page 1 of this narrative.

4. Exterior Lighting: We will use LED lamps in cast aluminum housings that are of high quality and appropriate for their placement. All fixtures have glare cut-off features built in. The photo on page 1 is an example the quality of the exterior lighting proposed, which include building sconce lights, bollard fixtures, pedestrian scale pole fixtures and parking lot pole lighting. Or better yet, visit the building on the first page and see the quality of the lighting fixtures and how they enhance the building even in daylight.

5. Screening of unsightly things:
    a. There is no roof equipment in this building shell, but the structure is designed to accommodate the required roof units during the TI permit process. These HVAC units are located centrally, and from a line-of-sight study they are not quite visible from the SW 108th curb because view is blocked by the building. We assume 12' HVAC units with curb, and this is our prelim finding only.
    b. Some site utilities, like fire hydrants, must remain visible and accessible for life-safety reasons, and we will follow code in those cases. Other utilities can be screened, and our plan is to employ thoughtful placement then planting to make them less visible.
    c. Dumpster/Recycle enclosures are proposed to be placed in the service area. They will be surrounded by concrete walls with doors as visual screens and then planting to soften the appearance.

AR-15-0028

To lessen the bulk of the notice of application and to address privacy concerns, this sheet substitutes for the photocopy of the mailing labels. A copy is available upon request.

NEIGHBORHOOD/DEVELOPER MEETING
AFFIDAVIT OF MAILING

STATE OF ~~OREGON~~ WASHINGTON)
) SS
COUNTY OF ~~WASHINGTON~~ KING)

I, JACK MARTIN, being first duly sworn, depose and say:

That on the 23rd day of September, 2015, I served upon the persons shown on Exhibit "A," attached hereto and by this reference incorporated herein, a copy of the Notice of Neighborhood/Developer meeting marked Exhibit "B," attached hereto and by this reference incorporated herein, by mailing to them a true and correct copy of the original hereof. I further certify that the addresses shown on said Exhibit "A" are their regular addresses as determined from the books and records of the Washington County and/or Clackamas County Departments of Assessment and Taxation Tax Rolls, and that said envelopes were placed in the United States Mail with postage fully prepared thereon.

Signature

SUBSCRIBED AND SWORN to before me this 1ST day of October, 2015.

MOLLY M BULLOCH
COMMISSION EXPIRES
NOTARY PUBLIC
05-13-17
STATE OF WASHINGTON

Molly M. Bulloch
Notary Public for ~~Oregon~~ Washington
My commission expires: May 13, 2017

RE: ______

Exhibit A

Molly Bulloch

From: Molly Bulloch <mollymbulloch@gmail.com>
Sent: Wednesday, September 23, 2015 3:05 PM
To: 'Lynette Sanford'; gkirby@ci.tualatin.or.us
Cc: jan.giunta@gmail.com; atasaedi@hotmail.com; cphill9@comcast.net; rmheide@comcast.net; charlie5915@hotmail.com; sander5389@comcast.net; doug_ulmer@comcast.net; stefan@feuerherdtlaw.com; tmpgarden@comcast.net; jrpride@frontier.com; roy@rueckco.com; lloop@klcorp.com; robertekellogg@yahoo.com; erik@johannesfamily.com; rfco@earthlink.com; jmakarowsky@comcast.net; edkcnw@comcast.net; willie.fisher@gmail.com; s.caporale@comcast.net; mwestenhaver@hotmail.com; kzlateff@comcast.net; tualatincommercialcio@gmail.com; Gannett@oregonrn.org; scottm@capacitycommercial.com; famtunstall1@frontier.com
Subject: Neighborhood/Developer Meeting
Attachments: LEVETON LLC NEIGHBORHOOD MEETING NOTICE.docx

To the Community Development Director and the City Engineer,

Attached please find notice of a Neighborhood/Developer meeting for the Leveton Project located at SW 108th Avenue at SW Leveton Drive. The proposed project is to build two new buildings to serve high-tech tenants at undeveloped property.

The meeting will be held on October 14, 2015 at 5:00 pm at 20185 SW 108th Avenue, Tualatin.

Thank you.

On behalf of Jack Martin,
Molly Bulloch
Bulloch Management, Inc.
P.O. Box 15523
Seattle, WA 98115
Phone: 206-605-8533
Fax: 206-729-7795
mollymbulloch@gmail.com

Exhibit B

LEVETON LLC
P.O. BOX 15523
SEATTLE, WA 98115

September 23, 2015

RE: Leveton Development
SW 108th Avenue at SW Leveton Drive

Dear Property Owner:

You are cordially invited to attend a meeting on October 14, 2015 at 5:00 pm to be held at 20185 SW 112th Avenue, Tualatin, OR. This meeting shall be held to discuss a proposed project located at SW 108th Avenue at SW Leveton Drive in Tualatin. This proposal is to build two new buildings to serve high-tech tenants at undeveloped property.

The purpose of this meeting is to provide a means for the applicant and surrounding property owners to meet and discuss this proposal and identify any issues regarding this proposal.

Regards,

Jack Martin
Leveton LLC
c/o Molly Bulloch
206-605-8533
mollymbulloch@gmail.com

NEIGHBORHOOD / DEVELOPER MEETING
CERTIFICATION OF SIGN POSTING

NOTICE

NEIGHBORHOOD / DEVELOPER MEETING

__/__/2010 _:__ _.m.

_____ SW _______________

503-___-____

18"

24"

In addition to the requirements of TDC 31.064(2) quoted earlier in the packet, the 18" x 24" sign that the applicant provides must display the meeting date, time, and address and a contact phone number. The block around the word "NOTICE" must remain **orange** composed of the **RGB color values Red 254, Green 127, 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 >.

As the applicant for the

LEVETON project, I

hereby certify that on this day, (October 1, 2015) 1 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: JACK MARTIN
(PLEASE PRINT)

Applicant's Signature:

Date: 10/1/15

NOTICE

NEIGHBORHOOD/ DEVELOPER MEETING

10/14/2015 5:00p.m.

20185 SW 112th AVE, TUALATIN

206-605-8533

LEVETON LLC
P.O. BOX 15523
SEATTLE, WA 98115

September 23, 2015

RE: Leveton Development
SW 108th Avenue at SW Leveton Drive

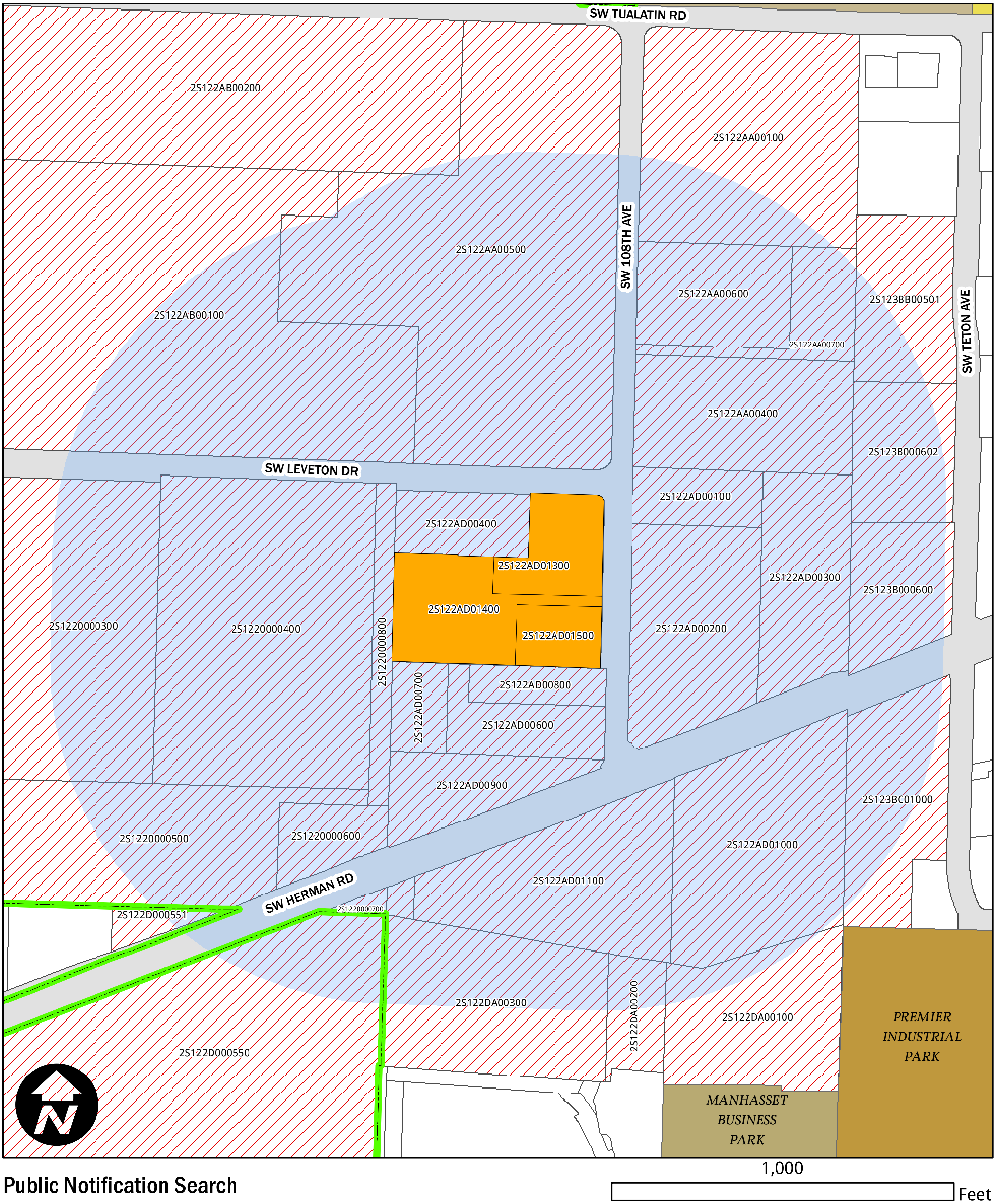
Dear Property Owner:

You are cordially invited to attend a meeting on October 14, 2015 at 5:00 pm to be held at 20185 SW 112th Avenue, Tualatin, OR. This meeting shall be held to discuss a proposed project located at SW 108th Avenue at SW Leveton Drive in Tualatin. This proposal is to build two new buildings to serve high-tech tenants at undeveloped property.

The purpose of this meeting is to provide a means for the applicant and surrounding property owners to meet and discuss this proposal and identify any issues regarding this proposal.

Regards,

Jack Martin
Leveton LLC
c/o Molly Bulloch
206-605-8533
mollymbulloch@gmail.com



Public Notification Search

Subject

Radius

Notification

City limits

Plats

MANHASSET BUSINESS PARK

MARICOPA

PREMIER INDUSTRIAL PARK

SKOOKUM MEADOWS

WINCHESTER ESTATES

Prepared by: Fidelity National Title
Data: CoreLogic, Metro RLIS
Date: 7/2/2015
This information is reliable, but not guaranteed. It is not a survey.

Fidelity National Financial, Inc.
Customer Service
900 SW 5th Ave, Mezzanine
Portland, OR 97204
tel: 503-796-6663 fax: 503-796-6631
csrequest@fnf.com

Thursday, July 02, 2015

The enclosed radius search was created using data purchased from Core Logic, City of Tualatin, and Metro RLIS. This data is derived from county tax records and is deemed reliable, but is not guaranteed. Fidelity National Title cannot be held liable for any additions, deletions, or errors in this search.

This research was completed on the date stated above.

Thank you.

Enclosures:

- Data summary of parcels to be notified
- Map of subject parcel, radius, and parcels to be notified
- County assessor maps for parcels to be notified
- Labels

 # 1 --------------------------------: **Fidelity National Title Company Of Oregon / Washington (OR)**------------------------------------

Parcel #	: R2176128	Ref Parcel#	: 2S122AD 01300
Owner	: **Leveton LLC**	Document #	: 36518 Multi-Parcel
Site	: *no Site Address* Tualatin 97062	Sale Date	: 06/18/2014
Mail	: PO Box 15523 Seattle Wa 98115	Price	: $1,400,000
Use	: 3000 Vacant,Industrial	Market Total	: $428,300
Improvement	:	Market Land	: $428,300
Legal	: 2011-024 Partition Plat, Lot 1,	Market Imps	:
	: ACRES 1.71	14-15 Taxes	: $6,337.64
	:	M-5 Rate	: 16.2230
	:	Bldg # Of	
Map Grid	:	Phone #	:

Bedrooms: Baths: Year Built: BldgSF: LotSqFt: 74,488 Acres: 1.71

 # 2 --------------------------------: **Fidelity National Title Company Of Oregon / Washington (OR)**------------------------------------

Parcel #	: R2176129	Ref Parcel#	: 2S122AD 01400
Owner	: **Leveton LLC**	Document #	: 36518 Multi-Parcel
Site	: *no Site Address* Tualatin 97062	Sale Date	: 06/18/2014
Mail	: PO Box 15523 Seattle Wa 98115	Price	: $1,400,000
Use	: 3000 Vacant,Industrial	Market Total	: $592,860
Improvement	:	Market Land	: $592,860
Legal	: 2011-024 Partition Plat, Lot 2,	Market Imps	:
	: ACRES 2.63	14-15 Taxes	: $8,772.67
	:	M-5 Rate	: 16.2230
	:	Bldg # Of	
Map Grid	:	Phone #	:

Bedrooms: Baths: Year Built: BldgSF: LotSqFt: 114,563 Acres: 2.63

 # 3 --------------------------------: **Fidelity National Title Company Of Oregon / Washington (OR)**------------------------------------

Parcel #	: R2176130	Ref Parcel#	: 2S122AD 01500
Owner	: **Leveton LLC**	Document #	: 36518 Multi-Parcel
Site	: *no Site Address* Tualatin 97062	Sale Date	: 06/18/2014
Mail	: PO Box 15523 Seattle Wa 98115	Price	: $1,400,000
Use	: 3000 Vacant,Industrial	Market Total	: $252,970
Improvement	:	Market Land	: $252,970
Legal	: 2011-024 Partition Plat, Lot 3,	Market Imps	:
	: ACRES 1.01	14-15 Taxes	: $3,743.27
	:	M-5 Rate	: 16.2230
	:	Bldg # Of	
Map Grid	:	Phone #	:

Bedrooms: Baths: Year Built: BldgSF: LotSqFt: 43,996 Acres: 1.01

Item 7

After recording return to:
Leveton LLC
c/o Bulloch Management
PO Box ~~1523~~ 15523
Seattle, WA 98115

Until a change is requested all tax statements shall be sent to the following address:
Leveton LLC
c/o Bulloch Management
PO Box ~~1523~~ 15523
Seattle, WA 98115

File No.: NCS-657116-OR1 (ch)

THIS SPACE RESERVED FOR RECORDER'S USE

READ AND APPROVED AS TO CONTENT AND FORM:

STATUTORY SPECIAL WARRANTY DEED

SFP Leveton LLC, an Oregon limited liability company, Grantor, conveys and specially warrants to **Leveton LLC, an Oregon limited liability company**, Grantee, the following described real property free of liens and encumbrances created or suffered by the Grantor, except as specifically set forth herein:

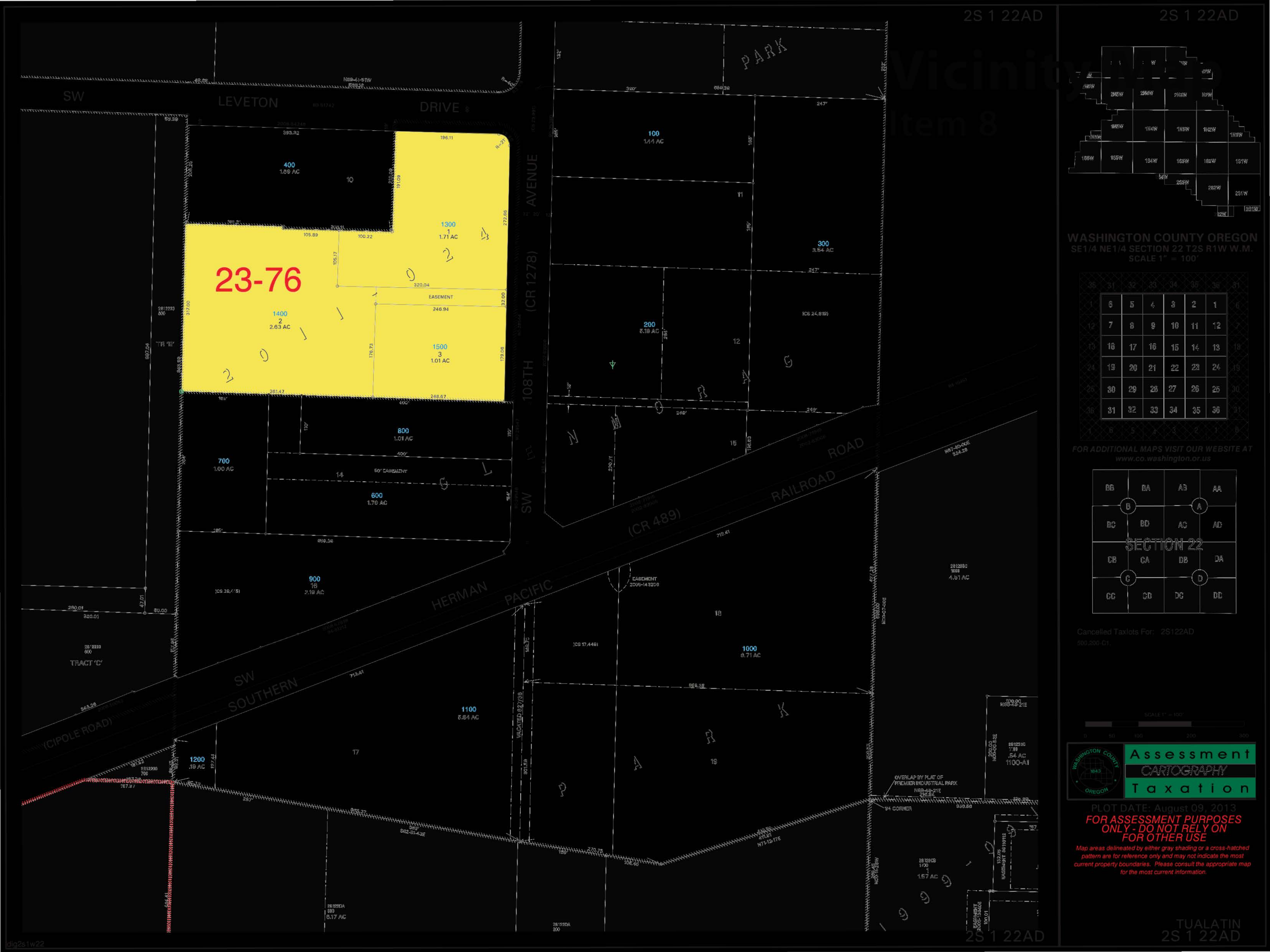
LEGAL DESCRIPTION: Real property in the County of Washington, State of Oregon, described as follows:

PARCELS 1, 2 AND 3 OF PARTITION PLAT 2011-024 IN THE CITY OF TUALATIN, WASHINGTON COUNTY, STATE OF OREGON.

This property is free from liens and encumbrances, EXCEPT: See Exhibit 'A' attached hereto and by reference made a part hereof.

The true consideration for this conveyance is **$1,400,000.00.** (Here comply with requirements of ORS 93.030)

BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON TRANSFERRING FEE TITLE SHOULD INQUIRE ABOUT THE PERSON'S RIGHTS, IF ANY, UNDER ORS 195.300, 195.301 AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424, OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010. THIS INSTRUMENT DOES 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 THAT THE UNIT OF LAND BEING TRANSFERRED IS A LAWFULLY ESTABLISHED LOT OR PARCEL, AS DEFINED IN ORS 92.010 OR 215.010, TO VERIFY THE APPROVED USES OF THE LOT OR PARCEL, TO DETERMINE ANY LIMITS ON LAWSUITS


2S 1 22AD
2S 1 22AD
23-76
SW LEVETON DRIVE
SW 108TH AVENUE (CR 1278)
SW HERMAN ROAD (CR 489)
SOUTHERN PACIFIC RAILROAD
(CIPOLE ROAD)
PARK
KOLLER PARK
EASEMENT
VACATED 82/38
TRACT 'C'
TR 'E'
400 1.89 AC
1300 1 1.71 AC
1400 2 2.63 AC
1500 3 1.01 AC
100 1.44 AC
200 5.18 AC
300 3.54 AC
700 1.00 AC
800 1.01 AC
600 1.70 AC
900 16 2.19 AC
1000 8.71 AC
1100 5.84 AC
1200 .19 AC
WASHINGTON COUNTY OREGON
SE1/4 NE1/4 SECTION 22 T2S R1W W.M.
SCALE 1" = 100'
FOR ADDITIONAL MAPS VISIT OUR WEBSITE AT
www.co.washington.or.us
SECTION 22
Cancelled Taxlots For: 2S122AD
Assessment
CARTOGRAPHY
Taxation
PLOT DATE: August 09, 2013
FOR ASSESSMENT PURPOSES ONLY - DO NOT RELY ON FOR OTHER USE
Map areas delineated by either gray shading or a cross-hatched pattern are for reference only and may not indicate the most current property boundaries. Please consult the appropriate map for the most current information.
TUALATIN
2S 1 22AD

distance and adequate vision clearances, and will comply with the City's access spacing standards. Left-turn movements into both site accesses from SW 108th Avenue can also be done in a safe manner. To achieve these conditions, we recommend the following actions:

- Prune overhanging branches adjacent to the proposed accesses to SW 108th Avenue to achieve adequate vision clearances and sight distances.
- Ensure regular maintenance of vegetation adjacent to the proposed site accesses to ensure vision clearance areas are maintained.
- Remove up to 75 feet of bicycle lane striping along the southern portion of the SW 108th Avenue site frontage to develop a center left-turn lane refuge in the median area for the south site access driveway.

If any additional information is needed to process this request, please call us at (503) 228-5230.

Sincerely,
KITTELSON & ASSOCIATES, INC.

Brian J. Dunn
Associate Engineer

REPUBLIC SERVICES
10295 SW Ridder Road, Wilsonville, OR 97070
O: 503.570.0626 F: 503.982.9307 republicservices.com

October 23, 2015

Bob Wells, Associate
Lance Mueller & Associates / Architects
130 Lakeside Drive, #250
Seattle, WA 98122

Re: Leveton Buildings: Trash Enclosures

Dear Bob;

Thank you, for sending me your site plans for these new building development's in Tualatin.

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

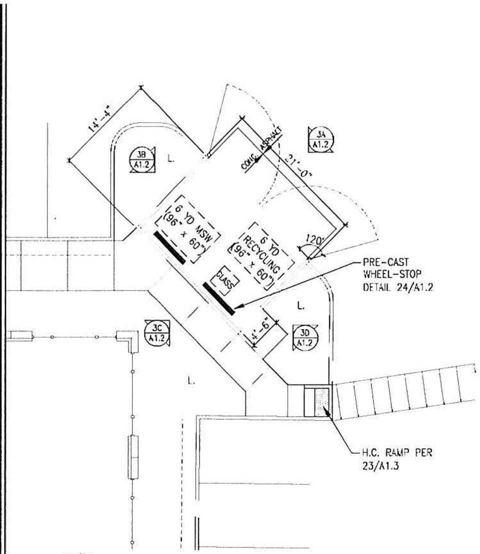
It looks like the locations of the enclosures, and size of the enclosures will be fine for us to service them. The entry and exits will work fine for my vehicles. Thank you for having the staggered gates for the North Wing enclosure. That will work for entry and taking the roll cart out.

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

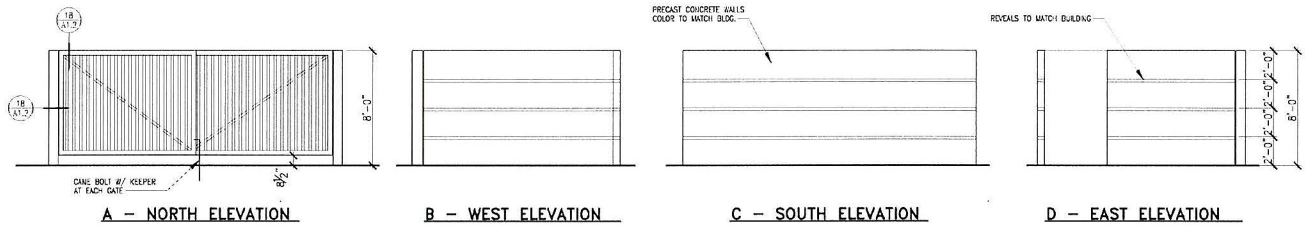
Sincerely,

Frank J. Lonergan

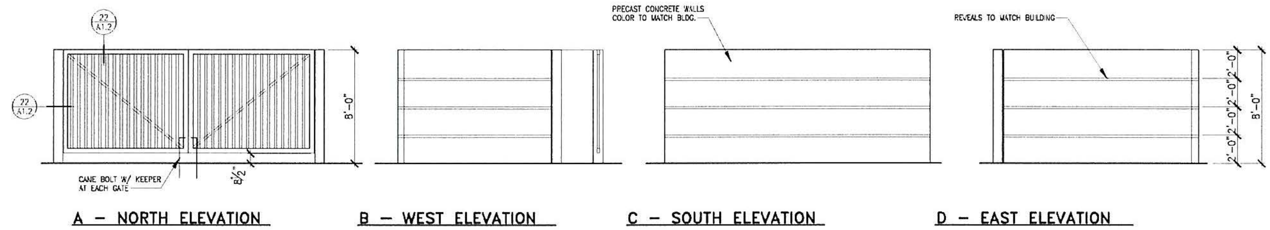
Frank J. Lonergan
Operations Manager
Republic Services Inc.



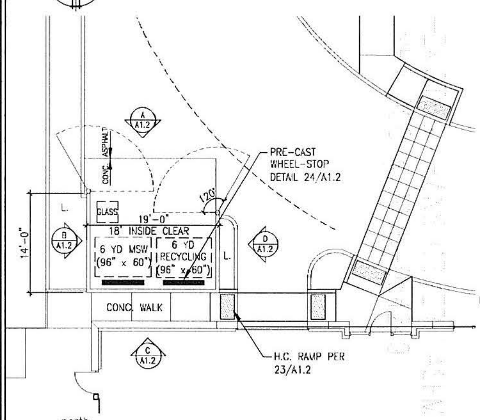
A ENLARGED SITE PLAN
SCALE: 1/4" = 1'-0"



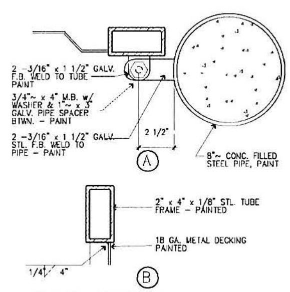
3 REFUSE RECYCLE ENCLOSURE ELEVATIONS
SCALE: 1/4" = 1'-0"



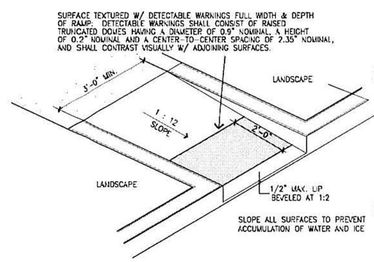
9 REFUSE RECYCLE ENCLOSURE ELEVATIONS
SCALE: 1/4" = 1'-0"



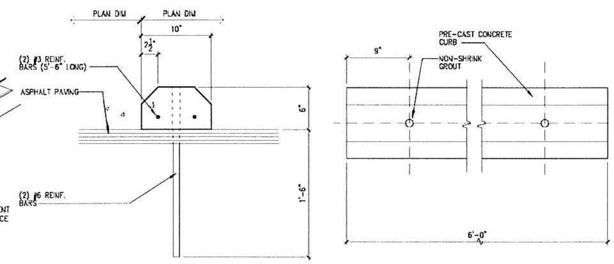
B ENLARGED SITE PLAN
SCALE: 1/4" = 1'-0"



22 GATE DETAIL
SCALE: N.T.S.



23 ACCESSIBLE CURB RAMP
SCALE: N.T.S.



24 PRECAST WHEEL STOP
SCALE: 1 1/2" = 1'-0"

Frank J Lonergan
10/23/15

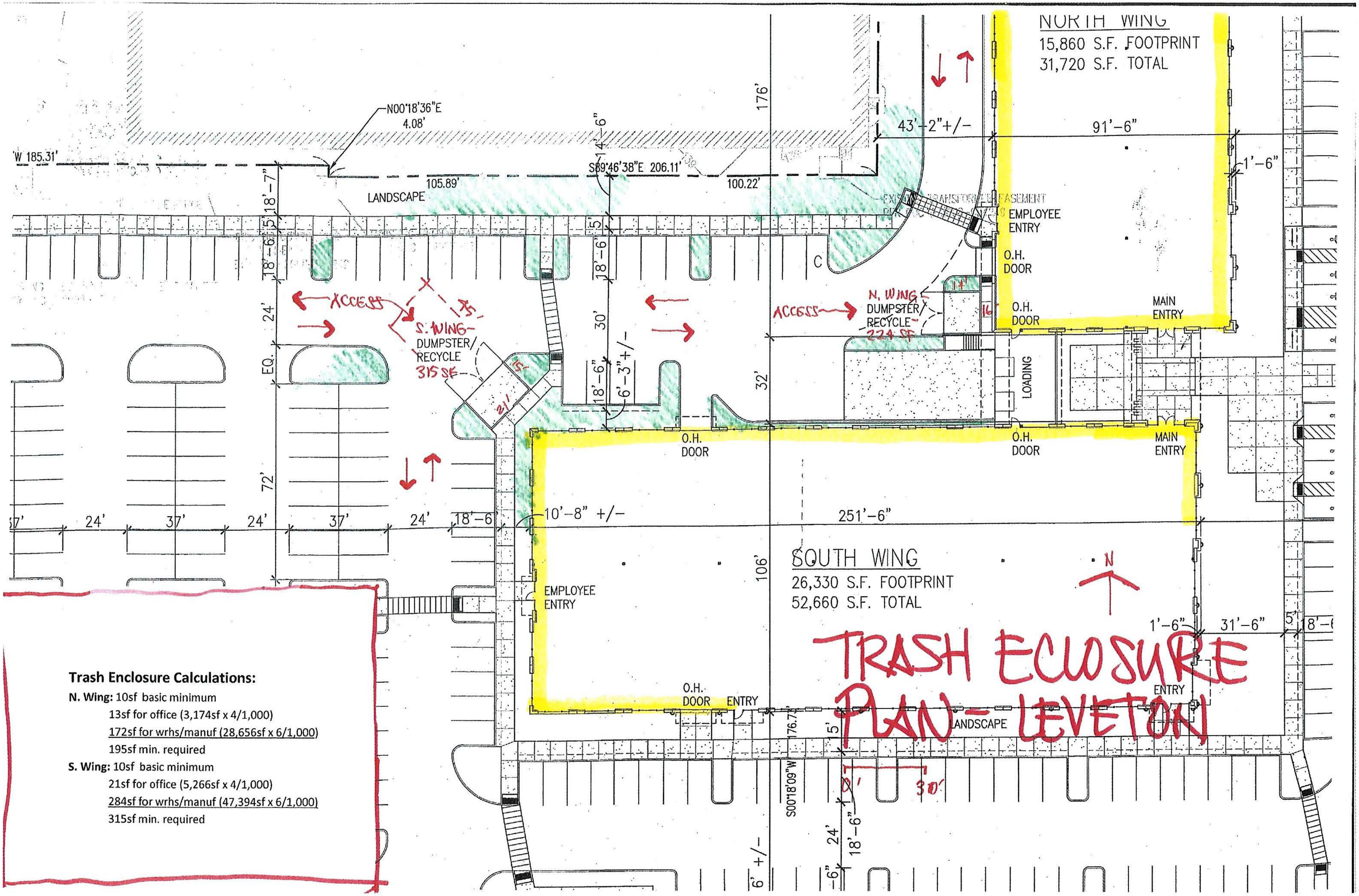
LEVETON
SW 108th Avenue at SW Leveton Drive
Tualatin, OR 97062
for: Leveton LLC

14-041	job no.	
EM	drawn	
	checked	
10-19-15	date	
no.	revision	date
	ARCHITECTURAL REVIEW SUBMITTAL	10-19-15

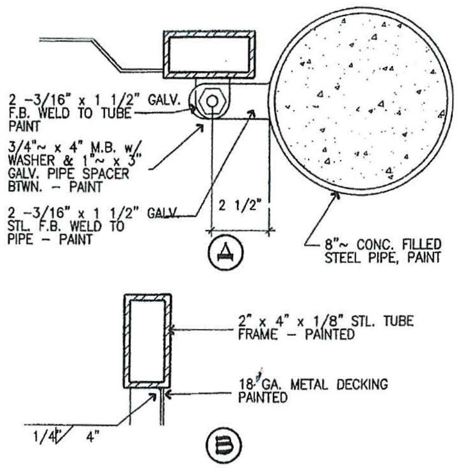
DUMPSTER PLANS AND ELEVATIONS

LANCE MUELLER & ASSOCIATES
A R C H I T E C T S • A I A
130 LAKESIDE • SUITE 250 • SEATTLE, WA 98122 • (206) 325-2553

sheet
A1.2

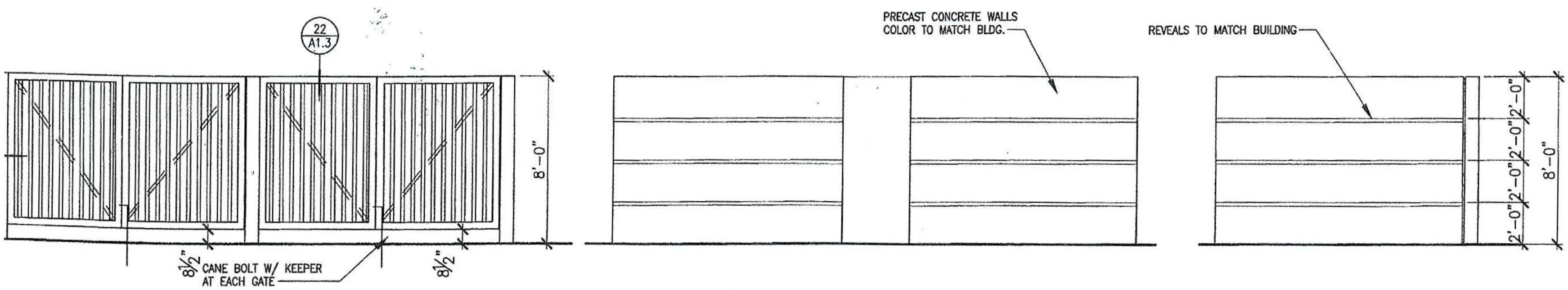


10/23/15 Frank J. Lonergan



22 GATE DETAIL

SCALE: N.T.S.



A - SOUTH ELEVATION

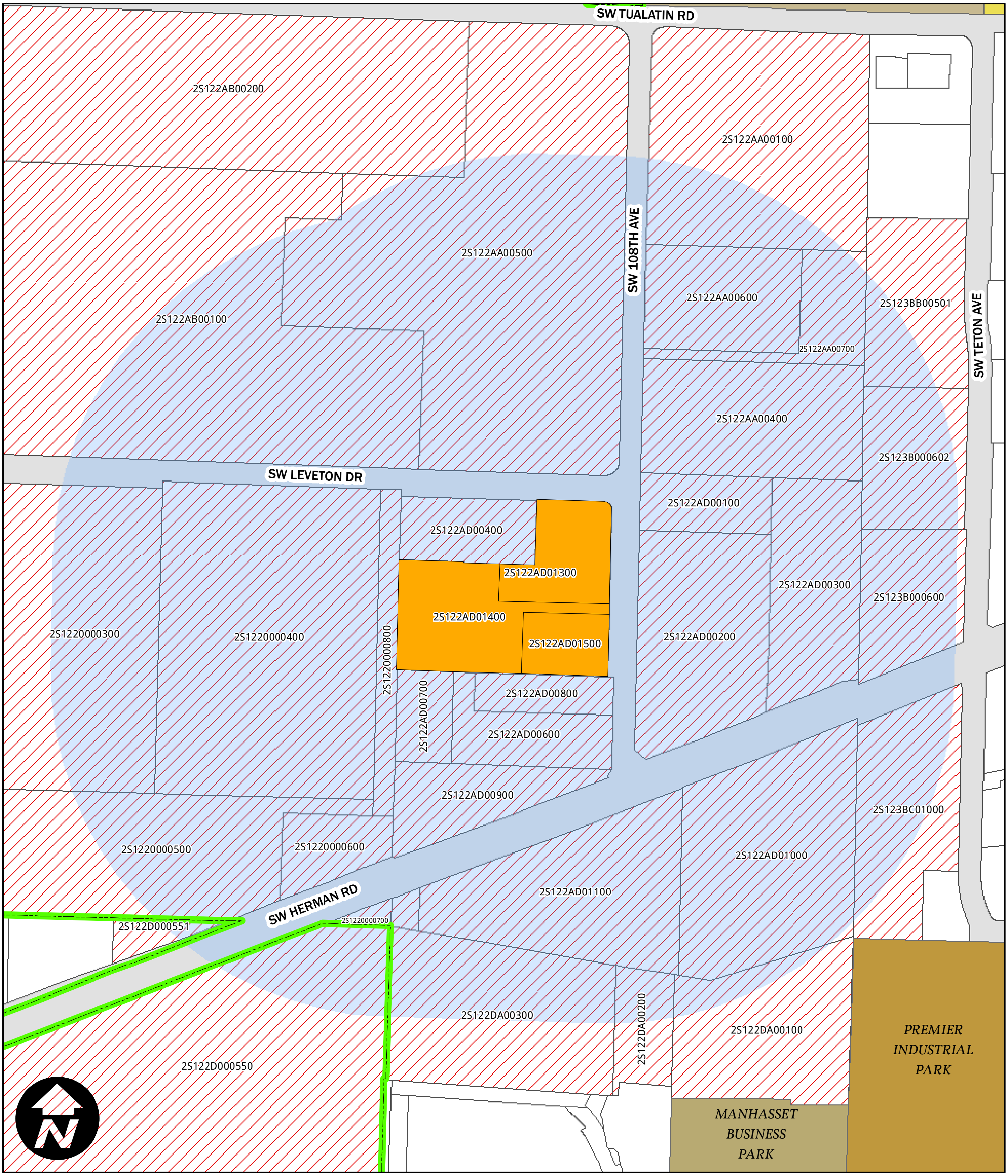
B - NORTH ELEVATION

C - WEST/EAST ELEVATION

28 REFUSE RECYCLE ENCLOSURE ELEVATIONS

SCALE: 1/2" = 1'-0"

10/23/15



Public Notification Search

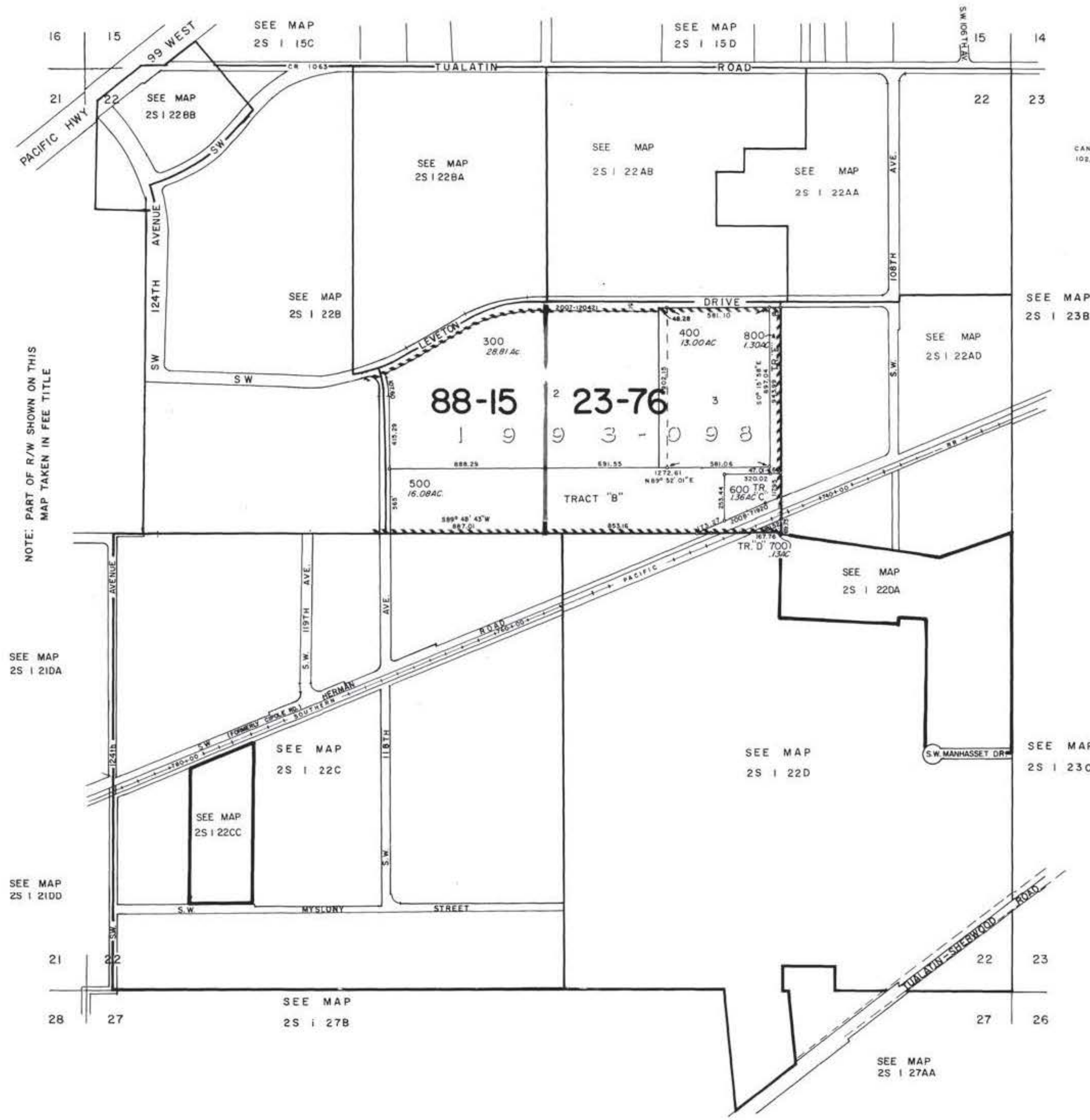
Subject
Radius
Notification
City limits

Plats

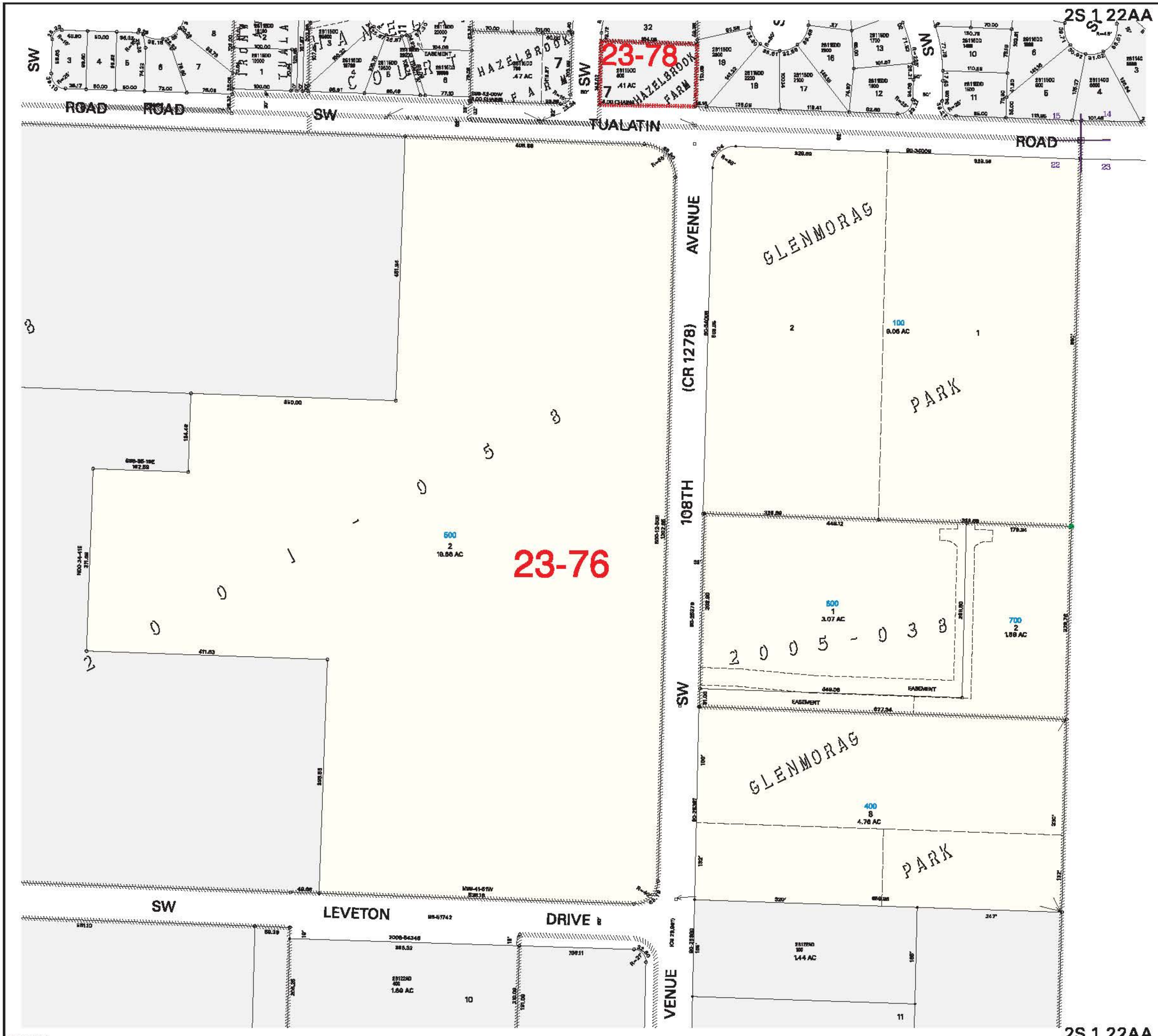
MANHASSET BUSINESS PARK
MARICOPA
PREMIER INDUSTRIAL PARK
SKOOKUM MEADOWS
WINCHESTER ESTATES

Prepared by: Fidelity National Title
Data: CoreLogic, Metro RLIS
Date: 7/2/2015
This information is reliable, but not guaranteed. It is not a survey.

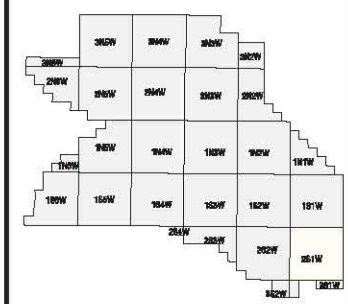
SECTION 22 T2S R1W W.M.
WASHINGTON COUNTY OREGON
SCALE 1"=400'



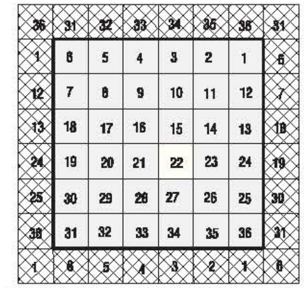
FOR ASSESSMENT PURPOSES ONLY
DO NOT RELY ON FOR ANY OTHER USE



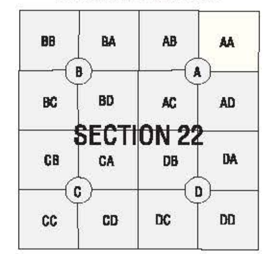
2S 1 22AA



WASHINGTON COUNTY OREGON
NE1/4 NE1/4 SECTION 22 T2S R1W W.M.
SCALE 1" = 100'



FOR ADDITIONAL MAPS VISIT OUR WEBSITE AT www.co.washington.or.us



Cancelled Taxlots For: 2S122AA
300,400-A1,200,200-A1,100-A1,500-A1,

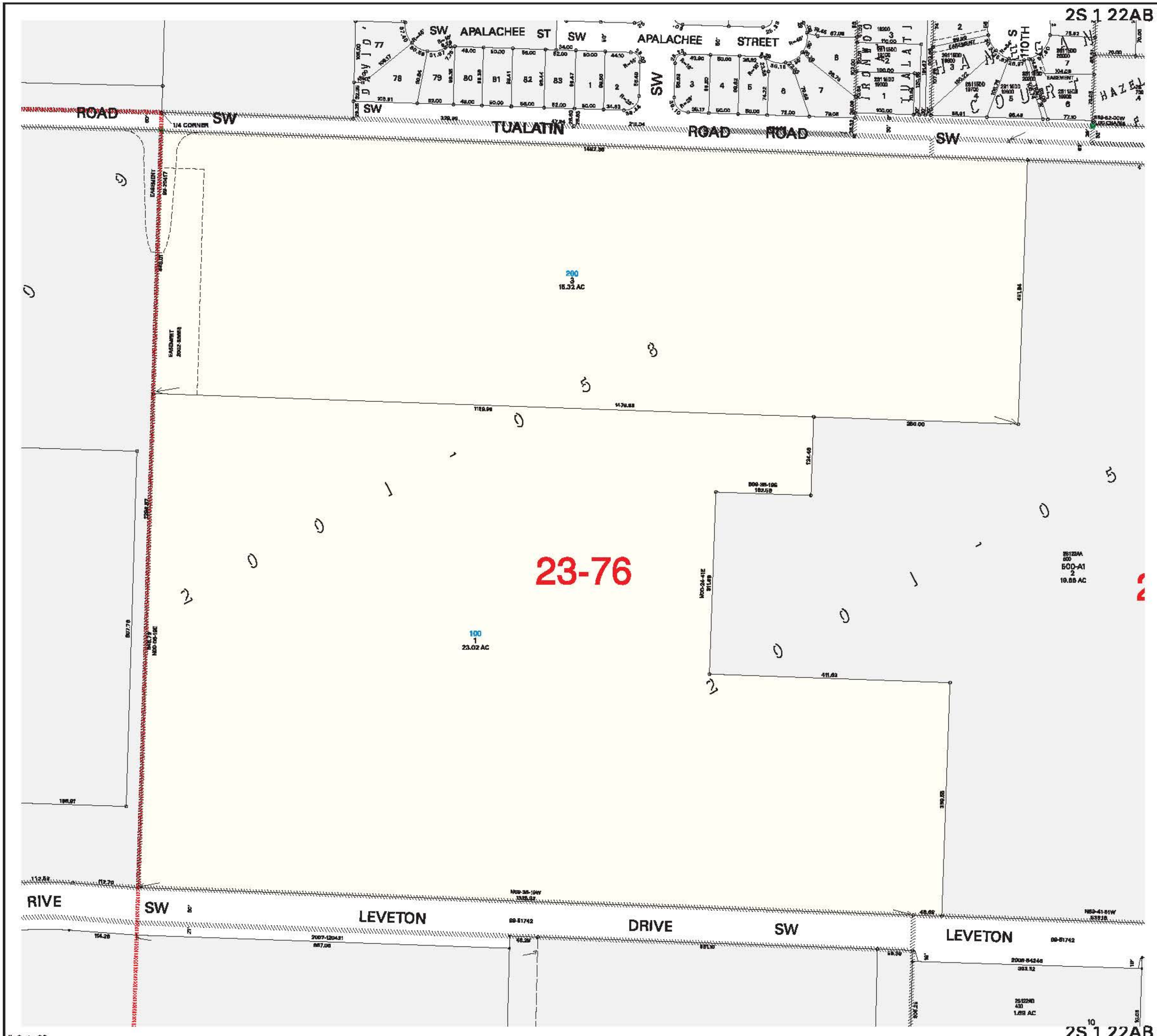
SCALE 1" = 100'
0 50 100 200 300

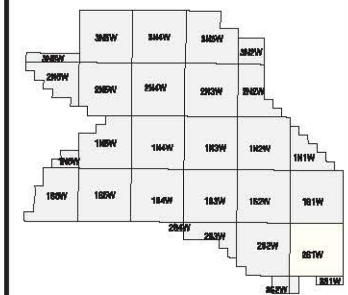
Assessment CARTOGRAPHY Taxation

PLOT DATE: August 09, 2013

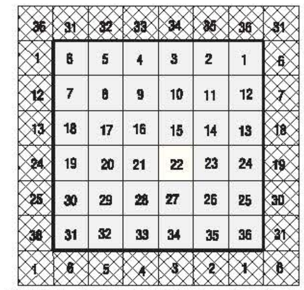
FOR ASSESSMENT PURPOSES ONLY - DO NOT RELY ON FOR OTHER USE

Map areas delineated by either gray shading or a cross-hatched pattern are for reference only and may not indicate the most current property boundaries. Please consult the appropriate map for the most current information.

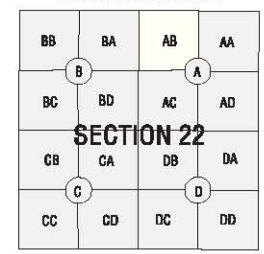




WASHINGTON COUNTY OREGON
NW1/4 NE1/4 SECTION 22 T2S R1W W.M.
SCALE 1" = 100'



FOR ADDITIONAL MAPS VISIT OUR WEBSITE AT
www.co.washington.or.us



SCALE 1" = 100'

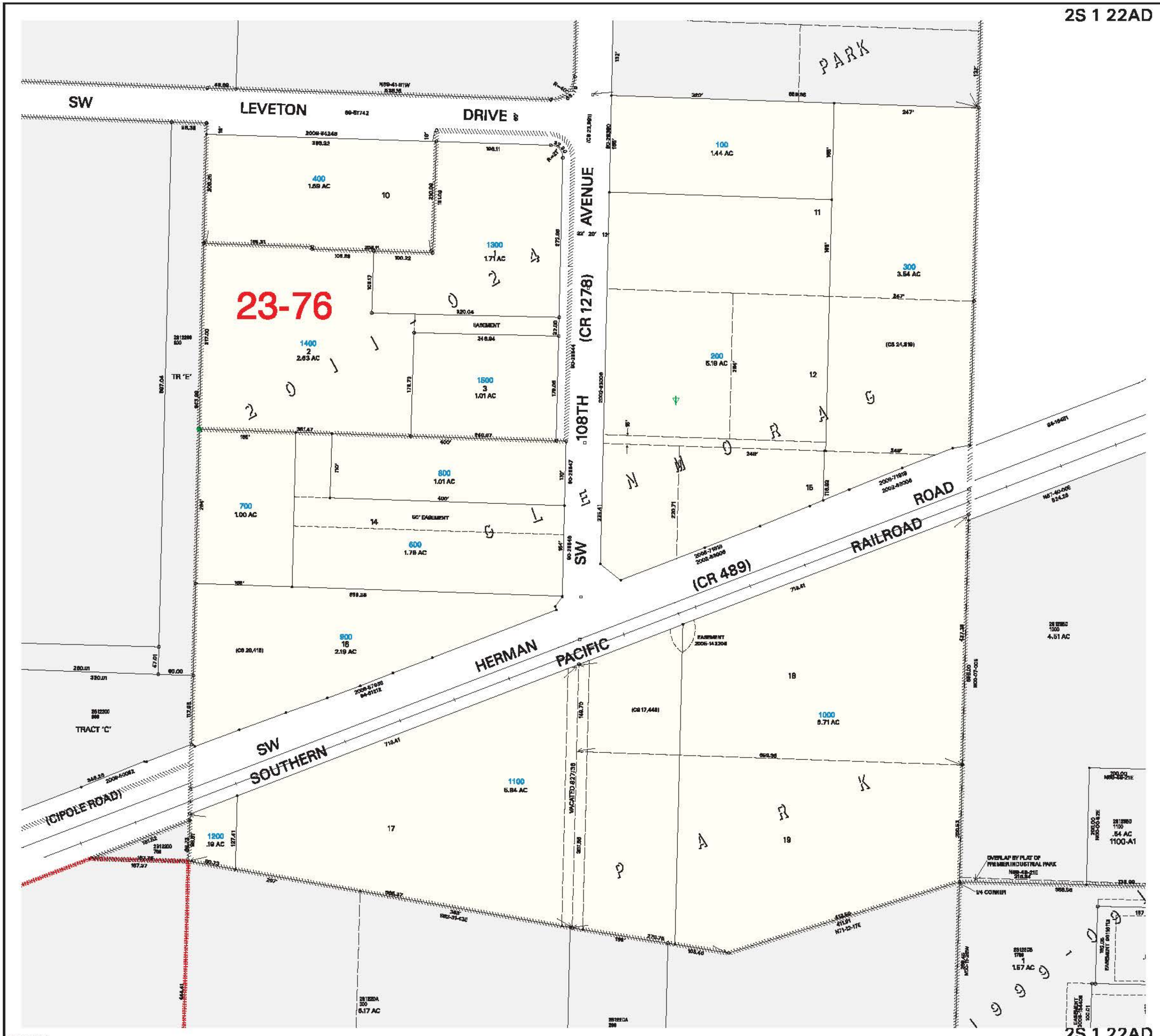
0 50 100 200 300

Assessment
CARTOGRAPHY
Taxation

PLOT DATE: June 25, 2010

FOR ASSESSMENT PURPOSES ONLY - DO NOT RELY ON FOR OTHER USE

Map areas delineated by either gray shading or a cross-hatched pattern are for reference only and may not indicate the most current property boundaries. Please consult the appropriate map for the most current information.



2S 1 22AD

WASHINGTON COUNTY OREGON
SE1/4 NE1/4 SECTION 22 T2S R1W W.M.
SCALE 1" = 100'

FOR ADDITIONAL MAPS VISIT OUR WEBSITE AT www.co.washington.or.us

SECTION 22

Cancelled Taxlots For: 2S122AD
500,200-C1,

SCALE 1" = 100'
0 50 100 200 300

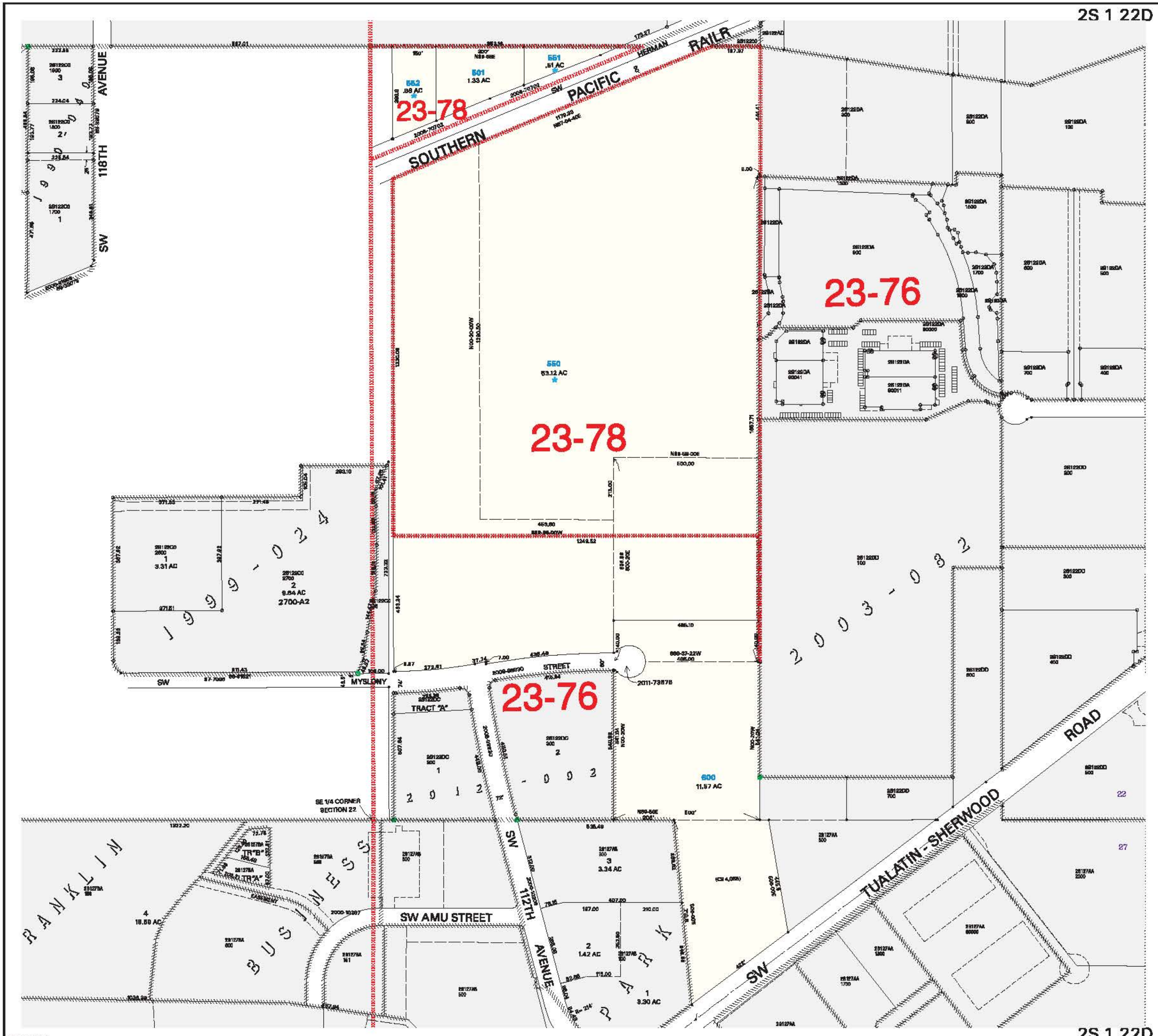
Assessment
CARTOGRAPHY
Taxation

PLOT DATE: August 09, 2013

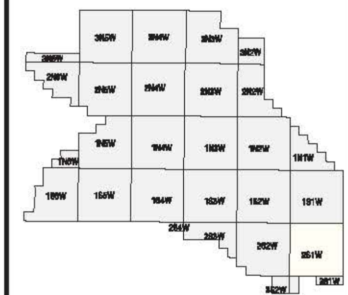
FOR ASSESSMENT PURPOSES ONLY - DO NOT RELY ON FOR OTHER USE

Map areas delineated by either gray shading or a cross-hatched pattern are for reference only and may not indicate the most current property boundaries. Please consult the appropriate map for the most current information.

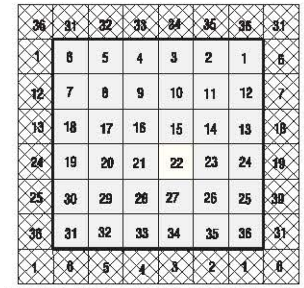
TUALATIN
2S 1 22AD



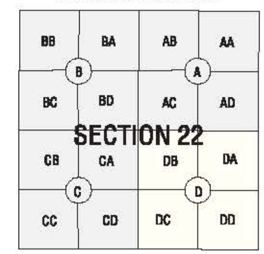
2S 1 22D



WASHINGTON COUNTY OREGON
SE1/4 SECTION 22 T2S R1W W.M.
SCALE 1" = 200'



FOR ADDITIONAL MAPS VISIT OUR WEBSITE AT
www.co.washington.or.us



Cancelled Taxlots For: 2S122D
400,104,100,102,201,401,601,202,301,300,101,103,
200,700,800,500,502,

SCALE 1" = 200'
0 100 200 400 600

Assessment
CARTOGRAPHY
Taxation

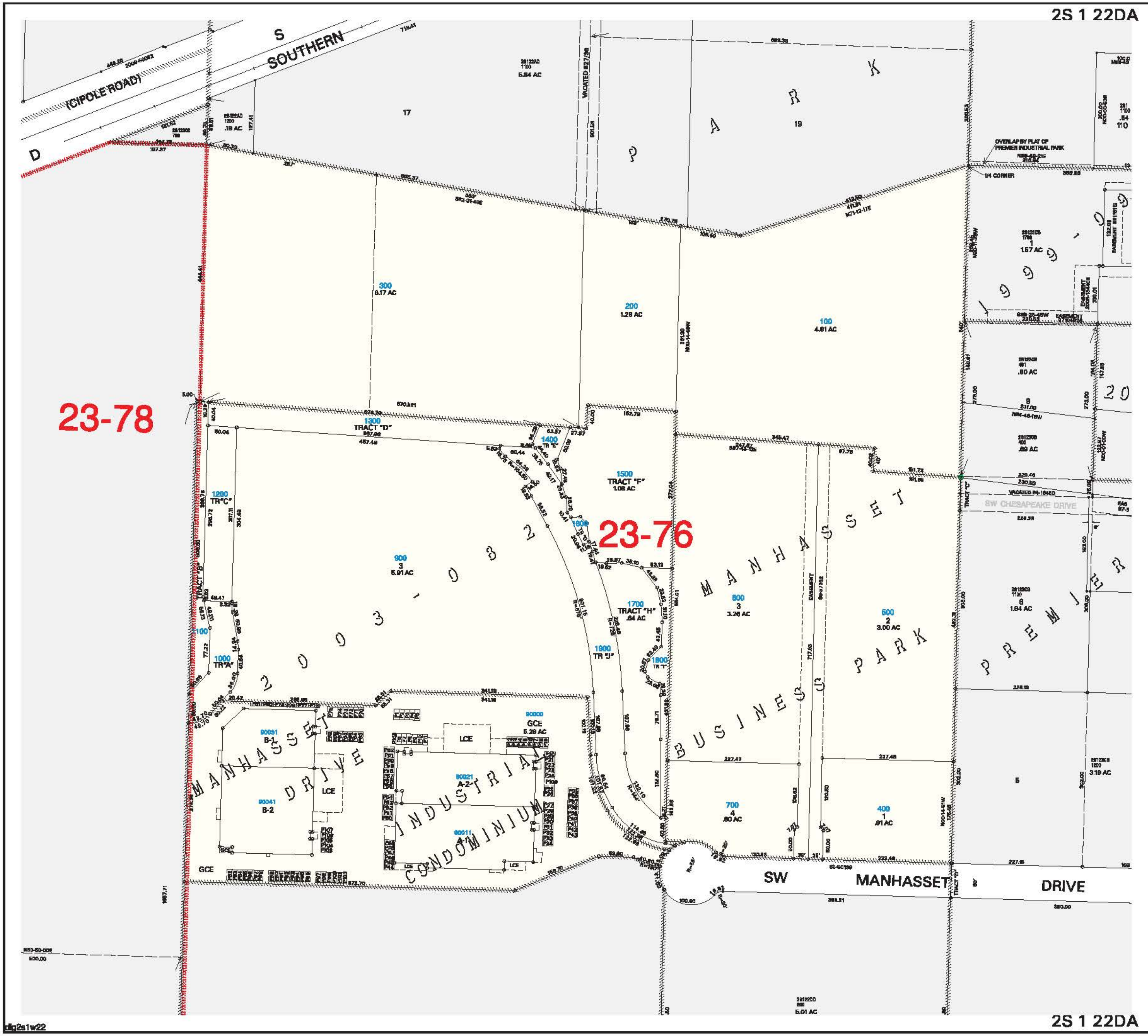
PLOT DATE: January 31, 2012

FOR ASSESSMENT PURPOSES ONLY - DO NOT RELY ON FOR OTHER USE

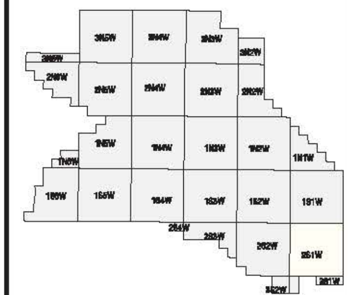
Map areas delineated by either gray shading or a cross-hatched pattern are for reference only and may not indicate the most current property boundaries. Please consult the appropriate map for the most current information.

TUALATIN
2S 1 22D

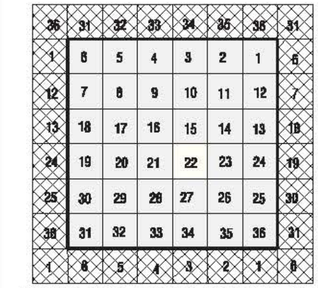
plg2s1w22



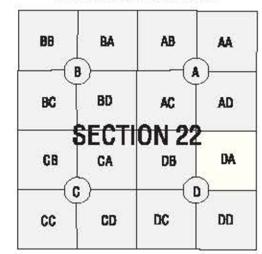
2S 1 22DA



WASHINGTON COUNTY OREGON
NE1/4 SE1/4 SECTION 22 T2S R1W W.M.
SCALE 1" = 100'



FOR ADDITIONAL MAPS VISIT OUR WEBSITE AT www.co.washington.or.us



Cancelled Taxlots For: 2S122DA
500,600-A1,900-A1,

SCALE 1" = 100'
0 50 100 200 300

Assessment
CARTOGRAPHY
Taxation

PLOT DATE: August 09, 2013

FOR ASSESSMENT PURPOSES ONLY - DO NOT RELY ON FOR OTHER USE

Map areas delineated by either gray shading or a cross-hatched pattern are for reference only and may not indicate the most current property boundaries. Please consult the appropriate map for the most current information.

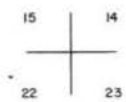
TUALATIN
2S 1 22DA

NW 1/4 SECTION 23 T2S R1W W.M.

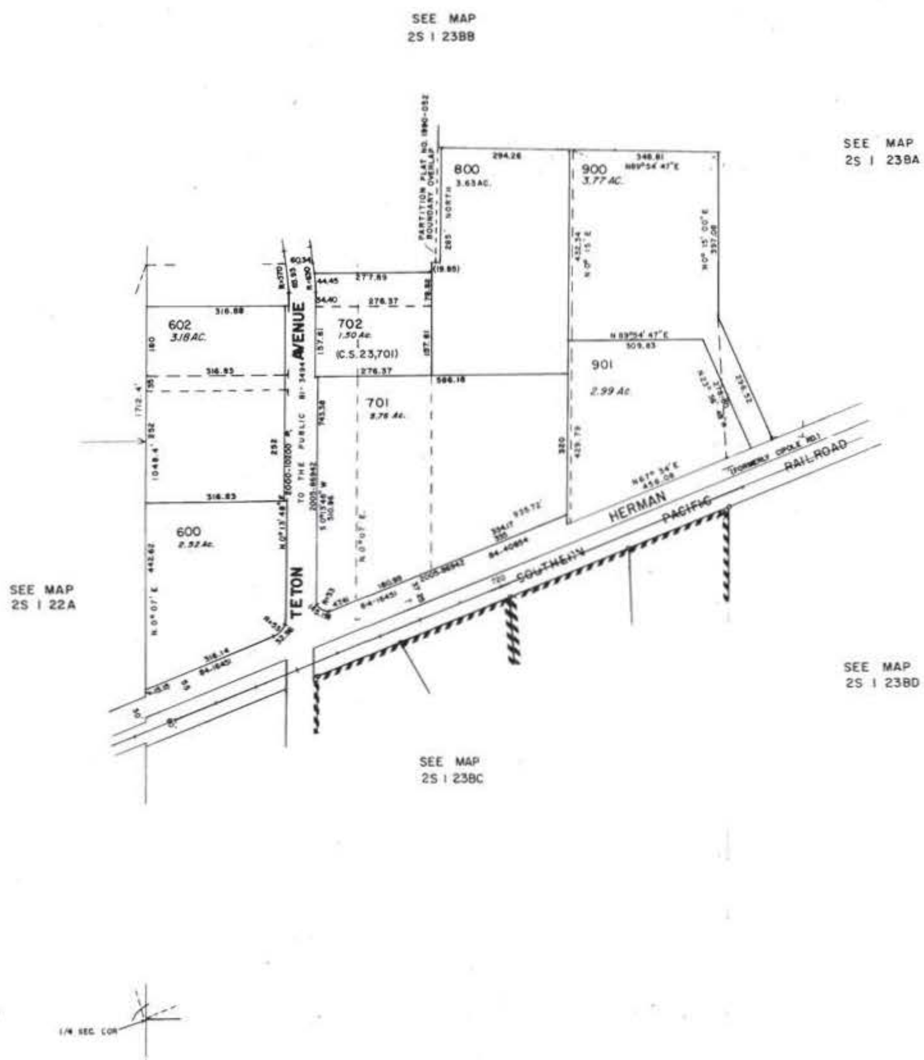
WASHINGTON COUNTY OREGON

SCALE 1" = 200'

23-76



CANCELLED TAX LOTS
1301, 100, 101, 200, 1000,
1100, 1200, 1202, 1300, 890,
401, 1403, 1404, 300, 400,
500, 501, 502, 603, 601, 700,
1204 A1, 1405, 1400, 1201,
1203, 1204, 1205, 1206,
1207-A1, 1207, 1208, 1209, 1406,
1401, 1407, 1402, 1900, 604,
1500, 1501, 1501-A1, 1600, 1700,
1800, 2000, 2000-A1, 2100, 2200,
2300, 2400, 901-A1, 602-A1,
901-A2.



FOR ASSESSMENT PURPOSES ONLY DO NOT RELY ON FOR ANY OTHER USE

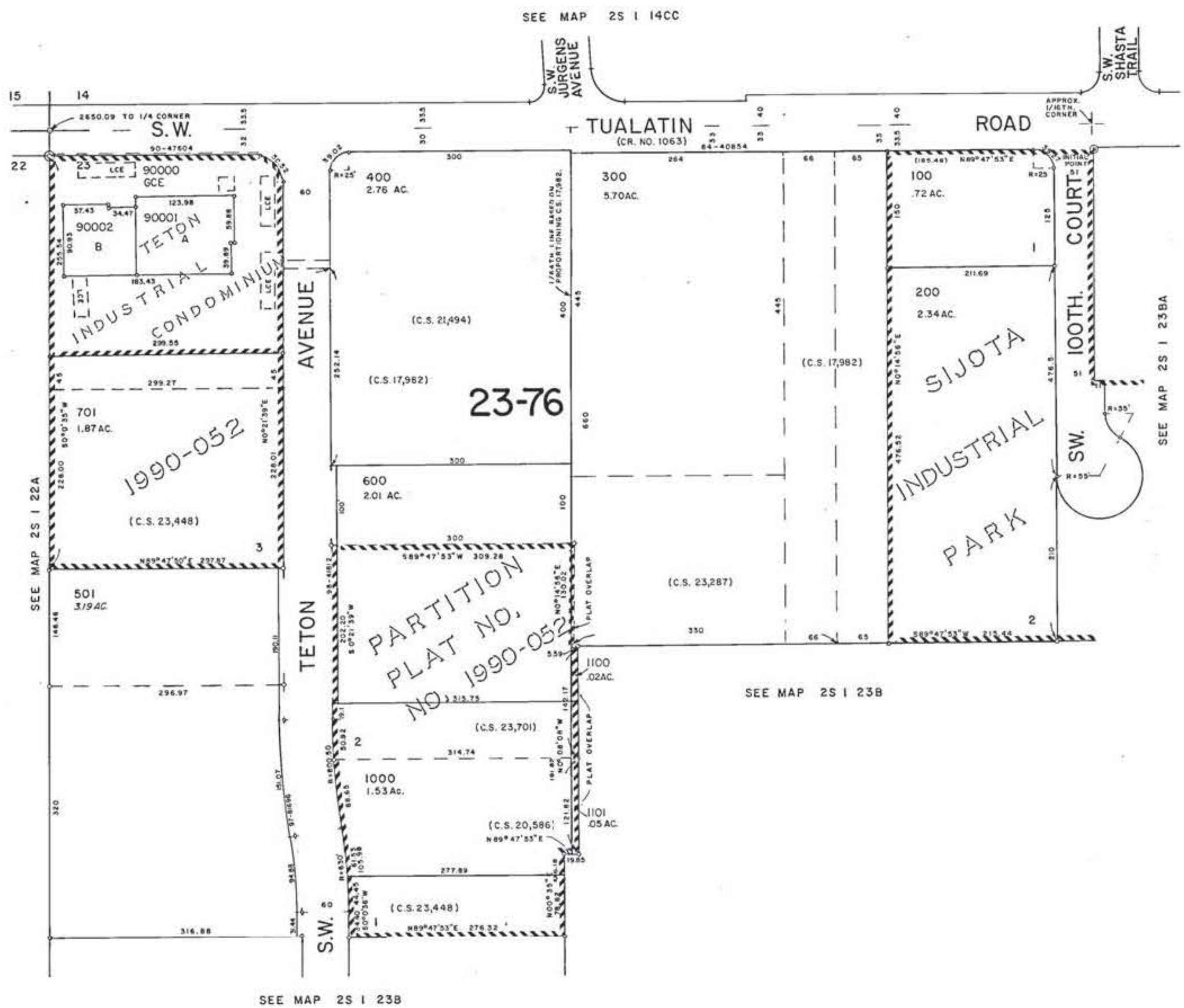
TUALATIN

FOR ASSESSMENT PURPOSES ONLY
DO NOT RELY ON FOR ANY OTHER USE

NW 1/4 NW 1/4 SECTION 23 T2S R1W W.M.
WASHINGTON COUNTY

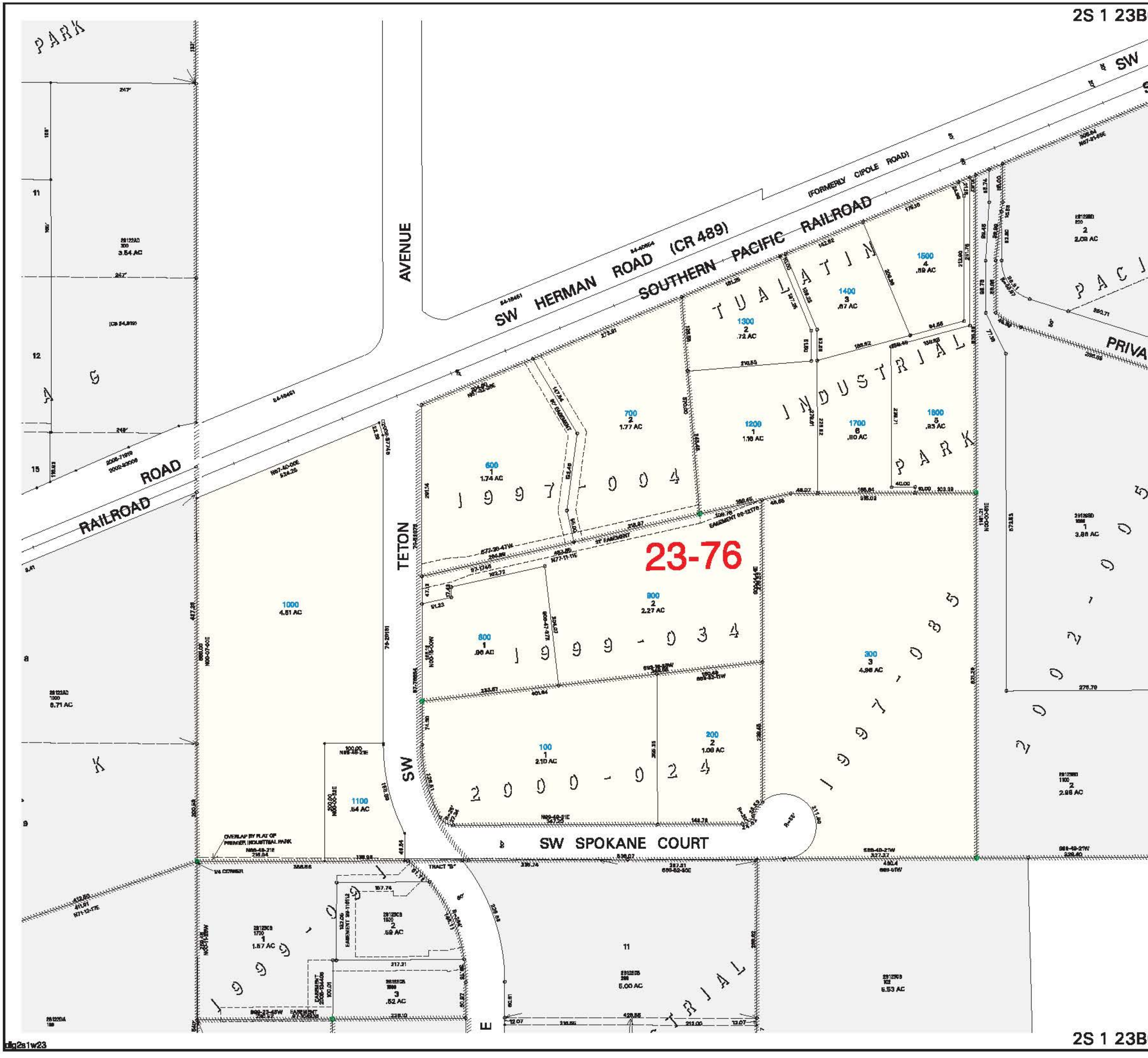
SCALE 1" = 100'

CANCELLED NUMBERS
502
500
800
700
900
702



APPROX. 1/16TH. CORNER

APPROX. 1/16TH CORNER



2S 1 23BC

WASHINGTON COUNTY OREGON
SW1/4 NW1/4 SECTION 23 T2S R1W W.M.
SCALE 1" = 100'

SECTION 23

FOR ADDITIONAL MAPS VISIT OUR WEBSITE AT
www.co.washington.or.us

Cancelled Taxlots For: 2S123BC
400,500,300-A2,800-A1,300-A1,1100-A1,

SCALE 1" = 100'

Assessment
CARTOGRAPHY
Taxation

PLOT DATE: August 12, 2013

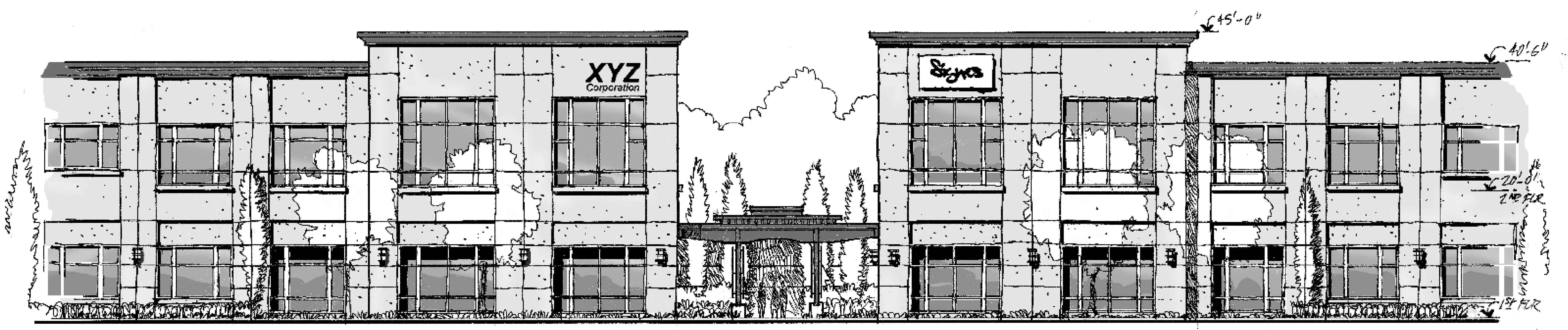
FOR ASSESSMENT PURPOSES ONLY - DO NOT RELY ON FOR OTHER USE

Map areas delineated by either gray shading or a cross-hatched pattern are for reference only and may not indicate the most current property boundaries. Please consult the appropriate map for the most current information.

REFPARCEL	OWNER	OWNERFIRST	OWNERLAST	MAILADDRES	MAILCITY	MAILSTATE	MAILZIP	SITEADDRES	SITECITY	SITESTATE	SITEZIP
2S122AA 00400	Bradley Johnson	Bradley	Johnson	Po Box 1506	Tualatin	OR	97062	18500 SW 108th Ave	Tualatin	OR	97062
2S122AD 00100	Dot Inc	Dot Inc		Po Box 115	Tualatin	OR	97062	18520 SW 108th Ave	Tualatin	OR	97062
2S122AD 00300	City Of Tualatin Oregon	City Of Tualatin Oregon		Po Box 369	Tualatin	OR	97062	10585 SW Herman Rd	Tualatin	OR	97062
2S122AD 01000	Marshall Associated LLC	Marshall Associated LLC		Po Box 278	Tualatin	OR	97062	10500 SW Herman Rd	Tualatin	OR	97062
2S122AD 01100	Travis Garske	Travis	Garske	Po Box 729	Colbert	WA	99005	10800 SW Herman Rd	Tualatin	OR	97062
2S122AD 01200	Pascuzzi Investment LLC	Pascuzzi Investment LLC		10250 SW North Dakota St	Tigard	OR	97223	*no Site Address*	Tualatin	OR	97062
2S122AD 00600	William Ray Morgan	William Ray	Morgan	4500 SW Advance Rd	Wilsonville	OR	97070	18805 SW 108th Ave	Tualatin	OR	97062
2S122AD 00700	William Ray Morgan	William Ray	Morgan	4500 SW Advance Rd	Wilsonville	OR	97070	*no Site Address*	Tualatin	OR	97062
2S122AD 00800	William Ray Morgan	William Ray	Morgan	4500 SW Advance Rd	Wilsonville	OR	97070	18745 SW 108th Ave	Tualatin	OR	97062
2S122AD 00400	Builders Wholesale Stone LLC	Builders Wholesale Stone LLC		10850 SW Leveton Dr	Tualatin	OR	97062	10850 SW Leveton Dr	Tualatin	OR	97062
2S122DA 00200	Wetlands Conservancy Inc The	Wetlands Conservancy Inc The		4640 SW Macadam Ave #50	Portland	OR	97239	*no Site Address*	Tualatin	OR	97062
2S123B0 00600	Chamberlain & Hussa Properties	Chamberlain & Hussa Properties		18755 SW Teton Ave	Tualatin	OR	97062	18755 SW Teton Ave	Tualatin	OR	97062
2S123BC 01000	Marshall Associated LLC	Marshall Associated LLC		Po Box 278	Tualatin	OR	97062	10400 SW Herman Rd	Tualatin	OR	97062
2S122DA 00300	Wetlands Conservancy Inc The	Wetlands Conservancy Inc The		4640 SW Macadam Ave #50	Portland	OR	97239	*no Site Address*	Tualatin	OR	97062
2S123B0 00602	Tualatin Teton LLC	Tualatin Teton LLC		621 SW Alder St #800	Portland	OR	97205	18555 SW Teton Ave	Tualatin	OR	97062
2S123BB 00501	18355 Teton Avenue Tualatin	18355 Teton Avenue Tualatin		19114 35th Pl	Lake Oswego	OR	97034	18355 SW Teton Ave	Tualatin	OR	97062
2S122DA 00100	Metro	Metro		600 NE Grand Ave	Portland	OR	97232	*no Site Address*	Tualatin	OR	97062
2S122AD 00900	Pnwp LLC 5	Pnwp LLC 5		6600 SW 175th Ave #175	Beaverton	OR	97008	10875 SW Herman Rd	Tualatin	OR	97062
2S12200 00300	Phight LLC	Phight LLC		1 SW Bowerman Dr	Beaverton	OR	97005	11500 SW Leveton Dr	Tualatin	OR	97062
2S12200 00400	Corp Fujimi	Corp	Fujimi	11200 SW Leveton Dr	Tualatin	OR	97062	11200 SW Leveton Dr	Tualatin	OR	97062
2S12200 00500	Washington County	Washington County		169 N 1st Ave #42	Hillsboro	OR	97124	*no Site Address*	Tualatin	OR	97062
2S12200 00600	Tualatin City	Tualatin City		18880 SW Martinazzi Ave	Tualatin	OR	97062	*no Site Address*	Tualatin	OR	97062
2S12200 00700	Tualatin City	Tualatin City		18880 SW Martinazzi Ave	Tualatin	OR	97062	*no Site Address*	Tualatin	OR	97062
2S12200 00800	Tualatin City	Tualatin City		18880 SW Martinazzi Ave	Tualatin	OR	97062	*no Site Address*	Tualatin	OR	97062
2S122AA 00100	Helser Limited Partnership	Helser Limited Partnership		Po Box 1569	Tualatin	OR	97062	10750 SW Tualatin Rd	Tualatin	OR	97062
2S122AB 00100	Lam Research Corp	Lam Research Corp		4650 Cushing Pkwy	Fremont	CA	94538	11355 SW Leveton Dr	Tualatin	OR	97062
2S122AA 00500	Lam Research Corp	Lam Research Corp		4650 Cushing Pkwy	Fremont	CA	94538	11155 SW Leveton Dr	Tualatin	OR	97062
2S122AB 00200	Lam Research Corp	Lam Research Corp		4650 Cushing Pkwy	Fremont	CA	94538	*no Site Address*	Tualatin	OR	97062
2S122AA 00600	Hr LLC	Hr LLC		14855 SW Murray Scholls Dr	Beaverton	OR	97007	18280 SW 108th Ave	Tualatin	OR	97062
2S122AA 00700	Lumber Co LLC	Lumber Co LLC		Po Box 1404	Tualatin	OR	97062	18290 SW 108th Ave	Tualatin	OR	97062
2S122AD 00200	Tualatin City	Tualatin City		10 Presidential Way	Woburn	MA	01801	10699 SW Herman Rd	Tualatin	OR	97062
2S122D0 00550	Gary Walgraeve	Gary	Walgraeve	11345 SW Herman Rd	Tualatin	OR	97062	*no Site Address*	Tualatin	OR	97062
2S122D0 00551	Gary Walgraeve	Gary	Walgraeve	11345 SW Herman Rd	Tualatin	OR	97062	*no Site Address*		OR	00000
2S122AD 01300	Leveton LLC	Leveton LLC		Po Box 15523	Seattle	WA	98115	*no Site Address*	Tualatin	OR	97062
2S122AD 01400	Leveton LLC	Leveton LLC		Po Box 15523	Seattle	WA	98115	*no Site Address*	Tualatin	OR	97062
2S122AD 01500	Leveton LLC	Leveton LLC		Po Box 15523	Seattle	WA	98115	*no Site Address*	Tualatin	OR	97062

LEVETON

Tualatin, OR



South Wing **North Wing - East Elevation at Front Entries**

0' 10'

PROJECT TEAM:

OWNER / DEVELOPER:
LEVETON LLC
PO BOX 15523
SEATTLE, WA 98115
CONTACT: JACK MARTIN
PHONE: (206) 660-8843

ARCHITECT/PERMIT COORDINATOR:
LANCE MUELLER & ASSOCIATES / ARCHITECTS
130 LAKESIDE AVE. S., SUITE 250
SEATTLE, WA 98122
CONTACT: BOB WELLS
PHONE: (206) 325-2553 X120

ENGINEER/CIVIL & STRUCTURAL:
VLMK ENGINEERING + DESIGN
3933 SW KELLY AVENUE
PORTLAND, OR 97239
CONTACT: TRENT NAGLE
PHONE: (503) 222-4453

LANDSCAPE ARCHITECT:
OTTEN LANDSCAPE ARCHITECTS
3933 SW KELLY AVE. SUITE B
PORTLAND, OR 97239
CONTACT: JANET OTTEN
PHONE: (503) 972-0311

GEOTECHNICAL ENGINEER:
GEODESIGN INC.
15575 SW SEQUOIA PARKWAY, SUITE 100
PORTLAND, OR 97224
CONTACT: GEORGE SAUNDERS
PHONE: (503) 968-8787

JURISDICTION:
CITY OF TUALATIN
PO BOX 363
18876 SW MARTINAZZI AVE.
TUALATIN, OR 97062
CONTACT: CLAIR FUCHS – PLANNING DEPT.
PHONE: (503) 691-3207

VICINITY MAP

north

Scope:

Leveton is two new two-story building "shells" intended for the high-tech market, and to be occupied they will require tenant improvement work. Projected mixed uses include office, light manufacturing, and storage.

Project Statistics and Notes:

Zoning District: General Manufacturing (MG)
Industrial Business Park Overlay

Statistics:

Building Area:

	1st Floor:	2nd Floor:	Total:
North Wing	15,920	15,920	**31,840**
South Wing	26,330	26,330	**52,660**
Deck at 2nd Floor	0	663	**663**
Canopies	Excluded	**Excluded**	**Excluded**
Total Building	**42,250**	**42,913**	**85,163**

Site: **233,404sf**
Coverage: **18.1%**
FAR: **.37**

Parking Required by assumed Use:

	Use	Assumed % of Bldg.	Sq Ft	Parking Req'd
N. Wing	Industrial: Manuf	75	23,880	@ 1.6/1,000sf = 38
	Industrial: Warehouse	15	4,776	@ 0.3/1,000sf = 1
	Office	10	3,174	@ 2.7/1,000sf = 9
	North Wing Total	**100**		**Total Req'd = 48**
S. Wing	Industrial: Manuf	75	39,495	@ 1.6/1,000sf = 63
	Industrial: Warehouse	15	7,899	@ 0.3/1,000sf = 2
	Office	10	5,266	@ 2.7/1,000sf = 14
	South Wing Total	**100**		**Total Req'd = 79**
Deck at 2nd floor	**Deck** (office)	100	663sf	**Total Req'd @ 2.7/1,000sf = 2**
Parking Required:				**Total = 129**

Parking Provided:
Total 336 stalls = 4/1,000sf

Bike Parking Required:

	Use	Assusmed % of Bldg.	Sq Ft	Bike Parking Req'd
N. Wing	Industrial: Manuf	75	23,880	@ 0.1/1,000 = 2
	Industrial: Wrhs	15	4,776	@ 0.1/1,000 = 0
	Office	10	3,174	@ 0.5/1,000 = 2
	North Wing Total	**100**		**Total Req'd = 4**
S. Wing	Industrial:Manuf	75	39,495	@ 0.1/1,000 = 4
	Industrial: Wrhs	15	7,899	@ 0.1/1,000 = 1
1	Office	10	5,266	@ 0.5/1,000 = 3
	South Wing Total	**100**		**Total Req'd = 8**
Deck at 2nd floor	**Deck** (office)	100	663	@ 0.5/1,000sf = 0
Bike Parking Required:				**Total = 12**

Bike Parking Proposed: 4 (at N. Wing) + 8 (at N. Wing) = 12

Mixed Use Percentage (Section 69.065)**:**
Estimate 10% Office; 75% Indust.; 15% Storage

Trash Enclosure Calculations:

N. Wing: 10sf basic minimum
13sf for office (3,174sf x 4/1,000)
172sf for wrhs/manuf (28,656sf x 6/1,000)
195sf min. required, 236sf provided

S. Wing: 10sf basic minimum
21sf for office (5,266sf x 4/1,000)
284sf for wrhs/manuf (47,394sf x 6/1,000)
315sf min. required, 315sf provided

Landscape Calculations:

Landscape Area Required: (Section 73.240)

	Requirement:	Developed Area:	Total:
Required:	15% of Developed. Area x	244,404 sf	35,011 sf
Provided:	(23.3% Provided)	-	56,865sf

Parking Landscape Required: (Section 73.360)

	Parking landscape required:	Stalls Provided:	Total:
Required:	25sf per stall	336	8,400 sf
Provided:	-	-	11,700 sf

Building Codes Notes:

Codes:
2010 Oregon Structural & Specialty Code (2009 IBC w/ Amendments)
2010 Oregon Fire Code (2009 IFC w/ Amendments)
2010 Oregon Mechanical Specialty Code
2011 Oregon Electrical Specialty Code
2011 Oregon Plumbing Specialty Code
2011 Oregon Elevator Specialty Code
2010 Oregon Energy Specialty Code

IBC Construction Type:
II-B, sprinklered

IBC Occupancy Groups:
B (Office)
F-1 (Factory)
S-1 (Light Storage)
A-3 (Large Conference/Dining – possible TI)

INDEX OF DRAWINGS (FOR AR REVIEW):

LEGAL DESCRIPTION:

TUALATIN TAX LOTS: 2S-1-22AD-1300, 1400, 1500.

BUILDING CODE NOTES:

CODES:
2010 OREGON STRUCTURAL & SPECIALTY CODE (2009 IBC W/ AMENDMENTS)
2010 OREGON FIRE CODE (2009 IFC W/ AMENDMENTS)
2010 OEGON MECHANICAL SPECIALTY CODE
2011 OREGON ELECTRICAL SPECIALTY CODE
2011 OREGON PLUMBING SPECIALTY CODE
2011 OREGON ELEVATOR SPECIALTY CODE
2010 OREGON ENERGY SPECIALTY CODE

IBC CONSTRUCTION TYPE:
II-B, SPRINKLERED

IBC OCCUPANCY GROUPS:
B (OFFICE)
F-1 (FACTORY)
S-1 (LIGHT STORAGE)
A-3 (LARGE CONFERENCE/DINING – POSSIBLE TI)

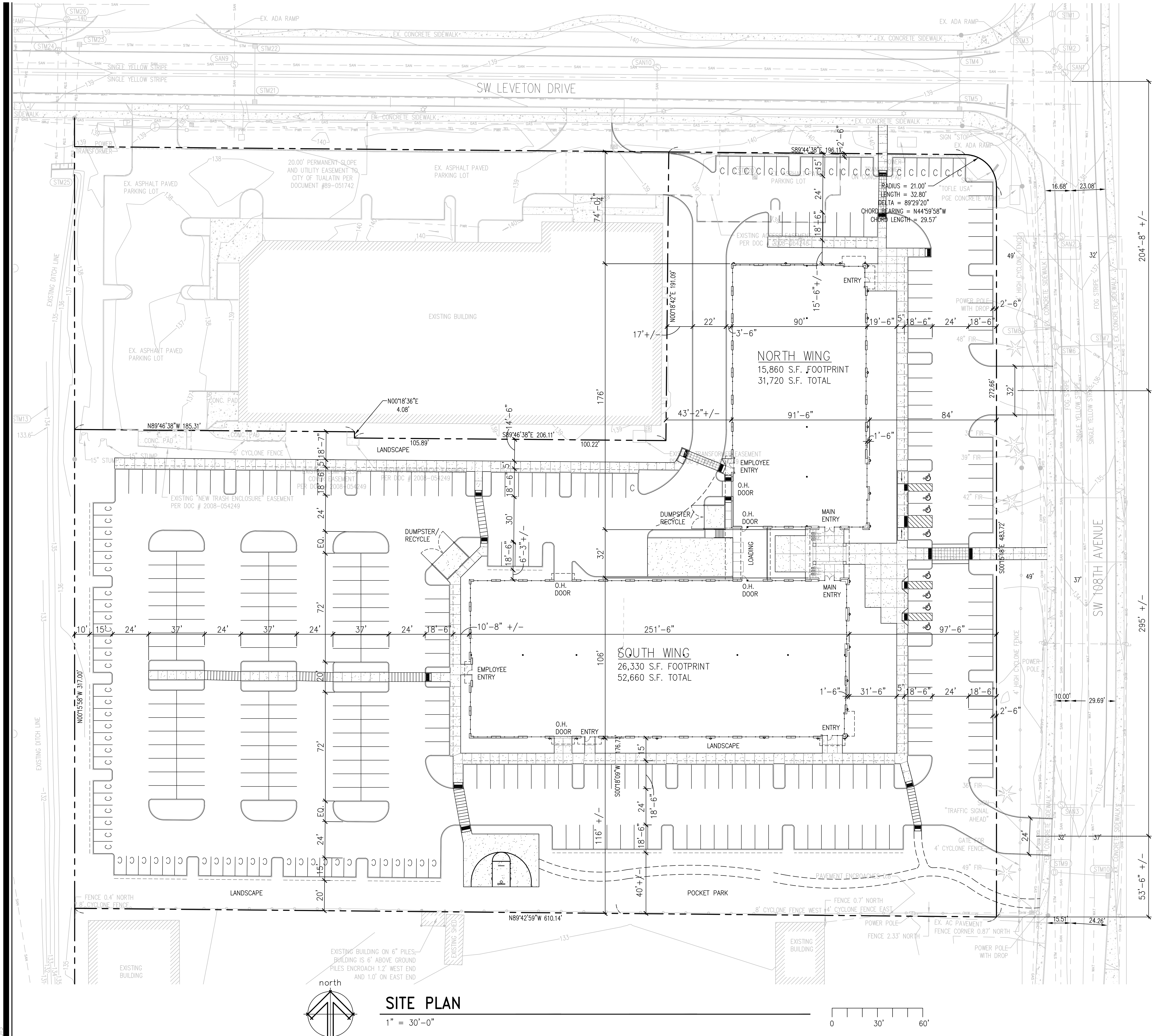
14-041 job no.		
EM drawn		
– checked		
8-21-15 date		
no.	revision	date
	ARCHITECTURAL REVIEW SUBMITTAL	10-19-15

LEVETON
SW 108th Avenue at SW Leveton Drive
Tualatin, OR 97062
for: Leveton LLC

LANCE MUELLER & ASSOCIATES
A R C H I T E C T S A I A
130 LAKESIDE • SUITE 250 • SEATTLE, WA 98122 • (206) 325-2553

COVER SHEET & NOTES

sheet
A0.0



SITE PLAN

1" = 30'-0"

0 30' 60'

LEVETON

SW 108th Avenue at SW Leveton Drive
Tualatin, OR
for: Leveton LLC

LANCE MUELLER & ASSOCIATES
ARCHITECTS AIA
130 LAKESIDE • SUITE 250 • SEATTLE, WA 98122 • (206) 325-2553

no.	revision	date
	ARCHITECTURAL REVIEW SUBMITTAL	8-21-15

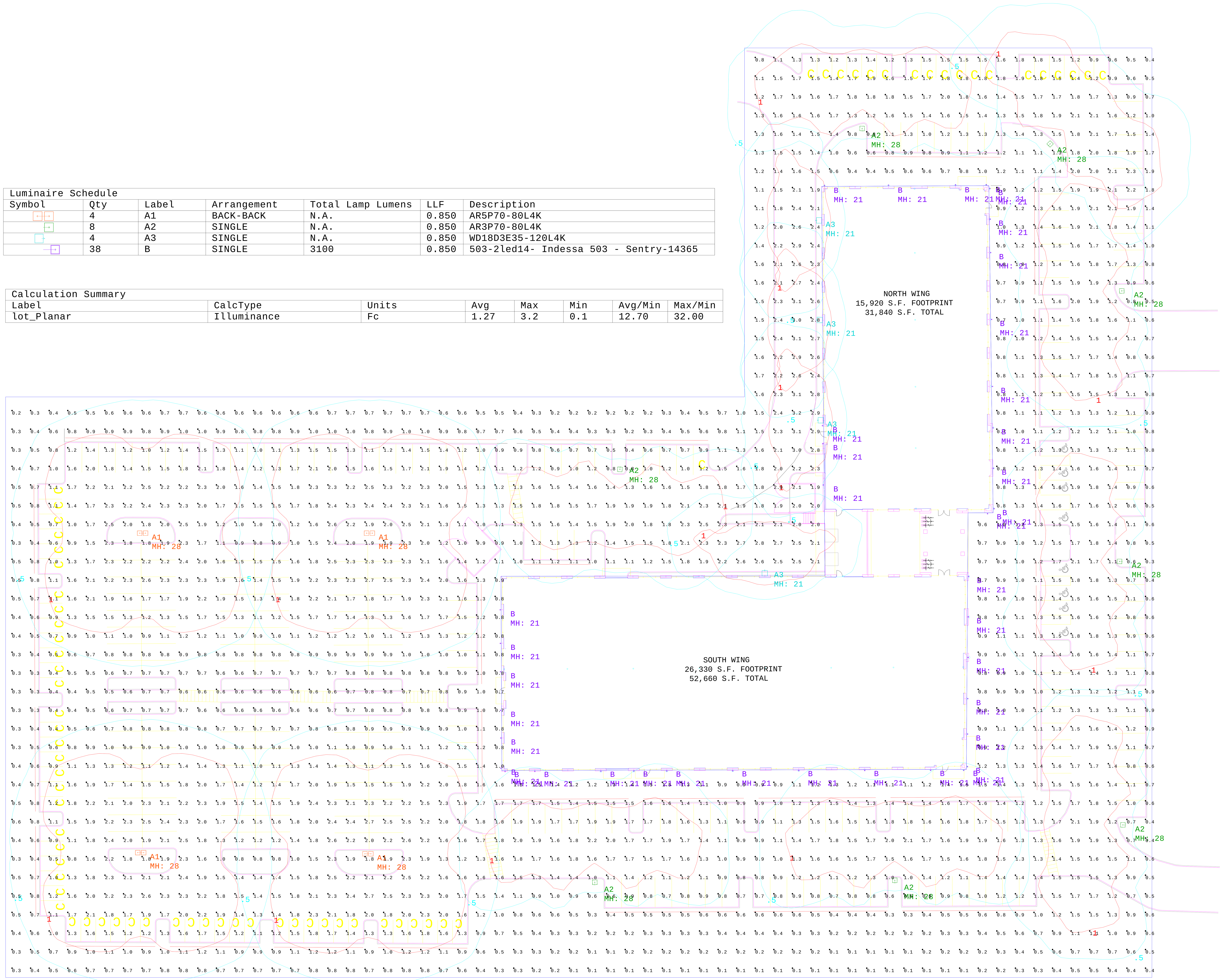
job no. 14-041
drawn EM
checked -
date 8-21-15

SITE PLAN

sheet A1.0

Luminaire Schedule						
Symbol	Qty	Label	Arrangement	Total Lamp Lumens	LLF	Description
	4	A1	BACK-BACK	N.A.	0.850	AR5P70-80L4K
	8	A2	SINGLE	N.A.	0.850	AR3P70-80L4K
	4	A3	SINGLE	N.A.	0.850	WD18D3E35-120L4K
	38	B	SINGLE	3100	0.850	503-2led14- Indessa 503 - Sentry-14365

Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
lot_Planar	Illuminance	Fc	1.27	3.2	0.1	12.70	32.00



lighting group northwest

Comments

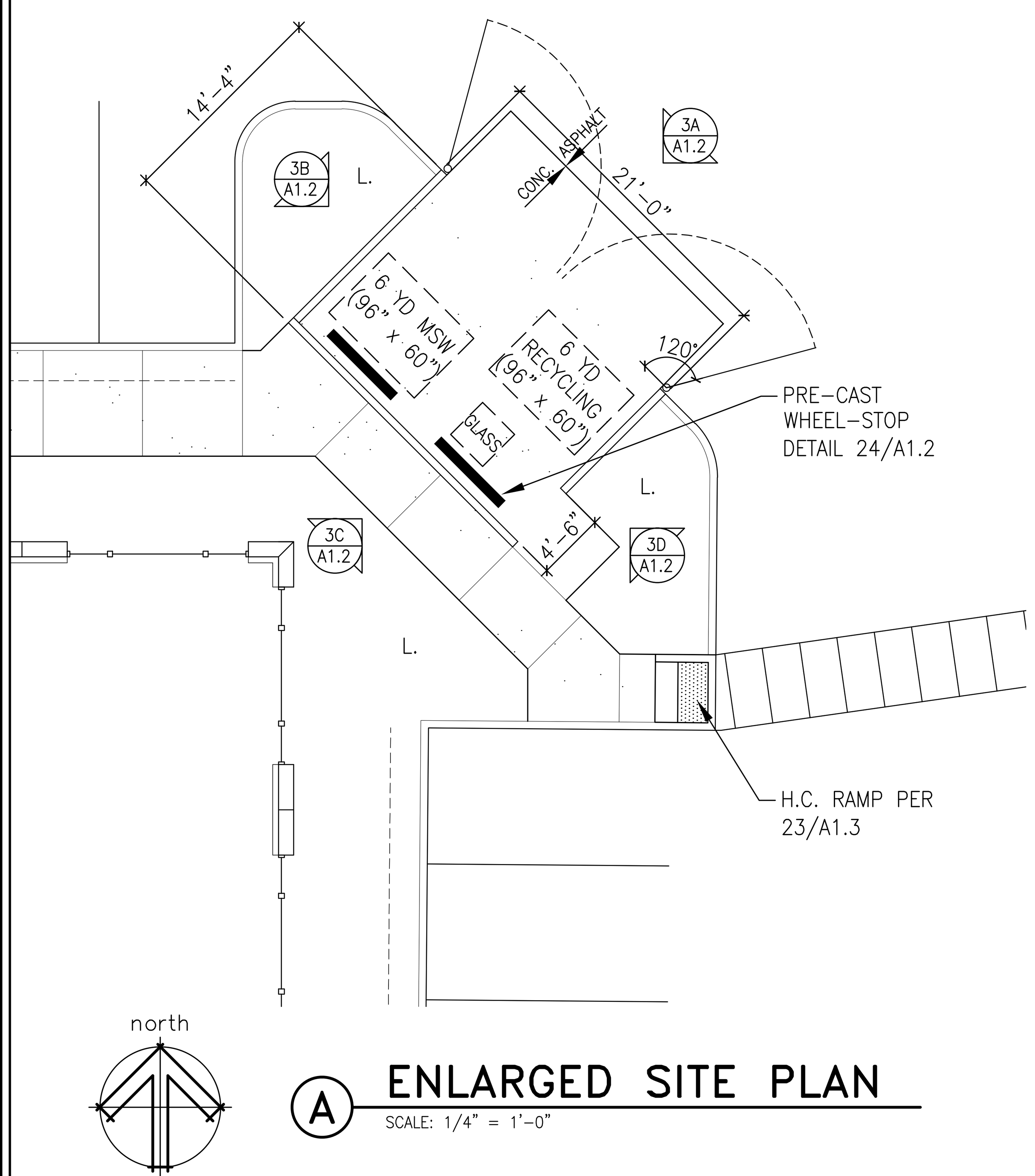
Drawn By:Roni Brizitski

Checked By:

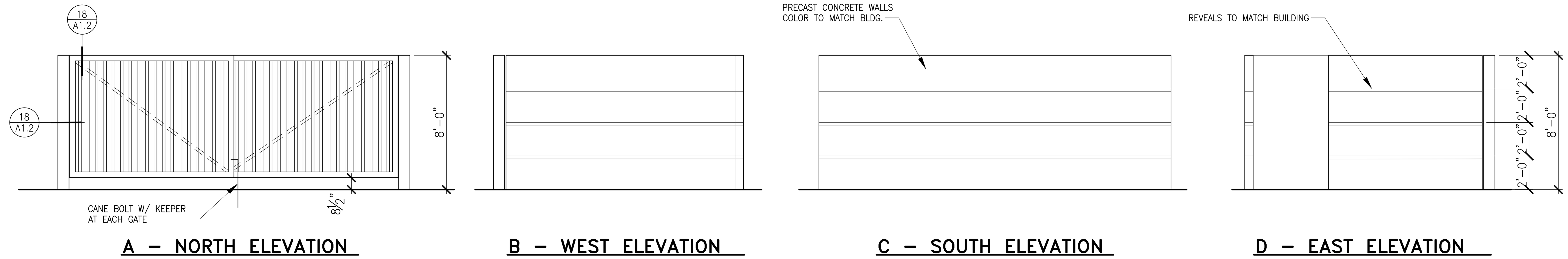
Date:7/9/2015

Scale:NONE

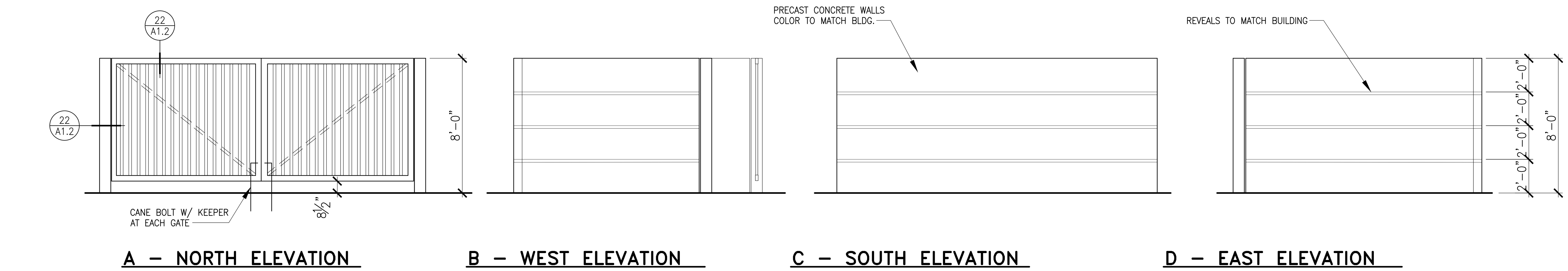
LEVETON



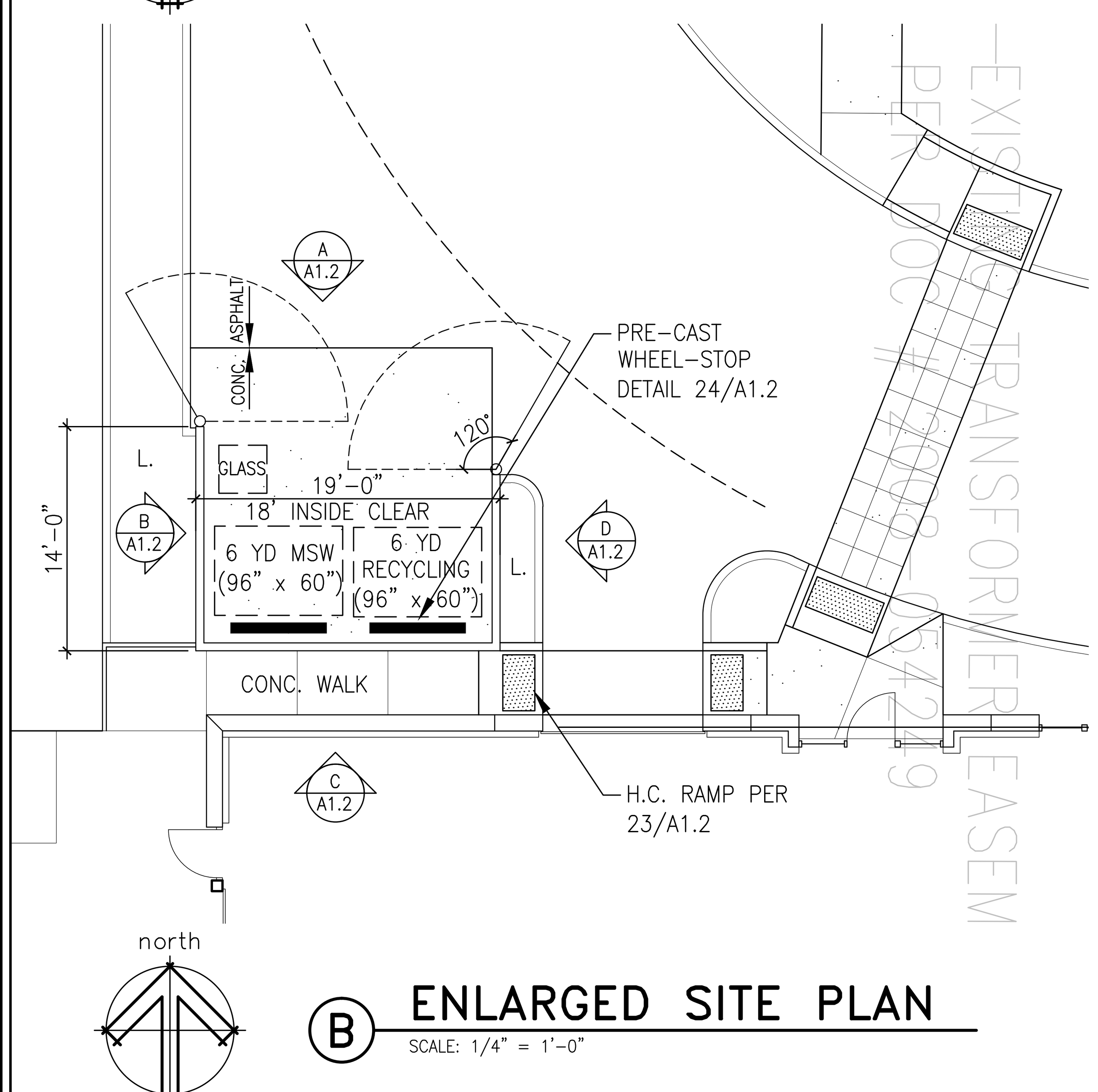
A ENLARGED SITE PLAN
SCALE: 1/4" = 1'-0"



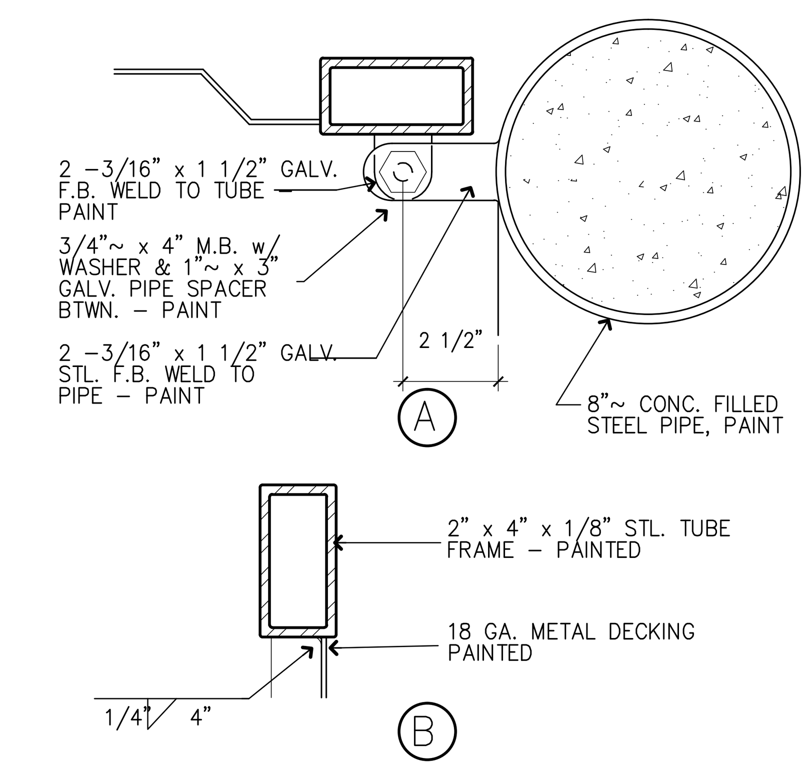
3 REFUSE RECYCLE ENCLOSURE ELEVATIONS
SCALE: 1/4" = 1'-0"



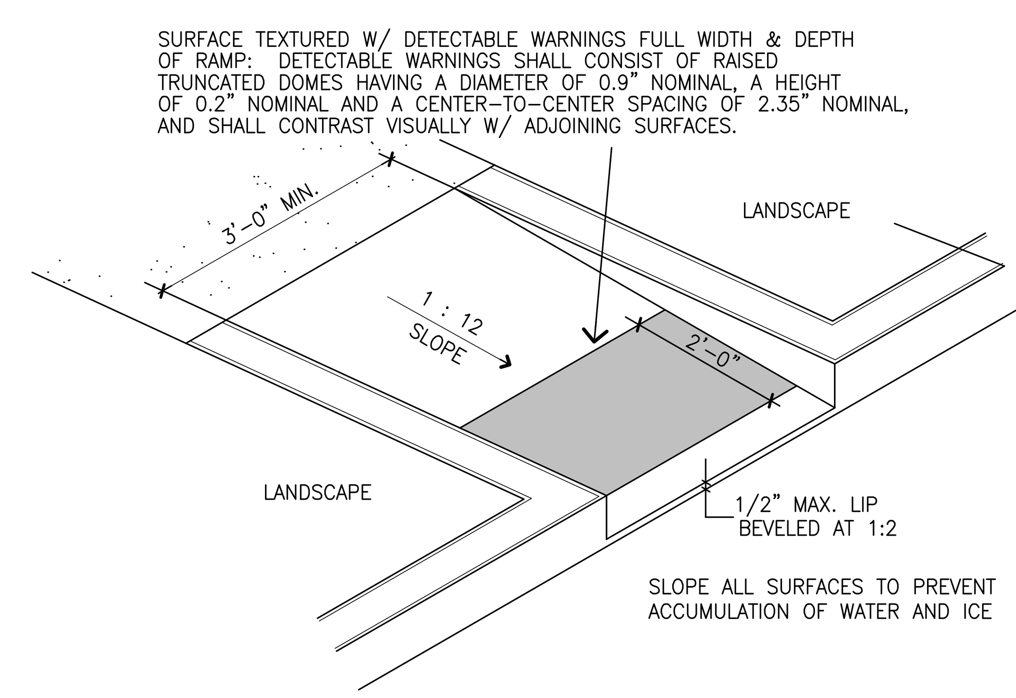
9 REFUSE RECYCLE ENCLOSURE ELEVATIONS
SCALE: 1/4" = 1'-0"



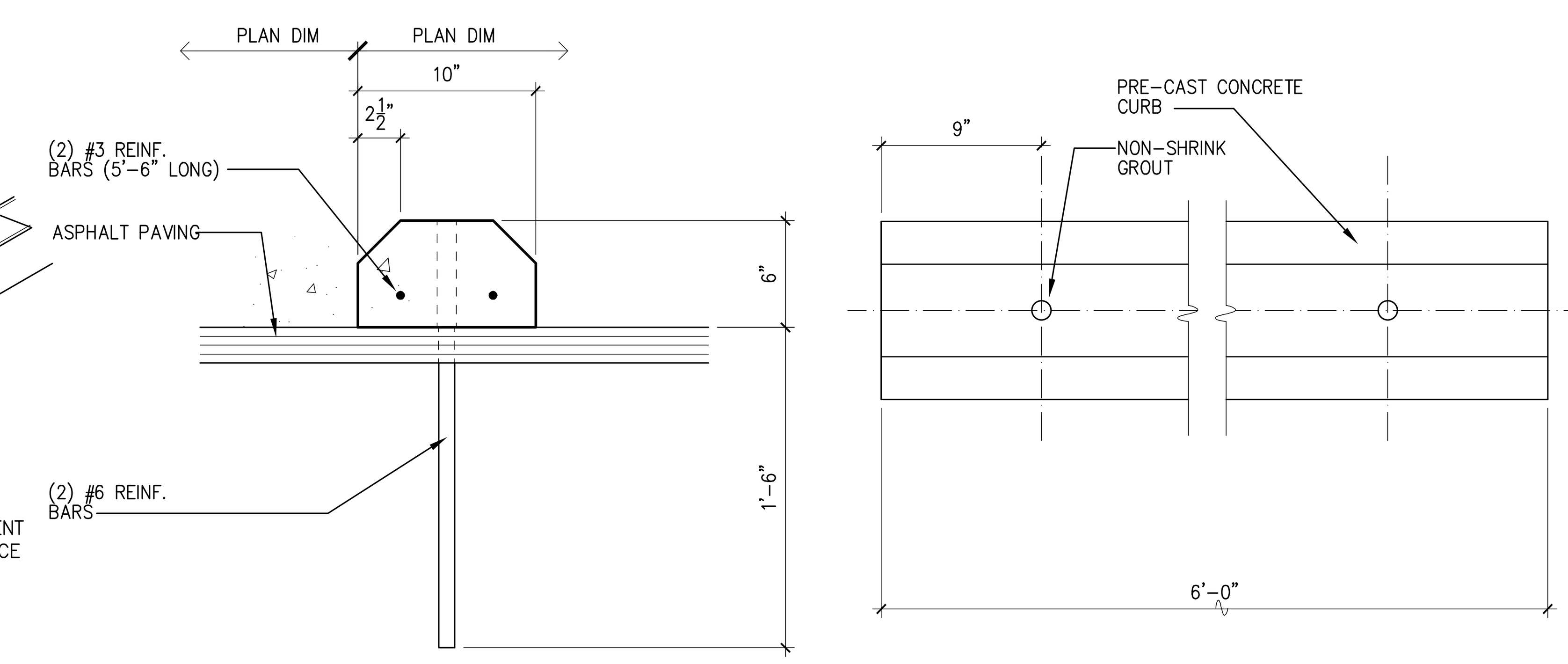
B ENLARGED SITE PLAN
SCALE: 1/4" = 1'-0"



22 GATE DETAIL
SCALE: N.T.S.



23 ACCESSIBLE CURB RAMP
SCALE: N.T.S.



24 PRECAST WHEEL STOP
SCALE: 1 1/2" = 1'-0"

14-041 job no.
EM drawn
– checked
10-19-15 date

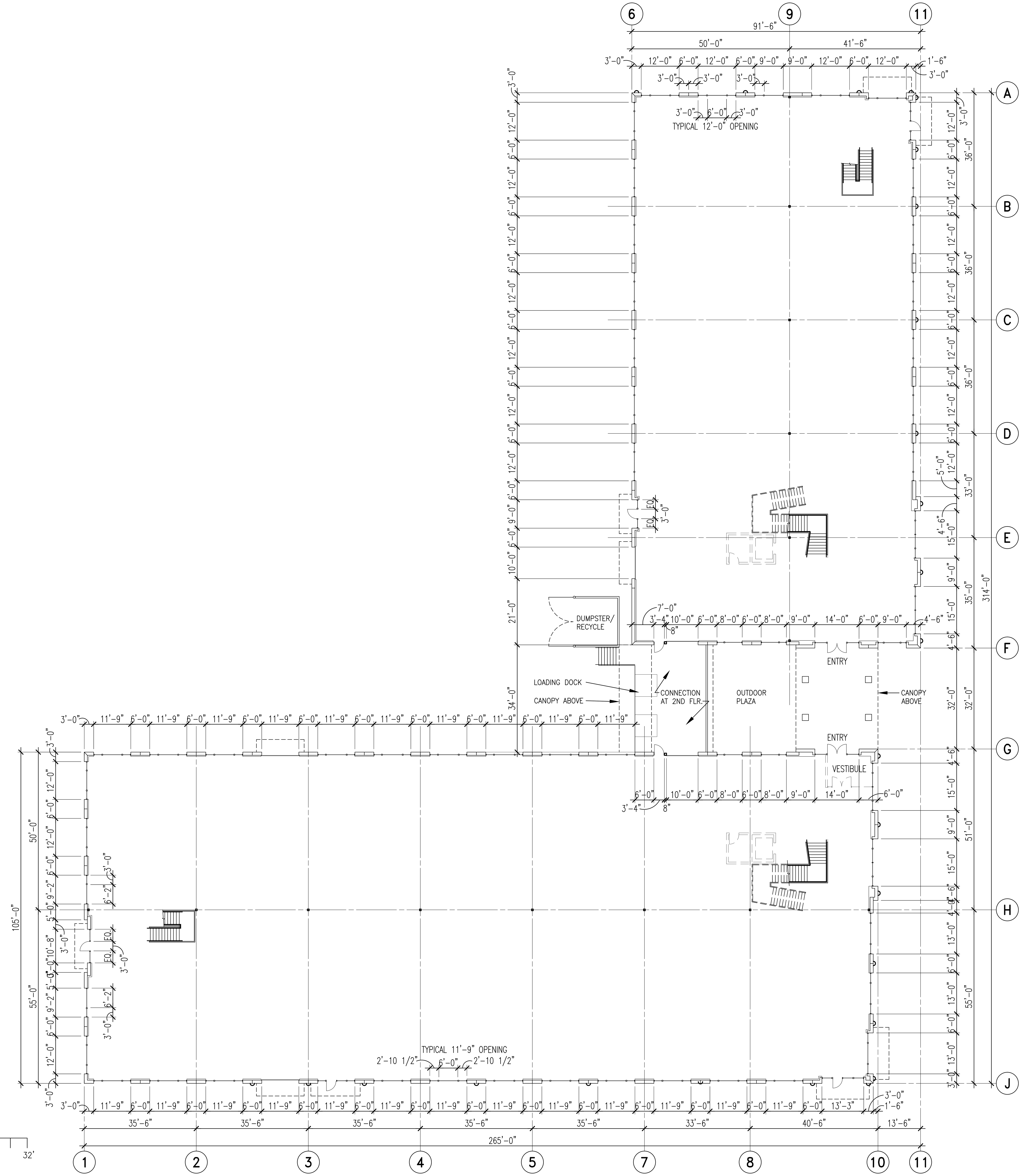
no.	revision	date
	ARCHITECTURAL REVIEW SUBMITTAL	10-19-15

LEVETON
SW 108th Avenue at SW Leveton Drive
Tualatin, OR 97062
for: Leveton LLC

DUMPSTER PLANS AND ELEVATIONS

LANCE MUELLER & ASSOCIATES
A R C H I T E C T S A I A
130 LAKESIDE • SUITE 250 • SEATTLE, WA 98122 • (206) 325-2553

sheet
A1.2



north

FIRST FLOOR PLAN

1/16" = 1'-0"

0 16' 32'

14-041 job no.			
EM drawn			
- checked		ARCHITECTURAL REVIEW SUBMITTAL	8-21-15
8-21-15 date	no.	revision	date

LEVETON

SW 108th Avenue at SW Leveton Drive

Tualatin, OR

for: Leveton LLC

LANCE MUELLER & ASSOCIATES

A R C H I T E C T S A I A

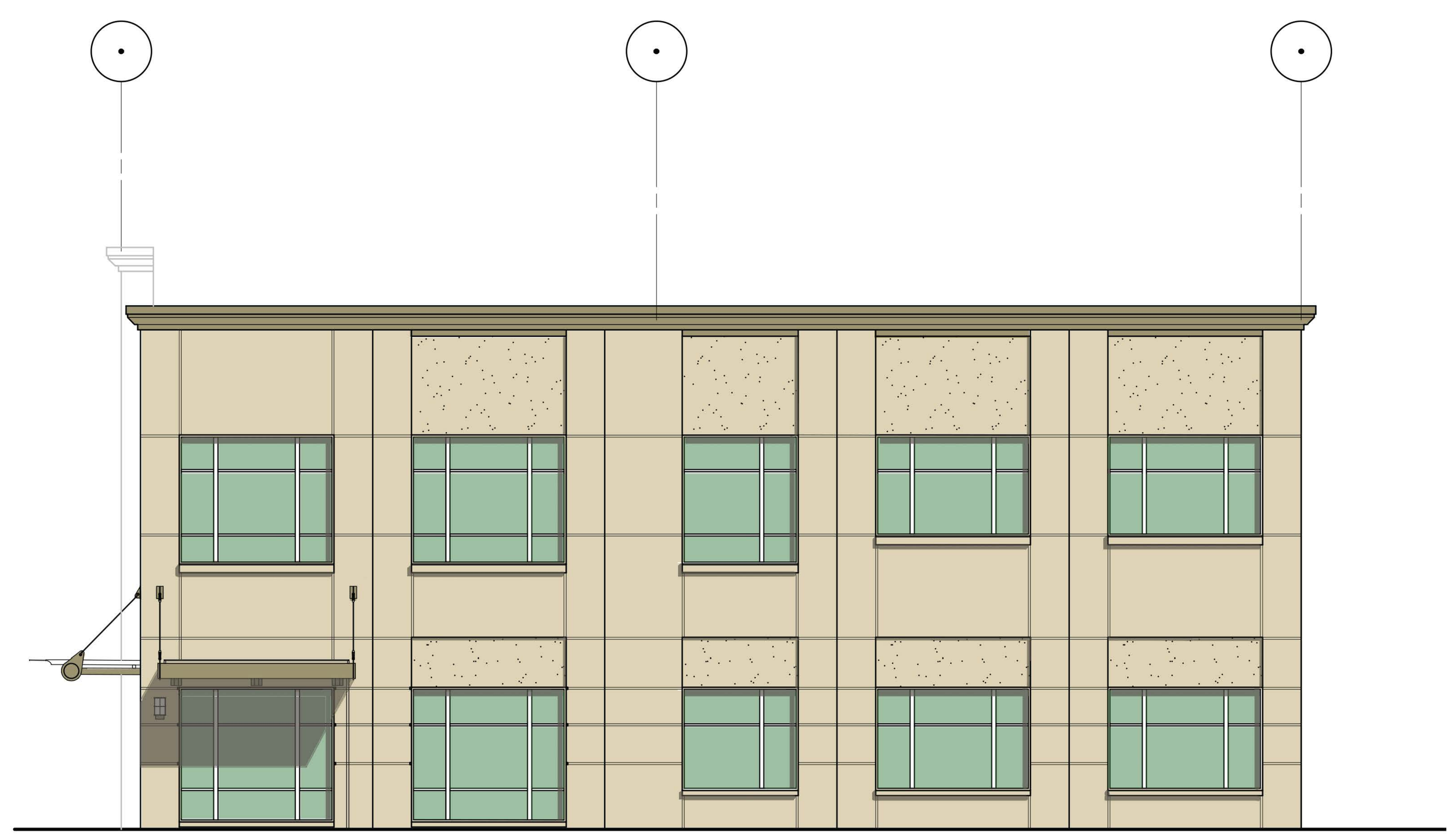
130 LAKESIDE • SUITE 250 • SEATTLE, WA 98122 • (206) 325-2553

1ST FLOOR PLAN

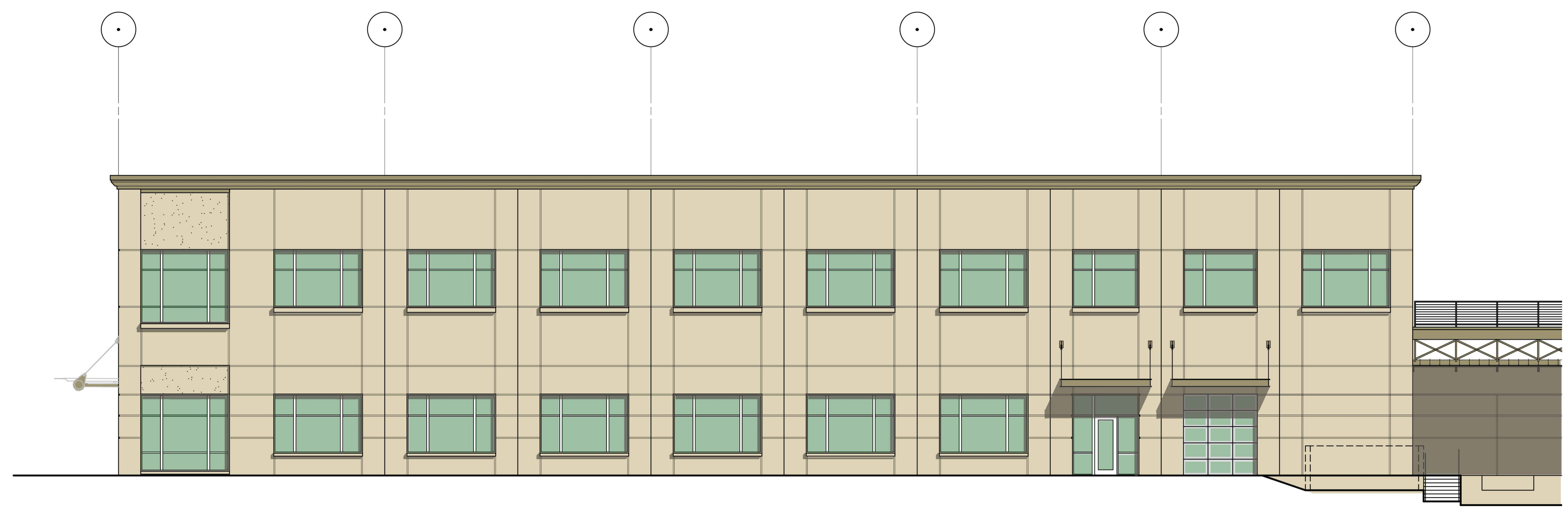
sheet

A2.0

EAST ELEVATION
3/32" = 1'-0"



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



WEST ELEVATION
3/32" = 1'-0"

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

Exterior Materials & Finishes:

Mark:	Item:	Description:	Remarks:
1.	Coping:	Galvanized metal, paint.	Color: light metallic bronze.
2.	Precast Walls (Stained):	Natural gray concrete w/ Okon sealer/stain.	Color: as selected in neutral range.
3.	Glass:	Blue-green tint insulated (PPG Solarban 60	Glass tint color: PPG Atlantica
4.	Storefrolnt:	Nominal 2" x 4" aluminum, paint	Color: light metallic bronze.
5.	Main Canopy:	Glass/aluminum glazing system (Deamor or approved) on steel frame, paint.	Glass Color: green tint. Alum Color: clear anod. alum. Steel Color: dark bronze.
6.	Other Canopies:	Steel frame, painted.	Color: dark bronze.
7.	Sconce:	Cast aluminum LED (example is W1 in Wilsonville).	Alum Color: dark bronze.

no.	revision	date
	ARCHITECTURAL REVIEW SUBMITTAL	8-21-15

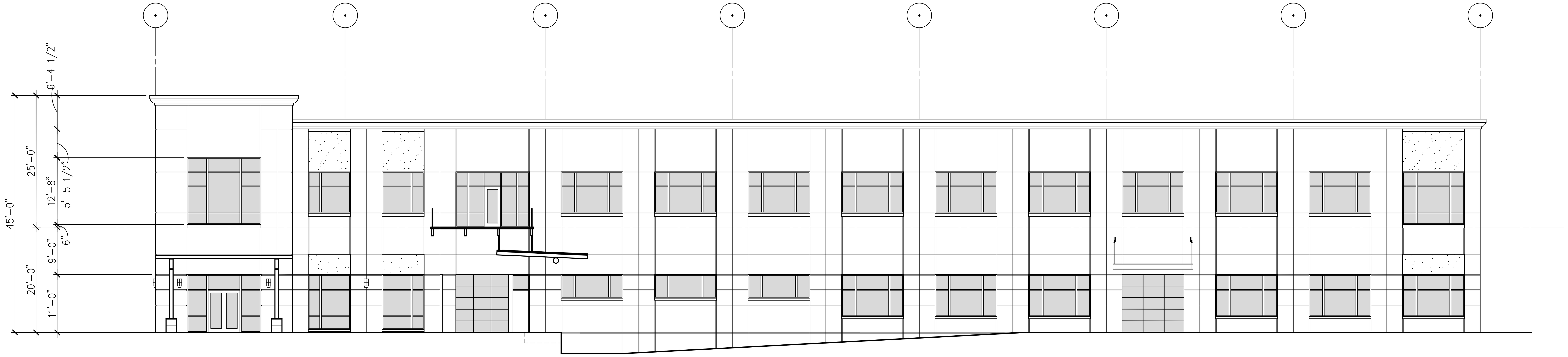
14-041 job no.
EM drawn
- checked
8-21-15 date

LEVETON
SW 108th Avenue at SW Leveton Drive
Tualatin, OR
for: Leveton LLC

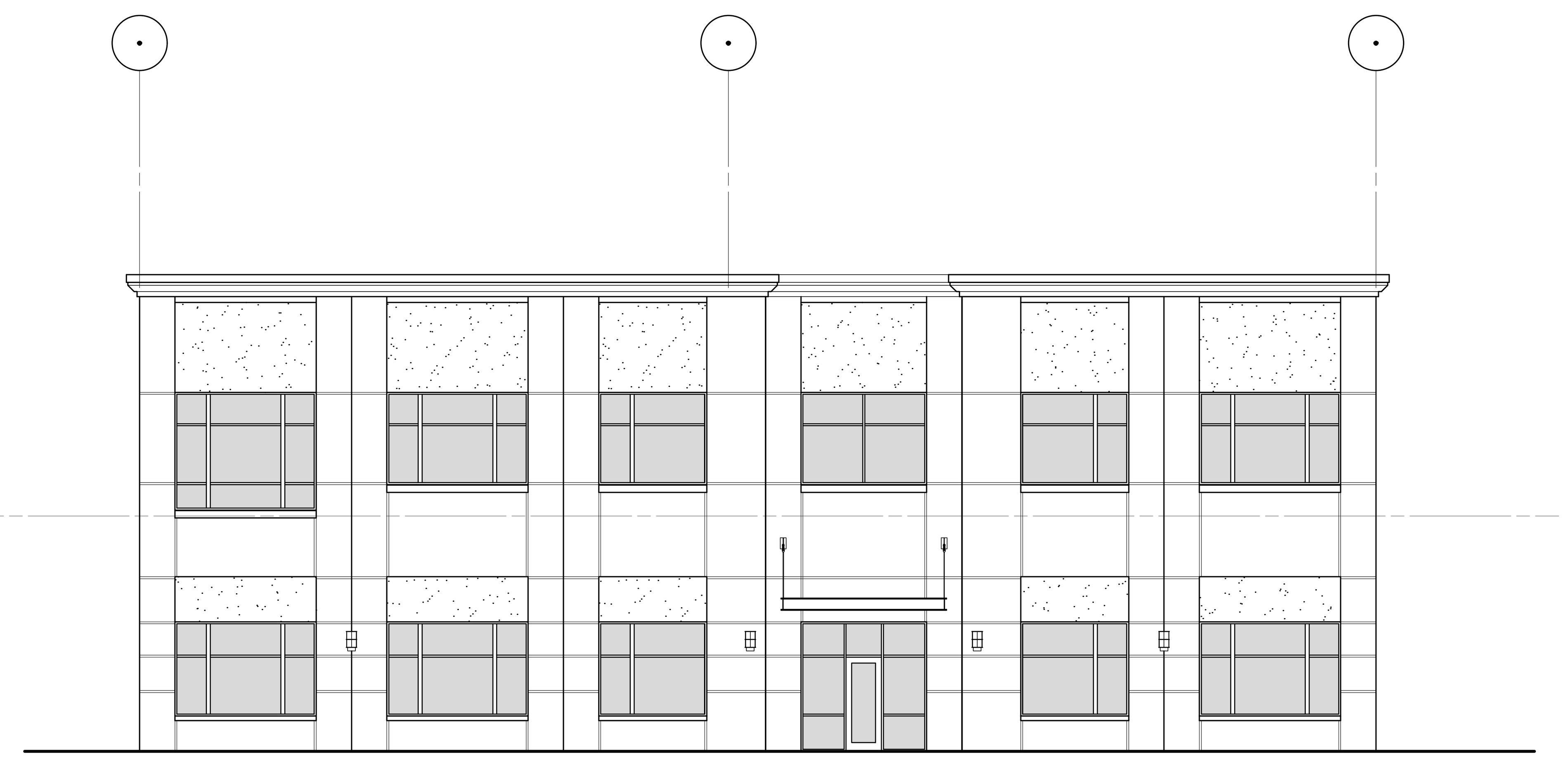
LANCE MUELLER & ASSOCIATES
ARCHITECTS AIA
130 LAKESIDE • SUITE 250 • SEATTLE, WA 98122 • (206) 325-2553

NORTH WING ELEVATIONS

sheet
A3.0

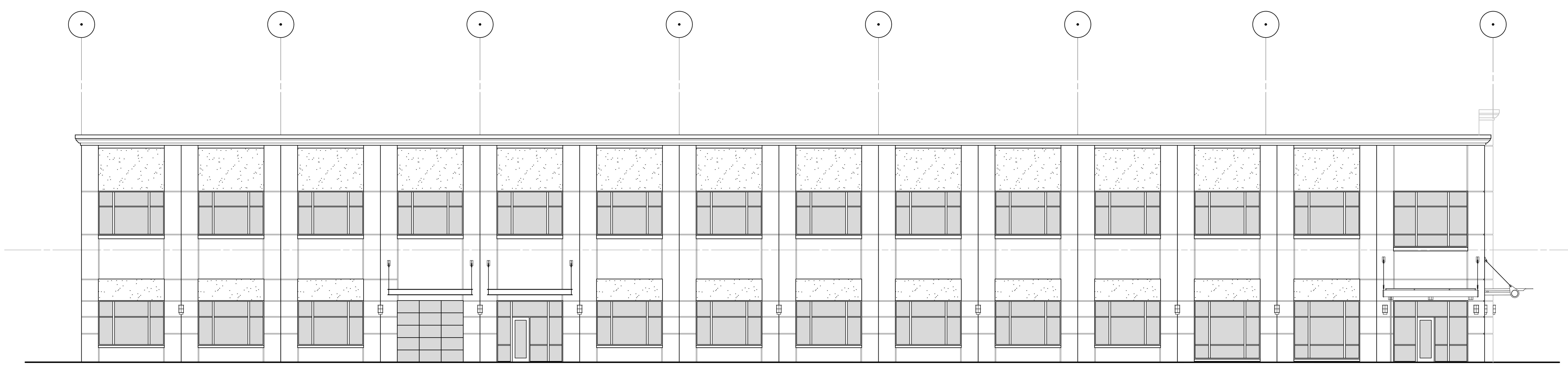


NORTH ELEVATION
3/32" = 1'-0"



WEST ELEVATION
3/32" = 1'-0"

EAST ELEVATION
3/32" = 1'-0"



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

Exterior Materials & Finishes:

Mark:	Item:	Description:	Remarks:
1.	Coping:	Galvanized metal, paint.	Color: light metallic bronze.
2.	Precast Walls (Stained):	Natural gray concrete w/ Okon sealer/stain.	Color: as selected in neutral range.
3.	Glass:	Blue-green tint insulated (PPG Solarban 60	Glass tint color: PPG Atlantica
4.	Storefrolnt:	Nominal 2" x 4" aluminum, paint	Color: light metallic bronze.
5.	Main Canopy:	Glass/aluminum glazing system (Deamor or approved) on steel frame, paint.	Glass Color: green tint. Alum Color: clear anod. alum. Steel Color: dark bronze.
6.	Other Canopies:	Steel frame, painted.	Color: dark bronze.
7.	Sconce:	Cast aluminum LED (example is W1 in Wilsonville).	Alum Color: dark bronze.

SOUTH WING ELEVATIONS

sheet A3.1

LANCE MUELLER & ASSOCIATES
A R C H I T E C T S A I A
130 LAKESIDE • SUITE 250 • SEATTLE, WA 98122 • (206) 325-2553

LEVETON
SW 108th Avenue at SW Leveton Drive
Tualatin, OR
for: Leveton LLC

14-041 job no.
EM drawn
– checked
8-21-15 date

no.	revision	date
	ARCHITECTURAL REVIEW SUBMITTAL	8-21-15

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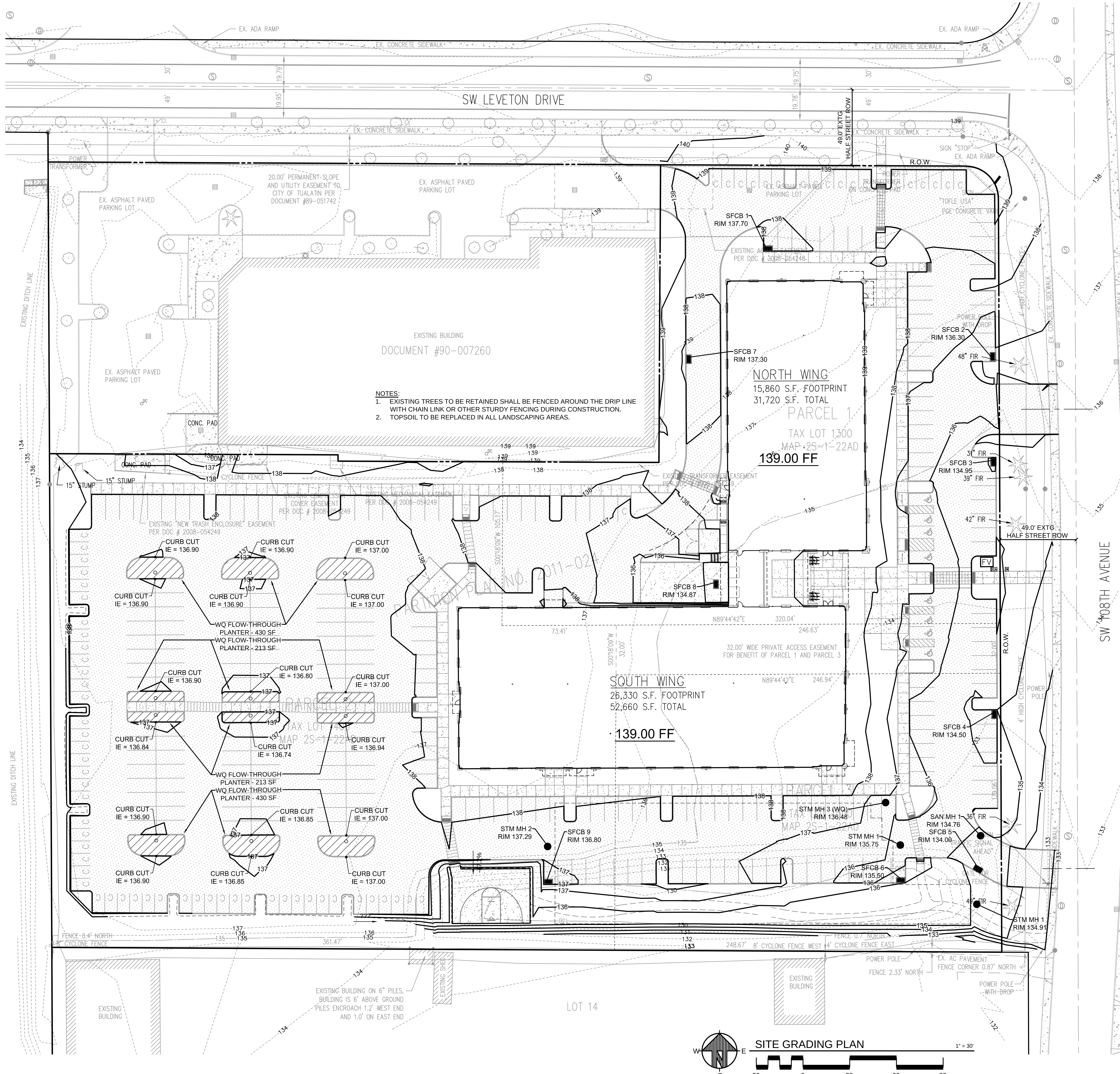


JOB NO.	20140303
DRAWN	RLB
CHECKED BY	BMD
DATE	JANUARY 2015

REV.	DESCRIPTION	DATE
no.	revision	date

LEVETON

SW 108th Avenue at SW Leveton Drive
Tualatin, OR
for: Leveton LLC

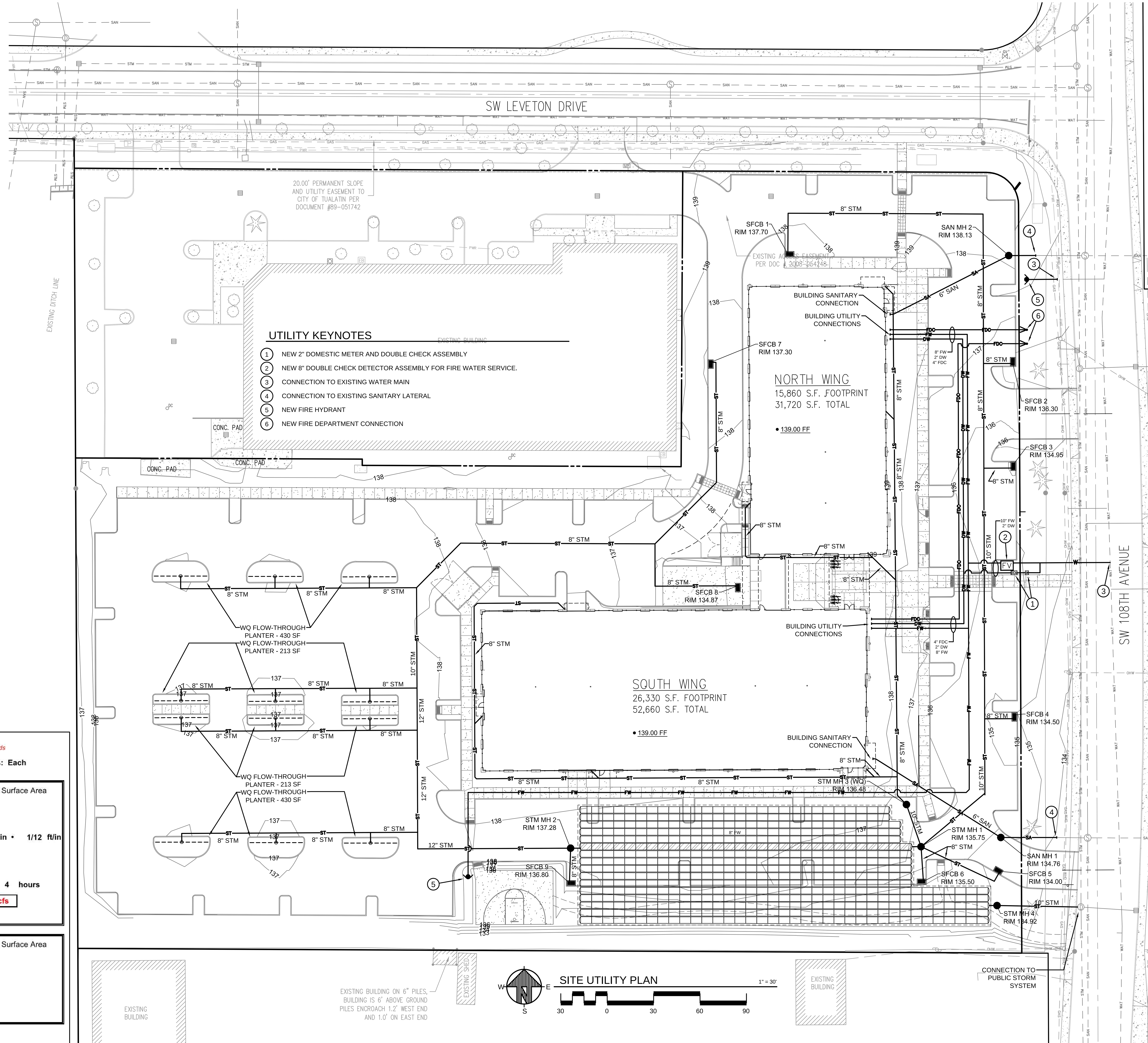
LANCE MUELLER & ASSOCIATES ARCHITECTS

VLMK ENGINEERING + DESIGN
3933 SW Kelly Avenue Portland, Oregon 97239 | tel. 503.222.4453 | fax. 503.248.9263 | www.vlmk.com

SITE GRADING PLAN

sheet

C1.0



Water Quality Calculations

Based on the CWS June 2007 Design and Construction Standards

Treat Using Contech StormFilter Catch Basin Units: Each Cartridge Treats 15 gpm (0.033 cfs)

East Lot **130,322** sf of Impervious Surface Area

Water Quality Volume (V_{wq}):

V_{wq} = Impervious Area • 0.36"

V_{wq} = 130,322 sf • 0.36 in • 1/12 ft/in

V_{wq} = 3,910 cf

Water Quality Flowrate (Q_{wq}):

Q_{wq} = V_{wq} / Time **Time = 4 hours**

Q_{wq} = 0.272 cfs < 0.300 cfs

Use Nine Cartridge Catch Basin Unit(s)

West Lot **57,116** sf of Impervious Surface Area

Flow Through Planter Sizing:

Required Area = Impervious Area • 0.06

Req. Area = 57,116 sf • 0.06

Req. Area = 3,427 sf

FT Planter Area Provided= 3,858 sf

Water Quality Requirements Met

JOB_NO	DRAWN	CHECKED_BY	DATE
20140303	RLB	BMD	JANUARY 2015

REV#	DESCRIPTION	DATE
no.	revision	date

LEVETON

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Tualatin, OR
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SITE UTILITY PLAN

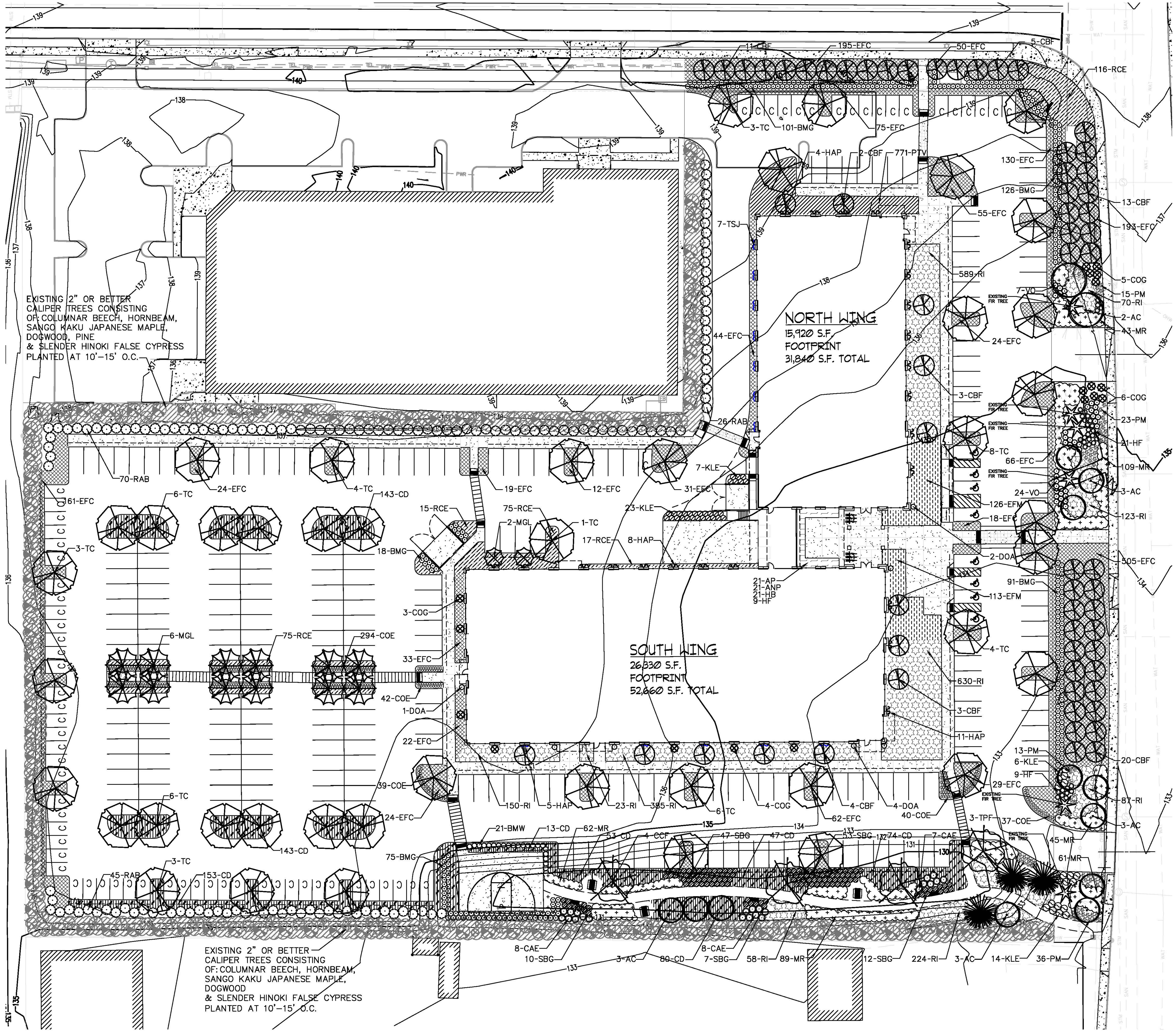
sheet
C2.0

PLANT LIST:

SYM.	#	ABBREV.	LATIN NAME/ Common Name	SIZE	SPACING
			TREES		
	14	AC	ACER CIRCINATUM Vine Maple (Min. 4 Stem)	6–7'	As shown
	61	CBF	CARPINUS BETULUS "FRANS FONTAINE" Frans Fontaine Hornbeam	1 3/4" cal	As shown
	4	CCF	CERCIS CANADENSIS "FOREST PANSY" Forest Pansy Canadian Redbud	1 1/2" cal	As shown
	18	COG	CHAMAECYPARIS OBTUSA "GRACILIS" Hinoki Cypress	6'	As shown
	8	MGL	MAGNOLIA GRANDIFLORA "LITTLE GEM" Little Gem Magnolia	15 gal.	As shown
	44	TC	TILIA CORDATA "GREENSPIRE" Greenspire Linden	2" cal.	As shown
	3	TPF	THUJA PLICATA "FASTIGIATA" Hogan Cedar	6–7'	As shown
			SHRUBS		
	406	BMG	BUXUS MICRO. JAP. 'GREEN BEAUTY' Green Beauty Boxwood	5 gal.	3' o.c.
	21	BMW	BUXUS MICRO. JAP. 'WINTERGREEN' Wintergreen Boxwood	2 gal.	3' o.c.
	23	CAE	CORNUS ALBA "BAILHALO" Ivory Halo Dogwood	2 gal.	4' o.c.
	7	DOA	DAPHNE ODORA "AUREO-MARGINATA" Aureo-marginata Winter Daphne	2 gal.	3' o.c.
	30	HF	HOSTA X 'FRANCEE' Francee Plantain Lily	1 gal.	3' o.c.
	50	KLE	KALMIA LATIFOLIA "ELF" Elf Mountain Laurel	2 gal.	3' o.c.
	141	RAB	RHODODENDRON "A. BEDFORD" A. Bedford Rhododendron	24" high	6' o.c.
	286	RI	RHODODENDRON IMPEDITUM DWARF PURPLE RHODODENDRON	1 gal.	2' o.c.
	129	SBG	SPIRAEA X BUM. "GOLDMOUND" Goldmound Spirea	2 gal.	3' o.c.
	31	VO	VACCINUM OVATUM Evergreen Huckleberry	2 gal.	3' o.c.
			GRASSES AND GROUNDCOVERS		
	706	CD	COTONEASTER DAMMERI Bearberry Cotoneaster	1 gal.	3' o.c.
	452	COE	CAREX HACHIJOENSIS 'EVERGOLD' Carex Evergold Sedge	1 gal.	18" o.c.
	859	EFC	EUONYMUS FORTUNEI "COLORATUS" Purple Wintercreeper Euonymus	1 gal.	3' o.c.
	239	EFM	EUONYMUS FORTUNEI "MINIMUS" Minimus Wintercreeper Euonymus	1 gal.	3' o.c.
	87	PM	POLYSTICHUM MUNITUM Sword Fern	1 gal.	30" o.c.
	409	MR	MAHONIA REPENS Creeping Mahonia	2 gal.	30" o.c.
	771	PTV	PACHYSANDRA TERMINALIS "VARIEGATA" Variegated Japanese Spurge	4" pot	18" o.c.
	298	RCE	RUBUS CALCYNOIDES "EMERALD CARPET" Emerald Carpet Bramble	1 gal.	3' o.c.
			MIXED NATIVE SHADE LOVING PLANTS:		
	9	HF	HOSTA X 'FRANCEE' Francee Plantain Lily	1 gal.	3' o.c.
	21	ANP	ATHYRIUM NIPONICUM "PICTUM" Japanese Painted Fern	1 gal.	2' o.c.
	21	AP	ADIANTUM PEDATUM American Maidenhair Fern	1 gal.	2' o.c.
	21	HB	HELEBORUS Heleborus	1 gal.	2' o.c.
			VINES		
	28	HAP	HYDRANGEA ANOMALA SUB. PETIOLARIS Climbing Hydrangea	3 gal.	as shown
	7	TSJ	TRACHELOSPERMUM Star Jasmine	3 gal.	as shown
			BENCH		
			PICNIC TABLE		

GENERAL NOTES:

1. Contractor is to verify all plant quantities.
2. Adjust plantings in the field as necessary.
3. Project is to be irrigated by an automatic, underground system, which will provide full coverage for all plant material. System is to be design/ build by Landscape Contractor. Guarantee system for a minimum one year. Show drip systems as alternate bid only.
4. All plants are to be fully foliaged, well branched and true to form.
5. Existing trees to be retained shall be fenced around the drip line with chain link or other sturdy fencing during construction. Indicate topsoil replacement in all landscape areas.
6. Contractor is to notify Landscape Architect and/or Owner's Representative of any site changes or conditions that may be detrimental to plant health or cause future problems.



LANDSCAPE PLAN

SCALE 1" = 30'-0"

REVISIONS | NO. | DATE

REGISTERED LANDSCAPE ARCHITECT
JANET L OTTEN
OREGON
EXP. 12/31/16

OTTEN LANDSCAPE ARCHITECTS Inc.
3933 SW Kelly Avenue • Suite B • Portland, Oregon 97239-4393
Phone (503) 972-0311 • Fax (503) 972-0314 • www.ottenla.com

LEVETON
SW 108TH AVENUE AT SW LEVETON DRIVE
TUALATIN, OR

LANDSCAPE PLAN

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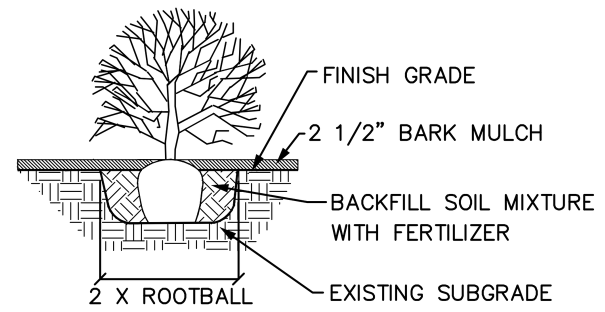
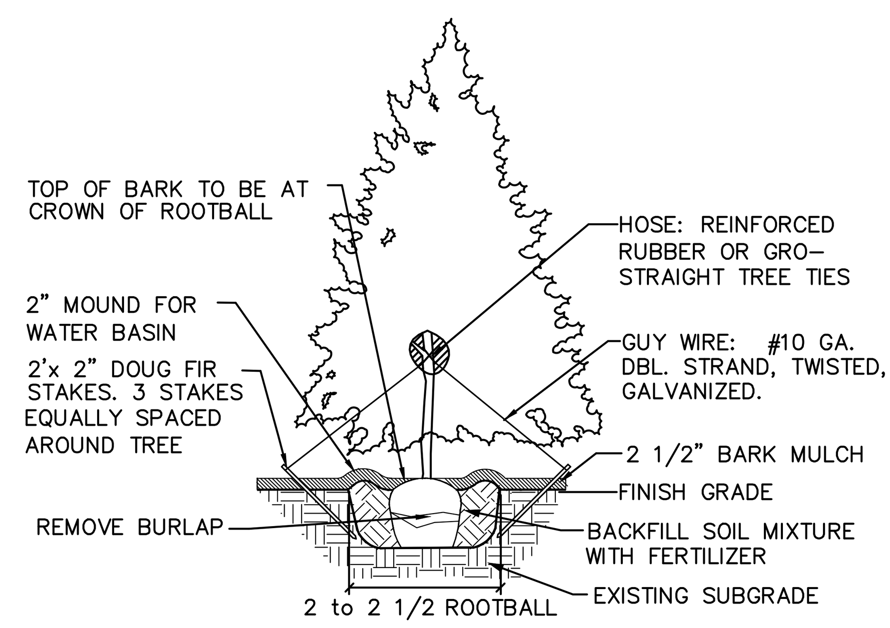
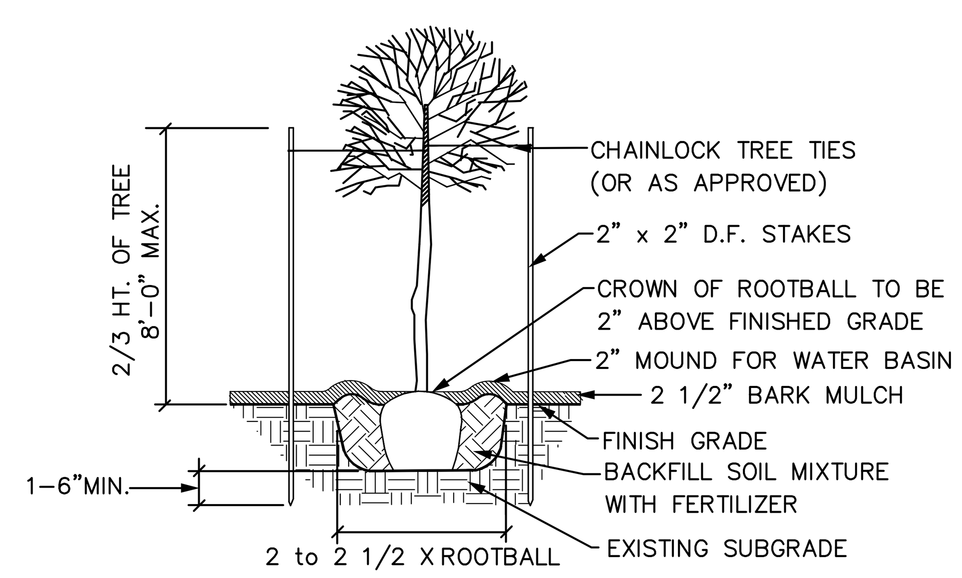


SHRUB PLANTING DETAIL
NOT TO SCALE



EVERGREEN TREE STAKING DETAIL
NOT TO SCALE



DECIDUOUS TREE PLANTING DETAIL
NOT TO SCALE

OUTLINE SPECIFICATIONS PLANTING AND SEEDING:

GENERAL: All plants shall conform to all applicable standards of the latest edition of the "American Association of Nurserymen Standards", A.N.S.I. Z60.1 – 1973. Meet or exceed the regulations and laws of Federal, State, and County regulations, regarding the inspection of plant materials, certified as free from hazardous insects, disease, and noxious weeds, and certified fit for sale in Oregon.

The apparent silence of the Specifications and Plans as to any detail, or the apparent omission from them of a detailed description concerning any point, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of first quality are to be used. All interpretations of these Specifications shall be made upon the basis above stated.

Landscape contractor shall perform a site visit prior to bidding to view existing conditions.

PERFORMANCE QUALITY ASSURANCE: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary horticultural practices and who are completely familiar with the specified requirements and methods needed for the proper performance of the work of this section.

NOTIFICATION: Give Landscape Architect minimum of 2 days advance notice of times for inspections. Inspections at growing site does not preclude Landscape Architect's right of rejection of deficient materials at project site. Each plant failing to meet the above mentioned "Standards" or otherwise failing to meet the specified requirements as set forth shall be rejected and removed immediately from the premises by the Contractor and at his expense, and replaced with satisfactory plants or trees conforming to the specified requirements.

SUBSTITUTIONS: Only as approved by the Landscape Architect or the Owner's Representative.

GUARANTEE AND REPLACEMENT: All plant material shall be guaranteed from final acceptance for one full growing season or one year, whichever is longer. During this period the Contractor shall replace any plant material that is not in good condition and producing new growth (except that material damaged by severe weather conditions, due to Owner's negligence, normally unforeseen peculiarities of the planting site, or lost due to vandalism). Guarantee to replace, at no cost to Owner, unacceptable plant materials with plants of same variety, age, size and quality as plant originally specified. Conditions of guarantee on replacement plant shall be same as for original plant.

Landscape Contractor shall keep on site for Owner's Representative's inspection, all receipts for soil amendment and topsoil deliveries.

PROTECTION: Protect existing roads, sidewalks, and curbs, landscaping, and other features remaining as final work. Verify location of underground utilities prior to doing work. Repair and make good any damage to service lines, existing features, etc. caused by landscaping installation.

PLANT QUALITY ASSURANCE: Deliver direct from nursery. Maintain and protect roots of plant material from drying or other possible injury. Store plants in shade and protect them from weather immediately upon delivery, if not to be planted within four hours.

Nursery stock shall be healthy, well branched and rooted, formed true to variety and species, full foliaged, free of disease, injury, defects, insects, weeds, and weed roots. Trees shall have straight trunks, symmetrical tips, and have an intact single leader. Any trees with double leaders will be rejected upon inspection. All Plants: True to name, with one of each bundle or lot tagged with the common and botanical name and size of the plants in accordance with standards of practice of the American Association of Nurserymen, and shall conform to the Standardized Plant Names, 1942 Edition.

Container grown stock: Small container–grown plants, furnished in removable containers, shall be well rooted to ensure healthy growth. **Grow container plants in containers a minimum of one year** prior to delivery, with roots filling container but not root bound. Bare root stock: Roots well–branched and fibrous. Balled and burlapped (B&B): Ball shall be of natural size to ensure healthy growth. Ball shall be firm and the burlap sound. No loose or made ball will be acceptable.

TOPSOIL AND FINAL GRADES: Landscape Contractor is to verify with the General Contractor if the on site topsoil is or is not conducive to proper plant growth. Supply alternate bid for imported topsoil.

Landscape Contractor is to supply and place 12" of topsoil in planting beds and 6" in lawn areas. If topsoil stockpiled on site is not conducive to proper plant growth, the Landscape Contractor shall import the required amount. Landscape Contractor is to submit samples of the imported soil and/or soil amendments to the Landscape Architect. The topsoil shall be a sandy loam, free of all weeds and debris inimical to lawn or plant growth.

Landscaping shall include finished grades and even distribution of topsoil to meet planting requirements. Grades and slopes shall be as indicated. Planting bed grades shall be approximately 3" below adjacent walks, paving, finished grade lines, etc., to allow for bark application. Finish grading shall remove all depressions or low areas to provide positive drainage throughout the area.

PLANTING SPECIFICATIONS:

HERBICIDES: Prior to soil preparation, all areas showing any undesirable weed or grass growth shall be treated with Round–up in strict accordance with the manufacturer's instructions.

SOIL PREPARATION: Work all areas by rototilling to a minimum depth of 8". Remove all stones (over 1½" size), sticks, mortar, large clumps of vegetation, roots, debris, or extraneous matter turned up in working. Soil shall be of a homogeneous fine texture. Level, smooth and lightly compact area to plus or minus .10 of required grades.

In groundcover areas add 2" of compost (or as approved) and till in to the top 6" of soil.

PLANTING HOLE: Lay out all plant locations and excavate all soils from planting holes to 2 1/2 times the root ball or root system width. Loosen soil inside bottom of plant hole. Dispose of any "subsoil" or debris from excavation. Check drainage of planting hole with water, and adjust any area showing drainage problems.

SOIL MIX: Prepare soil mix in each planting hole by mixing:
2 part native topsoil (no subsoil)
1 part compost (as approved)

Thoroughly mix in planting hole and add fertilizers at the following rates:
Small shrubs – 1/8 lb./ plant
Shrubs – 1/3 to 1/2 lb./ plant
Trees – 1/3 to 1 lb./ plant

FERTILIZER: For trees and shrubs use Commercial Fertilizer "A" Inorganic (5–4–3) with micro–nutrients and 50% slow releasing nitrogen. For initial application in fine seed lawn areas use Commercial Fertilizer "B" (8–16–8) with micro–nutrients and 50% slow–releasing nitrogen. For lawn maintenance use Commercial Fertilizer "C" (22–16–8) with micro–nutrients and 50% slow–releasing nitrogen. DO NOT apply fertilizer to Water Quality Swale.

PLANTING TREES AND SHRUBS: Plant upright and face to give best appearance or relationship to adjacent plants and structures. Place 6" minimum, lightly compacted layer of prepared planting soil under root system. Loosen and remove twine binding and burlap from top 1/2 of root balls. Cut off cleanly all broken or frayed roots, and spread roots out. Stagger Plants in rows. Backfill planting hole with soil mix while working each layer to eliminate voids.

When approximately 2/3 full, water thoroughly, then allow water to soak away. Place remaining backfill and dish surface around plant to hold water. Final grade should keep root ball slightly above surrounding grade, not to exceed 1". Water again until no more water is absorbed. Initial watering by irrigation system is not allowed.

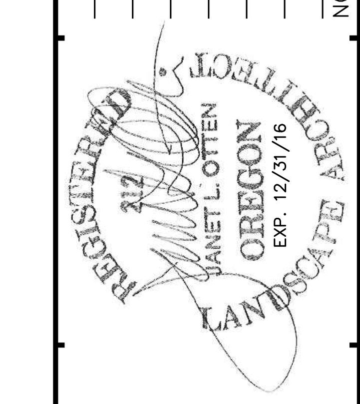
STAKING OF TREES: Stake or guy all trees. Stakes shall be 2" X 2" (nom.) quality tree stakes with point. They shall be of Douglas Fir, clear and sturdy. Stake to be minimum 2/3 the height of the tree, not to exceed 8'–0". Drive stake firmly 1'–6" below the planting hole. Tree ties for deciduous trees shall be "Chainlock" (or better). For Evergreen trees use "Gro–Strait" Tree Ties (or a reinforced rubber hose and guy wires) with guy wires of a minimum 2 strand twisted 12 ga. wire. Staking and guying shall be loose enough to allow movement of tree while holding tree upright.

MULCHING OF PLANTINGS: Mulch planting areas with dark, aged, medium grind fir or hemlock bark (aged at least 6 months) to a depth of 2" in ground cover areas and 2½" in shrub beds. Apply evenly, not higher than grade of plant as it came from the nursery, and rake to a smooth finish. Water thoroughly, then hose down planting area with fine spray to wash leaves of plants.

GENERAL MAINTENANCE: Protect and maintain work described in these specifications against all defects of materials and workmanship, through final acceptance. Replace plants not in normal healthy condition at the end of this period. Water, weed, cultivate, mulch, reset plants to proper grade or upright position, remove dead wood and do necessary standard maintenance operations. Irrigate when necessary to avoid drying out of plant materials, and to promote healthy growth.

CLEAN–UP: At completion of each division of work all extra material, supplies, equipment, etc., shall be removed from the site. All walks, paving, or other surfaces shall be swept clean, mulch areas shall have debris removed and any soil cleared from surface. All areas of the project shall be kept clean, orderly and complete.

REVISIONS
NO. DATE



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LEVETON
SW 108TH AVENUE AT SW LEVETON DRIVE
TUALATIN, OR

DETAILS & SPECS

DATE 07-14-15	
SCALE AS SHOWN	
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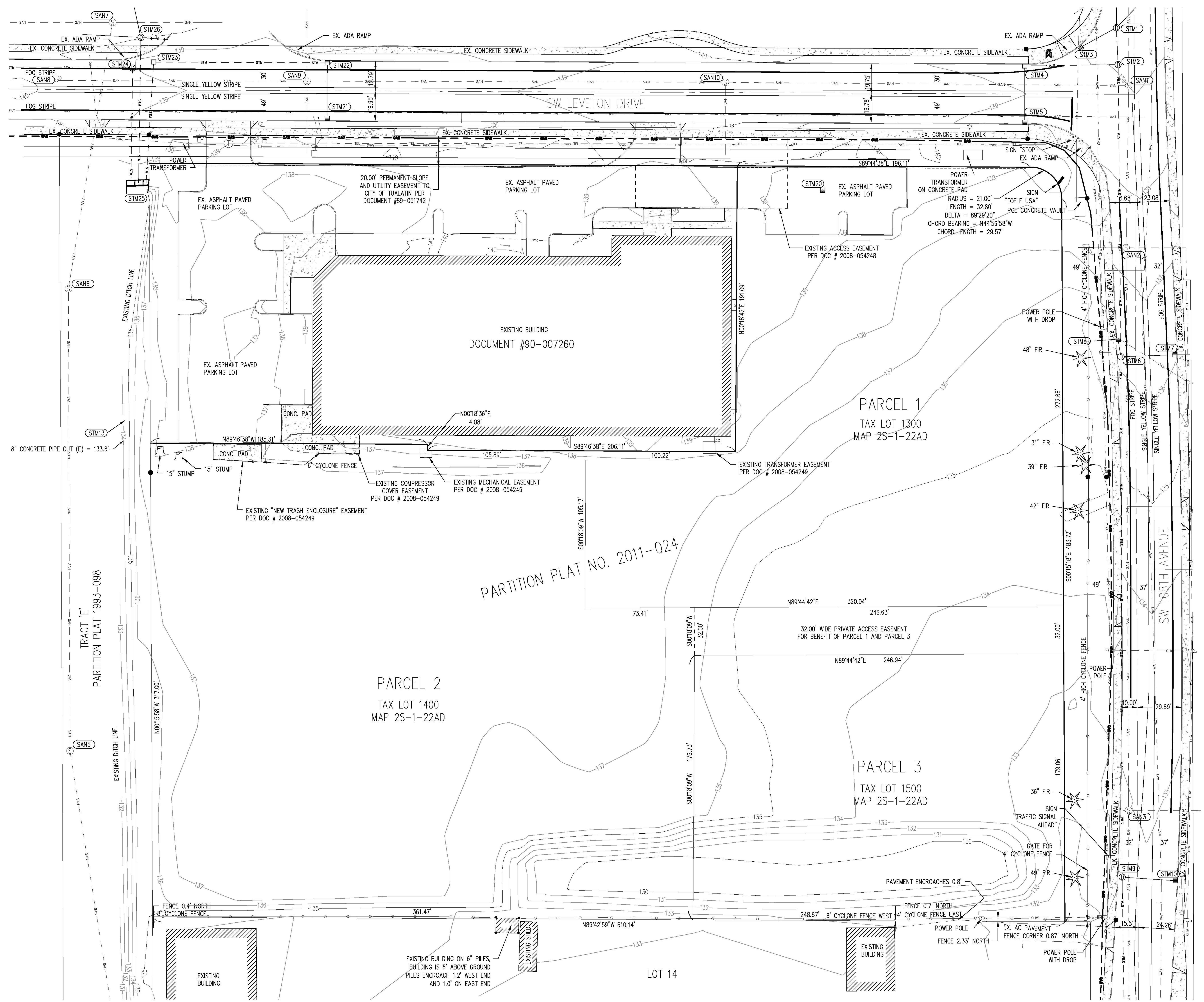


STORM SEWER NOTES

(STM1) STORM MANHOLE
RIM = 139.35'
I.E. 18" IN (N) = 131.9'
I.E. 12" IN (NE) = 131.8'
I.E. 12" IN (SW) = 134.6'
I.E. 18" OUT (S) = 131.4'

(STM2) STORM MANHOLE
RIM = 139.07'
I.E. 18" IN (N) = 131.3'
I.E. 12" IN (W) = 133.7'
I.E. 18" OUT (S) = 131.0'

(STM3) CATCH BASIN
RIM = 139.02'
FULL OF DEBRIS

(STM4) CATCH BASIN
RIM = 138.64'
I.E. 12" IN (S) = 135.0'
I.E. 12" OUT (E) = 134.9'

(STM5) CATCH BASIN
RIM = 138.58'
I.E. 12" OUT (N) = 135.5'

(STM6) STORM MANHOLE
RIM = 136.17'
I.E. 18" IN (N) = 130.6'
I.E. 12" IN (E) = 133.0'
I.E. 12" IN (NW) = 132.9'
I.E. 21" OUT (S) = 130.5'

(STM7) CATCH BASIN
RIM = 136.07'
I.E. 12" IN (E) = 133.3'
I.E. 12" OUT (W) = 133.3'

(STM8) CATCH BASIN
RIM = 136.25'
I.E. 12" IN (W) = 133.3'
I.E. 12" OUT (SE) = 133.2'

(STM9) STORM MANHOLE
RIM = 132.56'
I.E. 21" IN (N) = 128.8'
I.E. 12" IN (E) = 129.6'
I.E. 21" OUT (S) = 128.7'

(STM10) CATCH BASIN
RIM = 132.48'
I.E. 12" OUT (W) = 130.1'

(STM11) STORM MANHOLE
RIM = 132.40'
I.E. 21" IN (N) = 127.9'
I.E. 12" IN (E) = 128.8'
I.E. 12" IN (W) = 128.5'
I.E. 24" OUT (S) = 127.8'

(STM12) CATCH BASIN
RIM = 132.22'
I.E. 12" OUT (W) = 129.9'

(STM20) LYNCH STYLE CATCH BASIN
RIM = 137.99'

(STM21) CATCH BASIN
RIM = 138.15'
I.E. 12" OUT (N) = 136.0'

(STM22) CATCH BASIN
RIM = 138.18'
I.E. 12" IN (S) = 135.8'
I.E. 12" OUT (W) = 135.7'

(STM23) CATCH BASIN
RIM = 138.75'
I.E. 12" IN (E) = 135.0'
I.E. 12" OUT (S) = 135.0'

(STM24) STORM MANHOLE
RIM = 139.04'
I.E. 36" IN (W) = 134.1'
I.E. 36" OUT (S) = 133.5'

(STM25) STORM STRUCTURE
TOP OF GRATE = 138.38'
TOP OF WEIR = 137.2'
I.E. 12", 30" & 36" (N) = 134.05'

(STM26) STORM MANHOLE
RIM = 140.34'
I.E. 27" IN (W) = 135.0'
I.E. 18" IN (N) = 134.9'
I.E. 12" IN (E) = 135.1'
I.E. 30" OUT (S) = 134.9'

(STM27) STORM MANHOLE
RIM = 140.75'
I.E. 36" IN (W) = 135.3'
I.E. 12" IN (N) = 137.3'
I.E. 12" IN (S) = 136.4'
I.E. 36" OUT (E) = 135.2'

SANITARY SEWER NOTES

(SAN1) SANITARY MANHOLE
RIM = 139.01'
I.E. 8" IN (N) = 125.9'
I.E. 8" IN (W) = 128.8'
I.E. 8" IN (W) = 125.9'
I.E. 8" OUT (S) = 125.8'

(SAN2) SANITARY MANHOLE
RIM = 137.35'
I.E. 8" IN (N) = 125.4'
I.E. 8" IN (W) = 125.5'
I.E. 8" IN (E) = 125.3'
I.E. 8" OUT (S) = 125.2'

(SAN3) SANITARY MANHOLE
RIM = 132.95'
I.E. 8" IN (N) = 123.8'
I.E. 8" IN (W) = 124.0'
I.E. 8" IN (E) = 123.8'
I.E. 8" OUT (S) = 123.6'

(SAN4) SANITARY MANHOLE
RIM = 133.81'
I.E. 15" IN (N) = 121.9'
I.E. 15" OUT (S) = 121.6'

(SAN5) SANITARY MANHOLE
RIM = 137.51'
I.E. 15" IN (N) = 124.3'
I.E. 15" OUT (S) = 124.1'

(SAN6) SANITARY MANHOLE
RIM = 138.42'
I.E. 15" IN (N) = 126.3'
I.E. 15" OUT (S) = 126.0'

(SAN7) SANITARY MANHOLE
RIM = 140.44'
I.E. 15" IN (W) = 133.1'
I.E. 8" IN (E) = 134.5'
I.E. 15" OUT (S) = 132.6'

(SAN8) SANITARY CLEAN OUT
RIM = 139.87'

(SAN9) SANITARY MANHOLE
RIM = 138.50'
I.E. 8" IN (W) = 131.4'
I.E. 8" IN (N) = 131.3'
I.E. 8" IN (S) = 131.4'
I.E. 8" OUT (E) = 131.2'

(SAN10) SANITARY MANHOLE
RIM = 139.79'
I.E. 8" IN (W) = 130.1'
I.E. 8" IN (N) = 130.1'
I.E. 8" OUT (E) = 130.0'

SCALE 1" = 30 FEET

30 0 12 18 24 30

NOTES

1. INITIAL FIELD WORK FOR THIS SURVEY WAS COMPLETED IN 2006. ADDITIONAL FIELD WORK WAS COMPLETED ON JULY 17, 2013 TO UPDATE THE SITE GRADING.

2. ELEVATIONS AND CONTOURS SHOWN ON THIS MAP ARE BASED ON WASHINGTON COUNTY BENCH MARK NUMBER 905. BEING A BRASS DISK STAMPED " WASHINGTON COUNT BM 1987". THE BRASS DISK IS LOCATED APPROXIMATELY 270 FEET WEST OF THE CENTERLINE OF 118TH AVENUE AND 34 FEET NORTH OF THE CENTERLINE OF HERMAN ROAD. THE DISK HAS AN ELEVATION OF 136.17' ON THE NGVD 1929 DATUM.

UTILITY STATEMENT

THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH HE DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.

NORTHWEST SURVEYING, Inc.
1815 NW 169TH PL., SUITE 2090
BEAVERTON, OR 97007
PHONE: 503-848-2127 FAX: 503-848-2179
EMAIL: nwsurveying@nwsrvy.com

TOPOGRAPHIC SURVEY

SPECHT LEVETON PARTITION

TUALATIN, OREGON
TAX LOT 1300, 1400 & 1500
TAX MAP 2S-1-22AD

DRAWING NO.:	232TOPO UPDATE
SCALE:	AS NOTED
DRAWING GENERATED BY LD2004	
DRAWN BY:	CHS
CHECKED BY:	SFF

PREPARED FOR:
SPECHT DEVELOPMENT, INC.
15400 SW MILLIKAN WAY
BEAVERTON, OR 97006

REVISIONS:

DATE:

REGISTERED PROFESSIONAL LAND SURVEYOR
OREGON
JANUARY 15, 2002
CLINTON H. STUBBS JR.
55469LS
RENEWAL DATE: 06/30/14

JOB NUMBER
232

SHEET
1 OF 1

Lance Mueller & Associates
130 Lakeside, Suite 250
Seattle, Washington 98122

8/24/15 Revised

Leveton Job No. 14-041
SW 108th Avenue at SW Leveton Drive
Tualatin, OR

Exterior Lighting Fixture Schedule (Draft):

Mark	Description	Lamp	Manufacturer & Number
A1	(2) back to back Type 3 parking area fixtures - pole mounted w/ double arm, Straight Square Steel 25' pole on concrete base 30" high.	(2) LED = 188w (System Watts)	KIM Lighting–The Archetype: 2B/AR3P70 – 80L4K/277/DB/KSS25 4180 DB or approved.
A2	(1) Parking Type 5 area fixture - pole mounted w/ single arm, Straight Square Steel 25' pole on concrete base 30" high.	LED = 95w (System Watts)	KIM Lighting–The Archetype: 1A/AR5P70 – 80L4K/277/DB/KSS25 4180 DB or approved.
A3	Building mounted area fixture, 21' high (approx.)	LED = 127w (System Watts)	KIM Lighting–Wall Director LED: WD18D3E354K/277/DB
B	Wall sconce	LED 30w	Luminis-W633/L1W30/277/GRT
B (Alternate)	Wall Sconce	LED 22w	Rebelle-Orchestra Circle: 2756S-22I-40-277-PF-RF-GM
C (Place Marker)	Downlights (for exterior canopies) (Surface mounted can downlight @ 13'AFF approx.)	LED = 36w (System Watts)	Bega – 6503 LED – 277 – SLV
D (Place Marker)	Bollards (For walkways)	LED 30w	KIM Lighting–Bounce Bollard: BNB1-30LED277-DB
E (Place Marker)	Pedestrian Pole Top mounted Type 2 fixture mounted on 12' Straight Round Pole. Pole mounted flush with landscale	LED 60w	KIM Lighting–Bounce: FM-BNS1H2-60L-4K –DB PRA12 4125 DB

- Contractor to verify voltage requirements prior to placing order

Submitted by Lighting Group NorthwestChris Hamaker		Catalog Number:	Type:
lighting group northwest	**Job Name:** LEVETON Architect: Pending Architect Engineer: Pending Engineer	2B/AR5P70/80L4K-VOLT/ STANDARD FINISH Notes:	**A1** LGNW15-42252

KIM LIGHTING

AR

The Archetype® Large PicoPrism™ LED

8/18/14 • kl_arpled_spec.pdf

Type:
Job:
Catalog number:

/ / / / /

Mtg. Fixture Electrical Module Finish — See page 2
Options — See pages 3-4
Optional Vertical Slipfitter Mount — See page 4

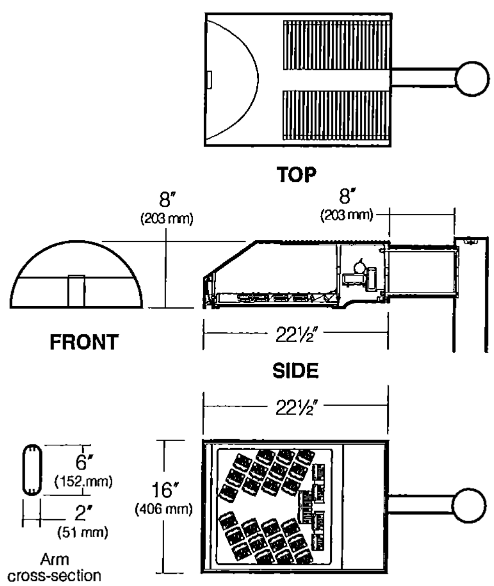
Select pole from Kim Arms and Poles Selection Guide. If pole is provided by others indicate O.D. for arm fitting.

Approvals:

Date: 2
Page: 1 of 6

Specifications

AR-LED
80 Light Emitting Diodes
95 System Watts for 350mA
188 System Watts for 700mA
Maximum Weight is 50 lbs.



IP66 constructed sealed PicoPrism™ optical modules do not require a glass lens and offer improved optical performance. Contact factory if glass lens is required.

Housing: One-piece die-cast, low copper (<0.6% Cu) aluminum alloy with integral cooling ribs over the optical chamber and electrical compartment. Solid barrier wall separates optical and electrical compartments. Double-thick wall with gussets on the support-arm mounting end. Housing forms a half cylinder with 55° front face plane providing a recess to allow a flush single-latch detail. All hardware is stainless steel or electro-zinc plated steel.
Frame: One-piece die-cast, low copper (<0.6% Cu) aluminum alloy lens frame with 1" minimum depth around the gasket flange. Integral hinges with stainless steel pins provide no-tool mounting and removal from housing. Single die-cast aluminum cam-latch provides positive locking by a one-piece extruded and vulcanized silicone gasket.
Electronic Module: All electrical components are UL and CSA recognized, mounted on a single plate and factory prewired with quick-disconnect plugs. Module includes a driver, thermal control device and surge protector. Electrical module attaches to housing with no-tool hinges and latches, accessible by opening the frame only. Driver is rated for -40°F starting and has a 0-10V dimming interface for multi-level illumination options.
Optical Module: Precision, IP66 replaceable PicoPrism™ modules are positioned to achieve directional control toward desired task. The entire light engine fastens to the housing as a one-piece module
Dimming: Driver has a 0-10V dimming interface with a dimming range of 10-100%. Approved dimmers include Lutron Diva AVTV, Lutron Nova NFTV and NTFTV. Note: Not compatible with current sourcing dimmers.
Support Arm: One-piece extruded aluminum with internal bolt guides and fully radiussed top and bottom. Luminaire-to-pole attachment is by internal draw bolts, and includes a pole reinforcing plate with wire strain relief. Arm is circular cut for specified round pole.
Finish: Each luminaire receives a fade and abrasion resistant, electrostatically applied, thermally cured, triglycidal isocyanurate (TGIC) polyester powdercoat finish. Standard colors include (BL) Black, (DB) Dark Bronze, (WH) White, (PS) Platinum Silver, (SG) Stealth Gray, (LG) Light Gray, and (CC) Custom Color (Include RAL#).
Listed to: UL 1598 Standard for Luminaires - UL 8750 Standard for Safety for Light Emitting Diode (LED) Equipment for use in Lighting Products and CSA C22.2#250.0 Luminaires. RoHS compliant. Meets Buy American provisions within ARRA.
Warranty: Kim Lighting warrants The Archetype LED products ("Product(s)") sold by Kim Lighting to be free from defects in material and workmanship for (i) a period of five (5) years for metal parts, (ii) a period of ten (10) years for exterior housing paint finish(s), (iii) a period of six (6) years for LED Light Engines (PicoPrisms™ and, (iv) a period of five (5) years for LED power components (LED Driver, LifeShield® device), from the date of sale of such goods to the buyer as specified in Kim Lighting shipment documents for each product. Occupancy sensors, Surge Protector, dimmers and relay wiring components are covered by the manufacturer's warranty.
CAUTION: Fixtures must be grounded in accordance with national, state and/or local electrical codes, Failure to do so may result in serious personal injury.personal injury.

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HUBBELL LIGHTING, INC.

US Patent Number D674,965 S.

KIM LIGHTING RESERVES THE RIGHT TO CHANGE SPECIFICATIONS WITHOUT NOTICE.

Submitted by Lighting Group NorthwestChris Hamaker		Catalog Number:	Type:
lighting group northwest	**Job Name:** LEVETON Architect: Pending Architect Engineer: Pending Engineer	2B/AR5P70/80L4K-VOLT/ STANDARD FINISH Notes:	**A1** LGNW15-42252

KIM LIGHTING

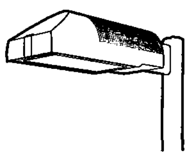
AR

The Archetype® Large PicoPrism™ LED

8/18/14 • kl_arpled_spec.pdf

Type:

Job:



Standard Features

Mounting

3Y configuration is available for round poles only.

Plan View:							Wall Mount
EPA:	1.2	2.4	2.0	3.2	3.2	3.9	n/a
Cat. No.:	☐ **1A**	☐ **2B**	☐ **2L**	☐ **3T**	☐ **3Y**	☐ **4C**	☐ **1W**

Fixture

Cat. No. designates fixture and optic

AR — x — P — xx

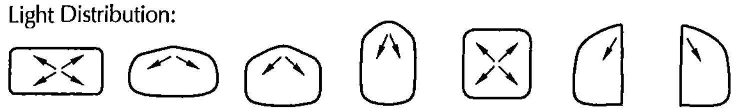
Housing Size:
AR

Distribution:
- ☐ 1 = Type I
- ☐ 2 = Type II
- ☐ 3 = Type III
- ☐ 4 = Type IV
- ☐ 5 = Type V
- ☐ L = Type L Left
- ☐ R = Type R Right

Optic:
P = PicoPrism™

Current:
~~35 = 350 mA~~
70 = 700 mA

Light Distribution:



Type I | Type II | Type III | Type IV Forward Throw | Type V Square | Type R Right | Type L Left

Electrical Module

Cat. Nos. for Electrical Modules available:

80L — xK — xxx SPECIFY

Source:
80L = 80 LED's

Color Temperature:
- ☐ 2K = 580nm - Amber
- ☐ 3K = 3000K
- ☐ 4K = 4200K
- ☐ 5K = 5100K

Voltage:
- ☐ 120 = 120V[1]
- ☐ 208 = 208V[1]
- ☐ 240 = 240V[1]
- ☐ 277 = 277V[1]
- ☐ 347 = 347V
- ☐ 480 = 480V

[1]120V through 277V is a variable driver.

Finish SPECIFY STANDARD FINISH

TGIC powder coat

Color:	Black	Dark Bronze	Light Gray	Stealth Gray	Platinum Silver	White	Custom Color[2]
Cat. No.:	☐ **BL**	☐ **DB**	☐ **LG**	☐ **SG**	☐ **PS**	☐ **WH**	☐ **CC**

[2]Custom colors subject to additional charges, minimum quantities and extended lead times. Consult representative. Custom color description:_______________

Reset Form

KIM LIGHTING

KSS

Square Steel Non-Tapered Pole

revision 6/12/09 • kss.pdf

Type:
Job:
Catalog number:

/ / / /

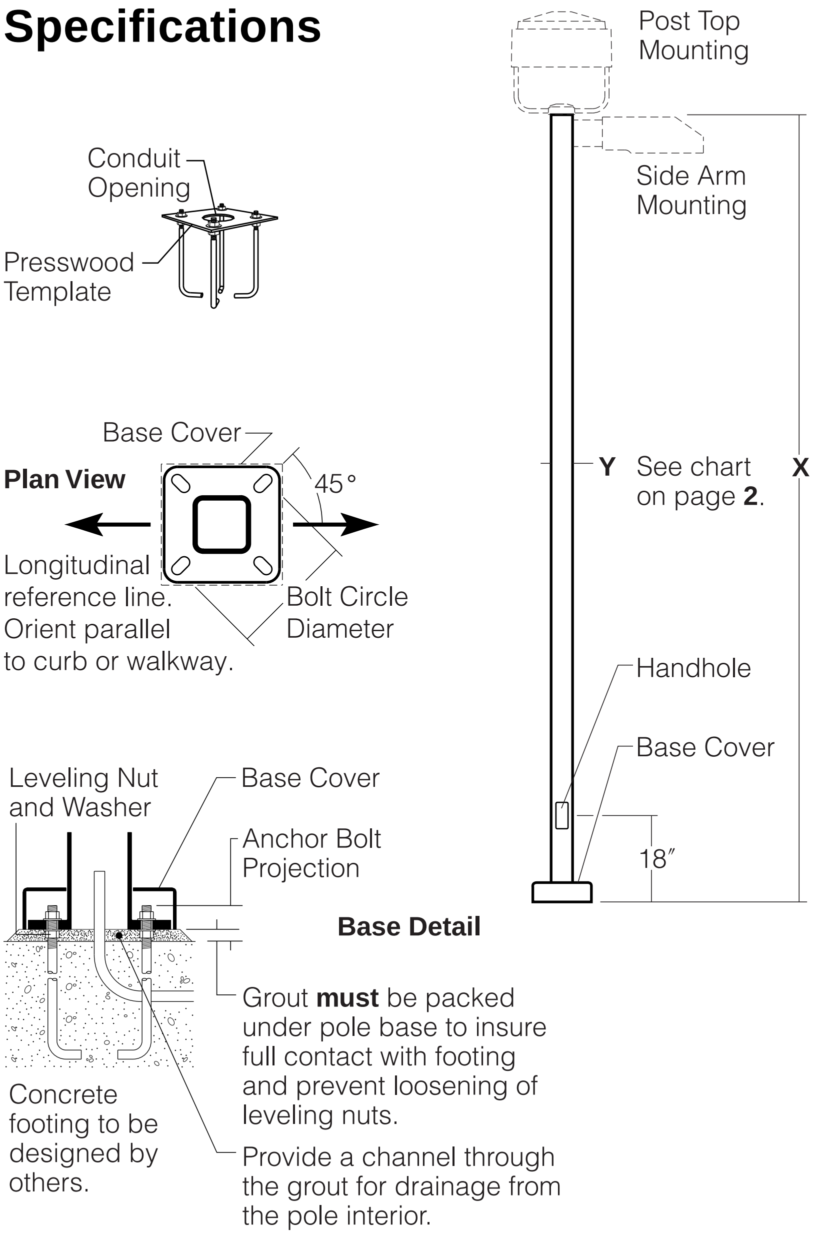
Pole Cat. No. | Mounting | Structural Luminaire Option | Finish | Optional Duplex Receptacle Receptical

See page 2 See page 4

Approvals:

Date:

Specifications



Pole Construction: One-piece non-tapered square shaft of low carbon steel (ASTM-A500, Grade B, 46,000 PSI min. yield) with one flush-welded vertical seam. Shaft is welded to a flat steel anchor base (ASTM-36, 36,000 PSI min. yield).

Base Cover: Base has a two-piece cast aluminum full cover of 319 alloy, secured by stainless steel screws.

Pole Cap: A flush-sided cast aluminum pole cap is provided for side arm mounted luminaires.

Handhole: 18″ up from base, with a gasketed cover and ground lug. 2″ x 4″ handhole provided on poles up to 16′. Reinforced 3″ x 6″ handhole provided on poles 20′ and taller.

Anchor Bolts: Four fully galvanized anchor bolts provided (ASTM-36, 36,000 PSI min. yield), complete with eight galvanized nuts, eight galvanized flat washers, and a presswood template.

Strength: Poles will withstand wind loads as listed in chart (see page **2**) when luminaires are mounted per fixture installation instructions.

Finish: Super TGIC thermoset polyester powder coat paint, 2.5 mil nominal thickness. 5 stage steel pretreatment to include phosphoric acid etch, followed by iron phosphate bath and chromate sealer for corrosion resistance. Standard colors are Black, Dark Bronze, Light Gray, Stealth Gray™, Platinum Silver, and White. Custom colors are available.

CAUTION: Do not install poles without luminaires or strength guarantee is voided. Any unauthorized accessories secured to pole shall void strength guarantee.

Maintenance: A regularly scheduled maintenance program must be established to insure the protective paint coating is intact, corrosion or structural damage has not occurred, and anchor bolt nuts are tight. Failure to do so could lead to pole collapse and serious personal injury.

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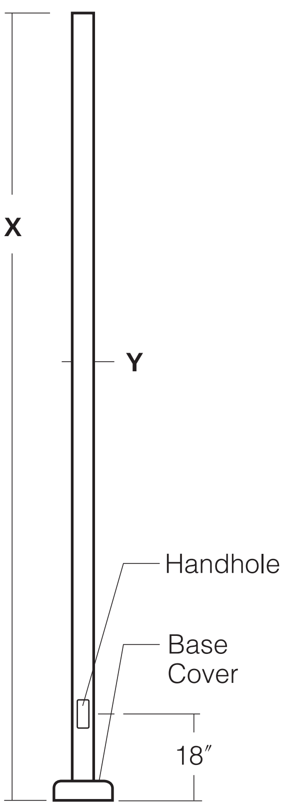
HUBBELL LIGHTING, INC.

Type:
Job:

Standard Features

NOTE: All allowable pole and fixture EPAs are derived from the AASHTO standard. Responsibility lies with the specifier for correct pole selection based on local codes and standards for the job location. (See page **4**)



Pole Pole Catalog Number	X	Y	**Allowable Pole EPA** 85	90	100	110	120	130	140	Wind Map Steady Wind 150
☐ **KSS10-4120**	10′	4″ x 11 ga.	34.16	30.24	27.67	22.51	18.58	15.52	13.10	11.14
☐ **KSS12-4120**	12′	4″ x 11 ga.	27.70	24.44	22.30	17.99	14.72	12.17	10.15	8.52
☐ **KSS14-4120**	14′	4″ x 11 ga.	22.97	20.17	18.34	14.65	11.84	9.66	7.93	6.53
☐ **KSS16-4120**	16′	4″ x 11 ga.	19.32	16.87	15.26	12.04	9.58	7.67	6.15	4.93
☐ **KSS20-4120**	19.5′	4″ x 11 ga.	13.78	11.90	10.66	8.16	6.27	4.80	3.63	2.68
☐ **KSS20-4180**	19.5′	4″ x 7 ga.	21.36	18.65	16.87	13.30	10.59	8.48	6.80	5.45
☐ **KSS25-4120**	25′	4″ x 11 ga.	8.55	7.11	6.16	4.26	2.61	1.69	0.80	—
☐ **KSS25-4180**	25′	4″ x 7 ga.	14.33	12.26	10.91	8.18	6.11	4.50	3.22	2.18
☐ **KSS25-5120**	25′	5″ x 11 ga.	15.24	12.94	11.44	8.41	6.11	4.32	2.90	1.75
☐ **KSS25-5180**	25′	5″ x 7 ga.	24.71	21.40	19.22	14.84	11.52	8.93	6.87	5.21
☐ **KSS30-4180**	30′	4″ x 7 ga.	9.80	8.14	7.06	4.87	3.21	1.91	—	—
☐ **KSS30-5180**	30′	5″ x 7 ga.	17.71	15.05	13.30	9.79	7.12	5.04	3.40	2.07

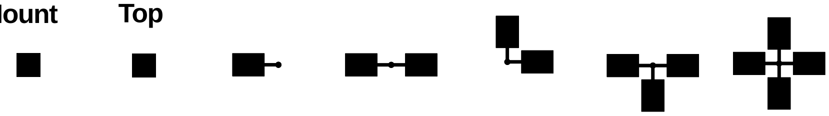
Anchor Base and Bolt Detail

Pole Height	Pole Size	Bolt Circle DIA	Anchor Bolt Projection	Anchor Bolts Size	Base Cover Size	Conduit Opening
10′-25′	4″	7½″-8½″	3⅜″	¾″ x 15″ + 3″	8⅝″ sq.	3″ DIA
25′	5″	10″-12½″	3⅞″	¾″ x 30″ + 4″	12⅝″ sq.	4″ DIA
30′	4″	7½″-8½″	3⅜″	¾″ x 30″ + 4″	8⅝″ sq.	3″ DIA
30′	5″	10″-12½″	3⅞″	¾″ x 30″ + 4″	12⅝″ sq.	4″ DIA.

Mounting

Flush Mount **Post Top** **Side Arm**

Plan Views:



Mounting[1]: ☐ **FM** ☐ **PT** ☐ **A** ☐ **SA** ☐ **B** ☐ **SB** ☐ **L** ☐ **SL** ☐ **T** ☐ **ST** ☐ **C** ☐ **SC**

NOTE: Allowable Pole EPA for jobsite wind conditions must be equal to or greater than fixture mount EPA. Please refer to Kim luminaire catalog for specific fixture.

[1]See luminaire drilling requirements in luminaire catalog.

Structural Luminaires *Only* - Examples

- ☐ **TS**:Single Tension for small and large Structural - KSS20-4120B-TS
- ☐ **TD**:Double Tension for small and large Structural - KSS20-4120B-TD
- ☐ **TR**:Truss for small and large Structural - KSS20-4120B-TR
- ☐ **XTS**:Single Tension for 1000W Structural - KSS20-4120B-XTS
- ☐ **XTD**:Double Tension for 1000W Structural - KSS20-4120B-XTD
- ☐ **XTR**:Truss for 1000W Structural - KSS20-4120B-XTR

Submitted by Lighting Group NorthwestChris Hamaker		Catalog Number:	Type:
lighting group northwest	**Job Name:** LEVETON Architect: Pending Architect Engineer: Pending Engineer	1A/AR3P70/80L4K-VOLT/ STANDARD FINISH Notes:	**A2** LGNW15-42252

KIM LIGHTING

AR

The Archetype® Large PicoPrism™ LED

8/18/14 • kl_arpled_spec.pdf

Type:
Job:
Catalog number:

Approvals:

Mtg.	Fixture	Electrical Module	Finish	Options	Optional Vertical Slipfitter Mount
See page 2				See pages 3-4	See page 4

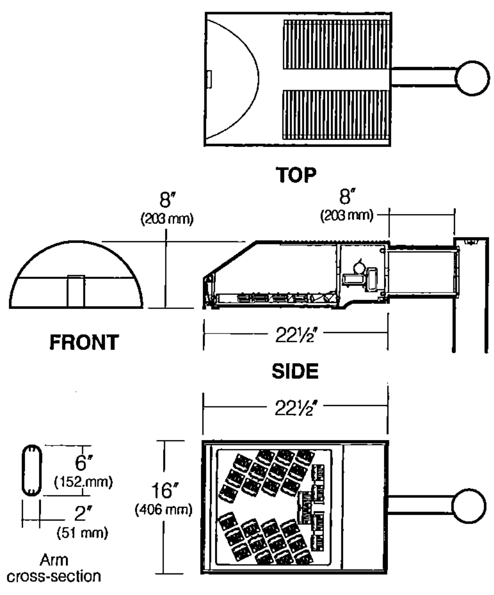
Select pole from Kim Arms and Poles Selection Guide. If pole is provided by others indicate O.D. for arm fitting.

Date: 2

Specifications

AR-LED

80 Light Emitting Diodes
95 System Watts for 350mA
188 System Watts for 700mA
Maximum Weight is 50 lbs.



IP66 constructed sealed PicoPrism™ optical modules do not require a glass lens and offer improved optical performance. Contact factory if glass lens is required.

Housing: One-piece die-cast, low copper (<0.6% Cu) aluminum alloy with integral cooling ribs over the optical chamber and electrical compartment. Solid barrier wall separates optical and electrical compartments. Double-thick wall with gussets on the support-arm mounting end. Housing forms a half cylinder with 55° front face plane providing a recess to allow a flush single-latch detail. All hardware is stainless steel or electro-zinc plated steel.
Frame: One-piece die-cast, low copper (<0.6% Cu) aluminum alloy lens frame with 1" minimum depth around the gasket flange. Integral hinges with stainless steel pins provide no-tool mounting and removal from housing. Single die-cast aluminum cam-latch provides positive locking by a one-piece extruded and vulcanized silicone gasket.
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Optical Module: Precision, IP66 replaceable PicoPrism™ modules are positioned to achieve directional control toward desired task. The entire light engine fastens to the housing as a one-piece module
Dimming: Driver has a 0-10V dimming interface with a dimming range of 10-100%. Approved dimmers include Lutron Diva AVTV, Lutron Nova NFTV and NTFTV. Note: Not compatible with current sourcing dimmers.
Support Arm: One-piece extruded aluminum with internal bolt guides and fully radiussed top and bottom. Luminaire-to-pole attachment is by internal draw bolts, and includes a pole reinforcing plate with wire strain relief. Arm is circular cut for specified round pole.
Finish: Each luminaire receives a fade and abrasion resistant, electrostatically applied, thermally cured, triglycidal isocyanurate (TGIC) polyester powdercoat finish. Standard colors include (BL) Black, (DB) Dark Bronze, (WH) White, (PS) Platinum Silver, (SG) Stealth Gray, (LG) Light Gray, and (CC) Custom Color (Include RAL#).
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Warranty: Kim Lighting warrants The Archetype LED products ("Product(s)") sold by Kim Lighting to be free from defects in material and workmanship for (i) a period of five (5) years for metal parts, (ii) a period of ten (10) years for exterior housing paint finish(s), (iii) a period of six (6) years for LED Light Engines (PicoPrisms™ and, (iv) a period of five (5) years for LED power components (LED Driver, LifeShield® device), from the date of sale of such goods to the buyer as specified in Kim Lighting shipment documents for each product. Occupancy sensors, Surge Protector, dimmers and relay wiring components are covered by the manufacturer's warranty.
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HUBBELL
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US Patent Number D674,965 S.

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Submitted by Lighting Group NorthwestChris Hamaker		Catalog Number:	Type:
lighting group northwest	**Job Name:** LEVETON Architect: Pending Architect Engineer: Pending Engineer	1A/AR3P70/80L4K-VOLT/ STANDARD FINISH Notes:	**A2** LGNW15-42252

KIM LIGHTING

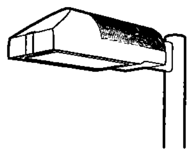
AR

The Archetype® Large PicoPrism™ LED

8/18/14 • kl_arpled_spec.pdf

Type:

Job:



Standard Features

Mounting

3Y configuration is available for round poles only.

Plan View:							Wall Mount
EPA:	1.2	2.4	2.0	3.2	3.2	3.9	n/a
Cat. No.:	☐ **1A**	☐ **2B**	☐ **2L**	☐ **3T**	☐ **3Y**	☐ **4C**	☐ **1W**

Fixture

Cat. No. designates fixture and optic

AR — x — P — xx

Housing Size:
AR

Distribution:
- ☐ 1 = Type I
- ☐ 2 = Type II
- ☐ 3 = Type III
- ☐ 4 = Type IV
- ☐ 5 = Type V
- ☐ L = Type L Left
- ☐ R = Type R Right

Optic:
P = PicoPrism™

Current:
35 = 350 mA
70 = 700 mA

Light Distribution:

Type I — Type II — Type III — Type IV Forward Throw — Type V Square — Type R Right — Type L Left

Electrical Module

Cat. Nos. for Electrical Modules available:

80L — xK — xxx SPECIFY

Source:
80L = 80 LED's

Color Temperature:
- ☐ 2K = 580nm - Amber
- ☐ 3K = 3000K
- ☐ 4K = 4200K
- ☐ 5K = 5100K

Voltage:
- ☐ 120 = 120V[1]
- ☐ 208 = 208V[1]
- ☐ 240 = 240V[1]
- ☐ 277 = 277V[1]
- ☐ 347 = 347V
- ☐ 480 = 480V

[1]120V through 277V is a variable driver.

Finish SPECIFY STANDARD FINISH

TGIC powder coat

Color:	Black	Dark Bronze	Light Gray	Stealth Gray	Platinum Silver	White	Custom Color[2]
Cat. No.:	☐ **BL**	☐ **DB**	☐ **LG**	☐ **SG**	☐ **PS**	☐ **WH**	☐ **CC**

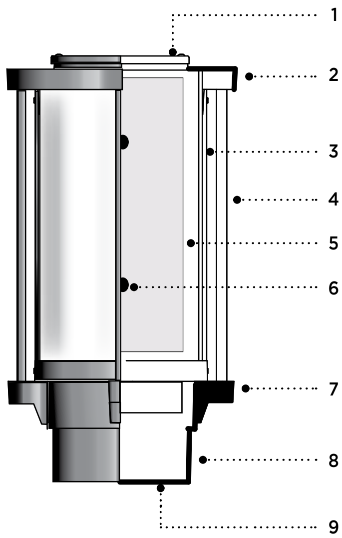
[2]Custom colors subject to additional charges, minimum quantities and extended lead times. Consult representative. Custom color description:__________

RESET

W633/W635/W639

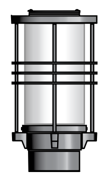
ECLIPSE - LED

TYPE:		QUANTITY:		PROJECT:			
CATALOG NUMBER:				ELECTRICAL	ELECTRICAL	ELECTRICAL	ACCESSORIE
	FIXTURE	WATTAGE	VOLTAGE	FINISH	OPTION	OPTION	OPTION	OPTION

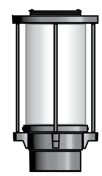


W633/W635/W639

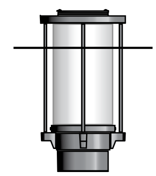
1- Top removable cover.
   (See option DL2 for up light)
2- Cast aluminum top sealed lens holder.
3- High impact satin ice frosted UV stabilized acrylic diffuser.
4- Set of 3 X 1/2" (13) solid aluminum struts.
5- Heat dissipation aluminum board.
6- LED light engine.
7- Cast aluminum strut holders.
8- Cast aluminum lower electrical chamber housing.
9- Removable bottom cover.
   (See option LDL for down light.)



W633
With three cast alum. louver blades



W635
With plain diffuser



W639
With light disc shield

MATERIALS

Eclipse is made of corrosion resistant 356 aluminum alloy with a copper (CU) content of less than 0.1%.
Light source is enclosed in a high impact satin ice frosted UV stabilized acrylic sealed diffuser, secured with a set of (3) 1/2" diameter solid aluminum struts.
W633: Set of three cast aluminum louver blades.
W635: High impact satin ice frosted acrylic diffuser.
W639: Field adjustable semi oblong aluminum light shield.

ELECTRICAL

LED

DRIVER 120/277V multi volt (50-60HZ) with a minimum starting temperature of -30ºC/-22ºF. Optional 347V on request. Output over voltage, output over current and output short circuit protection with auto-recovery. Over temperature protection (110ºC).

LED Standard 4000ºK LED platform included. Optional 3000ºK and 3500ºK. Removable modular LED platform.

LIFE

51,000hrs $L_{77}B_{50}$ (based on IESNA TM-21 Test Method and LM-80 data).
68,000hrs $L_{70}B_{50}$ (calculated projection from LM-80 data).

FINISH

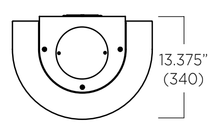
Five-stage preparation process including preheating of cast aluminum parts for air extraction, and an environmentally friendly alloy sealant. Polyester powder coating is applied through an electrostatic process and oven cured for long term finish.

MOUNTING

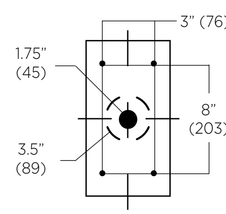
Maximum weight **W633**: 19.5lbs (8.8kg)
Maximum weight **W635**: 19.5lbs (8.8kg)
Maximum weight **W639**: 21.5lbs (9.7kg)
Eclipse is designed for ease of access and installation.
Standard luminaire is supplied with a full length steel galvanized wall mounting plate to ensure uniform adherence.

CERTIFICATION

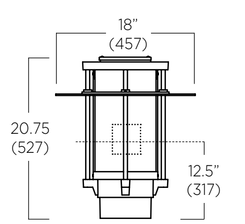
Tested to UL1598 and CSA 22.2 #250. ETL listed wet location.
Photometric testing performed by an independent laboratory in accordance with IES LM-79-08 standards at 25ºC. Lumen depreciation in accordance with IESNA LM80 standards. CE certification on request.
Rated IP65.



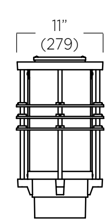
W639
Top view



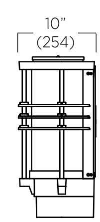
Wall mounting plate



W639
Front view



W633/W635
Front view



W633/W635
Side view

November 2013 Rev 0

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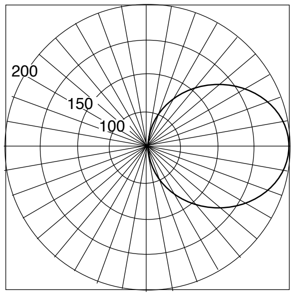
260 Labrosse, Pointe-Claire (QC) Canada H9R 5L5

LUMINIS.COM

TYPICAL PHOTOMETRY SUMMARY



Outdoor report Polar graph
Maximum Candela = 210 CP

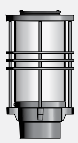
Descriptive Information
Total Lms: 1124 Lumens
Total Input Watts: 30 W
Source: LED
Total efficiency: 38%
BUG Rating: B1-U2-G1
Distribution: Type IV
CCT: 4000ºK

W635-L1W30

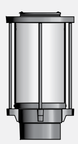
Please visit our web site www.luminis.com for complete I.E.S. formatted download data.

LUMINAIRE SELECTION

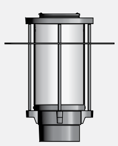
MODEL#



☐ W633



☐ W635



☐ W639

LED LIGHT SELECTION

SUFFIX	INPUT WATTS	DELIVERED LUMENS	CRI	CCT ºK
☐ L1W18	18W	700		
☐ L1W30	30W	1124	80	4000 ºK
☐ L3W18	56W	1950		

VOLTAGE [1]

☐ 120V
☐ 277V

Optional
☐ 347V

FINISH

STANDARD COLORS

☐ WHT Snow white
☐ BKT Jet black
☐ BZT Bronze
☐ MST Matte silver
☐ GRT Titanium gray
☐ DGT Gun metal
☐ CHT Champagne

OPTIONAL COLORS

☐ CS Custom color
☐ RAL RAL# color

(Refer to color chart)

OPTIONS

ELECTRICAL

☐ **FS** Fuse
☐ **PH** Photocell
☐ **347L** 347V input power driver
☐ **DL2** Diffused up light
☐ **LDC** Diffused up light with additional down light
☐ **LDL** LED down light. Beam angle: 24º

Alternate CCT ºK LED
☐ **K3** 3000ºK CCT LED
☐ **K35** 3500ºK CCT LED

ACCESSORIES

☐ **OS** 18” Diameter aluminum oblong disc

NOTES
1- Luminaires are factory pre wired for 120V (if no voltage is specified.) For other voltages, please specify with catalog number, or consult factory.

November 2013 Rev 0

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260 Labrosse, Pointe-Claire (QC) Canada H9R 5L5

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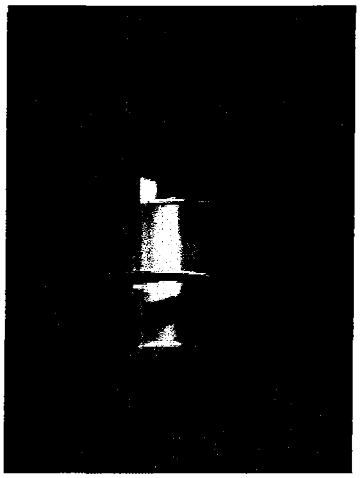
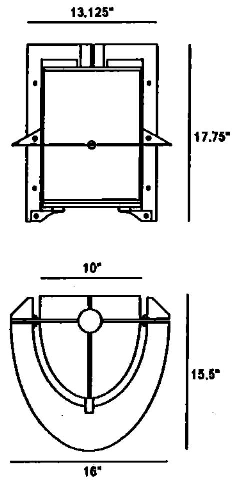
REBELLE
ARCHITECTURAL LIGHTING

B (ALTERNATE)





Orchestra Circle 2756SLED Maxi Wall Sconce EXTERIOR/INTERIOR

MODEL	LED		COLOR TEMPERATURE		VOLT	SHIELD		DIFFUSER		OPTIONS		COLOUR	
2756S	22L	*LED module* 1800 Lumens'	40*	*4000K* Lumen Multiplier 1.000	120*	PF	*perforated liner*	RF*	*frost*	DIM	*dimming driver*	WT	*white texture*
			30	*3000K* Lumen Multiplier 0.896	208							BT	*black texture*
			35	*3500K* Lumen Multiplier 0.925	240							SM	*silver metallic*
					277							AN	*aluminum natural*
					347							BZ	*bronze*
												GM	*gunmetal*
												WS	*white satin*
												BM	*black matte*
												RAL	*specify no.*

**Standard configuration unless otherwise specified 'Delivered +Consult facory*

SAMPLE CATALOG NUMBER: 2756S - 22L - 40 - 120 - RF - WT

Using this catalog number would order 1 model 2756S maxi wall sconce with a 22 watt 4000K temperature LED module wired to 120 volts without a liner and a frosted acrylic lens painted with white texture polyester powder coat.

CONSTRUCTION

Materials
Support frame: Heavy aluminum plate. Hinge/Lock up: Pressure die cast aluminum. Reflector disk: Aluminum sheet, die formed. Diffusers (side): Thermo-formed acrylic. Bottom lens: Acrylic. Fasteners: Stainless steel.

Integral Driver: Constant current. 233 - 350 ma LEDs. > 82 CRI on a FR4 white boards with thermal interface to housing heat sink.

MOUNTING

Designed for wall mounting over a 4" octagonal J-box. A heavy gauge mounting plate is attached to the J-box. Unit hooks on to the mounting plate and is secured with two stainless steel set screws. Silicone seal is required across the top of the housing and down each side to exclude moisture in exterior applications.

OPTICAL

Frosted outer diffuser with or without perforated metal liner to provide for glare control. The reflector disk re-directs stray light and can be adjusted in the field to three positions - top, middle and bottom.

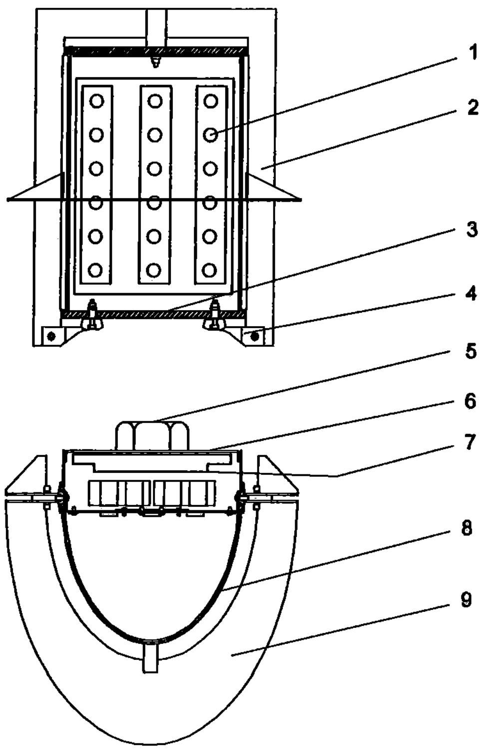
PROTECTION

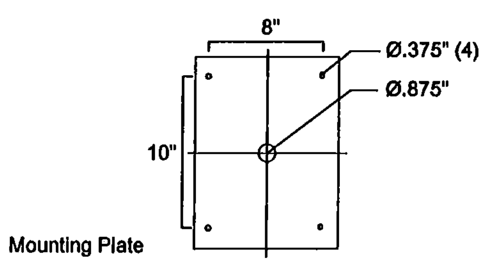
The Orchestra maxi wall sconce is listed for use in wet locations to UL and CSA Standards. (LOC 4, wall surface)

LEDs are rated for 50,000 hour life with lumen maintenance >70% (L70).

REBELLE
ARCHITECTURAL LIGHTING

B
(ALTERNATE)





Orchestra Circle 2756SLED Detailed Product Description

1 LED Boards with Heat Sink
2 Frame Support .250" Aluminum
3 Acrylic Lens .375" Thick
4 Diecast Aluminum Lock Up
5 J-Box (By Others)
6 Sub Mounting Plate .102" Aluminum
7 Driver - Constant Current
8 Light Frost Acrylic Lens .125" Thick
9 Reflector Disk .102" Aluminum (3 Position Adjustable)

www.rebellelighting.com

Submitted by Lighting Group NorthwestChris Hamaker		Catalog Number:	Type:
lighting group northwest	**Job Name:** LEVETON Architect: Pending Architect Engineer: Pending Engineer	6503LED Notes:	**C** LGNW15-42252

Surface-mounted ceiling with LED

Housing: Two piece die-cast aluminum provided with means for direct attachment to the ceiling over a 3½" or 4" octagonal wiring box. Die castings are marine grade, copper free (≤ 0.3% copper content) A360.0 aluminum alloy.

Enclosure: Tempered clear glass, retained by a one piece, die-cast aluminum step baffle frame. Frame is secured by one stainless steel captive screw threaded into a stainless steel insert. Internal reflector made from pure, anodized aluminum. Fully gasketed for weather tight operation using molded silicone rubber "U-channel" gasket.

Electrical: 31 W LED luminaire, 36 total system watts, -20° C start temperature. Integral 120 V through 277 V electronic LED driver, 0-10 V dimming. Standard LED color temperature is 3000K with an 80 CRI. Available in 4000K (80 CRI); consult factory.

Note: Due to the dynamic nature of LED technology, LED luminaire data on this sheet is subject to change at the discretion of BEGA-US. For the most current technical data, please refer to www.bega-us.com.

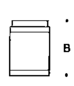
Finish: All BEGA standard finishes are polyester powder coat with minimum 3 mil thickness. Available in four standard BEGA colors: Black (BLK); White (WHT); Bronze (BRZ); Silver (SLV). To specify, add appropriate suffix to catalog number. Custom colors supplied on special order.

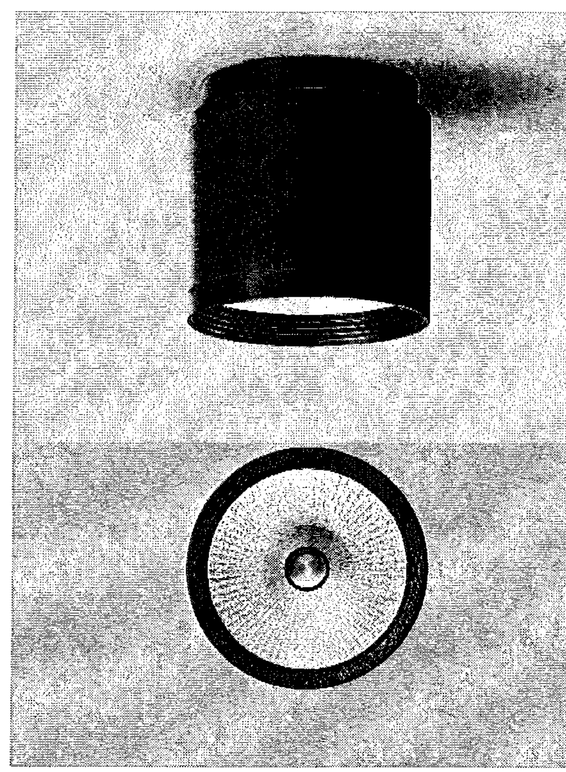
UL listed for US and Canadian Standards, suitable for wet locations. Protection class IP65.

Weight: 4.0 lbs.

Luminaire Lumens: 1328
Tested in accordance with LM-79-08

Type:
BEGA Product:
Project:
Voltage:
Color:
Options:
Modified:





		β	A	B
6503 LED	31 W LED	28°	7½	8

β = Beam angle

Submitted by Lighting Group NorthwestChris Hamaker		Catalog Number:	Type:
lighting group northwest	**Job Name:** LEVETON Architect: Pending Architect Engineer: Pending Engineer	BNB1/27LXKUV/STANDARD FINISH Notes:	~~A5~~ D LGNW15-42252

KIM LIGHTING

BNB1 LED

Bounce Bollard

revision 7/28/14 • kl_bnbled_spec.pdf

Type:
Job:
Catalog number:

/ / /

Fixture | Electrical Module | Luminaire Finish | Options

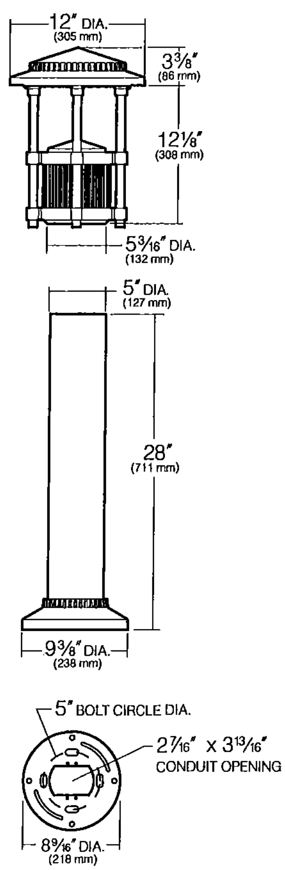
See page 2 · See page 3

Approvals:

Date: 2
Page: 1 of 1

Specifications

BNB1 LED
18, 27 or 36 LED



Hood and Lens Frame: Die-cast, low copper (<0.6% Cu) aluminum alloy with stainless steel hinge. Hood is opened by loosening one stainless steel captive button-head socket cap screw. 3/16" thick clear flat tempered glass lens seals against the lens frame by a one-piece molded silicone gasket. Lens frame seals against the hood by a one-piece extruded and vulcanized silicone gasket.

Body Support: Die-cast, low copper (<0.6% Cu) aluminum alloy flanges compress a ribbed extruded aluminum chamber. The four heavy wall extruded aluminum support rods are mechanically fastened to the lens frame with stainless steel fasteners. The support rods are held in position through die-cast arms and mechanically fastened at the bottom with a custom aluminum bolt. The electrical wiring is channeled through a support rod with a brass bushing.

Body Cap: Die-cast, low copper (<0.6% Cu) aluminum, retained by two captive stainless steel screws. Optional matte black finish to eliminate bounce light. See page **3**.

Shaft: One-piece aluminum extrusion, .125" minimum wall thickness and two internal 5/16"-16 mounting rods sandwich shaft between base and head.

Anchor Base Plate: A heavy cast aluminum anchor base is provided for mounting to the four 3/8" x 10" + 2" zinc plated J-bolts, each with two nuts and washers. A rigid pressed board template is provided to secure the anchor bolts during concrete pour (5" B.C.D.)

Electrical Module: Factory mounted to a rigid harness attached to the anchor base. A total of 27 mid power LED emitters configured in a rectangular array comprised together as a module. Two (2) modules for Type I version; three (3) modules for Type III version; and four (4) modules for Type V version. Available in 580nm Amber, 3000K, 4200K and 5100K color temperatures.

LED Driver: Universal voltage from 120 to 277V with a ±10% tolerance. -40°F starting temperature. All drivers are Underwriters Laboratories recognized.

Finish: Each luminaire receives a fade and abrasion resistant, electrostatically applied, thermally cured, triglycidal isocyanurate (TGIC) polyester powdercoat finish. Standard colors include (BL) Black, (DB) Dark Bronze, (WH) White, (PS) Platinum Silver, (SG) Stealth Gray, (LG) Light Gray, and (CC) Custom Color (Include RAL#).

Listed to: UL 1598 Standard for Luminaires - UL 8750 Standard for Safety for Light Emitting Diode (LED) Equipment for use in Lighting Products and CSA C22.2#250.0 Luminaires. RoHS compliant. Meets Buy American provisions within ARRA.

Warranty: Kim Lighting warrants Bollard LED products sold by Kim Lighting to be free from defects in material and workmanship for (i) a period of five (5) years for metal parts, (ii) a period of five (5 years for exterior housing paint finish(s), (iii) a period of five (5) years for LED Light Engines and, (iv) a period of five (5) years for LED power components (driver, surge protector and LifeShield® device), from the date of sale of such goods to the buyer as specified in Kim Lighting shipment documents for each product.

CAUTION: Fixtures must be grounded in accordance with national, state and/or local electrical codes. Failure to do so may result in serious personal injury.

HUBBELL
HUBBELL LIGHTING, INC.

Submitted by Lighting Group NorthwestChris Hamaker		Catalog Number:	Type:
lighting group northwest	**Job Name:** LEVETON Architect: Pending Architect Engineer: Pending Engineer	BNB1/27LXKUV/STANDARD FINISH Notes:	~~A5~~ D LGNW15-42252

KIM LIGHTING

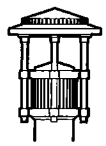
BNB1 LED

Bounce Bollard

revision 7/28/14 • kl_bnbled_spec.pdf

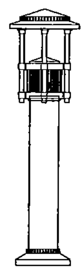
Type:

Job:



Standard Features

Fixture



Cat. No. ☐ **BNB1**

Electrical Module
LED = Light Emitting Diode

Cat. Nos. for LED Electrical Modules available: SPECIFY

xL	xK	UV
Source:	**Color Temperature:**	**Voltage:**
☐ **18L**= Type I	☐ 2K = 580nm - Amber	☐ **UV** Universal Voltage shall range from 120V-277V
☐ **27L**= Type III	☐ 3K = 3000K	
☐ **36L**= Type V	☐ 4K = 4200K	
	☐ 5K = 5100K	

~~SPECIFY STANDARD FINISH~~

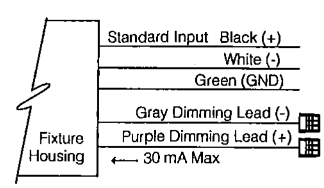
Luminaire Finish
TGIC powder coat paint on fixture and shaft.

Color:	Black	Dark Bronze	Light Gray	Stealth Gray	Platinum Silver	White	Custom Color[1]
Cat. No.:	☐ **BL**	☐ **DB**	☐ **LG**	☐ **SG**	☐ **PS**	☐ **WH**	☐ **CC**

[1]Custom colors subject to additional charges, minimum quantities and extended lead times. Consult representative. Custom color description:____________

0-10V Dimming Interface

Driver has a 0-10V dimming interface with a dimming range of 10-100%. Is compatible with most control systems including Hubbell Building Automation wiHUBB™. Approved dimmers include Lutron Diva AVTV, Lutron Nova NFTV and NTFTV. Note: Not compatible with current sourcing dimmers. Controls compatible via Gray and Purple dimming lead.



Submitted by Lighting Group NorthwestChris Hamaker		Catalog Number:	Type:
lighting group northwest	**Job Name:** LEVETON Architect: Pending Architect Engineer: Pending Engineer	FM/BNS1H5E35/60L4KVOLT/ STANDARD FINISH Notes:	~~A4~~ E LGNW15-42252

BNS1

KIM LIGHTING

Bounce® PicoEmitter™ LED

revision 2/18/15 • kl_bns1eled_spec.pdf

Type:
Job:
Catalog number:

/ / / /

Mtg. Fixture Electrical Module Finish Options

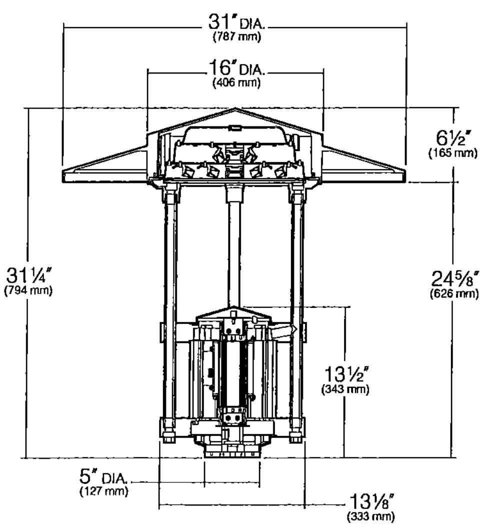
See page 2 See page 3 See pages 4 - 5

Approvals:

Date:
Page: 1 of 2

Specifications

BNS1-LED
31″ Diameter
60 Light Emitting Diodes
Total Max System Watts = 66W



Hood and Lens Frame: Die-cast, low copper (<0.6% Cu) aluminum alloy hood and lens frame with stainless steel hinge. The hood is opened with a tool-less latch made of die-cast aluminum and stainless steel brackets. The hood is held open for relamping with a stainless steel wire self-locking stop arm. The 3⁄16″ thick clear flat lens seals against the reflector flange by a one-piece molded silicone gasket, to produce a fully sealed optical chamber. The underside of the hood is always painted white.

Optical Module: Precision, replaceable PicoEmitters are positioned to achieve directional control toward desired task. The entire EmitterDeck® mounting assembly fastens to housing as a one-piece module.

Ballast Chamber: Die-cast, low copper (<0.6% Cu) aluminum alloy flanges compress a ribbed extruded aluminum chamber. The die-cast aluminum cover is held with two captive stainless steel screws and a retaining wire is provided to secure the cover during installation or servicing. The four heavy wall extruded support rods are mechanically fastened to the lens frame with stainless steel fasteners. The support rods are held in position through die-cast arms and mechanically fastened at the bottom with a custom aluminum bolt. The electrical wiring is channeled through a support rod with an aluminum bushing. The die-cast cover is always painted reflective white. (Optional Black Ballast Cover).

Mounted by one of the following pole attachment means:

FM - Flush Mounting by means of an expansion device activated by a single bolt within the ballast compartment. Pole must have a plain-cut top. Standard pole size is 4″ O.D. (Other pole adapter sizes available; contact Kim representative).

PT - Pole Tenon mounting by means of a cast aluminum adapter containing four recessed ⅜″ stainless steel allen head set screws. Pole must have a 2″ pipe-size tenon (2⅜″ O.D. x 4½″ minimum length). Pole tenon must be field drilled at one set screw location to secure against fixture rotation.

Electronic Module: All electrical components are UL and CSA recognized, mounted on a single plate and factory prewired with quick-disconnect plugs. Module includes a driver, LifeShield® temperature control device and surge protector. Electrical module attaches to housing with key hole slots, accessible by opening the lens frame and removing optical module. Driver is rated for -40°F starting temperature and has a 0-10V dimming interface on the LifeShield device for multi-level illumination options.

Finish: Each luminaire receives a fade and abrasion resistant, electrostatically applied, thermally cured, triglycidal isocyanurate (TGIC) polyester powdercoat finish. Standard colors include (BL) Black, (DB) Dark Bronze, (WH) White, (PS) Platinum Silver, (SG) Stealth Gray, (LG) Light Gray, and (CC) Custom Color (Include RAL#).

Listed To: UL 1598 Standard for Luminaires - UL 8750 Standard for Safety for Light Emitting Diode (LED) Equipment for use in Lighting Products and CSA C22.2#250.0 Luminaires.

CAUTION: Fixtures must be grounded in accordance with national, state, and/or local codes. Failure to do so may result in serious personal injury.

HUBBELL LIGHTING, INC. **U.S. Patent D473,333S**

Submitted by Lighting Group NorthwestChris Hamaker		Catalog Number:	Type: ~~A4~~ 6
lighting group northwest	**Job Name:** LEVETON Architect: Pending Architect Engineer: Pending Engineer	FM/BNS1H5E35/60L4KVOLT/ STANDARD FINISH Notes:	LGNW15-42252

KIM LIGHTING

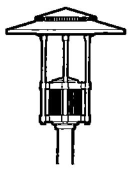
BNS1

Bounce® PicoEmitter™ LED

revision 2/18/15 • kl_bns1eled_spec.pdf

Type:

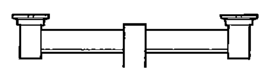
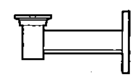
Job:



Standard Features

Mounting

		
EPA:	1.2	1.2
Cat. No:	☐ **FM** Flush Mount	☐ **PT** Pole Tenon Mount
Pole Top Requirements:	4″ O.D. Poles only	2″ Pipe-size Tenon (2⅜″ O.D. x 4½″ min. length)

		
EPA:	3.6	n/a
Cat. No:	☐ **2SB** Twin Mount	☐ **1W** Wall Mount
Pole Top Requirements:	4″ or 5″ O.D. Poles only	n/a

Fixture

Cat. No. designates fixture and optic

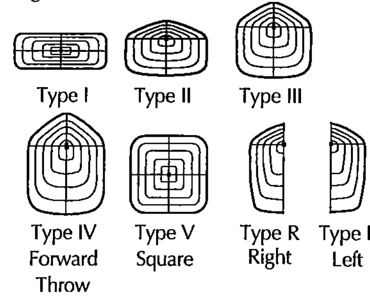
BNS1 x E35

Housing Size: BNS1

E35 = 350mA

Distribution:
- ☐ H1 = Type I
- ☐ H2 = Type II
- ☐ H3 = Type III
- ☐ H4 = Type IV
- ☐ H5 = Type V
- ☐ HR = Type R Right
- ☐ HL = Type L Left

Light Distribution:



Electrical Module

Cat. Nos. for Electrical Modules available:

60L xK x

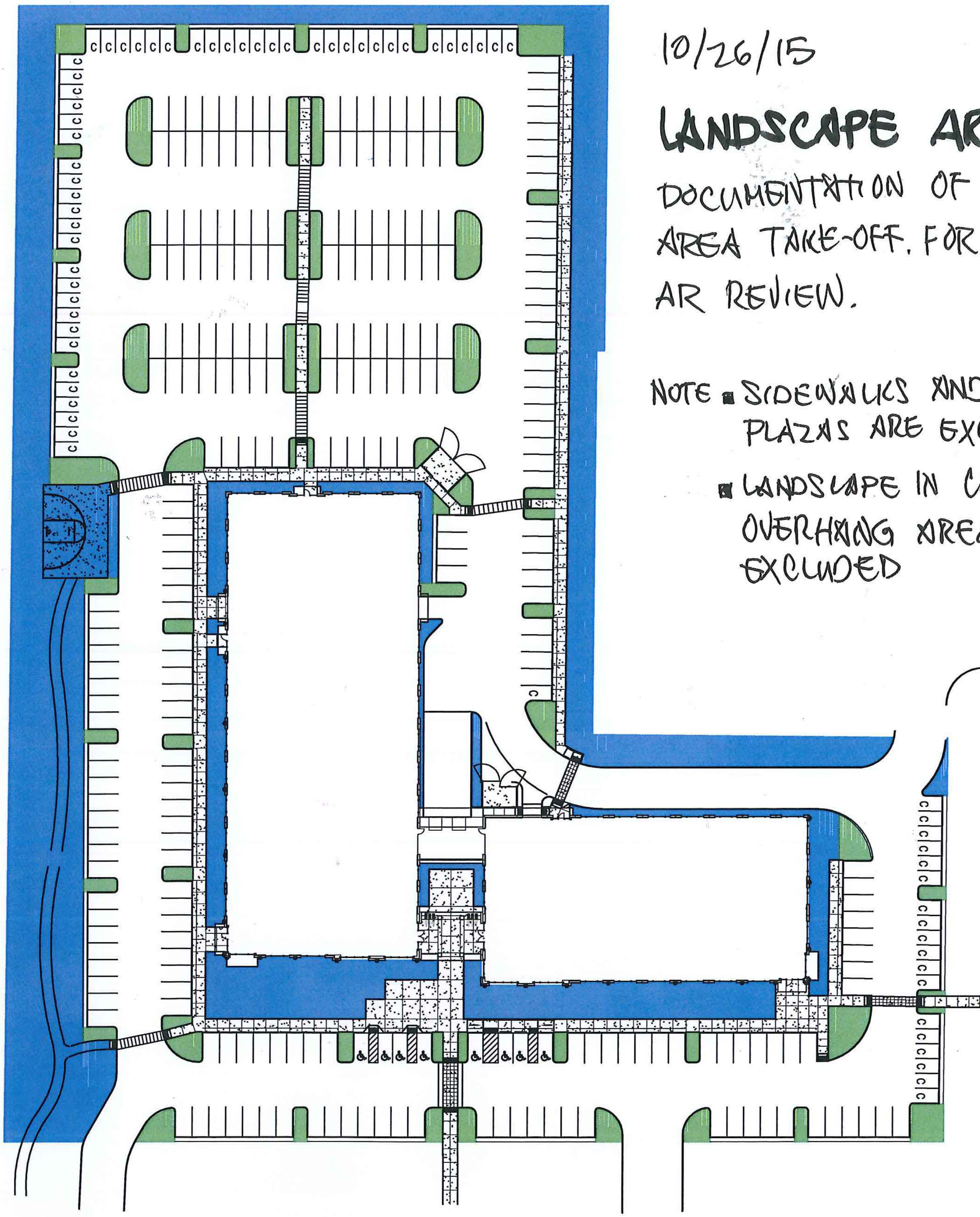
Source:
60L = 60 LED's

Color Temperature:
- ☐ 3K = 3000K
- ☐ 4K = 4200K
- ☐ 5K = 5100K
- ☐ 2K = 580nm - Amber

Voltage: -SPECIFY VOLTAGE
- ☐ 120 = 120V
- ☐ 208 = 208V
- ☐ 240 = 240V
- ☐ 277 = 277V
- ☐ 347 = 347V²
- ☐ 480 = 480V²

²Due to current unavailability of 347V and 480V drivers, specification of these voltages may feature an integral step-down transformer.

LEVETON



10/26/15

LANDSCAPE AREA:

DOCUMENTATION OF (CAD) AREA TAKE-OFF. FOR AR REVIEW.

NOTE ▪ SIDEWALKS AND PLAZAS ARE EXCLUDED.

▪ LANDSCAPE IN CAR OVERHANG AREA IS EXCLUDED

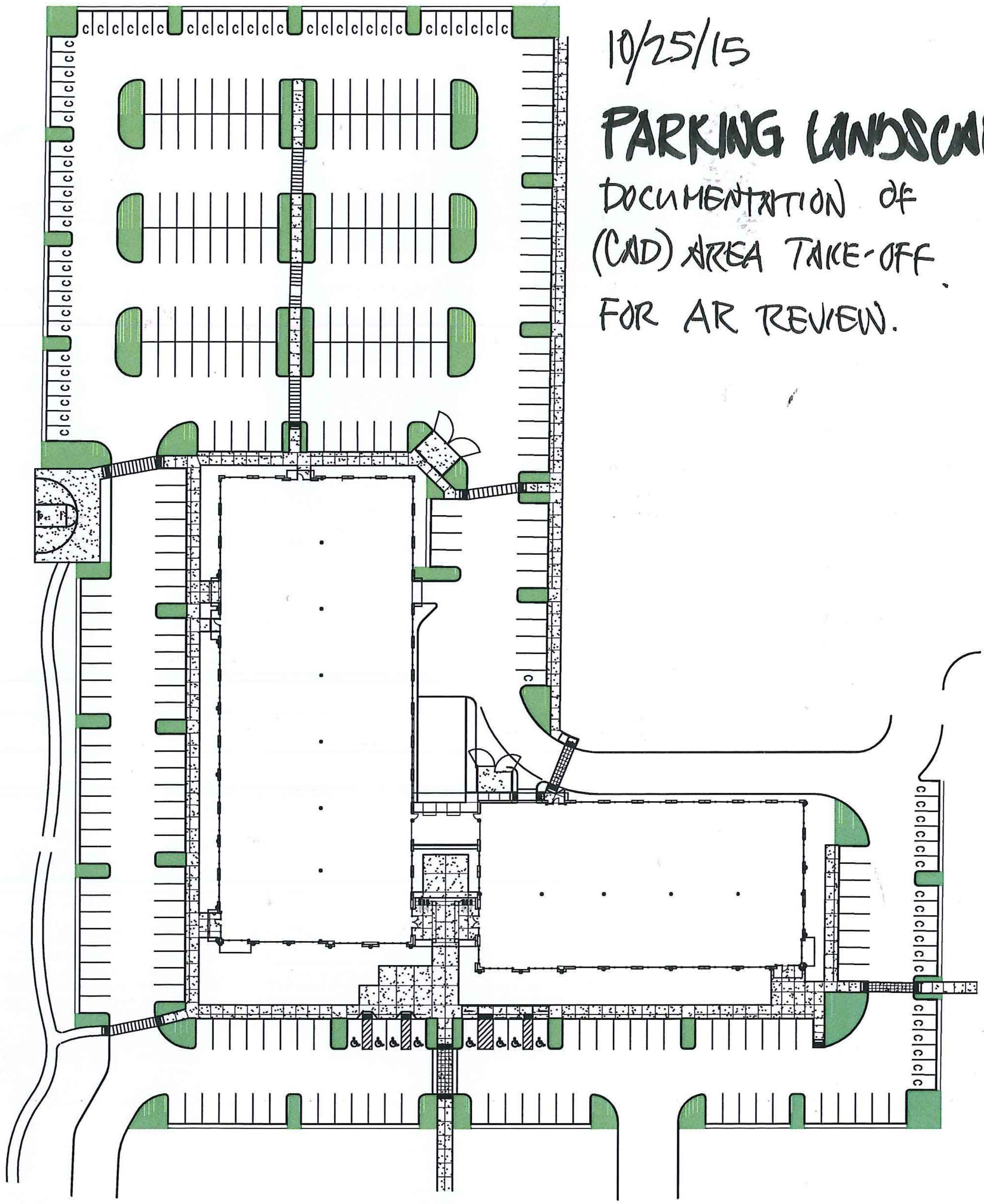
11,701 S.F. PARKING LOT LANDSCAPING + 45,164 S.F. SITE LANDSCAPING => 56,865 SF TOTAL

LEVETON

10/25/15

PARKING LANDSCAP'G:

DOCUMENTATION OF (CAD) AREA TAKE-OFF FOR AR REVIEW.



11,701 S.F.
PARKING LOT
LANDSCAPING

LEVETON DEVELOPMENT

SW 108th Ave at SW Leveton Drive
Tualatin, Oregon

PRELIMINARY STORMWATER REPORT

VLMK Project Number: 20140222

10/21/15

REGISTERED PROFESSIONAL
ENGINEER
51395PE
OREGON
JULY 9, 2002
BRIAN M. DUBAL
EXPIRES: 12/31/2015

VLMK
ENGINEERING + DESIGN

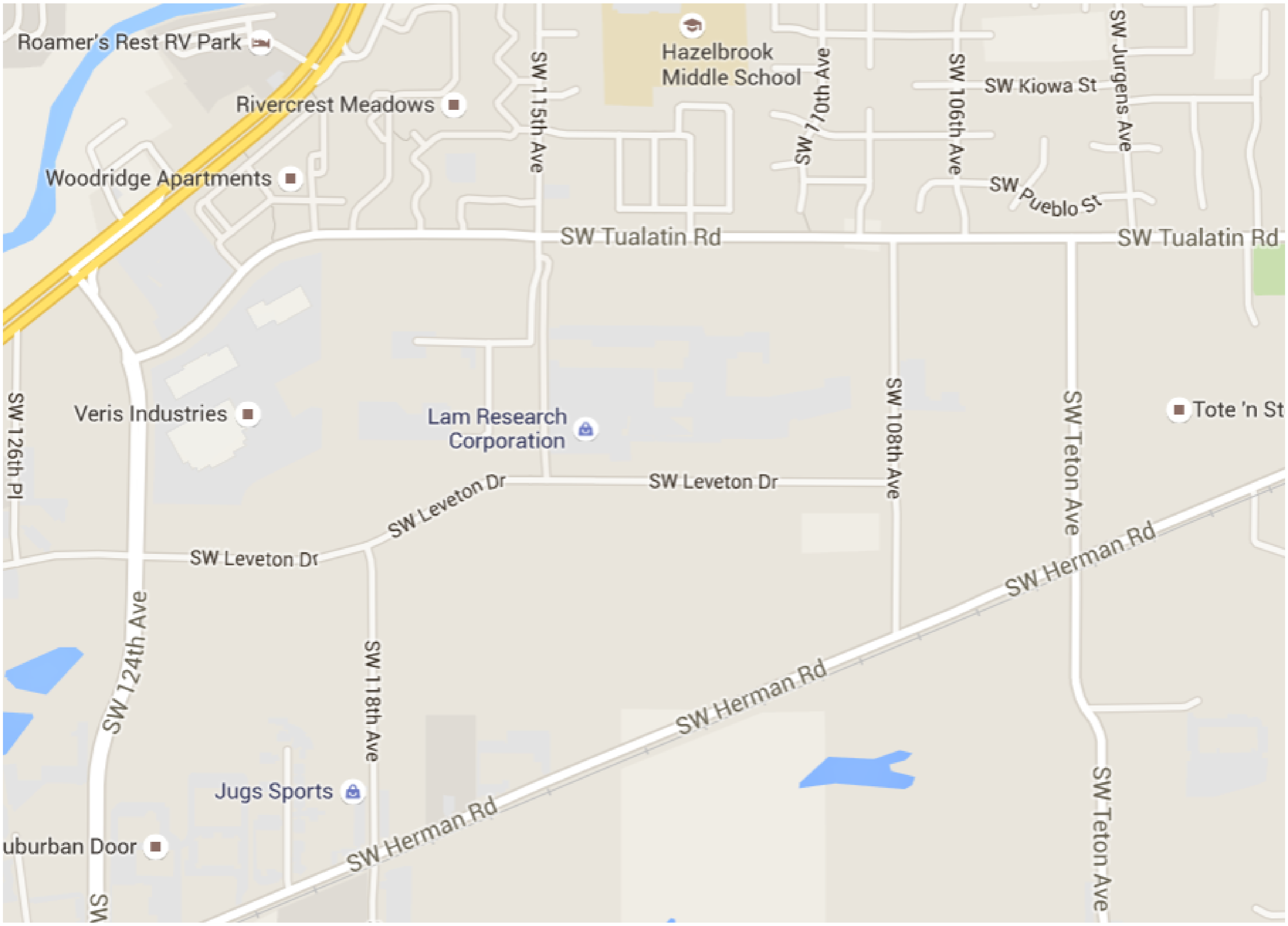
Prepared By: Corey Theisen, E.I.T.
October 21st, 2015

Project:	Leveton Development	***Project Number:***	20140222
Project Address:	SW 108th Ave and SW Leveton drive Tualatin, Oregon		

TABLE OF CONTENTS

I. SITE AND PROJECT INFORMATION

A. Vicinity Map



Site Vicinity Map

NOT TO SCALE

B. Project Overview and Description

Size and location of project site
The site is located at SW 108th Ave and SW Leveton Drive. The total site area is 233,404 sq ft (5.36 acres).

Property zoning
This property is zoned as ML, Light Manufacturing

Type of Development/proposed improvements
The onsite improvement will consist of the following:

- Two new two-story buildings of concrete tilt-up construction
- New Parking areas, drive aisles and loading dock area
- New driveway along SW 108th Ave
- Connection to water, sanitary, and storm lines in SW 108th Ave
- Underground Stormtech detention system
- LID water quality flow-through planters within parking area

Watershed description
The existing site does not currently have any drainage facilities for stormwater. Existing grading indicates that larger storm events would flow to the south-eastern portion of the property and overflow onto adjacent lands.

Existing vs. post-construction conditions
The existing site conditions are primarily covered by grassland. The proposed improvements will create approximately 4.06 acres of new impervious areas, including paving, sidewalks, loading dock areas and roof areas. Water quality systems will provide treatment to these new impervious areas. Stormfilter units and LID flow-through planters will be utilized to provide water quality. These systems will be sized to provide water quality treatment per the CWS Design & Construction Standards. See Appendix A for water quality calculations.

Water quantity control will be achieved through the use of underground Stormtech SC-740 storage chambers. These chambers will detain the 2, 5, 10 and 25 year storm events while a flow control manhole will release stormwater at or below the pre-developed runoff rates. Stormwater quality treatment post-development quantity control are based on actual post-development drainage basin areas within the property boundary.

This site is not within the 100-year Floodplain.

C. Analysis

Design Assumptions used:

- Pre-development time of concentration was calculated to be 43.46 minutes. See Appendix B for calculations. Post developed time of concentration was assumed to be 5 minutes.
- Sizing of the detention system assumed 85% post-developed impervious areas. Actual impervious area is less than 85%.
- Curve numbers are based on *TR-55 Urban Hydrology for Small Watersheds* Table 2-2a and Table 2-2c. See Appendix B.

Impervious areas treated
See "Impervious Areas Map", Appendix A

D. Engineering Conclusions

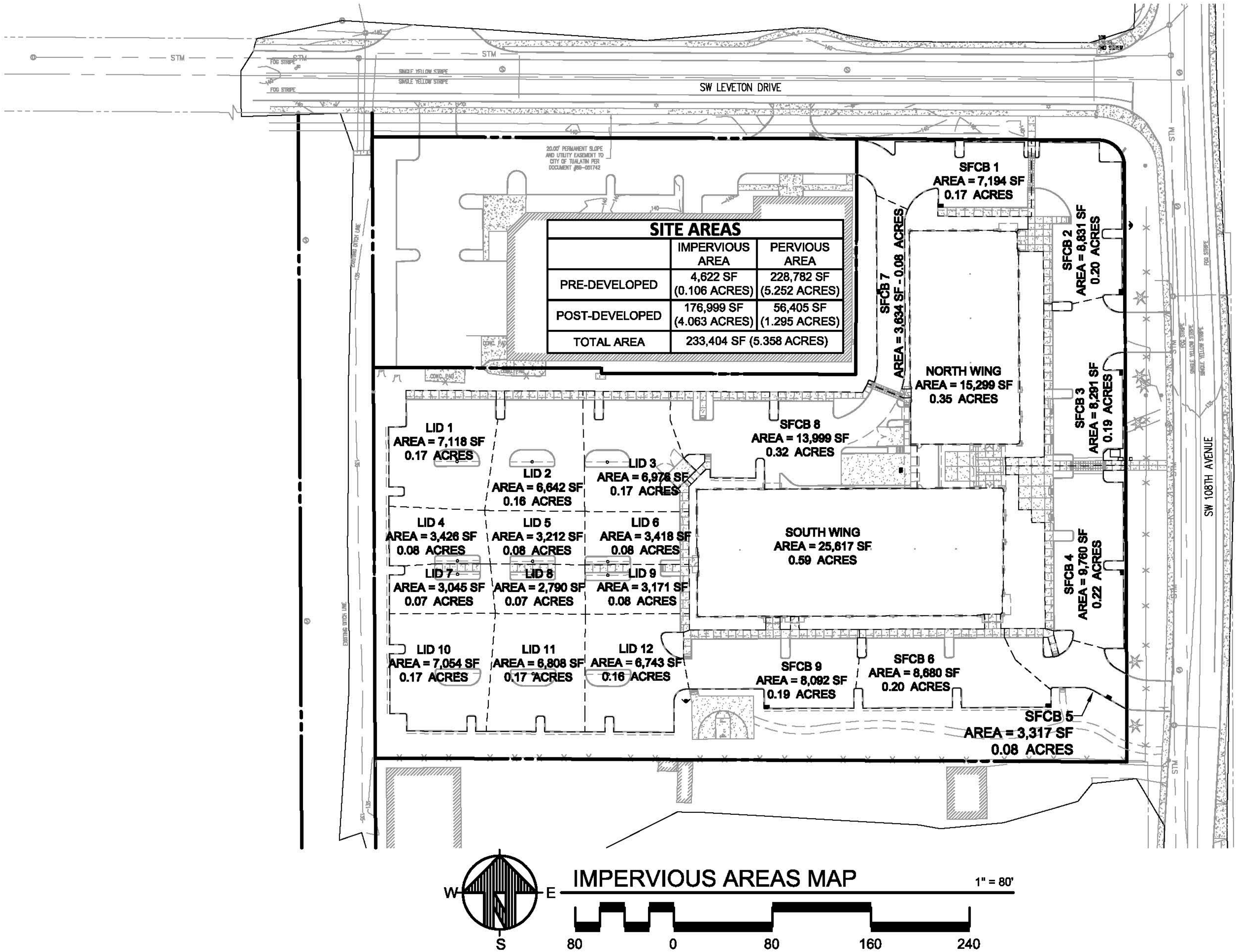
Based on compliance with the City of Tualatin Stormwater Management Manual, CWS Design & Construction Standards, and the CWS LIDA manual.
Stormwater management for this development complies with the requirements in these documents.

How water quality, flow control and discharge requirements are satisfied
The stormwater management systems on this site have been designed to handle the stormwater runoff from the additional impervious area. The proposed Stormfilter system is sized to handle the water quality flow rates as outlined in section 4.05.6 of the *CWS Design and Construction Standards* (see Appendix A). LID flow-through planters have been sized per the CWS LIDA manual in order to adequately treat the tributary area directed to them.

Water quantity requirements per section 4.03 of the *CWS Design and Construction Standards* have been met through the use of the Stormtech underground storage chambers. These chambers will detain post-developed runoff flow rates to pre-developed runoff flow rates for the 2, 5, 10, and 25 year storms (see Appendix B). It is assumed that the storm main in SW 108th Ave is sufficient for the required drainage. Furthermore, the LID swales in the western parking lot will provide additional detention that was not taken into consideration when sizing the underground chambers, thus reducing the peak flow rates into the detention system.

II. APPENDIX

Appendix A – Water Quality
- Impervious Areas Map
- Water Quality Calculations



SITE AREAS

	IMPERVIOUS AREA	PERVIOUS AREA
PRE-DEVELOPED	4,622 SF (0.106 ACRES)	228,782 SF (5.252 ACRES)
POST-DEVELOPED	176,999 SF (4.063 ACRES)	56,405 SF (1.295 ACRES)
TOTAL AREA	233,404 SF (5.358 ACRES)	

VLMK ENGINEERING + DESIGN
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Portland, Oregon 97239
503.222.4453
VLMK.COM

LEVETON
SW 108TH AVE AT SW LEVETON DRIVE
TUALATIN, OR

IMPERVIOUS AREAS MAP

DATE Oct. 19, 2015
SCALE ---
PROJ. NO. 20140222
DRAWN CLT
CHECKED BMD

Water Quality Calculations

Based on the CWS June 2007 Design and Construction Standards

Treat Using Contech StormFilter Catch Basin Units: Each Cartridge Treats 15 gpm (0.033 cfs)

SFCB 8 — **15,920** sf of Impervious Surface Area

Water Quality Volume (V_{wq}):

V_{wq} = Impervious Area • 0.36"

V_{wq} = 15,920 sf • 0.36 in • 1/12 ft/in

V_{wq} = 478 cf

Water Quality Flowrate (Q_{wq}):

$Q_{wq} = V_{wq}$ / Time Time = 4 hours

Q_{wq} = 0.033 cfs < 0.067 cfs

Use Two Cartridge Catch Basin Unit(s)

STM MH 3 (WQ) — **42,190** sf of Impervious Surface Area

Water Quality Volume (V_{wq}):

V_{wq} = Impervious Area • 0.36"

V_{wq} = 42,190 sf • 0.36 in • 1/12 ft/in

V_{wq} = 1,266 cf

Water Quality Flowrate (Q_{wq}):

$Q_{wq} = V_{wq}$ / Time Time = 4 hours

Q_{wq} = 0.088 cfs < 0.100 cfs

Use Three Cartridge Catch Basin Unit(s)

Water Quality Calculations

Based on the CWS June 2007 Design and Construction Standards

LID 1 **7,118** sf of Impervious Surface Area

Flow Through Planter Sizing:

Required Area = Impervious Area • 0.06

Req. Area = 7,118 sf • 0.06 (Sizing factor)

Req. Area = 427 sf

FT Planter Area Provided= 430 sf

LID 4 **3,426** sf of Impervious Surface Area

Flow Through Planter Sizing:

Required Area = Impervious Area • 0.06

Req. Area = 3,426 sf • 0.06 (Sizing factor)

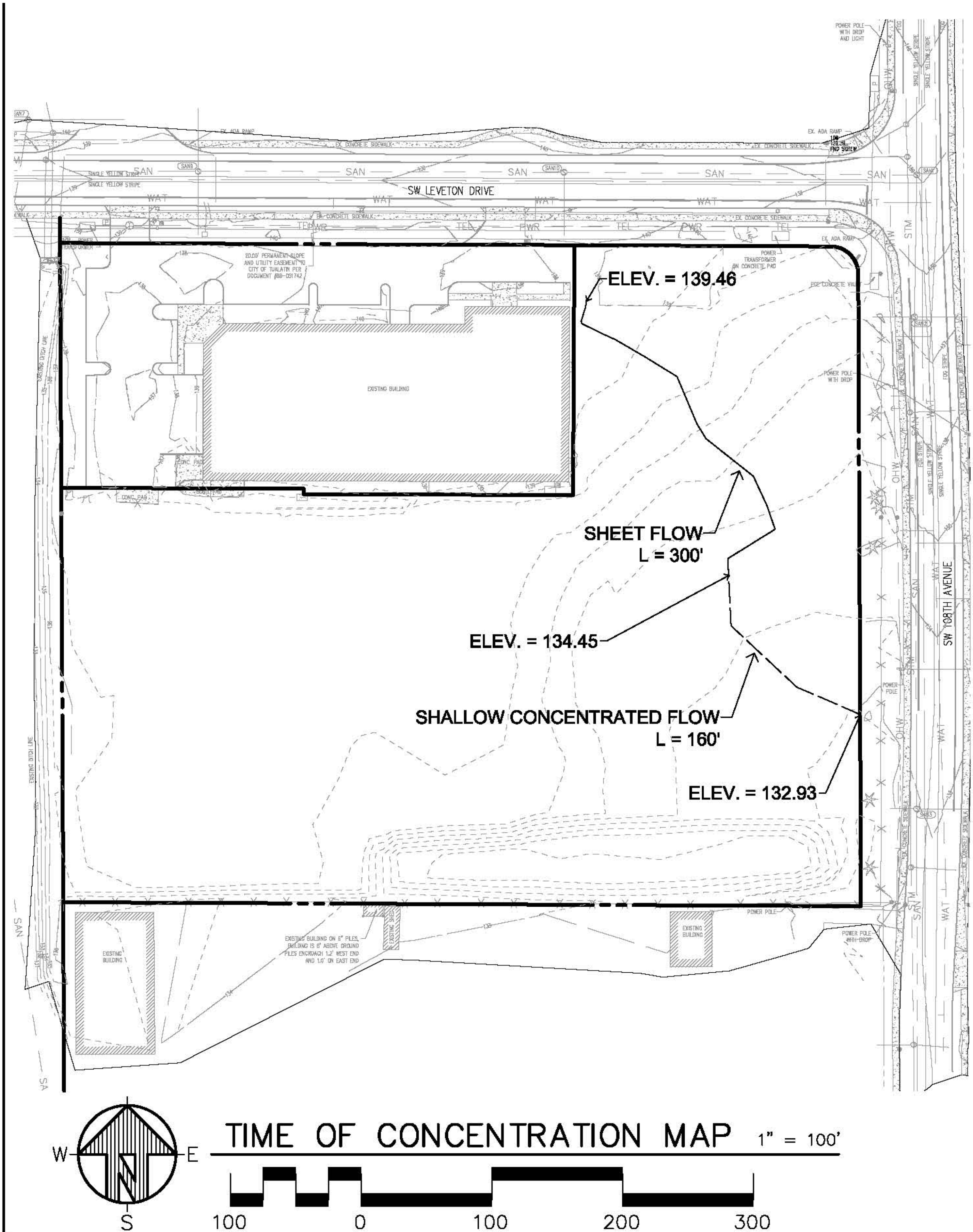
Req. Area = 206 sf

FT Planter Area Provided= 213 sf

Water Quality Requirements Met

Appendix B - Water Quantity

- Time of Concentration Map
- Time of Concentration Calculation
- Catchment Areas Map
- TR-55 Curve Numbers
- SBUH Calculations
- Retention/Detention Facility Calculations
- Stormtech Storage Table



TIME OF CONCENTRATION MAP

1" = 100'

VLMK ENGINEERING + DESIGN

3933 SW Kelly Avenue Portland, Oregon 97239 | tel: 503.222.4453 | fax: 503.248.9263 | www.vlmk.com

LEVETON 108TH AVE AT SW LEVETON DR TUALATIN, OR	20140222 PROJ. NO. / 10/20/15 DATE
	CLT DRAWN / BMD CHECKED
BASIN MAPS - TOC MAP	---- SHEET NO.

Time of Concentration

Based on the TR-55 by the USDA SCS, Second Edition, June 1986

SHEET FLOW

Less than 300' Length

$T_c = T_{t1} + T_{t2} + \ldots + T_n$ Time of Concentration

$T_t = (0.42 \cdot (\eta \cdot L)^{0.8}) / (P_2^{0.5} \cdot S^{0.4})$

Time of Travel T_{t1} = 41.8 minutes

Length of Flow	L	=	300	ft
Manning's value	η	=	0.24	
Intensity of storm	I	=	2.50	in
Slope of Surface	S	=	0.0167	ft/ft
High Point Elevation		=	139.46	ft
Low Point Elevation		=	134.45	ft

SHALLOW CONCENTRATED FLOW

$T_t = L / 60 \cdot v$

Time of Travel T_{t2} = 1.67 minutes

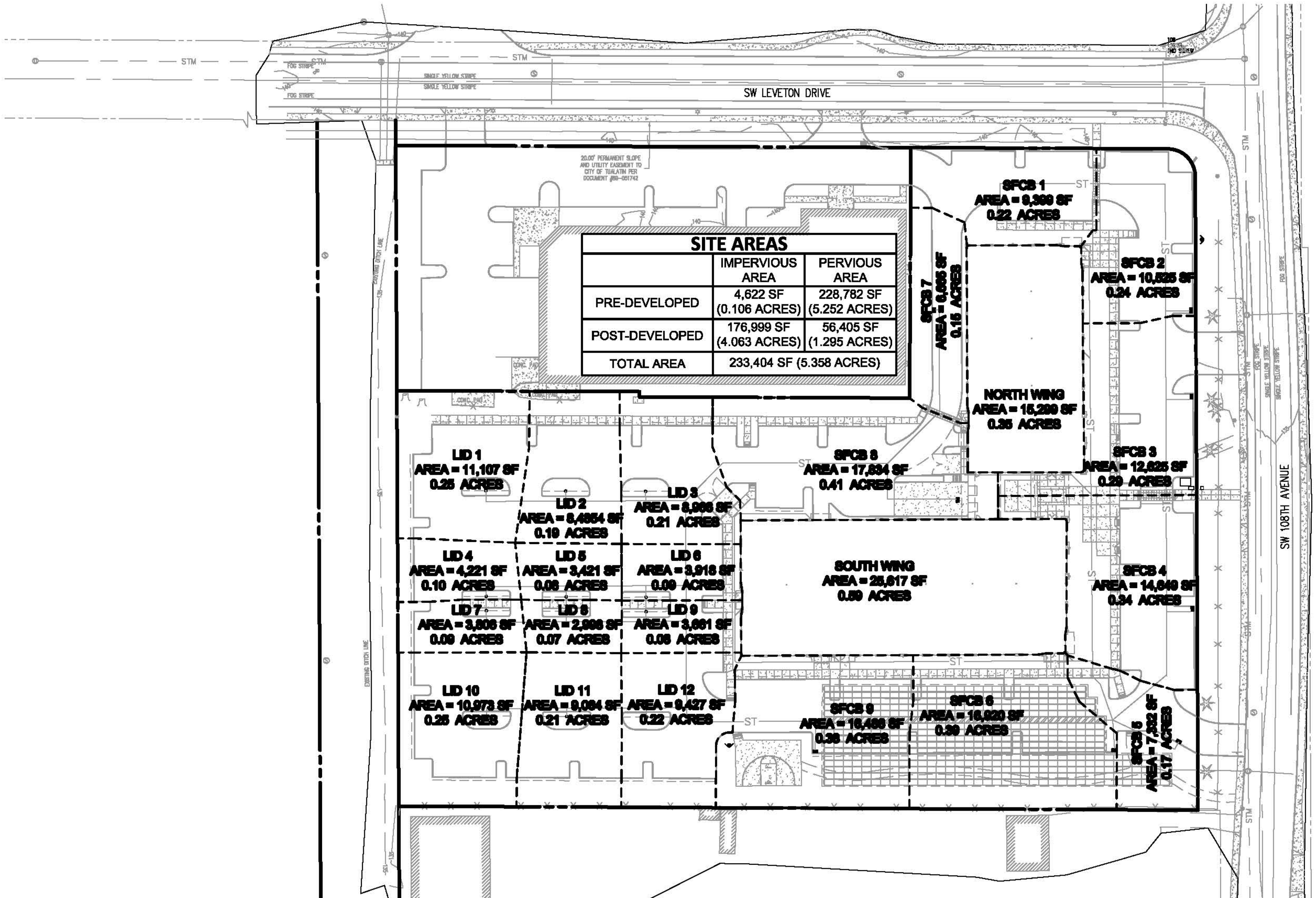
Velocity	v	=	1.6	fps TR-55 Figure 3-1
Length of Flow	L	=	160	ft
Slope of Surface	S	=	0.0095	ft/ft
High Point Elevation		=	134.45	ft
Low Point Elevation		=	132.93	ft

$T_c = T_{t1} + T_{t2}$ T_c = 43.46 minutes

Table 3-1 (TR-55 Page 3-3)
Roughness coefficients (Manning's η) for sheet flow

Surface description	η[1]
Smooth surfaces (concrete, asphalt, gravel, or bare soil) ……………………………………………..	0.01
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤20%	0.06
Residue cover >20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses[2]	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods:[3]	
Light underbrush	0.40
Dense underbrush	0.80

[1] The η values are a composite of information compiled by Engman (1986)
[2] Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass
[3] When selecting η, consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.



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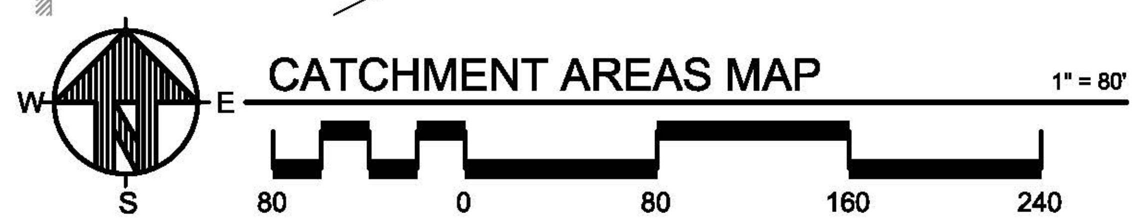

CATCHMENT AREAS MAP

1" = 80'

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ENGINEERING + DESIGN

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Portland, Oregon 97239
503.222.4453
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LEVETON
SW 108TH AVE AT SW LEVETON DRIVE
TUALATIN, OR

CATCHMENT AREAS MAP

DATE	Oct. 20, 2015
SCALE	—
PROJ. NO.	20140222
DRAWN	CLT
CHECKED	BMD

Table 2-2c Runoff curve numbers for other agricultural lands [1]

Pre-developed pervious condition

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition	A	B	C	D
Pasture, grassland, or range—continuous forage for grazing. [2]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element. [3]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30 [4]	48	65	73
Woods—grass combination (orchard or tree farm). [5]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods. [6]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30 [4]	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

1 Average runoff condition, and $I_a = 0.2S$.
2 *Poor:* <50%) ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: > 75% ground cover and lightly or only occasionally grazed.
3 *Poor:* <50% ground cover.
Fair: 50 to 75% ground cover.
Good: >75% ground cover.
4 Actual curve number is less than 30; use CN = 30 for runoff computations.
5 CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.
6 *Poor:* Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

Table 2-2a Runoff curve numbers for urban areas [1]

Post-developed pervious condition

Post-developed impervious condition

Cover description: Cover type and hydrologic condition	Average percent impervious area [2]	Curve numbers for hydrologic soil group: A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	$\boxed{69}$	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	$\boxed{98}$	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

1 Average runoff condition, and $I_a = 0.2S$.
2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.
3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.
4 Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.
5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

STORM EVENT: 25-YEAR, 24 HOUR, 3.9"

KING COUNTY DEPARTMENT OF PUBLIC WORKS
Surface Water Management Division

HYDROGRAPH PROGRAMS
Version 4.21B

1 - INFO ON THIS PROGRAM
2 - SBUHYD
3 - MODIFIED SBUHYD
4 - ROUTE
5 - ROUTE2
6 - ADDHYD
7 - BASEFLOW
8 - PLOTHYD
9 - DATA
10 - RDFAC
11 - 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. *********
----

25 YEAR PRE-DEVELOPED STORM

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO. 1
5.358,69,0,98,43.5

DATA PRINT-OUT:

```
 AREA(ACRES)    PERVIOUS    IMPERVIOUS   TC(MINUTES)
            A     CN     A     CN
     5.4      5.4  69.0    .0  98.0      43.5

 PEAK-Q(CFS)   T-PEAK(HRS)    VOL(CU-FT)
     .63         8.00         23248
```

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\HYD\20140222\25PRE

----

25 YEAR POST-DEVELOPED STORM

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO. 2
0.804,69,4.554,98,5

DATA PRINT-OUT:

```
 AREA(ACRES)    PERVIOUS    IMPERVIOUS   TC(MINUTES)
            A     CN     A     CN
     5.4       .8  69.0   4.6  98.0       5.0

 PEAK-Q(CFS)   T-PEAK(HRS)    VOL(CU-FT)
    4.83         7.67         64100
```

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\HYD\20140222\25POST

10 YEAR PRE-DEVELOPED STORM

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
5.358,69,0,98,43.5

DATA PRINT-OUT:

```
 AREA(ACRES)    PERVIOUS    IMPERVIOUS   TC(MINUTES)
            A     CN     A     CN
     5.4      5.4  69.0    .0  98.0      43.5

 PEAK-Q(CFS)   T-PEAK(HRS)    VOL(CU-FT)
```

.42 8.17 17888

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\HYD\20140222\10PRE

----

10 YEAR POST-DEVELOPED STORM

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO. 2
0.804,69,4.554,98,5

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
5.4	.8	69.0	4.6	98.0	5.0

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
4.21	7.67	55871

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\HYD\20140222\10POST

5 YEAR PRE-DEVELOPED STORM

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
5.358,69,0,98,43.5

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
5.4	5.4	69.0	.0	98.0	43.5

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
.28	8.50	14024

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\HYD\20140222\5PRE

----

5 YEAR PRE-DEVELOPED STORM

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO. 2
0.804,69,4.554,98,5

DATA PRINT-OUT:

```
 AREA(ACRES)    PERVIOUS    IMPERVIOUS   TC(MINUTES)
           A     CN     A     CN
    5.4       .8  69.0    4.6  98.0       5.0

 PEAK-Q(CFS)   T-PEAK(HRS)    VOL(CU-FT)
    3.74         7.67         49521
```

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\HYD\20140222\5POST

2 YEAR PRE-DEVELOPED STORM

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
5.358,69,0,98,43.5

DATA PRINT-OUT:

```
 AREA(ACRES)    PERVIOUS    IMPERVIOUS   TC(MINUTES)
           A     CN     A     CN
    5.4      5.4  69.0    .0  98.0      43.5

 PEAK-Q(CFS)   T-PEAK(HRS)    VOL(CU-FT)
     .16        12.50         8155
```

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\HYD\20140222\2PRE

----

2 YEAR POST-DEVELOPED STORM

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC FOR BASIN NO. 2
0.804,69,4.554,98,5

DATA PRINT-OUT:

```
 AREA(ACRES)    PERVIOUS    IMPERVIOUS   TC(MINUTES)
           A     CN     A     CN
    5.4      .8  69.0   4.6  98.0       5.0

 PEAK-Q(CFS)   T-PEAK(HRS)    VOL(CU-FT)
    2.94         7.67         38765
```

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\HYD\20140222\2POST

RETENTION/DETENTION FACILITY CALCULATIONS

KING COUNTY DEPARTMENT OF PUBLIC WORKS
Surface Water Management Division

HYDROGRAPH PROGRAMS
Version 4.21B

1 - INFO ON THIS PROGRAM
2 - SBUHYD
3 - MODIFIED SBUHYD
4 - ROUTE
5 - ROUTE2
6 - ADDHYD
7 - BASEFLOW
8 - PLOTHYD
9 - DATA
10 - RDFAC
11 - RETURN TO DOS

ENTER OPTION:
10
R/D FACILITY DESIGN ROUTINE

SPECIFY TYPE OF R/D FACILITY:

```
1 - POND        4 - INFILTRATION POND
2 - TANK        5 - INFILTRATION TANK
3 - VAULT       6 - GRAVEL TRENCH/BED
3
```

ENTER: EFFECTIVE STORAGE DEPTH(ft) BEFORE OVERFLOW
3.5

ENTER [d:][path]filename[.ext] OF PRIMARY DESIGN INFLOW HYDROGRAPH:
C:\HYD\20140222\25POST
PRIMARY DESIGN INFLOW PEAK = 4.83 CFS

ENTER PRIMARY DESIGN RELEASE RATE(cfs):
0.63

ENTER NUMBER OF INFLOW HYDROGRAPHS TO BE TESTED FOR PERFORMANCE (5 MAXIMUM):
3

ENTER [d:][path]filename[.ext] OF HYDROGRAPH 1:
C
ENTER TARGET RELEASE RATE(cfs):
C:\HYD\20140222\10POST
ENTER TARGET RELEASE RATE(cfs):
0.42

ENTER [d:][path]filename[.ext] OF HYDROGRAPH 2:
C:\HYD\20140222\5POST
ENTER TARGET RELEASE RATE(cfs):
0.28

ENTER [d:][path]filename[.ext] OF HYDROGRAPH 3:
C:\HYD\20140222\2POST
ENTER TARGET RELEASE RATE(cfs):
0.16

ENTER: NUMBER OF ORIFICES, RISER-HEAD(ft), RISER-DIAMETER(in)
3,3.5,48

RISER OVERFLOW DEPTH FOR PRIMARY PEAK INFLOW = .25 FT

INITIAL STORAGE VALUE FOR ITERATION PURPOSES: 36216 CU-FT BOTTOM ORIFICE: ENTER Q-MAX(cfs)
0.18
DIA.= 1.88 INCHES
MIDDLE ORIFICE: ENTER Q-MAX(cfs), HEIGHT(ft)
0.12,2.8
DIA.= 2.30 INCHES
TOP ORIFICE: ENTER HEIGHT(ft)
3.4
DIA.= 6.20 INCHES

ITERATION COMPUTATION BEGINS...

TRIAL	BOTTOM-AREA	STOR-AVAIL	STOR-USED	PK-STAGE	PK-OUTFLOW
1	10347.4	36216	36408	3.52	.66
2	10402.3	36408	36578	3.52	.65
3	10450.9	36578	36728	3.51	.65

4	10493.8	36728	36862	3.51	.65
5	10532.1	36862	36984	3.51	.65
6	10567.1	36984	37096	3.51	.65
7	10599.1	37096	37199	3.51	.64
8	10628.4	37199	37293	3.51	.64
9	10655.4	37293	37381	3.51	.64
10	10680.3	37381	37461	3.51	.64
11	10703.3	37461	37534	3.51	.64
12	10724.2	37534	37602	3.51	.64
13	10743.5	37602	37664	3.51	.64
14	10761.2	37664	37721	3.51	.64
15	10777.6	37721	37774	3.50	.64
16	10792.7	37774	37822	3.50	.64
17	10806.5	37822	37866	3.50	.64
18	10819.1	37866	37907	3.50	.64
19	10830.7	37907	37944	3.50	.64

PERFORMANCE:	INFLOW	TARGET-OUTFLOW	ACTUAL-OUTFLOW	PK-STAGE	STORAGE
DESIGN HYD:	4.83	.63	.64	3.50	37944
TEST HYD 1:	4.21	.42	.42	3.44	37240
TEST HYD 2:	3.74	.28	.28	3.33	36040
TEST HYD 3:	2.94	.16	.16	2.71	29340

REQUIRED
STORAGE=37,944 CF

Project: **LEVETON**

StormTech
Detention • Retention • Water Quality
A division of ADS

Chamber Model -	SC-740	
Units -	**Imperial**	Click Here for Metric
Number of chambers -	508	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	130.00	ft
Amount of Stone Above Chambers -	6	in
Amount of Stone Below Chambers -	6	in

☐ Include Perimeter Stone in Calculations

STORAGE PROVIDED VIA 508 SC-740 STORAGE CHAMBERS = 38,047 CF

Height of System *(inches)*	Incremental Single Chamber *(cubic feet)*	Incremental Total Chamber *(cubic feet)*	Incremental Stone *(cubic feet)*	Incremental Ch & St *(cubic feet)*	Cumulative Chamber *(cubic feet)*	Elevation *(feet)*
42	0.00	0.00	572.42	572.42	38047.34	133.50
41	0.00	0.00	572.42	572.42	37474.92	133.42
40	0.00	0.00	572.42	572.42	36902.51	133.33
39	0.00	0.00	572.42	572.42	36330.09	133.25
38	0.00	0.00	572.42	572.42	35757.67	133.17
37	0.00	0.00	572.42	572.42	35185.25	133.08
36	0.05	27.94	561.24	589.18	34612.84	133.00
35	0.16	82.76	539.31	622.08	34023.66	132.92
34	0.28	143.23	515.13	658.35	33401.58	132.83
33	0.60	306.81	449.69	756.51	32743.23	132.75
32	0.80	407.27	409.51	816.78	31986.72	132.67
31	0.95	482.94	379.24	862.18	31169.94	132.58
30	1.07	545.85	354.08	899.93	30307.76	132.50
29	1.18	599.69	332.54	932.23	29407.83	132.42
28	1.27	642.96	315.24	958.19	28475.60	132.33
27	1.36	688.35	297.08	985.42	27517.41	132.25
26	1.45	738.68	276.94	1015.63	26531.99	132.17
25	1.52	774.56	262.59	1037.15	25516.36	132.08
24	1.58	803.82	250.89	1054.71	24479.21	132.00
23	1.64	834.28	238.71	1072.98	23424.50	131.92
22	1.70	863.35	227.08	1090.43	22351.51	131.83
21	1.75	890.49	216.22	1106.71	21261.08	131.75
20	1.80	915.83	206.09	1121.91	20154.37	131.67
19	1.85	942.34	195.48	1137.82	19032.46	131.58
18	1.89	961.69	187.74	1149.43	17894.64	131.50
17	1.93	982.47	179.43	1161.90	16745.21	131.42
16	1.97	1003.30	171.10	1174.40	15583.30	131.33
15	2.01	1021.04	164.00	1185.04	14408.91	131.25
14	2.04	1038.86	156.88	1195.73	13223.87	131.17
13	2.07	1054.08	150.78	1204.87	12028.14	131.08
12	2.10	1069.30	144.70	1213.99	10823.27	131.00
11	2.13	1082.95	139.24	1222.19	9609.28	130.92
10	2.15	1094.16	134.75	1228.91	8387.09	130.83
9	2.18	1105.95	130.04	1235.99	7158.18	130.75
8	2.20	1116.77	125.71	1242.48	5922.19	130.67
7	2.21	1121.32	123.89	1245.21	4679.71	130.58
6	0.00	0.00	572.42	572.42	3434.50	130.50
5	0.00	0.00	572.42	572.42	2862.09	130.42
4	0.00	0.00	572.42	572.42	2289.67	130.33
3	0.00	0.00	572.42	572.42	1717.25	130.25
2	0.00	0.00	572.42	572.42	1144.83	130.17
1	0.00	0.00	572.42	572.42	572.42	130.08

VLMK ENGINEERING + DESIGN EST 1971

Appendix C – Web Soil Survey

NRCS Web Soil Survey

Soil Map


122° 47' 27" W
122° 47' 13" W
45° 23' 10" N
45° 23' 3" N
516370
516400
516430
516460
516490
516520
516550
516580
516610
516640
516670
5025860
5025830
5025800
5025770
5025740
5025710
5025680
21B
10
Sw 108th Ave
N
Map Scale: 1:1,430 if printed on A landscape (11" x 8.5") sheet.
Meters
0 20 40 80 120
Feet
0 50 100 200 300
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: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Washington County, Oregon
Survey Area Data: Version 12, Sep 19, 2014

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

Washington County, Oregon (OR067)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
10	Chehalis silt loam, occasional overflow	3.3	37.2%
21B	Hillsboro loam, 3 to 7 percent slopes	5.6	62.8%
Totals for Area of Interest		**9.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Washington County, Oregon

10—Chehalis silt loam, occasional overflow

Map Unit Setting

National map unit symbol: 21x9
Elevation: 100 to 300 feet
Mean annual precipitation: 40 to 60 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

Chehalis, occasional flooding, and similar soils: 85 percent
Minor components: 4 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chehalis, Occasional Flooding

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 16 inches: silt loam
H2 - 16 to 45 inches: silt loam
H3 - 45 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 3 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: Occasional
Frequency of ponding: None
Available water storage in profile: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Other vegetative classification: Well drained < 15% Slopes (G002XY002OR)

Minor Components

Wapato

Percent of map unit: 4 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

Other vegetative classification: Poorly Drained (G002XY006OR)

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

REPORT OF GEOTECHNICAL ENGINEERING SERVICES

Proposed Tualatin Industrial Center III

SW 108th Avenue and SW Leveton Drive

Tualatin, Oregon

For
Specht Development
January 8, 2007

GeoDesign Projects: Specht-37-01

Engineers | Geologists | Environmental Consultants

GeoDesign INC

January 8, 2007

Specht Development
15400 SW Millikan Way
Beaverton, OR 97006

Attention: Mr. Joe Curran

Report of Geotechnical Engineering Services
Tualatin Industrial Center III
SW 108th Avenue and SW Leveton Drive
Tualatin, Oregon
GeoDesign Project: Specht-37-01

GeoDesign, Inc. is pleased to submit our report of geotechnical engineering services for the proposed Tualatin Industrial Center III project. The site is located southwest of the intersection between SW 108th Avenue and SW Leveton Drive in Tualatin, Oregon. Our services for this project were conducted in accordance with our proposal dated November 20, 2006.

We appreciate the opportunity to be of continued service to you. Please call if you have questions regarding this report.

Sincerely,

GeoDesign, Inc.

George Saunders, P.E., G.E.
Principal Geotechnical Engineer

cc: Mr. Gene Mildren, Mildren Design Group, P.C. (two copies)

SPM:GPS:kt
Attachments
Four copies submitted
Document ID: Specht-37-01-010807-geor.doc

15575 SW Sequoia Pkwy - Suite 100 | Portland, OR 97224 | Off 503.968.8787 | Fax 503.968.3068

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1.0 INTRODUCTION

This report presents the results of GeoDesign's geotechnical engineering evaluation for the proposed Tualatin Industrial Center III project. The site is located southwest of the intersection between SW 108th Avenue and SW Leveton Drive in Tualatin, Oregon. The approximate location of the site relative to surrounding physical features is presented on Figure 1. The proposed site layout, along with our exploration locations, is included on Figure 2. For your reference, definitions of all acronyms used are attached at the end of this document.

1.1 PROJECT UNDERSTANDING

The project includes two parcels southwest of the above-referenced intersection. A warehouse structure currently occupies the western portion of the northern parcel (see Figure 2) and will remain. The current conceptual plans are to construct three new buildings of various sizes across the site (see Figure 2). The buildings will be surrounded by asphalt paved parking and driveway areas.

We anticipate the buildings will be single-story, concrete tilt-up structures. Estimates of the foundation loads were not available at the time of this report. Based on our experience with similar construction, we estimate that the interior column loads will vary between 80 and 120 kips, the exterior column loads will vary between 50 and 80 kips, and the exterior wall panel footings will vary between 3 and 6 kips per lineal foot. The maximum floor slab loading will likely be 350 psf. If final design loads vary from those stated, our office should be contracted to determine if our recommendations need to be revised. Based on existing site grades, limited cuts and fills will likely be necessary to achieve final grades.

2.0 PURPOSE AND SCOPE

The purpose of our geotechnical engineering evaluation was to explore the subsurface conditions at the site and provide geotechnical engineering recommendations for design and construction. The specific scope of our services included the following:

- Coordinated and managed the field investigation (including private and public utility locates, access preparation, and scheduling of subcontractors and GeoDesign field staff).
- Completed 10 excavated test pits to depths of 8 to 12 feet BGS.
- Completed two CPT soundings to depths of approximately 50 feet BGS.
- Obtained soil samples for laboratory testing, and maintained a log of encountered soil and groundwater conditions in each test pit exploration.
- Completed the following laboratory tests:
    - Nine moisture content and two dry density determination tests in general accordance with ASTM D 2216 and D 2937, respectively
    - Two particle size analyses for grain-size distribution and soil classification in general accordance with ASTM D 1140 (percent passing a U.S. Standard No. 200 Sieve)
- Provided recommendations for site preparation, grading and drainage, stripping depths, fill type for imported materials, compaction criteria, trench excavation and backfill, use of native soils, and wet/dry weather earthwork.

- Provided geotechnical engineering recommendations for design and construction of shallow spread foundations (including allowable design bearing pressure, minimum footing depth and width, and resistance to lateral loads in the form of passive resistance and base friction).
- Provided recommendations for preparation of floor slab subgrade.
- Estimated the settlement of foundations and floor slabs under design loads.
- Provided recommendations for retaining walls (including lateral earth pressure [equivalent fluid pressures], drainage, and backfill requirements).
- Provided recommendations for construction of asphalt pavements for on-site access roads and parking areas (including subbase, base course, and asphalt paving thickness).
- Provided seismic design parameters for the soil column as defined by the IBC, and assessed susceptibility to liquefaction during the design earthquake.
- Prepared this report of our explorations, findings, conclusions, and recommendations.

3.0 SITE CONDITONS

3.1 SURFACE CONDITIONS

The property is currently occupied by an existing warehouse building located in the northern portion of the site (see Figure 2). There is an asphalt parking lot immediately north and west of the building. The areas to the east and south of the building are vacant and covered by scattered trees and low lying grasses and shrubs. The site is bordered by SW Leveton Drive and SW 108th Avenue to the north and east, respectively, and industrial properties to the west and south. Site grades are relatively flat.

3.2 SUBSURFACE CONDITIONS

Our field investigation consisted of 10 test pits (TP-1 through TP-10) to depths of 8 to 12 feet BGS and 2 CPT probes (P-1 and P-2) to depths of approximately 50 feet BGS. The approximate exploration locations are shown on Figure 2. Exploration logs and laboratory test results are included in the appendices. In the areas explored, we observed generally 2 to 3 inches of roots and topsoil from surface vegetation. As discussed later in this report, our explorations were limited to easily accessible areas. Areas with thicker tree cover were not explored and will likely have deeper topsoil zones.

Our test pit explorations generally revealed medium stiff, silty sand fill overlying medium dense, fine sand with varying amounts of silt. The fill was encountered in test pits TP-1 through TP-7 to depths of 1 to 2.5 feet. Laboratory testing of one fill sample indicated a fines content of 57 percent. We encountered some debris and fine gravel in the fill soil. The fill is undocumented and is expected to vary in consistency and relative density.

The native sand is silty to a depth of 3 to 4.5 feet BGS. The silt content decreases below this. A laboratory test on one sand sample at a depth of 10 feet BGS indicated a fines content of 7 percent. The CPT probes do not return soil samples; however, soil types can be interpreted based on the CPT test results. Standard interpretation techniques indicate that the soil conditions consist of layers of sand and silty sand to the maximum depth explored (50 feet BGS). The CPT results indicate that the sand unit is in the medium dense range. The moisture content of the sand varied from 9 and 26 percent and dry densities varied from 80 to 91 pcf at the time of our exploration.

Groundwater was encountered at approximately 9 to 11 feet BGS in two of our test pits. Pore water pressure readings taken during the CPT probes indicated that groundwater elevations vary from 15 to 18 feet BGS. The depth to groundwater is expected to fluctuate in response to seasonal changes, changes in surface topography, and other factors not observed in the site vicinity.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 GENERAL

Based on the results of our subsurface explorations and analyses, it is our opinion that the project can be developed as proposed, provided the site is prepared as recommended in this report. The recommendations in this report should be incorporated in design and construction, as well as incorporated into project specifications. The following summarizes general considerations for the planned construction project:

- The proposed structure can be satisfactorily supported by conventional shallow foundations bearing on undisturbed, native soils or on structural fill/improved subgrade soil overlying undisturbed, native soil.
- There is a moderate risk of liquefacting loose zones of the native sand soils during the design earthquake. However, we do not expect liquefaction-induced settlements will exceed 1 inch.
- Our test pits experienced moderate to severe caving in the native sand soils. Site cuts and trench excavations will likely experience similar caving.
- A number of our explorations encountered fill to a depth of 1 to 2.5 feet BGS. In general, the fill may provide inadequate support for foundations, floor slabs, and pavements. We recommend that the fill soils be improved by replacing it with structural fill or scarifying and recompacting it.
- Site preparation will include stripping of topsoil within building and pavement areas. We were unable to access areas with thicker tree cover during our exploration. These areas could have thicker topsoil zones, possibly on the order of 6 to 12 inches, compared to those encountered elsewhere on the site.
- Building floor slabs should be underlain by a minimum of 6 inches of compacted crushed rock if the site is prepared as recommended.
- Erosion control measures to inhibit surface erosion from wind or rain should be in place during construction, and a stormwater pollution prevention plan should be prepared for the site.
- The native soils are suitable for use as structural fill, provided they are properly moisture conditioned. Moisture conditioning the soil will typically consist of drying the soil to within 3 percent of the optimum moisture content required for compaction. Compaction of silty soils will be difficult, if not impossible, in the wet winter and spring months.

The following sections present specific geotechnical recommendations for design and construction of the proposed building.

4.2 EROSION CONTROL AND DISTURBED SOIL

Erosion of the soil at this site will occur as exposed surfaces are disturbed due to construction activities and exposure to climatic conditions. Erosion control plans are required on construction projects located within Washington County. Jurisdictional requirements should be incorporated into the project development plan. Measures that can be employed to reduce erosion include the use of silt fences, hay bales, buffer zones of natural growth, sedimentation ponds, and granular haul roads.

Surface slopes and stockpiled soils should be protected by some form of weather-resistant cover or erosion control product if left exposed. Temporary erosion control measures in accordance with local and state ordinances should be in place prior to and during construction. Permanent slopes should be re-vegetated or otherwise protected as soon as practical after construction.

Subgrade or fill soil that becomes loosened or disturbed should be excavated to expose undisturbed soil and replaced with properly compacted fill. The contractor may reduce soil disturbance by the following:

- Working off of existing paved surfaces
- Preventing construction traffic over unprotected soil in stripped and cut areas
- Providing appropriate gravel working mats over stripped and cut areas
- Sloping excavated surfaces to promote runoff
- Trenching and providing brow ditches above cut slopes
- Sealing the exposed surface by rolling with a smooth-drum compactor or rubber-tire roller at the end of each working day and removing wet surface soil prior to commencing filling each day

4.3 SITE PREPARATION

4.3.1 Stripping and Grubbing

The existing topsoil zone should be stripped and removed from all proposed structural fill, pavement, and improvement areas and for a 5-foot margin around such areas. Based on our explorations, the average depth of stripping in lightly vegetated areas will be approximately 2 to 3 inches. We did not explore areas of thicker shrub or tree cover due to limited access. These areas are expected to have deeper topsoil zones, possibly on the order of 6 to 12 inches. The actual stripping depth should be based on field observations at the time of construction. Stripped material should be transported off site for disposal or used in landscaped areas.

We expect tree and root removal to be extensive. Existing trees and shrubs should be removed from all pavement and improvement areas. Root balls should be grubbed out to the full depth of the roots, which could exceed 3 feet BGS. Depending on the methods used to remove the root balls, considerable disturbance and loosening of the subgrade could occur during site grubbing. We recommend that soil disturbed during grubbing operations be removed to expose firm, undisturbed subgrade. The resulting excavations should be backfilled with structural fill.

4.3.2 Subgrade Improvement

We encountered undocumented fill at the ground surface in many of our explorations. We recommend that all pavement and floor slab subgrade be improved by scarifying and compacting the upper 12 inches of subgrade as described in the "Structural Fill" section of this report. Improvement is not necessary in areas where site cuts will be 24 inches or greater. Structural fill encountered in footing subgrade should be completely removed. The material can be replaced and recompacted if it meets the requirements in the "Structural Fill" section.

4.3.3 Subgrade Evaluation

A member of our geotechnical staff should observe the exposed subgrades after stripping, site cutting, and debris removal have been completed to determine if there are additional areas of unsuitable or unstable soil. Our representative should observe a proofroll with a fully loaded dump truck or similar heavy rubber-tire construction equipment to identify soft, loose, or unsuitable areas. Areas that appear to be too wet and soft to support proofrolling equipment should be evaluated by probing and prepared in accordance with the recommendations for wet weather construction presented in the "Wet Weather/Wet Soil Grading" section of this report.

4.3.4 Compacting Test Pit Locations

The test pit excavations were backfilled using the relatively minimal compactive effort of the backhoe bucket; therefore, soft spots can be expected at these locations. We recommend that these relatively uncompacted soils be removed from the test pits to a depth of 3 feet below finished subgrade elevation in pavement areas. The resulting excavation should be backfilled with structural fill.

4.3.5 Wet Weather/Wet Soil Grading

The fine-grained soils at the site are easily disturbed during the wet season and when they are moist. If not carefully executed, site preparation, utility trench work, and roadway excavation can create extensive soft areas and significant subgrade repair costs can result. If construction is planned when the surficial soils are wet or may become wet, the construction methods and schedule should be carefully considered with respect to protecting the subgrade to reduce the need to over-excavate disturbed or softened soil. The project budget should reflect the recommendations below if construction is planned during wet weather or when the surficial soils are wet.

If construction occurs when wet soils are present, site preparation activities may need to be accomplished using track-mounted excavating equipment that loads removed material into trucks supported on granular haul roads. The thickness of the granular material for haul roads and staging areas will depend on the amount and type of construction traffic. Generally, an 12- to 18-inch-thick mat of granular material is sufficient for light staging areas and the basic building pad, but is generally not expected to be adequate to support heavy equipment or truck traffic. The granular mat for haul roads and areas with repeated heavy construction traffic typically needs to be increased to between 18 to 24 inches. The actual thickness of haul roads and staging areas should be based on the contractor's approach to site development and the amount and type of construction traffic. The granular material should be placed in one lift over the prepared, undisturbed subgrade and compacted using a smooth-drum, non-vibratory roller. The imported granular material should meet the specifications for stabilization material in the "Structural Fill" section of this report. In addition, a geotextile fabric should be placed as a barrier between the subgrade and imported granular material in areas of repeated construction traffic. The geotextile should have a minimum Mullen burst strength of 250 psi for puncture resistance and an AOS between a U.S. Standard No. 70 and No. 100 Sieve.

As an alternative to placing thick rock sections to support construction traffic, the subgrade can be stabilized using a cement amendment. If this approach is used, the cement amended soil should meet the guidelines provided in the "Structural Fill" section of this report.

4.4 TRENCH EXCAVATION

4.4.1 Trench Cuts and Shoring

Our test pit excavations experienced moderate to severe caving in the on-site sandy soils generally below depths of 2 feet BGS. Caving was experienced as shallow as the ground surface in some excavations. Caving should be expected in trench excavations during utility installation. We recommend that excavation sidewalls be cut at a maximum slope of 1H:1V. Excavations that extend below 10 feet may need to be cut at a slope of 1.5H:1V or flatter. Installation of conventional box shoring may be difficult since trench sidewalls will likely cave as excavation proceeds.

It is the contractor's responsibility to select the excavation and dewatering methods, monitor the trench excavations for safety, and provide shoring required to protect personnel and adjacent improvements. Driven sheet piles (if needed) should be designed by a registered engineer to determine the pile thickness and embedment depth.

4.4.2 Dewatering

Groundwater was encountered in several test pits at depths of 9 to 11 feet BGS. Our CPT probes indicated groundwater generally between 15 and 18 feet BGS. If excavations proceed below groundwater elevation, seepage will likely be rapid in the on-site sandy soils. Dewatering can probably be accomplished by means of sumps if the invert elevations of the proposed utilities are less than 1 foot below the groundwater elevation. Removed water should be pumped to a suitable discharge point. For greater penetration depths below groundwater, dewatering will likely have to be accomplished by well points. GeoDesign can provide further recommendations if well points will be installed.

4.4.3 Safety

All excavations should be made in accordance with applicable OSHA requirements and regulations of the state, county, and local jurisdiction. While this report describes certain approaches to excavation and dewatering, the contract documents should specify that the contractor is responsible for selecting excavation and dewatering methods, monitoring the excavations for safety, and providing shoring (as required) to protect personnel and adjacent structural elements.

4.5 STRUCTURAL FILL

4.5.1 General

Fills should only be placed over a subgrade that has been prepared in conformance with the "Site Preparation" section of this report. All material used as structural fill should be free of organic matter or other unsuitable materials. The material should meet the specifications provided in OSSC 00330, depending on the application. All structural fill should have a maximum particle size of 4 inches. A brief characterization of some of the acceptable materials and our recommendations for their use as structural fill is provided below.

4.5.2 Native Soils

The native silt soils are generally suitable for use as structural fill if they meet the requirements set forth in OSSC 00330.12 (Borrow Material). Based on laboratory test results, the moisture content of the on-site soil generally varied from 15 to 26 percent at the time of our explorations. Based on our experience, we estimate the optimum moisture content for compaction to be approximately 13 to 17 percent for the native, sandy soils. Moisture conditioning (drying) will likely be required to use native soil for structural fill. Accordingly, extended dry weather will be required to adequately condition and place the soils as structural fill. The upper silty soils will be difficult, if not impossible, to adequately compact during periods of wet weather or when the moisture content is above optimum.

When used as structural fill, the native, sandy soil should be placed in lifts with a maximum uncompacted thickness of 8 inches and compacted to not less than 95 percent of the maximum dry density, as determined by ASTM D 1557.

4.5.3 Imported Granular Material

Imported granular material used for structural fill should be pit or quarry run rock, crushed rock, or crushed gravel and sand and should meet the requirements set forth in OSSC 00330.14 and 00330.15. Imported granular material should be fairly well graded between coarse and fine material and have less than 5 percent by dry weight passing a U.S. Standard No. 200 Sieve.

When used as structural fill, imported granular material should be placed in lifts with a maximum uncompacted thickness of 12 inches and be compacted to not less than 95 percent of the maximum dry density, as determined by ASTM D 1557.

4.5.4 Aggregate Base Rock

Imported granular material used as base rock for building floor slabs and pavements should consist of ¾- or 1½-inch-minus material meeting the requirements in OSSC 00641 (Aggregate Subbase, Base, and Shoulders Base Aggregate), with the exception that the aggregate has less than 5 percent by dry weight passing a U.S. Standard No. 200 Sieve.

The aggregate base rock material should be placed in lifts with a maximum uncompacted thickness of 12 inches and compacted to not less than 95 percent of the maximum dry density, as determined by ASTM D 1557.

4.5.5 Trench Backfill

Trench backfill for the utility pipe base and pipe zone should consist of well-graded, granular material with a maximum particle size of 1 inch, have less than 5 percent by dry weight passing a U.S. Standard No. 200 Sieve, and should meet OSSC 00405.14 (Class B Backfill). The material should be free of roots, organic matter, and other unsuitable materials.

Within building and pavement areas, trench backfill placed above the pipe zone should consist of imported granular material meeting requirements of OSSC 00405.14 (Class B Backfill). The backfill should be compacted to at least 92 percent of the maximum dry density, as determined by ASTM D 1557, at depths greater than 2 feet below the finished subgrade and 95 percent of the maximum dry density, as determined by ASTM D 1557, within 2 feet of finished subgrade. In all other areas, trench backfill above the pipe zone should be compacted to at least 92 percent of the maximum dry density, as determined by ASTM D 1557.

4.5.6 Trench Stabilization Material

Trench stabilization material should consist of pit or quarry run rock, crushed rock, or crushed gravel and sand and should meet the requirements set forth in OSSC 00330.14 and 00330.15, with a minimum particle size of 4 inches and less than 5 percent by dry weight passing a U.S. Standard No. 4 Sieve. The material should be free of organic matter and other deleterious material. Trench stabilization material should be placed in one lift and compacted to a firm condition.

4.5.7 Drain Rock

Drain rock should consist of angular, granular material with a maximum particle size of 2 inches and should meet OSSC 00430.11 (Granular Drain Backfill Material). The material should be free of roots, organic matter, and other unsuitable materials and have less than 2 percent by dry weight passing a U.S. Standard No. 200 Sieve (washed analysis). Drain rock should be compacted to a firm condition.

4.5.8 Soil Amendment

As an alternative to the use of imported granular material for wet weather structural fill, an experienced contractor may be able to amend the on-site soils with portland cement or with limekiln dust and portland cement to obtain suitable support properties. Successful use of soil amendment depends on the use of correct mixing techniques, soil moisture content, and amendment quantities. Soil amending should be conducted in accordance with OSSC 00344 (Treated Subgrade).

Specific recommendations, based upon exposed site conditions, for soil amending can be provided if necessary. However, for preliminary design purposes, we recommend a target strength for cement-amended soils of 80 psi. The amount of cement used to achieve this target generally varies with moisture content and soil type. It is difficult to predict field performance of soils to cement amendment due to variability in soil response, and we recommend laboratory testing to confirm expectations. Generally, 4 percent cement by weight of dry soil can be used when the soil moisture content does not exceed approximately 20 percent. If the soil moisture content is in the range of 20 to 35 percent, 5 to 7 percent by weight of dry soil is recommended. The amount of cement added to the soil may need to be adjusted based on field observations and performance. Moreover, depending on the time of year and moisture content levels during amendment, water may need to be applied during tilling to appropriately condition the soil moisture content. The amount of cement used during treatment should be based on an assumed soil dry unit weight of 100 pcf.

Typically, a minimum curing of 4 days is required between treatment and construction traffic access. The amended surface should be protected from abrasion by placing a minimum of 4 inches crushed rock. As discussed in the "Pavement Design" and "Wet Weather/Wet Soil Grading" sections of this report, thicker layers of crushed rock may be required for the pavement section or for staging and haul roads. The crushed rock may typically become contaminated with soil during construction. Contaminated base rock should be removed and replaced with clean rock in pavement areas such that the minimum thickness of free draining base at the surface is 4 inches.

Portland cement-amended soils are hard and have low permeability. Therefore, these soils do not drain well, nor are they suitable for planting. Future planted areas should not be cement amended (if practical) or accommodations should be planned for drainage and planting.

4.6 PERMANENT SLOPES

Permanent cut and fill slopes should not exceed 2H:1V. Buildings, access roads, and pavements should be located at least 5 feet from the top of cut and fill slopes. The slopes should be planted with appropriate vegetation to provide protection against erosion as soon as possible after grading. Surface water runoff should be collected and directed away from slopes to prevent water from running down the face of the slope.

5.0 FOUNDATION SUPPORT

5.1 GENERAL

Based on the foundation loads previously stated and assuming the site is prepared as recommended in the preceding sections, it is our opinion the proposed structure can be supported on conventional shallow footings. Foundation elements should not be supported on undocumented fill materials encountered near the ground surface. The fill thickness is generally less than 2 feet, with some deeper zones encountered. If present, undocumented fill materials should be removed and recompacted or replaced with structural fill as described in the "Site Preparation" section of this report. The project budget and specifications should include contingencies for over-excavation of fill soils at some footing locations.

As discussed in the "Seismic Design Criteria" section, liquefaction-induced settlement up to 1 inch is possible during the design earthquake. Foundation design should account for this potential settlement. If the structure cannot tolerate settlement of this magnitude, GeoDesign can provide recommendations for liquefaction mitigation.

5.2 DIMENSIONS AND CAPACITIES

Continuous wall and isolated spread footings should be at least 18 and 24 inches wide, respectively. The bottom of exterior footings should be at least 18 inches below the lowest adjacent exterior grade. The bottom of interior footings should be established at least 12 inches below the base of the slab.

Footings bearing on native silts, or structural fill overlying undisturbed, native silts, should be sized based on an allowable bearing pressure of 2,500 psf. This is a net bearing pressure; the weight of the footing and overlying backfill can be ignored in calculating footing sizes. The recommended allowable bearing pressure applies to the total of dead plus long-term live loads. The allowable bearing pressure may be increased by up to one-third for short-term loads, such as those resulting from wind and seismic forces. Total settlement of footings founded as recommended is anticipated to be less than 1 inch. Differential settlements are estimated at one-half of the total settlements.

5.3 RESISTANCE TO SLIDING

Lateral loads on footings can be resisted by passive earth pressure on the sides of the structures and by friction on the base of the footings. Our analysis indicates that the available passive earth pressure for footings confined by native soils and structural fills is 350 pcf modeled as an equivalent fluid pressure. Typically, the movement required to develop the available passive resistance may be relatively large; therefore, we recommend using a reduced passive pressure of 250 pcf equivalent fluid pressure. Adjacent floor slabs, pavements, or the upper 12-inch depth of adjacent, unpaved areas should not be considered when calculating passive resistance. In addition, in order to rely upon passive resistance, a minimum of 10 feet of horizontal clearance must exist between the face of the footings and any adjacent down slopes.

For footings in contact with native soil, a coefficient of friction equal to 0.30 may be used when calculating resistance to sliding. This value can be increased to 0.40 if the bottom of the footings are in contact with a layer of crushed rock.

5.4 FOOTING SUBGRADE

All footing and floor subgrades should be evaluated by the project geotechnical engineer or their representative to confirm suitable bearing conditions. Observations should also confirm that all undocumented fill, loose or soft material, organics, prior topsoil zones, and softened subgrades (if present) have been removed.

Shallow foundations should be founded on a prepared surface consisting of competent, native soils or compacted structural fill overlying competent, native soils. Loose or disturbed materials should be removed or compacted as described for structural fill before placing reinforcing steel and concrete. Foundation-bearing surfaces should not be exposed to standing water. Should water infiltrate and pool in the excavation, it should be removed before placing reinforcing steel or concrete.

If construction is undertaken during periods of rain, a 2- to 4-inch-thick layer of compacted crushed rock may be required over the footing subgrades and excavation bases to help protect them from disturbance resulting from foot traffic over wet subgrade.

6.0 FLOOR SLABS

Satisfactory subgrade support for floor slabs supporting up to 350 psf areal loading can be obtained provided the building areas are prepared as described in this report. Subgrade preparation should include scarification and compaction or replacement of the undocumented fill soils as recommended in the "Site Preparation" section of this report. Slabs should be reinforced according to their proposed use and per the structural engineer's recommendations. Load-bearing concrete slabs may be designed assuming a modulus of subgrade reaction (k) of 125 pounds per square inch per inch.

We recommend a minimum 6-inch-thick layer of imported granular material be placed and compacted over the prepared soil subgrade. Imported granular material placed beneath building floor slabs should meet the requirements for floor slab base rock, as described in the "Structural

Fill" section of this report. The imported granular material should be placed in one lift and compacted to not less than 95 percent of the maximum dry density, as determined by ASTM D 1557.

Flooring manufacturers often require vapor barriers to protect flooring and flooring adhesives. Many flooring manufacturers will warrant their product only if a vapor barrier is installed according to their recommendations. Selection and design of an appropriate vapor barrier (if needed) should be based on discussions among members of the design team. If moisture-sensitive flooring is proposed, we recommend using Stego Wrap vapor barrier. The recommended procedures for installing Stego Wrap are to pour the floor slab concrete directly over the vapor barrier. We recommend that the structural engineer be contacted to determine if the mix design for the concrete should be modified assuming the above-referenced construction sequence.

7.0 RETAINING STRUCTURES

7.1 ASSUMPTIONS

Our retaining wall design recommendations are based on the following assumptions: (1) the walls consist of conventional, cantilevered retaining walls; (2) the walls are less than 8 feet in height; (3) the backfill is drained and consists of imported granular materials; and (4) the backfill has a slope flatter than 4H:1V. Re-evaluation of our recommendations will be required if the retaining wall design criteria for the project varies from these assumptions.

7.2 WALL DESIGN PARAMETERS

For unrestrained retaining walls, an active pressure of 35 pcf equivalent fluid pressure should be used for design. For embedded building walls, a superimposed seismic lateral force should be calculated based on a dynamic force of $6H^2$ pounds per lineal foot of wall (where H is the height of the wall in feet) and applied a distance of 0.6H from the base of the wall. Where retaining walls are restrained from rotation prior to being backfilled, a pressure of 55 pcf equivalent fluid pressure should be used for design.

If surcharges (e.g., retained slopes, building foundations, vehicles, steep slopes, terraced walls, etc.) are located within a horizontal distance from the back of a wall equal to twice the height of the wall, then additional pressures will need to be accounted for in the wall design. Our office should be contacted for appropriate wall surcharges based upon the actual magnitude and configuration of the applied loads.

The base of the wall footing excavations should extend a minimum of 18 inches below lowest adjacent grade. The footing excavations should be prepared as described in the "Structural Fill" section of this report.

The wall footings should be designed in accordance with the guidelines provided in the appropriate portion of the "Foundation Support" section of this report.

7.3 *WALL DRAINAGE AND BACKFILL*

The above design parameters have been provided assuming that back-of-wall drains will be installed to prevent buildup of hydrostatic pressures behind all walls. If a drainage system is not installed, then our office should be contacted for revised design forces.

Backfill material placed behind retaining walls and extending a horizontal distance of ½H (where H is the height of the retaining wall) should consist of well-graded sand or gravel, with not more than 5 percent by dry weight passing a U.S. Standard No. 200 Sieve and meeting OSSC 00510.12 (Granular Wall Backfill). We recommend the select granular wall backfill be separated from general fill, native soil, and/or topsoil using a geotextile fabric that meets the requirements provided in OSSC 350 and 2320 for drainage geotextiles.

Alternatively, the native soils can be used as backfill material provided a minimum 2-foot-wide column of angular drain rock wrapped in a geotextile is placed against the wall and the native soils can be adequately moisture conditioned for compaction. The rock column should extend from the perforated drainpipe or foundation drains to within approximately 1 foot of the ground surface. The angular drain rock should meet the requirements provided in the "Structural Fill" section of this report.

The wall backfill should be compacted to a minimum of 95 percent of the maximum dry density, as determined by ASTM D 1557. However, backfill located within a horizontal distance of 3 feet from a retaining wall should only be compacted to approximately 90 percent of the maximum dry density, as determined by ASTM D 1557. Backfill placed within 3 feet of the wall should be compacted in lifts less than 6 inches thick using hand-operated tamping equipment (such as jumping jack or vibratory plate compactors). If flat work (sidewalks or pavements) will be placed atop the wall backfill, we recommend that the upper 2 feet of material be compacted to 95 percent of the maximum dry density, as determined by ASTM D 1557.

Perforated collector pipes should be placed at the base of the granular backfill behind the walls. The pipe should be embedded in a minimum 2-foot-wide zone of angular drain rock. The drain rock should meet specifications provided in the "Structural Fill" section of this report. The drain rock should be wrapped in a geotextile fabric that meets the specifications provided in OSSC 350 and 2320 for drainage geotextiles. The collector pipes should discharge at an appropriate location away from the base of the wall. Unless measures are taken to prevent backflow into the wall's drainage system, the discharge pipe should not be tied directly into stormwater drain systems.

Settlements of up to 1 percent of the wall height commonly occur immediately adjacent to the wall as the wall rotates and develops active lateral earth pressures. Consequently, we recommend that construction of flat work adjacent to retaining walls be postponed at least 4 weeks after backfilling of the wall, unless survey data indicates that settlement is complete prior to that time.

8.0 SEISMIC DESIGN CRITERIA

8.1 IBC PARAMETERS

Based on our investigation, the following design parameters can be applied if the building is designed using the applicable provisions of the 2003 IBC and SOSSCA. The parameters in Table 1 should be used to compute seismic base shear forces.

Table 1. IBC Parameters

Parameter	Short Period (T_s = 0.2 second)	1 Second Period (T_1 = 1.0 second)
Maximum Credible Earthquake Spectral Acceleration, S	S_s = 1.05g	S_1 = 0.37 g
Site Class	D	
Site Coefficient, F	F_a = 1.08	F_v = 1.67
Adjusted Spectral Acceleration, S_M	S_{MS} = 1.13 g	S_{M1} = 0.61 g
Design Spectral Response Acceleration Parameters, S_D	S_{DS} = 0.75 g	S_{D1} = 0.41 g
Design PGA, S_{aPGA}	0.30 g	

8.2 LIQUEFACTION

Liquefaction can be defined as the sudden loss of shear strength in a soil due to an excessive buildup of pore water pressure. Liquefied soil layers generally follow a path of least resistance to dissipate pore pressures, often resulting in sudden surface settlement, sand boils or ejections, and/or lateral spreading in extreme cases. Clean, loose, uniform or silty, fine-grained, saturated sands are particularly susceptible to liquefaction. Lateral spreading is a liquefaction-related seismic hazard. Areas subject to lateral spreading are typically gently sloping or flat sites underlain by liquefiable sediments adjacent to an open face, such as riverbanks. Liquefied soils adjacent to open faces may "flow" in that direction, resulting in lateral displacement and surface cracking.

Based on the anticipated groundwater conditions and the results from the CPT probes, it is our opinion that there is a moderate risk of liquefaction at the site in discrete zones of loose clean sand. Our analyses indicate that liquefaction induced settlement will not likely exceed 1 inch at the ground surface.

9.0 PAVEMENT DESIGN

New pavements should be installed on competent subgrade or new engineered fills prepared in conformance with the "Site Preparation" and "Structural Fill" sections of this report. We do not have specific information on the frequency and type of vehicles expected at the site. We have assumed that the traffic will consist mainly of large delivery trucks, with some passenger cars.

Our pavement recommendations are based on the following assumptions:

- A resilient modulus of 20,000 psi was estimated for the aggregate base.
- A resilient modulus of 3,700 psi was estimated for the improved subgrade (as recommended in the "Site Preparation" section of this report).
- Initial and terminal serviceability index of 4.2 and 2.5, respectively.
- Reliability and standard deviation of 75 percent and 0.45, respectively.
- Structural coefficients of 0.42 and 0.10 for the asphalt and aggregate base, respectively.

If any of these assumptions vary from project design values, our office should be contacted with the appropriate information so that the pavement designs can be revised. Our pavement design recommendations and specific assumed breakdown of traffic conditions are summarized in Table 2.

Table 2. Pavement Section Thickness

Traffic Levels		Pavement Section Thicknesses on Native Subgrade[1] (inches)		Pavement Thicknesses with CTB[1,2] (inches)	
Cars/Day	**Trucks/Day**	**AC**	**Base Rock**	**AC**	**Base Rock**
100	0	2.5	7.0	2.5	4.0
100	20	3.5	10.0	3.5	6.0

1. All thicknesses are intended to be the minimum acceptable values.
2. CTB layer is assumed to be a minimum of 12 inches thick and have a minimum 7-day compressive strength of 80 psi.

If the soil subgrade is cement treated to a minimum depth of 12 inches, the pavement thicknesses "with CTB" may be used. These sections assume the subgrade is cement treated as discussed in the "Structural Fill" section of this report and has a minimum 7-day compressive strength of 80 psi. In addition, to prevent strength loss during curing, cement-amended soil should be allowed to cure for at least 4 days prior to construction traffic or placing the base rock.

The AC should be Level 2, ½-inch, dense HMAC according to OSSC 00745 and be compacted to 91 percent of Rice Density of the mix, as determined by AASHTO T209. Minimum lift thickness for ½-inch HMAC is 2.0 inches. Asphalt binder should be performance graded and conform to PG 64-22. The aggregate base should meet the specifications for aggregate base rock provided in the "Structural Fill" section of this report.

The pavement subgrade should be prepared in accordance with the "Site Preparation" and "Structural Fill" sections of this report. The top 12 inches of subgrade below the pavement should be compacted to at least 92 percent of the maximum dry density, as determined by ASTM D 1557, or until proofrolling with a fully loaded dump or water truck indicates an unyielding, non-pumping subgrade is present.

Construction traffic should be limited to non-building unpaved portions of the site or haul roads. Construction traffic should not be allowed on new pavements. If construction traffic is to be allowed on newly constructed road sections, an allowance for this additional traffic will need to be made in the design pavement section.

10.0 OBSERVATION OF CONSTRUCTION

Satisfactory foundation and earthwork performance depends to a large degree on quality of construction. Sufficient monitoring of the contractor's activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications. Subsurface conditions observed during construction should be compared with those encountered during the subsurface exploration. Recognition of changed conditions often requires experience; therefore, qualified personnel should visit the site with sufficient frequency to detect if subsurface conditions change significantly from those anticipated.

We recommend that GeoDesign be retained to observe earthwork activities, including stripping, proofrolling of the subgrade and repair of soft areas, footing subgrade preparation, performing laboratory compaction and field moisture-density tests, observing final proofrolling of the pavement subgrade and base rock, and asphalt placement and compaction.

11.0 LIMITATIONS

We have prepared this report for use Specht Development and its design and construction team for the proposed project. The data and report can be used for bidding or estimating purposes, but our report, conclusions and interpretations should not be construed as warranty of the subsurface conditions and are not applicable to other sites.

Exploration observations indicate soil conditions only at specific locations and only to the depths penetrated. They do not necessarily reflect soil strata or water level variations that may exist between exploration locations. If subsurface conditions differing from those described are noted during the course of excavation and construction, re-evaluation will be necessary.

The site development plans and design details were preliminary at the time this report was prepared. When the design has been finalized and if there are changes in the site grades or location, configuration, design loads, or type of construction for the buildings, the conclusions and recommendations presented may not be applicable. If design changes are made, we request that we be retained to review our conclusions and recommendations and to provide a written modification or verification.

The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in this area at the time the report was prepared. No warranty, express or implied, should be understood.

♦ ♦ ♦

We appreciate the opportunity to be of continued service to you. Please call if you have questions concerning this report or if we can provide additional services.

Sincerely,

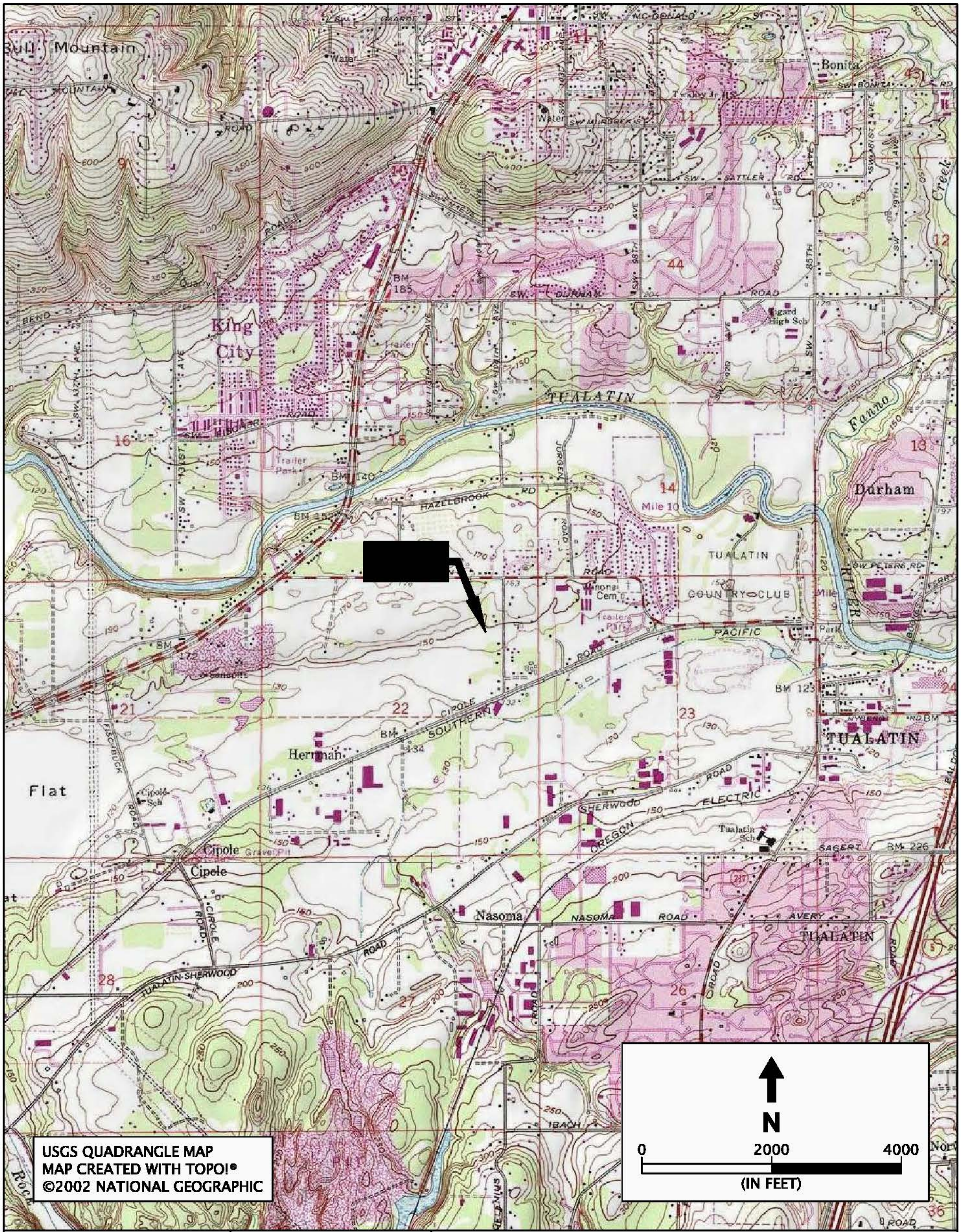
GeoDesign, Inc.

Scott P. McDevitt, P.E.
Project Geotechnical Engineer

George Saunders, P.E., G.E.
Principal Geotechnical Engineer

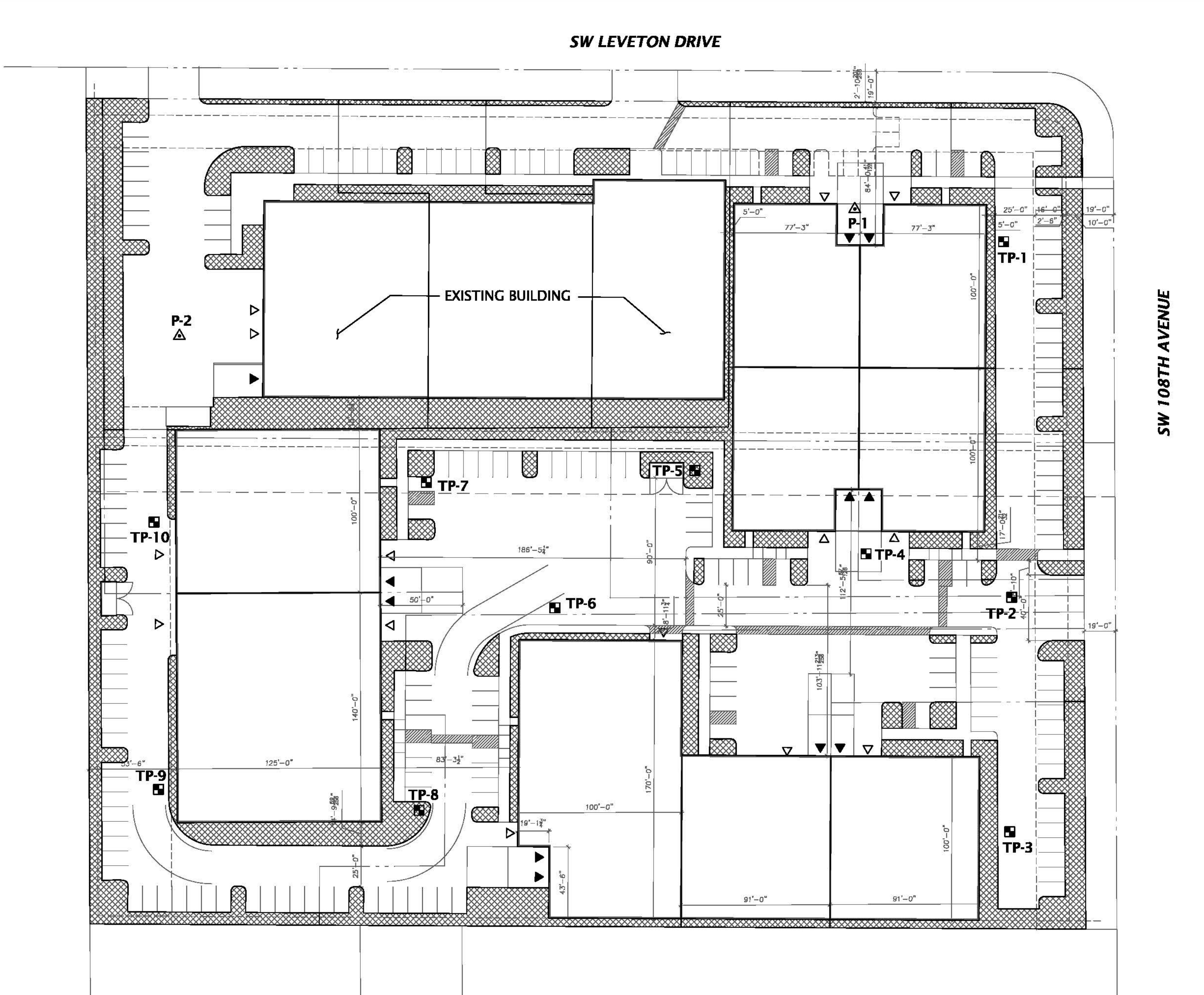
REGISTERED PROFESSIONAL ENGINEER
63094
OREGON
JULY 11, 2000
SCOTT P McDEVITT
EXPIRES: 12/31/08

FIGURES



GEODESIGN INC 15575 SW Sequoia Parkway - Suite 100 Portland OR 97224 Off 503.968.8787 Fax 503.968.3068	SPECHT-37-01	**VICINITY MAP**
	JANUARY 2007	TUALATIN INDUSTRIAL CENTER III TUALATIN, OR — **FIGURE 1**

DWG Name: Specht-37-01-F1-VM.dwg | Layout: Layout1 | Updated By: akd | Date: 1/7/2007 9:02:55 AM



EXPLANATION:

SITE BOUNDARY

TP-1 TEST PIT

P-1 CONE PENETROMETER

N

0 60 120

(IN FEET)

SITE PLAN BASED ON DRAWING PROVIDED BY MILDREN DESIGN GROUP, P.C.

DWG Name: Specht-37-01-F2-SP.dwg | Layout: Layout1 | Updated By: akd | Date: 1/7/2007 9:01:11 AM

SITE PLAN

TUALATIN INDUSTRIAL CENTER III
TUALATIN, OR

FIGURE 2

SPECHT-37-01

JANUARY 2007

GEODESIGN INC
15575 SW Sequoia Parkway - Suite 100
Portland OR 97224
Off 503.968.8787 Fax 503.968.3068

APPENDIX A

APPENDIX A

FIELD EXPLORATIONS

GENERAL

Our field investigation consisted of 10 test pits (TP-1 through TP-10) to depths up to 12 feet BGS and 2 CPT probes (P-1 and P-2) to depths of approximately 50 feet BGS. Dan J. Fischer Excavating, Inc. performed the test pit explorations on December 4, 2006 using a rubber-tire backhoe. The CPT probes were completed by Boart Longyear Company of Tualatin, Oregon, on December 4, 2006. The CPT program is discussed in Appendix B.

The approximate exploration locations are shown on Figure 2. Exploration locations were chosen based on a site plan provided by Mildren Design Group, P.C. The locations of the explorations were determined in the field by referencing and pacing from site features. This information should be considered accurate to the degree implied by the methods used.

A member of our geotechnical staff observed all explorations. We obtained disturbed and undisturbed samples of the soils encountered in the test pits for geotechnical laboratory testing. Classifications and sampling intervals are presented on the exploration logs included in this appendix.

SOIL SAMPLING

A member of our geologic staff observed the explorations. Representative grab samples (disturbed) of the soil that were observed in the test pit explorations were obtained from the walls and/or base of the test pits using the backhoe bucket. Samples were sealed in plastic bags and transported to our soil laboratory.

Relatively undisturbed samples were obtained using a standard Shelby tube in general accordance with guidelines presented in ASTM D 1587, the Standard Practice for Thin-walled Tube Sampling of Soils.

SOIL CLASSIFICATION

The soil samples were classified in accordance with the "Key to Test Pit and Boring Logs Symbols" (Table A-1) and "Soil Classification System and Guidelines" (Table A-2), copies of which are included in this appendix. The exploration logs indicate the depths at which the soils or their characteristics change, although the change actually could be gradual. If the change occurred between sample locations, the depth was interpreted. Classifications and sampling intervals are presented on the exploration logs included in this appendix.

LABORATORY TESTING

The soil samples were classified in the laboratory to confirm field classifications. The laboratory classifications are presented on the exploration logs if those classifications differed from the field classifications.

MOISTURE CONTENT

We tested the natural moisture content of selected soil samples in general accordance with ASTM D 2216. The natural moisture content is a ratio of the weight of the water to soil in a test sample and is expressed as a percentage. The moisture contents are presented on the exploration logs.

DRY DENSITY

We tested selected soil samples to determine the in-situ dry density. The tests were performed in general accordance with ASTM D 2937. The dry density is defined as the ratio of the dry weight of the soil sample to the volume of that sample. The dry density typically is expressed in units of pcf. The dry densities are presented on the exploration logs.

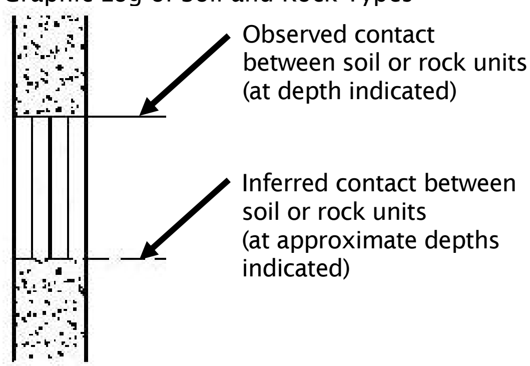
PARTICLE SIZE ANALYSIS

Particle size analysis was completed on field samples in general accordance with ASTM D 1140 (percent passing a U.S. Standard No. 200 Sieve). The test results are presented on the exploration logs.

KEY TO TEST PIT AND BORING LOG SYMBOLS

SYMBOL	SAMPLING DESCRIPTION
	Location of sample obtained in general accordance with ASTM D 1586 Standard Penetration Test with recovery
	Location of sample obtained using thin-wall shelby tube or Geoprobe® sampler in general accordance with ASTM D 1587 with recovery
	Location of sample obtained using Dames & Moore sampler and 300-pound hammer or pushed with recovery
	Location of sample obtained using Dames & Moore sampler and 140-pound hammer or pushed with recovery
	Location of grab sample
	Rock coring interval
	Water level during drilling
	Water level taken on date shown

Graphic Log of Soil and Rock Types



GEOTECHNICAL TESTING EXPLANATIONS

PP	Pocket Penetrometer	DD	Dry Density
TOR	Torvane	ATT	Atterberg Limits
CON	Consolidation	CBR	California Bearing Ratio
DS	Direct Shear	OC	Organic Content
P200	Percent Passing U.S. Standard No. 200 Sieve	P	Pushed Sample
HYD	Hydrometer Gradation	RES	Resilient Modulus
UC	Unconfined Compressive Strength	VS	Vane Shear
SIEV	Sieve Gradation	kPa	kiloPascal

ENVIRONMENTAL TESTING EXPLANATIONS

CA	Sample Submitted for Chemical Analysis	ND	Not Detected
PID	Photoionization Detector Headspace Analysis	NS	No Visible Sheen
ppm	Parts per Million	SS	Slight Sheen
P	Pushed Sample	MS	Moderate Sheen
		HS	Heavy Sheen

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KEY TO TEST PIT AND BORING LOG SYMBOLS

TABLE A-1

SOIL CLASSIFICATION SYSTEM

CONSISTENCY - COARSE-GRAINED SOILS

Relative Density	Standard Penetration Resistance	Dames & Moore Sampler (140-pound hammer)	Dames & Moore Sampler (300-pound hammer)
Very Loose	0 – 4	0 - 11	0 - 4
Loose	4 – 10	11 - 26	4 - 10
Medium Dense	10 – 30	26 - 74	10 - 30
Dense	30 – 50	74 - 120	30 - 47
Very Dense	More than 50	More than 120	More than 47

CONSISTENCY - FINE-GRAINED SOILS

Consistency	Standard Penetration Resistance	Dames & Moore Sampler (140-pound hammer)	Dames & Moore Sampler (300-pound hammer)	Unconfined Compressive Strength (tsf)
Very Soft	Less than 2	Less than 3	Less than 2	Less than 0.25
Soft	2 - 4	3 – 6	2 - 5	0.25 - 0.50
Medium Stiff	4 - 8	6 – 12	5 - 9	0.50 - 1.0
Stiff	8 - 15	12 – 25	9 - 19	1.0 - 2.0
Very Stiff	15 - 30	25 – 65	19 – 31	2.0 - 4.0
Hard	More than 30	More than 65	More than 31	More than 4.0

SOIL CLASSIFICATION NAME

Name and Modifier Terms		Constituent Percentage
Coarse Grained	GRAVEL, SAND	>50%
	sandy, gravelly	30 - 50%
	silty, clayey	15 - 50%
	some (gravel, sand)	15 - 30%
	some (silt, clay)	5 - 15%
	trace (gravel, sand)	
	trace (silt, clay)	<5%
Fine Grained	CLAY, SILT	>50%
	silty, clayey	30 - 50%
	sandy, gravelly	
	some (sand, gravel)	15 - 30%
	some (silt, clay)	
	trace (sand, gravel)	5 - 15%
	trace (silt, clay)	
Organic	PEAT	50 - 100%
	organic (soil name)	15 - 50%
	(soil name) with some organics	5 - 15%

MOISTURE CLASSIFICATION

Term	Field Test
dry	very low moisture, dry to touch
moist	damp, without visible moisture
wet	visible free water, usually saturated

GRAIN SIZE CLASSIFICATION

Description		Sieve*	Observed Size
boulders		-	>12”
cobbles		-	3” - 12”
gravel	coarse	0.75” - 3”	0.75” - 3”
	fine	#4 - 0.75”	0.19” - 0.75”
sand	coarse	#10 - #4	0.079” - 0.19”
	medium	#40 - #10	0.017” - 0.079”
	fine	#200 - #40	00029” - 0.017”
fines		<#200	<0.0029”

* Use of #200 field sieve encouraged

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SOIL CLASSIFICATION SYSTEM AND GUIDELINES

TABLE A-2

TP-1

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT %	COMMENTS
0.0	Medium stiff, brown, sandy SILT with trace to occasional organics (fine rootlets and roots up to 1 inch diameter); moist (2½-inch-thick root zone) - **FILL**. with isolated cobble (4-inch diameter) at 2.0 feet			☒	●	Severe caving observed from 1.0 foot to 11.0 feet.
2.5	Medium dense, brown SAND with some silt; moist.	2.5		☒		
7.5				☒		
10.0						No groundwater seepage observed to the depth explored. Surface elevation was not readily available at the time of exploration.
11.0	Exploration completed at 11.0 feet.	11.0				

TP-2

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT %	COMMENTS
0.0	Medium stiff, brown, sandy SILT with trace to some fine gravel and trace to occasional organics (rootlets and roots up to 4-inch diameter); moist (2- to 3-inch-thick root zone) - **FILL**. no gravel observed at 1.0 foot			☒		
2.0	Medium dense, brown, fine, silty SAND; moist. grades with some silt at 4.5 feet	2.0	P200	☒	●	P200 = 57%
4.5						Moderate caving observed at 4.5 feet.
6.0				☒		
8.0	grades to brown-orange with weak cementation at 8.0 feet					Operator comment: firming up at 8.0 feet.
9.0				☒	●	
10.5	grades to moist to wet at 10.5 feet					Moderate groundwater seepage observed at 11.0 feet. Surface elevation was not readily available at the time of exploration.
11.5				☒		
12.0	Exploration completed at 12.0 feet.	12.0				

EXCAVATED BY: Dan J. Fischer Excavating, Inc. LOGGED BY: JGH COMPLETED: 12/04/06

EXCAVATION METHOD: backhoe (see report text)

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TEST PIT

TUALATIN INDUSTRIAL CENTER III
TUALATIN, OR

FIGURE A-1

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
TP-3							
0.0		Medium stiff, brown-dark gray, fine to medium, gravelly, sandy SILT with trace organics (fine rootlets); moist; subangular gravel (2- to 3-inch-thick root zone) - **FILL**.	1.3				
2.5		Medium dense, brown, silty SAND with trace to occasional organics (roots up to 3/4-inch diameter); moist. grades to light brown-orange with weak cementation at 3.0 feet					Operator comment: harder digging at 3.5 feet
5.0							
7.5		grades to gray-dark gray and fine to medium; moist to wet at 8.5 feet					Slow groundwater seepage observed at 9.0 feet. Moderate caving observed at 9.0 feet. Moderate to rapid groundwater seepage observed at 11.0 feet.
10.0							
12.5		Exploration completed at 12.0 feet.	12.0				Surface elevation was not readily available at the time of exploration.
15.0							
TP-4							
0.0		Medium stiff, brown, sandy SILT with trace organics (fine rootlets); moist (3-inch-thick root zone) - **FILL**.	1.0				Severe caving observed from 0.0 to 8.0 feet.
2.5		Medium dense, brown, silty SAND with occasional organics (rootlets up to ½-inch diameter); moist.					
5.0		grades to gray-brown with some silt at approximately 4.5 feet					
7.5		Exploration completed at 8.0 feet due to refusal from caving.	8.0				No groundwater seepage observed to the depth explored. Surface elevation was not readily available at the time of exploration.
10.0							
12.5							
15.0							

EXCAVATED BY: Dan J. Fischer Excavating, Inc. LOGGED BY: JGH COMPLETED: 12/04/06

EXCAVATION METHOD: backhoe (see report text)

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 – 50 – 100)	COMMENTS
TP-5							
0.0		Medium stiff, brown-orange, sandy SILT with trace to some gravel and trace debris (garden hose, fabric, plastic fragments, wood pieces 4 inches long and ½-inch diameter); moist (2- to 3-inch-thick root zone) - **FILL**.	1.5		☒ ☒		Severe caving observed from 2.0 to 10.0 feet.
		Medium dense, brown, silty SAND with occasional organics (fine rootlets); moist. becomes gray-brown with some silt at 4.5 feet					
10.0				P200	☒	●	P200 = 7% Operator comment: firmer excavation at 10.0 feet Moderate caving observed from 10.0 to 11.0 feet. No groundwater seepage observed to the depth explored. Surface elevation was not readily available at the time of exploration.
		Exploration completed at 11.0 feet due to caving.	11.0				
TP-6							
0.0		Medium stiff, brown, sandy SILT with trace organics (rootlets and roots up to ½-inch diameter); moist (4-inch-thick root zone) - **FILL**. with isolated tree root (4-inch diameter) at 1.5 feet	2.0		☒ ☒		
		Medium dense, brown, silty SAND with trace to occasional organics (fine rootlets and roots up to 1/8-inch diameter); moist. no organics observed at 4.0 feet becomes gray-brown with some silt and trace to occasional gravel at approximately 5.0 feet		DD	■ ☒	●	DD = 91 pcf Moderate caving observed from 5.0 to 12.0 feet.
		Exploration completed at 12.0 feet.	12.0				No groundwater seepage observed to the depth explored. Surface elevation was not readily available at the time of exploration.

EXCAVATED BY: Dan J. Fischer Excavating, Inc. LOGGED BY: JGH COMPLETED: 12/04/06

EXCAVATION METHOD: backhoe (see report text)

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TEST PIT

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FIGURE A-3

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS

TP-7

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION DEPTH	SAMPLE	COMMENTS
0.0	Medium stiff, brown, sandy SILT with trace to occasional gravel and trace organics (fine rootlets and roots up to ¾-inch diameter); moist - **FILL**.	1.5	☒	
2.5	Medium dense, brown, silty SAND; moist.		☒	Moderate caving observed from 2.5 to 10.0 feet.
5.0	becomes gray-brown with some silt at 4.0 feet		☒	
10.0	Exploration completed at 10.0 feet due to caving.	10.0		No groundwater seepage observed to the depth explored. Surface elevation was not readily available at the time of exploration.

TP-8

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION DEPTH	SAMPLE	COMMENTS
0.0	Medium dense, brown, silty SAND with trace to occasional organics (fine rootlets and roots up to ½-inch diameter); moist.		☒	Moderate caving observed from 2.0 to 4.0 feet.
5.0	becomes gray-brown with some silt and trace to occasional gravel; dry to moist at approximately 4.0 feet		☒	Severe caving observed from 4.0 to 10.0 feet.
10.0	Exploration completed at 10.5 feet due to caving.	10.5	☒	No groundwater seepage observed to the depth explored. Surface elevation was not readily available at the time of exploration.

EXCAVATED BY: Dan J. Fischer Excavating, Inc.   LOGGED BY: JGH   COMPLETED: 12/04/06

EXCAVATION METHOD: backhoe (see report text)

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JANUARY 2007

TEST PIT

TUALATIN INDUSTRIAL CENTER III
TUALATIN, OR

FIGURE A-4

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS

TP-9

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	COMMENTS
0.0	Medium dense, brown, silty SAND with trace organics (fine rootlets and roots up to 1½-inch diameter); moist.			
4.0	becomes gray-brown with some silt and occasional organics (fine rootlets) at 4.0 feet			Severe caving observed from 2.5 to 10.0 feet.
10.5	Exploration completed at 10.5 feet due to caving.	10.5		No groundwater seepage observed to the depth explored. Surface elevation was not readily available at the time of exploration.

TP-10

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	COMMENTS
0.0	Medium dense, brown, silty SAND with trace organics (rootlets and roots up to 1 inch diameter); moist.		DD	DD = 80 pcf
4.0	becomes gray-brown with some silt and occasional organics (fine rootlets and roots up to 1 inch diameter) at 4.0 feet			Severe caving observed from 2.0 to 10.0 feet.
10.0	Exploration completed at 10.0 feet due to caving.	10.0		No groundwater seepage observed to the depth explored. Surface elevation was not readily available at the time of exploration.

EXCAVATED BY: Dan J. Fischer Excavating, Inc. LOGGED BY: JGH COMPLETED: 12/04/06

EXCAVATION METHOD: backhoe (see report text)

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TEST PIT

TUALATIN INDUSTRIAL CENTER III
TUALATIN, OR

FIGURE A-5

APPENDIX B

APPENDIX B

CONE PENETROMETER TESTING

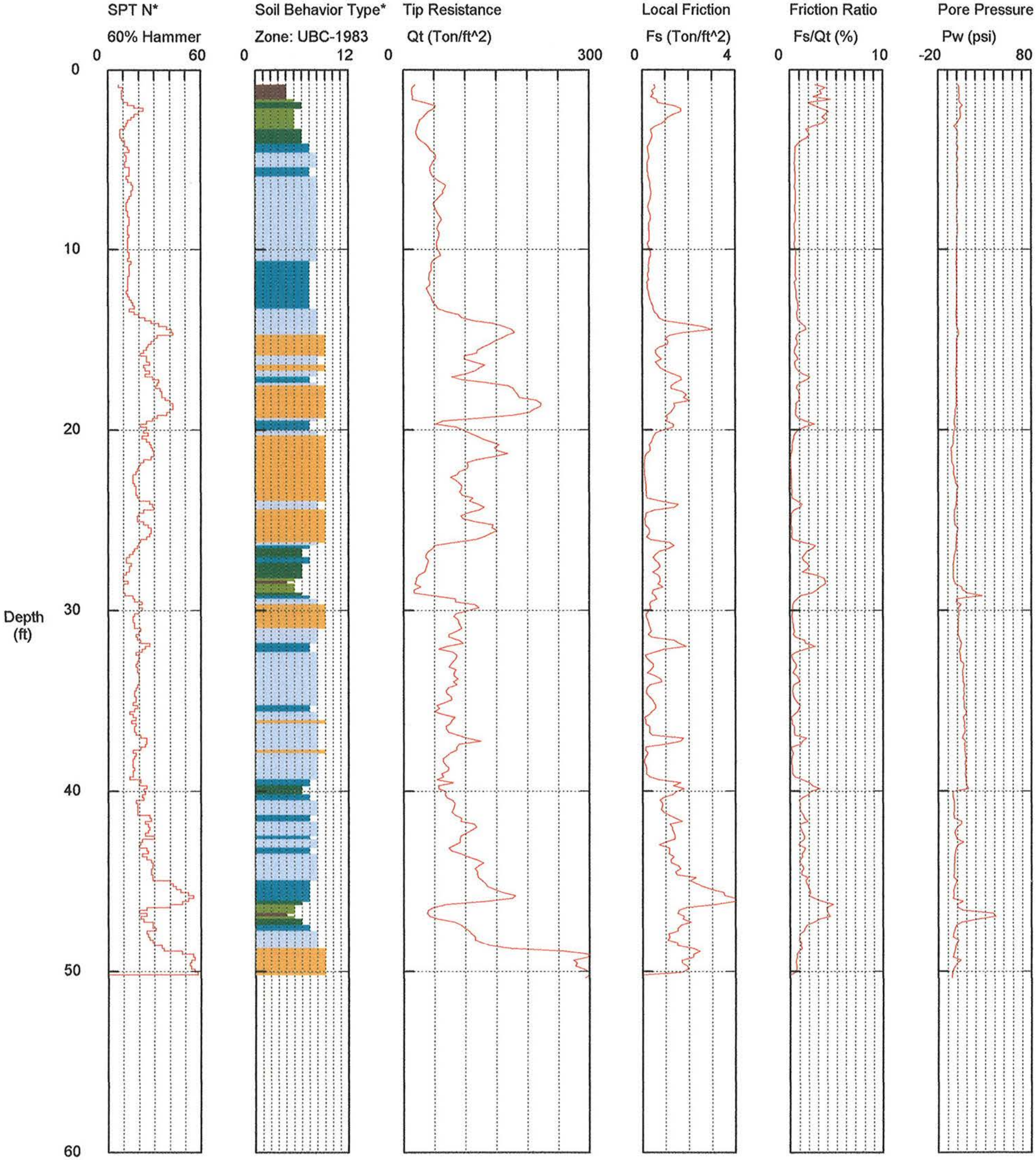
Boart Longyear Company of Tigard, Oregon, advanced two CPT probes (P-1 and P-2) on December 4, 2006 to depths of approximately 50 feet BGS. The approximate locations of the probes are shown on Figure 2. The CPTs were performed in general accordance with ASTM D 5778.

The CPT is an in-situ test that characterizes subsurface stratigraphy. The testing includes advancing a 35.6-millimeter-diameter cone and friction sleeve through the soil profile. The cone is advanced at a rate of approximately 2 centimeters per second. Tip resistance, sleeve friction, and pore pressure are typically recorded at 0.1 meter intervals. At selected depths, the cone advancement can be suspended and pore-water dissipation rates measured. This appendix presents the results of the CPT completed for this project.

GEO DESIGN / P - 1 / 108TH & LEVETON, TUALATIN

Operator: MJC/SVAN/GEOTECH
Sounding: FILN01
Cone Used: 4CH

CPT Date/Time: 12-04-06 10:11
Location: P1 108TH LVNTN T
Job Number: GD/SPECT-37-01



Maximum Depth = 50.36 feet

Depth Increment = 0.164 feet

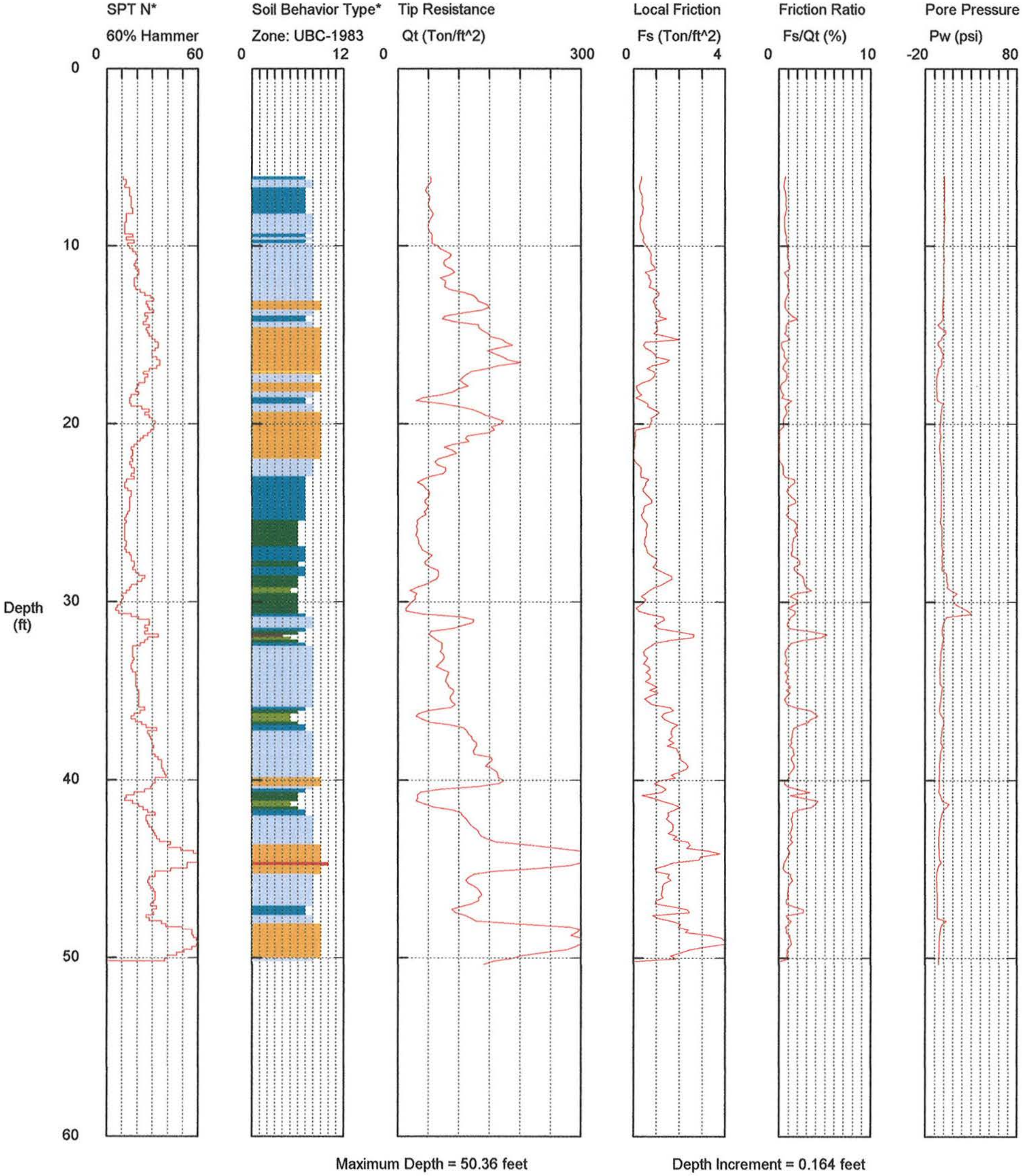
1	sensitive fine grained
2	organic material
3	clay
4	silty clay to clay
5	clayey silt to silty clay
6	sandy silt to clayey silt
7	silty sand to sandy silt
8	sand to silty sand
9	sand
10	gravelly sand to sand
11	very stiff fine grained (*)
12	sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

GEO DESIGN / P - 2 / 108TH & LEVETON, TUALATIN

Operator: MJC/SVAN/GEOTECH
Sounding: FILN02
Cone Used: 4CH

CPT Date/Time: 12-04-06 11:47
Location: P2 108TH LVTN TU
Job Number: GD/SPECT-37-01



Maximum Depth = 50.36 feet

Depth Increment = 0.164 feet

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

*Soil behavior type and SPT based on data from UBC-1983

ACRONYMS

ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
AC	asphalt concrete
AOS	apparent opening size
ASTM	American Society for Testing and Materials
BGS	below the ground surface
CPT	cone penetration test
CTB	cement-treated base
g	gravitational acceleration (32.2 feet/second^2)
H:V	horizontal to vertical
HMAC	hot mix asphalt concrete
IBC	International Building Code
OSHA	Occupational Safety and Health Administration
pcf	pounds per cubic foot
PG	performance grade
PGA	peak ground acceleration
psf	pounds per square foot
psi	pounds per square inch
SOSSCA	State of Oregon 2004 Structural Specialty Code Amendments

GEODESIGN INC

July 25, 2007

City of Tualatin
Building and Engineering Dept.
18880 SW Martinazzi Avenue
Tualatin, OR 97062

Attention: Mr. Randall Soelberg, Plans Examiner

Geotechnical Engineering Services
Import Fill Material
Leveton Commons
SW 108th Avenue and SW Leveton Drive
Tualatin, Oregon
GeoDesign Project: Specht-37-02

INTRODUCTION

GeoDesign, Inc. is pleased to submit this letter providing our evaluation of the proposed import fill material for the Leveton Commons site (formally know as the Tualatin Industrial Center III site). The site is located southwest of the intersection between SW 108th Avenue and SW Leveton Drive in Tualatin, Oregon. GeoDesign prepared the January 8, 2007 geotechnical engineering report[1] for the project.

PROPOSED IMPORT MATERIAL

We understand that Coffman Excavation has proposed importing material from a deep (45 to 55 feet) excavation currently underway in downtown Portland. The site is located northeast of the intersection between SW Park Avenue and SW Columbia Street in Portland, Oregon. Mr. Joe Curran of Specht Development provided us a copy of the January 31, 2006 geotechnical engineering report[2] prepared by Terra Associates, Inc. (TAI) for the export site. We understand that the excavation will be completed over a paved parking area at the above-referenced site.

---

[1] *Report of Geotechnical Engineering Services, Tualatin Industrial Center III, SW 108th Avenue and SW Leveton Drive, Tualatin, Oregon*, GeoDesign Project: Specht-37-01
[2] *Geotechnical Engineering Report, 1300 SW Park Tower, Portland, Oregon*, prepared by Terra Associates, Inc., January 31, 2006.

Based on our review of the TAI report and our own prior experience with several sites in the downtown area, the soil conditions at the export site consist of clayey silt, silt, or sandy silt to depths varying between 8 and 13 feet underlain by sand with varying amounts of silt. Copies of the site plan and the boring logs from the TAI report are attached. We understand that the material proposed for export to the Leveton Commons site will be derived from below 10 feet. Accordingly, the material will likely vary between silty sand (SM, using the Unified Soil Classification System) to sand with silt (SP-SM).

CONCLUSIONS

The proposed import material consists of silty sand (SM) to sand with silt (SP-SM), which generally agrees with the soil at the Leveton Commons site below a depth of approximately 1 to 2.5 feet. Accordingly, this material can be used as fill at the site provided the fill is placed and compacted as recommended in the "Structural Fill" section of our geotechnical engineering report.

◆ ◆ ◆

We appreciate the opportunity to submit this letter. Please call if you have any questions regarding this submittal.

Sincerely,

GeoDesign, Inc.

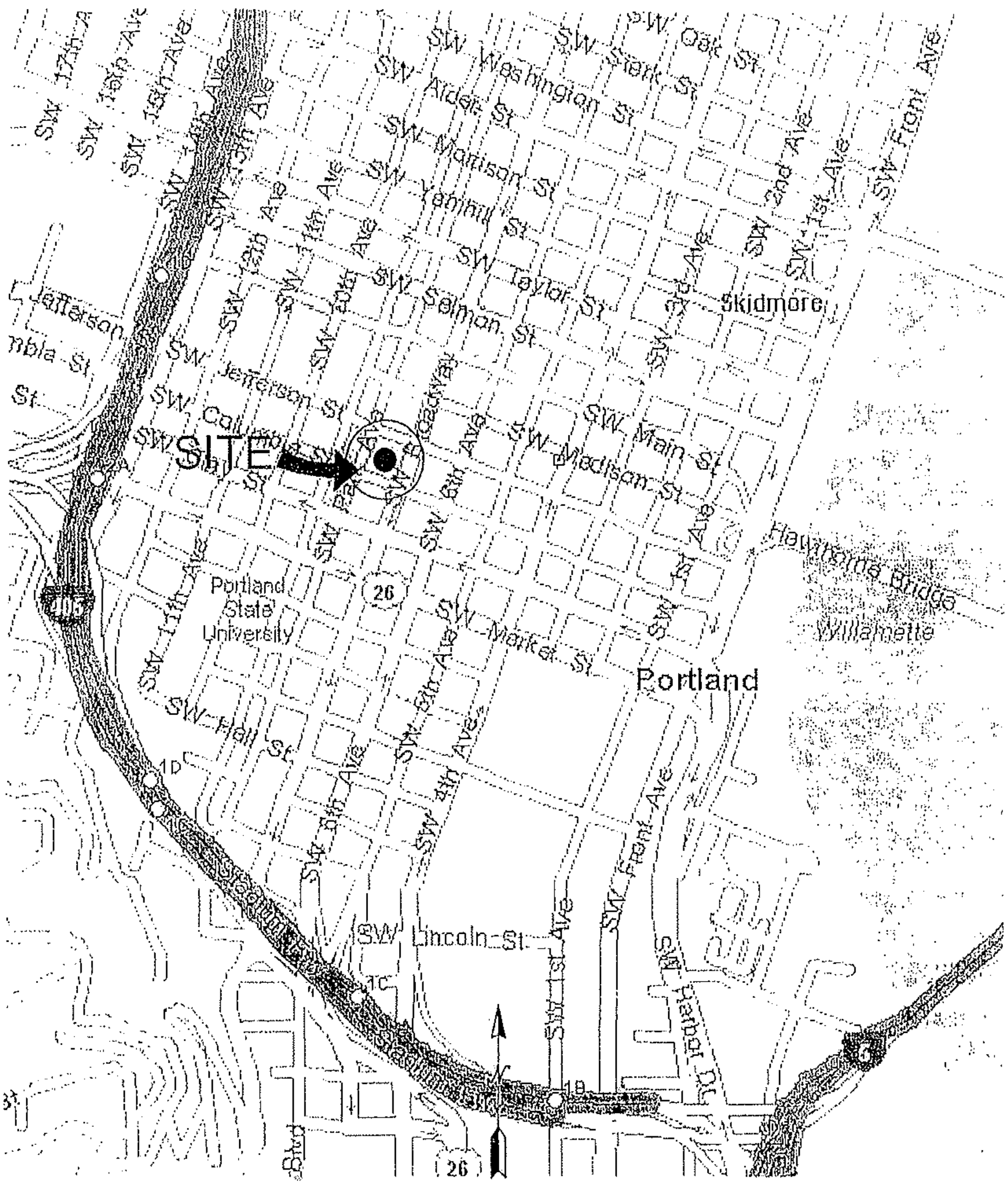
George Saunders, P.E., G.E.
Principal Engineer

GEOTECHNICAL
REGISTERED PROFESSIONAL
ENGINEER
15025GE
OREGON
May 16, 2006
GEORGE SAUNDERS
EXPIRES: 6/2008

cc: Mr. Joe Curran, Specht Development
Mr. Gene Mildren, Mildren Design Group, P.C.
Mr. Karl Koroch, TM Rippey Consulting Engineers
Mr. Jake Ausmus, Coffman Excavation

GPS:kt
Attachments
Two copies submitted
Document ID: Specht-37-02-072507-geol.doc

ATTACHMENT



REFERENCE: THOMAS GUIDE CD-ROM, KING/PIERCE/SNOHOMISH COUNTIES, 2004   NOT TO SCALE

Terra Associates, Inc. Consultants in Geotechnical Engineering Geology and Environmental Earth Sciences	VICINITY MAP 1300 SW PARK TOWER PORTLAND, OREGON		
	Proj. No. T-5735	Date JAN 2006	Figure 1

Boring No. B-1

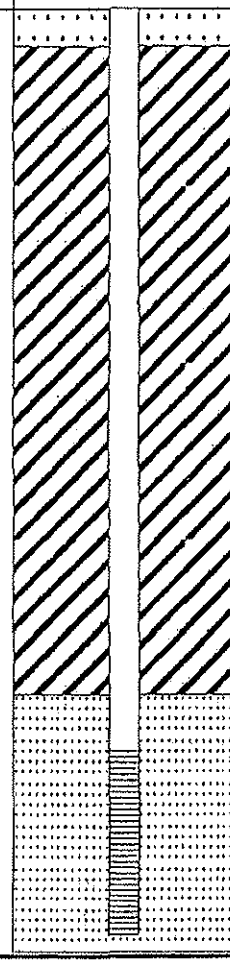
Logged by: TA

Date: 6/15/05

Approximate Elev. 122

Soil Description	Consistency/ Relative Density	Depth (ft.)	Sample	(N) Blows/ ft.	Moisture Content (%)
					24.7
(6 inches ASPHALT CONCRETE over 4 inches CRUSHED ROCK)	Medium Stiff		I	7	23.2
Brown clayey SILT, moist. (ML) LL=31 PL=27 PI=4			I	6	20.8
Light water seepage at 9 feet.					
Brown silty SAND, moist. (SM)	Loose to Medium Dense	10	I	7	22.0
			I	11	12.5
		20	I	12	10.3
Gray SAND with silt, moist. (SP-SM)	Medium Dense		I	14	6.2
		30	I	17	11.1
			I	22	13.0
Brown silty SAND, oxidization staining, moist. (SM)	Medium Dense	40	I	12	17.8
			I	25	28.3
Wet at 51 feet.		50	I	17	34.7

Well As-Built



Boring terminated at 51.5 feet.
2-inch diameter well installed to 50 feet.
No groundwater recorded/observed on 6/16, 6/17, and 6/18.

Terra Associates, Inc.
Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

BORING LOG
1300 SW PARK TOWER
PORTLAND, OREGON

Proj. No. T-5735 | Date JAN 2006 | Figure A-2

Boring No. B-2

Logged by: TA

Date: 6/16/05

Approximate Elev. 123

Soil Description	Consistency/ Relative Density	Depth (ft.)	Sample	(N) Blows/ ft.	Moisture Content (%)
4 inches ASPHALT CONCRETE.					21.8
Brown clayey SILT to SILT. (ML)	Medium Stiff		I	8	30.0
Brown silty SAND, moist. (SM)	Loose	10	I	5	16.3
			I	7	26.6
		20	I	9	13.5
Brown SAND with silt, moist. (SP-SM)	Medium Dense		I	11	11.6
	Loose	30	I	9	26.4
Brown silty SAND, moist. (SM)	Medium Dense		I	12	24.1
		40	I	20	9.9
Gray SAND with silt, moist. (SP-SM)	Medium Dense		I	19	16.1
		50	I	28	8.0
Brown clayey SILT to SILT, oxidation staining, wet. (ML)	Medium Stiff		I	8	32.7
Gray SAND with silt, moist. (SP-SM)					

Continued on next page

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Environmental Earth Sciences

BORING LOG
1300 SW PARK TOWER
PORTLAND, OREGON

Proj. No. T-5735 | Date JAN 2006 | Figure A-3

Boring No. B-2 (Continued)

Logged by: TA

Date: 6/16/05

Soil Description	Consistency/ Relative Density	Depth (ft.)	Sample	(N) Blows/ ft.	Moisture Content (%)
Gray SAND with silt, moist. (SP-SM)	Dense to Medium Dense			42	6.3
				24	10.8
		70		24	18.3
Brown silty SAND, wet. (SM)	Medium Dense			20	24.6
Brown SAND at 81 feet.		80		18	33.9

Boring terminated at 81.5 feet.
No groundwater was observed.

Terra Associates, Inc.
Consultants in Geotechnical Engineering
Geology and
Environmental Earth Sciences

BORING LOG
1300 SW PARK TOWER
PORTLAND, OREGON

Proj. No. T-5735	Date JAN 2006	Figure A-3

Boring No. B-3

Logged by: TA

Date: 6/16/05 & 6/17/05

Approximate Elev. 123

Soil Description	Consistency/ Relative Density	Depth (ft.)	Sample	(N) Blows/ ft.	Moisture Content (%)
3 Inches ASPHALT CONCRETE. Brown clayey SILT to sandy SILT, moist. (ML)	Medium Stiff		I	5	20.5
		10	I	5	32.4
Brown silty SAND, moist. (SM)	Loose to Medium Dense		I	6	21.8
		20	I	7	17.3
			I	6	27.0
		30	I	15	8.0
Gray SAND with silt, moist. (SP-SM) 6-inch sandy SILT seams at 41 feet.	Medium Dense		I	14	10.9
		40	I	11	22.2
			I	17	9.3
		50	I	21	11.5
Brown sandy SILT, moist to wet. (ML)	Loose		I	10	59.6

Continued on next page

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BORING LOG
1300 SW PARK TOWER
PORTLAND, OREGON

Proj. No. T-5735 | Date JAN 2006 | Figure A-4

Boring No. B-3 (Continued)

Logged by: TA

Date: 6/16/05

Soil Description	Consistency/ Relative Density	Depth (ft.)	Sample	(N) Blows/ ft.	Moisture Content (%)
Brown sandy SILT, moist to wet. (ML)				19	14.0
	Medium Dense			21	12.6
	Dense	70		32	20.8
	Medium Dense	LL=30 PL=25 PI=5		25	26.6
Brown clayey SILT, wet. (ML-CL)	Very Stiff	80		18	30.2

Boring terminated at 81.5 feet.
No groundwater was observed.

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Environmental Earth Sciences

BORING LOG
1300 SW PARK TOWER
PORTLAND, OREGON

Proj. No. T-5735 | Date JAN 2006 | Figure A-4

Boring No. B-4

Logged by: TA

Date: 6/17/05

Approximate Elev. 120

Soil Description	Consistency/ Relative Density	Depth (ft.)	Sample	(N) Blows/ ft.	Moisture Content (%)
(6 inches ASPHALT CONCRETE over 4 inches CRUSHED ROCK) Brown sandy SILT, moist. (ML)	Loose		I	6	21.4
Brown silty SAND, moist. (SM)	Loose	10	I	7	17.4
			I	8	12.9
Gray SAND with silt, moist. (SP-SM)	Medium Dense	20	I	12	9.0
			I	13	9.5
		30	I	21	5.7
Brown silty SAND, moist. (SM)	Medium Dense		I	11	15.0
		40	I	15	18.7
Brown clayey SILT, moist. (ML)	Very Stiff		I	12	36.4
Brown SAND with silt, moist. (SP-SM)	Medium Dense	50	I	20	7.8
			I	24	9.4

Continued on next page

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BORING LOG
1300 SW PARK TOWER
PORTLAND, OREGON

Proj. No. T-5735 | Date JAN 2006 | Figure A-5

Boring No. B-4 (Continued)

Logged by: TA

Date: 6/17/05

Soil Description	Consistency/ Relative Density	Depth (ft.)	Sample	(N) Blows/ ft.	Moisture Content (%)
				24	13.6
Brown SAND with silt, moist. (SP-SM)				30	14.8
Gray below 70 feet.		70		26	8.6
	Dense			32	9.5
Brown SAND and GRAVEL at 80 feet.	Very Dense	80		73/9"	3.4

Boring terminated at 81.5 feet.
No groundwater was observed.

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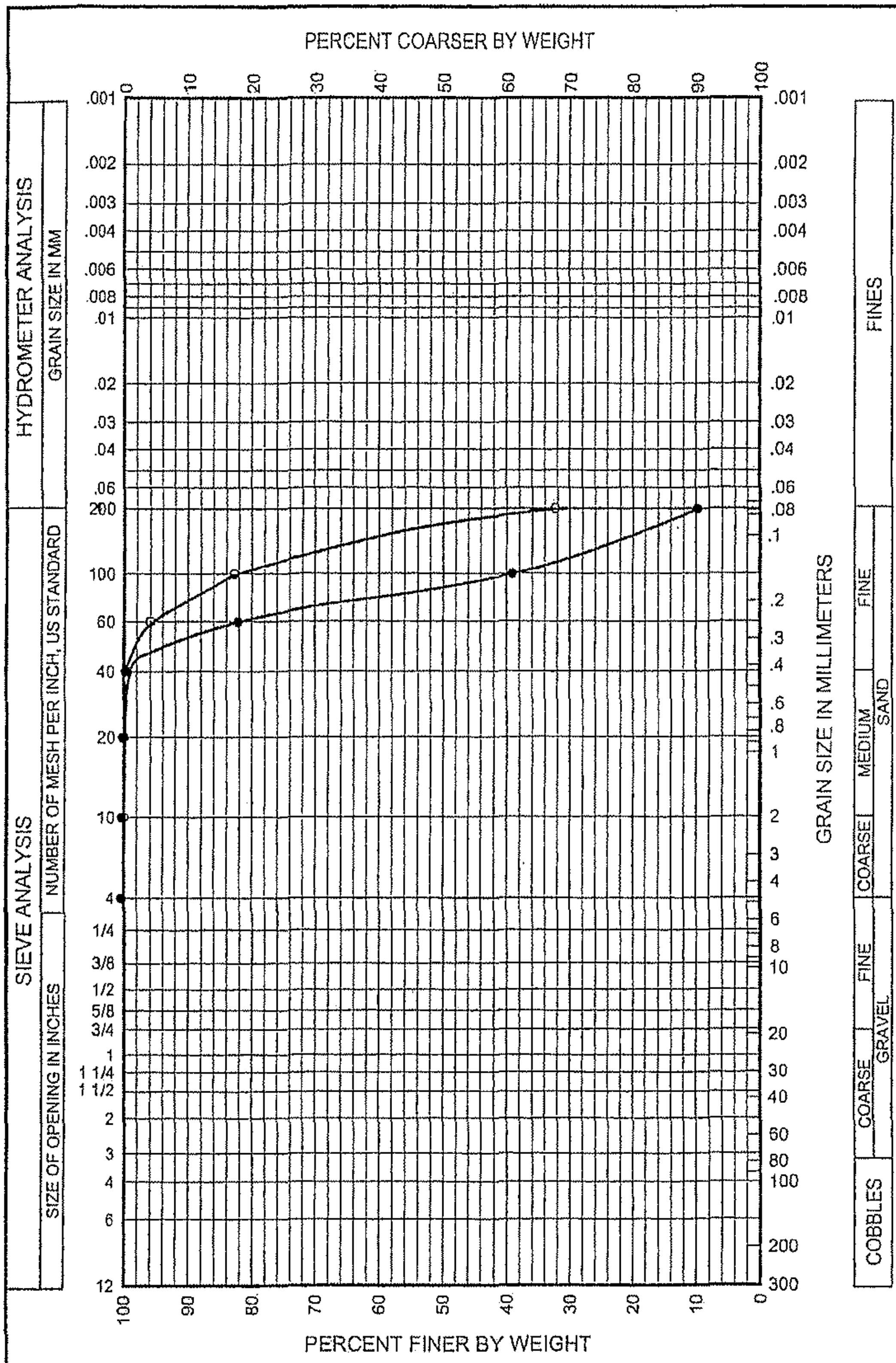
Geology and
Environmental Earth Sciences

BORING LOG
1300 SW PARK TOWER
PORTLAND, OREGON

Proj. No. T-5735 | Date JAN 2006 | Figure A-5



Key	Exploration Number	Depth (ft.)	USCS	Description	Moisture Content (%)	LL	PL
●	B-1	25.0	SP-SM	poorly graded SAND with silt	6.2		
O	B-2	10.0	SM	silty SAND	16.2		

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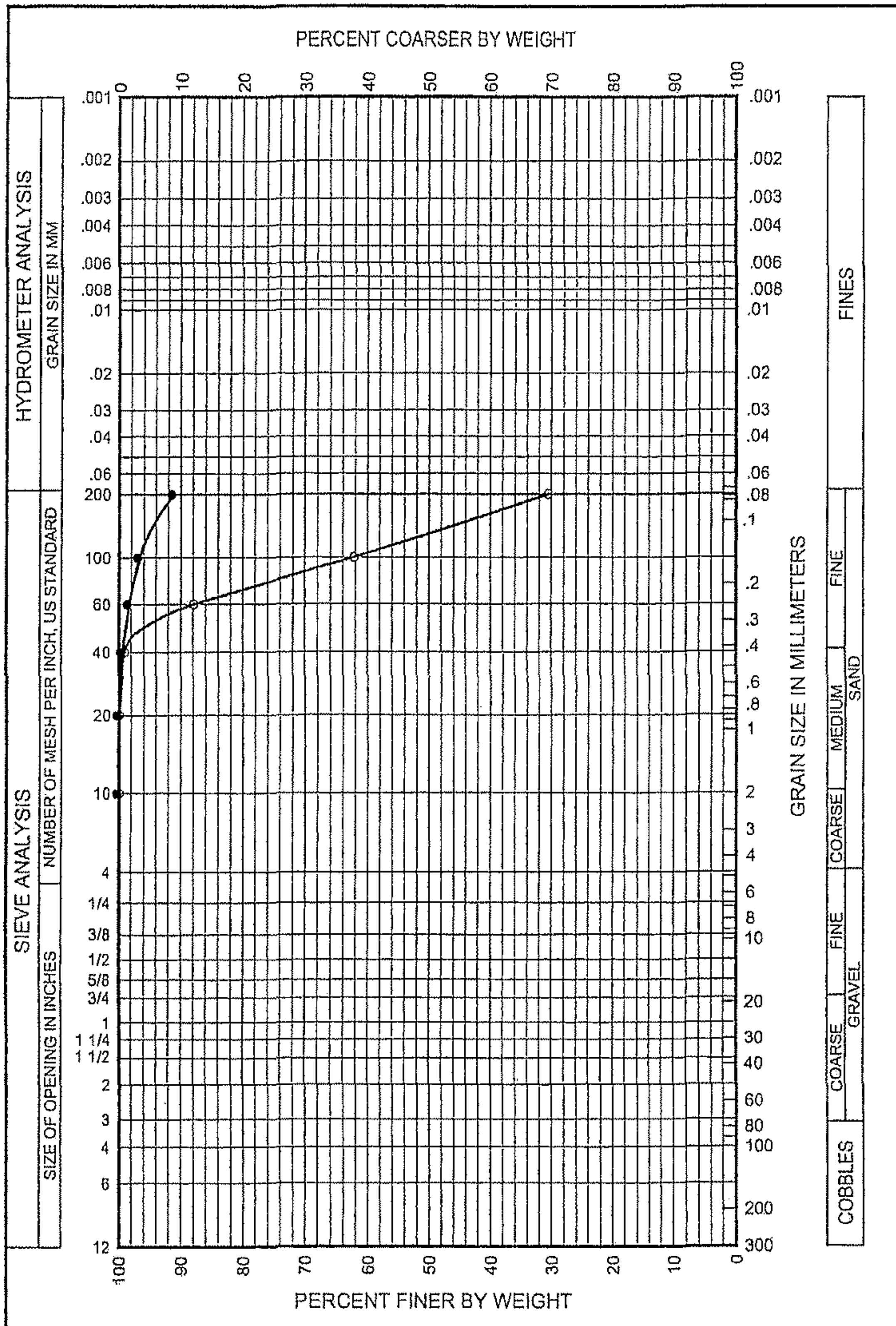
GRAIN SIZE ANALYSIS
1300 SW PARK TOWER
PORTLAND, OREGON

Proj. No. T-5735	Date JAN 2006	Figure A-6



Key	Exploration Number	Depth (ft.)	USCS	Description	Moisture Content (%)	LL	PL
●	B-2	55.0	ML	SILT	32.7		
○	B-3	35.0	SM	silty SAND	10.8		

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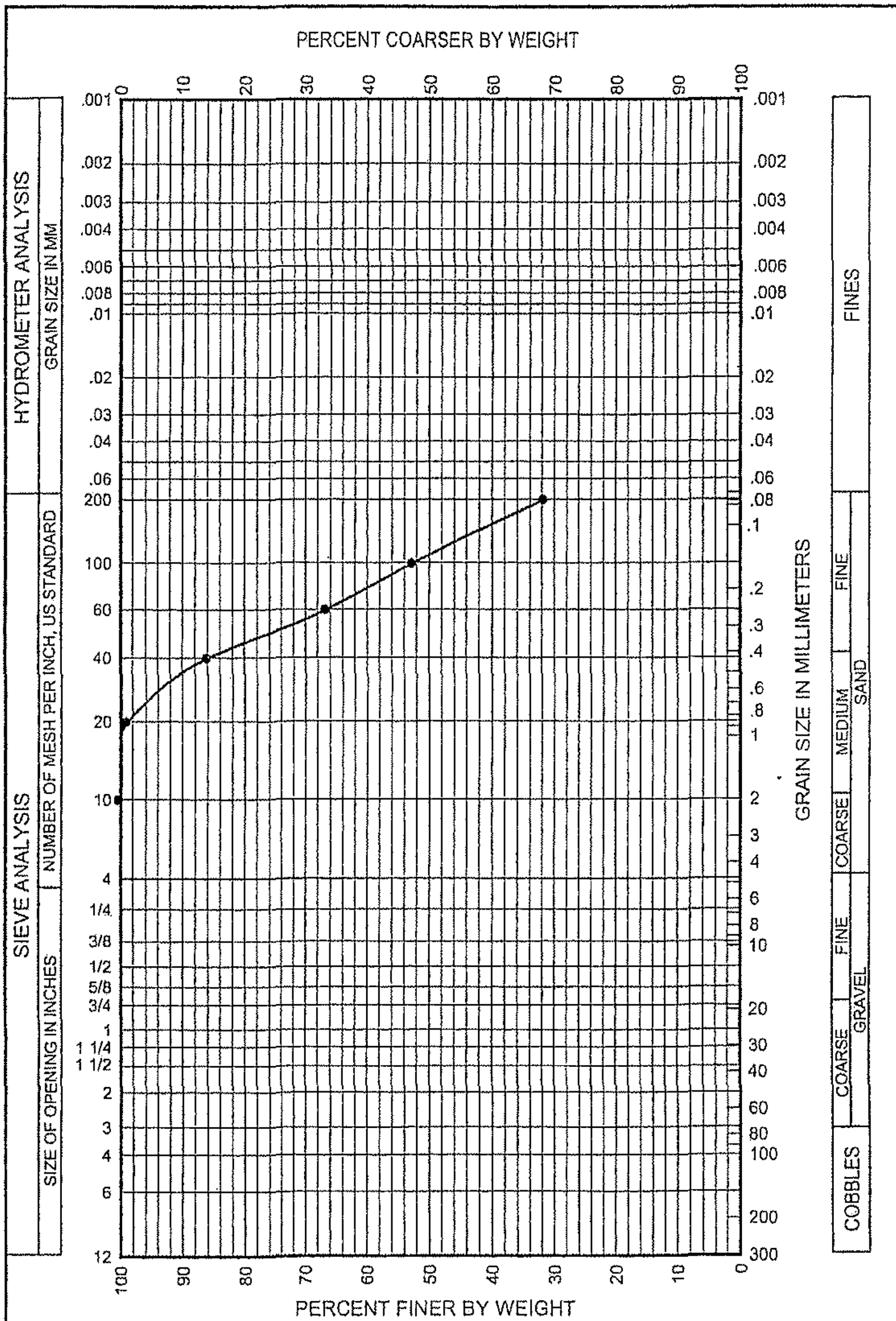
GRAIN SIZE ANALYSIS
1300 SW PARK TOWER
PORTLAND, OREGON

Proj. No. T-5735	Date JAN 2006	Figure A-7



Key	Exploration Number	Depth (ft.)	USCS	Description	Moisture Content (%)	LL	PL
●	B-4	60.0	SM	silty SAND	13.6		

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GRAIN SIZE ANALYSIS
1300 SW PARK TOWER
PORTLAND, OREGON

Proj. No. T-5735	Date JAN 2006	Figure A-8

Storm Drainage Basin Analysis

Leveton Commons

108th Avenue and Leveton Drive
Tualatin, Oregon

December 2013
Project Number: 12236

REGISTERED PROFESSIONAL
ENGINEER
15504
OREGON
JULY 25, 1991
KARL KOROCH
EXPIRES: 6/30/15

TM RIPPEY
CONSULTING ENGINEERS

7650 SW Beveland Street,
Suite 100
Tigard, Oregon 97223

Phone: 503 443 3900
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kkoroch@tmrippey.com

Table of Contents

Analysis Overview:

The project is a new commercial development located at the SW corner of SW 108th Avenue and Leveton Drive in Tualatin. The project site consists of two parcels totaling approximately 5.36 acres. The southern parcel, approximately 4.41 acres will be developed initially and the remaining parcel will be developed at a future time. Storm runoff from this site will be collected from building roof and paved areas and conveyed by pipe to an on-site private facility that will provide runoff quality treatment and flow control in conformance with the City of Tualatin and Clean Water Services (CWS) requirements. Discharge from this facility will be directed to an existing public storm system located in 108th.

City of Tualatin staff has indicated that an analysis of the capacity of the existing public storm drainage system in 108th is required to ensure that runoff from the site can be accommodated in the existing public system.

Several discussions with staff have occurred during the preparation of this analysis. Staff provided an aerial photograph with topographic contours and general limits of the drainage basin tributary to the 108th storm system. Staff also provided record drawings for the 108th system, record drawings for the storm drainage system in Leveton Drive which connects to 108th, a drainage analysis for Tax Lots 600 an 700, and record drawings for a public improvement project at Herman Road with a drainage analysis for that project.

City of Tualatin and CWS standards indicate the basin analysis is to extend either ¼ mile downstream of the site or until the site runoff is less than 10% of the basin flow under present conditions. Runoff was quantified based on the Santa Barbara Unit Hydrograph Method, Type 1A 24 hour 25 year rainfall event, using HydroCad software, in compliance with City and CWS standards.

The available construction records indicate the storm system in 108th consist of a series of catch basins connected to a main pipe system extending south to Herman Road. Site service laterals have been provided at many parcels adjacent to this system. The storm system in 108th appears to terminate approximately 700 ft. north of Leveton Drive.

Runoff is directed west along the north side of Herman Road in a grassed ditch for approximately 660 lineal feet. The public improvement project at Herman road improved this ditch and installed two culverts at existing private driveways along the ditch.

Staff indicated only the parcels immediately adjacent to 108th drain to the public storm system. Runoff from parcels that are adjacent to the street was quantified based on both their current development state or if under or undeveloped, runoff was quantified based on their potential runoff with required flow control following development or redevelopment. It is presumed at impervious site area will not exceed 85% of total parcel area, based on Tualatin development standards.

Public Street runoff was calculated between catch basins based on a 50 ft. width of impervious surface, to account for both street paving and sidewalks.

Runoff from Development Parcels:
The following is a discussion of the development status of parcels adjacent to 108th listed from north to south.

TL 100 Helser (T2S R1W 22AA)
This site is currently developed with a commercial building and paved parking and maneuvering areas. Construction plans and drainage analysis for this site were not available. Available construction plans, dated August 1988 indicate the runoff from this site is directed easterly through a 10 ft. wide easement to a system in Teton Avenue. This is consistent with the record drawings for 108th; they show no storm pipe extended to this site. Runoff from this site was not included in this analysis.

TL 600/700 Pacific Cornetta/Shultz Clearwater (T2S R1W 22AA)
These two sites were subject to developed in 2005 and 2009 resulting commercial buildings and paved parking and maneuvering areas. Staff provided drainage analysis documentation that indicates runoff flow control was provided on TL 600 in 2005 that accommodated both parcels. Post-detention flow rates for these to parcels were used in the analysis.

TL 400 (T2S R1W 22AA)
This site is developed with a commercial building and paved parking and maneuvering areas. Plans available at the City (Crystal Lite Building, November 1990) indicate detention was provided which limits discharge from a 25 year event to 1.60 cfs. As development relatively modern, it is also presumed redevelopment that would provide additional flow control in the near term is unlikely.

TL 500 Novellus (T2S R1W 22AA)
This is a very large site (19.7 acres) that has been partially developed. Staff indicates as development progresses runoff from the newly created impervious areas will be directed to an existing culvert and ditch system crossing Leveton drive approximately mid-site and no runoff is intended to be directed to the system in 108th. A field inlet exists along the west side of 108th, approximately 250 ft. north of Leveton Drive. Runoff from the undeveloped area tributary to this inlet has been quantified and included in this analysis though it will be eliminated with additional development at that portion of the site.

TL 100 Dot Storage (T2S R1W 22AD)
This site contains several older buildings associated with a storage business. While it is likely this site could redevelop in the near term, modeling was performed based on existing conditions of buildings, asphalt and gravel surfacing, and relatively large landscape areas.

TL 1300, 1400, and 1500 Specht Development (T2S R1W 22AD)
These parcels are the development parcels that trigger the requirement for this basin analysis. The have recently been consolidated into two parcels and runoff was modeled as the developed site with flow control.

TL 200 Tualatin Operations Center (T2S R1W 22AD)
This site is developed with several buildings and paved parking and maneuvering areas. Staff indicates this site's runoff is disposed on site with infiltration facilities and no connection to the 108th or western Herman Road systems will occur. This site has not been included in this analysis.

TL 800 NW Metal Fab (T2S R1W 22AD)
This site presently contains several older buildings, paving and gravel areas, and landscaped areas. This site is likely to redevelop and modeling was performed both in the current state and redeveloped with runoff flow control.

TL 600 NW Metal Fab (T2S R1W 22AD)
This site presently contains several older buildings, paving and gravel areas, and landscaped areas. This site is likely to redevelop and modeling was performed both in the current state and redeveloped with runoff flow control.

TL 700 NW Metal Fab (T2S R1W 22AD)
This site presently contains several older buildings, paving and gravel areas, and landscaped areas. This site is likely to redevelop and modeling was performed both in the current state and redeveloped with runoff flow control. As this site is set west of TL 600 and 800 and since the storm system in 108th is approximately four feet below grade it is likely this site, when redeveloped will drain either west to an existing ditch or south through TL 900 to the ditch along Herman Road. Runoff was included in flow directed to the ditch via TL 900.

TL 900 Brockway (T2S R1W 22AD)
This site is undeveloped with a small building and a combination of gravel and grass. Preliminary plans were included with an Architectural Review submittal in 2007 but the current status is not known. Runoff from this site has been modeled as if developed and with runoff flow control.

Below is a summary of the runoff from the development parcels based on 25 year events under current conditions, with development/redevelopment and also based on a 50 year event under current conditions:

Description	**Net Runoff Area (sf)**	**25 Year (cfs) Current Conditions**	**25 Year (cfs) Development/ Redevelopment**	**50 Year (cfs) Current Conditions**
TL 600/700 Pacific Cornetta/Shultz Clearwater	206,925	1.64	1.64	1.88
TL 400	206,910	1.60	1.60	2.00
TL 500 Novellus	126,460	1.09	1.09	1.26
TL 100 Dot Storage	62,700	0.43	0.43	0.51
TL 1300/1400/1500 Specht Development	21,916	1.87	1.87	2.15
TL 800 NW Metal Fab	66,276	0.46	0.38	0.50
TL 600 NW Metal Fab	66,278	1.39	0.57	1.50
TL 700 NW Metal Fab	37,026	0.78	0.32	0.84
TL 900 Brockway	81,086	1.71	0.70	1.84

The table below represents runoff from sections of 108th and from Leveton that are tributary to the public storm system in 108th: Sections are based on 108th street stationing per the record drawings by CH2M Hill, dated November 1990 and tributary to street inlets.

Roadway Section	Areas (SF)	25 Year (cfs)	50 Year (cfs)
108th north of 3+00	15,000	0.32	0.34
108th 3+00 to 6+00	15,000	0.32	0.34
108th 6+00 to 9+55	17,750	0.37	0.40
108th 9+55 to 11+79	11,200	0.24	0.25
108th 11+79 to 15+25	17,300	0.36	0.39
108th 15+25 to 18+20 (inlet at 16+60)	14,750	0.31	0.33
Leveton inlets at 32+20	9,200	0.19	0.21

Existing storm pipes within 108th are numbered north (upstream) to south (downstream) from 1 to 9, with capacities calculated using Manning's equation, roughness coefficient, n=0.013 and based on the size and slope listed on the storm system record drawings, shown below.

The existing roadside ditch configuration is based on the section listed on the record drawings for Herman road by CH2M Hill, dated February 2011. The plans indicate the ditch has a bottom width of 2 ft. with 2h:1v side slopes and a minimum slope of 0.08% and an average depth of 5 ft. The ditch has long grass and vegetation but is well defined and straight so a Manning's roughness coefficient of 0.035 was used. Two short concrete culverts at driveways are located along the ditch but these were ignored as the ditch has significant excess capacity.

Pipe Segment/Tributary Area	Capacity (cfs)	25 year Current Conditions (cfs)	25 year Development/ Redevelopment (cfs)	50 Year Current Conditions (cfs)
Pipe 1—12 inch at 5.6%	8.5			
108th north of 3+00		0.32	0.32	0.34
Pipe 2—12 inch at 1.94%	5.0			
Pipe 1		0.32	0.32	0.34
108th to 6+00		0.32	0.32	0.34
TL 600/700 Pacific Cornetta/Shultz		1.64	1.64	1.88
Total	**5.0**	**2.28**	**2.28**	**2.56**

Pipe Segment/Tributary Area	Capacity (cfs)	25 year Current Conditions (cfs)	25 year Development/ Redevelopment (cfs)	50 Year Current Conditions (cfs)
Pipe 3—18 inch at 0.40%	6.7			
Pipe 2		2.28	2.28	2.56
108th to 9+55		0.37	0.37	0.40
Leveton Drive		0.19	0.19	0.21
TL 400		1.60	1.60	2.00
TL 500 Novellus		1.09	1.09	1.26
Total	**6.7**	**5.53**	**5.53**	**6.43**
Pipe 4—21 inch at 0.40%	11.3			
Pipe 3		5.53	5.53	6.43
108th to 11+79		0.24	0.24	0.25
TL 100 Dot Storage		0.43	0.43	0.51
Total	**11.3**	**6.20**	**6.20**	**7.19**
Pipe 5—24 inch at 0.50%	16.1			
Pipe 4		6.20	6.20	7.19
108th to 15+25		0.36	0.36	0.39
TL 1300/1400/1500 Specht		1.87	1.87	2.15
Total	**16.1**	**8.43**	**8.43**	**9.73**
Pipe 6—30 inch at 0.18%	17.6			
Pipe 5		8.43	8.43	9.73
108th to 18+20		0.31	0.31	0.33
TL 800 NW Metal Fab		0.46	0.38	0.50
Total	**17.6**	**9.20**	**9.12**	**10.56**

Pipe Segment/Tributary Area	Capacity (cfs)	25 year Current Conditions (cfs)	25 year Development/ Redevelopment (cfs)	50 Year Current Conditions (cfs)
Pipe 7—30 inch at 0.72%	35.1			
Pipe 6		9.20	9.12	10.56
TL 600 NW Metal Fab		1.39	0.57	1.50
Total	**35.1**	**10.59**	**9.69**	**12.06**
Ditch at Herman Road	183.3			
Pipe 7		10.59	9.69	12.06
TL 700 NW Metal Fab		0.78	0.32	0.84
TL 900 Brockway		1.71	0.70	1.84
Total	**183.3**	**13.08**	**10.71**	**14.74**

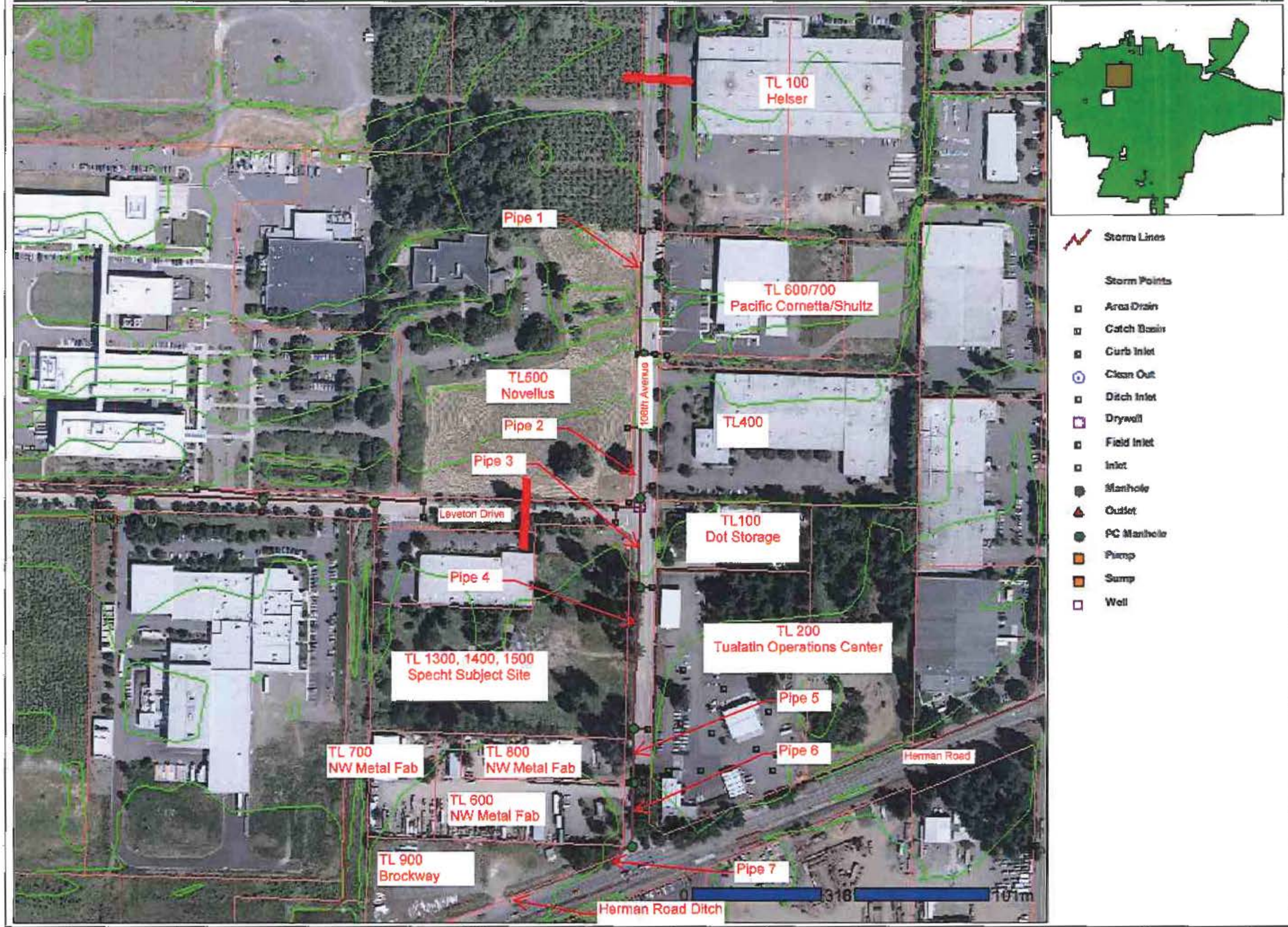
As shown above, existing storm pipes in 108th and the storm pipe at 108th and Herman Road as well as the roadside ditch have sufficient capacity to pass both the 25 year and 50 year events both under current conditions and with future development/redevelopment.

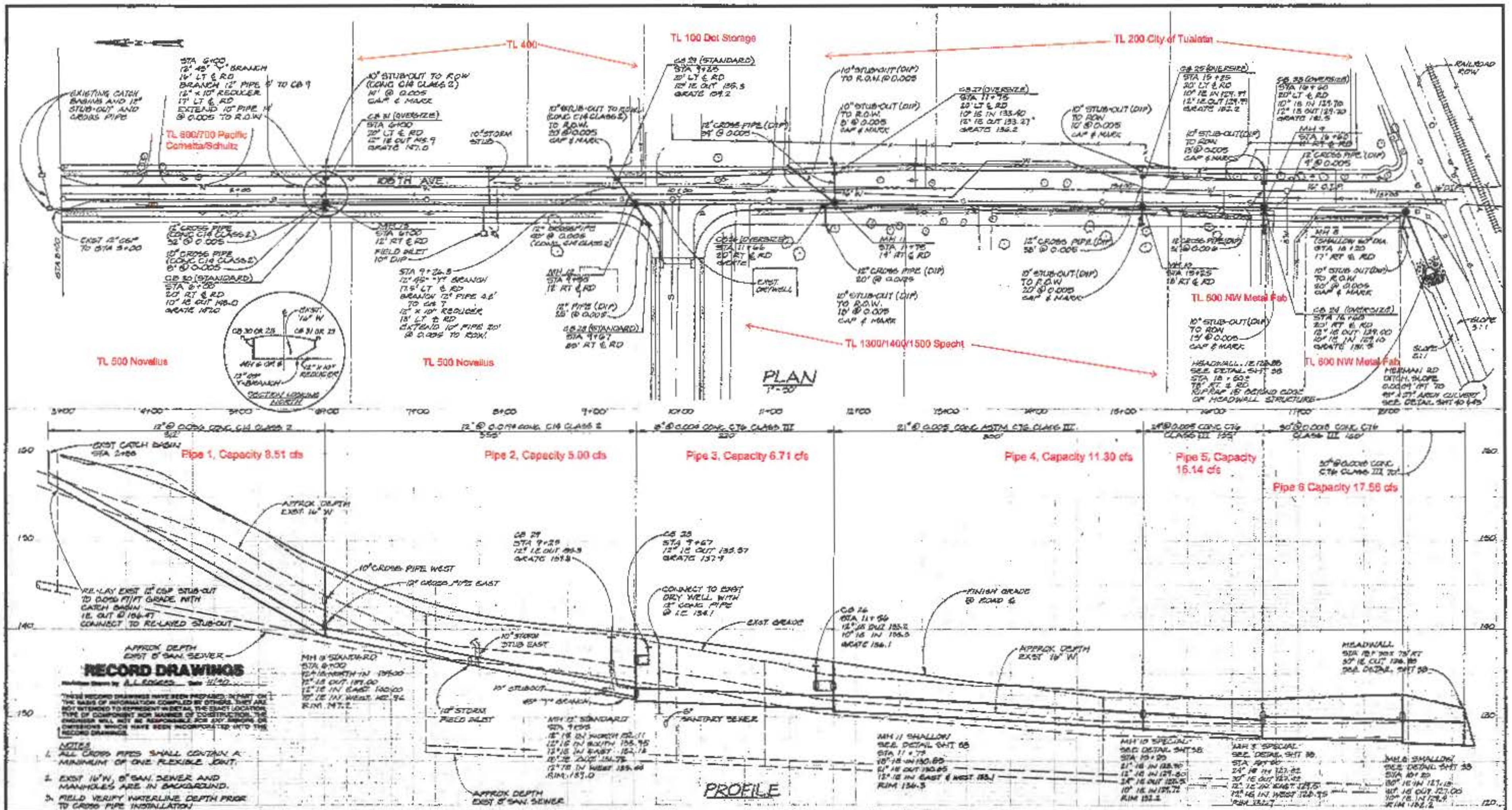
The drainage analysis for Herman Road, prepared by CH2M Hill (see Appendix) indicates two culverts crossing Herman Road at Sta 52+00 were undersized and were replaced with an 18 and 36 inch culvert. The analysis indicated that total flow to these culverts is 65 cfs and the new culverts and downstream ditch (also modified with the Herman Road project for approximately 100 ft. downstream of the culverts) provide adequate capacity to pass the flow.

As the development site runoff of 1.87 cfs is 2.9 percent of basin flow , no further analysis downstream is required. Based on the calculations, the existing system in 108th and along Herman Road has adequate existing capacity to pass the discharge from the subject site without modification.

Aerial Map and Record of Construction Plans

TualMap: Area of Interest Map





CITY OF TUALATIN OREGON
18880 S.W. MARTINAZZI AVENUE
TUALATIN, OR 97062

DRAWN	A.L. ROHMAN 2/19/90
CHECKED	J.M. ABRAMS 2/19/90
APPROVED	M.F. MADISON 2/19/90
SCALE	1" = 50' HORIZ. 1" = 5' VERT.

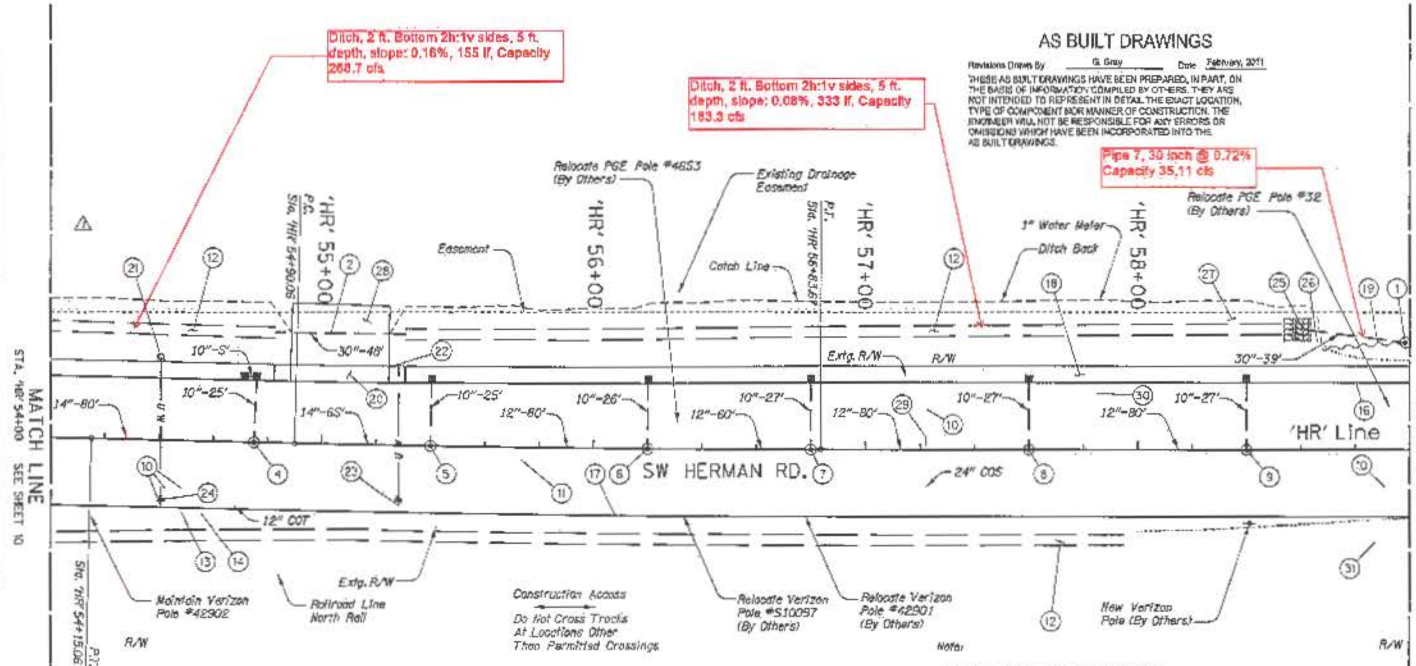
CH2M HILL

108TH AVENUE STORM SEWER

NO.	REVISION	DATE	BY
1	RECORD DRAWING	11/90	

SHEET 46 OF 46

DRAWING NUMBER 90-17-44



Note:
1. Maintain Driveway Access At All Times

AS BUILT DRAWINGS

Revisions Drawn By G. Gray Date February, 2011

THESE AS BUILT DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE AS BUILT DRAWINGS.

ENGLISH

CH2MHILL

(1) Sta. 'HR' 58+90.64, 37.36' Lt.
Const. Conc. Manhole, 60" Flat Top
Rim El. 132.24
(See COT Std. Dwg. No. 011, 030, 031, 032)

(2) Install 30" Class III Reinforced Concrete Culvert – 46'
I.E. W – 126.33
I.E. E – 126.40

(3) Not Used

(4) Sta. 'HR' 54+75.00, 0'
Const. Conc. Manhole, 48" Flat Top
Rim El. 131.05
Const. CG–48
Inst. 10" DIP Storm Sew. Pipe – 25'
Inst. 14" DIP Storm Sew. Pipe – 65'
Sta. 'HR' 54+68.22, 23.00' Lt.
Const. CG–30
Inst. 10" DIP Storm Sew. Pipe – 5'
(See COT Std. Dwg. No. 011, 030, 031, 032, 041, 042)

(5) Sta. 'HR' 55+40.00, 0'
Const. Conc. Manhole, 48" Flat Top
Rim El. 131.26
Inst. 10" DIP Storm Sew. Pipe – 25'
Inst. 12" DIP Storm Sew. Pipe – 80'
Const. CG–30
(See COT Std. Dwg. No. 011, 030, 031, 032, 041)

(6) Sta. 'HR' 56+20.00, 0'
Const. Conc. Manhole, 48" Flat Top
Rim El. 131.62
Inst. 10" DIP Storm Sew. Pipe – 26'
Inst. 12" DIP Storm Sew. Pipe – 60'
Const. CG–30
(See COT Std. Dwg. No. 011, 030, 031, 032, 041)

(7) Sta. 'HR' 56+80.00, 0'
Const. Conc. Manhole, 48" Flat Top
Rim El. 131.89
Inst. 10" DIP Storm Sew. Pipe – 27'
Inst. 12" DIP Storm Sew. Pipe – 80'
Const. CG–30
(See COT Std. Dwg. No. 011, 030, 031, 032, 041)

(8) Sta. 'HR' 57+60.00, 0'
Const. Conc. Manhole, 48" Flat Top
Rim El. 132.85
Inst. 10" DIP Storm Sew. Pipe – 27'
Inst. 12" DIP Storm Sew. Pipe – 80'
Const. CG–30
(See COT Std. Dwg. No. 011, 030, 031, 032, 041)

(9) Sta. 'HR' 58+40.00, 0'
Const. Conc. Manhole, 48" Flat Top
Rim El. 132.59
Inst. 10" DIP Storm Sew. Pipe – 27'
Const. CG–30
(See COT Std. Dwg. No. 011, 030, 031, 032, 041)

(10) Adjust Valve Box

(11) Adjust Manhole

(12) Const. Ditch
(For Details, See Sht. 2A Thru 2A-2)

(13) Relocate Pressure Relief Valve And Manhole (By Others)
Coordinate With City Of Sherwood

(14) Remove & Salvage Hydrant–
Plug Abandoned 6" & Close Valve
(Deliver Salvaged Hydrant To COT Ops)

(16) Const. Conc. Curb And Gutter
(For Details, See COT Dwg. No. 470)

(17) Const. Conc. Curb
(For Details, See COT Dwg. No. 471)

(18) Const. Conc. Sidewalk
(For Details, See COT Dwg. No. 475)

(19) Abandon Existing Pipe

(20) Const. Commercial Driveway Approach
(For Details, See COT Dwg. No. 440)

(21) Sta. 'HR' 54+41.00
Install New 6" Fire Hydrant
(See COT Std. Dwg. No. 610)

(22) Sta. 'HR' 55+27.63
Install 8" RJ DI Pipe – 53'
Install Temp Blow Off
(See COT Std. Dwg. No. 606)

(23) Sta. 'HR' 55+27.63
Install 12"x8" Flanged Tapping Sleeve And 8" FLG x RJ MJ Tapping Valve
(See COT Std. Dwg. No. 600)

(24) Sta. 'HR' 54+41.00
Install 12"x6" Flanged Tapping Sleeve And 6" FLG x RJ MJ Tapping Valve
(See COT Std. Dwg. No. 600)

(25) Sta. 'HR' 58+60.00, 44.71' Lt.
Install 30" Class III Reinforced Concrete Storm Sew. Pipe – 31'
Install Bio-Protected Riprap Pad (Class 50)
Outfall Elev. – 126.55
(For Details, See Sht. 2C)

(26) Remove Extg. Conc. Headwall

(27) Protect Slope With Riprap Pad (Class 50) Depth 1.5'
Approx. Qty. – 31 C.Y.
(For Details & Limits See Sht. 2C)

(28) Install Asphalt Approach Pad
Thkn. – 3" AC/6" Agg. Base

(29) See Sht. 10, Note 46

(30) Maintain Water Service

(31) Adjust NWG Box (By Others)

0 20 40 60
Scale In Feet

Revised By WCD #7, 06/10/2009

DRAINAGE ENGINEER	ROADWAY ENGINEER
THE CONTRACT DOCUMENT DRAWINGS ARE THE PRINTED DOCUMENTS DATED SEPTEMBER, 2008 AS SUBSEQUENTLY OFFICIALLY AMENDED, WHICH DEFINE THE SCOPE, EXTENT, AND CHARACTER OF THE WORK. THIS ORIGINALLY ISSUED CONTRACT DOCUMENT DRAWING WAS SEALED AND SIGNED BY RICHARD E. ATTANASIO OREGON P.E. NO. 15058 IN SEPTEMBER, 2008	THE CONTRACT DOCUMENT DRAWINGS ARE THE PRINTED DOCUMENTS DATED SEPTEMBER, 2008 AS SUBSEQUENTLY OFFICIALLY AMENDED, WHICH DEFINE THE SCOPE, EXTENT, AND CHARACTER OF THE WORK. THIS ORIGINALLY ISSUED CONTRACT DOCUMENT DRAWING WAS SEALED AND SIGNED BY DARREN A. HIPPENSTIEL OREGON P.E. NO. 72662 IN SEPTEMBER, 2008

TUALATIN DEVELOPMENT COMMISSION

S.W. HERMAN RD.
S.W. 124TH AVE. TO S.W. TETON AVE.
WASHINGTON COUNTY

Reviewed By – Steve Kotko
Designed By – Darren Hippenstiel
Drafted By – Priscilliano Pereira-Ramirez

ROADWAY AND DRAINAGE PLAN
STA. 'HR' 54+00 TO STA. 'HR' 59+00

SHEET NO. 11

As Built

NGM: 352590 352590pl11.dgn 5/3/2011 11:43:55 AM ggray

11-05-39

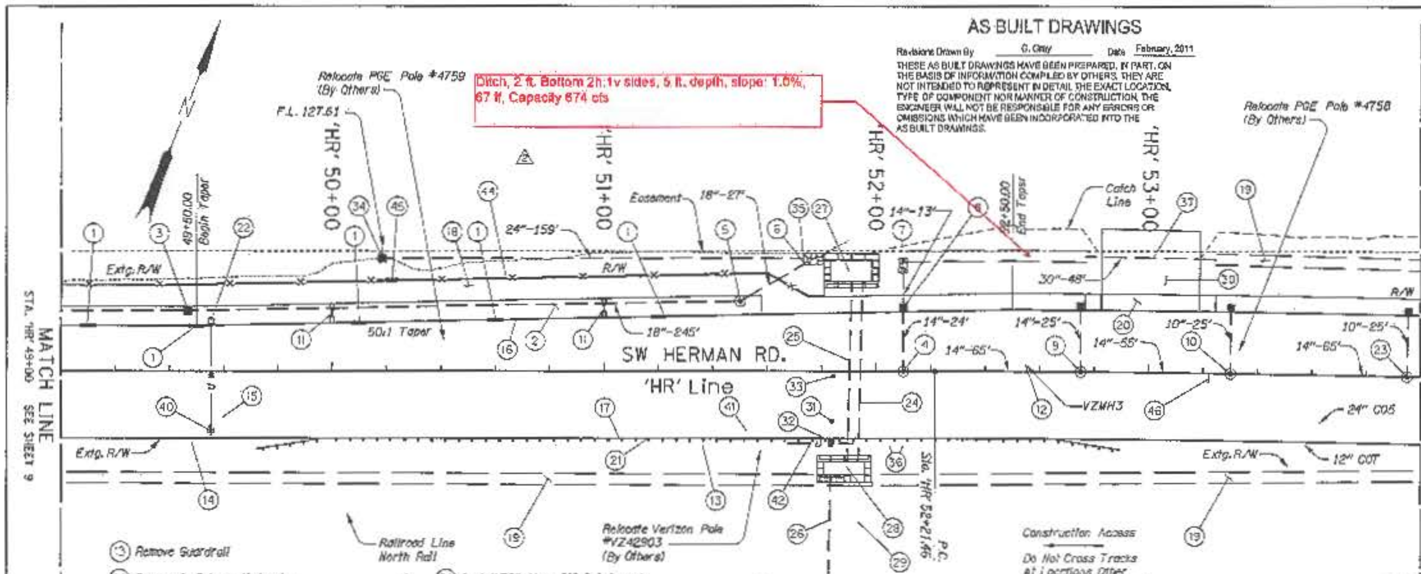
AS BUILT DRAWINGS

Revisions Drawn By G. Gray Date February, 2011

THESE AS BUILT DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE AS BUILT DRAWINGS.

ENGLISH

CH2MHILL



(1) Const. Curb Cut
(For Detail, See Sht. 2C-3)

(2) Const. Street Swale
(For Detail, See Sht. 2C-2)

(3) Sta. 'HR' 49+46.83, 22.10' Lt.
Const. Area Drain (Type II)
Inst. 16" DIP Storm Sew. Pipe - 181'
(See CWS Std. Dwg. No. 380)
(For Details, See COT Std. Dwg. No. 470, And Sht. 2C-2)

(4) Sta. 'HR' 52+10.00, 0'
Const. Conc. Manhole, 48" Flat Top
Rim El. 131.93
Inst. 14" DIP Storm Sew. Pipe - 65'
(See COT Std. Dwg. No. 011, 030, 031, 032)

(5) Sta. 'HR' 51+50.00, 26.00' Lt.
Const. Conc. Manhole, 48" Flat Top
Rim El. 131.94
Inst. 18" DIP Storm Sew. Pipe - 203'
(See COT Std. Dwg. No. 011, 030, 031, 032)

(6) Sta. 'HR' 51+71.00, 37.00' Lt.
Inst. 18" DIP Storm Sew. Pipe - 27'
Inst. Bio-Protected Riprap Pad (Class 50)
(For Details, See Sht. 2C)

(7) Sta. 'HR' 52+10.00, 36.55' Lt.
Inst. 14" DIP Storm Sew. Pipe - 13'
Inst. Bio-Protected Riprap Pad (Class 50)
(For Details, See Sht. 2C)

(8) Sta. 'HR' 52+10.00, 22.00' Lt.
Const. CG-30
Inst. 14" DIP Storm Sew. Pipe - 24'
(See COT Std. Dwg. No. 011, 030, 031, 032, 041)

(9) Sta. 'HR' 52+75.00, 0'
Const. Conc. Manhole, 48" Flat Top
Rim El. 131.79
Inst. 14" DIP Storm Sew. Pipe - 55'
Const. CG-30
Inst. 14" DIP Storm Sew. Pipe - 25'
(See COT Std. Dwg. No. 011, 030, 031, 032, 041)

(10) Sta. 'HR' 53+30.00, 0'
Const. Conc. Manhole, 48" Flat Top
Rim El. 131.58
Inst. 14" DIP Storm Sew. Pipe - 65'
Const. CG-30
Inst. 10" DIP Storm Sew. Pipe - 25'
(See COT Std. Dwg. No. 011, 030, 031, 032, 041)

(11) Inst. Rock Check Dam
(For Details, See Sht. 2C-2)

(12) Adjust Manhole

(13) Remove Guardrail

(14) Remove & Salvage Hydrant -
Plug Abandoned 6" & Close Valve
(Deliver Salvaged Hydrant To COT Ops)

(15) Adjust Valve Box

(16) Const. Conc. Curb And Gutter
(For Details, See COT Dwg. No. 470)

(17) Const. Conc. Curb
(For Details, See COT Dwg. No. 471)

(18) Const. Conc. Sidewalk
(For Details, See COT Dwg. No. 475)

(19) Const. Ditch
(For Details, See Sht. 2A Thru 2A-2)

(20) Const. Commercial Driveway Approach
(For Details, See COT Dwg. No. 440)

(21) Sta. 'HR' 49+71.83 To Sta. 'HR' 52+89.56
Const. Guardrail - 268' (Type 2A)
Inst. Energy Absorbing Terminals, Non-Flared - 2
Flare Rate 0, W=2, E=0
(For Details, See ODOT Std. Dwg. RD400, RD405, RD420)

(22) Sta. 'HR' 49+55.00
Install New 6" Fire Hydrant
(See COT Std. Dwg. No. 610)

(23) Sta. 'HR' 53+95.00, 0'
Const. Conc. Manhole, 48" Flat Top
Rim El. 130.32
Inst. 14" DIP Storm Sew. Pipe - 80'
Const. CG-30
Inst. 10" DIP Storm Sew. Pipe - 25'
(See COT Std. Dwg. No. 011, 030, 031, 032, 041)

(24) Install 36" Class III Reinforced
Concrete Culvert - 67'

(25) Install 18" Class III Reinforced
Concrete Culvert - 67'

(26) Install 24-Inch Steel Culvert - 34'
Min. Wall Thkn. - 0.75"
I.E. N - 126.05
I.E. S - 126.04
(For Details, See Sht 2C-2 And COT Std. Dwg. No. 290)

(27) Sta. 'HR' 51+91, 37.4' Lt.
Const. Drop Inlet
(For Details, See Sht. 2C-4)

(28) Sta. 'HR' 51+88, 36.5' Rt.
Const. Drop Inlet
(For Details, See Sht. 2C-4)

(29) Maintain Extg. 36" Culvert

(30) Install Asphalt Approach Pad
Thkn. - 3" AC/6" Agg. Base

(31) Extg. Pothole W-16 (By Others)

(32) Extg. Pothole W-15 (By Others)

(33) Extg. Pothole G-11 (By Others)

(34) Sta. 'HR' 50+18.48, 41.80' Lt.
Inst. Ditch Inlet
Rim El. 130.68
Inst. 24" Conc. Storm Sew. Pipe - 6'
Inst. Animal Grate At End Of 24" Pipe
(See COT Dwg. No. 043)

Note:

1. Maintain Driveway Access At All Times

(35) Sta. 'HR' 51+77.50, 42.45' Lt.
Inst. 24" Conc. Storm Sew. Pipe - 155'
I.E. 126.96
(For Details, See Sht. 2C)

(36) Uncover Valve - 2
City To Adjust Valve And Box On The Side Of The Valve.
Coordinate With City For Adjustment.

(37) Install 30" Class III Reinforced Concrete Storm Pipe - 48'
I.E. W - 126.03
I.E. E - 126.10

(40) Sta. 'HR' 49+55.00
Install 12"x6" Flanged Tapping Sleeve And
6" FLG x RJ MJ Tapping Valve
(See COT Std. Dwg. No. 600)

(41) Remove Culvert

(42) Relocate Extg. 12" City Of Tualatin Waterline. Coordinate Shutdown With City
(For Details, See Sht. WA-4)

(43) Clean Out Extg. Channel Approx. 100' Downstream Of Culvert End.
Hydroseed Surfaces After Grading.
(For Details, See Sht. 2C-3)

(44) Install Black Vinyl Chain Link Fence, 4' Height - 288'

(45) Install Black Vinyl Locking Gate - 3' Width

(46) Sta. 'HR' 53+22± To 'HR' 57+22±
Plug Abandoned Gas Line

(47) Sanitary Sewer Upgrade
(By Others)

3 Revised By WCO #7, 06/10/2009
2 Revised 11/20/2008
1 Revised By Addendum 1.

0 20 40 60
Scale In Feet

DRAINAGE ENGINEER	ROADWAY ENGINEER
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TUALATIN DEVELOPMENT COMMISSION

S.W. HERMAN RD.
S.W. 124TH AVE. TO S.W. TETON AVE.
WASHINGTON COUNTY

Reviewed By - Steve Kotko
Designed By - Carren Hippenstiel
Drafted By - Priscilliana Peralta-Ramirez

ROADWAY AND DRAINAGE PLAN
STA. 'HR' 49+00 TO STA. 'HR' 54+00

SHEET NO. 10

NDM: 35259G 352590pl10.dgn 5/3/2011 11:43:44 AM ggray

11-05-37

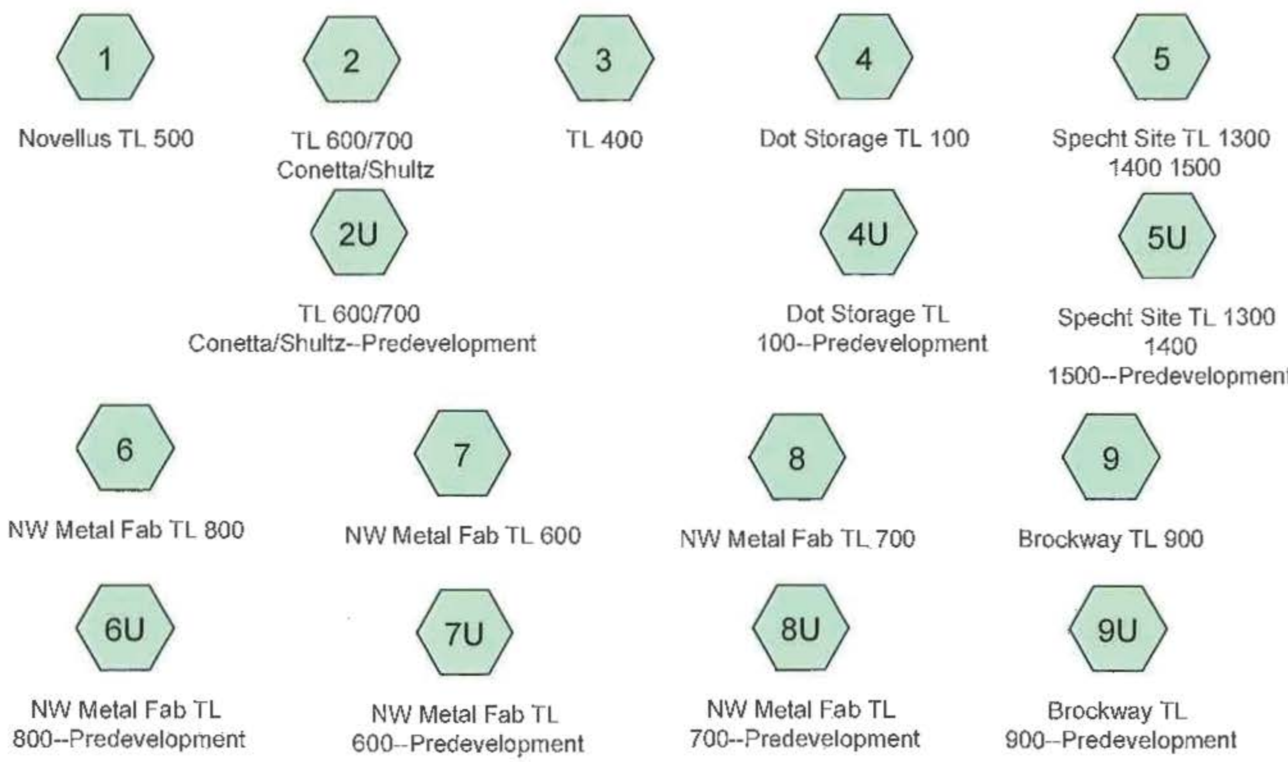
1. Pipe Conveyance Calculations
2. HydroCad™ Analysis Output

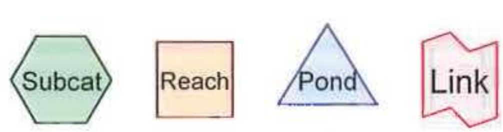
TM Rippey Consulting Engineers
7650 SW Beveland St
Suite 100
Tigard, Oregon 97223
Phone: 503 443 3900

STORM SEWER DESIGN FORM
Project Number: 12236
Leveton Business Park
Basin Analysis
December 26, 2013

Unit Conversion (acre/ft^2)	2.30E-05
Runoff Coefficient:	0.9
Rainfall Intensity (in/hr):	3.4
Manning's Coefficient (n)=	0.013

	PIPE NUMBER	PIPE LENGTH L	PIPE SIZE in	INVERT SLOPE ft/ft	DESIGN DISCHARGE cfs	FULL FLOW CAPACITY cfs	APACITY RATI Q/Qf %	COMMENTS	
	1	312	12	0.0560	0.320	8.506	3.76		
	2	355	12	0.0194	2.280	5.007	45.54		
	3	220	18	0.0040	5.530	6.703	82.50		
	4	350	21	0.0050	6.200	11.304	54.85		
	5	135	24	0.0050	8.430	16.139	52.23		
	6	160	30	0.0018	9.200	17.557	52.40		
	7	39	30	0.0072	10.590	35.114	30.16		
		20	10	0.0050	0.000	1.563	0.00	Std Site Lateral	





Routing Diagram for 12-26-13 Leveton Basin Study Property Runoff
Prepared by Microsoft, Printed 12/27/2013
HydroCAD® 10.00 s/n 02239 © 2012 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
31,038	61	>75% Grass cover, Good, HSG B (2)
12,535	85	Gravel roads, HSG B (2U)
55,100	69	Pasture/grassland/range, Fair, HSG B (4)
802,858	79	Pasture/grassland/range, Poor, HSG B (1, 2U, 4U, 5U, 6U, 7U, 8U, 9U)
364	98	Paved parking, HSG B (2U)
795,094	98	Paving (2, 3, 4, 5, 6, 7, 8, 9)
7,104	98	Unconnected roofs, HSG B (2U)
1,704,093	**87**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
908,999	HSG B	1, 2, 2U, 4, 4U, 5U, 6U, 7U, 8U, 9U
0	HSG C	
0	HSG D	
795,094	Other	2, 3, 4, 5, 6, 7, 8, 9
1,704,093		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	31,038	0	0	0	31,038	>75% Grass cover, Good
0	12,535	0	0	0	12,535	Gravel roads
0	55,100	0	0	0	55,100	Pasture/grassland/range, Fair
0	802,858	0	0	0	802,858	Pasture/grassland/range, Poor
0	364	0	0	0	364	Paved parking
0	0	0	0	795,094	795,094	Paving
0	7,104	0	0	0	7,104	Unconnected roofs
0	**908,999**	**0**	**0**	**795,094**	**1,704,093**	**TOTAL AREA**

Time span=0.20-100.00 hrs, dt=0.01 hrs, 9981 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Novellus TL 500 Runoff Area=126,460 sf 0.00% Impervious Runoff Depth=1.88"
Flow Length=300' Tc=15.0 min CN=79/0 Runoff=1.09 cfs 19,840 cf

Subcatchment 2: TL 600/700 Runoff Area=206,925 sf 85.00% Impervious Runoff Depth=3.23"
Flow Length=300' Tc=5.0 min CN=61/98 Runoff=3.74 cfs 55,695 cf

Subcatchment 2U: TL 600/700 Runoff Area=206,925 sf 3.61% Impervious Runoff Depth=1.95"
Flow Length=300' Tc=26.3 min CN=79/98 Runoff=1.54 cfs 33,573 cf

Subcatchment 3: TL 400 Runoff Area=206,910 sf 100.00% Impervious Runoff Depth=3.67"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=4.35 cfs 63,200 cf

Subcatchment 4: Dot Storage TL 100 Runoff Area=62,700 sf 12.12% Impervious Runoff Depth=1.50"
Flow Length=300' Tc=5.0 min CN=69/98 Runoff=0.43 cfs 7,841 cf

Subcatchment 4U: Dot Storage TL Runoff Area=62,700 sf 0.00% Impervious Runoff Depth=1.88"
Flow Length=300' Tc=5.0 min CN=79/0 Runoff=0.62 cfs 9,837 cf

Subcatchment 5: Specht Site TL 1300 Runoff Area=198,393 sf 100.00% Impervious Runoff Depth=3.67"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=4.17 cfs 60,598 cf

Subcatchment 5U: Specht Site TL 1300 Runoff Area=198,393 sf 0.00% Impervious Runoff Depth=1.88"
Flow Length=300' Tc=10.0 min CN=79/0 Runoff=1.87 cfs 31,125 cf

Subcatchment 6: NW Metal Fab TL 800 Runoff Area=21,916 sf 100.00% Impervious Runoff Depth=3.67"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=0.46 cfs 6,694 cf

Subcatchment 6U: NW Metal Fab TL Runoff Area=43,995 sf 0.00% Impervious Runoff Depth=1.88"
Flow Length=300' Tc=15.0 min CN=79/0 Runoff=0.38 cfs 6,902 cf

Subcatchment 7: NW Metal Fab TL 600 Runoff Area=66,276 sf 100.00% Impervious Runoff Depth=3.67"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=1.39 cfs 20,244 cf

Subcatchment 7U: NW Metal Fab TL Runoff Area=66,276 sf 0.00% Impervious Runoff Depth=1.88"
Flow Length=300' Tc=15.0 min CN=79/0 Runoff=0.57 cfs 10,398 cf

Subcatchment 8: NW Metal Fab TL 700 Runoff Area=37,026 sf 100.00% Impervious Runoff Depth=3.67"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=0.78 cfs 11,309 cf

Subcatchment 8U: NW Metal Fab TL Runoff Area=37,026 sf 0.00% Impervious Runoff Depth=1.88"
Flow Length=300' Tc=15.0 min CN=79/0 Runoff=0.32 cfs 5,809 cf

Subcatchment 9: Brockway TL 900 Runoff Area=81,086 sf 100.00% Impervious Runoff Depth=3.67"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=1.71 cfs 24,767 cf

Subcatchment 9U: Brockway TL Runoff Area=81,086 sf 0.00% Impervious Runoff Depth=1.88"
Flow Length=300' Tc=15.0 min CN=79/0 Runoff=0.70 cfs 12,721 cf

Total Runoff Area = 1,704,093 sf Runoff Volume = 380,554 cf Average Runoff Depth = 2.68"
52.90% Pervious = 901,531 sf 47.10% Impervious = 802,562 sf

Summary for Subcatchment 1: Novellus TL 500

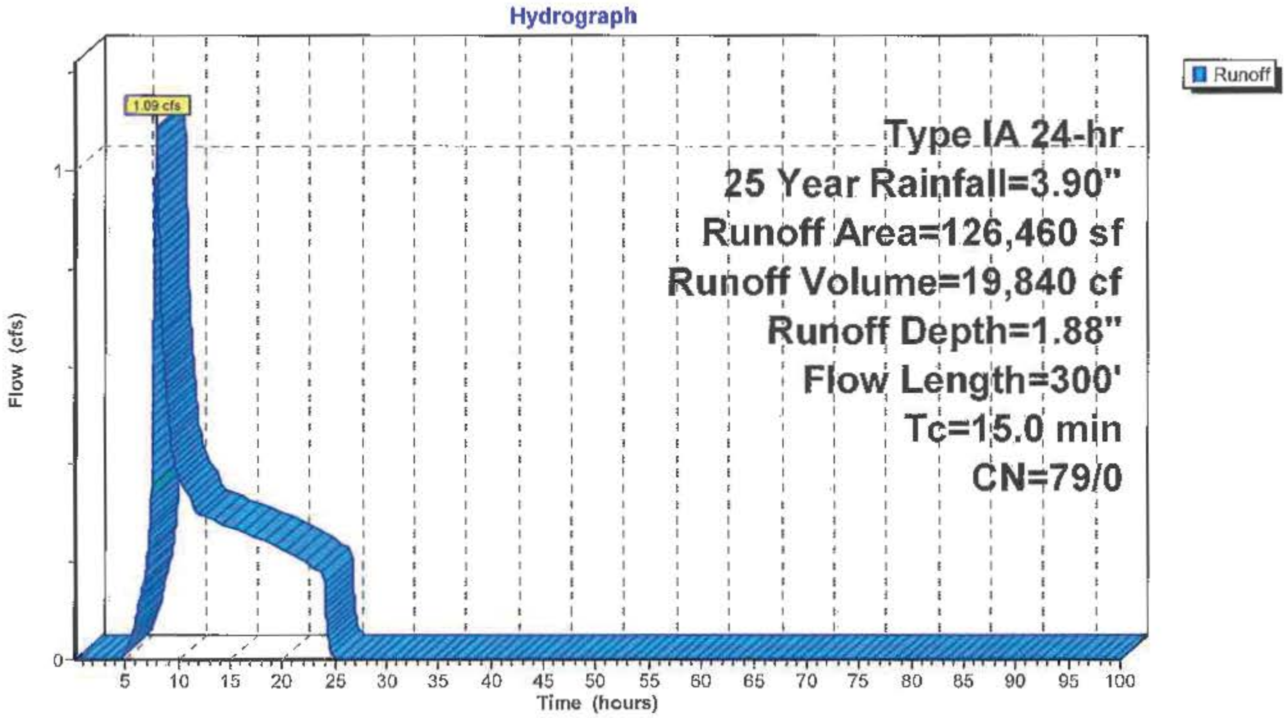
Runoff = 1.09 cfs @ 8.00 hrs, Volume= 19,840 cf, Depth= 1.88"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

Area (sf)	CN	Description
126,460	79	Pasture/grassland/range, Poor, HSG B
126,460	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	300		0.33		**Direct Entry, Sheet Flow**

Subcatchment 1: Novellus TL 500



Summary for Subcatchment 2: TL 600/700 Conetta/Shultz

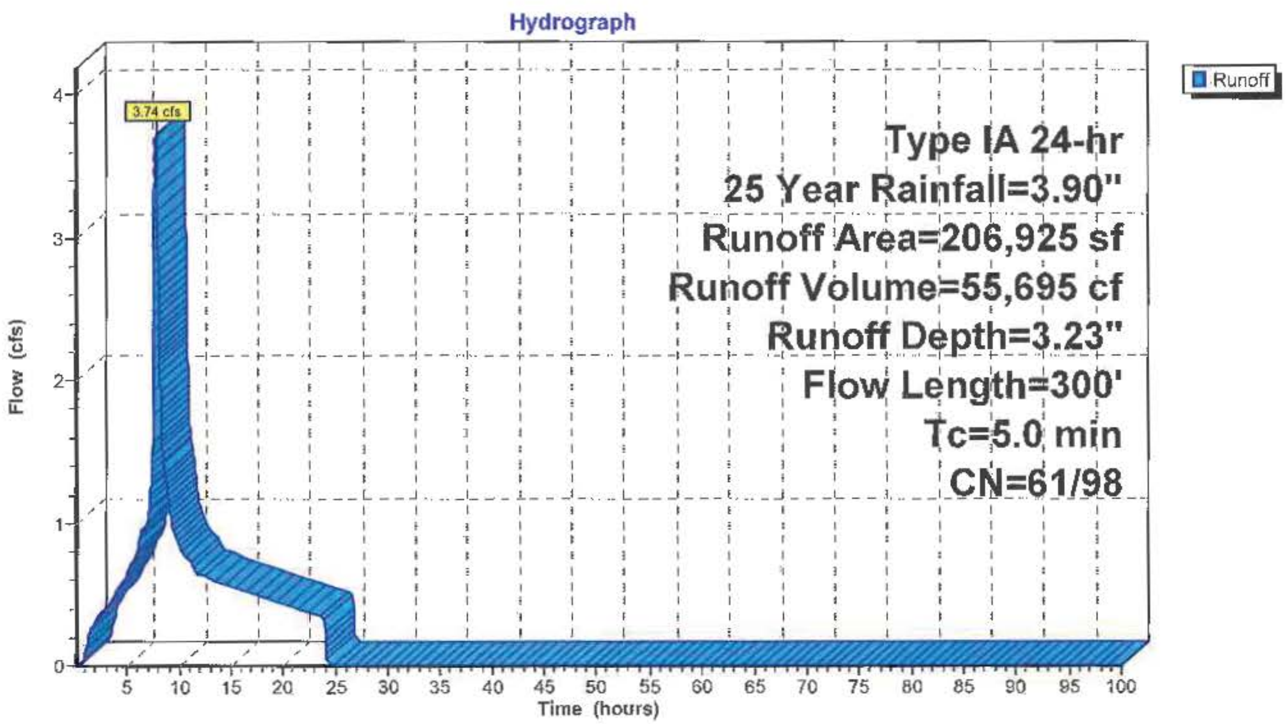
Runoff = 3.74 cfs @ 7.89 hrs, Volume= 55,695 cf, Depth= 3.23"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

	Area (sf)	CN	Description
*	175,887	98	Paving
	31,038	61	>75% Grass cover, Good, HSG B
	206,925	92	Weighted Average
	31,038	61	15.00% Pervious Area
	175,887	98	85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 2: TL 600/700 Conetta/Shultz



Summary for Subcatchment 2U: TL 600/700 Conetta/Shultz--Predevelopment

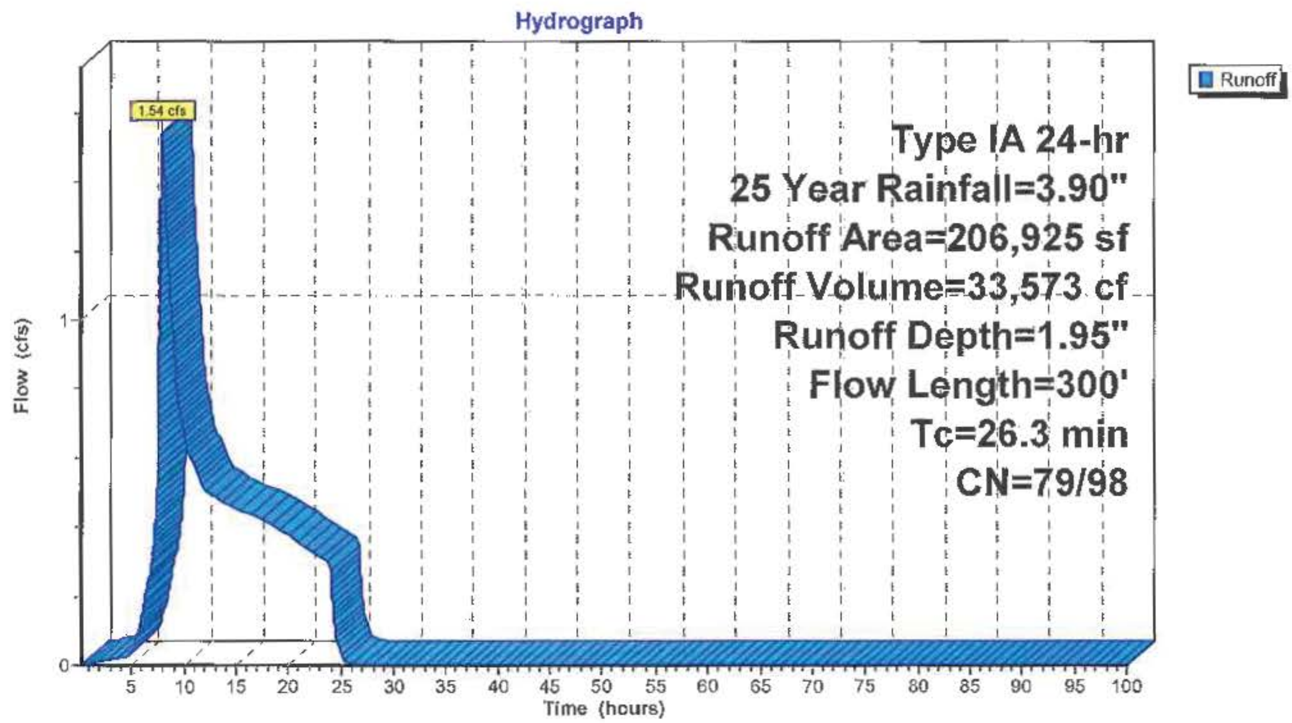
Runoff = 1.54 cfs @ 8.01 hrs, Volume= 33,573 cf, Depth= 1.95"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

Area (sf)	CN	Description
7,104	98	Unconnected roofs, HSG B
364	98	Paved parking, HSG B
12,535	85	Gravel roads, HSG B
186,922	79	Pasture/grassland/range, Poor, HSG B
206,925	80	Weighted Average
199,457	79	96.39% Pervious Area
7,468	98	3.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.3	300		0.19		**Direct Entry, Sheet Flow**

Subcatchment 2U: TL 600/700 Conetta/Shultz--Predevelopment



Summary for Subcatchment 3: TL 400

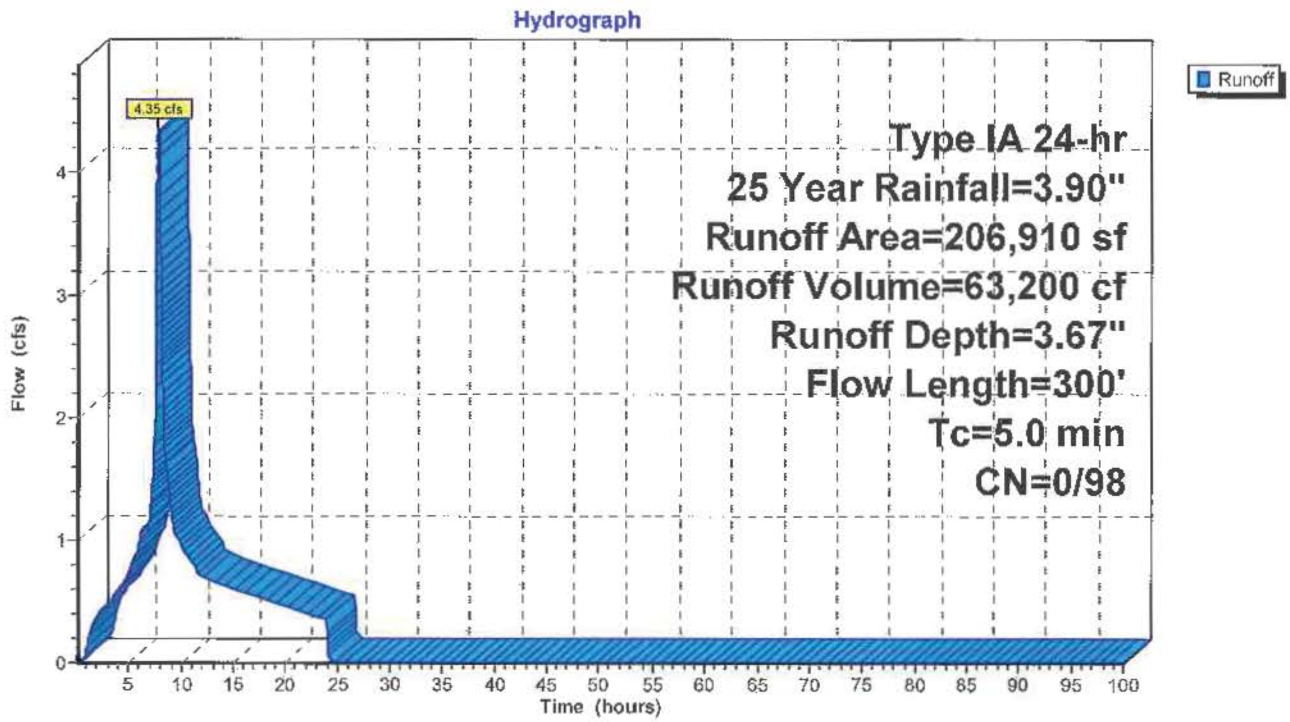
Runoff = 4.35 cfs @ 7.88 hrs, Volume= 63,200 cf, Depth= 3.67"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

	Area (sf)	CN	Description
*	206,910	98	Paving
	206,910	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 3: TL 400



Summary for Subcatchment 4: Dot Storage TL 100

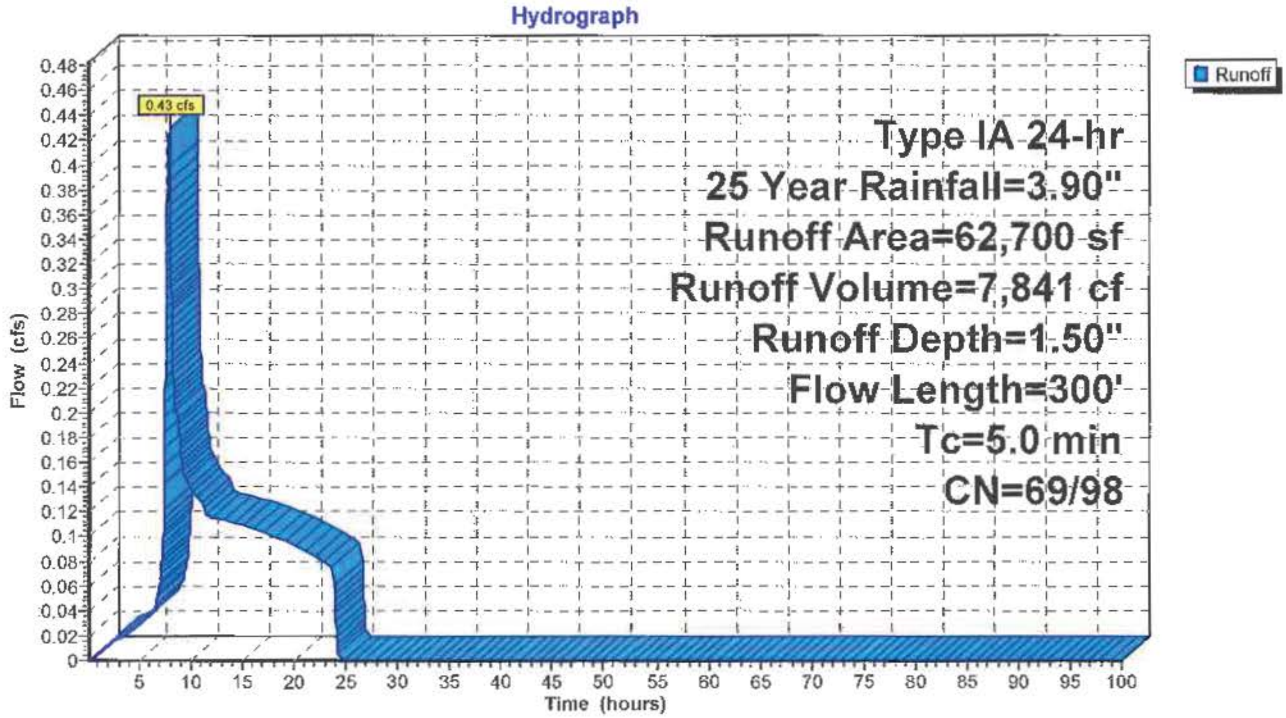
Runoff = 0.43 cfs @ 8.00 hrs, Volume= 7,841 cf, Depth= 1.50"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

	Area (sf)	CN	Description
*	7,600	98	Paving
	55,100	69	Pasture/grassland/range, Fair, HSG B
	62,700	73	Weighted Average
	55,100	69	87.88% Pervious Area
	7,600	98	12.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 4: Dot Storage TL 100



Summary for Subcatchment 4U: Dot Storage TL 100--Predevelopment

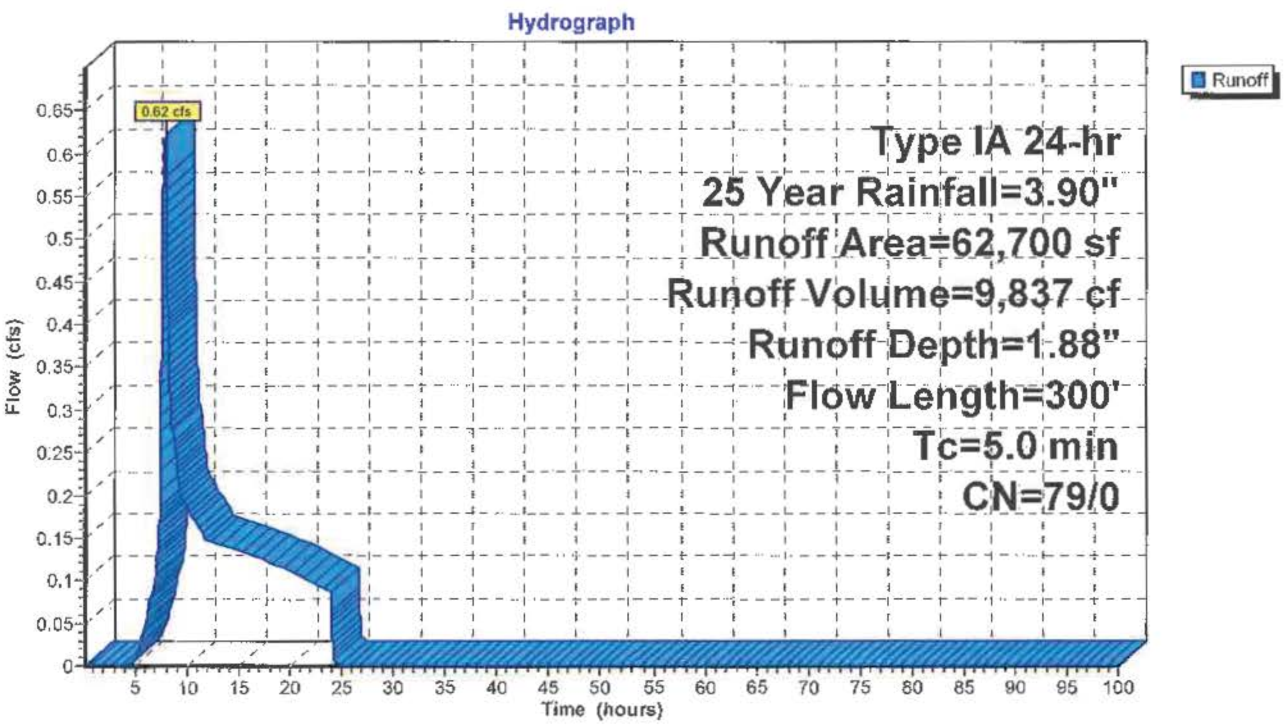
Runoff = 0.62 cfs @ 7.98 hrs, Volume= 9,837 cf, Depth= 1.88"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

Area (sf)	CN	Description
7,600	79	Pasture/grassland/range, Poor, HSG B
55,100	79	Pasture/grassland/range, Poor, HSG B
62,700	79	Weighted Average
62,700	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 4U: Dot Storage TL 100--Predevelopment



Summary for Subcatchment 5: Specht Site TL 1300 1400 1500

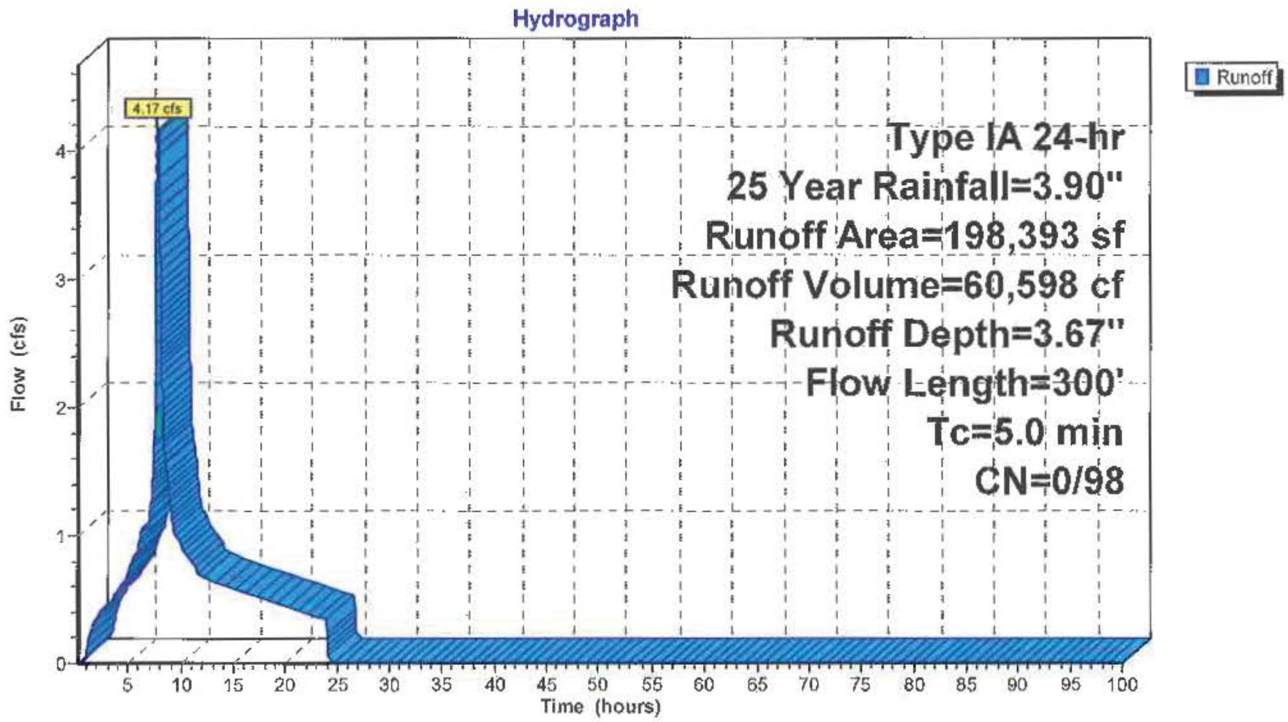
Runoff = 4.17 cfs @ 7.88 hrs, Volume= 60,598 cf, Depth= 3.67"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

	Area (sf)	CN	Description
*	198,393	98	Paving
	198,393	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 5: Specht Site TL 1300 1400 1500



Summary for Subcatchment 5U: Specht Site TL 1300 1400 1500--Predevelopment

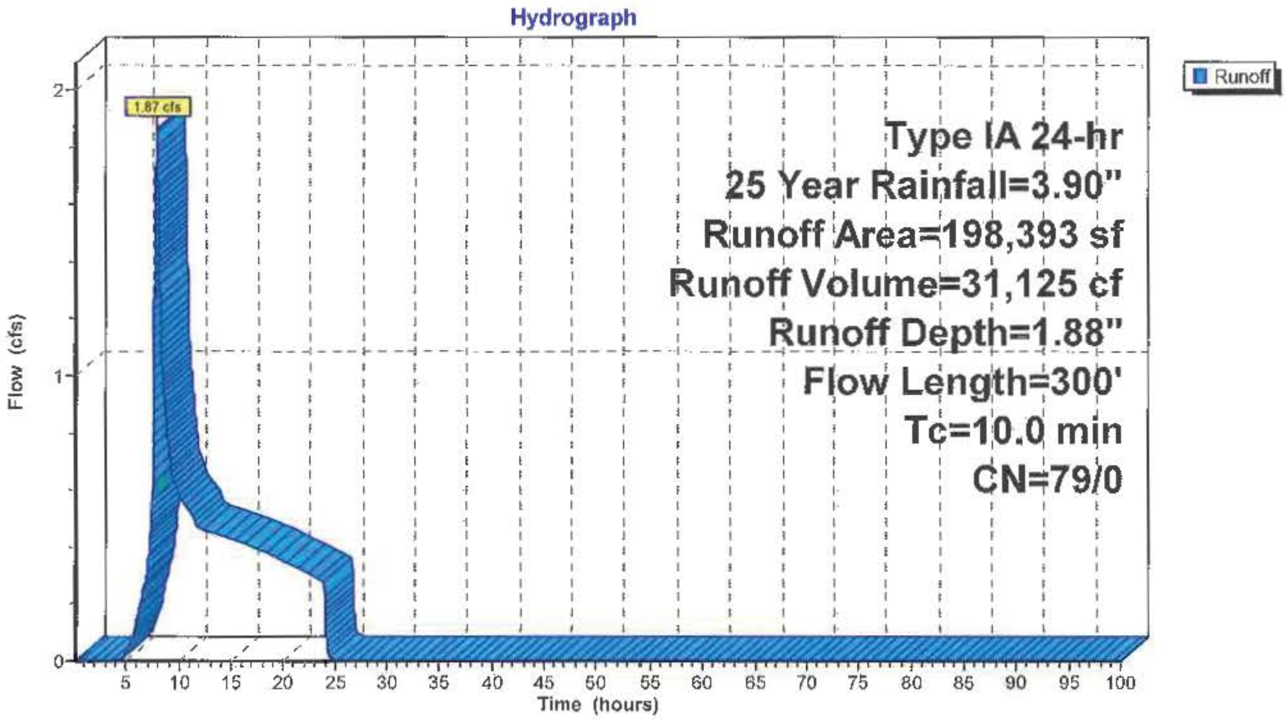
Runoff = 1.87 cfs @ 8.00 hrs, Volume= 31,125 cf, Depth= 1.88"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

Area (sf)	CN	Description
198,393	79	Pasture/grassland/range, Poor, HSG B
198,393	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	300		0.50		**Direct Entry, Sheet Flow**

Subcatchment 5U: Specht Site TL 1300 1400 1500--Predevelopment



Summary for Subcatchment 6: NW Metal Fab TL 800

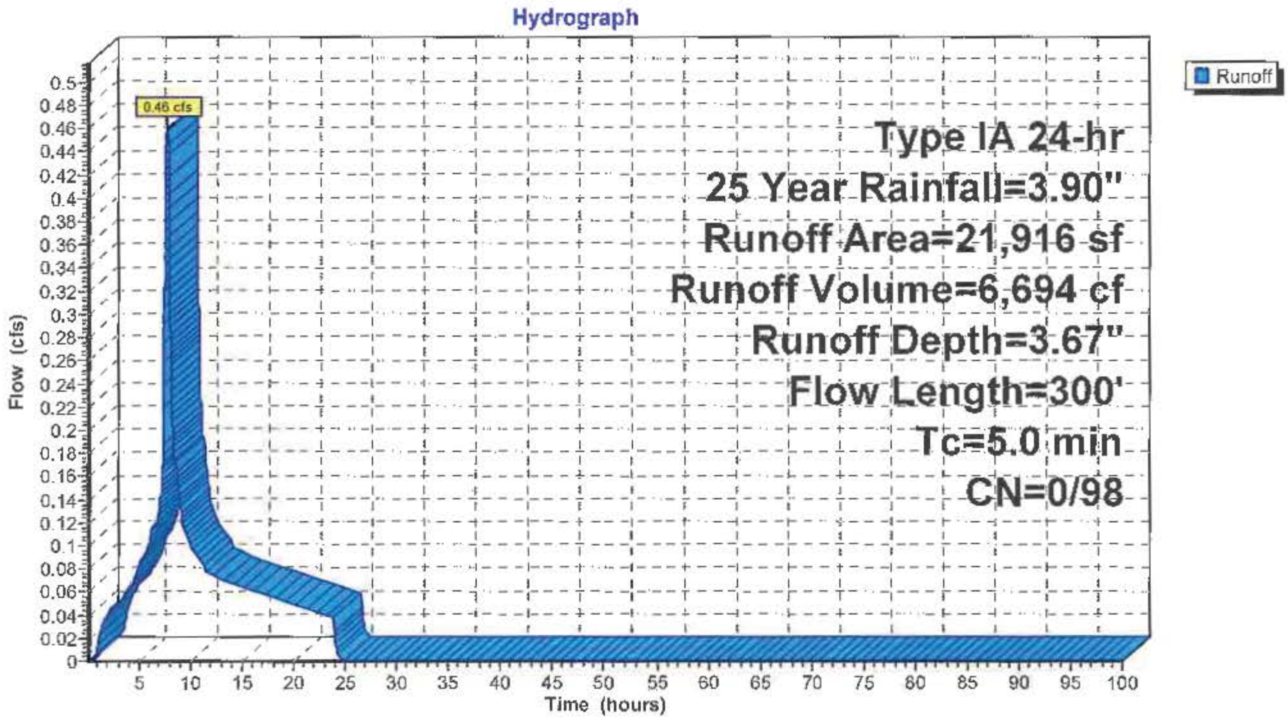
Runoff = 0.46 cfs @ 7.88 hrs, Volume= 6,694 cf, Depth= 3.67"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

	Area (sf)	CN	Description
*	21,916	98	Paving
	21,916	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 6: NW Metal Fab TL 800



Summary for Subcatchment 6U: NW Metal Fab TL 800--Predevelopment

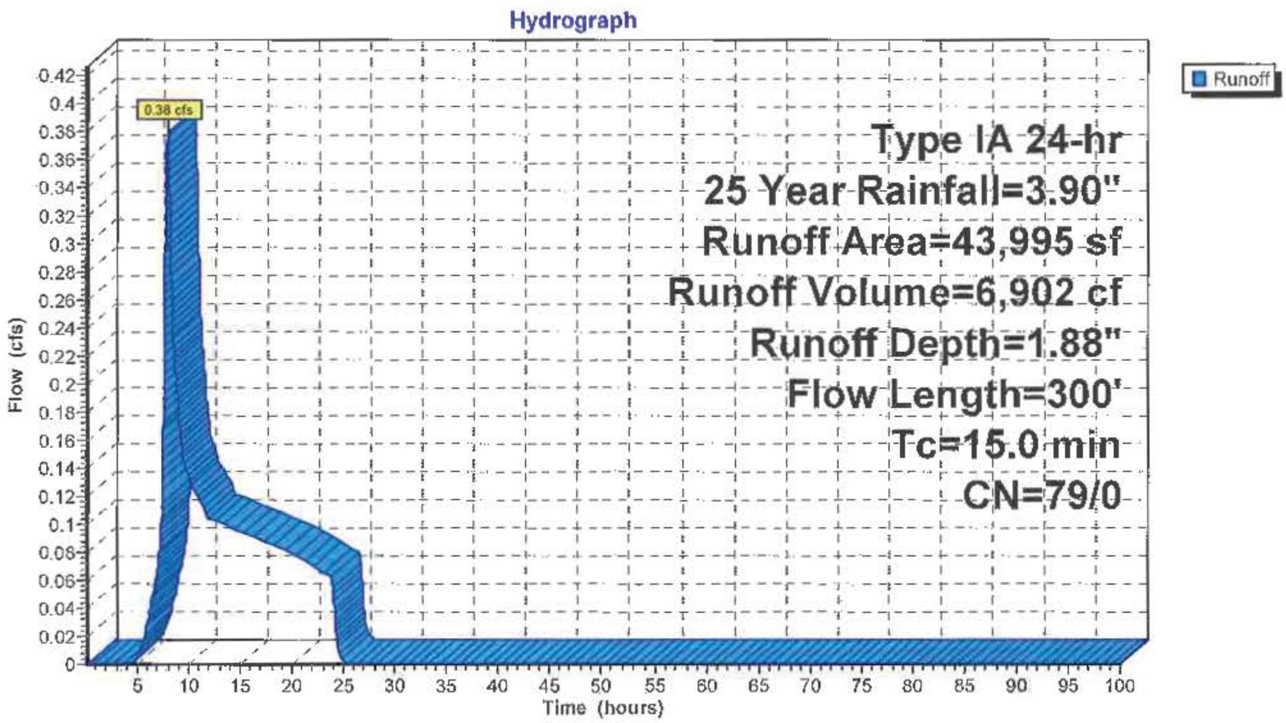
Runoff = 0.38 cfs @ 8.00 hrs, Volume= 6,902 cf, Depth= 1.88"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

Area (sf)	CN	Description
43,995	79	Pasture/grassland/range, Poor, HSG B
43,995	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	300		0.33		**Direct Entry, Sheet Flow**

Subcatchment 6U: NW Metal Fab TL 800--Predevelopment



Summary for Subcatchment 7: NW Metal Fab TL 600

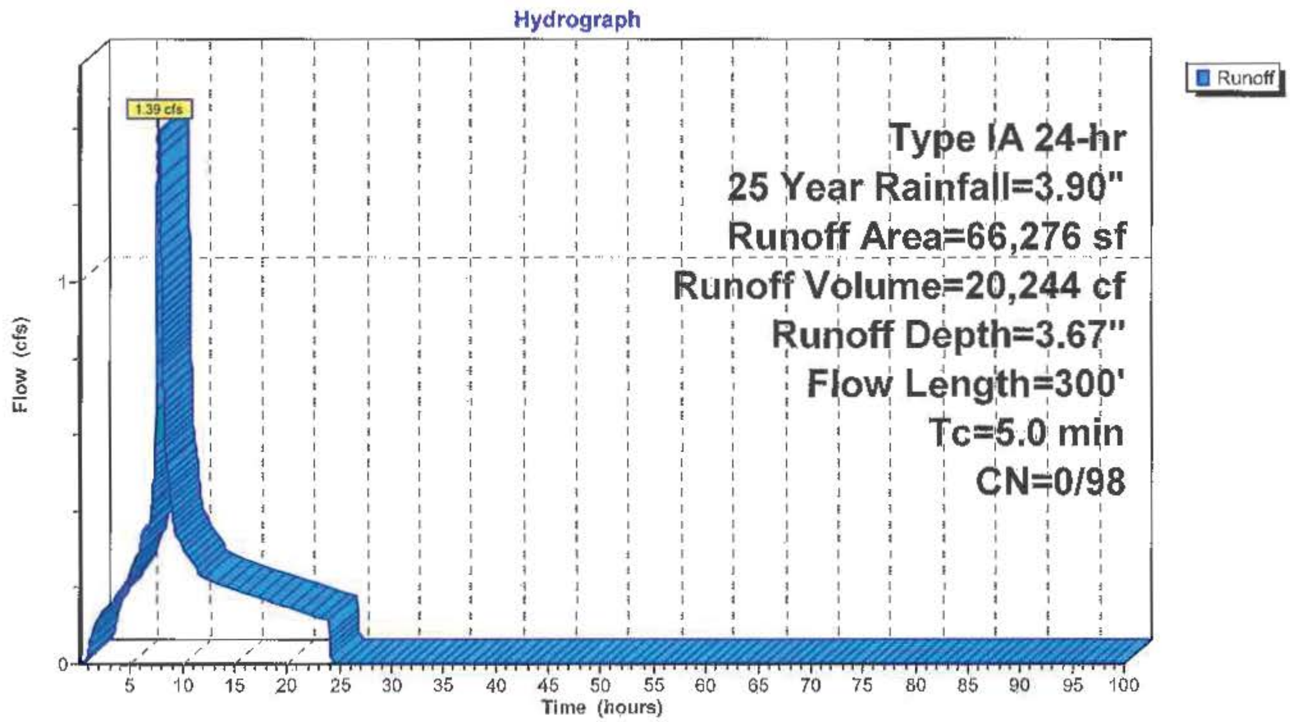
Runoff = 1.39 cfs @ 7.88 hrs, Volume= 20,244 cf, Depth= 3.67"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

	Area (sf)	CN	Description
*	66,276	98	Paving
	66,276	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 7: NW Metal Fab TL 600



Summary for Subcatchment 7U: NW Metal Fab TL 600--Predevelopment

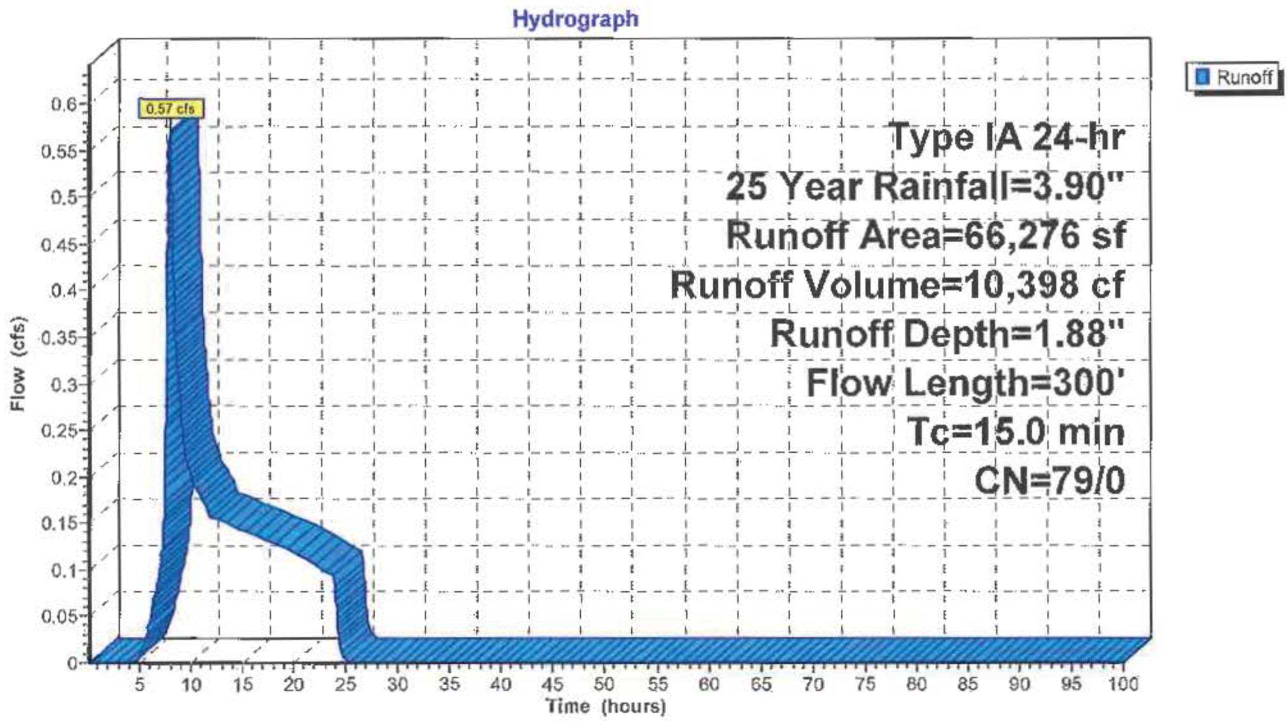
Runoff = 0.57 cfs @ 8.00 hrs, Volume= 10,398 cf, Depth= 1.88"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

Area (sf)	CN	Description
66,276	79	Pasture/grassland/range, Poor, HSG B
66,276	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	300		0.33		**Direct Entry, Sheet Flow**

Subcatchment 7U: NW Metal Fab TL 600--Predevelopment



Summary for Subcatchment 8: NW Metal Fab TL 700

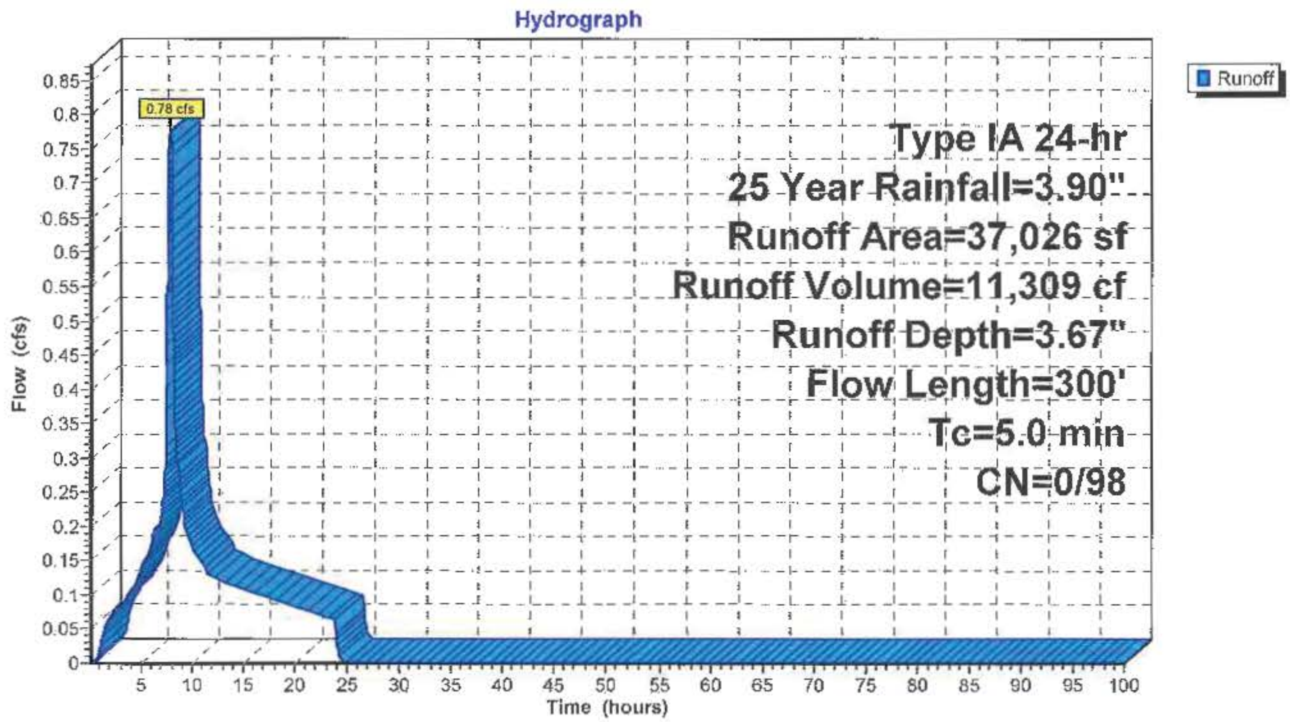
Runoff = 0.78 cfs @ 7.88 hrs, Volume= 11,309 cf, Depth= 3.67"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

	Area (sf)	CN	Description
*	37,026	98	Paving
	37,026	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 8: NW Metal Fab TL 700



Summary for Subcatchment 8U: NW Metal Fab TL 700--Predevelopment

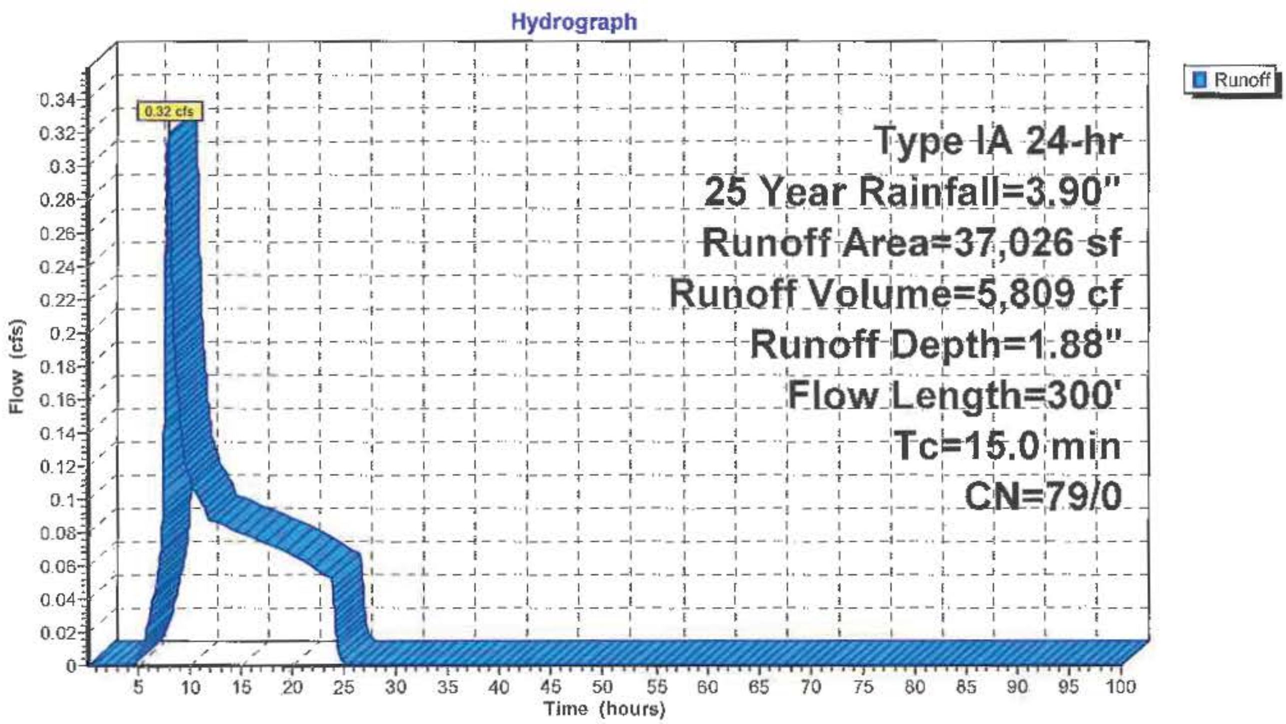
Runoff = 0.32 cfs @ 8.00 hrs, Volume= 5,809 cf, Depth= 1.88"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

Area (sf)	CN	Description
37,026	79	Pasture/grassland/range, Poor, HSG B
37,026	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	300		0.33		**Direct Entry, Sheet Flow**

Subcatchment 8U: NW Metal Fab TL 700--Predevelopment



Summary for Subcatchment 9: Brockway TL 900

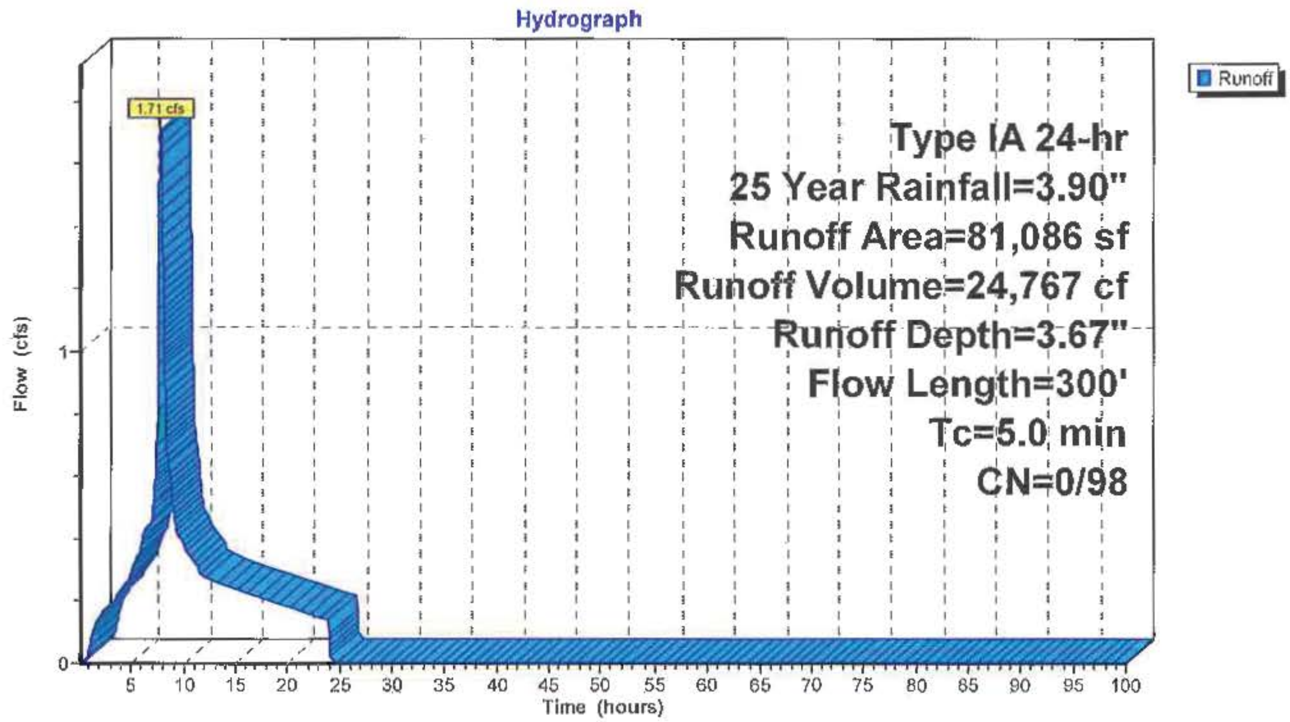
Runoff = 1.71 cfs @ 7.88 hrs, Volume= 24,767 cf, Depth= 3.67"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

	Area (sf)	CN	Description
*	81,086	98	Paving
	81,086	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 9: Brockway TL 900



Summary for Subcatchment 9U: Brockway TL 900--Predevelopment

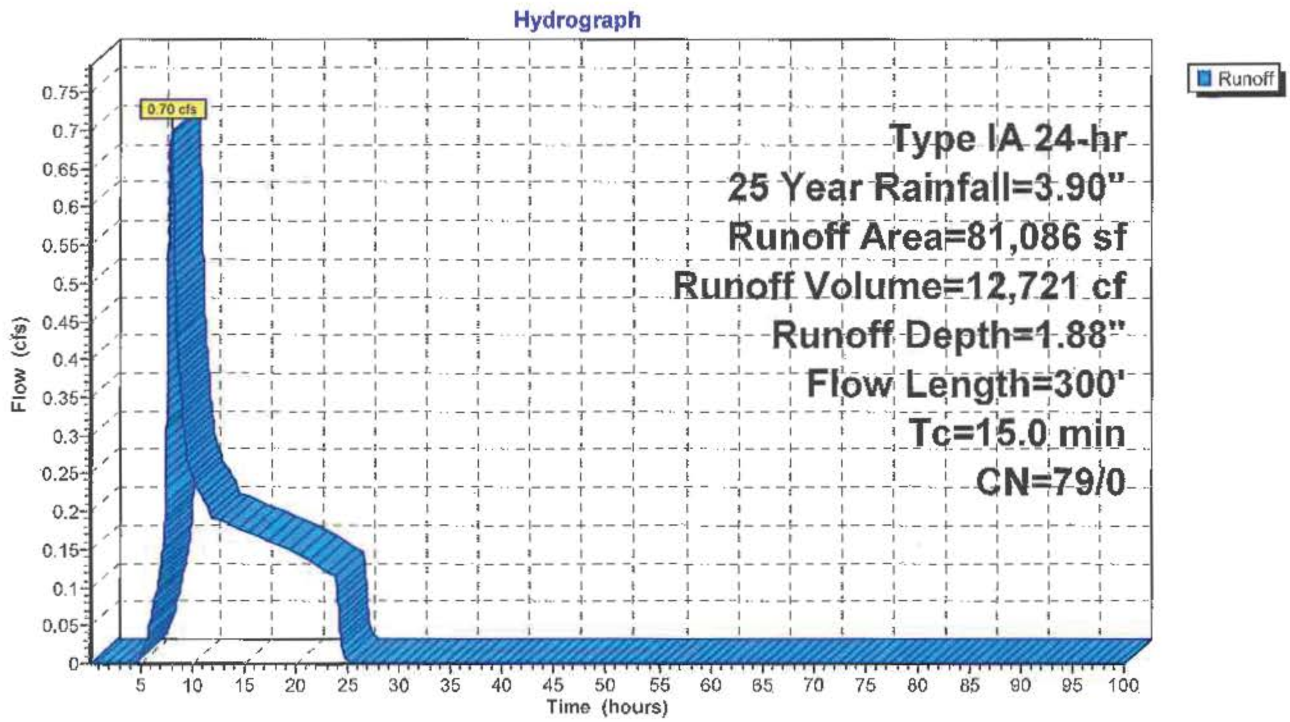
Runoff = 0.70 cfs @ 8.00 hrs, Volume= 12,721 cf, Depth= 1.88"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

Area (sf)	CN	Description
81,086	79	Pasture/grassland/range, Poor, HSG B
81,086	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	300		0.33		**Direct Entry, Sheet Flow**

Subcatchment 9U: Brockway TL 900--Predevelopment



Time span=0.20-100.00 hrs, dt=0.01 hrs, 9981 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Novellus TL 500 Runoff Area=126,460 sf 0.00% Impervious Runoff Depth=2.13"
Flow Length=300' Tc=15.0 min CN=79/0 Runoff=1.26 cfs 22,415 cf

Subcatchment 2: TL 600/700 Runoff Area=206,925 sf 85.00% Impervious Runoff Depth=3.51"
Flow Length=300' Tc=5.0 min CN=61/98 Runoff=4.06 cfs 60,481 cf

Subcatchment 2U: TL 600/700 Runoff Area=206,925 sf 3.61% Impervious Runoff Depth=2.19"
Flow Length=300' Tc=26.3 min CN=79/98 Runoff=1.78 cfs 37,822 cf

Subcatchment 3: TL 400 Runoff Area=206,910 sf 100.00% Impervious Runoff Depth=3.96"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=4.70 cfs 68,360 cf

Subcatchment 4: Dot Storage TL 100 Runoff Area=62,700 sf 12.12% Impervious Runoff Depth=1.71"
Flow Length=300' Tc=5.0 min CN=69/98 Runoff=0.51 cfs 8,932 cf

Subcatchment 4U: Dot Storage TL Runoff Area=62,700 sf 0.00% Impervious Runoff Depth=2.13"
Flow Length=300' Tc=5.0 min CN=79/0 Runoff=0.72 cfs 11,114 cf

Subcatchment 5: Specht Site TL 1300 Runoff Area=198,393 sf 100.00% Impervious Runoff Depth=3.96"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=4.50 cfs 65,547 cf

Subcatchment 5U: Specht Site TL 1300 Runoff Area=198,393 sf 0.00% Impervious Runoff Depth=2.13"
Flow Length=300' Tc=10.0 min CN=79/0 Runoff=2.15 cfs 35,166 cf

Subcatchment 6: NW Metal Fab TL 800 Runoff Area=21,916 sf 100.00% Impervious Runoff Depth=3.96"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=0.50 cfs 7,241 cf

Subcatchment 6U: NW Metal Fab TL Runoff Area=43,995 sf 0.00% Impervious Runoff Depth=2.13"
Flow Length=300' Tc=15.0 min CN=79/0 Runoff=0.44 cfs 7,798 cf

Subcatchment 7: NW Metal Fab TL 600 Runoff Area=66,276 sf 100.00% Impervious Runoff Depth=3.96"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=1.50 cfs 21,897 cf

Subcatchment 7U: NW Metal Fab TL Runoff Area=66,276 sf 0.00% Impervious Runoff Depth=2.13"
Flow Length=300' Tc=15.0 min CN=79/0 Runoff=0.66 cfs 11,748 cf

Subcatchment 8: NW Metal Fab TL 700 Runoff Area=37,026 sf 100.00% Impervious Runoff Depth=3.96"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=0.84 cfs 12,233 cf

Subcatchment 8U: NW Metal Fab TL Runoff Area=37,026 sf 0.00% Impervious Runoff Depth=2.13"
Flow Length=300' Tc=15.0 min CN=79/0 Runoff=0.37 cfs 6,563 cf

Subcatchment 9: Brockway TL 900 Runoff Area=81,086 sf 100.00% Impervious Runoff Depth=3.96"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=1.84 cfs 26,790 cf

Subcatchment 9U: Brockway TL Runoff Area=81,086 sf 0.00% Impervious Runoff Depth=2.13"
Flow Length=300' Tc=15.0 min CN=79/0 Runoff=0.81 cfs 14,373 cf

Total Runoff Area = 1,704,093 sf Runoff Volume = 418,477 cf Average Runoff Depth = 2.95"
52.90% Pervious = 901,531 sf 47.10% Impervious = 802,562 sf

Summary for Subcatchment 1: Novellus TL 500

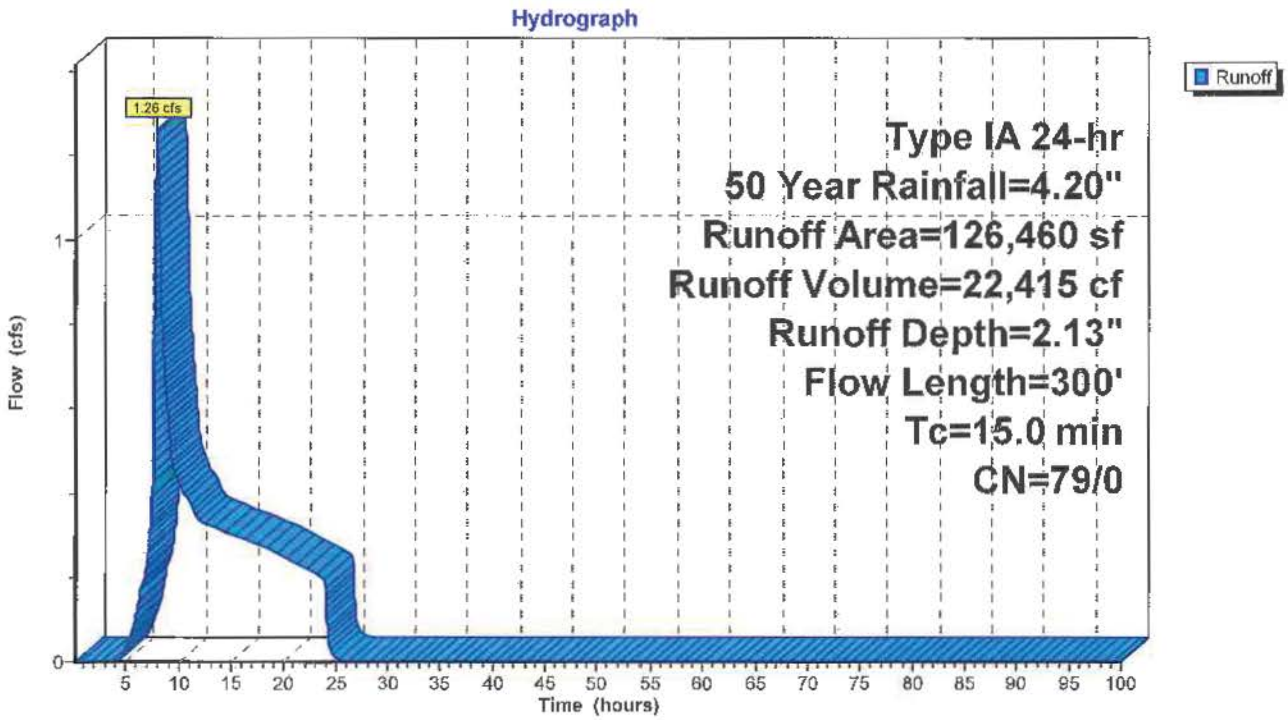
Runoff = 1.26 cfs @ 8.00 hrs, Volume= 22,415 cf, Depth= 2.13"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

Area (sf)	CN	Description
126,460	79	Pasture/grassland/range, Poor, HSG B
126,460	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	300		0.33		**Direct Entry, Sheet Flow**

Subcatchment 1: Novellus TL 500



Summary for Subcatchment 2: TL 600/700 Conetta/Shultz

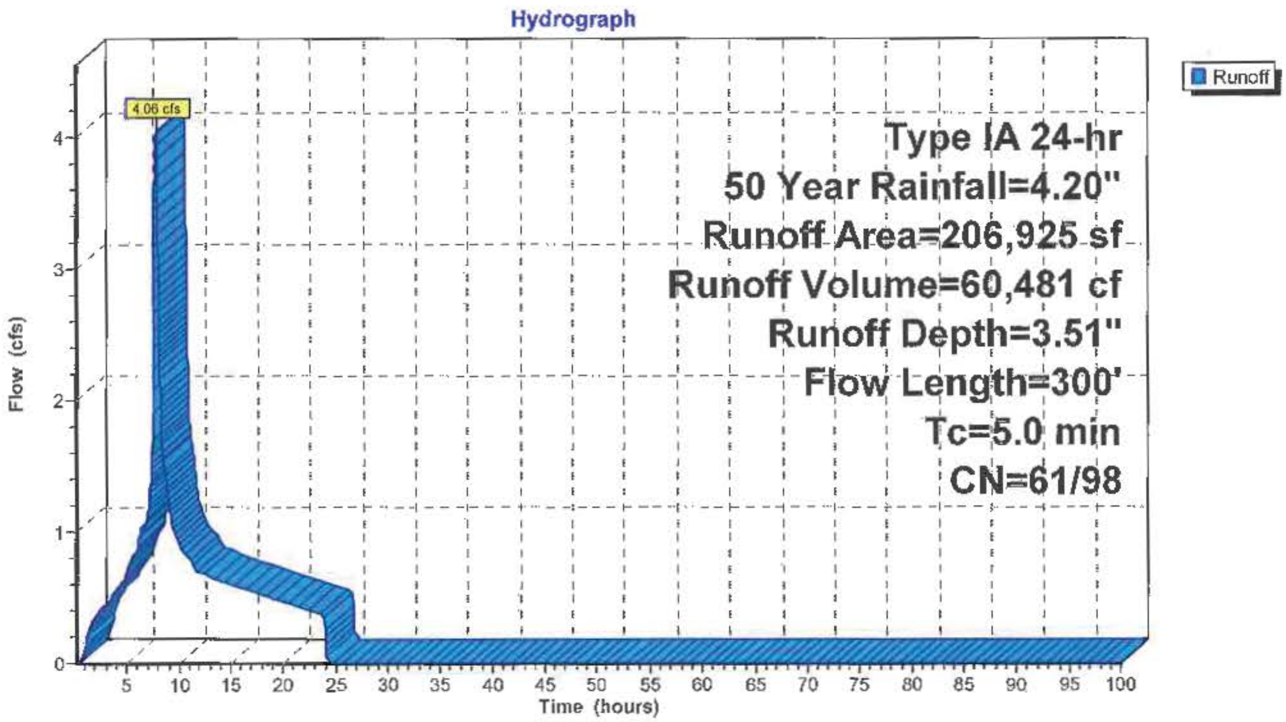
Runoff = 4.06 cfs @ 7.88 hrs, Volume= 60,481 cf, Depth= 3.51"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

	Area (sf)	CN	Description
*	175,887	98	Paving
	31,038	61	>75% Grass cover, Good, HSG B
	206,925	92	Weighted Average
	31,038	61	15.00% Pervious Area
	175,887	98	85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 2: TL 600/700 Conetta/Shultz



Summary for Subcatchment 2U: TL 600/700 Conetta/Shultz--Predevelopment

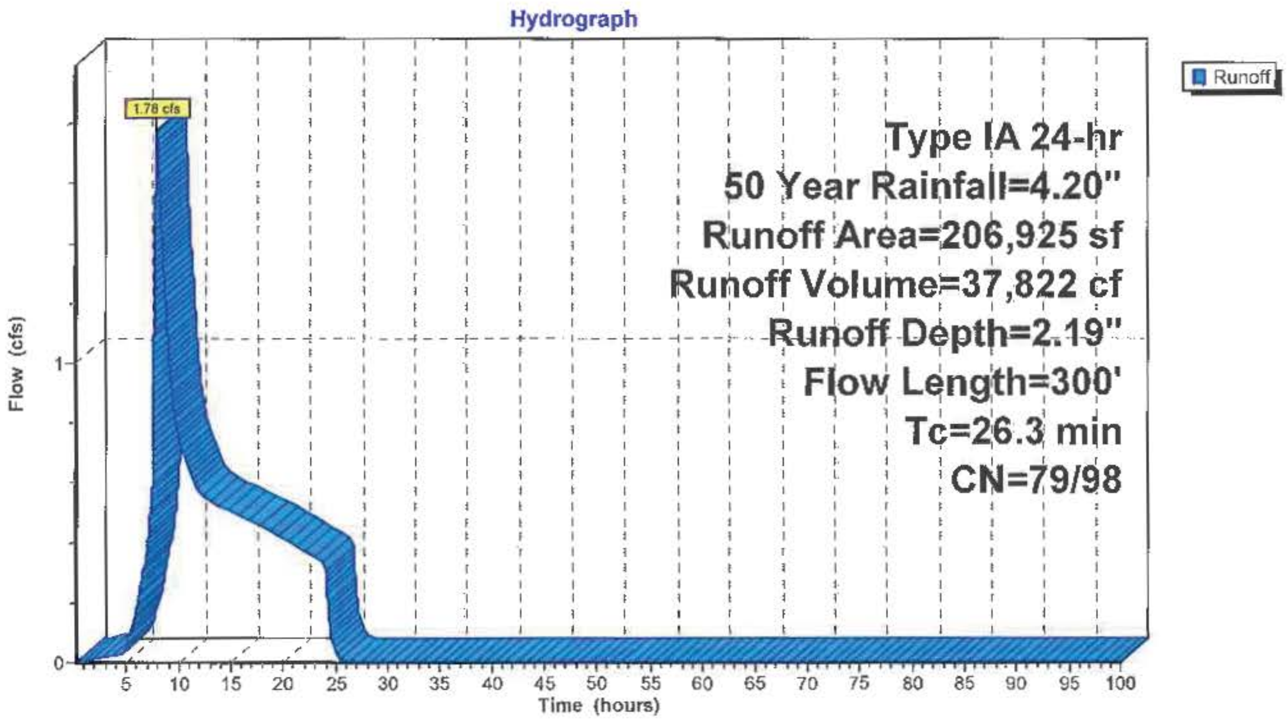
Runoff = 1.78 cfs @ 8.01 hrs, Volume= 37,822 cf, Depth= 2.19"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

Area (sf)	CN	Description
7,104	98	Unconnected roofs, HSG B
364	98	Paved parking, HSG B
12,535	85	Gravel roads, HSG B
186,922	79	Pasture/grassland/range, Poor, HSG B
206,925	80	Weighted Average
199,457	79	96.39% Pervious Area
7,468	98	3.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.3	300		0.19		**Direct Entry, Sheet Flow**

Subcatchment 2U: TL 600/700 Conetta/Shultz--Predevelopment



Summary for Subcatchment 3: TL 400

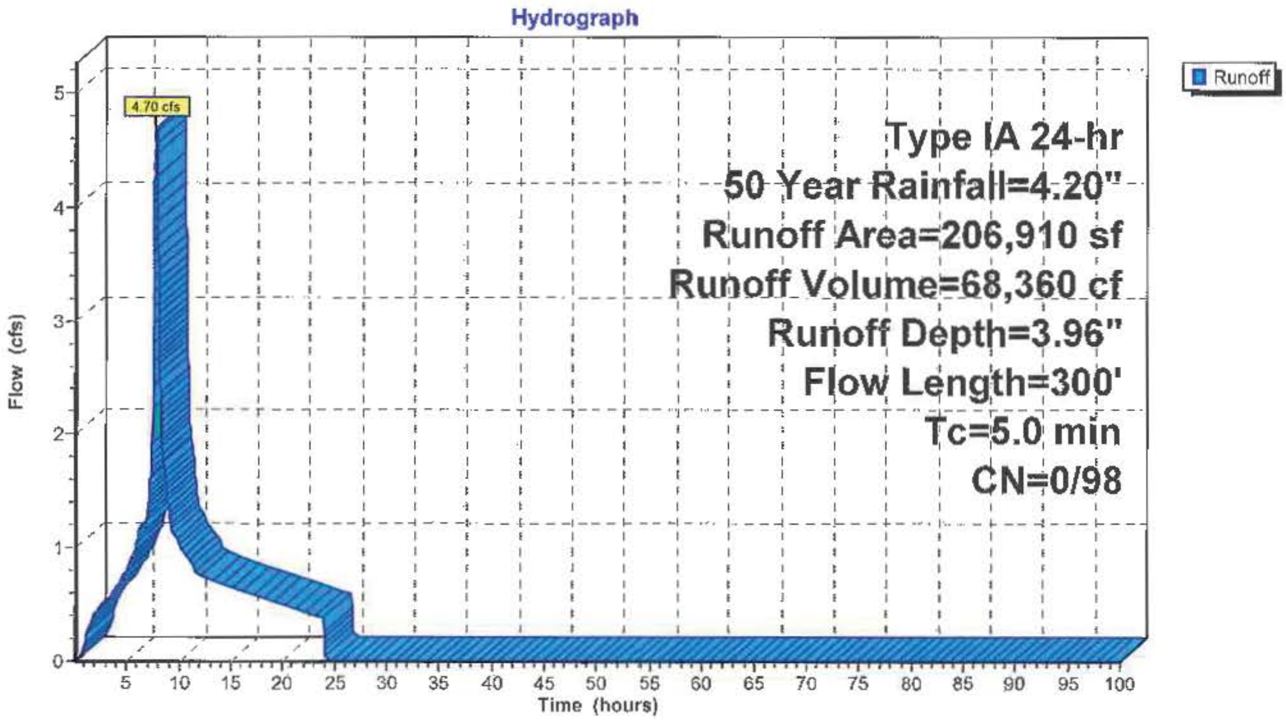
Runoff = 4.70 cfs @ 7.88 hrs, Volume= 68,360 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

	Area (sf)	CN	Description
*	206,910	98	Paving
	206,910	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 3: TL 400



Summary for Subcatchment 4: Dot Storage TL 100

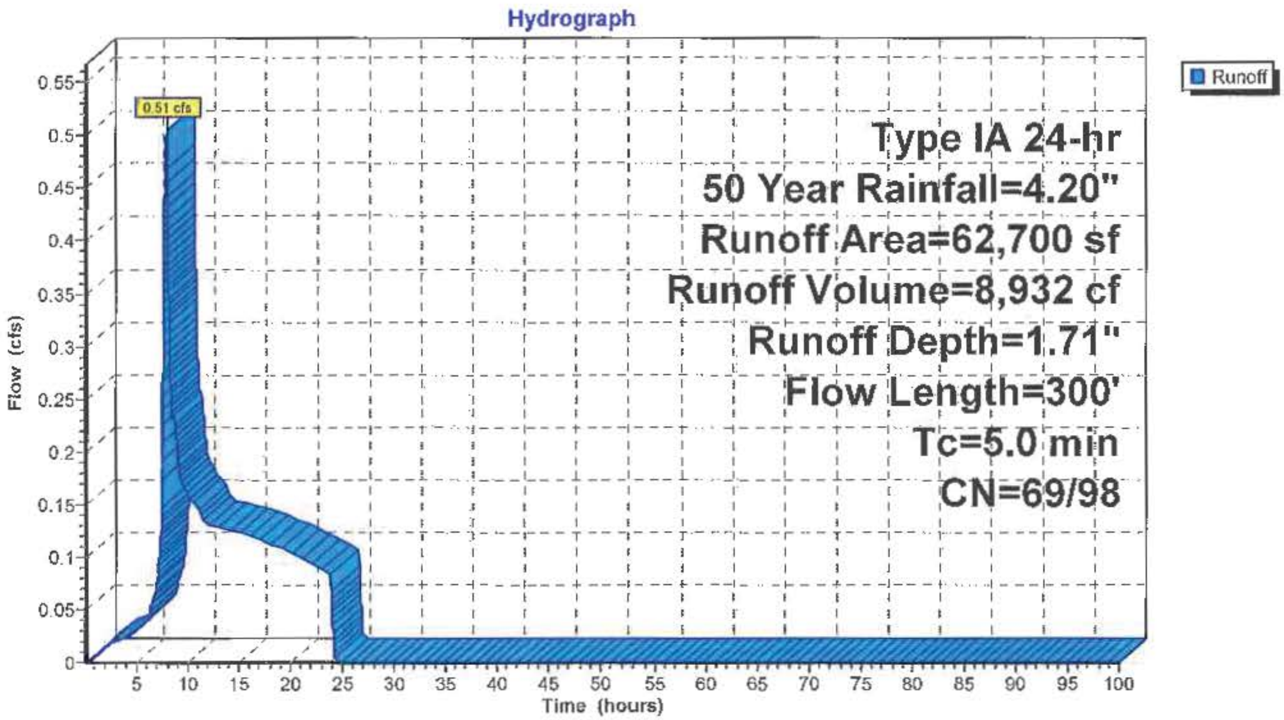
Runoff = 0.51 cfs @ 8.00 hrs, Volume= 8,932 cf, Depth= 1.71"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

	Area (sf)	CN	Description
*	7,600	98	Paving
	55,100	69	Pasture/grassland/range, Fair, HSG B
	62,700	73	Weighted Average
	55,100	69	87.88% Pervious Area
	7,600	98	12.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 4: Dot Storage TL 100



Summary for Subcatchment 4U: Dot Storage TL 100--Predevelopment

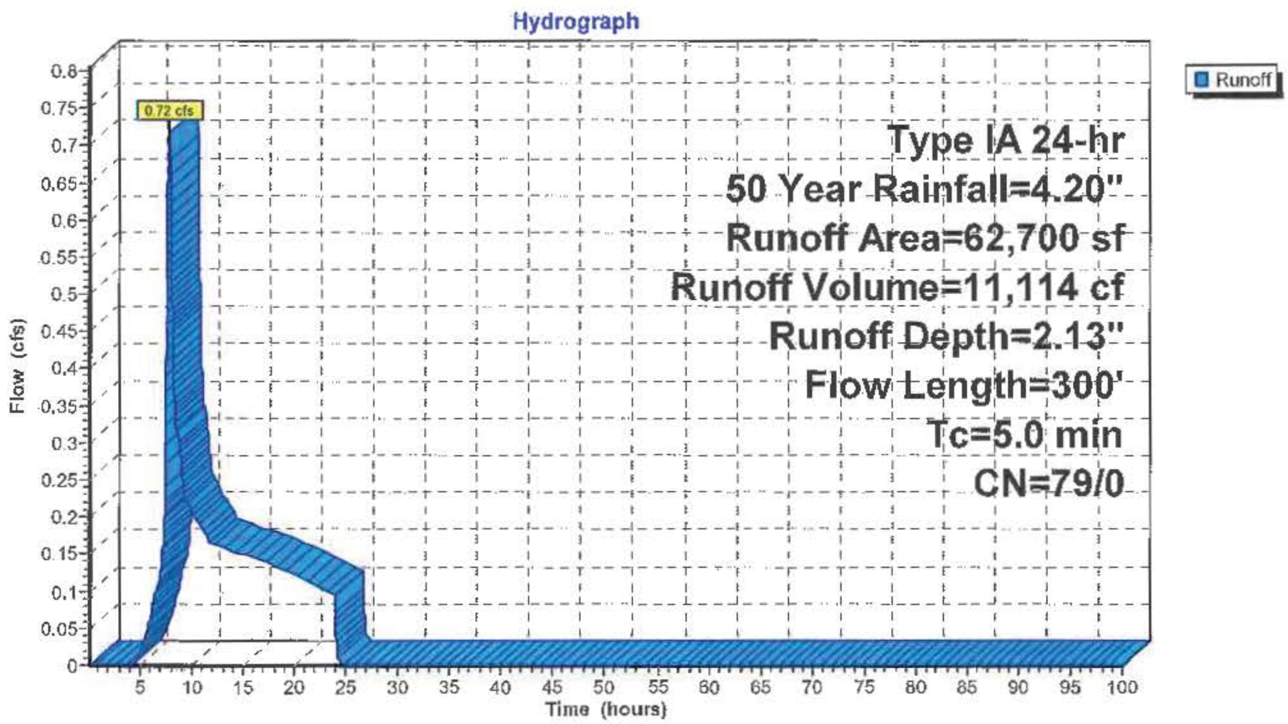
Runoff = 0.72 cfs @ 7.97 hrs, Volume= 11,114 cf, Depth= 2.13"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

Area (sf)	CN	Description
7,600	79	Pasture/grassland/range, Poor, HSG B
55,100	79	Pasture/grassland/range, Poor, HSG B
62,700	79	Weighted Average
62,700	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 4U: Dot Storage TL 100--Predevelopment



Summary for Subcatchment 5: Specht Site TL 1300 1400 1500

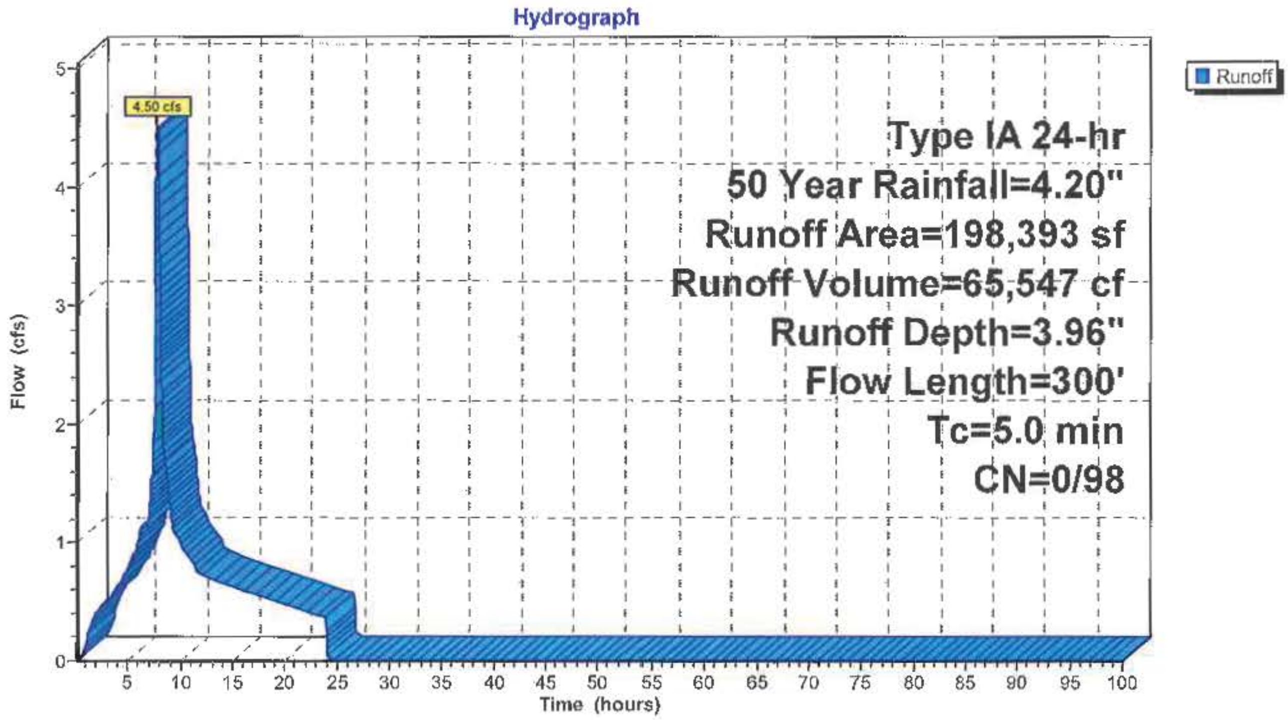
Runoff = 4.50 cfs @ 7.88 hrs, Volume= 65,547 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

	Area (sf)	CN	Description
*	198,393	98	Paving
	198,393	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 5: Specht Site TL 1300 1400 1500



Summary for Subcatchment 5U: Specht Site TL 1300 1400 1500--Predevelopment

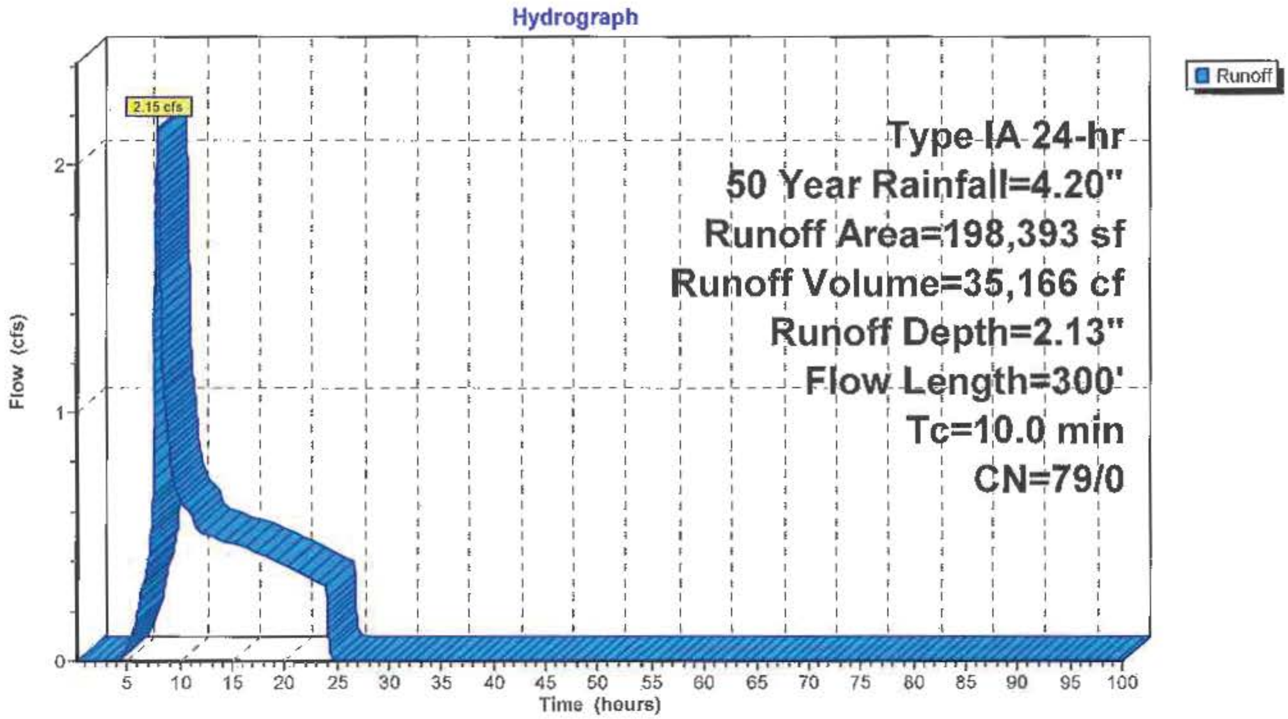
Runoff = 2.15 cfs @ 8.00 hrs, Volume= 35,166 cf, Depth= 2.13"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

Area (sf)	CN	Description
198,393	79	Pasture/grassland/range, Poor, HSG B
198,393	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	300		0.50		**Direct Entry, Sheet Flow**

Subcatchment 5U: Specht Site TL 1300 1400 1500--Predevelopment



Summary for Subcatchment 6: NW Metal Fab TL 800

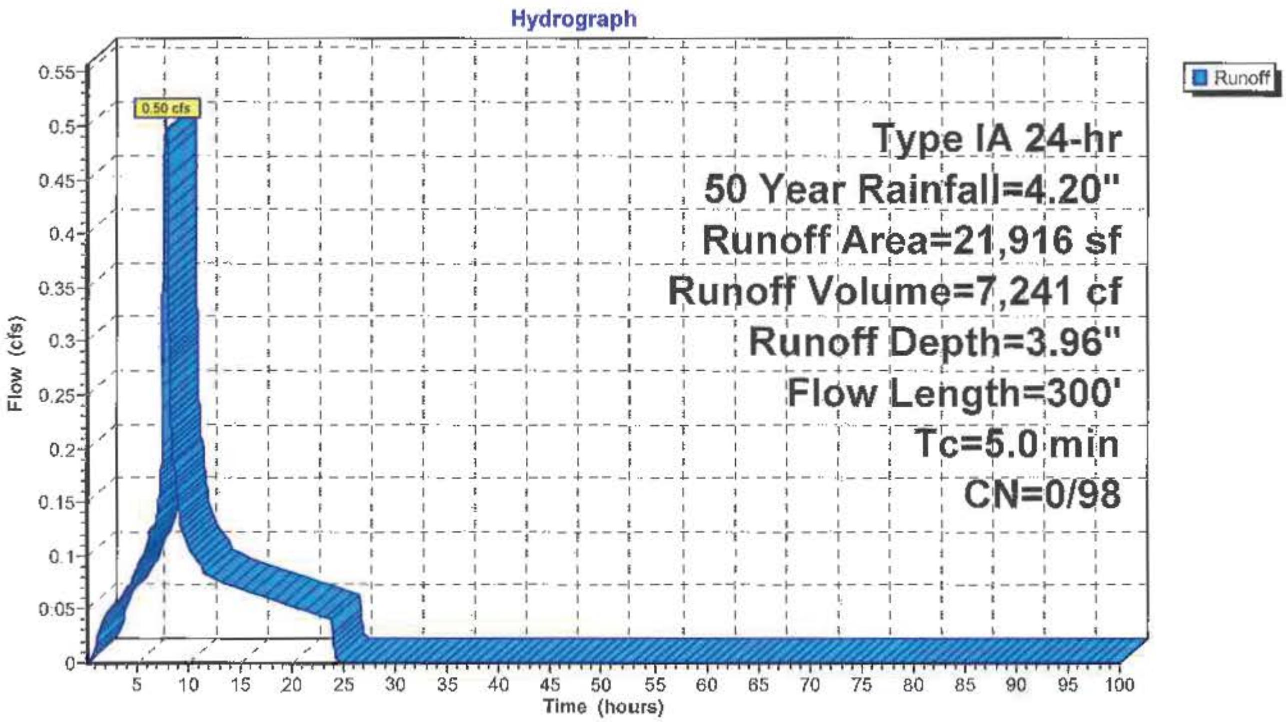
Runoff = 0.50 cfs @ 7.88 hrs, Volume= 7,241 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

	Area (sf)	CN	Description
*	21,916	98	Paving
	21,916	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 6: NW Metal Fab TL 800



Summary for Subcatchment 6U: NW Metal Fab TL 800--Predevelopment

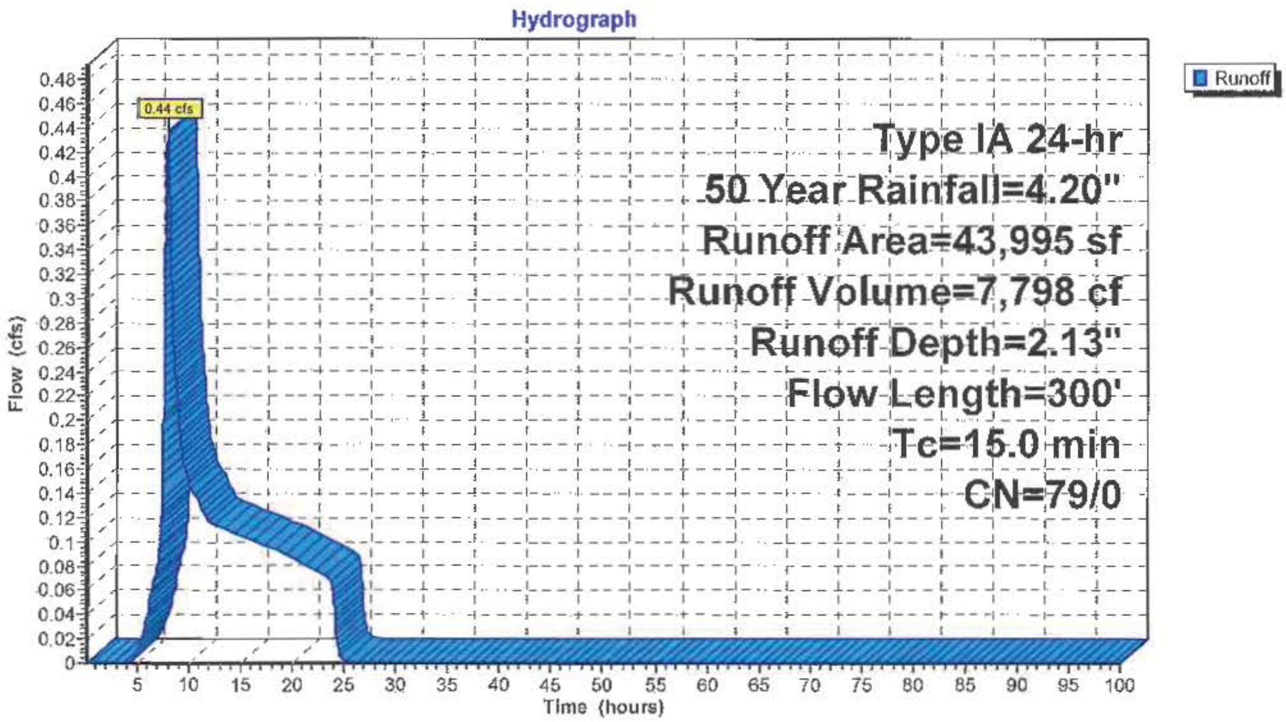
Runoff = 0.44 cfs @ 8.00 hrs, Volume= 7,798 cf, Depth= 2.13"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

Area (sf)	CN	Description
43,995	79	Pasture/grassland/range, Poor, HSG B
43,995	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	300		0.33		**Direct Entry, Sheet Flow**

Subcatchment 6U: NW Metal Fab TL 800--Predevelopment



Summary for Subcatchment 7: NW Metal Fab TL 600

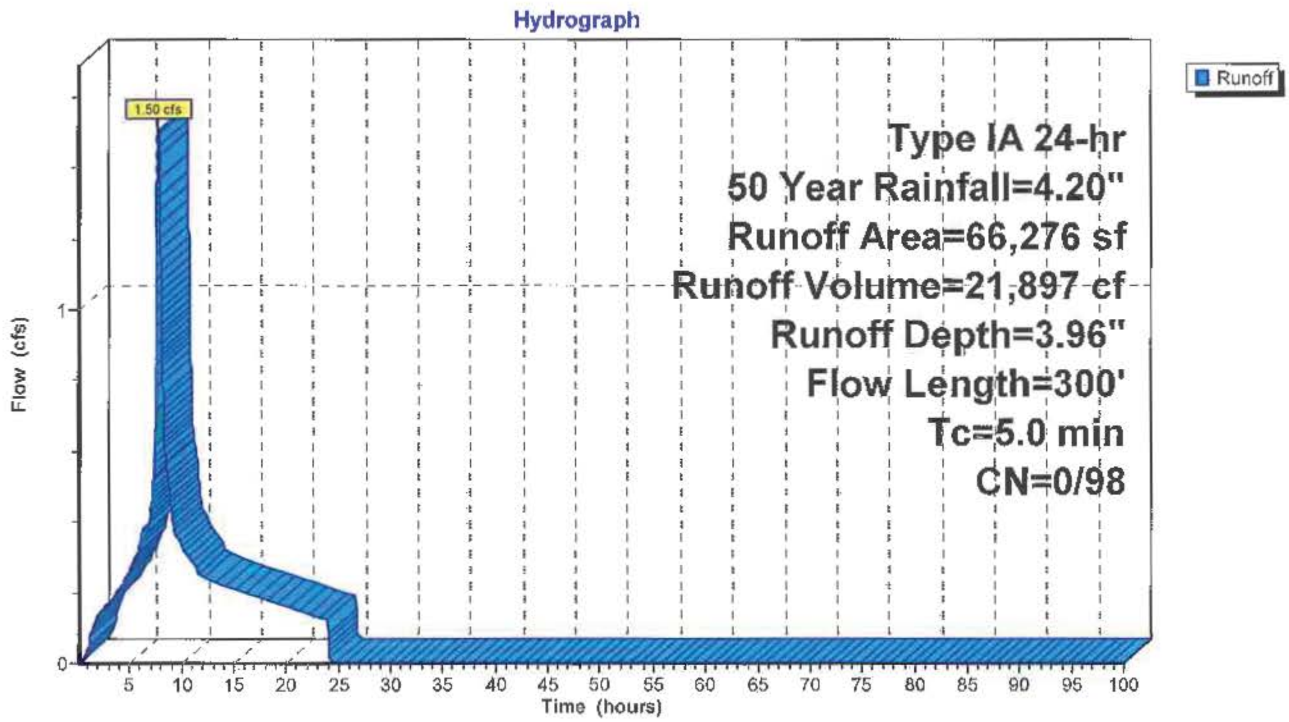
Runoff = 1.50 cfs @ 7.88 hrs, Volume= 21,897 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

	Area (sf)	CN	Description
*	66,276	98	Paving
	66,276	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 7: NW Metal Fab TL 600



Summary for Subcatchment 7U: NW Metal Fab TL 600--Predevelopment

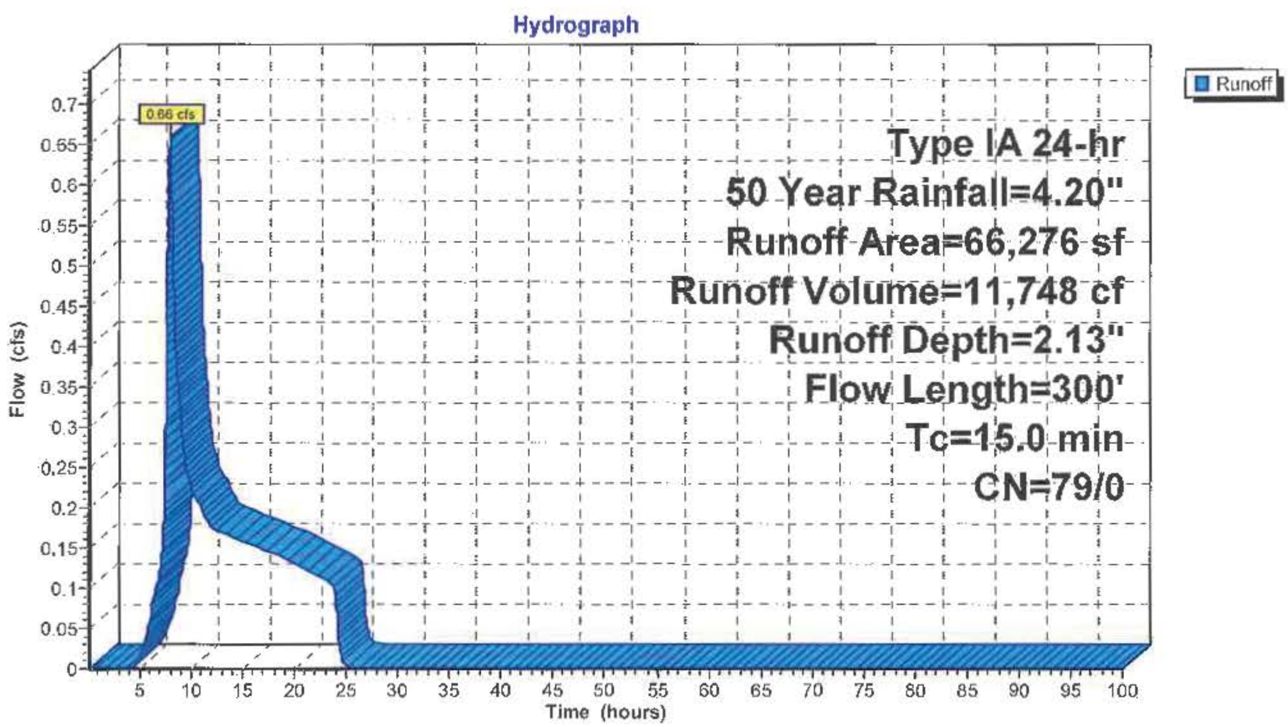
Runoff = 0.66 cfs @ 8.00 hrs, Volume= 11,748 cf, Depth= 2.13"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

Area (sf)	CN	Description
66,276	79	Pasture/grassland/range, Poor, HSG B
66,276	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	300		0.33		**Direct Entry, Sheet Flow**

Subcatchment 7U: NW Metal Fab TL 600--Predevelopment



Summary for Subcatchment 8: NW Metal Fab TL 700

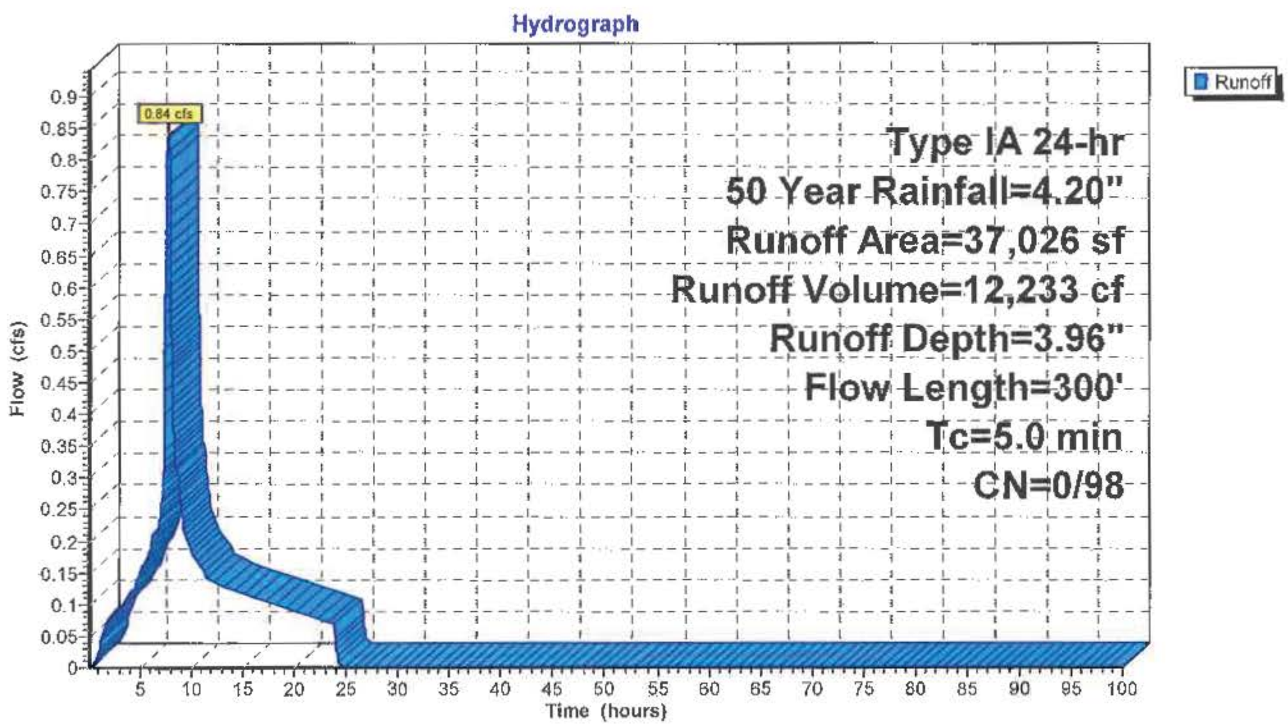
Runoff = 0.84 cfs @ 7.88 hrs, Volume= 12,233 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

	Area (sf)	CN	Description
*	37,026	98	Paving
	37,026	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 8: NW Metal Fab TL 700



Summary for Subcatchment 8U: NW Metal Fab TL 700--Predevelopment

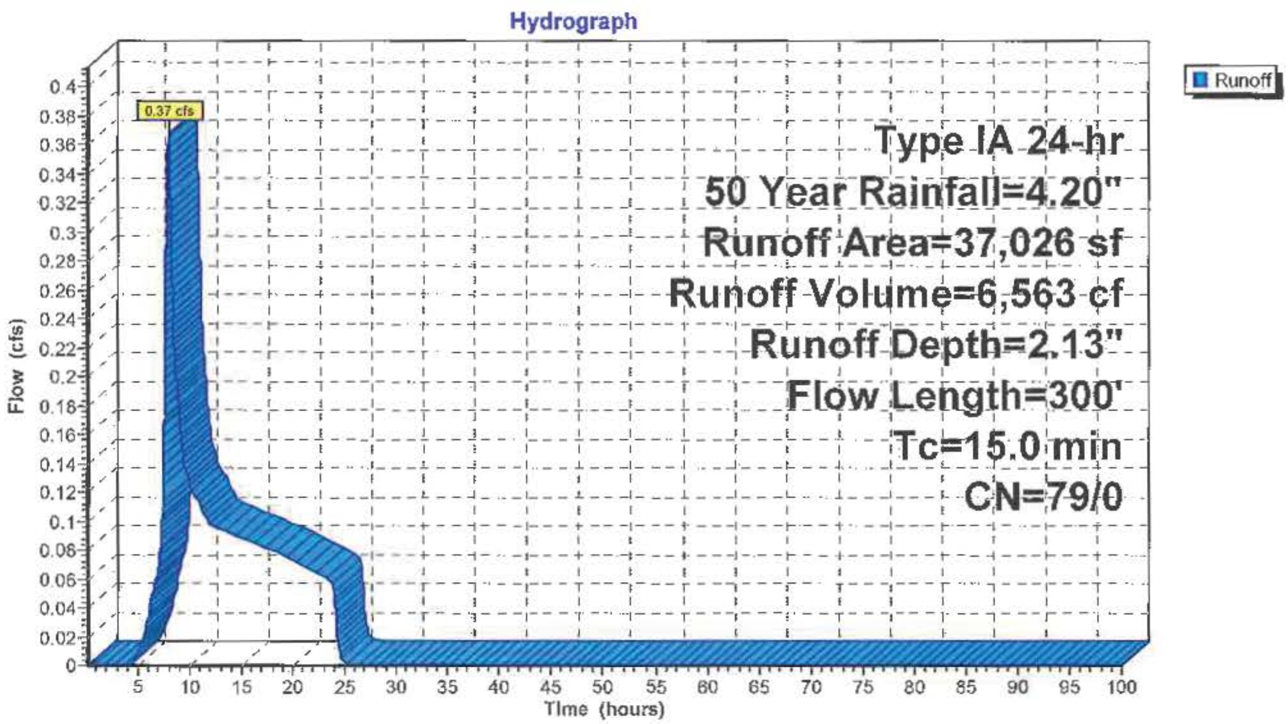
Runoff = 0.37 cfs @ 8.00 hrs, Volume= 6,563 cf, Depth= 2.13"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

Area (sf)	CN	Description
37,026	79	Pasture/grassland/range, Poor, HSG B
37,026	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	300		0.33		**Direct Entry, Sheet Flow**

Subcatchment 8U: NW Metal Fab TL 700--Predevelopment



Summary for Subcatchment 9: Brockway TL 900

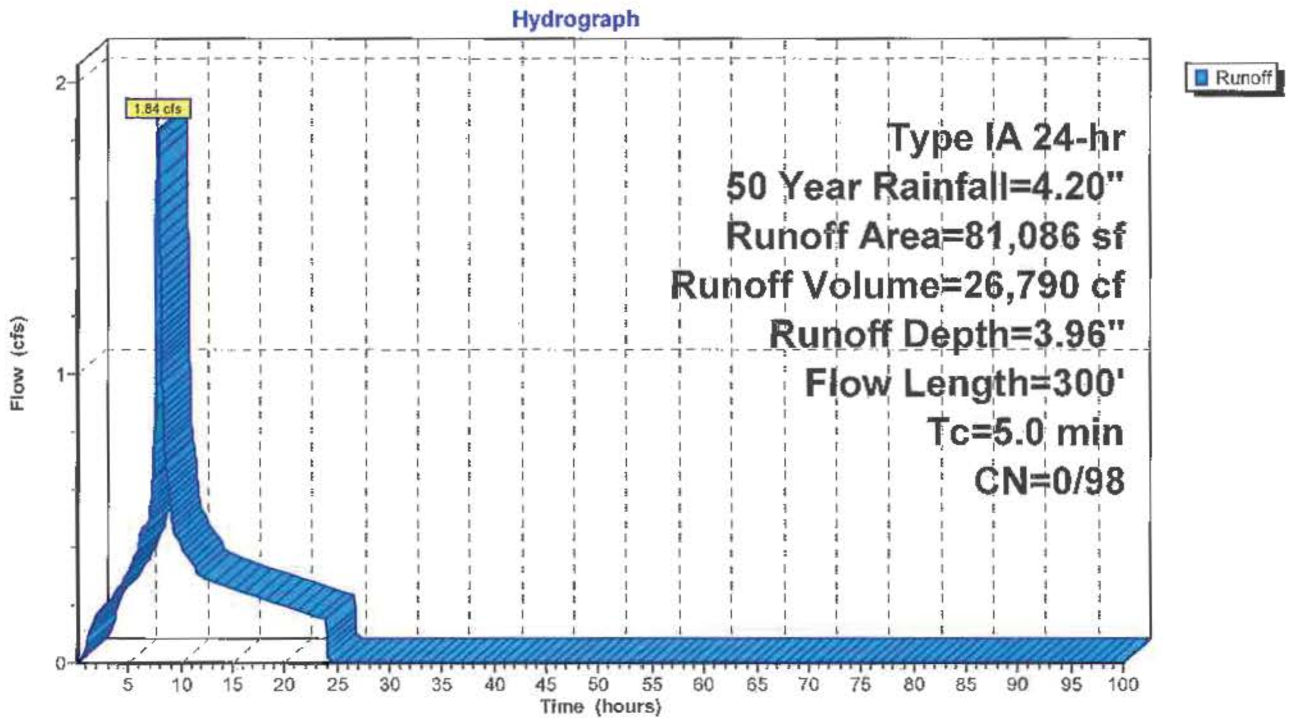
Runoff = 1.84 cfs @ 7.88 hrs, Volume= 26,790 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

	Area (sf)	CN	Description
*	81,086	98	Paving
	81,086	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 9: Brockway TL 900



Summary for Subcatchment 9U: Brockway TL 900--Predevelopment

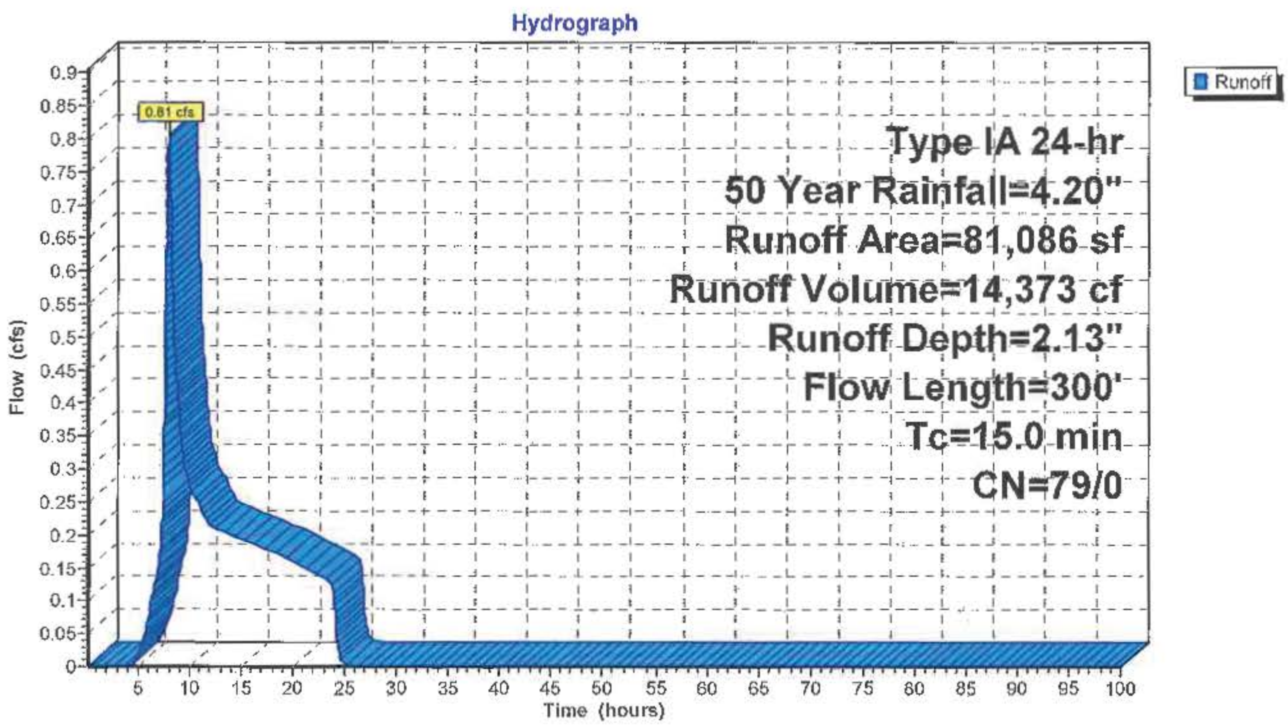
Runoff = 0.81 cfs @ 8.00 hrs, Volume= 14,373 cf, Depth= 2.13"

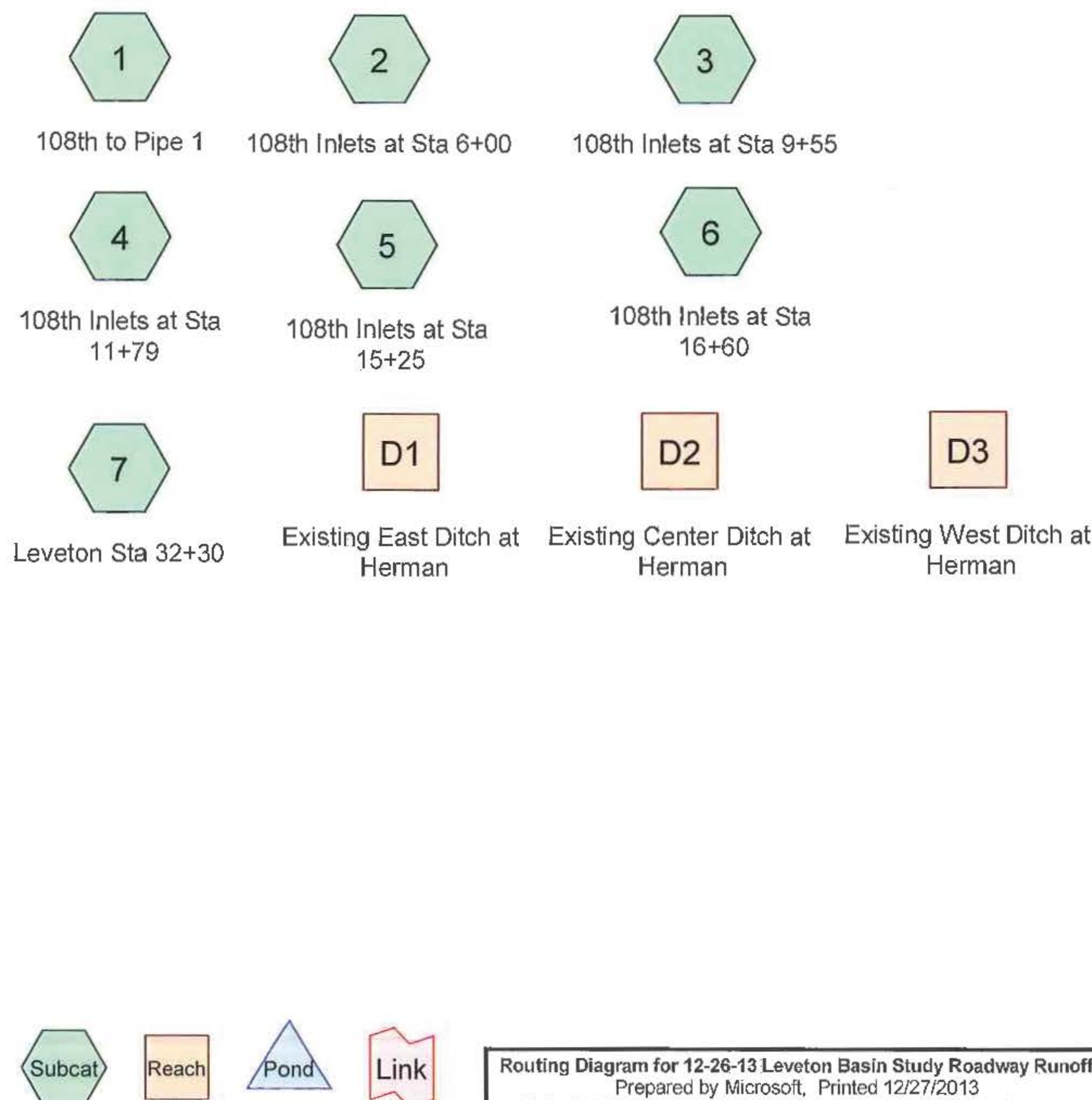
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

Area (sf)	CN	Description
81,086	79	Pasture/grassland/range, Poor, HSG B
81,086	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	300		0.33		**Direct Entry, Sheet Flow**

Subcatchment 9U: Brockway TL 900--Predevelopment





Routing Diagram for 12-26-13 Leveton Basin Study Roadway Runoff
Prepared by Microsoft, Printed 12/27/2013

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
100,200	98	Paved roads w/curbs & sewers, HSG B (1, 2, 3, 4, 5, 6, 7)
100,200	**98**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
100,200	HSG B	1, 2, 3, 4, 5, 6, 7
0	HSG C	
0	HSG D	
0	Other	
100,200		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	100,200	0	0	0	100,200	Paved roads w/curbs & sewers
0	**100,200**	**0**	**0**	**0**	**100,200**	**TOTAL AREA**

Time span=0.20-100.00 hrs, dt=0.01 hrs, 9981 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: 108th to Pipe 1 Runoff Area=15,000 sf 100.00% Impervious Runoff Depth=3.67"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=0.32 cfs 4,582 cf

Subcatchment 2: 108th Inlets at Sta 6+00 Runoff Area=15,000 sf 100.00% Impervious Runoff Depth=3.67"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=0.32 cfs 4,582 cf

Subcatchment 3: 108th Inlets at Sta 9+55 Runoff Area=17,750 sf 100.00% Impervious Runoff Depth=3.67"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=0.37 cfs 5,422 cf

Subcatchment 4: 108th Inlets at Sta 11+79 Runoff Area=11,200 sf 100.00% Impervious Runoff Depth=3.67"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=0.24 cfs 3,421 cf

Subcatchment 5: 108th Inlets at Sta 15+25 Runoff Area=17,300 sf 100.00% Impervious Runoff Depth=3.67"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=0.36 cfs 5,284 cf

Subcatchment 6: 108th Inlets at Sta 16+60 Runoff Area=14,750 sf 100.00% Impervious Runoff Depth=3.67"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=0.31 cfs 4,505 cf

Subcatchment 7: Leveton Sta 32+30 Runoff Area=9,200 sf 100.00% Impervious Runoff Depth=3.67"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=0.19 cfs 2,810 cf

Reach D1: Existing East Ditch at Herman Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.035 L=333.0' S=0.0008 '/' Capacity=183.31 cfs Outflow=0.00 cfs 0 cf

Reach D2: Existing Center Ditch at Herman Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.035 L=155.0' S=0.0016 '/' Capacity=268.68 cfs Outflow=0.00 cfs 0 cf

Reach D3: Existing West Ditch at Herman Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.035 L=67.0' S=0.0101 '/' Capacity=673.98 cfs Outflow=0.00 cfs 0 cf

Total Runoff Area = 100,200 sf Runoff Volume = 30,606 cf Average Runoff Depth = 3.67"
0.00% Pervious = 0 sf 100.00% Impervious = 100,200 sf

Summary for Subcatchment 1: 108th to Pipe 1

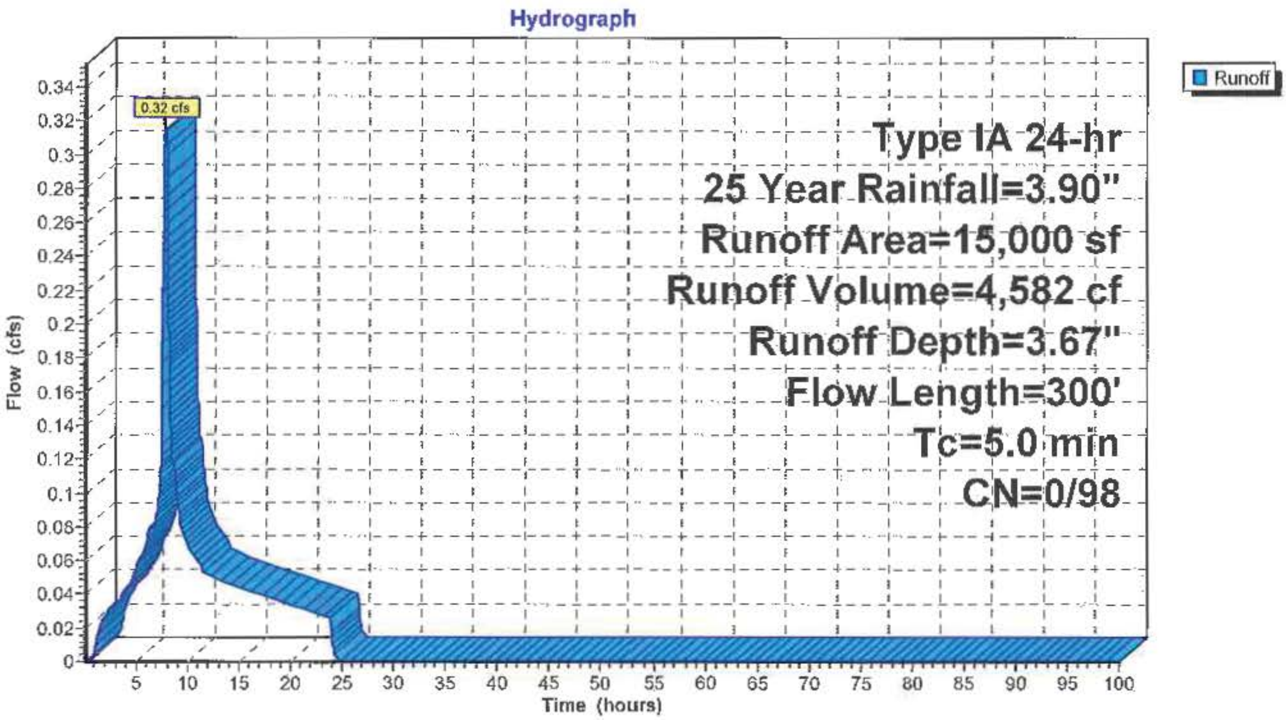
Runoff = 0.32 cfs @ 7.88 hrs, Volume= 4,582 cf, Depth= 3.67"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

Area (sf)	CN	Description
15,000	98	Paved roads w/curbs & sewers, HSG B
15,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 1: 108th to Pipe 1



Summary for Subcatchment 2: 108th Inlets at Sta 6+00

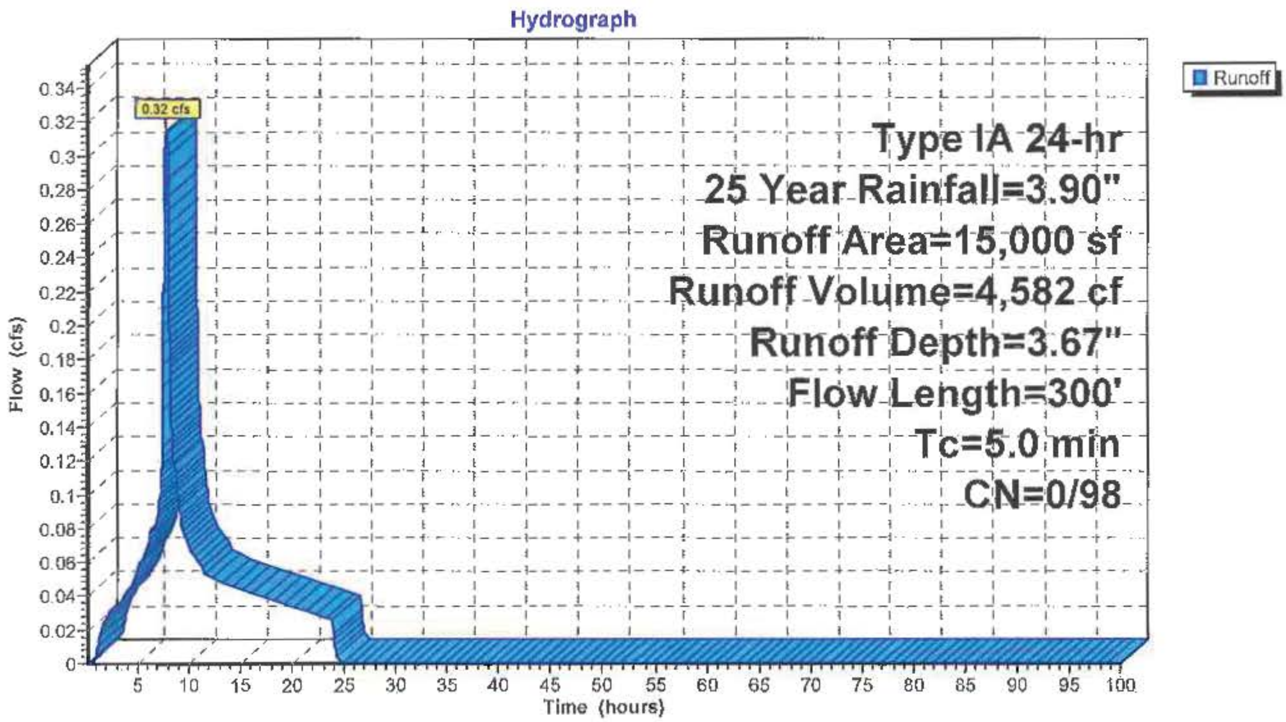
Runoff = 0.32 cfs @ 7.88 hrs, Volume= 4,582 cf, Depth= 3.67"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

Area (sf)	CN	Description
15,000	98	Paved roads w/curbs & sewers, HSG B
15,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 2: 108th Inlets at Sta 6+00



Summary for Subcatchment 3: 108th Inlets at Sta 9+55

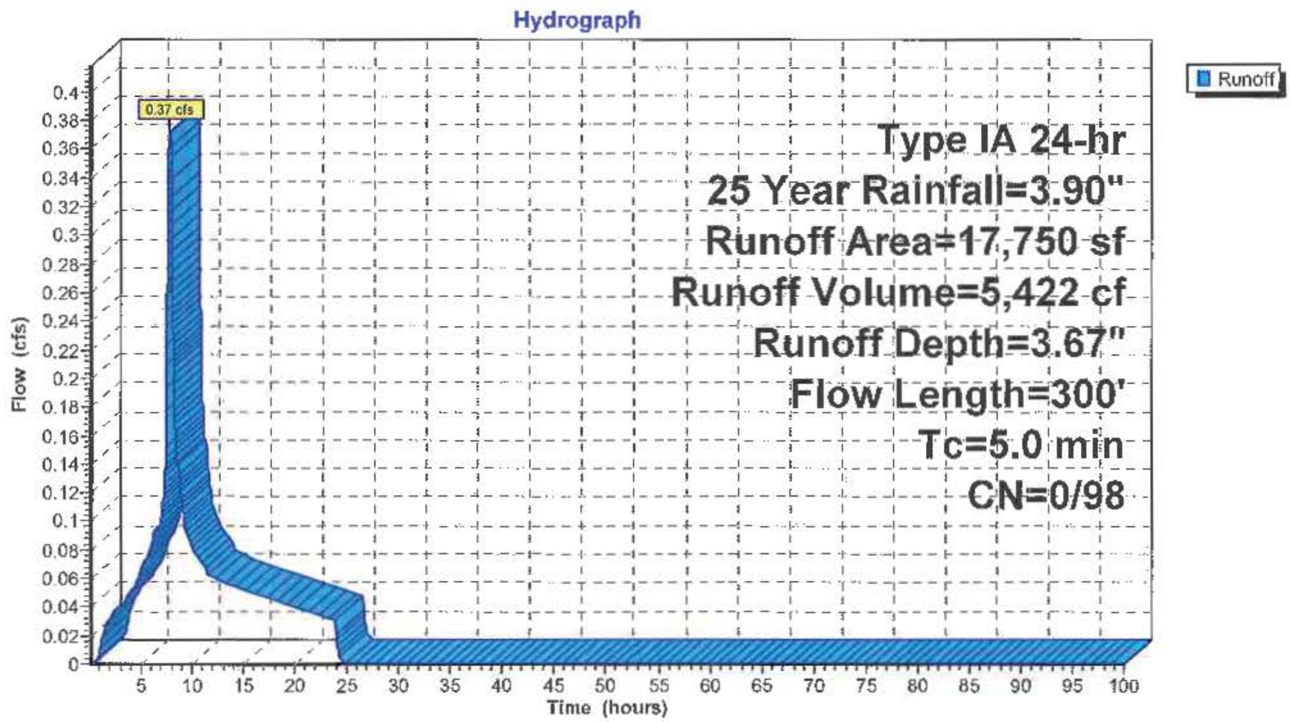
Runoff = 0.37 cfs @ 7.88 hrs, Volume= 5,422 cf, Depth= 3.67"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

Area (sf)	CN	Description
17,750	98	Paved roads w/curbs & sewers, HSG B
17,750	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 3: 108th Inlets at Sta 9+55



Summary for Subcatchment 4: 108th Inlets at Sta 11+79

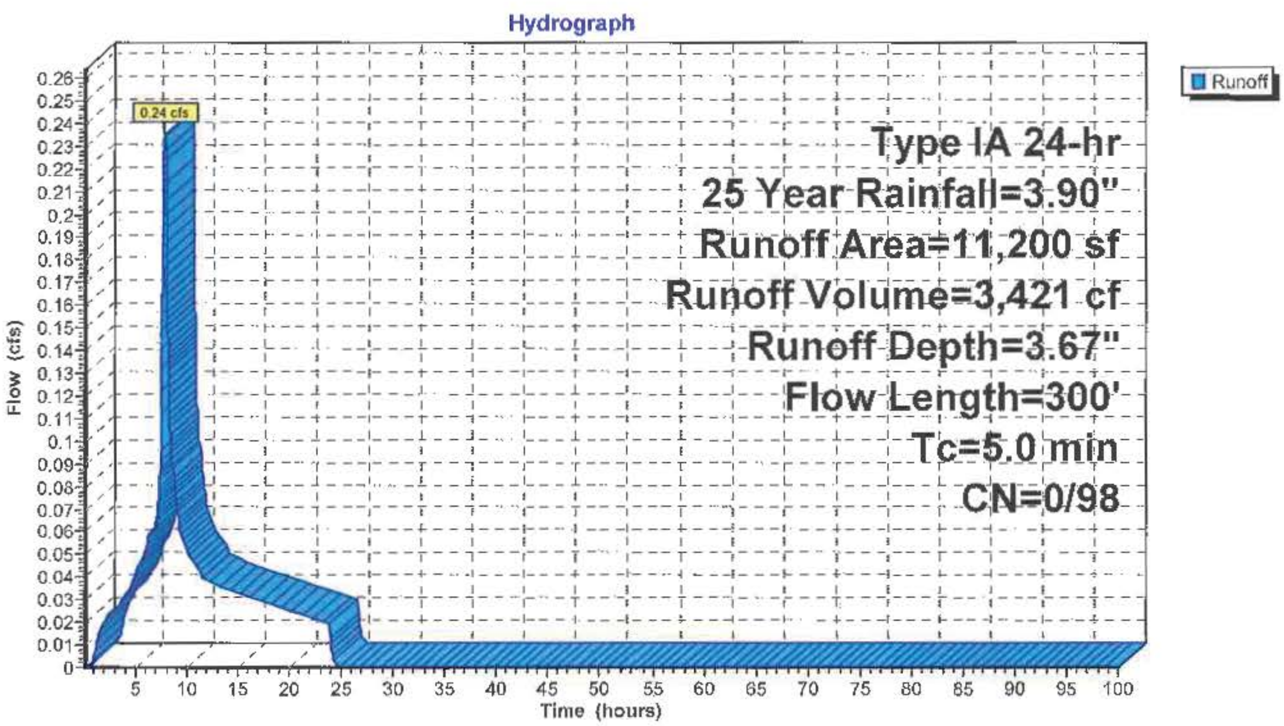
Runoff = 0.24 cfs @ 7.88 hrs, Volume= 3,421 cf, Depth= 3.67"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

Area (sf)	CN	Description
11,200	98	Paved roads w/curbs & sewers, HSG B
11,200	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 4: 108th Inlets at Sta 11+79



Summary for Subcatchment 5: 108th Inlets at Sta 15+25

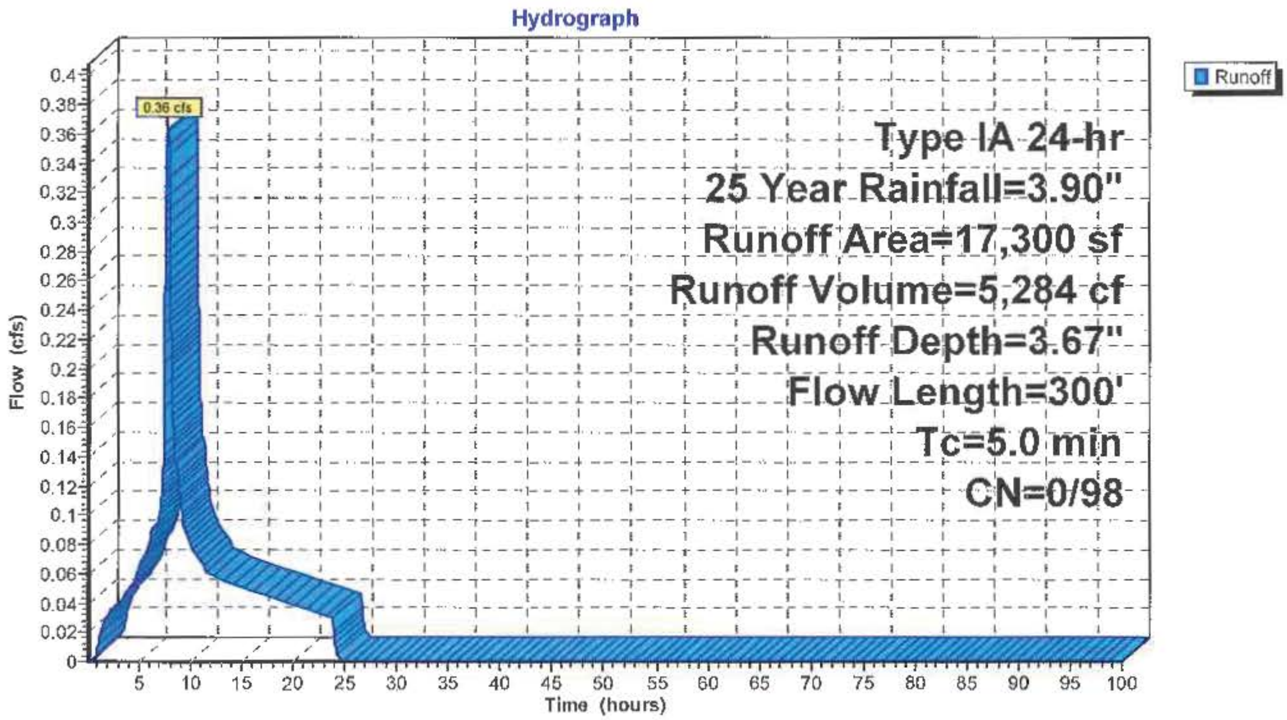
Runoff = 0.36 cfs @ 7.88 hrs, Volume= 5,284 cf, Depth= 3.67"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

Area (sf)	CN	Description
17,300	98	Paved roads w/curbs & sewers, HSG B
17,300	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 5: 108th Inlets at Sta 15+25



Summary for Subcatchment 6: 108th Inlets at Sta 16+60

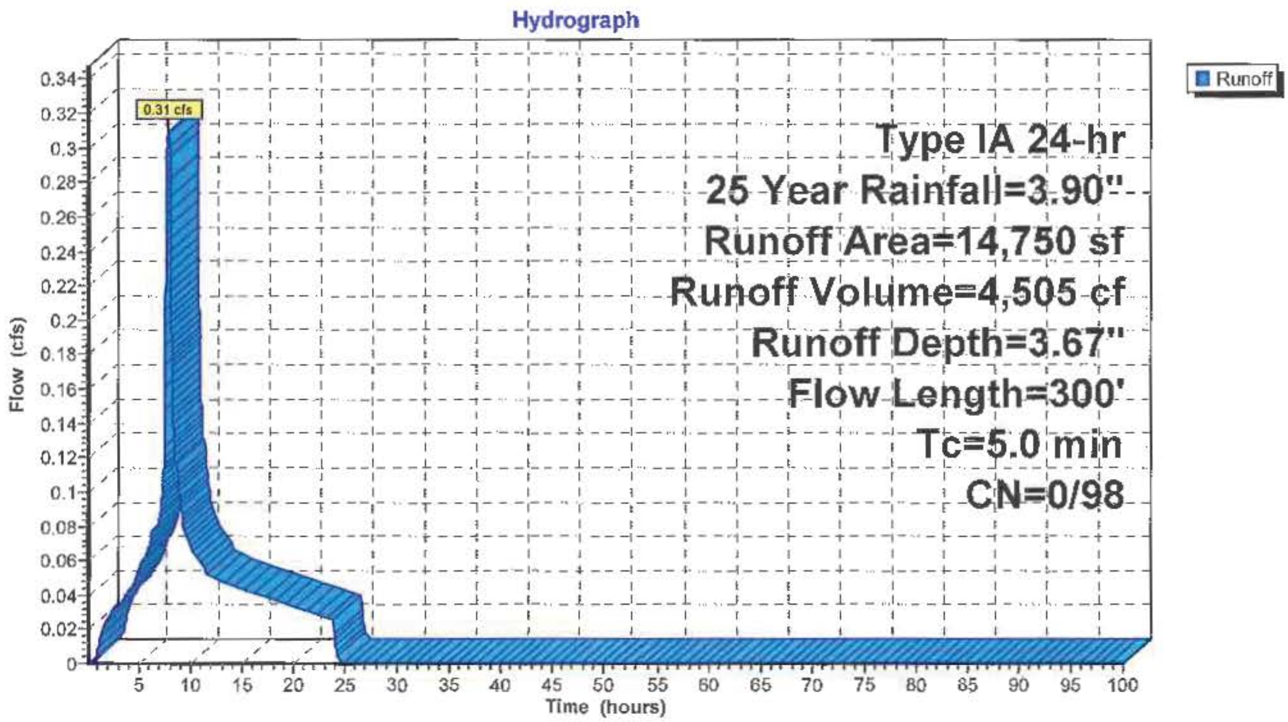
Runoff = 0.31 cfs @ 7.88 hrs, Volume= 4,505 cf, Depth= 3.67"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

Area (sf)	CN	Description
14,750	98	Paved roads w/curbs & sewers, HSG B
14,750	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 6: 108th Inlets at Sta 16+60



Summary for Subcatchment 7: Leveton Sta 32+30

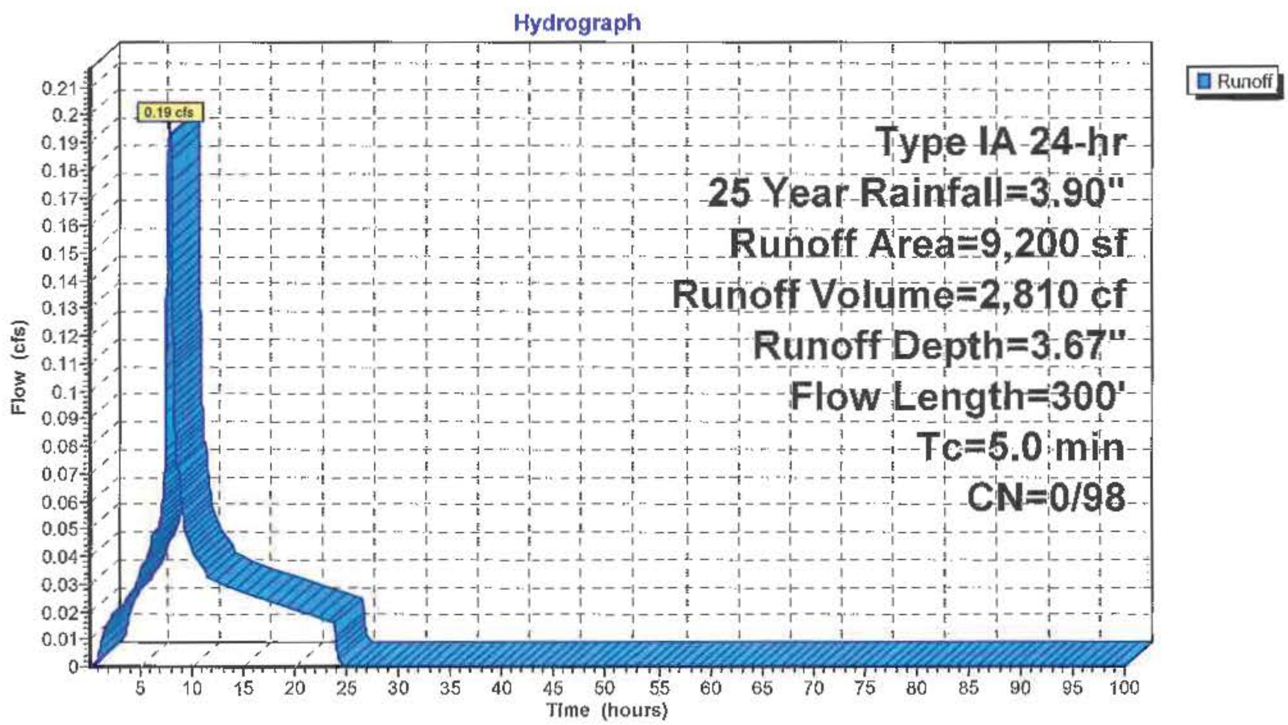
Runoff = 0.19 cfs @ 7.88 hrs, Volume= 2,810 cf, Depth= 3.67"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 Year Rainfall=3.90"

Area (sf)	CN	Description
9,200	98	Paved roads w/curbs & sewers, HSG B
9,200	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 7: Leveton Sta 32+30



Summary for Reach D1: Existing East Ditch at Herman

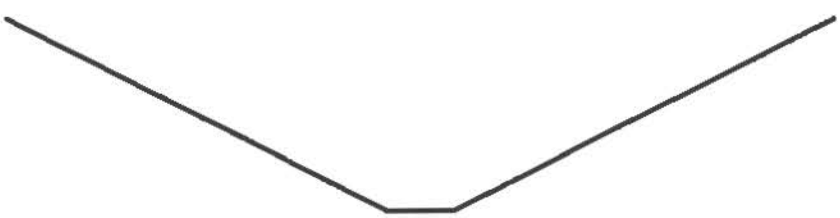
[43] Hint: Has no inflow (Outflow=Zero)

Outflow = 0.00 cfs @ 0.20 hrs, Volume= 0 cf

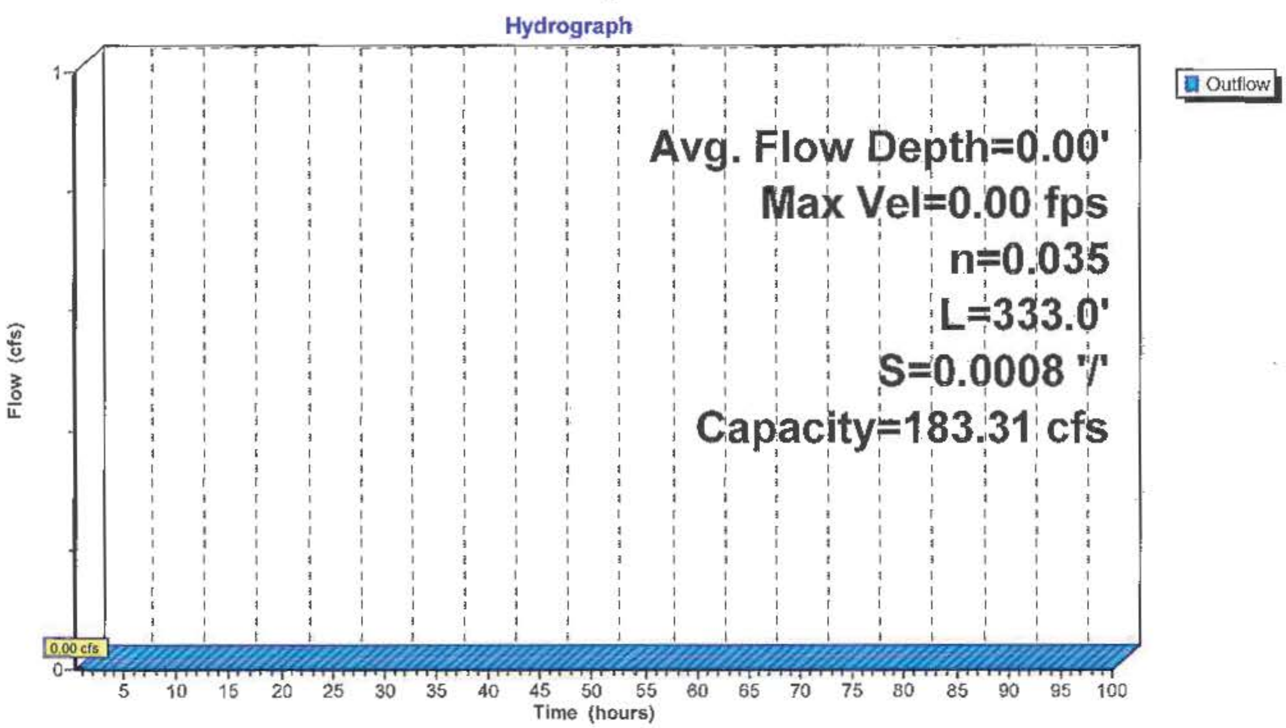
Routing by Stor-Ind+Trans method, Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 5.80' Flow Area= 78.9 sf, Capacity= 183.31 cfs

2.00' x 5.80' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 25.20'
Length= 333.0' Slope= 0.0008 '/'
Inlet Invert= 126.65', Outlet Invert= 126.40'



Reach D1: Existing East Ditch at Herman



Summary for Reach D2: Existing Center Ditch at Herman

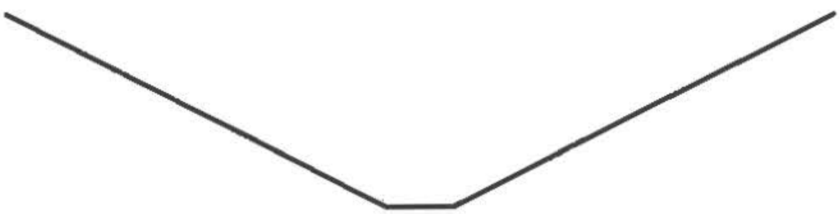
[43] Hint: Has no inflow (Outflow=Zero)

Outflow = 0.00 cfs @ 0.20 hrs, Volume= 0 cf

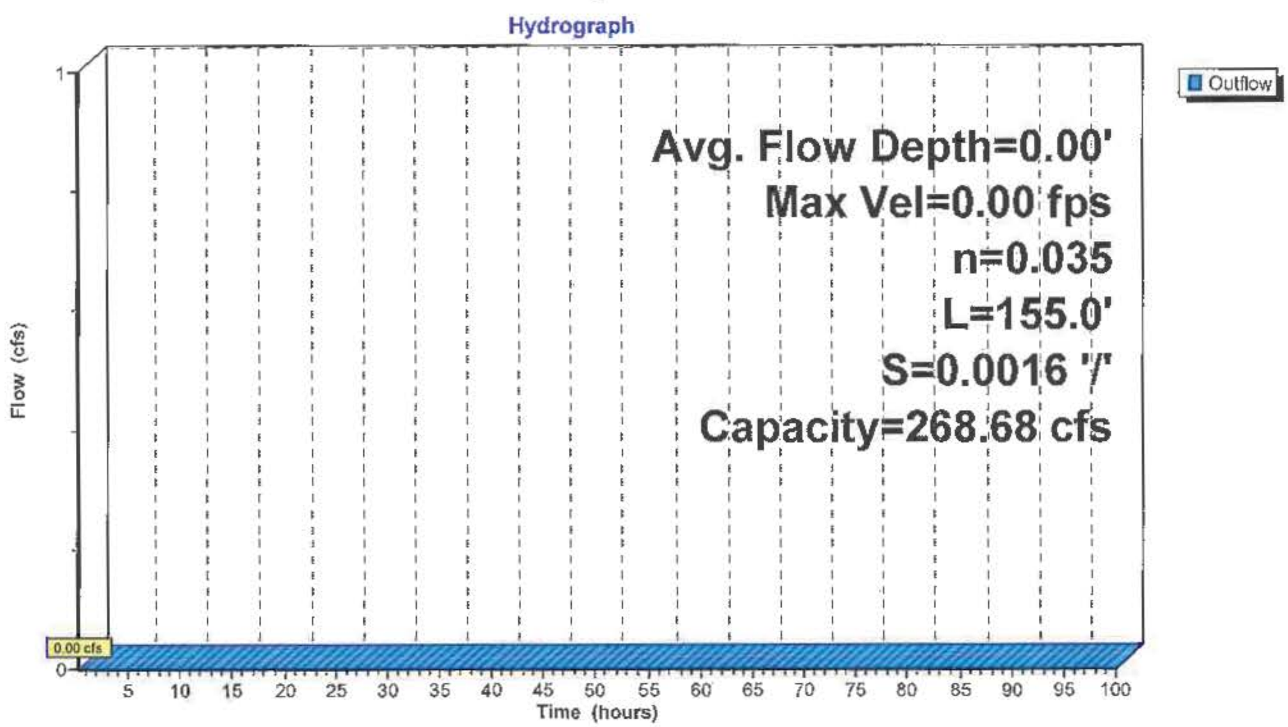
Routing by Stor-Ind+Trans method, Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 5.80' Flow Area= 78.9 sf, Capacity= 268.68 cfs

2.00' x 5.80' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 25.20'
Length= 155.0' Slope= 0.0016 '/'
Inlet Invert= 126.35', Outlet Invert= 126.10'



Reach D2: Existing Center Ditch at Herman



Summary for Reach D3: Existing West Ditch at Herman

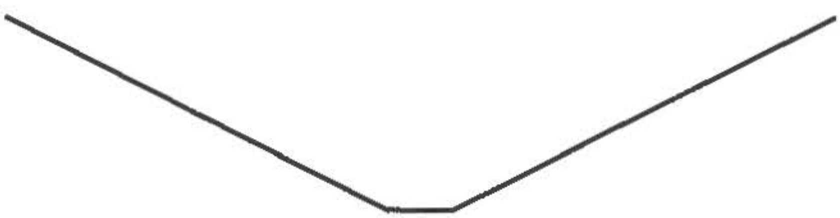
[43] Hint: Has no inflow (Outflow=Zero)

Outflow = 0.00 cfs @ 0.20 hrs, Volume= 0 cf

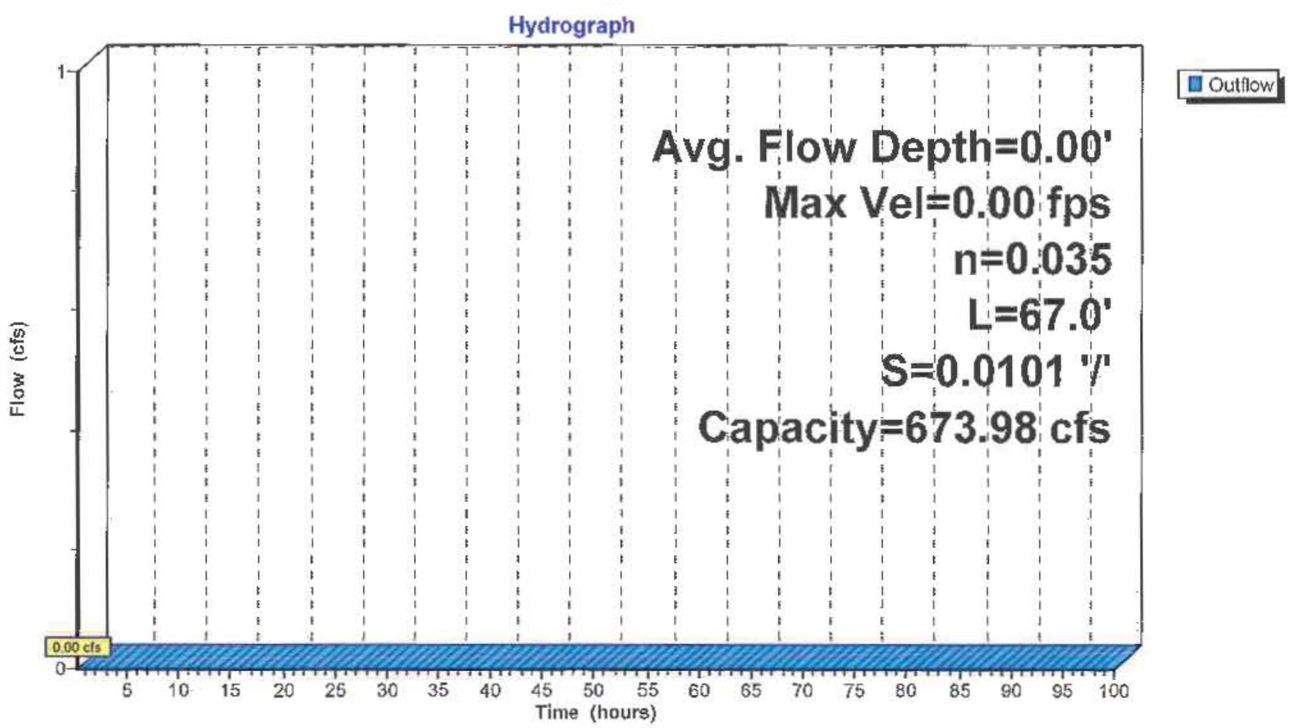
Routing by Stor-Ind+Trans method, Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 5.80' Flow Area= 78.9 sf, Capacity= 673.98 cfs

2.00' x 5.80' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 25.20'
Length= 67.0' Slope= 0.0101 '/'
Inlet Invert= 126.05', Outlet Invert= 125.37'



Reach D3: Existing West Ditch at Herman



Time span=0.20-100.00 hrs, dt=0.01 hrs, 9981 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: 108th to Pipe 1 Runoff Area=15,000 sf 100.00% Impervious Runoff Depth=3.96"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=0.34 cfs 4,956 cf

Subcatchment 2: 108th Inlets at Sta 6+00 Runoff Area=15,000 sf 100.00% Impervious Runoff Depth=3.96"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=0.34 cfs 4,956 cf

Subcatchment 3: 108th Inlets at Sta 9+55 Runoff Area=17,750 sf 100.00% Impervious Runoff Depth=3.96"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=0.40 cfs 5,864 cf

Subcatchment 4: 108th Inlets at Sta 11+79 Runoff Area=11,200 sf 100.00% Impervious Runoff Depth=3.96"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=0.25 cfs 3,700 cf

Subcatchment 5: 108th Inlets at Sta 15+25 Runoff Area=17,300 sf 100.00% Impervious Runoff Depth=3.96"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=0.39 cfs 5,716 cf

Subcatchment 6: 108th Inlets at Sta 16+60 Runoff Area=14,750 sf 100.00% Impervious Runoff Depth=3.96"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=0.33 cfs 4,873 cf

Subcatchment 7: Leveton Sta 32+30 Runoff Area=9,200 sf 100.00% Impervious Runoff Depth=3.96"
Flow Length=300' Tc=5.0 min CN=0/98 Runoff=0.21 cfs 3,040 cf

Reach D1: Existing East Ditch at Herman Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.035 L=333.0' S=0.0008 '/' Capacity=183.31 cfs Outflow=0.00 cfs 0 cf

Reach D2: Existing Center Ditch at Herman Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.035 L=155.0' S=0.0016 '/' Capacity=268.68 cfs Outflow=0.00 cfs 0 cf

Reach D3: Existing West Ditch at Herman Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.035 L=67.0' S=0.0101 '/' Capacity=673.98 cfs Outflow=0.00 cfs 0 cf

Total Runoff Area = 100,200 sf Runoff Volume = 33,105 cf Average Runoff Depth = 3.96"
0.00% Pervious = 0 sf 100.00% Impervious = 100,200 sf

Summary for Subcatchment 1: 108th to Pipe 1

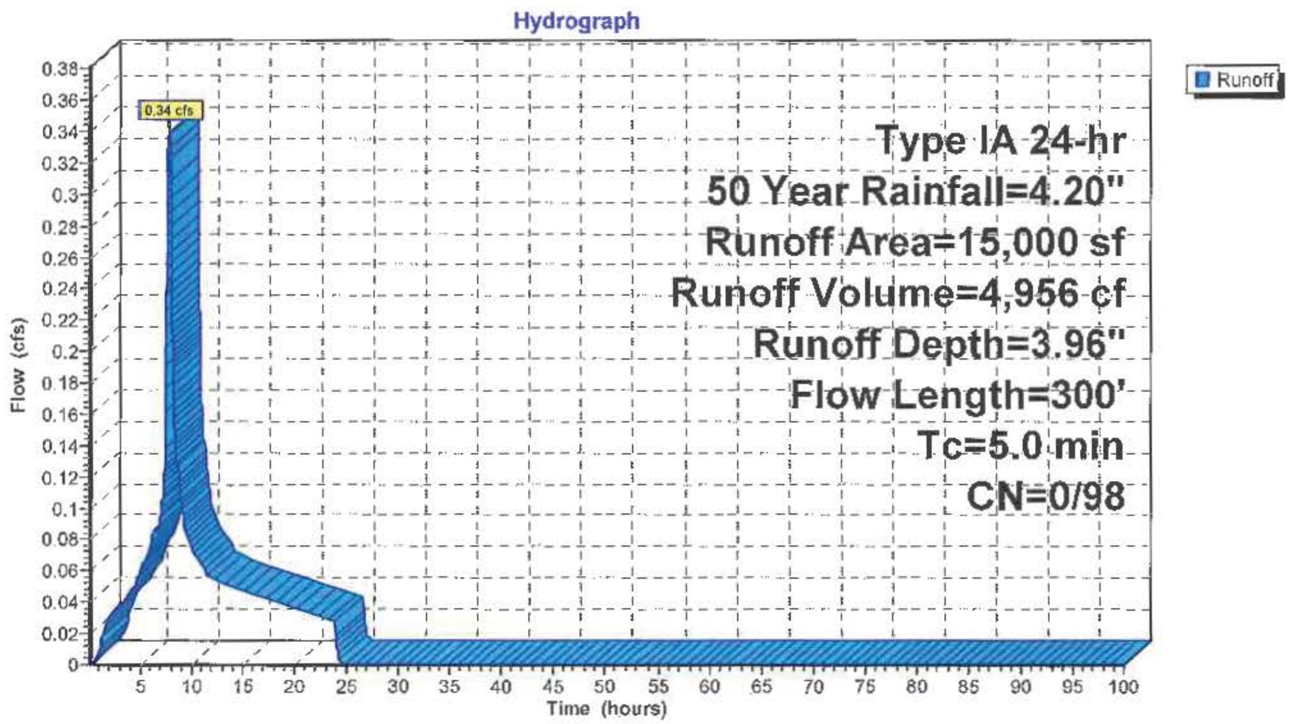
Runoff = 0.34 cfs @ 7.88 hrs, Volume= 4,956 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

Area (sf)	CN	Description
15,000	98	Paved roads w/curbs & sewers, HSG B
15,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 1: 108th to Pipe 1



Summary for Subcatchment 2: 108th Inlets at Sta 6+00

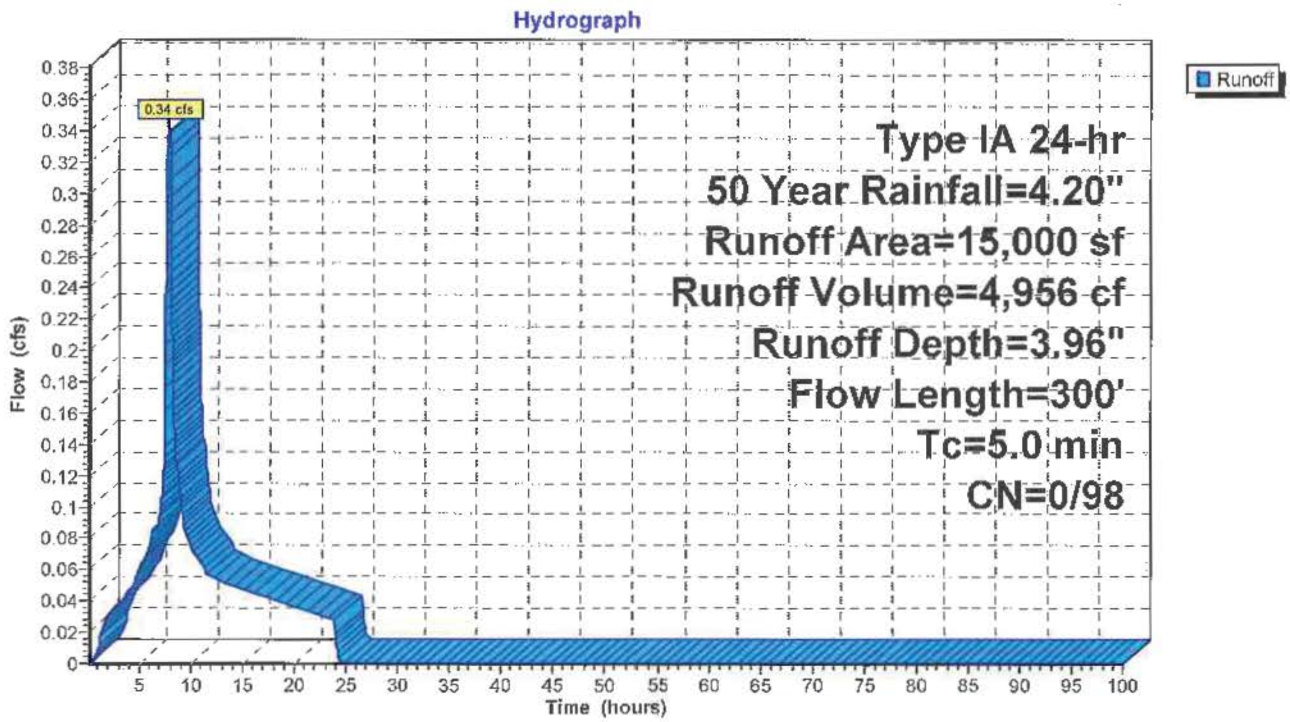
Runoff = 0.34 cfs @ 7.88 hrs, Volume= 4,956 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

Area (sf)	CN	Description
15,000	98	Paved roads w/curbs & sewers, HSG B
15,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 2: 108th Inlets at Sta 6+00



Summary for Subcatchment 3: 108th Inlets at Sta 9+55

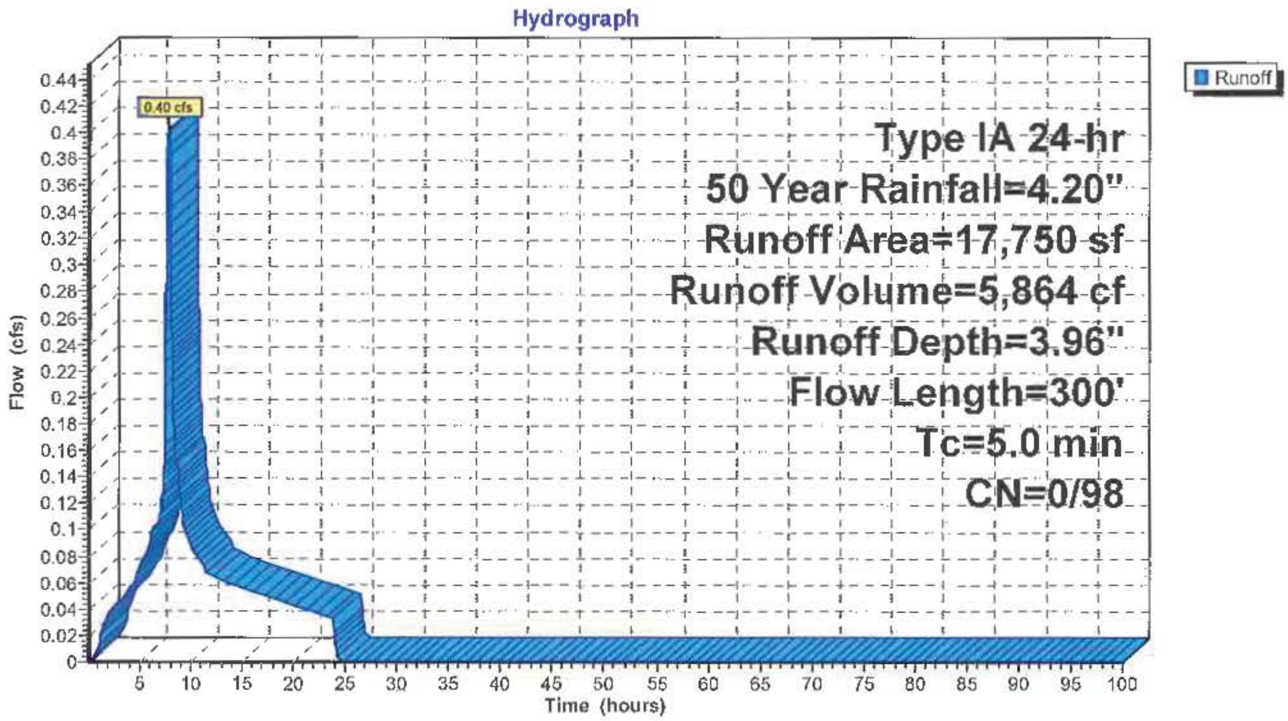
Runoff = 0.40 cfs @ 7.88 hrs, Volume= 5,864 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

Area (sf)	CN	Description
17,750	98	Paved roads w/curbs & sewers, HSG B
17,750	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 3: 108th Inlets at Sta 9+55



Summary for Subcatchment 4: 108th Inlets at Sta 11+79

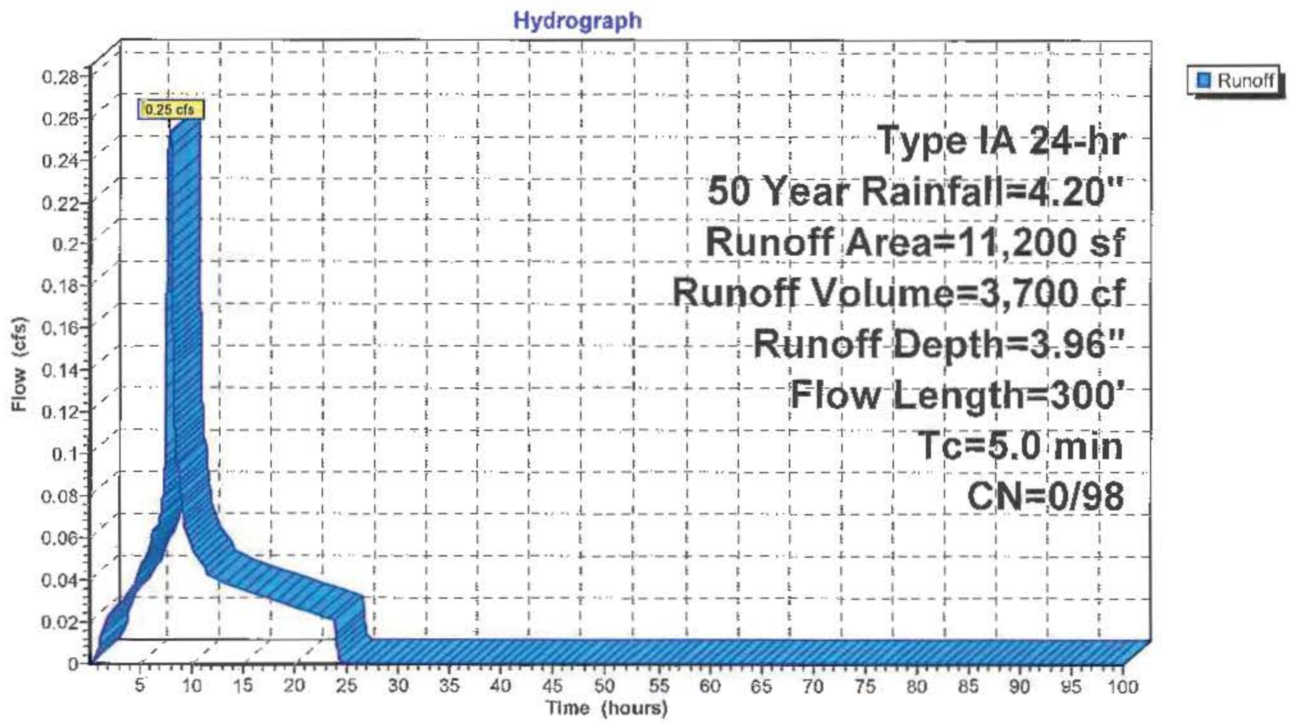
Runoff = 0.25 cfs @ 7.88 hrs, Volume= 3,700 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

Area (sf)	CN	Description
11,200	98	Paved roads w/curbs & sewers, HSG B
11,200	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 4: 108th Inlets at Sta 11+79



Summary for Subcatchment 5: 108th Inlets at Sta 15+25

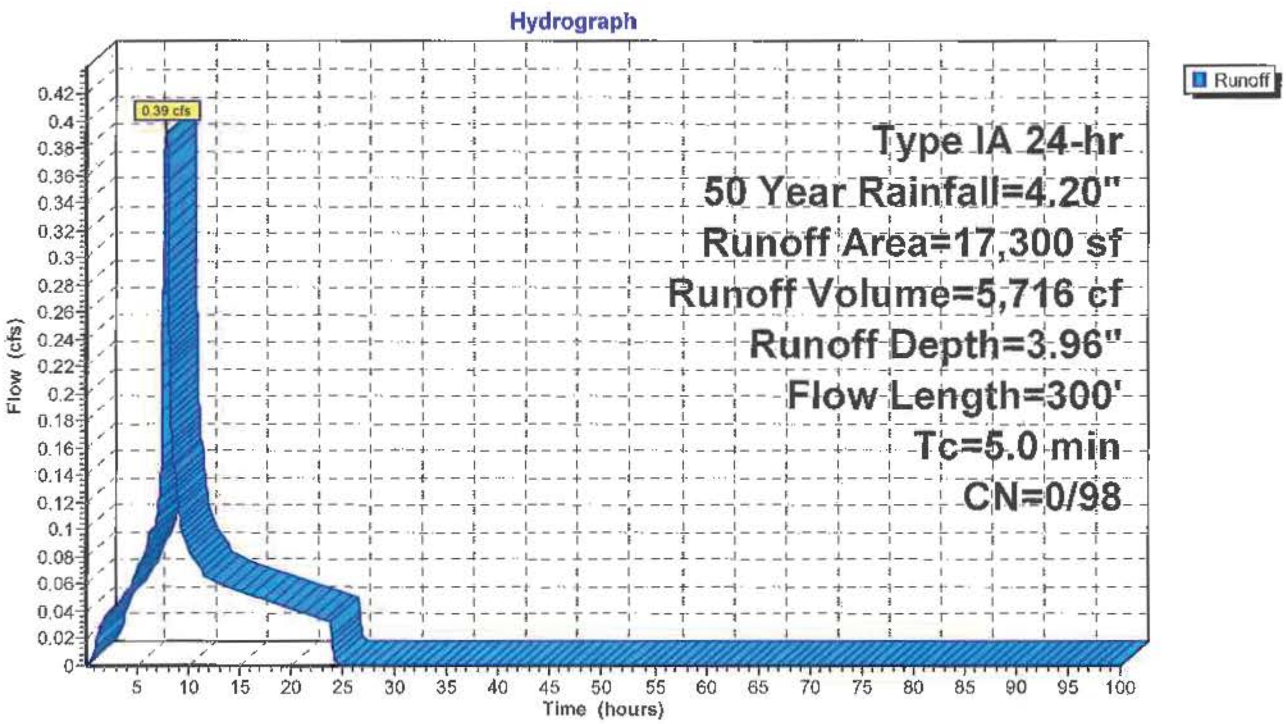
Runoff = 0.39 cfs @ 7.88 hrs, Volume= 5,716 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

Area (sf)	CN	Description
17,300	98	Paved roads w/curbs & sewers, HSG B
17,300	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 5: 108th Inlets at Sta 15+25



Summary for Subcatchment 6: 108th Inlets at Sta 16+60

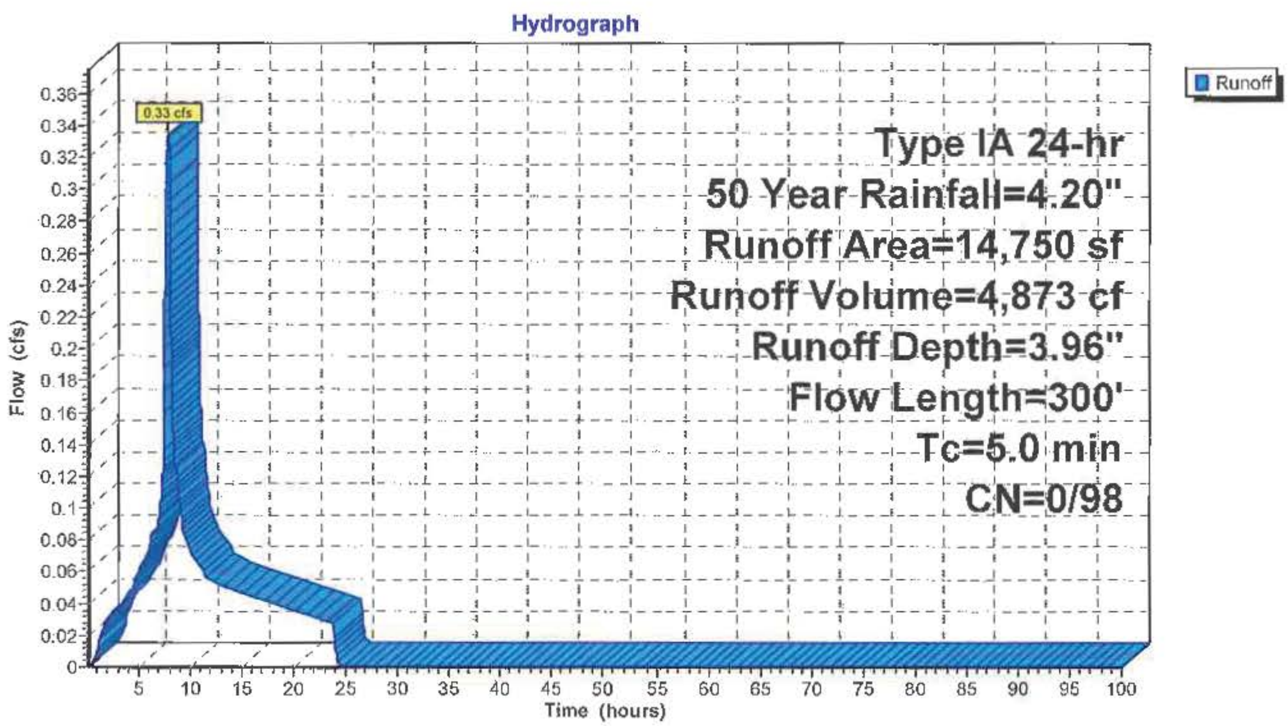
Runoff = 0.33 cfs @ 7.88 hrs, Volume= 4,873 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

Area (sf)	CN	Description
14,750	98	Paved roads w/curbs & sewers, HSG B
14,750	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 6: 108th Inlets at Sta 16+60



Summary for Subcatchment 7: Leveton Sta 32+30

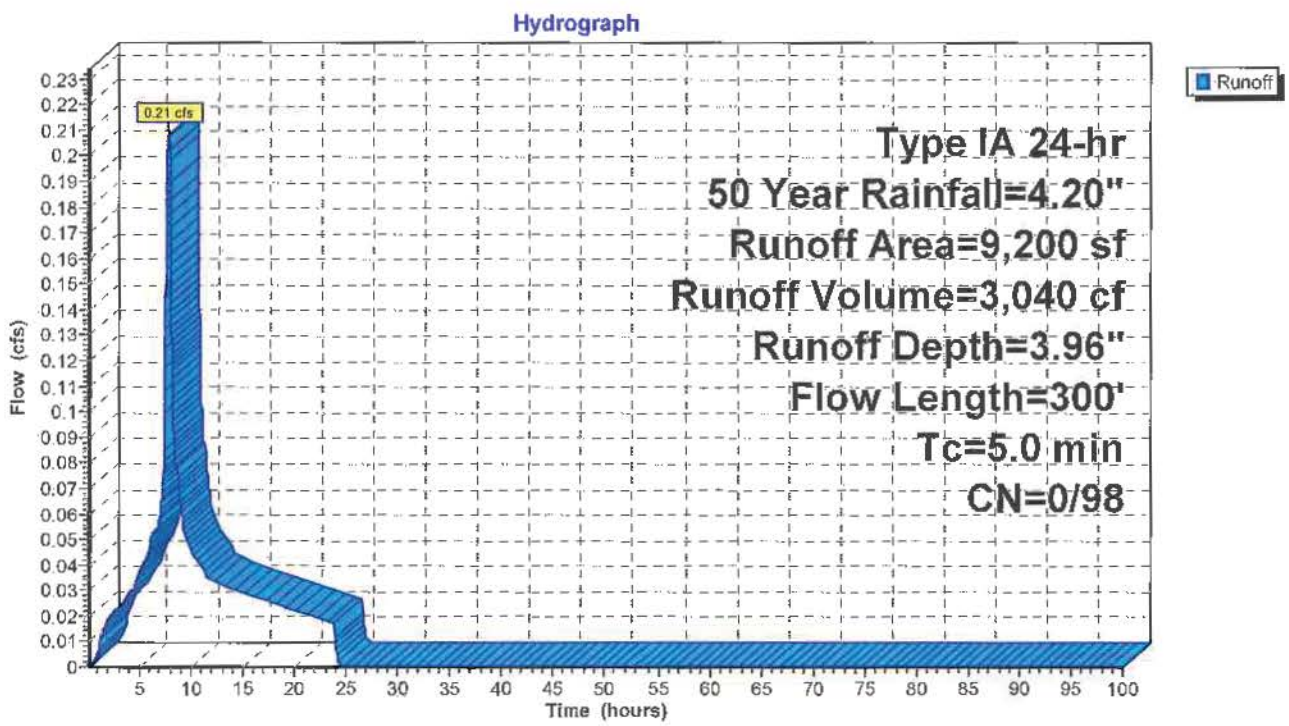
Runoff = 0.21 cfs @ 7.88 hrs, Volume= 3,040 cf, Depth= 3.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Type IA 24-hr 50 Year Rainfall=4.20"

Area (sf)	CN	Description
9,200	98	Paved roads w/curbs & sewers, HSG B
9,200	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	300		1.00		**Direct Entry, Sheet Flow**

Subcatchment 7: Leveton Sta 32+30



Summary for Reach D1: Existing East Ditch at Herman

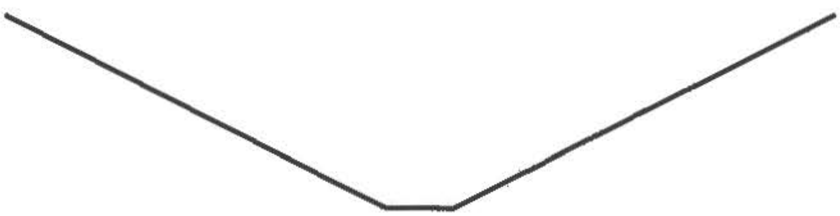
[43] Hint: Has no inflow (Outflow=Zero)

Outflow = 0.00 cfs @ 0.20 hrs, Volume= 0 cf

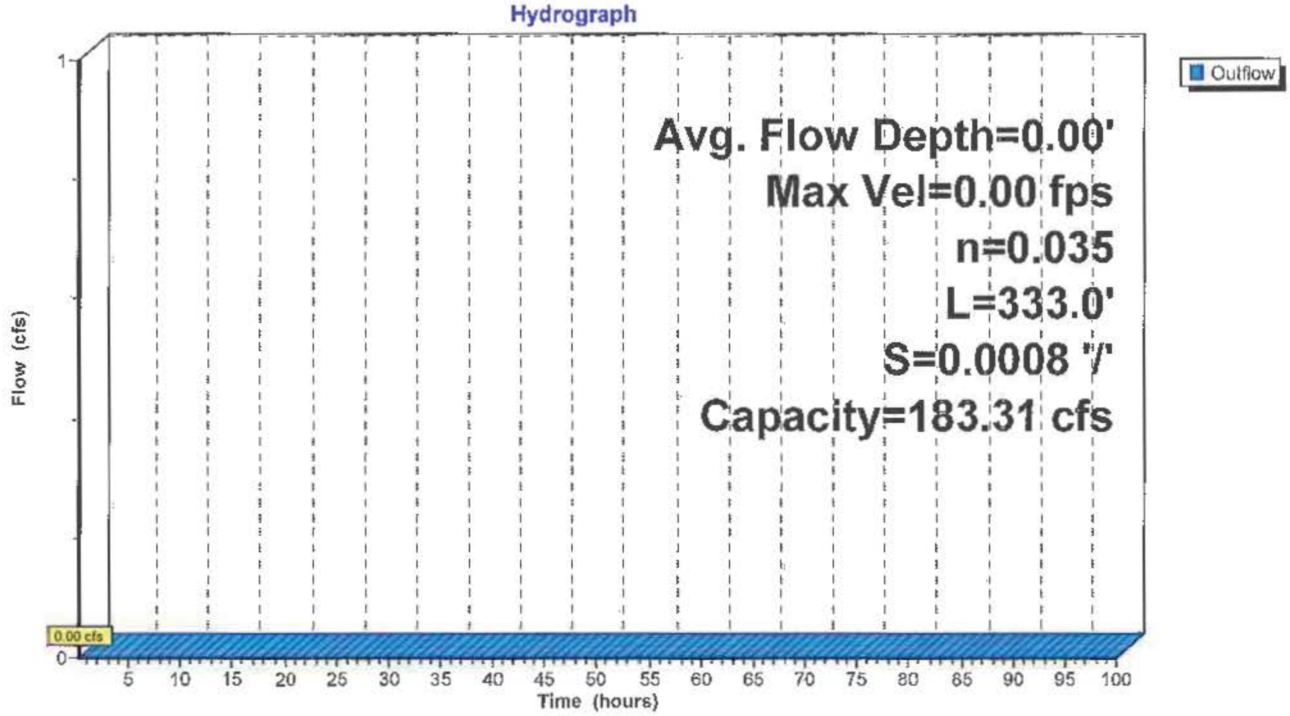
Routing by Stor-Ind+Trans method, Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 5.80' Flow Area= 78.9 sf, Capacity= 183.31 cfs

2.00' x 5.80' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 25.20'
Length= 333.0' Slope= 0.0008 '/'
Inlet Invert= 126.65', Outlet Invert= 126.40'



Reach D1: Existing East Ditch at Herman



Summary for Reach D2: Existing Center Ditch at Herman

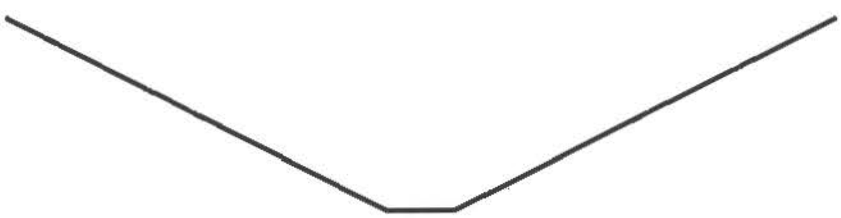
[43] Hint: Has no inflow (Outflow=Zero)

Outflow = 0.00 cfs @ 0.20 hrs, Volume= 0 cf

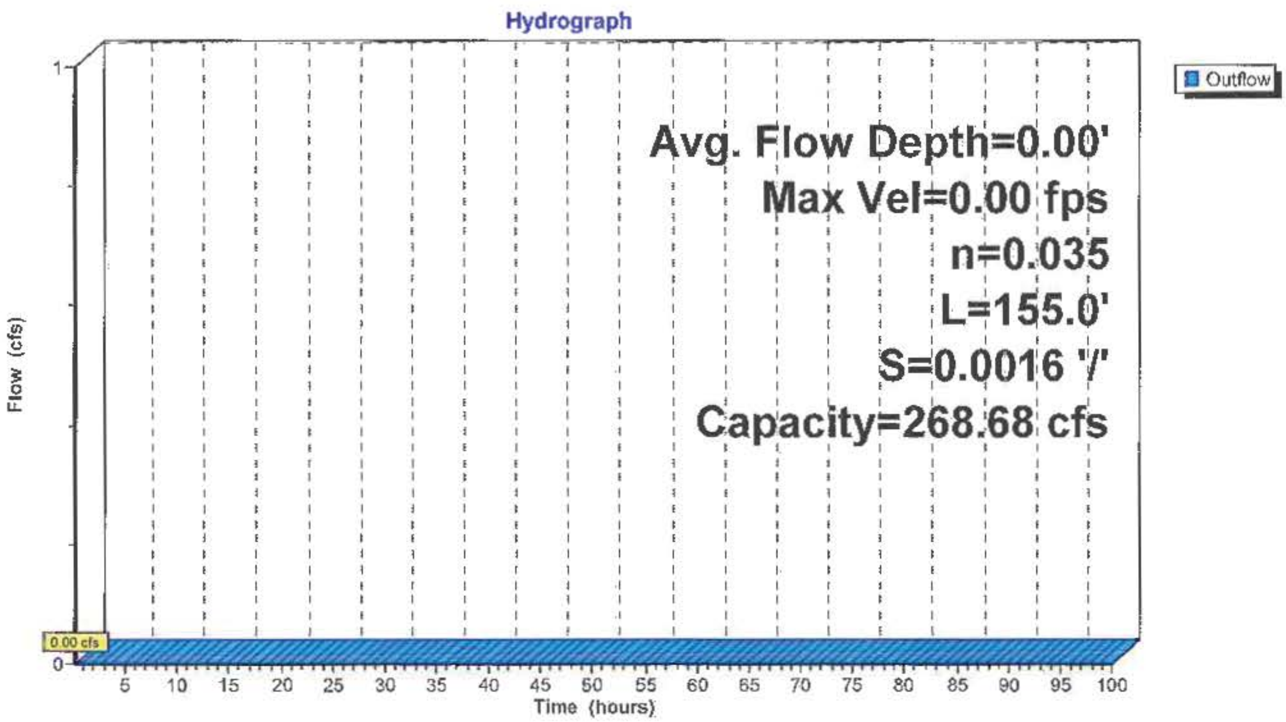
Routing by Stor-Ind+Trans method, Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 5.80' Flow Area= 78.9 sf, Capacity= 268.68 cfs

2.00' x 5.80' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 25.20'
Length= 155.0' Slope= 0.0016 '/'
Inlet Invert= 126.35', Outlet Invert= 126.10'



Reach D2: Existing Center Ditch at Herman



Summary for Reach D3: Existing West Ditch at Herman

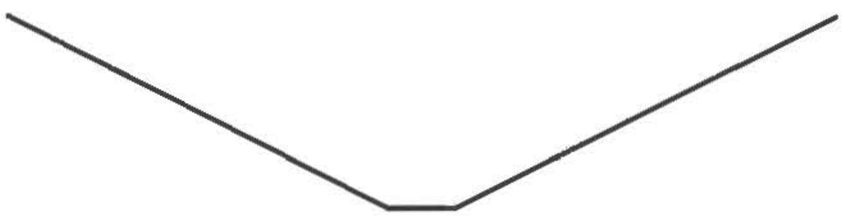
[43] Hint: Has no inflow (Outflow=Zero)

Outflow = 0.00 cfs @ 0.20 hrs, Volume= 0 cf

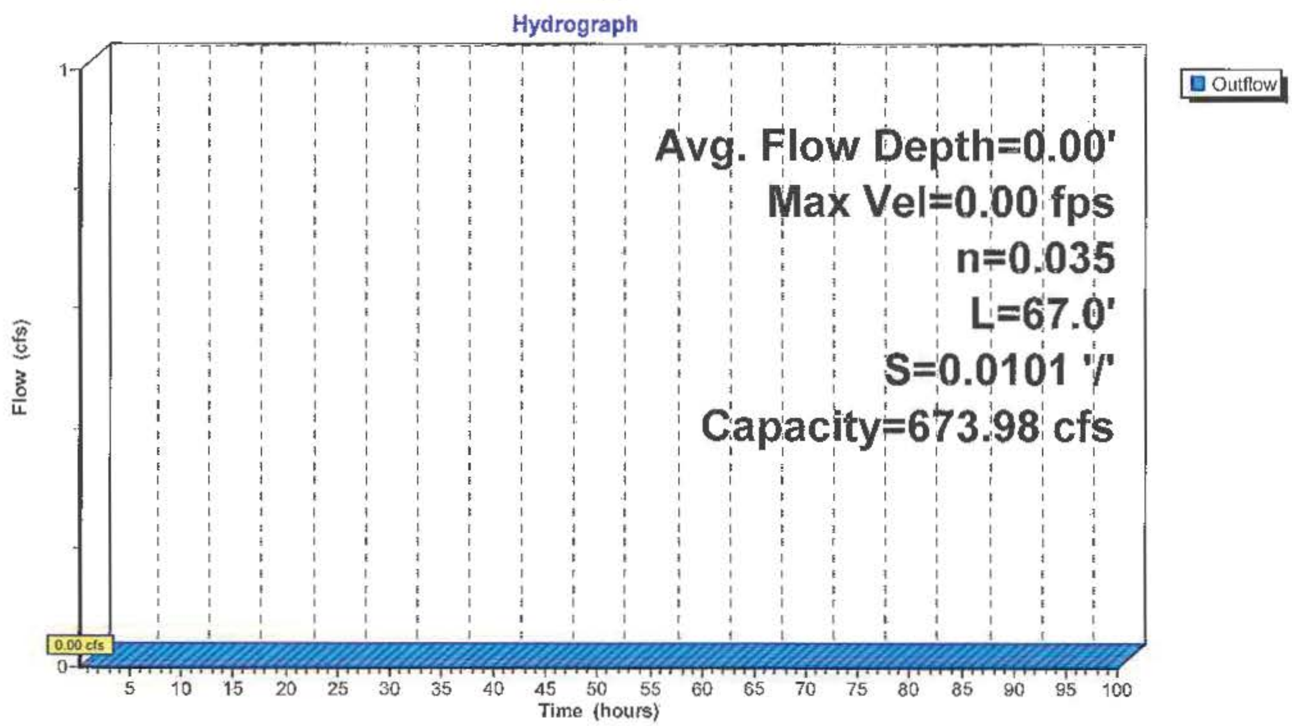
Routing by Stor-Ind+Trans method, Time Span= 0.20-100.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 5.80' Flow Area= 78.9 sf, Capacity= 673.98 cfs

2.00' x 5.80' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 25.20'
Length= 67.0' Slope= 0.0101 '/'
Inlet Invert= 126.05', Outlet Invert= 125.37'



Reach D3: Existing West Ditch at Herman



Herman Road Drainage Analysis

Final Stormwater Report: S. W. Herman Rd.-S.W. 124th Ave. To S. W. Teton Ave.

PREPARED FOR: Kaaren Hofman , City of Tualatin

PREPARED BY: Shahrzad Dey, EIT/CH2M HILL

Richard Attanasio, PE, CFM / CH2M HILL

THROUGH: Steve Katko, PE/ CH2M HILL

DATE: February 28, 2008

This Technical Memorandum was prepared for the City of Tualatin to address the stormwater improvements needed for the S. W. Herman Road from S. W. 124th Avenue to S. W. Teton Avenue. Herman Road will receive an urban section with curbs, sidewalks, street swales, and enclosed stormwater drainage system.

Existing Regulatory and Physical Conditions

Regulatory Conditions

The stormwater design standards that will be used for the S. W. Herman Road Project are the *Design and Construction Standards for Sanitary Sewer and Surface Water Management* (Clean Water Services, 2007), City of Tualatin design standards, Department of Transportation (ODOT) Hydraulics Manual. Additionally, National Marine Fisheries Service (NMFS) HCD Guidance for Stormwater was reviewed to advance compliance with the Endangered Species Act. Clean Water Services (CWS) standards are being used as guidance for the stormwater management design to assure the project meets federal Clean Water Act Standards and the stormwater management guidelines of the Oregon Department of Environmental Quality.

Existing Physical Conditions

Existing Drainage –Stormwater runoff from about S.W. 124th to S.W 108th avenue is currently collected and conveyed in roadside ditches, located on north and south sides of S. W. Herman Road. Stormwater flows from properties along S. W. Herman Road drain to the existing inlets away from the road. On the south side of S. W. Herman Road there is rail road track. There is an existing system starting about 675 feet west of S. W. 108th continuing east to the Teton Avenue.

Water quality – No engineered water quality systems currently exist on the project.

Floodplains and Drain Hazard Areas- The FEMA flood insurance map (Community Panel Numbers 410277 0001D) were reviewed (see Appendix A for FEMA Floodplain). S. W. Herman Road is not in the 100- year FEMA floodplain.

Proposed Stormwater System

Collection & Conveyance

General

The proposed stormwater collection/conveyance system for S. W. Herman Road from east of S. W. 108th Ave to the end of project at STA 66+65.00 will be a curb and gutter enclosed drainage system. Runoff from this area will be collected by inlets and then conveyed in a new piped system. The new system will connect to the existing stormwater structure at STA 66+65.00 and continue eastward to the S. W. Teton Avenue stormwater collection system.

S. W. Herman Road from STA 36+56.67 to the west of S. W. 108th Ave is proposed as a shed section. The proposed stormwater collection system for this section will be vegetated street swales located on the northern side of S. W. Herman Road. Runoff will be directed to the swales through curb openings. Stormwater will be stored and infiltrated along the swales length. Check dam will be installed to slow and detain the flow. During high flow runoff that does not infiltrate will be collected by swale inlets and conveyed in a piped system and directed to the creek crossing at STA 52+00.00.

From the beginning of the project to STA 36+56.67, the proposed stormwater collection/conveyance system will be a curb and gutter enclosed drainage system as well as vegetated street swales. From STA 16+11.67 to S.W. 118th Ave a curb and gutter enclosed drainage system located on the south side of S. W. Herman road and vegetated street swales on the North side. From S. W. 118th Ave to STA 36+56.67 the road is a shed section and street swales are located on the north side of the street. Runoff from STA 16+11.67 to S. W. 118th Ave will be collected by inlets located south of S. W. Herman Road and then conveyed in a piped system going eastward to S.W. 118th Ave. The rest of the runoff will be directed to the street swales located on the north side of S. W. Herman Road through curb cuts. During high flow runoff that does not infiltrate will be collected by inlets and conveyed in a piped system and directed east ward to S. W. 118th Ave. Flow from STA 36+56.67 will be collected in the street swales through curb openings. Flow will be stored and infiltrated along the swales length. Flow that does not infiltrate will be directed east ward to S.W. 118th Ave through swale inlets and a piped system during high season. Check dams will be installed to slow and detain the flow. Flows from east and west of S. W. 118th Ave. will be co-mingled and conveyed northward through a 18" pipe to the existing creek crossing located north – east of S. W. 118th Ave.

At the intersection of S. W. Herman Road and S.W. 118th Ave a CDS unit, PMSU 20-15-4, will be installed to provide pretreatment prior to the flow entering the creek crossing located north – east of S. W. 118th Ave. CDS unit is capable of capturing and retaining pollutants such as trash and debris, total suspended solids, sediments, and oil and grease.

PMSU 20-15-4 has a minimum treatment flow capacity of 0.7 cfs with a minimum sump volume of 0.5 cubic yard for storage of sediments, trash and debris, and organic solids.

Culverts

Presently there is an existing 30-inch concrete culvert under S. W. Herman Road at road station 52+00. Upstream, to the north of the road, a large wetland complex discharges to the culvert under Herman Road. Discharge from the wetland complex is currently controlled by a concrete structure with an orifice and weir configuration. The culvert discharges to the ditch between the railroad to the south and Herman Road. The flow is carried through the railroad embankment to a Hedges Creek tributary, south of the railroad, by a 36-inch concrete culvert. There are reports of Herman Road being submerged during previous high water events; however, it is unclear whether this is a result of backwater from Hedges Creek or inadequate culvert capacity.

Previous studies identified the 25-year flow incident to Herman Road as 65 cfs, based on commercial build-out of the upstream tributary area. As part of the Herman Road improvement project the culvert capacity is to upgraded to pass the 25-year flow.

There are design constraints related to the culvert improvements. The railroad wants to assure that the culvert capacity under their embankment is equal to the culvert capacity under the road. The railroad requires steel casing for pipe crossings under their right of way, which present constraints on installing large culverts due to the lack of cover. From culvert invert to top of ballast is approximately six feet.

We propose installing a 36-inch and 18-inch culvert under the road by open cut. Then we will improve conveyance under the railroad embankment by installing an 18-inch culvert using trenchless technology. This will provide equal conveyance under the road and railroad, while providing adequate cover for the culvert casing and preventing track heave during the installation process. To reduce backwater during normal flow conditions approximately 130-lineal feet of the downstream channel will require maintenance to restore channel capacity. Hydraulic calculations are contained in Appendix D. The railroads could potentially require a 24-inch minimum culvert size.

Design Criteria

Inlet/Catch Basin Spacing

Inlet/catch basins for S. W. Herman Road are curb inlets. CG-48 inlets and single flanking inlets are used in sags on the south side of the Herman Road. Area Drain (Type II) is used in swales on the northern side of S. W. Herman road. Curb Cuts are used along the swales on northern side of S. W. Herman Road. Other inlets are CG-30s.

Design Criteria:

- Design Storm Event: 5-minute, 25-year rainfall intensity
- Sag inlet capacities are based on 25-year rainfall intensity.
- Maximum gutter flow spread: 6′ shoulder width.

Conveyance System

The conveyance system will be designed to convey at least the peak, post-development runoff for the 25-year design storm event. The piped storm system will be designed to convey the 25-year flow without surcharge.

Additional Design Criteria:

- Design Storm Event: 25-year, 24-hour return event
- Pipe Slope – Sufficient slope to maintain a minimum flow velocity of 3 feet per second when flowing half or full
- Distance between structures – Distance for storm system mains will be controlled by the inlet/catch basin spacing. The maximum distance between structure is 400-feet for 12-inch or larger pipe
- Minimum Pipe size – 10-inch diameter for inlet/catch basin leads, within right-of-way; 12-inch (300 mm) diameter for main line Pipe Outlet Protection

A bio-protected riprap outlet pad will be provided at the outlet of all storm pipes that discharge to creek crossing.

Stormwater Quality Facility

General

Water quality during construction will be provided by controlling erosion and stormwater impacts in accordance with the City of Tualatin design Standards and the Clean Water Services Design and Construction Standards.

Stormwater runoff from the roadway between Sta. 17+50 and Sta. 51+55.00 will be treated by street swales. Street swales are planted or grassed open channels that trap pollutants by filtering and slowing flows, allowing particles to settle out. A 1.5' long Curb cut will be installed at about every 60-70 foot (the intervals maybe different at some location) to allow the runoff to enter the street swales. The streets swales are located within the landscaped areas between the curb line and sidewalks on north side of S. W. Herman Road. The minimum top width of the street swales will be 6.5 feet.

Check dams will be installed to slow and detain the flow. This will create a temporary surface storage area during larger storm events and evenly distribute the incoming gutter flow to prevent erosion of the vegetated swales. After the onset of a rain event, the area behind the check dams will fill ponding water for infiltration and treatment. Water quality improvement is achieved by the settling out of particulates in the water column and by the biological and chemical action of the water. During high flow any surface flow that does not infiltrated will enter the swale inlets for conveyance. The swales provide treatment prior to the flow entering creek crossings.

A CDS unit will be installed at intersection of S. W. Herman Road and S.W. 118th Ave to provide pretreatment prior to the flow entering the creek crossing located north – east of S. W. 118th Ave.

The following table summarizes the pre and post project impervious areas and proposed areas of water quality treatment for S. W. Herman Rd.

Segment F: Impervious Areas Treated

	Area (SF)	Area (Ac)
Existing Impervious Area	164,168	3.77
Proposed Impervious Area	306,616	7.04
New Impervious Area	142,448	3.27
Area Treated from Herman Rd	214,100	4.92
Percent of New Impervious in Herman Rd Treated	150%	150%

Design Criteria

The design criteria in the *Design and Construction Standards for Sanitary Sewer and Surface Water Management Manual* (CWS, 2007) were used to design the runoff treatment system for this project.

The design criteria for the Low Impact Development Approaches (LIDA) for street swales (CWS, 2007) are as follows:

- Sizing factor of 0.12 should be used to calculate the required surface area of street swales.
- LIDA may be used in combination or with standard water quantity and quality facilities.

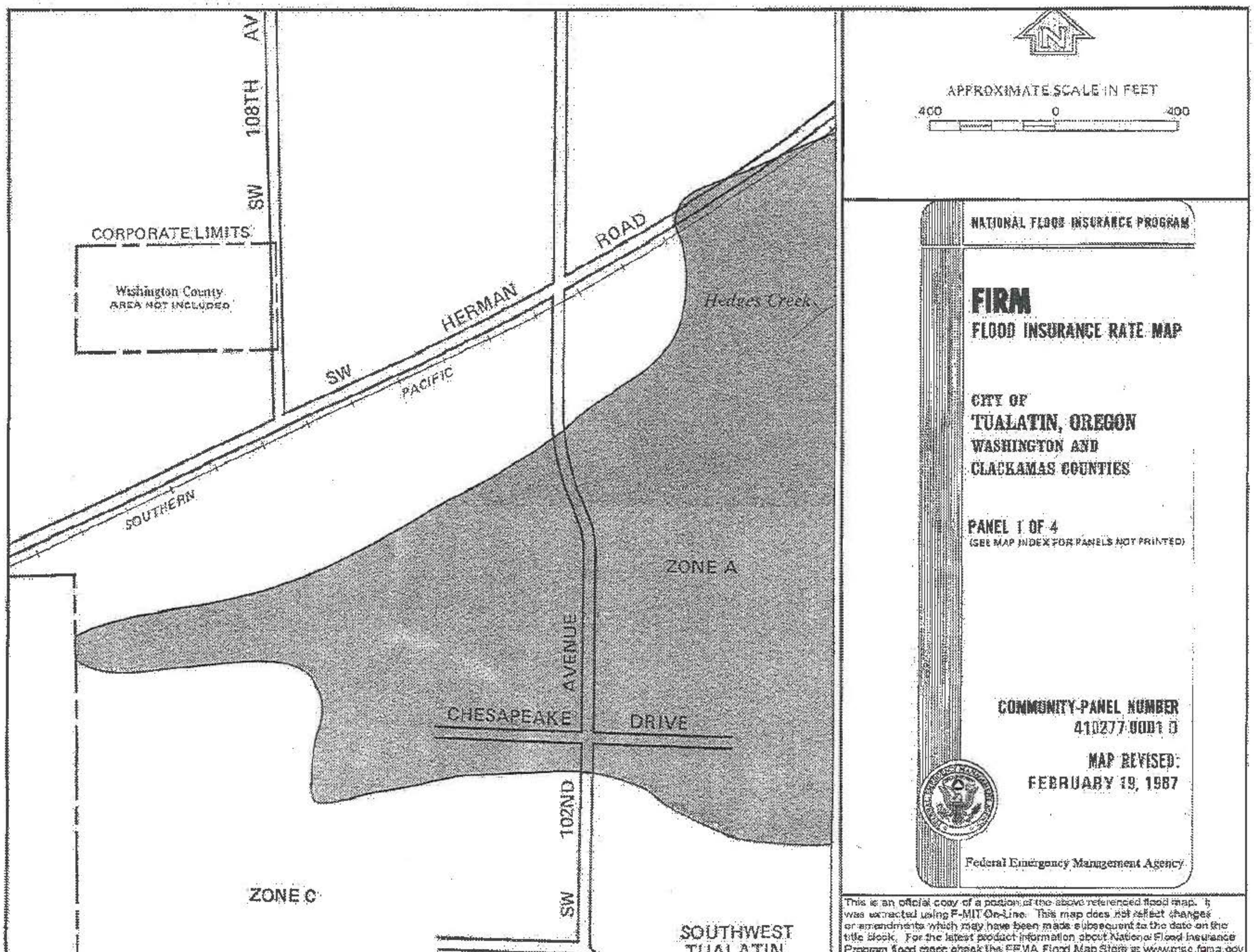
Table 2 displays the stormwater quality volume and flow.

S. W. Herman Road	STA 15+00 to STA 67+00
CWS WQ Volume	4,273 ft^3
CWS WQ Flow	0.30 cfs

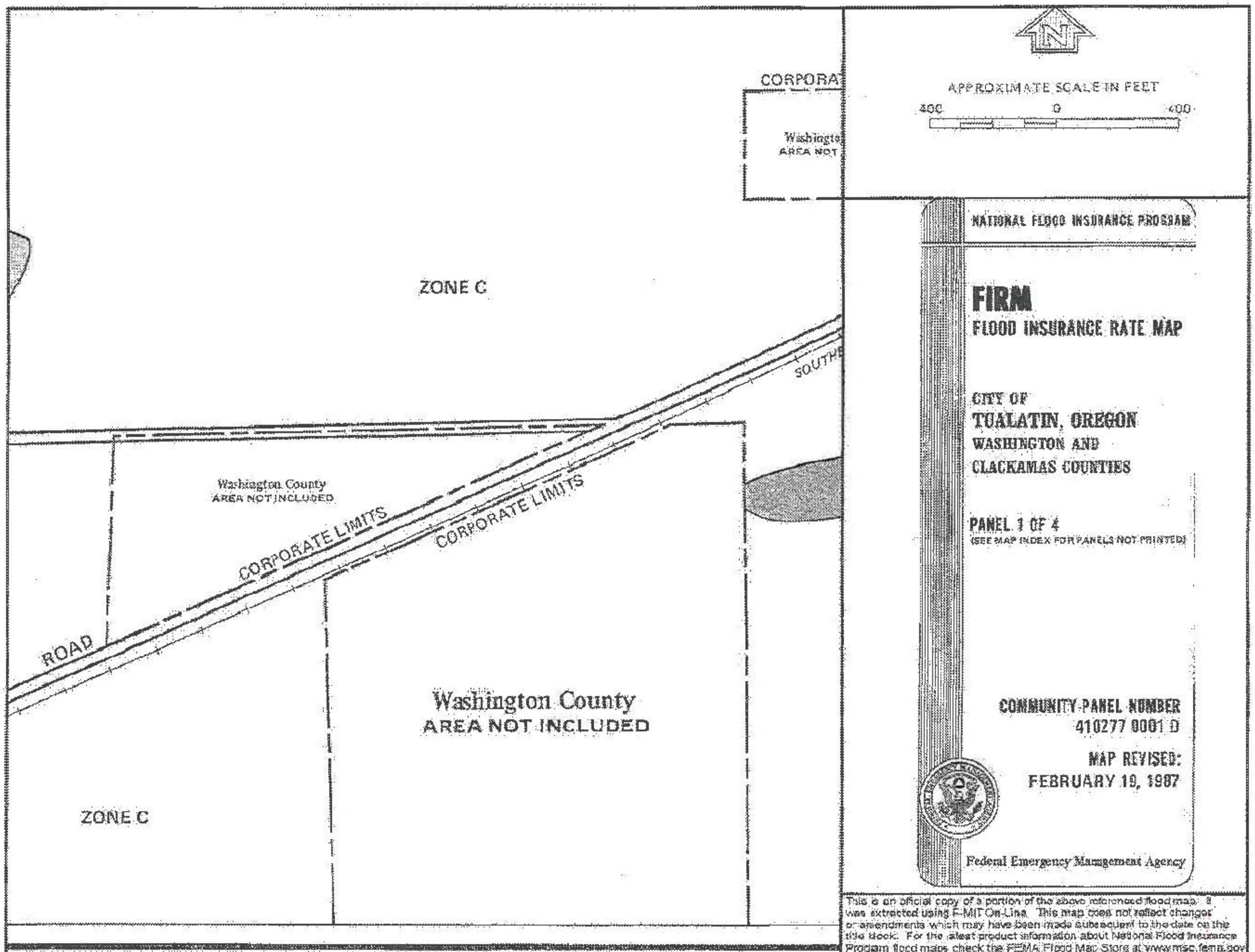
Stormwater Quantity Control

Quantity control is provided by the street swales discussed above. Stormwater in the street swale segment will retain the stormwater collected in the swale. The minimum storage volume of the street swales from the beginning of the project to the end is about 4,813 ft^3 assuming 6" of storage. Water will be stored and infiltrated into the ground through porous media or will be taken up by the plants through transpiration. Any surface flow that does not infiltrate will enter the swale inlets for conveyance.

APPENDIX A
FIGURES



SW 108TH AV
CORPORATE LIMITS
Washington County
AREA NOT INCLUDED
SW HERMAN ROAD
SOUTHERN PACIFIC
Hedges Creek
ZONE A
SW 102ND AVENUE
CHESAPEAKE DRIVE
ZONE C
SOUTHWEST TUALATIN
APPROXIMATE SCALE IN FEET
400 0 400
N
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
CITY OF
TUALATIN, OREGON
WASHINGTON AND
CLACKAMAS COUNTIES
PANEL 1 OF 4
(SEE MAP INDEX FOR PANELS NOT PRINTED)
COMMUNITY-PANEL NUMBER
410277 0001 D
MAP REVISED:
FEBRUARY 19, 1987
Federal Emergency Management Agency
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



APPROXIMATE SCALE IN FEET
400
0
400
CORPORAT
Washingto
AREA NOT
ZONE C
SOUTHE
Washington County
AREA NOT INCLUDED
CORPORATE LIMITS
CORPORATE LIMITS
ROAD
Washington County
AREA NOT INCLUDED
ZONE C
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
CITY OF
TUALATIN, OREGON
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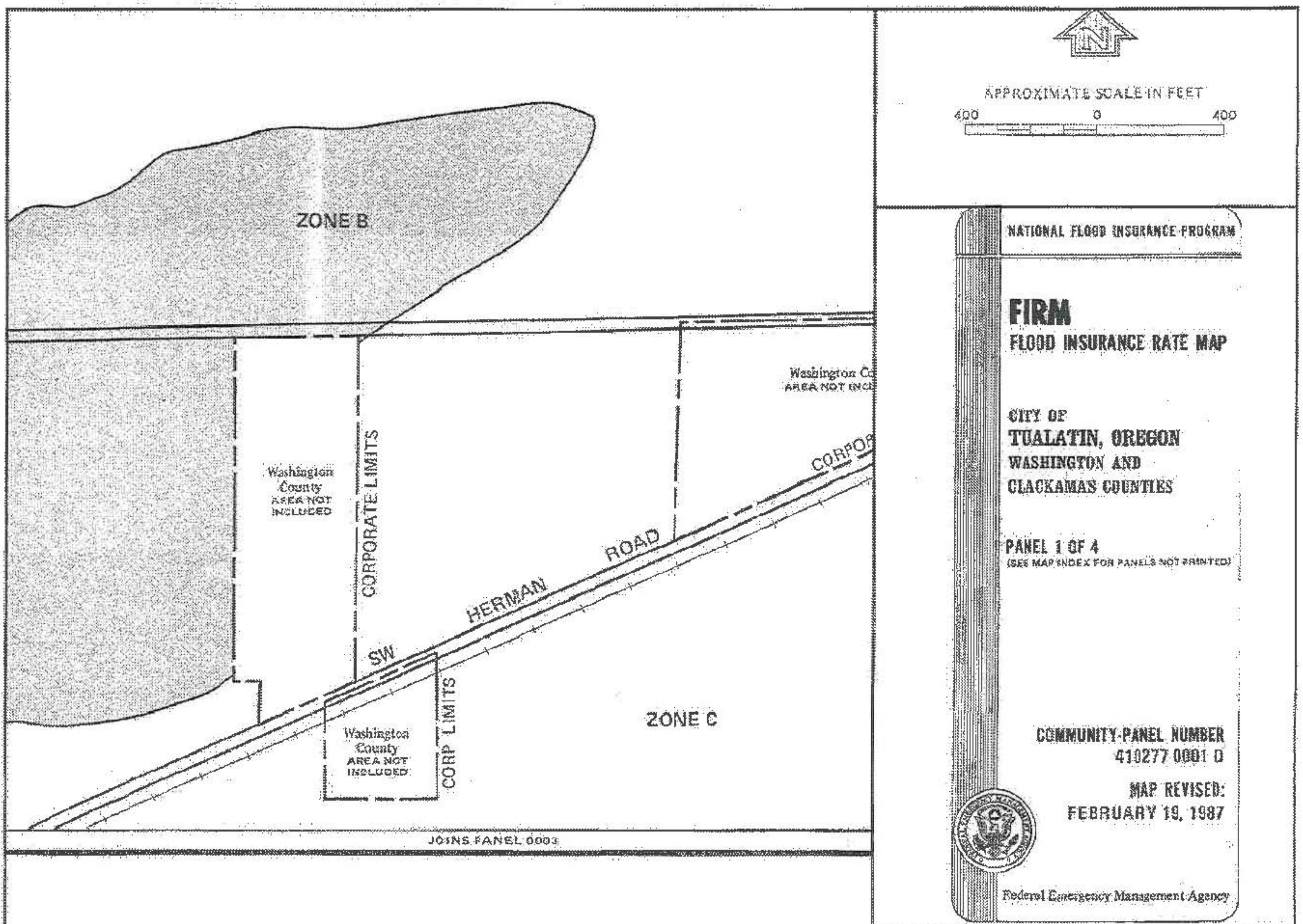

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APPENDIX B
DRAINAGE CALCULATIONS

Herman Road -
INLET PLACEMENT

Inlet Placement
Project: Herman Road
Job Number: 352590

Location	Inlet No.	From STA	To STA	Section Width (ft)	Section Length (ft)	Area (ft^2)	Area (ac)	C 0.90	CA	Tc to CO (min)	Intensity I (in/hr)	Flow Q (cfs)	Slope: Pavement Long. SL (ft/ft)	Slope: Pavement Cross Sx (ft/ft)	Slope: Equiv. Cross Se	Pavement Manning's n 0.016	Prev. Bypass Qb (cfs)	Total Gutter Qg (cfs)	Depth D (ft)	Opening Length L (ft)	L_T (ft)	Spread T (ft)	W/T	Inlet Type	Gutter Width W (ft)	Gutter Velocity V_g (ft/sec)	Eo	Efficiency E	Rf	Rs	Intercept Flow Qi (cfs)	Bypass Flow (cfs)
STA 13+95 to 66+65																																
Existing inlet - Right	13+95.00	13+95.00	15+28.00	25.0	133	3325	0.08	0.90	0.07	5.00	3.88	0.27	0.0040	0.0200	0.1000	0.016	0.00	0.27	0.10	2.50	3.13	5.24	0.38	CG-3	2.00	0.97	0.72	0.94	1.00	0.54	0.25	0.01
Right	15+28.00	15+28.00	16+11.67	25.0	84	2092	0.05	0.90	0.04	5.00	3.88	0.17	0.0040	0.0200	0.1000	0.016	0.00	0.17	0.09	2.50	2.57	4.40	0.45	CG-3	2.00	0.86	0.80	1.00	1.00	0.59	0.17	0.00
Right	18+10.00	16+11.67	18+10.00	25.0	198	4958	0.11	0.90	0.10	5.00	3.88	0.40	0.0056	0.0200	0.1000	0.016	0.00	0.40	0.11	2.50	4.09	5.71	0.35	CG-3	2.00	1.21	0.68	0.82	1.00	0.44	0.32	0.07
SAG - Right	19+04.67	18+10.00	20+80.00	25.0	270	6750	0.15	0.90	0.14	5.00	3.88	0.54	0.0056	0.0200	0.1000	0.016	0.14	0.68	0.12	4.00	5.14	5.80	0.34	CG-4S	2.00	1.23	0.68	0.93	1.00	0.69	0.64	0.05
Flank inlet - Right	19+14.67																															
Right	20+80.00	20+80.00	22+81.25	25.0	201	5031	0.12	0.90	0.10	5.00	3.88	0.40	0.0051	0.0200	0.1000	0.016	0.00	0.40	0.12	2.50	4.00	5.85	0.34	CG-3	2.00	1.18	0.67	0.83	1.00	0.45	0.33	0.07
Right	22+81.25	22+81.25	24+70.00	25.0	189	4719	0.11	0.90	0.10	5.00	3.88	0.38	0.0045	0.0200	0.1000	0.016	0.00	0.38	0.12	2.50	3.75	5.84	0.34	CG-3	2.00	1.10	0.67	0.86	1.00	0.48	0.33	0.05
Right	26+30.00	24+70.00	26+30.00	25.0	160	4000	0.09	0.90	0.08	5.00	3.88	0.32	0.0045	0.0200	0.1000	0.016	0.05	0.37	0.12	2.50	3.73	5.81	0.34	CG-3	2.00	1.10	0.68	0.86	1.00	0.48	0.32	0.05
Right	27+00.00	26+30.00	27+00.00	25.0	70	1750	0.04	0.90	0.04	5.00	3.88	0.14	0.0045	0.0200	0.1000	0.016	0.05	0.19	0.09	2.50	2.82	4.52	0.44	CG-3	2.00	0.93	0.79	0.98	1.00	0.56	0.19	0.00
Right	28+43.00	27+00.00	28+43.00	25.0	143	3575	0.08	0.90	0.07	5.00	3.88	0.29	0.0045	0.0200	0.1000	0.016	0.00	0.29	0.11	2.50	3.36	5.29	0.38	CG-3	2.00	1.03	0.72	0.91	1.00	0.51	0.27	0.02
Right	61+80.00	60+54.57	61+80.00	25.0	125	3136	0.07	0.90	0.06	5.00	3.88	0.25	0.0040	0.0200	0.1000	0.016	0.00	0.25	0.10	2.50	3.05	5.12	0.39	CG-3	2.00	0.95	0.73	0.95	1.00	0.54	0.24	0.01
Right	63+10.00	61+80.00	63+10.00	25.0	130	3250	0.07	0.90	0.07	5.00	3.88	0.26	0.0040	0.0200	0.1000	0.016	0.01	0.27	0.11	2.50	3.15	5.28	0.38	CG-3	2.00	0.97	0.72	0.94	1.00	0.54	0.26	0.02
Right	64+10.00	63+10.00	64+10.00	25.0	100	2500	0.06	0.90	0.05	5.00	3.88	0.20	0.0040	0.0200	0.1000	0.016	0.02	0.22	0.10	2.50	2.87	4.85	0.41	CG-3	2.00	0.92	0.76	0.98	1.00	0.56	0.21	0.01
Right	65+25.00	64+10.00	65+25.00	25.0	115	2875	0.07	0.90	0.06	5.00	3.88	0.23	0.0040	0.0200	0.1000	0.016	0.01	0.24	0.10	2.50	2.97	5.00	0.40	CG-3	2.00	0.94	0.74	0.96	1.00	0.55	0.23	0.01
Right	66+65.00	65+25.00	66+65.00	25.0	140	3500	0.08	0.90	0.07	5.00	3.88	0.28	0.0040	0.0200	0.1000	0.016	0.01	0.29	0.11	2.50	3.24	5.40	0.37	CG-3	2.00	0.99	0.71	0.93	1.00	0.53	0.27	0.02
Existing inlet - Left	13+95.00	13+95.00	15+28.00	25.0	133	3325	0.08	0.90	0.07	5.00	3.88	0.27	0.0040	0.0200	0.1000	0.016	0.00	0.27	0.10	2.50	3.13	5.24	0.38	CG-3	2.00	0.97	0.72	0.94	1.00	0.54	0.25	0.01
Left	15+28.00	15+28.00	16+11.67	25.0	84	2092	0.05	0.90	0.04	5.00	3.88	0.17	0.0040	0.0200	0.1000	0.016	0.00	0.17	0.09	2.50	2.57	4.40	0.45	CG-3	2.00	0.86	0.80	1.00	1.00	0.59	0.17	0.00
Left	17+55.00	16+11.67	17+55.00	25.0	143	3583	0.08	0.90	0.07	5.00	3.88	0.29	0.0056	0.0200	0.1400	0.016	0.00	0.29	0.10	1.50	2.92	5.06	0.40	C-CUT	2.00	1.12	0.74	0.73	1.00	0.22	0.21	0.08
Left	18+35.00	17+55.00	18+35.00	25.0	80	2000	0.05	0.90	0.04	5.00	3.88	0.16	0.0056	0.0200	0.1400	0.016	0.08	0.24	0.09	1.50	2.70	4.72	0.42	C-CUT	2.00	1.07	0.77	0.77	1.00	0.23	0.18	0.06
SAG - Left	19+05.00	18+35.00	19+65.00	25.0	130	3250	0.07	0.90	0.07	5.00	3.88	0.26	0.0056	0.0200	0.1000	0.016	0.09	0.35	0.11	1.50	3.87	5.44	0.37	C-CUT	2.00	1.17	0.71	0.59	1.00	0.20	0.20	0.14
Left	19+65.00	19+65.00	20+45.00	25.0	80	2000	0.05	0.90	0.04	5.00	3.88	0.16	0.0051	0.0200	0.1400	0.016	0.03	0.19	0.09	1.50	2.39	4.42	0.45	C-CUT	2.00	0.98	0.80	0.83	1.00	0.26	0.16	0.03
Left	20+45.00	20+45.00	21+25.00	25.0	80	2000	0.05	0.90	0.04	5.00	3.88	0.16	0.0051	0.0200	0.1400	0.016	0.03	0.19	0.09	1.50	2.37	4.39	0.46	C-CUT	2.00	0.97	0.80	0.83	1.00	0.26	0.16	0.03
Left	21+25.00	21+25.00	22+05.00	25.0	80	2000	0.05	0.90	0.04	5.00	3.88	0.16	0.0051	0.0200	0.1400	0.016	0.02	0.18	0.09	1.50	2.33	4.31	0.46	C-CUT	2.00	0.96	0.81	0.85	1.00	0.27	0.15	0.03
Left	22+05.00	22+05.00	22+81.25	25.0	76	1906	0.04	0.90	0.04	5.00	3.88	0.15	0.0051	0.0200	0.1400	0.016	0.00	0.15	0.08	1.50	2.18	4.06	0.49	C-CUT	2.00	0.92	0.84	0.88	1.00	0.28	0.13	0.02
Left	23+67.00	22+81.25	23+67.00	25.0	86	2144	0.049	0.90	0.04	5.00	3.88	0.17	0.0045	0.0200	0.1400	0.016	0.00	0.17	0.09	1.50	2.20	4.35	0.46	C-CUT	2.00	0.91	0.81	0.87	1.00	0.29	0.15	0.02
Left	24+47.00	23+67.00	24+47.00	25.0	80	2000	0.046	0.90	0.04	5.00	3.88	0.16	0.0045	0.0200	0.1400	0.016	0.02	0.18	0.09	1.50	2.26	4.44	0.45	C-CUT	2.00	0.92	0.80	0.86	1.00	0.28	0.16	0.03
Left	25+27.00	24+47.00	25+27.00	25.0	80	2000	0.046	0.90	0.04	5.00	3.88	0.16	0.0045	0.0200	0.1400	0.016	0.03	0.19	0.09	1.50	2.28	4.48	0.45	C-CUT	2.00	0.92	0.79	0.86	1.00	0.28	0.16	0.03
Left	26+10.00	25+27.00	26+10.00	25.0	83	2075	0.048	0.90	0.04	5.00	3.88	0.17	0.0045	0.0200	0.1400	0.016	0.03	0.19	0.09	1.50	2.31	4.54	0.44	C-CUT	2.00	0.93	0.79	0.85	1.00	0.28	0.16	0.03
Left	27+00.00	26+10.00	27+00.00	25.0	90	2250	0.052	0.90	0.05	5.00	3.88	0.18	0.0045	0.0200	0.1400	0.016	0.03	0.21	0.09	1.50	2.39	4.68	0.43	C-CUT	2.00	0.95	0.77	0.83	1.00	0.27	0.17	0.04
Left	28+75.00	27+00.00	28+75.00	25.0	175	4375	0.10	0.90	0.09	5.00	3.88	0.35	0.0045	0.0200	0.1400	0.016	0.04	0.39	0.12	1.50	3.09	5.89	0.34	C-CUT	2.00	1.11	0.67	0.70	1.00	0.22	0.27	0.12
Left	29+30.00	28+75.00	29+30.00	50.0	55	2750	0.06	0.90	0.06	5.00	3.88	0.22	0.0045	0.0200	0.1400	0.016	0.12	0.34	0.11	1.50	2.92	5.60	0.36	C-CUT	2.00	1.07	0.69	0.73	1.00	0.23	0.25	0.09
Left	29+80.00	29+30.00	29+80.00	50.0	50	2500	0.06	0.90	0.05	5.00	3.88	0.20	0.0045	0.0200	0.1400	0.016	0.09	0.29	0.11	1.50	2.75	5.31	0.38	C-CUT	2.00	1.04	0.72	0.76	1.00	0.24	0.22	0.07
Left	30+30.00	29+80.00	30+30.00	50.0	50	2500	0.06	0.90	0.05	5.00	3.88	0.20	0.0045	0.0200	0.1400	0.016	0.07	0.27	0.10	1.50	2.67	5.16	0.39	C-CUT	2.00	1.02	0.73	0.77	1.00	0.25	0.21	0.06
Left	31+05.00	30+30.00	31+05.00	50.0	75	3750	0.09	0.90	0.08	5.00	3.88	0.30	0.0045	0.0200	0.1400	0.016	0.06	0.36	0.11	1.50	3.01	5.75	0.35	C-CUT	2.00	1.09	0.68	0.71	1.00	0.22	0.26	0.10
Left	31+50.00	31+05.00	31+50.00	50.0	45	2250	0.05	0.90	0.05	5.00	3.88	0.18	0.0045	0.0200	0.1400	0.016	0.10	0.28	0.11	1.50	2.72	5.25	0.38	C-CUT	2.00	1.03	0.72	0.76	1.00	0.24	0.22	0.07
Left	31+90.00	31+50.00	31+90.00	50.0	40	2000	0.05	0.90	0.04	5.00	3.88	0.16	0.0045	0.0200	0.1400	0.016	0.07	0.23	0.10	1.50	2.48	4.83	0.41	C-CUT	2.00	0.97	0.76	0.81	1.00	0.26	0.19	0.04
SAG - Left	32+25.88	31+90.00	32+40.00	50.0	50	2500	0.06	0.90	0.05	5.00	3.88	0.20	0.0045	0.0200	0.1400	0.016	0.17	0.37	0.12	1.50	3.03	5.78	0.35	C-CUT	2.00	1.10	0.68	0.71	1.00	0.22	0.26	0.11
Left	32+40.00	32+40.00	33+10.00	50.0	70	3500	0.08	0.90	0.07	5.00	3.88	0.28	0.0040	0.0200	0.1400	0.016	0.08	0.37	0.12	1.50	2.92	5.90	0.34	C-CUT	2.00	1.05	0.67	0.73	1.00	0.24	0.27	0.10
Left	33+10.00	33+10.00	33+70.00	50.0	60	3000	0.07	0.90	0.06	5.00	3.88	0.24	0.0040	0.0200	0.1400	0.016	0.09	0.33	0.11	1.50	2.83	5.71	0.35	C-CUT	2.00	1.02	0.68	0.75	1.00	0.24	0.25	0.08
Left	33+70.00	33+70.00	34+40.00	50.0	70	3500	0.08	0.90	0.07	5.00	3.88	0.28	0.0040	0.0200	0.1400	0.016	0.07	0.35	0.12	1.50	2.88	5.83	0.34	C-CUT	2.00	1.04	0.67	0.73	1.00	0.24	0.26	0.09
Left	34+40.00	34+40.00	35+00.00	50.0	60	3000	0.07	0.90	0.06	5.00	3.88	0.24	0.0040	0.0200	0.1400	0.016	0.07	0.31	0.11	1.50	2.72	5.55	0.36	C-CUT	2.00	1.01	0.70	0.76	1.00	0.25	0.24	0.07
Left	35+00.00	35+00.00	35+60.00	50.0	60	3000	0.07	0.90	0.06	5.00	3.88	0.24	0.0040	0.0200	0.1400	0.016	0.06	0.30	0.11	1.50	2.69	5.49	0.36	C-CUT	2.00	1.00	0.70	0.77	1.00	0.25	0.23	0.07
Left	35+60.00	35+60.00	36+30.00	50.0	70	3500	0.08	0.90	0.07	5.00	3.88	0.28	0.0040	0.0200	0.1400	0.016	0.00	0.28	0.11	1.50	2.62	5.36	0.37	C-CUT	2.00	0.98	0.71	0.78	1.00	0.26	0.22	0.06
Left	36+30.00	36+30.00	36+56.67	50.0	27	1334	0.03	0.90	0.03	5.00	3.88	0.11	0.0040	0.0200	0.1400	0.016	0.00	0.11	0.07	1.50	1.74	3.72	0.54	C-CUT	2.00	0.77	0.87	0.97	1.00	0.35	0.10	0.00
Left	36+80.00	36+56.79	36+80.00	50.0	23	1161	0.03	0.90	0.02	5.00	3.88	0.09	0.0035	0.0200	0.1400	0.016	0.00	0.09	0.07	1.50	1.58	3.62	0.55	C-CUT	2.00	0.71	0.88	1.00	1.00	0.39	0.09	0.00
Left	37+60.00	36+80.00	37+60.00	50.0	80	4000	0.09	0.90	0.08	5.00	3.88	0.32	0.0035	0.0200	0.1400	0.016	0.00	0.32	0.12	1.50	2.65	5.76	0.35	C-CUT	2.00	0.96	0.68	0.78	1.00	0.27	0.25	0.07
Left	38+20.00	37+60.00	38+20.00	50.0	60	3000	0.07	0.90	0.06	5.00	3.88	0.24	0.0035	0.0200	0.1400	0.016	0.07	0.31	0.11	1.50	2.62	5.70	0.35	C-CUT	2.00	0.96	0.68	0.78	1.00	0.27	0.24	0.07
Left	38+90.00	38+20.00	38+90.00	50.0	70	3500	0.08	0.90	0.07	5.00	3.88	0.28	0.0035	0.0200	0.1400	0.016	0.07	0.35	0.12	1.50	2.75	5.94	0.34	C-CUT	2.00	0.98	0.67	0.76	1.00	0.26	0.26	0.08

Herman Road -
INLET PLACEMENT

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Inlet Placement**												
2	**Project:**	**Herman Road**											
3	**Job Number:**	**352590**											
5–8	Location	Inlet No.	From STA	To STA	Section Width (ft)	Section Length (ft)	Area (ft^2)	Area (ac)	C 0.90	CA	Tc to CO (min)	Intensity I (in/hr)	Flow Q (cfs)
9	STA 13+95 to 66+65												
65	Left	39+12.00	39+90.00	39+12.00	50.0	22	1100	0.03	0.90	0.02	5.00	3.88	0.09
66	Left	39+72.00	39+12.00	39+72.00	50.0	60	3000	0.07	0.90	0.06	5.00	3.88	0.24
67	Left	40+10.00	39+72.00	40+10.00	50.0	38	1900	0.04	0.90	0.04	5.00	3.88	0.15
68	Left	40+80.00	40+10.00	40+80.00	50.0	70	3500	0.08	0.90	0.07	5.00	3.88	0.22
69	Left	41+53.00	40+80.00	41+53.00	50.0	73	3650	0.08	0.90	0.08	5.00	3.88	0.29
70	Left	42+20.00	41+53.00	42+20.00	50.0	67	3350	0.08	0.90	0.07	5.00	3.88	0.27
71	Left	42+75.00	42+20.00	42+75.00	50.0	55	2750	0.06	0.90	0.06	5.00	3.88	0.22
72	Left	43+40.00	42+75.00	43+40.00	50.0	65	3250	0.07	0.90	0.07	5.00	3.88	0.26
73	Left	44+05.00	43+40.00	44+05.00	50.0	65	3250	0.07	0.90	0.07	5.00	3.88	0.26
74	Left	44+70.00	44+05.00	44+70.00	50.0	65	3250	0.07	0.90	0.07	5.00	3.88	0.26
75	Left	45+35.00	44+70.00	45+35.00	50.0	65	3250	0.07	0.90	0.07	5.00	3.88	0.26
76	Left	46+00.00	45+35.00	46+00.00	50.0	65	3250	0.07	0.90	0.07	5.00	3.88	0.26
77	Left	46+65.00	46+00.00	46+65.00	50.0	65	3250	0.07	0.90	0.07	5.00	3.88	0.26
78	Left	47+30.00	46+65.00	47+30.00	50.0	65	3250	0.07	0.90	0.07	5.00	3.88	0.26
79	Left	47+90.00	47+30.00	47+90.00	50.0	60	3000	0.07	0.90	0.06	5.00	3.88	0.24
80	Left	48+50.00	47+90.00	48+50.00	50.0	60	3000	0.07	0.90	0.06	5.00	3.88	0.24
81	Left	48+95.00	48+50.00	48+95.00	50.0	45	2250	0.05	0.90	0.05	5.00	3.88	0.18
82	SAG - Left	49+10.00	48+95.00	49+50.00	50.0	55	2750	0.06	0.90	0.06	5.00	3.88	0.22
83	Left	49+50.00	49+50.00	50+10.00	50.0	60	3000	0.07	0.90	0.06	5.00	3.88	0.24
84	Left	50+10.00	50+10.00	50+60.00	50.0	50	2500	0.06	0.90	0.05	5.00	3.88	0.20
85	Left	50+60.00	50+60.00	51+20.00	50.0	60	3000	0.07	0.90	0.06	5.00	3.88	0.24
86	Left	51+20.00	51+20.00	52+00.00	50.0	80	4000	0.09	0.90	0.08	5.00	3.88	0.32
87													
88	Left	52+10.00	32+00.00	52+10.00	50.0	10	500	0.01	0.90	0.01	5.00	3.88	0.04
89	Left	52+74.00	52+10.00	52+74.00	50.0	64	3200	0.07	0.90	0.07	5.00	3.88	0.26
90	Left	53+65.00	52+74.00	53+65.00	50.0	91	4550	0.10	0.90	0.09	5.00	3.88	0.36
91	Left	54+45.00	53+65.00	54+45.00	50.0	80	4000	0.09	0.90	0.08	5.00	3.88	0.32
92	SAG - Left	55+05.22	54+45.00	54+76.00	50.0	31	1550	0.04	0.90	0.03	5.00	3.88	0.12
93	Left	54+76.00	54+76.00	55+32.00	50.0	56	2800	0.06	0.90	0.06	5.00	3.88	0.22
94	Left	55+32.00	55+32.00	56+00.00	50.0	68	3400	0.08	0.90	0.07	5.00	3.88	0.27
95	Left	56+00.00	56+00.00	56+80.00	50.0	80	4000	0.09	0.90	0.08	5.00	3.88	0.32
96	Left	56+80.00	56+80.00	57+60.00	50.0	80	4000	0.09	0.90	0.08	5.00	3.88	0.32
97	Left	57+60.00	57+60.00	58+40.00	50.0	80	4000	0.09	0.90	0.08	5.00	3.88	0.32
98	Left	58+40.00	58+40.00	59+10.00	50.0	70	3500	0.08	0.90	0.07	5.00	3.88	0.28
99	Left	61+80.00	60+54.57	61+80.00	25.0	125	3136	0.07	0.90	0.06	5.00	3.88	0.25
100	Left	63+10.00	61+80.00	63+10.00	25.0	130	3250	0.07	0.90	0.07	5.00	3.88	0.26
101	Left	63+86.00	63+10.00	63+86.00	25.0	76	1900	0.04	0.90	0.04	5.00	3.88	0.15
102	Left	65+25.00	63+86.00	65+25.00	25.0	139	3475	0.08	0.90	0.07	5.00	3.88	0.22
103	Left	66+65.00	65+25.00	66+65.00	25.0	140	3500	0.08	0.90	0.07	5.00	3.88	0.22
104													

	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
4	Slope																			
5–8	Pavement Long. SL (ft/ft)	Pavement Cross Sx (ft/ft)	Equiv. Cross Se	Pavement Manning's n 0.016	Prev. Bypass Qb (cfs)	Total Gutter Qg (cfs)	Depth D (ft)	Opening Length L (ft)	L_T (ft)	Spread T (ft)	W/T	Inlet Type	Gutter Width W (ft)	Gutter Velocity Vg (ft/sec)	Eo	Efficiency E	Rf	Rs	Intercept Flow Qi (cfs)	Bypass Flow (cfs)
65	0.0035	0.0200	0.1400	0.016	0.08	0.17	0.09	1.50	2.04	4.56	0.44	C-CUT	2.00	0.83	0.79	0.91	1.00	0.32	0.16	0.02
66	0.0035	0.0200	0.1400	0.016	0.02	0.26	0.11	1.50	2.42	5.29	0.38	C-CUT	2.00	0.91	0.72	0.83	1.00	0.29	0.21	0.04
67	0.0035	0.0200	0.1400	0.016	0.04	0.20	0.10	1.50	2.16	4.80	0.42	C-CUT	2.00	0.85	0.76	0.88	1.00	0.31	0.17	0.02
68	0.0035	0.0200	0.1400	0.016	0.02	0.30	0.11	1.50	2.59	5.64	0.35	C-CUT	2.00	0.95	0.69	0.79	1.00	0.27	0.24	0.06
69	0.0035	0.0200	0.1400	0.016	0.06	0.36	0.12	1.50	2.78	5.99	0.33	C-CUT	2.00	0.99	0.66	0.75	1.00	0.26	0.27	0.09
70	0.0035	0.0200	0.1400	0.016	0.09	0.36	0.12	1.50	2.77	5.99	0.33	C-CUT	2.00	0.99	0.66	0.75	1.00	0.26	0.27	0.09
71	0.0035	0.0200	0.1400	0.016	0.09	0.31	0.11	1.50	2.61	5.67	0.35	C-CUT	2.00	0.95	0.69	0.79	1.00	0.27	0.24	0.07
72	0.0035	0.0200	0.1400	0.016	0.07	0.33	0.12	1.50	2.67	5.80	0.34	C-CUT	2.00	0.97	0.68	0.77	1.00	0.26	0.25	0.07
73	0.0035	0.0200	0.1400	0.016	0.07	0.33	0.12	1.50	2.70	5.85	0.34	C-CUT	2.00	0.97	0.67	0.77	1.00	0.26	0.26	0.08
74	0.0035	0.0200	0.1400	0.016	0.08	0.34	0.12	1.50	2.71	5.87	0.34	C-CUT	2.00	0.98	0.67	0.77	1.00	0.26	0.26	0.08
75	0.0035	0.0200	0.1400	0.016	0.08	0.34	0.12	1.50	2.72	5.89	0.34	C-CUT	2.00	0.98	0.67	0.76	1.00	0.26	0.26	0.08
76	0.0035	0.0200	0.1400	0.016	0.08	0.34	0.12	1.50	2.72	5.89	0.34	C-CUT	2.00	0.98	0.67	0.76	1.00	0.26	0.26	0.08
77	0.0035	0.0200	0.1400	0.016	0.08	0.34	0.12	1.50	2.72	5.89	0.34	C-CUT	2.00	0.98	0.67	0.76	1.00	0.26	0.26	0.08
78	0.0035	0.0200	0.1400	0.016	0.08	0.34	0.12	1.50	2.72	5.89	0.34	C-CUT	2.00	0.98	0.67	0.76	1.00	0.26	0.26	0.08
79	0.0035	0.0200	0.1400	0.016	0.09	0.32	0.12	1.50	2.66	5.76	0.35	C-CUT	2.00	0.96	0.68	0.78	1.00	0.27	0.25	0.07
80	0.0035	0.0200	0.1400	0.016	0.07	0.31	0.11	1.50	2.62	5.70	0.35	C-CUT	2.00	0.96	0.68	0.78	1.00	0.27	0.24	0.07
81	0.0035	0.0200	0.1400	0.016	0.07	0.25	0.10	1.50	2.38	5.23	0.38	C-CUT	2.00	0.90	0.72	0.85	1.00	0.29	0.21	0.04
82	0.0040	0.0200	0.1400	0.016	0.11	0.33	0.11	1.50	2.80	5.68	0.35	C-CUT	2.00	1.02	0.69	0.75	1.00	0.25	0.25	0.08
83	0.0040	0.0200	0.1400	0.016	0.06	0.30	0.11	1.50	2.68	5.47	0.37	C-CUT	2.00	1.00	0.70	0.77	1.00	0.25	0.23	0.07
84	0.0040	0.0200	0.1400	0.016	0.05	0.28	0.11	1.50	2.60	5.32	0.38	C-CUT	2.00	0.98	0.72	0.79	1.00	0.26	0.22	0.06
85	0.0040	0.0200	0.1400	0.016	0.08	0.32	0.11	1.50	2.75	5.60	0.36	C-CUT	2.00	1.01	0.69	0.76	1.00	0.25	0.24	0.08
86	0.0040	0.0200	0.1400	0.016	0.00	0.32	0.11	1.50	2.76	5.61	0.36	C-CUT	2.00	1.01	0.69	0.76	1.00	0.25	0.24	0.08
87																				
88	0.0040	0.0200	0.1000	0.016	0.00	0.04	0.05	2.50	1.41	2.57	0.78	CG-3	2.00	0.60	0.98	1.00	1.00	0.73	0.04	0.00
89	0.0040	0.0200	0.1000	0.016	0.00	0.26	0.10	2.50	3.08	5.16	0.39	CG-3	2.00	0.96	0.73	0.95	1.00	0.54	0.24	0.01
90	0.0040	0.0200	0.1000	0.016	0.01	0.38	0.12	2.50	3.62	5.97	0.34	CG-3	2.00	1.06	0.66	0.88	1.00	0.50	0.33	0.05
91	0.0040	0.0200	0.1000	0.016	0.05	0.37	0.12	2.50	3.57	5.90	0.34	CG-3	2.00	1.05	0.67	0.89	1.00	0.50	0.32	0.04
92	0.0040	0.0200	0.1000	0.016	0.07	0.20	0.09	4.00	2.75	4.66	0.43	CG-48	2.00	0.90	0.78	1.00	1.00	0.80	0.20	0.00
93	0.0052	0.0200	0.1000	0.016	0.06	0.29	0.10	2.50	3.48	5.12	0.39	CG-3	2.00	1.09	0.73	0.90	1.00	0.49	0.26	0.03
94	0.0052	0.0200	0.1000	0.016	0.06	0.33	0.11	2.50	3.70	5.41	0.37	CG-3	2.00	1.13	0.71	0.87	1.00	0.47	0.29	0.04
95	0.0052	0.0200	0.1000	0.016	0.06	0.38	0.11	2.50	3.92	5.69	0.35	CG-3	2.00	1.17	0.69	0.84	1.00	0.45	0.32	0.06
96	0.0052	0.0200	0.1000	0.016	0.05	0.37	0.11	2.50	3.89	5.64	0.35	CG-3	2.00	1.16	0.69	0.84	1.00	0.46	0.31	0.06
97	0.0052	0.0200	0.1000	0.016	0.03	0.35	0.11	2.50	3.79	5.51	0.36	CG-3	2.00	1.14	0.70	0.86	1.00	0.46	0.30	0.05
98	0.0052	0.0200	0.1000	0.016	0.00	0.28	0.10	2.50	3.46	5.08	0.39	CG-3	2.00	1.08	0.74	0.90	1.00	0.49	0.25	0.03
99	0.0052	0.0200	0.1000	0.016	0.00	0.25	0.10	2.50	3.30	4.88	0.41	CG-3	2.00	1.05	0.76	0.92	1.00	0.50	0.23	0.02
100	0.0050	0.0200	0.1000	0.016	0.02	0.28	0.10	2.50	3.41	5.12	0.39	CG-3	2.00	1.07	0.75	0.91	1.00	0.49	0.25	0.03
101	0.0050	0.0200	0.1000	0.016	0.03	0.18	0.09	2.50	2.82	4.32	0.46	CG-3	2.00	0.95	0.81	0.98	1.00	0.55	0.17	0.00
102	0.0050	0.0200	0.1000	0.016	0.00	0.28	0.10	2.50	3.42	5.13	0.39	CG-3	2.00	1.07	0.75	0.91	1.00	0.49	0.26	0.03
103	0.0050	0.0200	0.1000	0.016	0.03	0.31	0.11	2.50	3.55	5.30	0.38	CG-3	2.00	1.09	0.72	0.89	1.00	0.48	0.27	0.03
104																				

Herman Road
PIPE CONVEYANCE

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	AB	AC
1	Conveyance Calculations																									
2	Project:	Herman Road																								
3	Job Number:	352590																								
5	Location										Hydrology							Sewer Design						ewer Profi		
6							Total				Tc	Tc	Sum	Intensity	Flow	Offsite	Total	Diameter	Slope	Manning's	Capacity	Velocity		Length	Q/Qf	Slope
7		Pipe		Length	Width	Area	Area	Cf =	1.0	Sum	from STA	in Pipe	Tc	I		Flow	Flow	D	S	n	Qf	V	Q/Qf	L	Check	Check
8	Description	From	To	(ft)	(ft)	(ft²)	(acres)	C	CfCA	CA	(min)	(min)	(min)	(in/hr)	(cfs)	(cfs)	(cfs)	(in)	(ft/ft)	0.013	(cfs)	(fps)		(ft)		
9	Herman Road																									
10	Main line																									
11	Existing	13+95.00	15+28.00	83.67	25.00	2092	0.05	0.90	0.04	0.04	5.00	0.74	5.7	3.73	0.16		0.16	12	0.44%	0.013	2.36	3.01	0.07	133.00	ok	ok
12																										
13	18+10, 25'R to 18+10, 6'R	18+10.00	18+10.00	158.33	25.00	4958	0.11	0.90	0.10	0.10	5.00	0.11	5.1	3.86	0.40		0.40	10	0.56%	0.013	1.84	3.01	0.24	20.00	ok	ok
14	18+10, 6'R to 19+05, 6'R	18+10.00	19+04.67		25.00	0	0.00	0.90	0.00	0.10	5.11	0.53	5.6	3.75	0.38		0.38	12	0.44%	0.013	2.36	3.01	0.16	95.00	ok	ok
15	19+05, 6'R to 20+30, 6'R	19+04.67	20+30.00		25.00	0	0.00	0.90	0.00	0.33	5.64	0.69	6.3	3.60	1.20		1.20	12	0.44%	0.013	2.36	3.01	0.51	125.00	ok	ok
16	20+30, 6'R to 20+80, 6'R	20+30.00	20+80.00		25.00	0	0.00	0.90	0.00	0.79	6.33	0.28	6.6	3.53	2.79		2.79	14	0.36%	0.013	3.22	3.02	0.86	50.00	ok	ok
17	20+80, 6'R to 24+70, 6'R	20+80.00	24+70.00		25.00	0	0.00	0.90	0.00	0.89	6.60	2.15	8.8	3.07	2.74		2.74	14	0.36%	0.013	3.22	3.02	0.85	390.00	ok	ok
18	24+70, 6'R to 25+40, 6'r	24+70.00	25+40.00		25.00	0	0.00	0.90	0.00	0.99	8.76	0.39	9.1	2.99	2.96		2.96	15	0.33%	0.013	3.71	3.03	0.80	70.00	ok	ok
19	25+40, 6'R to 26.30, 6'R	25+40.00	26+30.00		25.00	0	0.00	0.90	0.00	1.17	9.14	0.50	9.6	2.88	3.36		3.36	15	0.33%	0.013	3.71	3.03	0.91	90.00	ok	ok
20	26+30, 6'R to 27+05, 2'R	26+30.00	27+05.00		25.00	0	0.00	0.90	0.00	1.26	9.64	0.42	10.1	2.79	3.49		3.49	15	0.33%	0.013	3.71	3.03	0.94	77.00	ok	ok
21	27+05, 2'R to 28+43, 2'R	27+05.00	28+43.00		25.00	0	0.00	0.90	0.00	1.40	10.06	0.76	10.8	2.71	3.81		3.81	18	0.26%	0.013	5.31	3.01	0.72	138.00	ok	ok
22																										
23	33+00, 25'L to 32+26, 26'L	33+00.00	32+25.88	356.79	58.00	20694	0.48	0.90	0.43	0.43	5.00	0.41	5.4	3.79	1.62		1.62	12	0.44%	0.013	2.36	3.01	0.69	74.12	ok	ok
24	32+26, 25'L to 30+30, 25'L	32+25.88	30+40.00	260.00	58.00	15080	0.35	0.90	0.31	0.74	6.41	1.03	6.4	3.57	2.64		2.64	14	0.36%	0.013	3.22	3.02	0.82	186.00	ok	ok
25	30+30, 25'L to 28+80, 25'L	30+40.00	28+80.00	160.00	58.00	9280	0.21	0.90	0.19	0.93	6.44	0.88	7.3	3.38	3.15		3.15	14	0.36%	0.013	3.22	3.02	0.98	160.00	ok	ok
26	28+80, 25'L to 28+80, 2'R	28+80.00	28+80.00	160.00	58.00	9280	0.21	0.90	0.19	1.12	7.32	0.14	7.5	3.34	3.75		3.75	16	0.36%	0.013	4.60	3.30	0.81	28.00	ok	ok
27	28+80, 2'R to 28+43, 2'R	28+80.00	28+43.00		58.00	0	0.00	0.90	0.00	1.12	7.46	0.17	7.6	3.29	3.69		3.89	18	0.36%	0.013	6.30	3.57	0.59	37.00	ok	ok
28																										
29	28+43, 2'R to 28+50, 28'L (to CDS)	28+43.00	28+50.00			0	0.00	0.90	0.00	2.60	10.83	0.13	11.0	2.70	7.02		7.02	18	0.45%	0.013	7.04	3.99	1.00	31.00	ok	ok
30	28+50, 28'L to 30+02.67, 397.72 L	28+50.00	30+02.67			0	0.00	0.90	0.00	2.60	10.96	2.18	13.1	2.68	6.97		6.97	24	0.18%	0.013	9.59	3.06	0.73	400.00	ok	ok
31	30+02.67, 397.72 L to31+40.08,730.46 L	30+02.67	outfall			0	0.00	0.90	0.00	2.60	13.14	1.96	15.1	2.53	6.58		6.58	24	0.18%	0.013	9.59	3.06	0.69	360.00	ok	ok
32																										
33	39+00, 32'L to 40+20, 32'L	39+00.00	40+20.00	120.00	58.00	6960	0.16	0.90	0.14	0.14	5.00	0.66	5.7	3.73	0.54		0.54	12	0.44%	0.013	2.36	3.01	0.23	120.00	ok	ok
34	40+20, 32'L to 41+65, 32'L	40+20.00	41+60.00	120.00	58.00	6960	0.16	0.90	0.14	0.29	5.66	0.78	6.4	3.57	1.03		1.03	12	0.44%	0.013	2.36	3.01	0.43	140.00	ok	ok
35	41+65, 32'L to 43+65, 30'L	41+60.00	43+65.00	140.00	58.00	8120	0.19	0.90	0.17	0.46	6.44	1.13	7.6	3.31	1.51		1.51	12	0.44%	0.013	2.36	3.01	0.64	205.00	ok	ok
36	43+65, 30'L to 45+65, 25'L	43+65.00	45+65.00	205.00	58.00	11890	0.27	0.90	0.25	0.70	7.57	1.10	8.7	3.07	2.15		2.15	14	0.36%	0.013	3.22	3.02	0.67	200.00	ok	ok
37	45+65, 25'L to 47+65, 24'L	45+65.00	47+65.00	200.00	58.00	11600	0.27	0.90	0.24	0.94	8.68	1.10	9.8	2.83	2.66		2.66	14	0.36%	0.013	3.22	3.02	0.83	200.00	ok	ok
38	47+65, 24'L to 49+05, 24'L	47+65.00	49+05.00	200.00	58.00	11600	0.27	0.90	0.24	1.18	9.78	0.71	10.5	2.74	3.23		3.23	16	0.36%	0.013	4.60	3.30	0.70	140.00	ok	ok
39	49+05, 24'L to 51+50, 28'L	49+05.00	51+50.00	140.00	58.00	8120	0.19	0.90	0.17	1.35	10.49	1.14	11.6	2.61	3.52		3.52	18	0.36%	0.013	6.30	3.57	0.56	245.00	ok	ok
40	51+50, 28'L to 51+64, 34'L	51+50.00	51+69.00	245.00	58.00	14210	0.33	0.90	0.29	1.64	11.63	0.09	11.7	2.60	4.27		4.27	18	0.36%	0.013	6.30	3.57	0.68	20.00	ok	ok
41																										
42																										
43	58+40, 25'L to 58+40, 7'L	58+40.00	58+40.00	70.00	58.00	4060	0.09	0.90	0.08	0.08	5.00	0.11	5.11	3.79	0.32		0.32	12	0.44%	0.013	2.36	3.01	0.13	19.00	ok	ok
44	58+40, 7'L to 57+60, 7'L	58+40.00	57+60.00		58.00	0	0.00	0.90	0.00	0.08	5.11	0.44	5.55	3.71	0.31		0.31	12	0.44%	0.013	2.36	3.01	0.13	80.00	ok	ok
45	57+60, 7'L to 56+80, 7'L	57+60.00	56+80.00		58.00	0	0.00	0.90	0.00	0.18	5.55	0.44	5.99	3.60	0.65		0.65	12	0.44%	0.013	2.36	3.01	0.27	80.00	ok	ok
46	56+80, 7'L to 56+00, 7'L	56+80.00	56+00.00		58.00	0	0.00	0.90	0.00	0.28	5.99	0.44	6.43	3.51	0.97		0.97	12	0.44%	0.013	2.36	3.01	0.41	80.00	ok	ok
47	56+00, 7'L to 55+32, 7'L	56+00.00	55+32.00		58.00	0	0.00	0.90	0.00	0.28	5.99	0.53	6.52	3.40	0.94		0.94	12	0.44%	0.013	2.36	3.01	0.40	95.00	ok	ok
48	55.32, 7'L to 54+75, 7'L	55+32.00	54+75.00		58.00	0	0.00	0.90	0.00	0.36	6.43	0.53	6.96	3.40	1.21		1.21	12	0.44%	0.013	2.36	3.01	0.51	95.00	ok	ok
49	54+75, 7'L to 54+45, 7'L	54+75.00	54+45.00		58.00	0	0.00	0.90	0.00	0.57	6.96	0.33	7.29	3.51	1.88		1.88	12	0.44%	0.013	2.36	3.01	0.80	60.00	ok	ok
50	54+45, 7'L to 53+65, 7'L	54+45.00	53+65.00		58.00	0	0.00	0.90	0.00	0.67	7.29	0.44	7.73	3.23	2.15		2.15	14	0.36%	0.013	3.22	3.02	0.67	80.00	ok	ok
51	53+65, 7'L to 52+75, 7'L	53+65.00	52+75.00		58.00	0	0.00	0.90	0.00	0.76	7.73	0.47	8.20	3.12	2.37		2.37	14	0.36%	0.013	3.22	3.02	0.74	85.00	ok	ok
52	52+75, 7'L to 52+10, 7'L	52+75.00	52+10.00		58.00	0	0.00	0.90	0.00	0.87	8.20	0.09	8.29	3.10	2.69		2.69	14	0.36%	0.013	3.22	3.02	0.84	16.00	ok	ok
53	52+10, 7'L to 52+10, 22'L	52+10.00	52+10.00		58.00	0	0.00	0.90	0.00	0.87	8.29	0.39	8.68	3.01	2.62		2.62	14	0.36%	0.013	3.22	3.02	0.81	70.00	ok	ok
54	52+10, 22'L to 52+10, 30'L	52+10.00	52+10.00		58.00	0	0.00	0.90	0.00	0.88	8.68	0.04	8.72	3.01	2.65		2.65	15	0.36%	0.013	3.87	3.16	0.68	7.00	ok	ok
55																										
56	63+30, 25'L to 61+80, 6'R	61+80.00	61+80.00	125.43	25.00	3135	0.07	0.90	0.06	0.06	5.00	0.17	5.17	3.84	0.25		0.25	12	0.50%	0.013	2.52	3.21	0.10	32.00	ok	ok
57	61+80, 6'R to 63+10, 6'R	61+80.00	63+10.00		25.00	0	0.00	0.90	0.00	0.13	5.17	0.72	5.89	3.68	0.48		0.48	12	0.44%	0.013	2.36	3.01	0.20	130.00	ok	ok
58	63+10, 6'R to 63.86, 6'R	63+10.00	63+86.00		25.00	0	0.00	0.90	0.00	0.28	5.89	0.55	6.44	3.57	0.94		0.94	12	0.44%	0.013	2.36	3.01	0.40	100.00	ok	ok
59	63.86, 6'R to 64+10, 6'R	63+86.00	64+10.00		25.00	0	0.00	0.90	0.00	0.20	5.89	0.64	6.52	3.42	0.67		0.67	12	0.44%	0.013	2.36	3.01	0.28	115.00	ok	ok
60	64+10, 6'R to 65+25, 6'R	64+10.00	65+25.00		25.00	0	0.00	0.90	0.00	0.32	6.44	0.64	7.08	3.42	1.08		1.08	12	0.44%	0.013	2.36	3.01	0.46	115.00	ok	ok
61	65+25, 6'R to 66+65, 6'R	65+25.00	66+65.00		25.00	0	0.00	0.90	0.00	0.46	7.08	0.78	7.85	3.27	1.46		1.46	12	0.44%	0.013	2.36	3.01	0.62	140.00	ok	ok

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	AB	AC
1	**Conveyance Calculations**																									
2	**Project:**	**Herman Road**																								
3	**Job Number:**	**352590**																								
5	Location											**Hydrology**								**Sewer Design**				ewer Profi		
6							Total				Tc	Tc	Sum	Intensity	Flow	Offsite	Total	Diameter	Slope	Manning's	Capacity	Velocity		Length	Q/Qf	Slope
7		Pipe		Length	Width	Area	Area	Cf =	1.0	Sum	from STA	in Pipe	Tc	I		Flow	Flow	D	S	n	Qf	V	Q/Qf	L	Check	Check
8	Description	From	To	(ft)	(ft)	(ft^2)	(acres)	C	CfCA	CA	(min)	(min)	(min)	(in/hr)	(cfs)	(cfs)	(cfs)	(in)	(ft/ft)	0.013	(cfs)	(fps)		(ft)		
9	**Herman Road**																									
62	66+65, 6'R to 66+65, 2.6'L	66+65.00	66+65.00		25.00	0	0.00	0.90	0.00	0.50	7.85	0.04	7.89	3.27	1.93		1.93	14	0.50%	0.013	3.80	3.56	0.51	8.6	ok	ok
63																										
64	Lateral-Right	19+04.67	19+04.67	270.00	25.00	6,750	0.15	0.90	0.14	0.23	5.00	0.11	5.11	3.86	0.89		0.89	10	0.56%	0.013	1.64	3.01	0.54	20.0	ok	ok
65	Lateral-Right	19+04.67	19+14.67	175.33	25.00	4,383	0.10	0.90	0.09	0.09	5.00	0.06	5.06	3.86	0.35		0.35	10	0.56%	0.013	1.64	3.01	0.21	10.0	ok	ok
66	Lateral-Right	20+80.00	20+80.00	201.25	25.00	5,031	0.12	0.90	0.10	0.10	5.00	0.10	5.10	3.86	0.40		0.40	12	0.50%	0.013	2.52	3.21	0.16	20.0	ok	ok
67	Lateral-Right	24+70.00	24+70.00	188.75	25.00	4,719	0.11	0.90	0.10	0.10	5.00	0.10	5.10	3.86	0.38		0.38	12	0.50%	0.013	2.52	3.21	0.15	20.0	ok	ok
68	Lateral-Right	26+30.00	26+30.00	160.00	25.00	4,000	0.09	0.90	0.08	0.08	5.00	0.10	5.10	3.86	0.32		0.32	12	0.50%	0.013	2.52	3.21	0.13	20.0	ok	ok
69	Lateral-Right	27+08.00	27+08.00	70.00	25.00	1,750	0.04	0.90	0.04	0.04	5.00	0.14	5.14	3.86	0.14		0.14	12	0.50%	0.013	2.52	3.21	0.06	26.0	ok	ok
70	Lateral-Right	28+43.00	28+43.00	143.00	25.00	3,575	0.08	0.90	0.07	0.07	5.00	0.13	5.13	3.86	0.29		0.29	12	0.50%	0.013	2.52	3.21	0.11	25.0	ok	ok
71																										
72	Lateral-Right	61+80.00	61+80.00	125.43	25.00	3,136	0.07	0.90	0.06	0.06	5.00	0.10	5.10	3.86	0.25		0.25	12	0.50%	0.013	2.52	3.21	0.10	20.0	ok	ok
73	Lateral-Right	63+10.00	63+10.00	130.00	25.00	3,250	0.07	0.90	0.07	0.07	5.00	0.10	5.10	3.86	0.26		0.26	12	0.50%	0.013	2.52	3.21	0.10	20.0	ok	ok
74	Lateral-Right	64+10.00	64+10.00	100.00	25.00	2,500	0.06	0.90	0.05	0.05	5.00	0.10	5.10	3.86	0.20		0.20	12	0.50%	0.013	2.52	3.21	0.08	20.0	ok	ok
75	Lateral-Right	65+25.00	65+25.00	115.00	25.00	2,875	0.07	0.90	0.06	0.06	5.00	0.10	5.10	3.86	0.23		0.23	12	0.50%	0.013	2.52	3.21	0.09	20.0	ok	ok
76	Lateral-Right	66+65.00	66+65.00	140.00	25.00	3,500	0.08	0.90	0.07	0.07	5.00	0.10	5.10	3.86	0.28		0.28	12	0.50%	0.013	2.52	3.21	0.11	20.0	ok	ok
77																										
78																										
79	18+10, 25'Lt to 19+10.67, 25'Lt	18+10.00	19+10.67	198.33	33.00	6,545	0.15	0.90	0.14	0.14	5.00	0.58	5.58	3.75	0.51		0.51	12	0.44%	0.013	2.36	3.01	0.21	105.0	ok	ok
80	19+10.67, 25'Lt to 20+30, 25'Lt	19+10.67	20+30.00	220.00	33.00	7,260	0.17	0.90	0.15	0.29	5.58	0.64	6.22	3.62	1.03		1.03	12	0.44%	0.013	2.36	3.01	0.44	115.0	ok	ok
81	Lateral-Left	20+30.00	20+30.00	251.25	33.00	8,291	0.19	0.90	0.17	0.46	6.22	0.17	6.38	3.57	1.63		1.63	12	0.50%	0.013	2.52	3.21	0.65	32.0	ok	ok
82	Lateral-Left	25+40.00	25+40.00	258.75	33.00	8,539	0.20	0.90	0.18	0.18	5.00	0.17	5.17	3.84	0.68		0.68	12	0.50%	0.013	2.52	3.21	0.27	32.0	ok	ok
83	Lateral-Left	27+15.00	27+05.00	175.00	33.00	5,775	0.13	0.90	0.12	0.12	5.00	0.15	5.15	3.84	0.46		0.46	12	0.50%	0.013	2.52	3.21	0.18	29.0	ok	ok
84																										
85	Lateral-Left	52+10.00	52+10.00	10.00	58.00	580	0.01	0.90	0.01	0.01	5.00	0.09	5.09	3.88	0.05		0.05	10	0.56%	0.013	1.64	3.01	0.03	16.0	ok	ok
86	Lateral-Left	52+75.00	52+75.00	90.00	58.00	5,220	0.12	0.90	0.11	0.11	5.00	0.09	5.09	3.86	0.42		0.42	10	0.56%	0.013	1.64	3.01	0.25	16.0	ok	ok
87	Lateral-Left	53+65.00	53+65.00	80.00	58.00	4,640	0.11	0.90	0.10	0.10	5.00	0.09	5.09	3.86	0.37		0.37	10	0.56%	0.013	1.64	3.01	0.23	16.0	ok	ok
88	Lateral-Left	54+45.00	54+45.00	83.00	58.00	4,814	0.11	0.90	0.10	0.10	5.00	0.10	5.10	3.86	0.38		0.38	10	0.56%	0.013	1.64	3.01	0.23	18.0	ok	ok
89	Lateral-Left	54+75.00	54+75.00	87.00	58.00	5,046	0.12	0.90	0.10	0.21	5.00	0.10	5.10	3.86	0.82		0.82	10	0.56%	0.013	1.64	3.01	0.50	18.0	ok	ok
90	Lateral-Left	55+05.00	55+10.00	90.00	58.00	5,220	0.12	0.90	0.11	0.11	5.00	0.10	5.10	3.88	0.42		0.42	10	0.56%	0.013	1.64	3.01	0.26	18.0	ok	ok
91	Lateral-Left	55+32.00	55+32.00	68.00	58.00	3,944	0.09	0.90	0.08	0.08	5.00	0.11	5.11	3.86	0.31		0.31	10	0.56%	0.013	1.64	3.01	0.19	19.0	ok	ok
92	Lateral-Left	56+00.00	56+00.00	80.00	58.00	4,640	0.11	0.90	0.10	0.10	5.00	0.11	5.11	3.86	0.37		0.37	10	0.56%	0.013	1.64	3.01	0.23	19.0	ok	ok
93	Lateral-Left	56+80.00	56+80.00	80.00	58.00	4,640	0.11	0.90	0.10	0.10	5.00	0.11	5.11	3.86	0.37		0.37	10	0.56%	0.013	1.64	3.01	0.23	19.0	ok	ok
94	Lateral-Left	57+60.00	57+60.00	80.00	58.00	4,640	0.11	0.90	0.10	0.10	5.00	0.11	5.11	3.86	0.37		0.37	10	0.56%	0.013	1.64	3.01	0.23	19.0	ok	ok
95																										
96																										
97	Lateral-Left	63+10.00	63+10.00	130.00	25.00	3,250	0.07	0.90	0.07	0.07	5.00	0.17	5.17	3.84	0.26		0.26	12	0.50%	0.013	2.52	3.21	0.10	32.0	ok	ok
98	Lateral-Left	63+87.00	63+87.00	77.00	25.00	1,925	0.04	0.90	0.04	0.04	5.00	0.17	5.17	3.84	0.15		0.15	12	0.50%	0.013	2.52	3.21	0.06	32.0	ok	ok
99	Lateral-Left	65+25.00	65+25.00	138.00	25.00	3,450	0.08	0.90	0.07	0.07	5.00	0.17	5.17	3.84	0.27		0.27	12	0.50%	0.013	2.52	3.21	0.11	32.0	ok	ok
100	Lateral-Left	66+65.00	66+65.00	140.00	25.00	3,500	0.08	0.90	0.07	0.07	5.00	0.13	5.13	3.84	0.28		0.28	12	0.50%	0.013	2.52	3.21	0.11	24.4	ok	ok

APPENDIX C

WATER QUALITY CALCULATIONS

Appended on: 14:53:53 Tuesday, September 11, 2007

Herman Event Summary

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method	Raintype
72 % of 2 year	1.0644	8.00	0.3796	2.8900	SBUH	TYPE1A

Record Id: Herman

Design Method	SBUH	**Rainfall type**	TYPE1A
Hyd Intv	10.00 min	**Peaking Factor**	484.00
		Abstraction Coeff	0.20
Pervious Area (AMC 2)	2.89 ac	**DCIA**	0.00 ac
Pervious CN	98.00	**DC CN**	0.00
Pervious TC	10.90 min	**DC TC**	0.00 min

Pervious CN Calc

Description	SubArea	Sub cn
Impervious surfaces (pavements, roofs, etc)	2.89 ac	98.00
Pervious Composited CN (AMC 2)		98.00

Pervious TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Fixed						10.90 min
Pervious TC						10.90 min

Licensed to: Ch2M Hill - Bellevue, WA

$$Q_{AVG} = \frac{0.3796^{\,ac \cdot ft} \times 43560^{\,ft^2/ac \times ft}}{24^{\,hr} \times 3600^{\,sec/hr}}$$

$= 0.19$ cfs

$Q = C\, i\, A$

$= 0.9 \times 2.69 \times 2.89$

$= 6.996^{\,cfs} \simeq 7^{\,cfs}$

Area Drain Inlet Type II - Aug 30

Project Description

Solve For	Spread

Input Data

Discharge		0.67	ft³/s
Gutter Width		0.00	ft
Gutter Cross Slope		0.00	ft/ft
Road Cross Slope		0.02	ft/ft
Grate Width		1.67	ft
Grate Length		3.52	ft
Local Depression		0.00	in
Local Depression Width		0.00	ft
Grate Type	P-50 mm (P-1-7/8")		
Clogging		50.00	%

Discharge (ft³/s)	Spread (ft)	Depth (ft)
0.00		
0.01	1.59	0.03
0.02	1.92	0.04
0.03	2.13	0.04
0.04	2.30	0.05
0.05	2.45	0.05
0.06	2.60	0.05
0.07	2.74	0.05
0.08	2.86	0.06
0.09	2.99	0.06
0.10	3.11	0.06
0.11	3.22	0.06
0.12	3.33	0.07
0.13	3.44	0.07
0.14	3.55	0.07
0.15	3.65	0.07
0.16	3.75	0.07
0.17	3.85	0.08
0.18	3.94	0.08
0.19	4.04	0.08

Area Drain Inlet Type II - Aug 30

Input Data

Discharge (ft^3/s)	Spread (ft)	Depth (ft)
0.20	4.13	0.08
0.21	4.22	0.08
0.22	4.31	0.09
0.23	4.40	0.09
0.24	4.49	0.09
0.25	4.57	0.09
0.26	4.66	0.09
0.27	4.74	0.09
0.28	4.82	0.10
0.29	4.90	0.10
0.30	4.98	0.10
0.31	5.06	0.10
0.32	5.14	0.10
0.33	5.22	0.10
0.34	5.30	0.11
0.35	5.37	0.11
0.36	5.45	0.11
0.37	5.53	0.11
0.38	5.60	0.11
0.39	5.67	0.11
0.40	5.75	0.11
0.41	5.82	0.12
0.42	5.89	0.12
0.43	5.96	0.12
0.44	6.03	0.12
0.45	6.10	0.12
0.46	6.17	0.12
0.47	6.24	0.12
0.48	6.31	0.13
0.49	6.38	0.13
0.50	6.45	0.13
0.51	6.51	0.13
0.52	6.58	0.13
0.53	6.65	0.13
0.54	6.71	0.13
0.55	6.78	0.14
0.56	6.84	0.14

Area Drain Inlet Type II - Aug 30

Input Data

Discharge (ft^3/s)	Spread (ft)	Depth (ft)
0.57	6.91	0.14
0.58	6.97	0.14
0.59	7.03	0.14
0.60	7.10	0.14
0.61	7.16	0.14
0.62	7.22	0.14
0.63	7.28	0.15
0.64	7.35	0.15
0.65	7.41	0.15
0.66	7.47	0.15
0.67	7.54	0.15
0.68	7.60	0.15
0.69	7.66	0.15
0.70	7.72	0.15
0.71	7.78	0.16
0.72	7.84	0.16
0.73	7.90	0.16
0.74	7.96	0.16
0.75	8.02	0.16
0.76	8.07	0.16
0.77	8.13	0.16
0.78	8.19	0.16
0.79	8.25	0.16
0.80	8.31	0.17
0.81	8.36	0.17
0.82	8.42	0.17
0.83	8.48	0.17
0.84	8.54	0.17
0.85	8.59	0.17
0.86	8.65	0.17
0.87	8.70	0.17
0.88	8.76	0.18
0.89	8.82	0.18
0.90	8.87	0.18
0.91	8.93	0.18
0.92	8.98	0.18
0.93	9.04	0.18

Area Drain Inlet Type II - Aug 30

Input Data

Discharge (ft^3/s)	Spread (ft)	Depth (ft)
0.94	9.09	0.18
0.95	9.15	0.18
0.96	9.20	0.18
0.97	9.25	0.19
0.98	9.31	0.19
0.99	9.36	0.19
1.00	9.41	0.19
1.01	9.47	0.19
1.02	9.52	0.19
1.03	9.57	0.19
1.04	9.63	0.19
1.05	9.68	0.19
1.06	9.73	0.19
1.07	9.79	0.20
1.08	9.84	0.20
1.09	9.89	0.20
1.10	9.94	0.20
1.11	9.99	0.20
1.12	10.05	0.20
1.13	10.10	0.20
1.14	10.15	0.20
1.15	10.20	0.20
1.16	10.25	0.20
1.17	10.30	0.21
1.18	10.35	0.21
1.19	10.40	0.21
1.20	10.45	0.21
1.21	10.50	0.21
1.22	10.55	0.21
1.23	10.60	0.21
1.24	10.65	0.21
1.25	10.70	0.21
1.26	10.75	0.22
1.27	10.80	0.22
1.28	10.85	0.22
1.29	10.90	0.22
1.30	10.95	0.22

Area Drain Inlet Type II - Aug 30

Input Data

Discharge (ft^3/s)	Spread (ft)	Depth (ft)
1.31	11.00	0.22
1.32	11.05	0.22
1.33	11.10	0.22
1.34	11.14	0.22
1.35	11.19	0.22
1.36	11.24	0.22
1.37	11.29	0.23
1.38	11.34	0.23
1.39	11.38	0.23
1.40	11.43	0.23
1.41	11.48	0.23
1.42	11.53	0.23
1.43	11.57	0.23
1.44	11.62	0.23
1.45	11.67	0.23
1.46	11.72	0.23
1.47	11.76	0.24
1.48	11.81	0.24
1.49	11.86	0.24
1.50	11.90	0.24
1.51	11.95	0.24
1.52	12.00	0.24
1.53	12.04	0.24
1.54	12.09	0.24
1.55	12.14	0.24
1.56	12.18	0.24
1.57	12.23	0.24
1.58	12.28	0.25
1.59	12.32	0.25
1.60	12.37	0.25
1.61	12.41	0.25
1.62	12.46	0.25
1.63	12.50	0.25
1.64	12.55	0.25
1.65	12.59	0.25
1.66	12.64	0.25
1.67	12.69	0.25

Area Drain Inlet Type II - Aug 30

Input Data

Discharge (ft^3/s)	Spread (ft)	Depth (ft)
1.68	12.73	0.25
1.69	12.78	0.26
1.70	12.82	0.26
1.71	12.86	0.26
1.72	12.91	0.26
1.73	12.95	0.26
1.74	13.00	0.26
1.75	13.04	0.26
1.76	13.09	0.26
1.77	13.13	0.26
1.78	13.18	0.26
1.79	13.22	0.26
1.80	13.26	0.27
1.81	13.31	0.27
1.82	13.35	0.27
1.83	13.40	0.27
1.84	13.44	0.27
1.85	13.48	0.27
1.86	13.53	0.27
1.87	13.57	0.27
1.88	13.61	0.27
1.89	13.66	0.27
1.90	13.70	0.27
1.91	13.74	0.27
1.92	13.78	0.28
1.93	13.83	0.28
1.94	13.87	0.28
1.95	13.91	0.28
1.96	13.96	0.28
1.97	14.00	0.28
1.98	14.04	0.28
1.99	14.08	0.28
2.00	14.13	0.28
2.01	14.17	0.28
2.02	14.21	0.28
2.03	14.25	0.29
2.04	14.30	0.29

Area Drain Inlet Type II - Aug 30

Input Data

Discharge (ft^3/s)	Spread (ft)	Depth (ft)
2.05	14.34	0.29
2.06	14.38	0.29
2.07	14.42	0.29
2.08	14.46	0.29
2.09	14.51	0.29
2.10	14.55	0.29
2.11	14.59	0.29
2.12	14.63	0.29
2.13	14.67	0.29
2.14	14.71	0.29
2.15	14.76	0.30
2.16	14.80	0.30
2.17	14.84	0.30
2.18	14.88	0.30
2.19	14.92	0.30
2.20	14.96	0.30
2.21	15.00	0.30
2.22	15.05	0.30
2.23	15.09	0.30
2.24	15.13	0.30
2.25	15.17	0.30
2.26	15.21	0.30
2.27	15.25	0.30
2.28	15.29	0.31
2.29	15.33	0.31
2.30	15.37	0.31
2.31	15.41	0.31
2.32	15.45	0.31
2.33	15.49	0.31
2.34	15.53	0.31
2.35	15.57	0.31
2.36	15.61	0.31
2.37	15.65	0.31
2.38	15.69	0.31
2.39	15.73	0.31
2.40	15.77	0.32
2.41	15.81	0.32

Area Drain Inlet Type II - Aug 30

Input Data

Discharge (ft^3/s)	Spread (ft)	Depth (ft)
2.42	15.85	0.32
2.43	15.89	0.32
2.44	15.93	0.32
2.45	15.97	0.32
2.46	16.01	0.32
2.47	16.05	0.32
2.48	16.09	0.32
2.49	16.13	0.32
2.50	16.17	0.32

APPENDIX D

CULVERT HYDRALIC CALCULATIONS

HY-8 Culvert Analysis Report

Existing Road Culvert

Table 1 - Summary of Culvert Flows at Crossing: Extg Road

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
132.08	40.00	25.36	14.34	9
132.09	42.50	25.44	16.85	3
132.10	45.00	25.52	19.32	3
132.11	47.50	25.59	21.79	3
132.12	50.00	25.66	24.24	3
132.13	52.50	25.73	26.70	3
132.13	55.00	25.79	29.15	3
132.14	57.50	25.85	31.29	2
132.15	60.00	25.92	34.02	3
132.15	62.50	25.97	36.22	2
132.16	65.00	26.03	38.92	3

Rating Curve Plot for Crossing: Extg Road

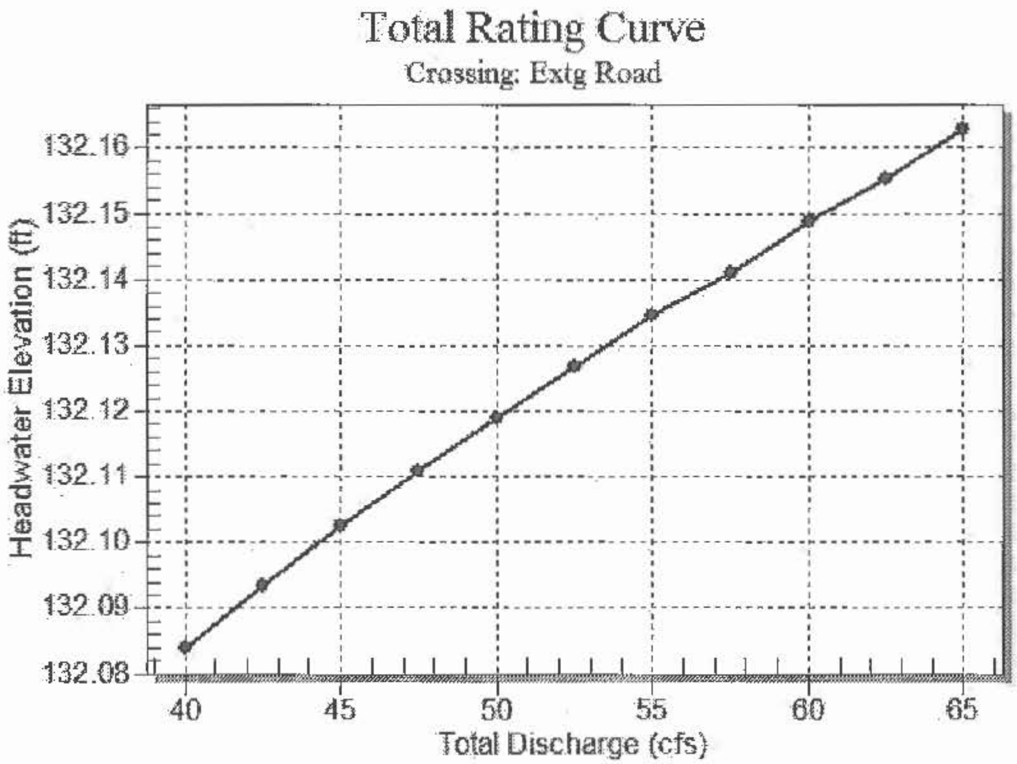


Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
40.00	25.36	132.08	2.721	5.914	4-FFf	2.500	1.713	2.500	4.810	5.166	0.000
42.50	25.44	132.09	2.728	5.923	4-FFf	2.500	1.716	2.500	4.810	5.183	0.000
45.00	25.52	132.10	2.735	5.932	4-FFf	2.500	1.719	2.500	4.810	5.199	0.000
47.50	25.59	132.11	2.741	5.941	4-FFf	2.500	1.722	2.500	4.810	5.214	0.000
50.00	25.66	132.12	2.747	5.949	4-FFf	2.500	1.724	2.500	4.810	5.228	0.000
52.50	25.73	132.13	2.753	5.957	4-FFf	2.500	1.727	2.500	4.810	5.241	0.000
55.00	25.79	132.13	2.759	5.964	4-FFf	2.500	1.729	2.500	4.810	5.255	0.000
57.50	25.85	132.14	2.763	5.971	4-FFf	2.500	1.731	2.500	4.810	5.266	0.000
60.00	25.92	132.15	2.769	5.979	4-FFf	2.500	1.734	2.500	4.810	5.280	0.000
62.50	25.97	132.15	2.774	5.985	4-FFf	2.500	1.736	2.500	4.810	5.290	0.000
65.00	26.03	132.16	2.779	5.993	4-FFf	2.500	1.738	2.500	4.810	5.304	0.000

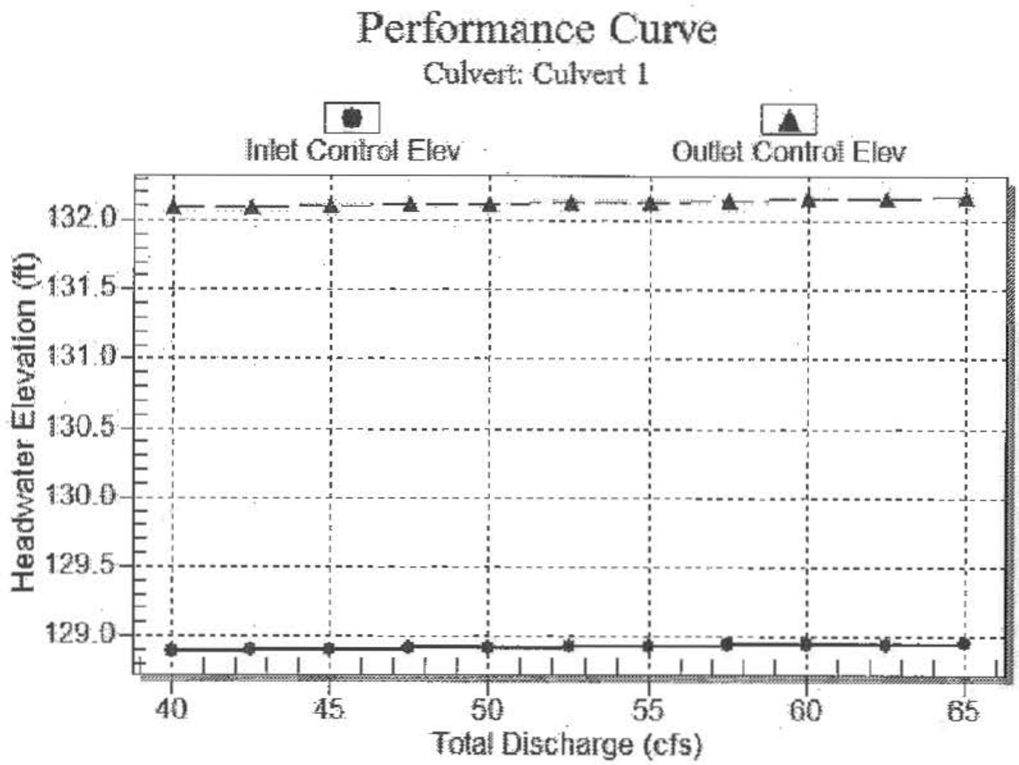
****

Inlet Elevation (invert): 126.17 ft, Outlet Elevation (invert): 125.81 ft

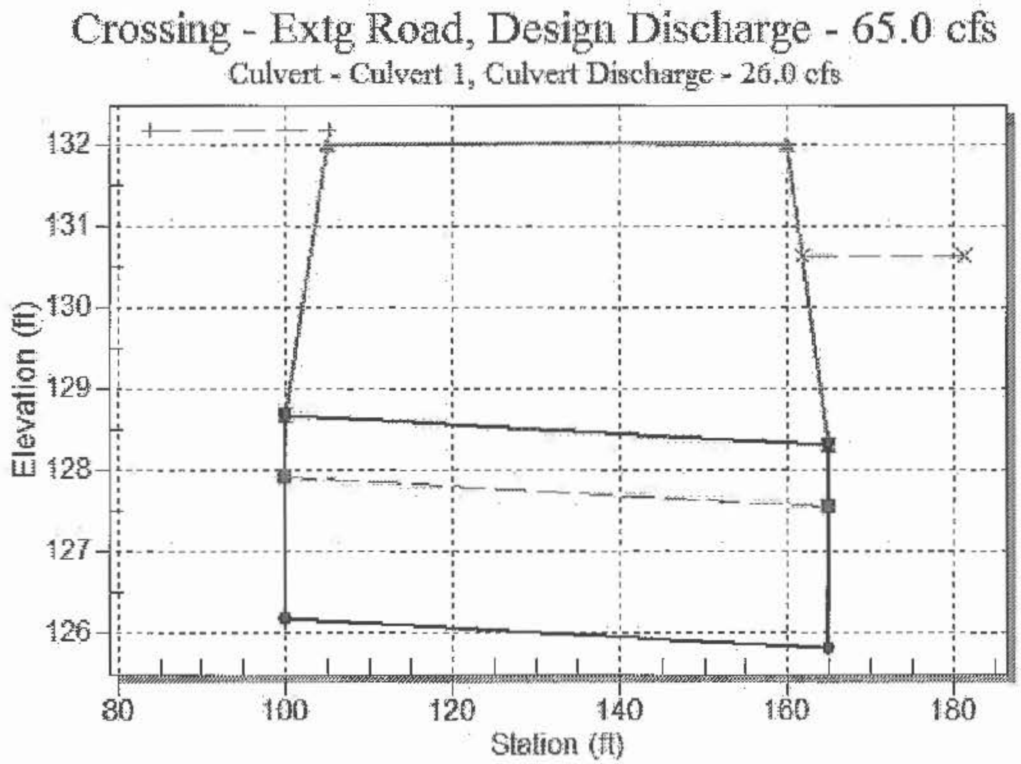
Culvert Length: 65.00 ft, Culvert Slope: 0.0055

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 100.00 ft

Inlet Elevation: 126.17 ft

Outlet Station: 165.00 ft

Outlet Elevation: 125.81 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Corrugated Steel

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Extg Road)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
40.00	130.62	4.81
42.50	130.62	4.81
45.00	130.62	4.81
47.50	130.62	4.81
50.00	130.62	4.81
52.50	130.62	4.81
55.00	130.62	4.81
57.50	130.62	4.81
60.00	130.62	4.81
62.50	130.62	4.81
65.00	130.62	4.81

Tailwater Channel Data - Extg Road

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 130.62 ft

Roadway Data for Crossing: Extg Road

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 132.00 ft

Roadway Surface: Paved

Roadway Top Width: 55.00 ft

HY-8 Culvert Analysis Report

EXISTING RAILROAD CULVERT

Table 1 - Summary of Culvert Flows at Crossing: Extg RR

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
129.17	40.00	40.00	0.00	1
129.30	42.50	42.50	0.00	1
129.44	45.00	45.00	0.00	1
129.57	47.50	47.50	0.00	1
129.70	50.00	50.00	0.00	1
129.83	52.50	52.50	0.00	1
129.98	55.00	55.00	0.00	1
130.11	57.50	57.50	0.00	1
130.27	60.00	60.00	0.00	1
130.43	62.50	62.50	0.00	1
130.62	65.00	65.00	0.00	1

Rating Curve Plot for Crossing: Extg RR

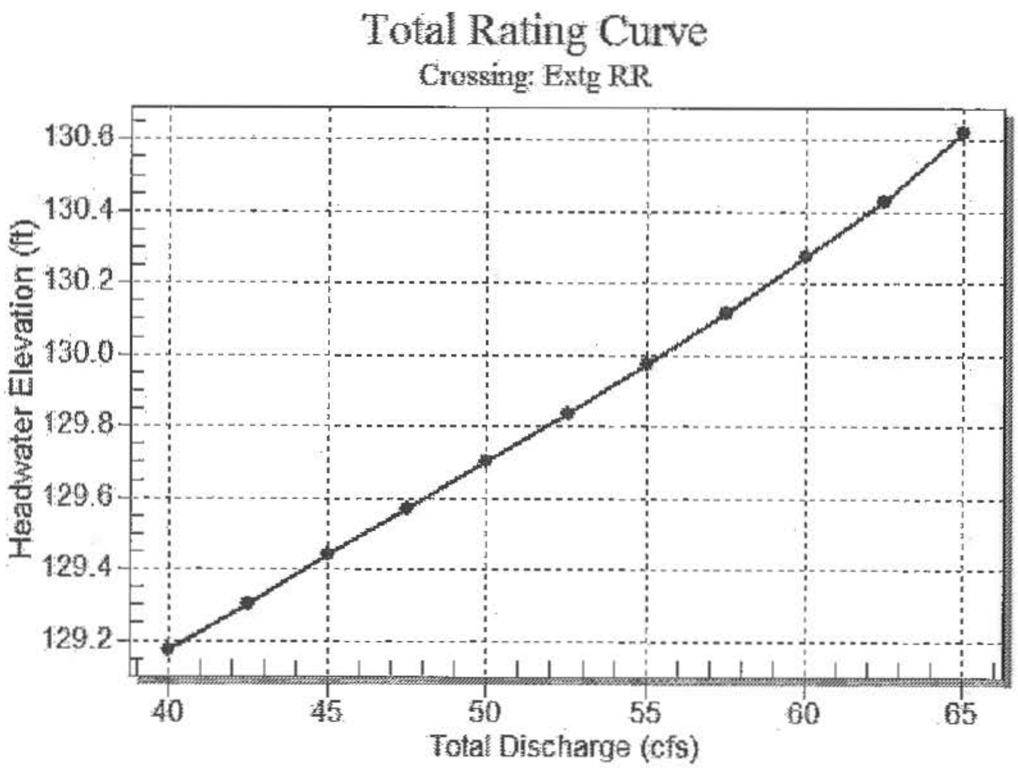


Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
40.00	40.00	129.17	3.067	3.214	2-M2c	3.000	2.056	2.056	1.095	7.753	3.847
42.50	42.50	129.30	3.200	3.344	2-M2c	3.000	2.121	2.121	1.135	7.951	3.936
45.00	45.00	129.44	3.337	3.478	2-M2c	3.000	2.178	2.178	1.175	8.200	4.021
47.50	47.50	129.57	3.480	3.609	2-M2c	3.000	2.236	2.236	1.213	8.427	4.102
50.00	50.00	129.70	3.628	3.741	2-M2c	3.000	2.293	2.293	1.250	8.643	4.181
52.50	52.50	129.83	3.783	3.873	2-M2c	3.000	2.350	2.350	1.287	8.848	4.258
55.00	55.00	129.98	3.944	4.016	2-M2c	3.000	2.405	2.405	1.323	9.052	4.332
57.50	57.50	130.11	4.112	4.155	2-M2c	3.000	2.445	2.445	1.359	9.305	4.403
60.00	60.00	130.27	4.288	4.314	2-M2c	3.000	2.486	2.486	1.393	9.609	4.473
62.50	62.50	130.43	4.471	4.468	7-M2c	3.000	2.526	2.526	1.427	9.874	4.541
65.00	65.00	130.62	4.661	4.628	7-M2c	3.000	2.566	2.566	1.461	10.132	4.607

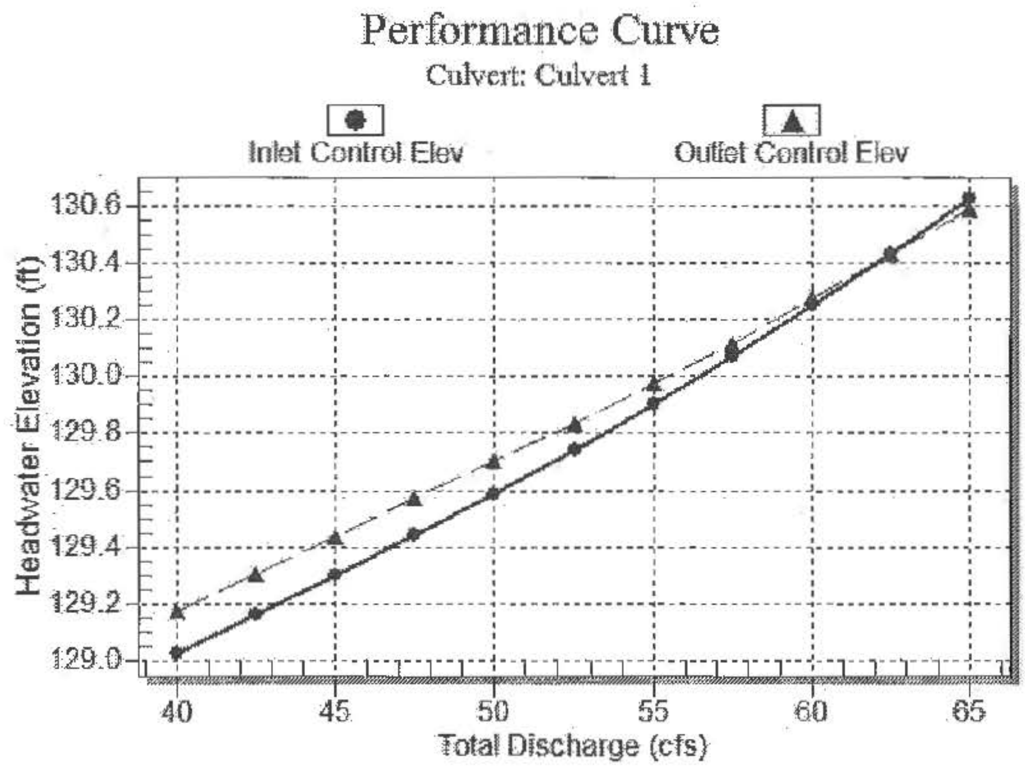
****

Inlet Elevation (invert): 125.96 ft, Outlet Elevation (invert): 125.95 ft

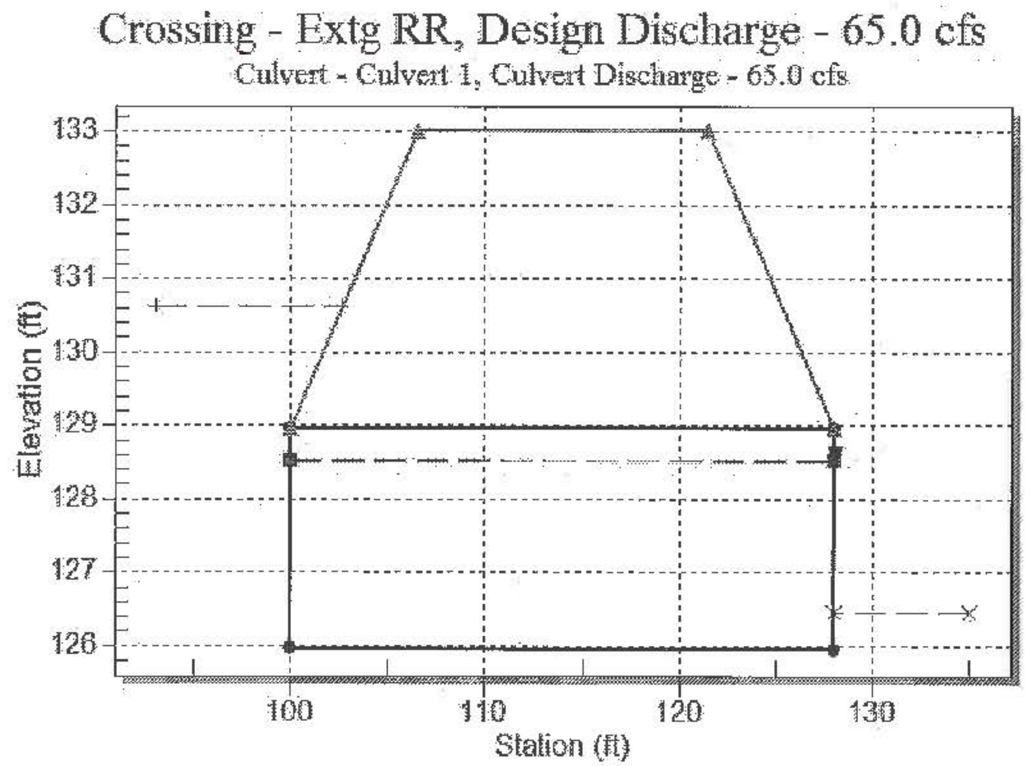
Culvert Length: 28.00 ft, Culvert Slope: 0.0004

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 100.00 ft

Inlet Elevation: 125.96 ft

Outlet Station: 128.00 ft

Outlet Elevation: 125.95 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Grooved End in Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Extg RR)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
40.00	126.10	1.10	3.85	0.27	0.66
42.50	126.14	1.14	3.94	0.28	0.67
45.00	126.17	1.17	4.02	0.29	0.67
47.50	126.21	1.21	4.10	0.30	0.67
50.00	126.25	1.25	4.18	0.31	0.68
52.50	126.29	1.29	4.26	0.32	0.68
55.00	126.32	1.32	4.33	0.33	0.68
57.50	126.36	1.36	4.40	0.34	0.69
60.00	126.39	1.39	4.47	0.35	0.69
62.50	126.43	1.43	4.54	0.36	0.69
65.00	126.46	1.46	4.61	0.36	0.69

Tailwater Channel Data - Extg RR

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0040

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	60.00	127.20	0.0350
2	80.00	127.10	0.0350
3	105.00	127.00	0.0350
4	106.00	125.00	0.0250
5	115.00	125.00	0.0250
6	116.00	127.50	0.0400
7	130.00	127.70	0.0000

Roadway Data for Crossing: Extg RR

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 150.00 ft

Crest Elevation: 133.00 ft

Roadway Surface: Gravel

Roadway Top Width: 15.00 ft

HY-8 Culvert Analysis Report

New Road Culverts (36" & 18")

Table 1 - Summary of Culvert Flows at Crossing: New Road -No DS Mods

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Culvert 2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
130.20	40.00	33.38	6.66	0.00	10
130.27	42.50	35.45	7.08	0.00	3
130.35	45.00	37.53	7.49	0.00	3
130.43	47.50	39.61	7.91	0.00	3
130.51	50.00	41.68	8.33	0.00	3
130.60	52.50	43.77	8.74	0.00	3
130.69	55.00	45.86	9.16	0.00	3
130.79	57.50	47.94	9.58	0.00	3
130.89	60.00	50.03	9.99	0.00	3
131.00	62.50	52.11	10.41	0.00	3
131.11	65.00	54.19	10.82	0.00	3

Rating Curve Plot for Crossing: New Road -No DS Mods

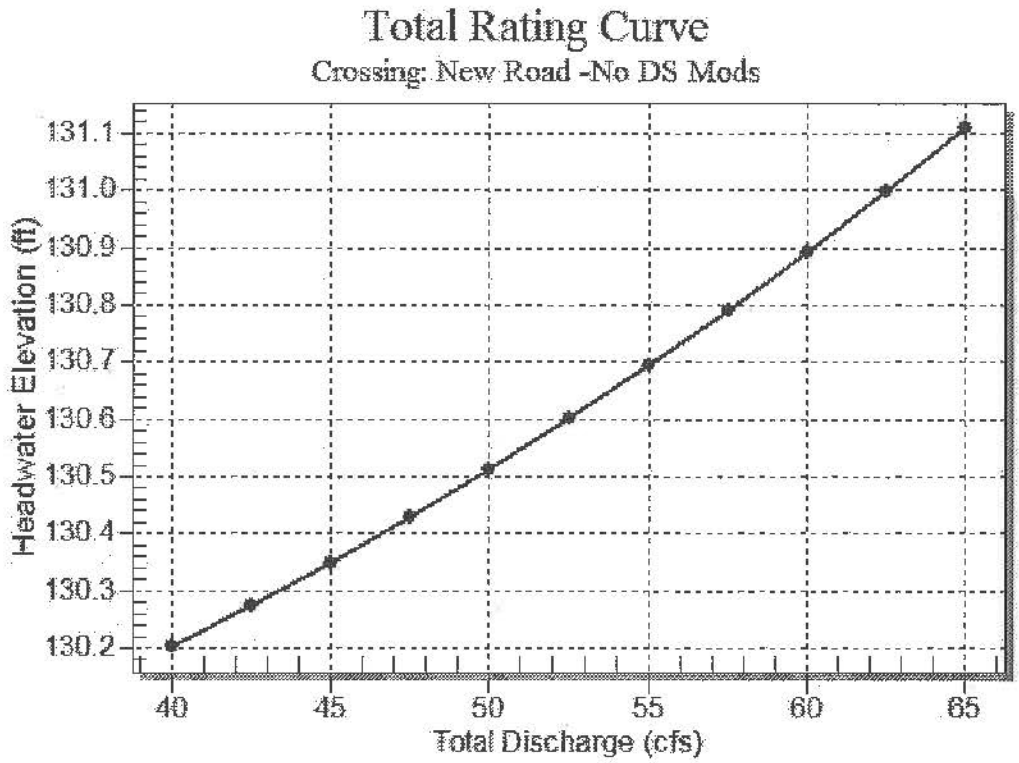


Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
40.00	33.38	130.20	2.732	4.394	4-FFf	3.000	1.871	3.000	3.840	4.723	0.000
42.50	35.45	130.27	2.835	4.464	4-FFf	3.000	1.929	3.000	3.840	5.015	0.000
45.00	37.53	130.35	2.941	4.540	4-FFf	3.000	1.987	3.000	3.840	5.310	0.000
47.50	39.61	130.43	3.048	4.619	4-FFf	3.000	2.045	3.000	3.840	5.604	0.000
50.00	41.68	130.51	3.157	4.703	4-FFf	3.000	2.102	3.000	3.840	5.897	0.000
52.50	43.77	130.60	3.269	4.792	4-FFf	3.000	2.150	3.000	3.840	6.192	0.000
55.00	45.86	130.69	3.386	4.884	4-FFf	3.000	2.198	3.000	3.840	6.487	0.000
57.50	47.94	130.79	3.506	4.982	4-FFf	3.000	2.246	3.000	3.840	6.782	0.000
60.00	50.03	130.89	3.630	5.083	4-FFf	3.000	2.294	3.000	3.840	7.078	0.000
62.50	52.11	131.00	3.758	5.189	4-FFf	3.000	2.341	3.000	3.840	7.372	0.000
65.00	54.19	131.11	3.891	5.299	4-FFf	3.000	2.389	3.000	3.840	7.666	0.000

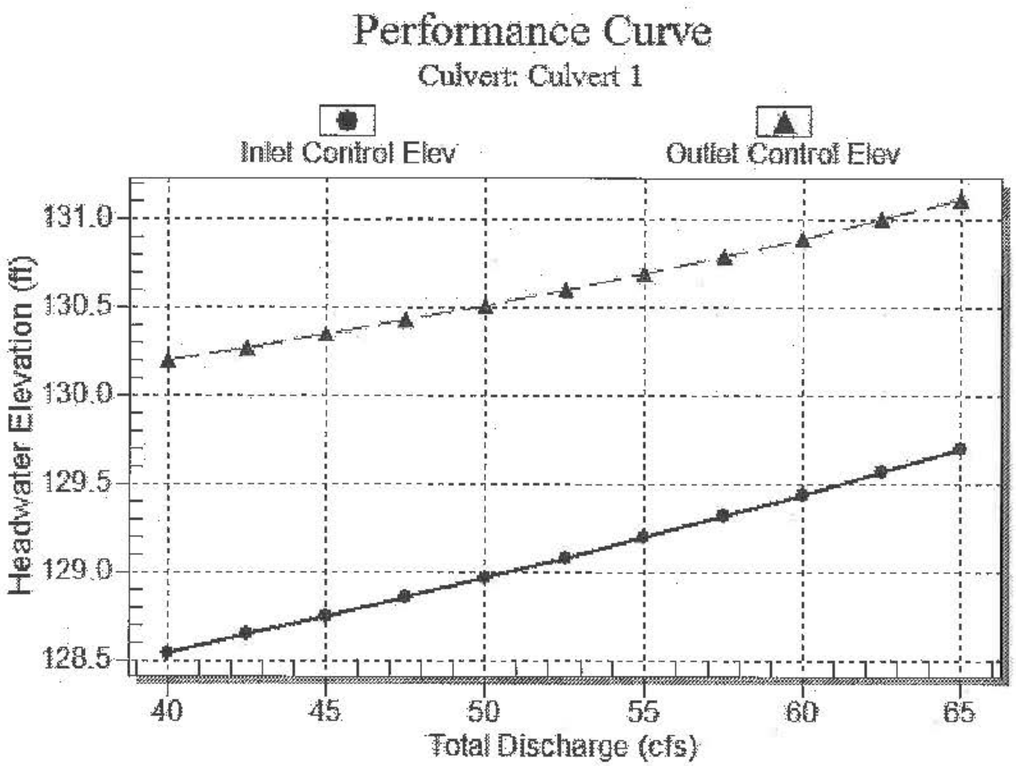
****

Inlet Elevation (invert): 125.81 ft, Outlet Elevation (invert): 125.81 ft

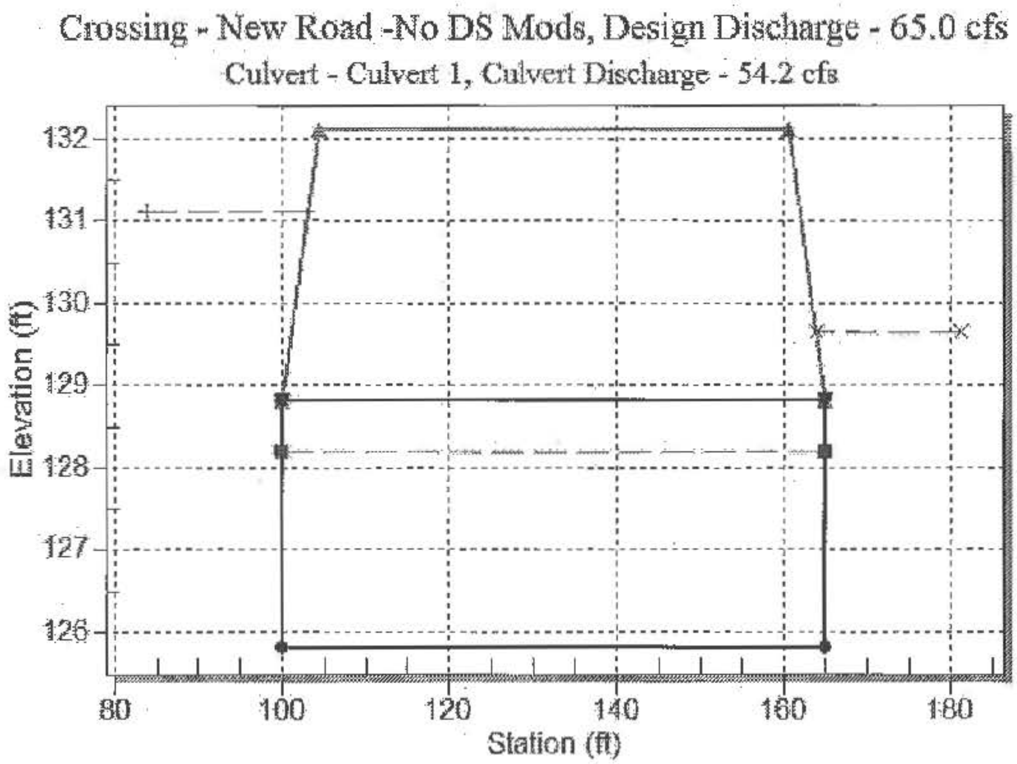
Culvert Length: 65.00 ft, Culvert Slope: 0.0000

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 100.00 ft

Inlet Elevation: 125.81 ft

Outlet Station: 165.00 ft

Outlet Elevation: 125.81 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Grooved End in Headwall

Inlet Depression: None

Table 3 - Culvert Summary Table: Culvert 2

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
40.00	6.66	130.20	1.579	4.203	4-FFf	1.500	0.996	1.500	3.840	3.771	0.000
42.50	7.08	130.27	1.652	4.274	4-FFf	1.500	1.028	1.500	3.840	4.005	0.000
45.00	7.49	130.35	1.729	4.349	4-FFf	1.500	1.059	1.500	3.840	4.240	0.000
47.50	7.91	130.43	1.809	4.429	4-FFf	1.500	1.086	1.500	3.840	4.476	0.000
50.00	8.33	130.51	1.892	4.513	4-FFf	1.500	1.113	1.500	3.840	4.711	0.000
52.50	8.74	130.60	1.980	4.602	4-FFf	1.500	1.140	1.500	3.840	4.947	0.000
55.00	9.16	130.69	2.071	4.694	4-FFf	1.500	1.167	1.500	3.840	5.183	0.000
57.50	9.58	130.79	2.168	4.791	4-FFf	1.500	1.194	1.500	3.840	5.418	0.000
60.00	9.99	130.89	2.268	4.893	4-FFf	1.500	1.215	1.500	3.840	5.653	0.000
62.50	10.41	131.00	2.374	4.999	4-FFf	1.500	1.234	1.500	3.840	5.889	0.000
65.00	10.82	131.11	2.484	5.108	4-FFf	1.500	1.253	1.500	3.840	6.125	0.000

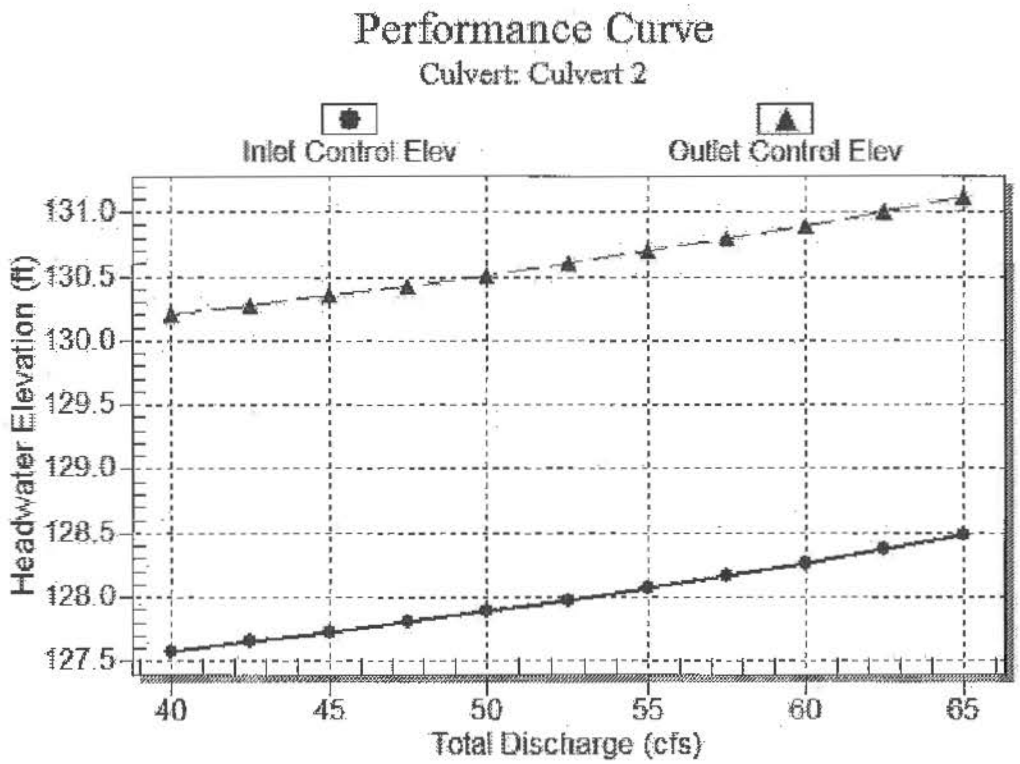
****

Inlet Elevation (invert): 126.00 ft, Outlet Elevation (invert): 126.00 ft

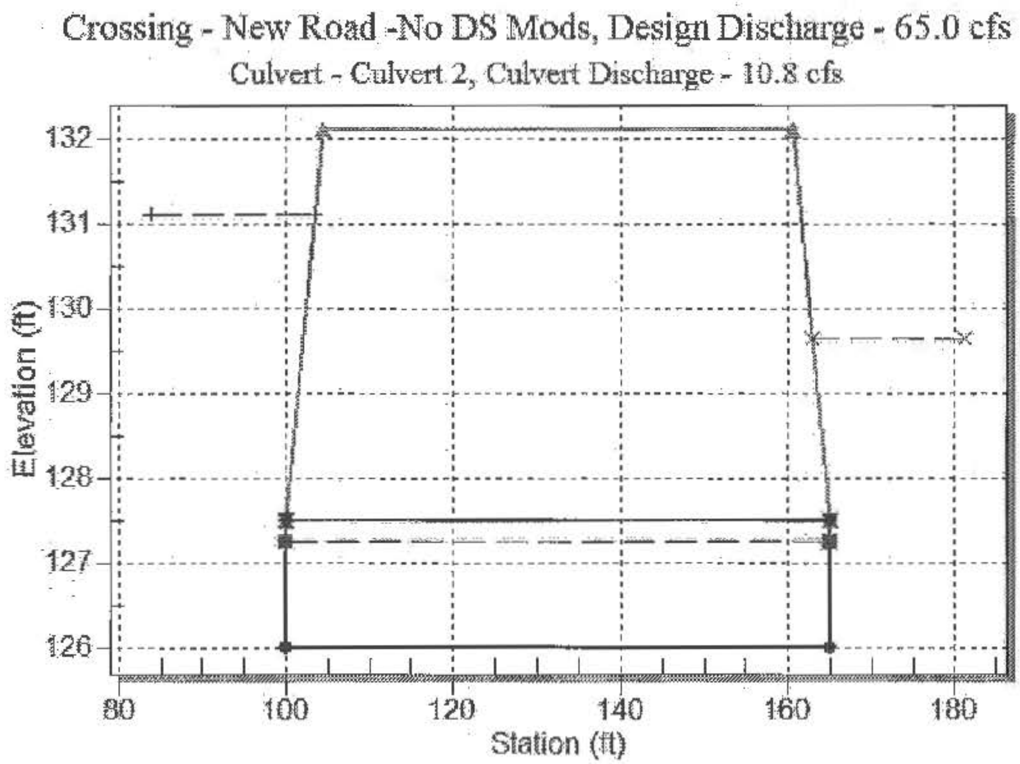
Culvert Length: 65.00 ft, Culvert Slope: 0.0000

****

Culvert Performance Curve Plot: Culvert 2



Water Surface Profile Plot for Culvert: Culvert 2



Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 100.00 ft

Inlet Elevation: 126.00 ft

Outlet Station: 165.00 ft

Outlet Elevation: 126.00 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 4 - Downstream Channel Rating Curve (Crossing: New Road -No DS Mods)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
40.00	129.65	3.84
42.50	129.65	3.84
45.00	129.65	3.84
47.50	129.65	3.84
50.00	129.65	3.84
52.50	129.65	3.84
55.00	129.65	3.84
57.50	129.65	3.84
60.00	129.65	3.84
62.50	129.65	3.84
65.00	129.65	3.84

Tailwater Channel Data - New Road -No DS Mods

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 129.65 ft

Roadway Data for Crossing: New Road -No DS Mods

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 150.00 ft

Crest Elevation: 132.10 ft

Roadway Surface: Paved

Roadway Top Width: 56.00 ft

HY-8 Culvert Analysis Report

Railroad with Additional 18" Culvert

Table 1 - Summary of Culvert Flows at Crossing: RR Addl Culvert - No DS Mods

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Culvert 2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
128.55	40.00	28.21	11.80	0.00	5
128.66	42.50	30.20	12.29	0.00	3
128.76	45.00	32.20	12.77	0.00	4
128.87	47.50	34.20	13.28	0.00	4
128.98	50.00	36.23	13.76	0.00	3
129.09	52.50	38.39	14.12	0.00	3
129.20	55.00	40.46	14.54	0.00	3
129.31	57.50	42.57	14.94	0.00	3
129.42	60.00	44.69	15.31	0.00	3
129.54	62.50	46.84	15.66	0.00	3
129.65	65.00	49.00	16.00	0.00	4

Rating Curve Plot for Crossing: RR Addl Culvert - No DS Mods

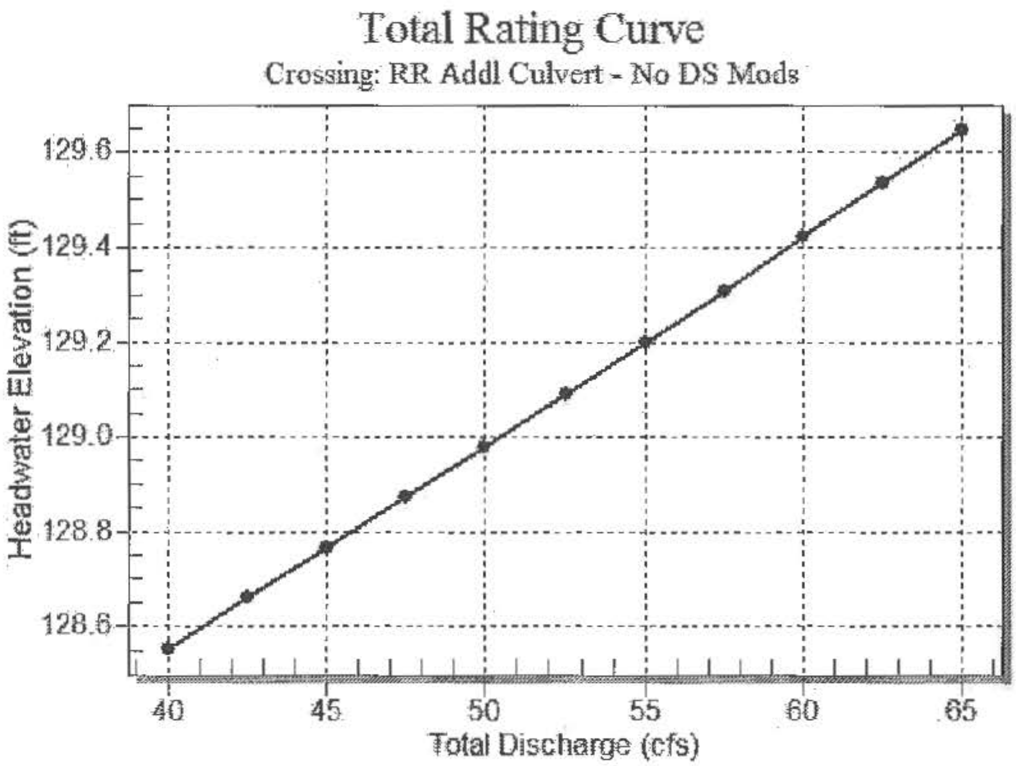


Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
40.00	28.21	128.55	2.473	2.593	2-M2c	3.000	1.713	1.713	1.095	6.767	3.847
42.50	30.20	128.66	2.573	2.700	2-M2c	3.000	1.779	1.779	1.135	6.919	3.936
45.00	32.20	128.76	2.673	2.804	2-M2c	3.000	1.838	1.838	1.175	7.090	4.021
47.50	34.20	128.87	2.772	2.913	2-M2c	3.000	1.894	1.894	1.213	7.282	4.102
50.00	36.23	128.98	2.874	3.020	2-M2c	3.000	1.951	1.951	1.250	7.458	4.181
52.50	38.39	129.09	2.984	3.131	2-M2c	3.000	2.011	2.011	1.287	7.632	4.258
55.00	40.46	129.20	3.091	3.237	2-M2c	3.000	2.069	2.069	1.323	7.787	4.332
57.50	42.57	129.31	3.204	3.347	2-M2c	3.000	2.123	2.123	1.359	7.957	4.403
60.00	44.69	129.42	3.320	3.462	2-M2c	3.000	2.171	2.171	1.393	8.171	4.473
62.50	46.84	129.54	3.441	3.575	2-M2c	3.000	2.221	2.221	1.427	8.368	4.541
65.00	49.00	129.65	3.568	3.686	2-M2c	3.000	2.270	2.270	1.461	8.558	4.607

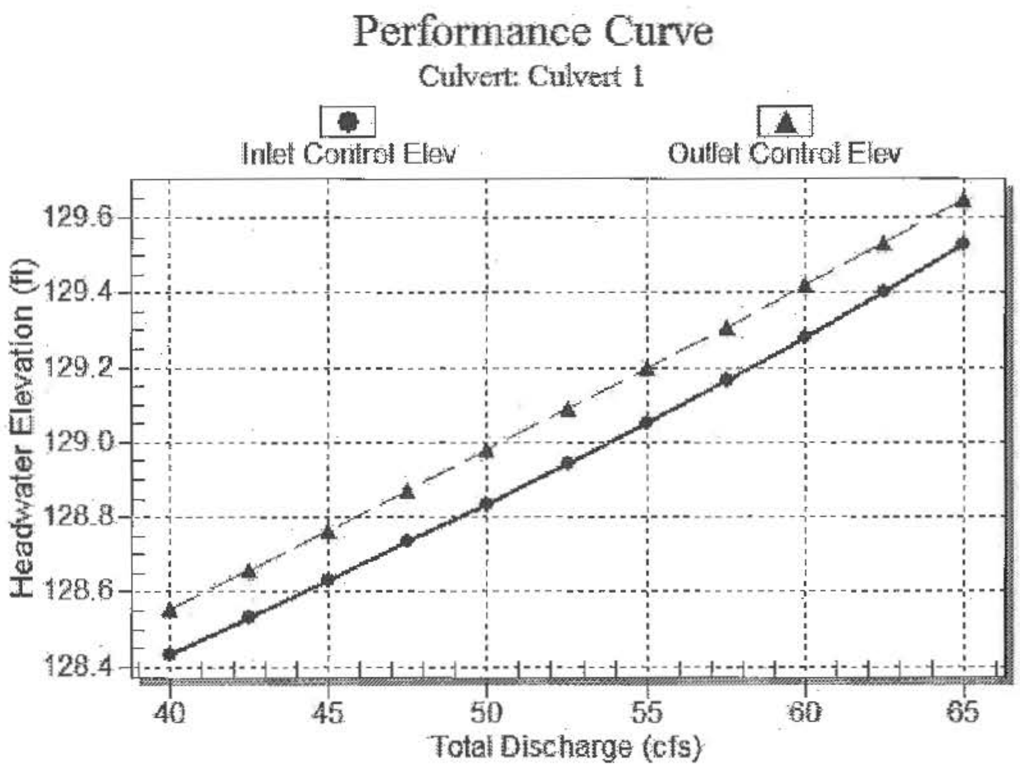
****

Inlet Elevation (invert): 125.96 ft, Outlet Elevation (invert): 125.95 ft

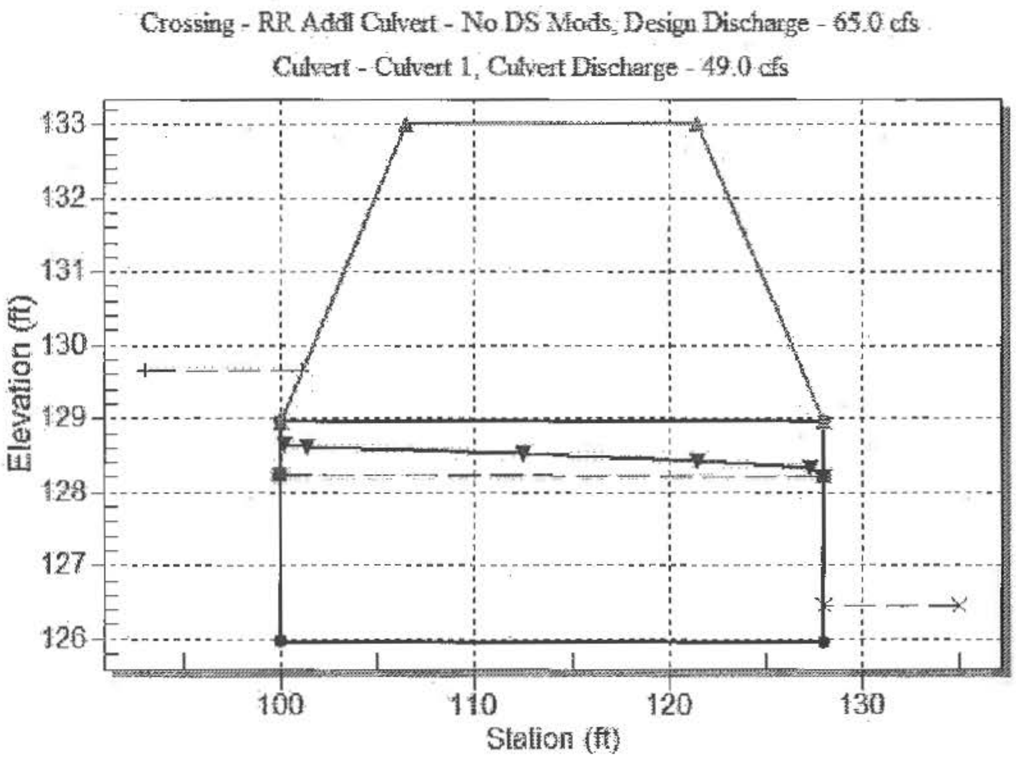
Culvert Length: 28.00 ft, Culvert Slope: 0.0004

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 100.00 ft

Inlet Elevation: 125.96 ft

Outlet Station: 128.00 ft

Outlet Elevation: 125.95 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Grooved End in Headwall

Inlet Depression: None

Table 3 - Culvert Summary Table: Culvert 2

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
40.00	11.80	128.55	2.441	2.551	7-M2c	1.500	1.297	1.297	1.095	7.288	3.847
42.50	12.29	128.66	2.562	2.659	7-M2c	1.500	1.319	1.319	1.135	7.482	3.936
45.00	12.77	128.76	2.687	2.763	7-M2c	1.500	1.341	1.341	1.175	7.668	4.021
47.50	13.28	128.87	2.822	2.872	7-M2c	1.500	1.364	1.364	1.213	7.856	4.102
50.00	13.76	128.98	2.958	2.978	7-M2c	1.500	1.386	1.386	1.250	8.032	4.181
52.50	14.12	129.09	3.060	3.090	7-M2c	1.500	1.402	1.402	1.287	8.271	4.258
55.00	14.54	129.20	3.186	3.197	7-M2c	1.500	1.422	1.422	1.323	8.461	4.332
57.50	14.94	129.31	3.307	3.298	7-M2c	1.500	1.440	1.440	1.359	8.636	4.403
60.00	15.31	129.42	3.421	3.393	7-M2c	1.500	1.456	1.456	1.393	8.796	4.473
62.50	15.66	129.54	3.534	3.486	7-M2c	1.500	1.472	1.472	1.427	8.948	4.541
65.00	16.00	129.65	3.645	3.575	7-M2c	1.500	1.488	1.488	1.461	9.093	4.607

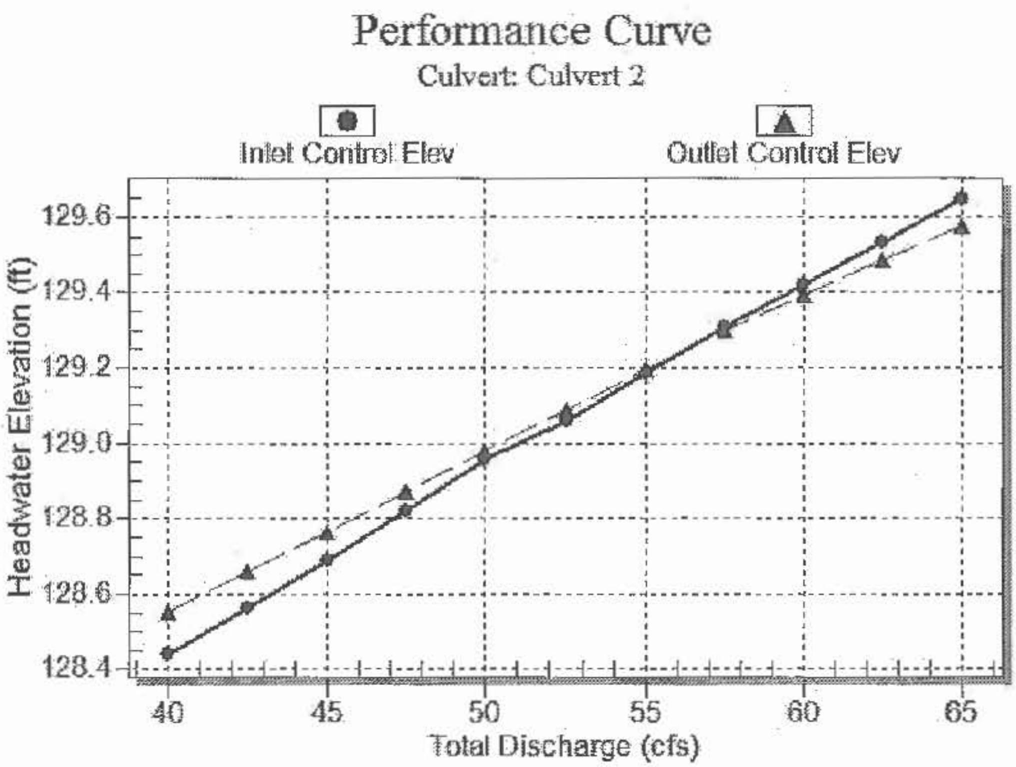
****

Inlet Elevation (invert): 126.00 ft, Outlet Elevation (invert): 126.00 ft

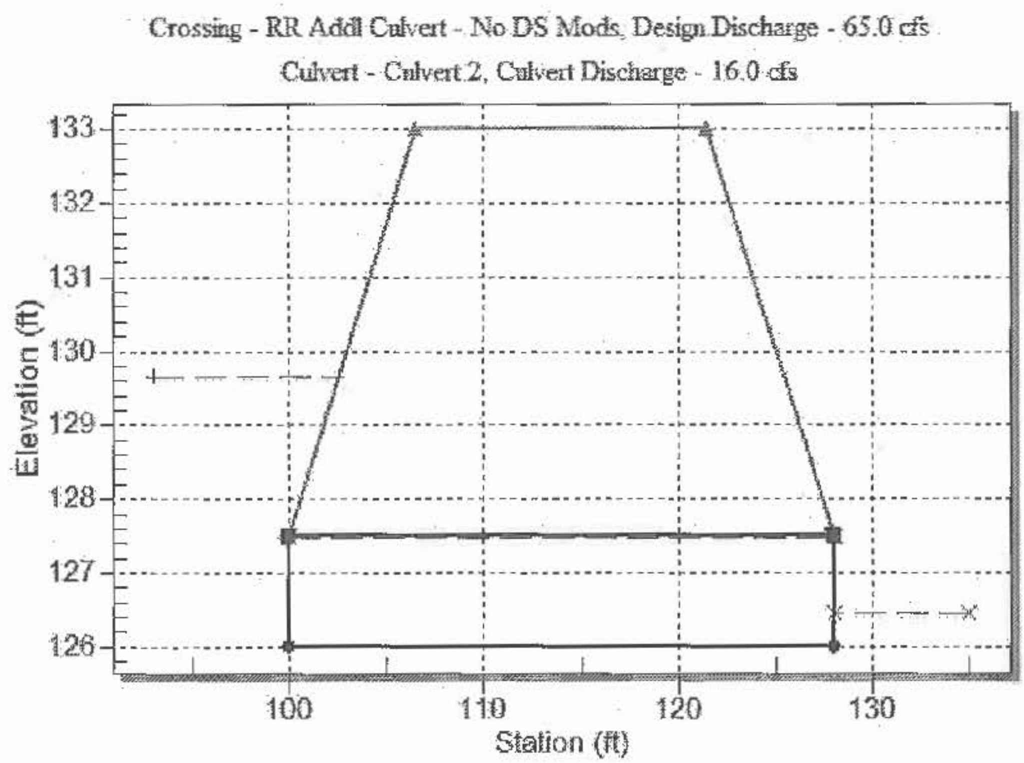
Culvert Length: 28.00 ft, Culvert Slope: 0.0000

****

Culvert Performance Curve Plot: Culvert 2



Water Surface Profile Plot for Culvert: Culvert 2



Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 100.00 ft

Inlet Elevation: 126.00 ft

Outlet Station: 128.00 ft

Outlet Elevation: 126.00 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Grooved End Projecting

Inlet Depression: None

Table 4 - Downstream Channel Rating Curve (Crossing: RR Addl Culvert - No DS Mods)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
40.00	126.10	1.10	3.85	0.27	0.66
42.50	126.14	1.14	3.94	0.28	0.67
45.00	126.17	1.17	4.02	0.29	0.67
47.50	126.21	1.21	4.10	0.30	0.67
50.00	126.25	1.25	4.18	0.31	0.68
52.50	126.29	1.29	4.26	0.32	0.68
55.00	126.32	1.32	4.33	0.33	0.68
57.50	126.36	1.36	4.40	0.34	0.69
60.00	126.39	1.39	4.47	0.35	0.69
62.50	126.43	1.43	4.54	0.36	0.69
65.00	126.46	1.46	4.61	0.36	0.69

Tailwater Channel Data - RR Addl Culvert - No DS Mods

Tailwater Channel Option: Irregular Channel

Channel Slope: 0.0040

User Defined Channel Cross-Section:

Coord No.	Station (ft)	Elevation (ft)	Manning's n
1	60.00	127.20	0.0350
2	80.00	127.10	0.0350
3	105.00	127.00	0.0350
4	106.00	125.00	0.0250
5	115.00	125.00	0.0250
6	116.00	127.50	0.0400
7	130.00	127.70	0.0000

Roadway Data for Crossing: RR Addl Culvert - No DS Mods

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 150.00 ft

Crest Elevation: 133.00 ft

Roadway Surface: Gravel

Roadway Top Width: 15.00 ft

Pacific Cornetta/Shultz Site Drainage Analysis

VLMK CONSULTING ENGINEERS
3933 SW Kelly Avenue • Portland • Oregon 97239-4393

P 503.222.4453
F 503.248.9263
E vlmk@vlmk.com
W www.vlmk.com

STORMWATER CALCULATIONS

for

Pacific CORNETTA

TUALATIN SITE

AND ADJACENT FUTURE BUILDING SITE
18280 SW 108TH AVENUE
TUALATIN, OREGON 97062-8016

WASHINGTON COUNTY

March 2, 2005

REGISTERED PROFESSIONAL ENGINEER
61270PE
Robert J. Léger
OREGON
JULY 15, 2003
ROBERT JAMES LÉGER
EXPIRES: 12/31/2006

Prepared by: Robert Léger

VLMK Job Number 204440

PACIFIC CORNETTA

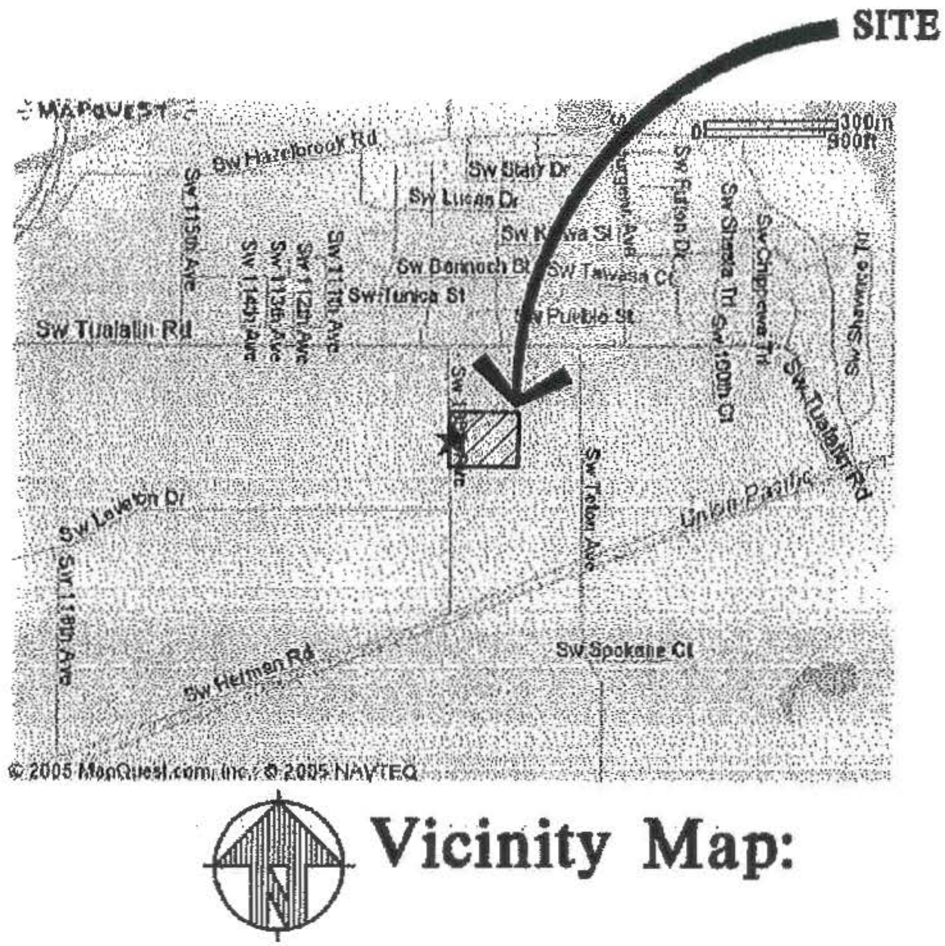
Tualatin, Oregon

STORMWATER CALCULATIONS

March 2, 2005

TABLE OF CONTENTS

PACIFIC CORNETTA
204440



Vicinity Map:

PROJECT INFORMATION AND STORMWATER NARRATIVE

Project:

The proposed project is located at 18280 SW 108th Avenue. Pacific Cornetta is building a new facility. Survey information is from a Topographical Survey in Lot 8, "Glenmorag Park," in the Northeast ¼ of Section 22, Township 2 South, Range 1 West of the Willamette Meridian, City of Tualatin, Washington County, Oregon – provided by Development & Construction Services, Inc. (339 W. Main Street, Hillsboro, Oregon 97123, Phone: 503-648-4959)

The proposed project will construct a 34,650 s.f. building, loading docks, and a stormwater quality/quantity facility and necessary conveyance system. A future 18,663 s.f. building expansion and adjacent Lot 2 development (east of the PC building) has been planned for in the design of the stormwater system. All calculations have been made assuming 85% impervious area coverage for the entire project. No additional stormwater analysis, or stormwater facility modification, will be necessary with Lot 2 or the building expansion.

Existing Conditions:

The site is mostly undeveloped land, with five structures (house, two garages, shop building, shed). The land is approximately 4.750 acres in area, with elevations between 138.00 and 160.00

Stormwater Narrative:

The stormwater runoff from paved areas will be routed to trapped catch basins and conveyed underground to a vegetated swale for water quality treatment. The stormwater runoff from roof areas will be routed underground to the vegetated swale for water quality treatment. An outflow control structure has been designed to control (detain) the outflow of storm events larger than the water quality event. Storage volume is provided above the swale, and flow control will be performed using a structure (standpipe). See details, on plans and in this report.

The swale is a flow-through system that provides stormwater quality treatment via a minimum 9.0-minute residence time of stormwater. Swales function like a shallow clarifier. Hydraulic efficiency is maximized by the geometry of the swale (long length to width ratio, shallow depth of flow); dead zones and short-circuiting is minimized as plug flow through the system is maximized. The swale facility is designed using a 0.50-foot maximum treatment flow depth, 2.0' minimum wide bottom, 4:1 side slopes, and 18" tall vegetation (sedges and/or rushes, per the landscape plan).

Water quality treatment is primarily achieved in swales through sedimentation of suspended solids. Secondary treatment is through the sorption of some dissolved nutrients and metals through extended contact with vegetation in the swale.

A temporary sediment pond will be created on Lot 2. Until good vegetative cover is established, the temporary sediment pond will reduce the coarse sediment load to the water quality swale, extending periods between maintenance. The temporary sediment pond can remain, with minor modifications, if the Pacific Cornetta building expansion is completed prior to development of Lot 2. The temporary sediment pond will be completely removed with the development of Lot 2.

Stormwater is discharged into an existing public stormwater system in SW 108th Avenue after water quality treatment and water quantity control. An overflow route is provided between the west end of the pond and the street right of way.

The owner of the property will be responsible for maintaining the stormwater conveyance system. An Operations and Maintenance agreement is attached to this report.

VLMK CONSULTING ENGINEERS
3933 SW Kelly Avenue • Portland • Oregon 97239-4393
P 503.222.4453 503.248.9263 F

Job PACIFIC CORNETTA
Client PACIFIC CORNETTA
Job No. 204440 By RJL
Date OCT 5.04 Sheet No.

PRE-DEVELOPMENT SITE AREAS

TOTAL SITE AREA: 206,925 SF (4.750 ACRES)

ROOF AREA: 7,104 SF (0.163 Ac.) CN: 98
ASPHALT AREA: 364 SF (0.008 Ac.) CN: 98
GRAVEL AREA: 12,535 SF (0.288 Ac.) CN: 85
PERVIOUS AREA: 186,922 SF (4.291 Ac.) CN: 79
(PASTURE, GRASS LAND OR RANGE, POOR CONDITION)

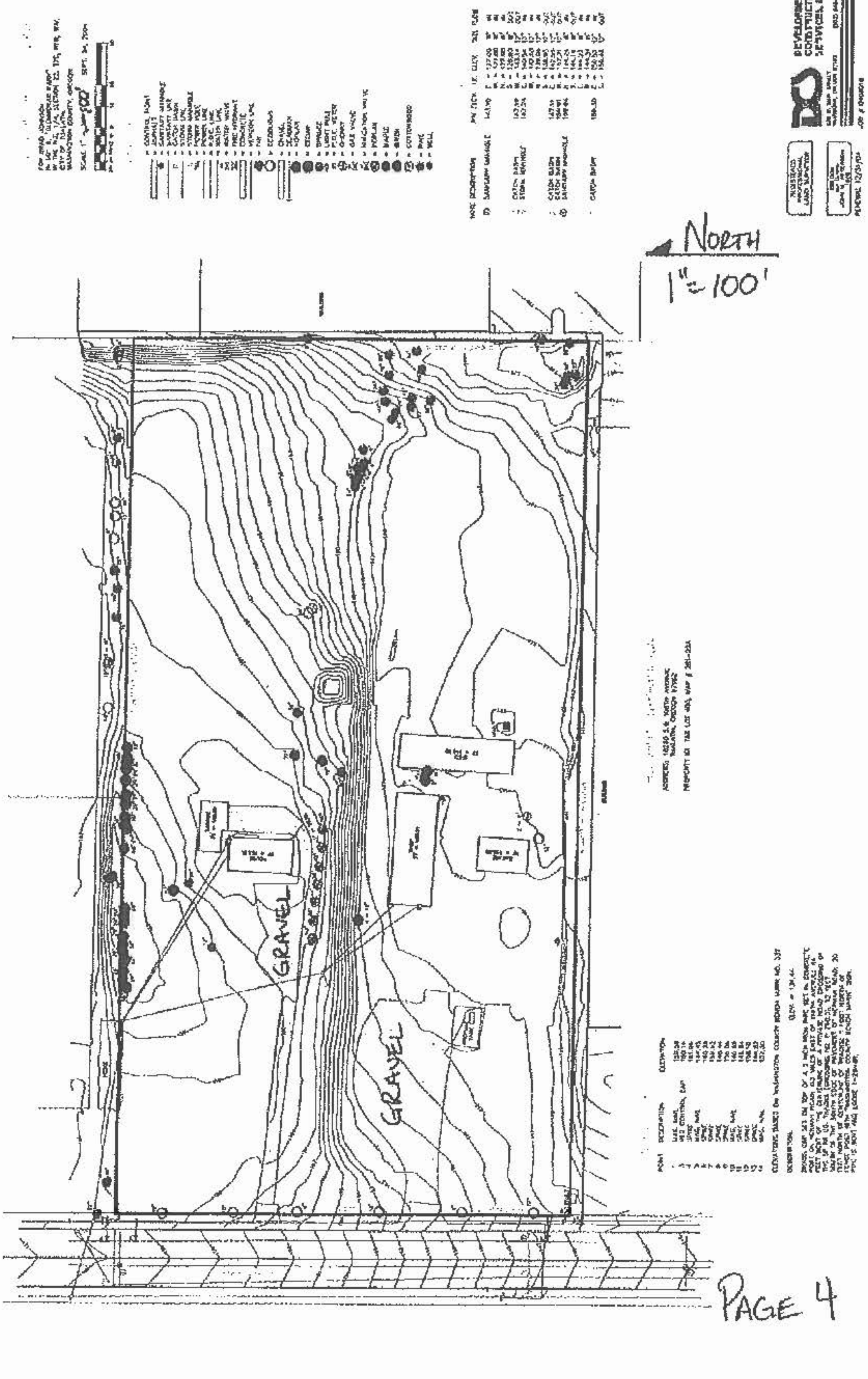
IMPERVIOUS AREA COMPOSITE CN:

$$\frac{(0.163+0.008)(98)+(0.288)(85)}{(0.163+0.008+0.288)} = 89.8$$

PERVIOUS AREA: 4.291 Ac., CN = 79
IMPERVIOUS AREA: 0.459 Ac., CN = 89.8

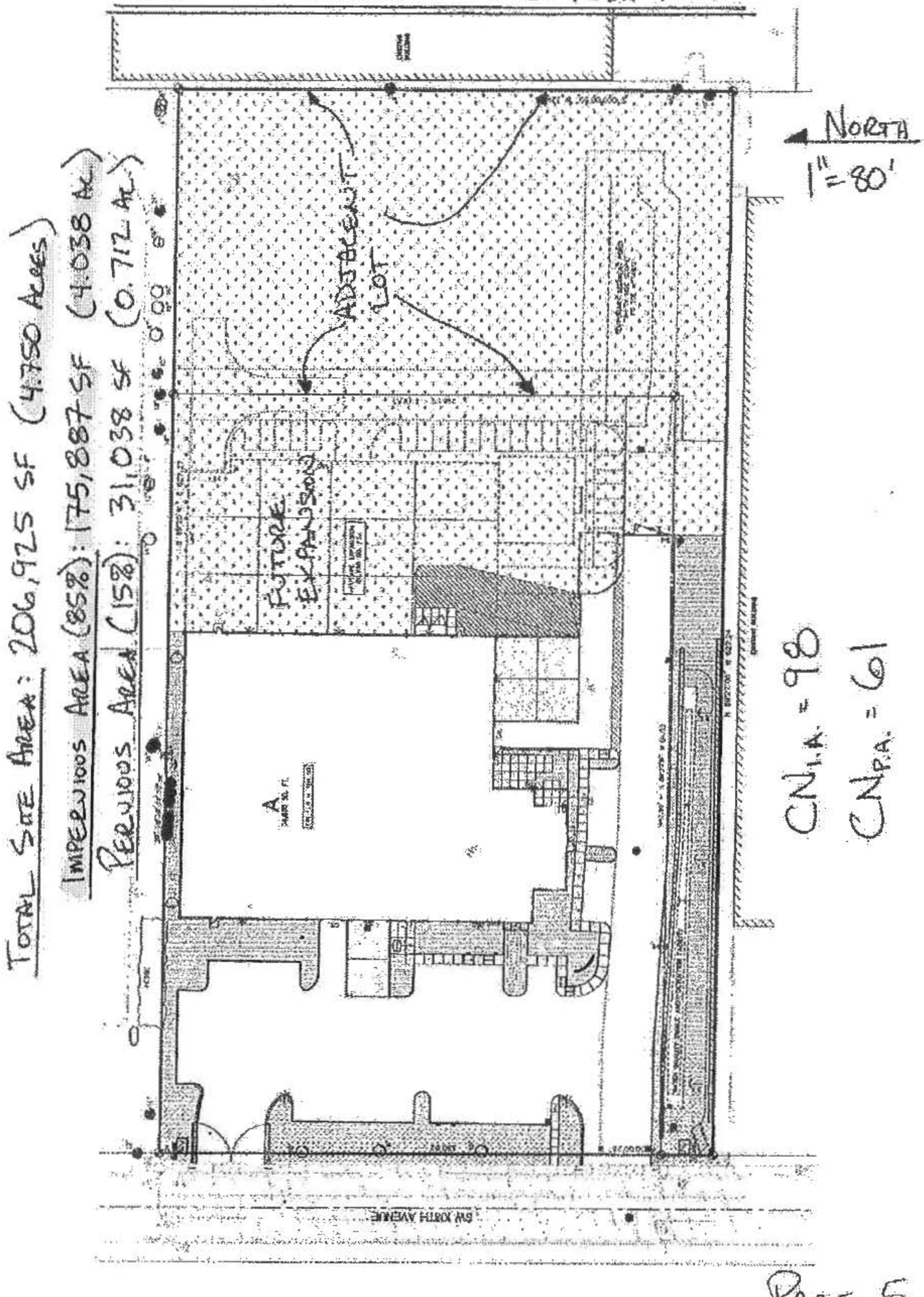
Pacific Cornetta
204440

Pre-Development Site Map



PACIFIC CORNETTA
204440

POST-DEVELOPMENT SITE AREA & MAP



PACIFIC CORNETTA
204440

WATER QUALITY CALCULATION

SITE AREAS (TOTAL AREA: 4.750 AC.)

PRE-DEVELOPMENT
PERVIOUS AREA 4.290 AC (186,851 SQ. FT.)
IMPERVIOUS AREA 0.173 AC (7539 SQ. FT.) ROOF/CONCRETE
IMPERVIOUS AREA 0.288 AC (12,535 SQ. FT.) GRAVEL DRIVE

POST-DEVELOPMENT
PERVIOUS AREA 0.712 AC (31,038 SQ. FT.)
IMPERVIOUS AREA 4.038 AC (175,887 SQ. FT.)

WATER QUALITY CALCULATIONS:

REQUIRED WATER QUALITY VOLUME (Vwq):

Vwq = IMPERVIOUS AREA X 0.36"

Vwq = 175,887 SQ. FT. X 0.36" X $\frac{1 \text{ FT}}{12"}$

Vwq = 5,276 CU. FT.

WATER QUALITY DISCHARGE RATE: Qwq

Qwq = $\frac{Vwq}{T}$

DRAWDOWN TIME, T = 4 HRS.

Qwq = $\frac{5,276 \text{ CU. FT.}}{4 \text{ HRS. X } 3600 \text{ SEC/HR}}$

Qwq = 0.37 CFS

WATER QUALITY SWALE DESIGN:

2' MINIMUM BOTTOM WIDTH 4:1 SIDE SLOPES

6" MAX. FLOW DEPTH SLOPE = 0.0050 ft/ft n = 0.24

9 MINUTE RESIDENCE TIME v = 0.20 ft/s

108' SWALE LENGTH REQUIRED

230' SWALE LENGTH PROVIDED, WATER QUALITY REQUIREMENTS MET

PACIFIC CORNETTA
204440

Water Quality Swale Flow Properties
Worksheet for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\204440.fm2
Worksheet	Swale
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

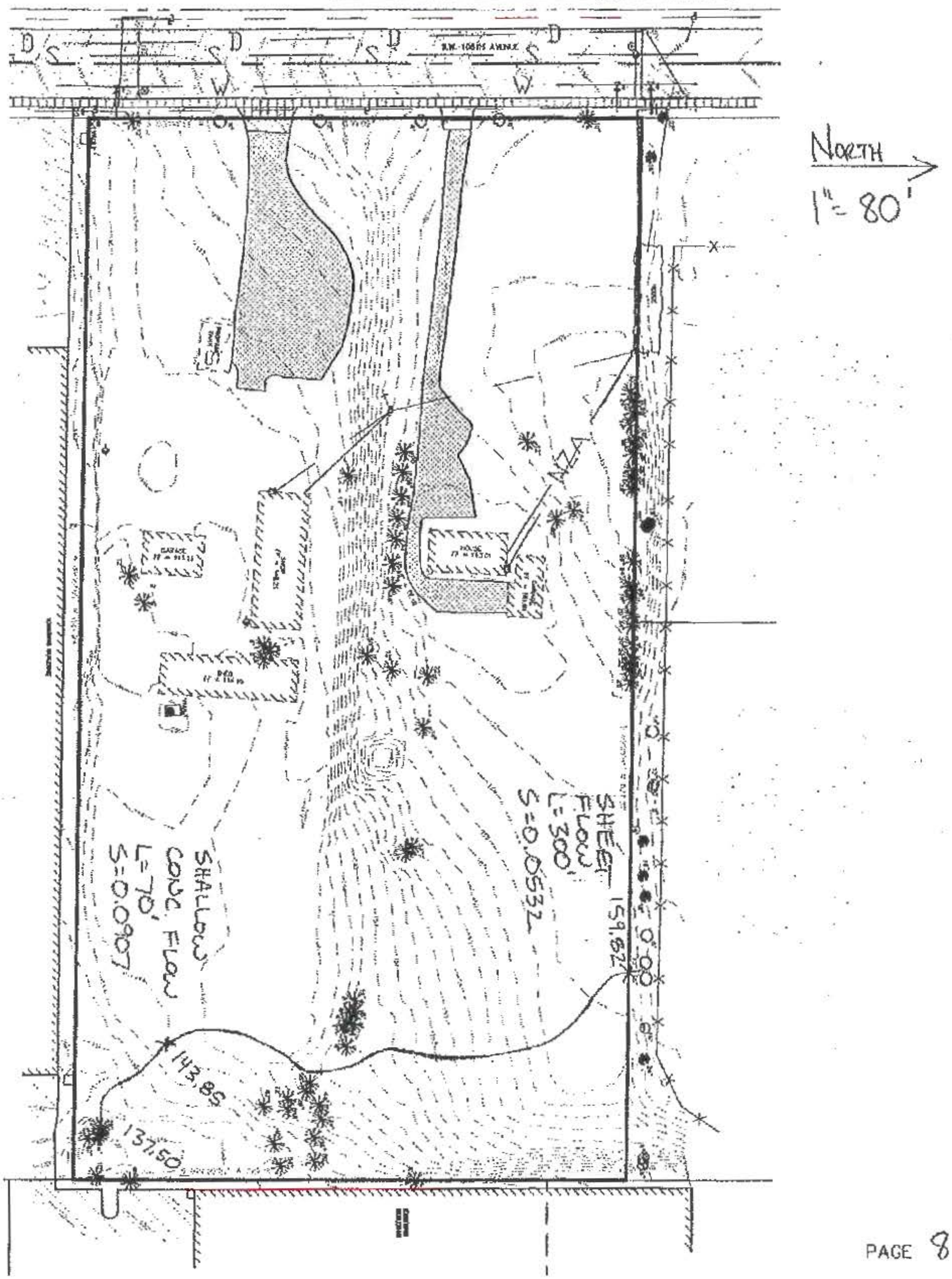
Input Data			
Mannings Coefficient	0.240		
Channel Slope	0.005000 ft/ft		
Left Side Slope	4.000000 H : V		
Right Side Slope	4.000000 H : V		
Bottom Width	2.00	ft	2' MIN.
Discharge	0.37	cfs	MAX. WQ Q

Results			
Depth	5.6	in	LESS THAN 6"
Flow Area	1.82	ft²	
Wetted Perimeter	5.88	ft	
Top Width	6.76	ft	
Critical Depth	0.09	ft	
Critical Slope	1.955461 ft/ft		
Velocity	0.20	ft/s	$(9 \text{ min})\left(\frac{60 \text{ s}}{\text{min.}}\right)(0.20 \text{ ft/s}) = 108$ ft. SWALE REQUIRED
Velocity Head	0.63e-3	ft	
Specific Energy	0.47	ft	
Froude Number	0.06		
Flow is subcritical.			

PACIFIC CORNETTA
204440

TIME OF CONCENTRATION MAP

PRE-DEVELOPMENT CONDITION



Pacific Cornetta
204440

TIME OF CONCENTRATION CALCULATIONS

Time of Travel — **Clean Water Services**

SHEET FLOW — Less than 300' Length

$$Tt = (0.93 \times L^{0.6} \times n^{0.3}) / (I^{0.4} \times S^{0.3})$$

Time of Travel	**Tt = 25.82 min.**	
Length of Flow	L = 300 ft	
Manning's value	n = 0.13	Range (natural)
Intensity of storm	I = 2.50 in.	2-year storm intensity (P2)
Slope of Surface	S = 0.0532 ft/ft	
High Point Elevation	= 159.82 ft	
Low Point Elevation	= 143.85 ft	

SHALLOW CONCENTRATED FLOW — Beyond 300' Length

Time of Travel	**Tt = 0.53 min.**
Velocity	v = 2.2 fps
Length of Flow	L = 70 ft

Time of Concentration Tc = 26.35 minutes PRE-DEVELOPMENT

T_C = 5.0 MINUTES FOR POST-DEVELOPMENT

SBUH EVENTS – PRE- & POST-DEVELOPMENT

```
KING COUNTY DEPARTMENT OF PUBLIC WORKS
    Surface Water Management Division

          HYDROGRAPH PROGRAMS
             Version 4.21B

         1 - INFO ON THIS PROGRAM
         2 - SBUHYD
         3 - MODIFIED SBUHYD
         4 - ROUTE
         5 - ROUTE2
         6 - ADDHYD
         7 - BASEFLOW
         8 - PLOTHYD
         9 - DATA
        10 - RDFAC
        11 - 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)
2,24,2.50
2-YR. PRE-DEVELOPED
------------------------------------------------------------------------
******************** 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
4.292,79,0.459,89.8,26.35

DATA PRINT-OUT:
  AREA(ACRES)    PERVIOUS     IMPERVIOUS    TC(MINUTES)
                 A     CN     A     CN
      4.8        4.3  79.0    .5   89.8        26.4

  PEAK-Q(CFS)   T-PEAK(HRS)    VOL(CU-FT)
      .61          7.83          15504

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\ODRAWING\204440\PRE2.HYD
```

204440 PACIFIC CORNETTA

2-YR. POST-DEVELOPED

```
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.712,61,4.048,98,5.0

DATA PRINT-OUT:
  AREA(ACRES)    PERVIOUS    IMPERVIOUS   TC(MINUTES)
                 A     CN     A     CN
      4.8        .7  61.0    4.0  98.0        5.0

  PEAK-Q(CFS)   T-PEAK(HRS)    VOL(CU-FT)
     2.60          7.67          33873

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\ODRAWING\204440\POST2.HYD
```

5-YR. PRE-DEVELOPED

```
S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
5,24,3.10
--------------------------------------------------------------------
******************** 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
4.292,79,0.459,89.8,26.35

DATA PRINT-OUT:
  AREA(ACRES)    PERVIOUS    IMPERVIOUS   TC(MINUTES)
                 A     CN     A     CN
      4.8       4.3  79.0     .5  89.8       26.4

  PEAK-Q(CFS)   T-PEAK(HRS)    VOL(CU-FT)
     1.02          7.83          23002

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\ODRAWING\204440\PRE5.HYD
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5-YR. POST-DEVELOPED

```
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.712,61,4.048,98,5.0

DATA PRINT-OUT:
  AREA(ACRES)    PERVIOUS    IMPERVIOUS   TC(MINUTES)
                 A     CN     A     CN
      4.8        .7  61.0    4.0  98.0        5.0

  PEAK-Q(CFS)   T-PEAK(HRS)    VOL(CU-FT)
     3.26          7.67          43184

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\ODRAWING\204440\POST5.HYD
```

204440 PACIFIC CORNETTA

10-YR. PRE-DEVELOPED

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
4.292,79,0.459,89.8,26.35

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
4.8	4.3	79.0	.5	89.8	26.4

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
1.28	7.83	27609

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\ODRAWING\204440\PRE10.HYD

10-YR. POST-DEVELOPED

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.712,61,4.048,98,5.0

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
4.8	.7	61.0	4.0	98.0	5.0

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
3.65	7.67	48688

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\ODRAWING\204440\POST10.HYD

204440 PACIFIC CORNETTA

25-YR. PRE-DEVELOPED

S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
25,24,3.90

******************* 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
4.292,79,0.459,89.8,26.35

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
4.8	4.3	79.0	.5	89.8	26.4

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
1.64	7.83	33822

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\0DRAWING\204440\PRE25.HYD

25-YR. POST-DEVELOPED

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.712,61,4.048,98,5.0

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
4.8	.7	61.0	4.0	98.0	5.0

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
4.18	7.67	55829

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\0DRAWING\204440\POST25.HYD

```
204440        PACIFIC CORNETTA
100-YR. POST-DEVELOPED
S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
100,24,4.50
------------------------------------------------------------------------
******************** S.C.S. TYPE-1A DISTRIBUTION ********************
********* 100-YEAR  24-HOUR STORM  ****  4.50" TOTAL PRECIP. *********
------------------------------------------------------------------------
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.712,61,4.048,98,5.0

DATA PRINT-OUT:
  AREA(ACRES)    PERVIOUS     IMPERVIOUS   TC(MINUTES)
                 A     CN     A     CN
      4.8         .7  61.0    4.0  98.0        5.0

  PEAK-Q(CFS)   T-PEAK(HRS)    VOL(CU-FT)
     4.89          7.67          65446

ENTER [d:][path]filename[.ext] FOR STORAGE OF COMPUTED HYDROGRAPH:
C:\ODRAWING\204440\POST100.HYD
```

ROUTING CALCULATIONS

KING COUNTY DEPARTMENT OF PUBLIC WORKS
Surface Water Management Division

HYDROGRAPH PROGRAMS
Version 4.21B

1 - INFO ON THIS PROGRAM
2 - SBUHYD
3 - MODIFIED SBUHYD
4 - ROUTE
5 - ROUTE2
6 - ADDHYD
7 - BASEFLOW
8 - PLOTHYD
9 - DATA
10 - RDFAC
11 - RETURN TO DOS

```
ENTER OPTION:
10
R/D FACILITY DESIGN ROUTINE

SPECIFY TYPE OF R/D FACILITY:

1 - POND            4 - INFILTRATION POND
2 - TANK            5 - INFILTRATION TANK
3 - VAULT           6 - GRAVEL TRENCH/BED
1
ENTER: POND SIDE SLOPE (HORIZ. COMPONENT)
3

ENTER: EFFECTIVE STORAGE DEPTH(ft) BEFORE OVERFLOW
4.0

ENTER [d:][path]filename[.ext] OF PRIMARY DESIGN INFLOW HYDROGRAPH:
C:\ODRAWING\204440\POST25.HYD                          ← 25-YEAR POST-DEV.
PRIMARY DESIGN INFLOW PEAK =    4.18 CFS
ENTER PRIMARY DESIGN RELEASE RATE(cfs):
1.64                                                   ← 25-YEAR PRE-DEV.

ENTER NUMBER OF INFLOW HYDROGRAPHS TO BE TESTED FOR PERFORMANCE (5 MAXIMUM):
3

ENTER [d:][path]filename[.ext] OF HYDROGRAPH 1:
C:\ODRAWING\204440\POST10.HYD                          ← 10-YEAR POST-DEV.
ENTER TARGET RELEASE RATE(cfs):
1.28                                                   ← 10-YEAR PRE-DEV.

ENTER [d:][path]filename[.ext] OF HYDROGRAPH 2:
C:\ODRAWING\204440\POST5.HYD                           ← 5-YEAR POST-DEV.
ENTER TARGET RELEASE RATE(cfs):
1.02                                                   ← 5-YEAR PRE-DEV.
```

```
204440      PACIFIC CORNETTA
ENTER [d:][path]filename[.ext] OF HYDROGRAPH 3:
C:\0DRAWING\204440\POST2.HYD                            ← 2-YEAR POST-DEV.
ENTER TARGET RELEASE RATE(cfs):
0.61                                                    ← 2-YEAR PRE-DEV.

ENTER:  NUMBER OF ORIFICES,  RISER-HEAD(ft),  RISER-DIAMETER(in)
3,4.5,10

RISER OVERFLOW DEPTH FOR PRIMARY PEAK INFLOW =  2.53 FT

SPECIFY ITERATION DISPLAY:  Y - YES,  N - NO
y

SPECIFY:  R - REVIEW/REVISE INPUT,  C - CONTINUE
c

INITIAL STORAGE VALUE FOR ITERATION PURPOSES:    21402 CU-FT

BOTTOM ORIFICE:  ENTER Q-MAX(cfs)
.72
DIA.= 3.54 INCHES
MIDDLE ORIFICE:  ENTER Q-MAX(cfs), HEIGHT(ft)
0.61,3.40
DIA.= 4.63 INCHES
TOP ORIFICE:  ENTER HEIGHT(ft)
4.04
DIA.= 4.11 INCHES

ITERATION COMPUTATION BEGINS...
```

TRIAL	BOTTOM-AREA	STOR-AVAIL	STOR-USED	PK-STAGE	PK-OUTFLOW
1	3625.7	21402	15106	3.57	.87
2	2981.6	18254	13995	3.79	1.01
3	2553.1	16125	13288	3.98	1.11
4	2271.4	14706	12696	4.10	1.25
5	2074.1	13701	12263	4.20	1.34
6	1934.1	12982	11935	4.27	1.41
7	1832.9	12458	11715	4.33	1.47
8	1761.4	12087	11541	4.37	1.52
9	1709.2	11814	11426	4.41	1.55
10	1672.2	11620	11343	4.43	1.57
11	1645.8	11481	11282	4.45	1.59
12	1626.8	11382	11238	4.46	1.61
13	1613.1	11310	11206	4.47	1.61
14	1603.3	11258	11182	4.48	1.62
15	1596.1	11220	11165	4.49	1.63
16	1590.9	11193	11153	4.49	1.63
17	1587.2	11173	11144	4.49	1.63
18	1584.4	11158	11137	4.49	1.63
19	1582.5	11148	11133	4.50	1.64
20	1581.0	11140	11129	4.50	1.64

PERFORMANCE:	INFLOW	TARGET-OUTFLOW	ACTUAL-OUTFLOW	PK-STAGE	ELEVATION(FT)	STORAGE
DESIGN HYD:	4.18	1.64	1.64	4.50	145.50	11129
TEST HYD 1:	3.65	1.28	1.28	4.13	145.13	9650
TEST HYD 2:	3.26	1.02	1.02	3.81	144.81	8460
TEST HYD 3:	2.60	.61	.61	3.26	144.26	6540

204440 PACIFIC CORNETTA
STRUCTURE DATA: R/D-POND (2.0:1 SIDE SLOPES)

RISER-HEAD	POND-BOTTOM-AREA	TOP-AREA(@1'F.B.)	STOR-DEPTH	STORAGE-VOLUME
4.50 FT	1581.0 SQ-FT	5011.4 SQ-FT	4.00 FT	11129 CU-FT

TRIPLE ORIFICE RESTRICTOR:	DIA(INCHES)	HT(FEET)	ELEVATION(FT)	Q-MAX(CFS)
BOTTOM ORIFICE:	3.54	.00	141.00	.720
MIDDLE ORIFICE:	4.63	3.40	144.40	.610
TOP ORIFICE:	4.11	4.04	145.04	.310

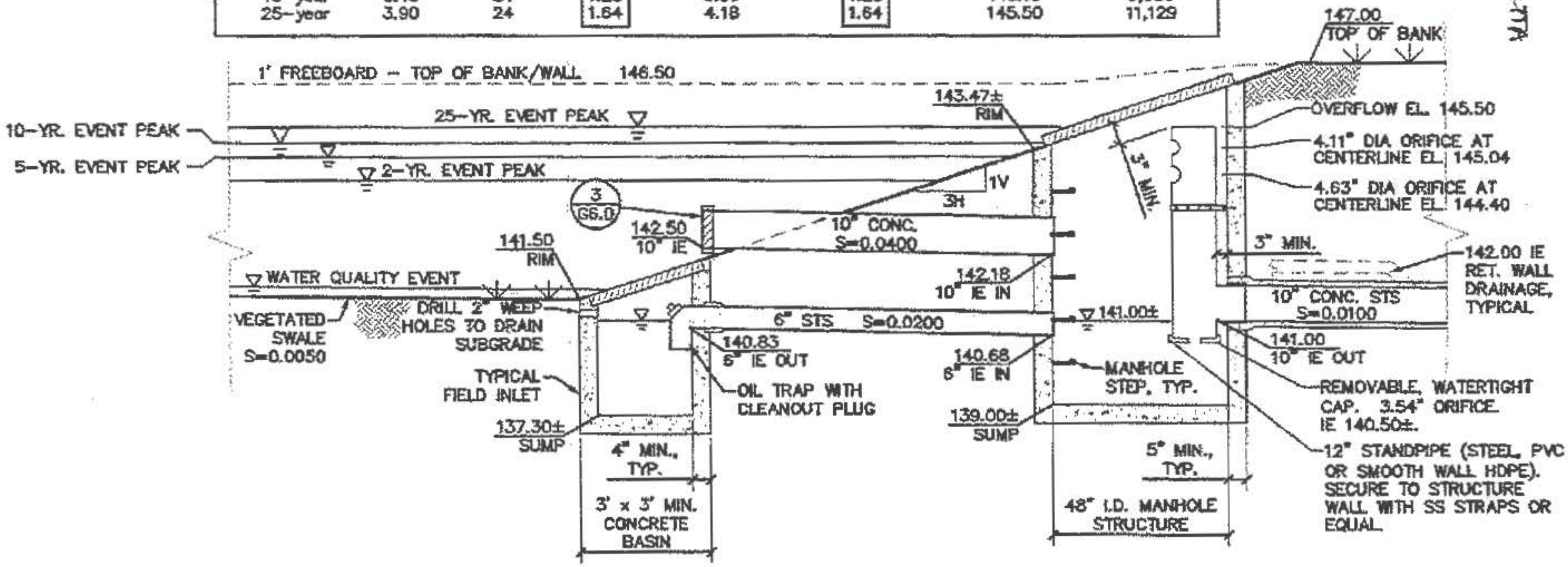
ROUTING DATA:

STAGE(FT)	DISCHARGE(CFS)	STORAGE(CU-FT)	PERM-AREA(SQ-FT)	ELEVATION(FT)
.00	.00	.0	.0	141.00 (10" IE OUT)
.45	.23	.0	.0	
.90	.32	673.7	.0	
1.35	.39	1534.1	.0	
1.80	.46	2509.3	.0	
2.25	.51	3606.0	.0	
2.70	.56	4830.7	.0	
3.15	.60	6190.0	.0	
3.40	.63	7005.7	.0	144.40 (MID ORIF.)
3.60	.90	7690.4	.0	
4.04	1.15	9300.1	.0	145.04 (TOP ORIF.)
4.05	1.20	9338.4	.0	
4.50	1.64	11140.7	.0	145.50 (OVERFLOW)
4.60	1.96	11562.8	.0	
4.70	2.50	11993.0	.0	
4.80	3.16	12431.2	.0	
4.90	3.55	12877.6	.0	
5.00	3.80	13332.2	.0	146.00 (0.5' FB)
5.10	4.03	13795.1	.0	
5.20	4.24	14266.3	.0	
5.30	4.45	14746.1	.0	
5.40	4.64	15234.3	.0	
5.50	4.82	15731.1	.0	146.50 (1.0' FB)

Pacific Corneta
204440

Water Quality/Water Quantity Control Facility Design Information Summary
(See Stormwater Calculations for Pacific Cornetta Tualatin)
Water Quantity discharge limited to pre-development flowrate per Clean Water Services

Event	Precipitation (inches)	Duration (hours)	Pre-development Q (cfs)	Post-development Q (cfs)	Post-development Release Rate Q (cfs)	Peak Water Surface Elevation in Pond (ft)	Peak Storage in Pond (cf)
Wat. Quality	0.36	4	N/A	0.37	N/A	6"	N/A
2-year	2.50	24	0.61	2.60	0.61	144.26	6,540
5-year	3.10	24	1.02	3.26	1.02	144.81	8,460
10-year	3.45	24	1.28	3.65	1.28	145.13	9,650
25-year	3.90	24	1.64	4.18	1.64	145.50	11,129



5
G6.0

CONTROL STRUCTURE DETAIL

204440 CONTROL STRUCTURE.dwg N.T.S.

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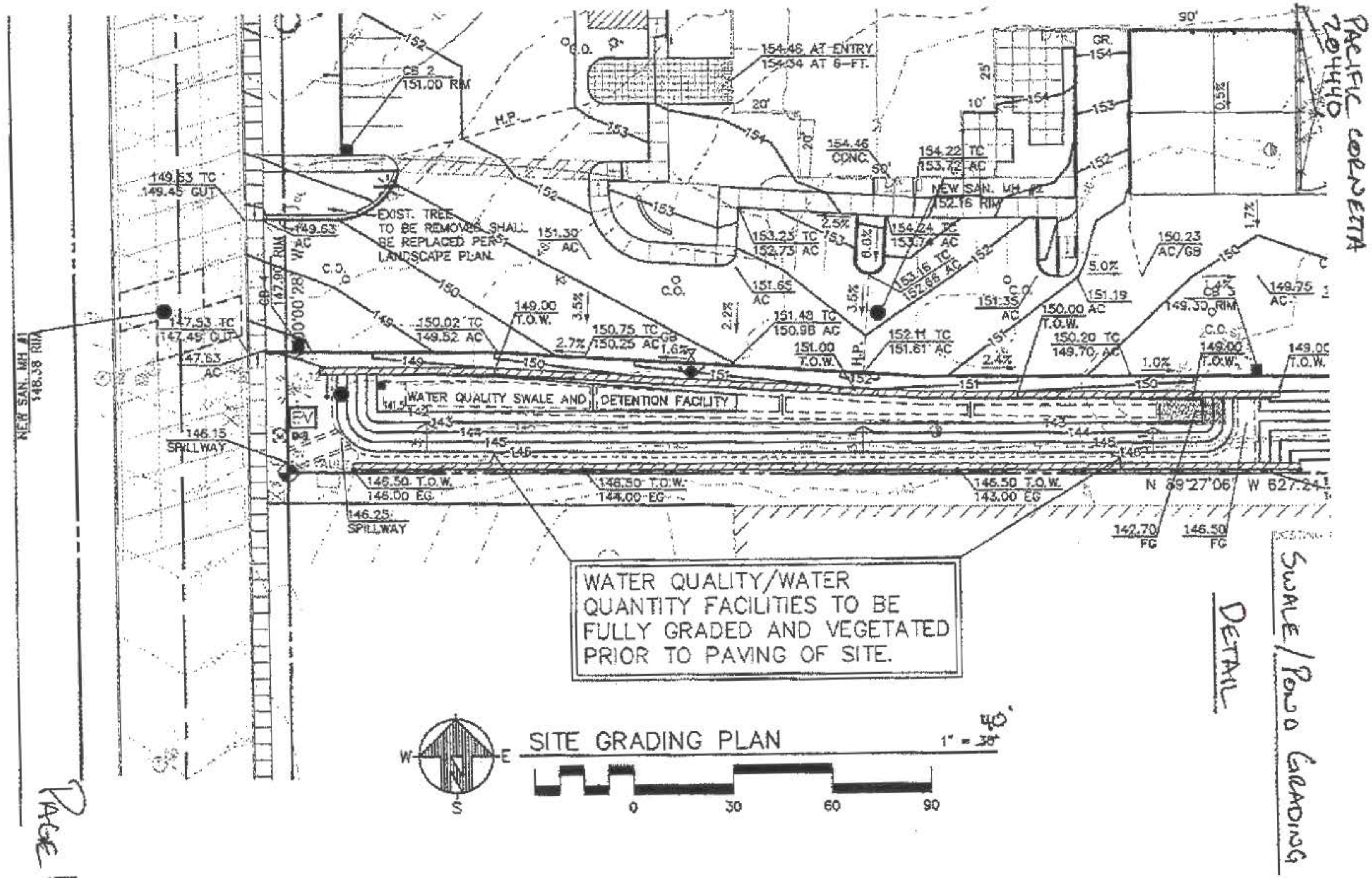

PACIFIC CORNETTA
20440
SWALE/POND GRADING
DETAIL
WATER QUALITY SWALE AND DETENTION FACILITY
WATER QUALITY/WATER QUANTITY FACILITIES TO BE FULLY GRADED AND VEGETATED PRIOR TO PAVING OF SITE.
EXIST. TREE TO BE REMOVED SHALL BE REPLACED PER LANDSCAPE PLAN.
NEW SAN. MH #1 148.38 RIM
NEW SAN. MH #2 152.16 RIM
CB 2 151.00 RIM
154.46 AT ENTRY
154.34 AT 6-FT.
146.15 SPILLWAY
146.25 SPILLWAY
146.50 T.O.W. 146.00 EG
146.50 T.O.W. 144.00 EG
146.50 T.O.W. 143.00 EG
N 89°27'06" W 627.24
SITE GRADING PLAN
1" = 40'
0 30 60 90

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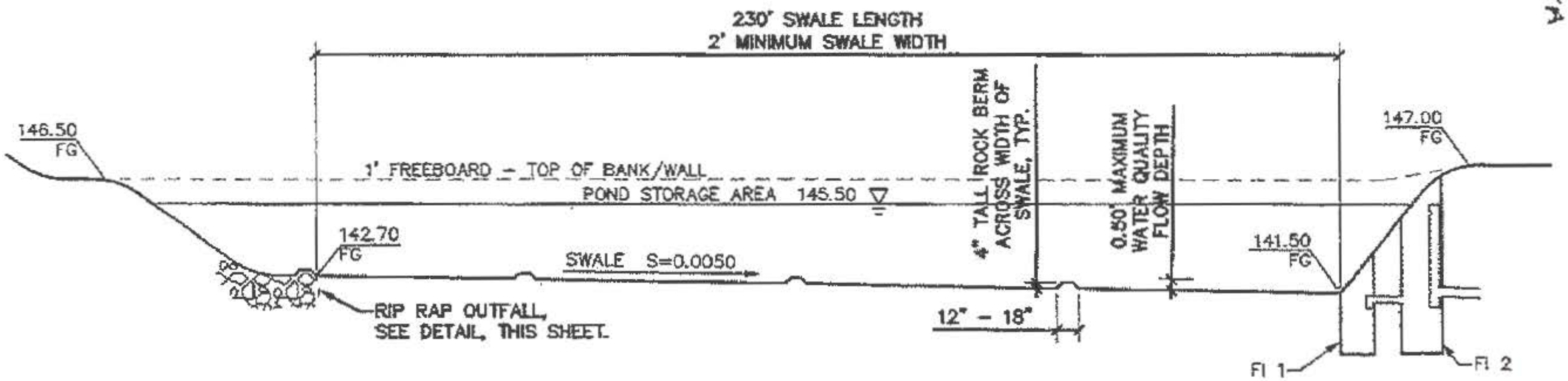
PACIFIC CORNETTA
20440



1
G6.0

SWALE PROFILE

SWALE-POND PROFILE.dwg N.T.S.

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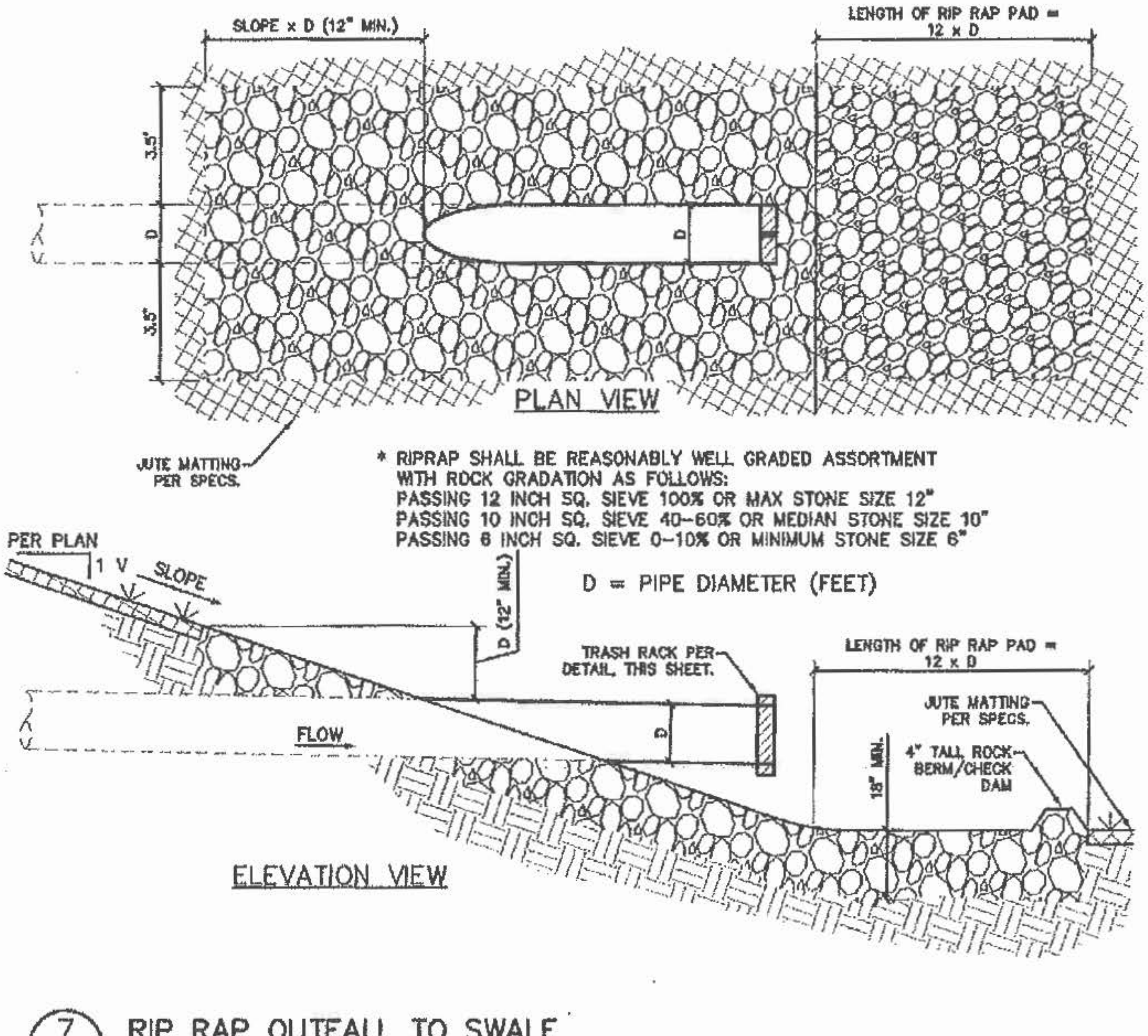
PACIFIC CORNETTA
204440

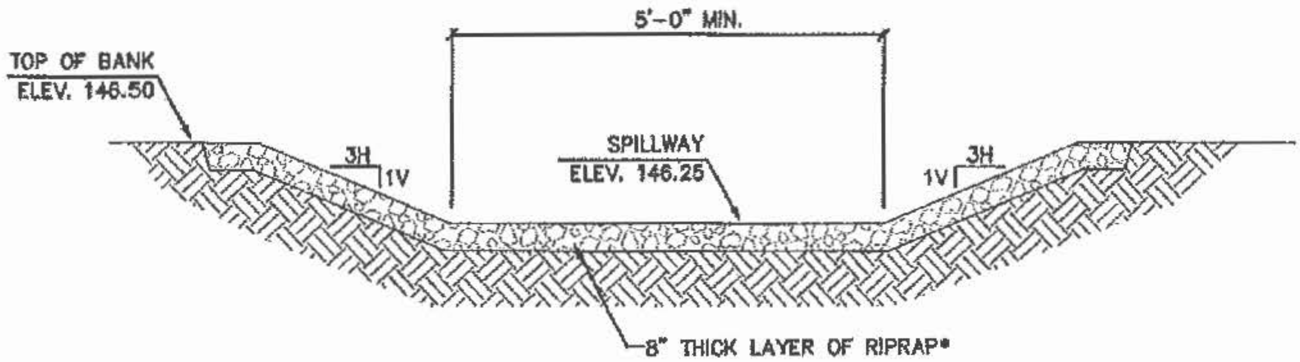


7
G6.0

RIP RAP OUTFALL TO SWALE

RIP RAP OUTFALL.dwg N.T.S.

PACIFIC CORNETTA
204440



* RIPRAP SHALL BE REASONABLY WELL GRADED ASSORTMENT
WITH ROCK GRADATION AS FOLLOWS:
PASSING 8 INCH SQ. SIEVE 100% OR MAX STONE SIZE 8"
PASSING 6 INCH SQ. SIEVE 40-60% OR MEDIAN STONE SIZE 6"
PASSING 2 INCH SQ. SIEVE 0-10% OR MINIMUM STONE SIZE 2"

NOTE: RIPRAP SHALL BE GROUTED IN PLACE TO STABILIZE SPILLWAY.

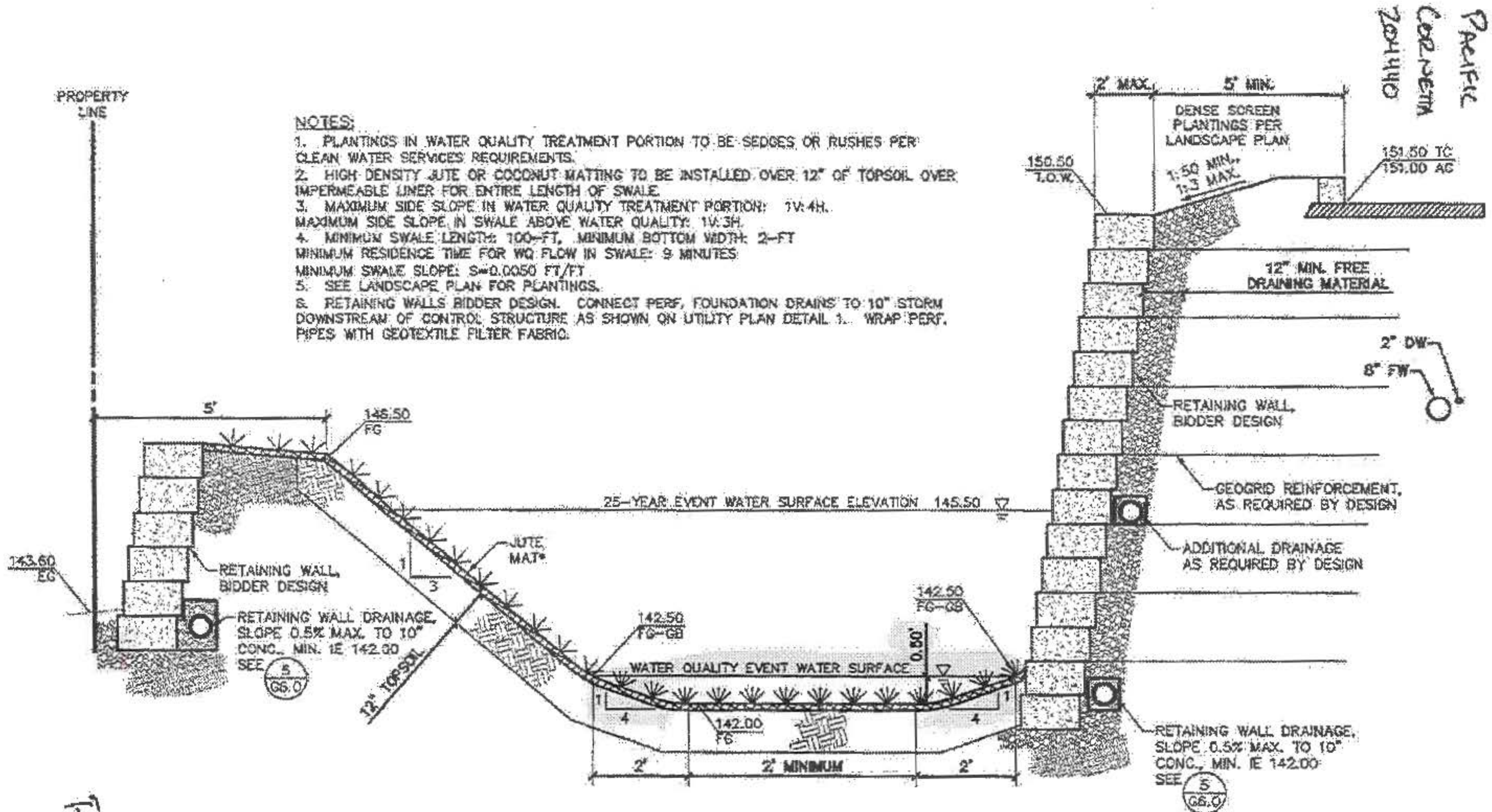
11 / G6.0 POND OVERFLOW SPILLWAY

SPILLWAY1.dwg N.T.S.

Pacific Cornetta 204440

NOTES:

1. PLANTINGS IN WATER QUALITY TREATMENT PORTION TO BE SEDGES OR RUSHES PER CLEAN WATER SERVICES REQUIREMENTS.
2. HIGH DENSITY JUTE OR COCONUT MATTING TO BE INSTALLED OVER 12" OF TOPSOIL OVER IMPERMEABLE LINER FOR ENTIRE LENGTH OF SWALE.
3. MAXIMUM SIDE SLOPE IN WATER QUALITY TREATMENT PORTION: 1V:4H.
MAXIMUM SIDE SLOPE IN SWALE ABOVE WATER QUALITY: 1V:3H.
4. MINIMUM SWALE LENGTH: 100-FT. MINIMUM BOTTOM WIDTH: 2-FT
MINIMUM RESIDENCE TIME FOR WQ FLOW IN SWALE: 9 MINUTES
MINIMUM SWALE SLOPE: S=0.0050 FT/FT
5. SEE LANDSCAPE PLAN FOR PLANTINGS.
6. RETAINING WALLS BIDDER DESIGN. CONNECT PERF. FOUNDATION DRAINS TO 10" STORM DOWNSTREAM OF CONTROL STRUCTURE AS SHOWN ON UTILITY PLAN DETAIL 1. WRAP PERF. PIPES WITH GEOTEXTILE FILTER FABRIC.



2 G6.0 SWALE SECTION A

SWALE SECTION A.dwg N.T.S.

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PACIFIC CORNETTA
204440

Date: January 26, 2005

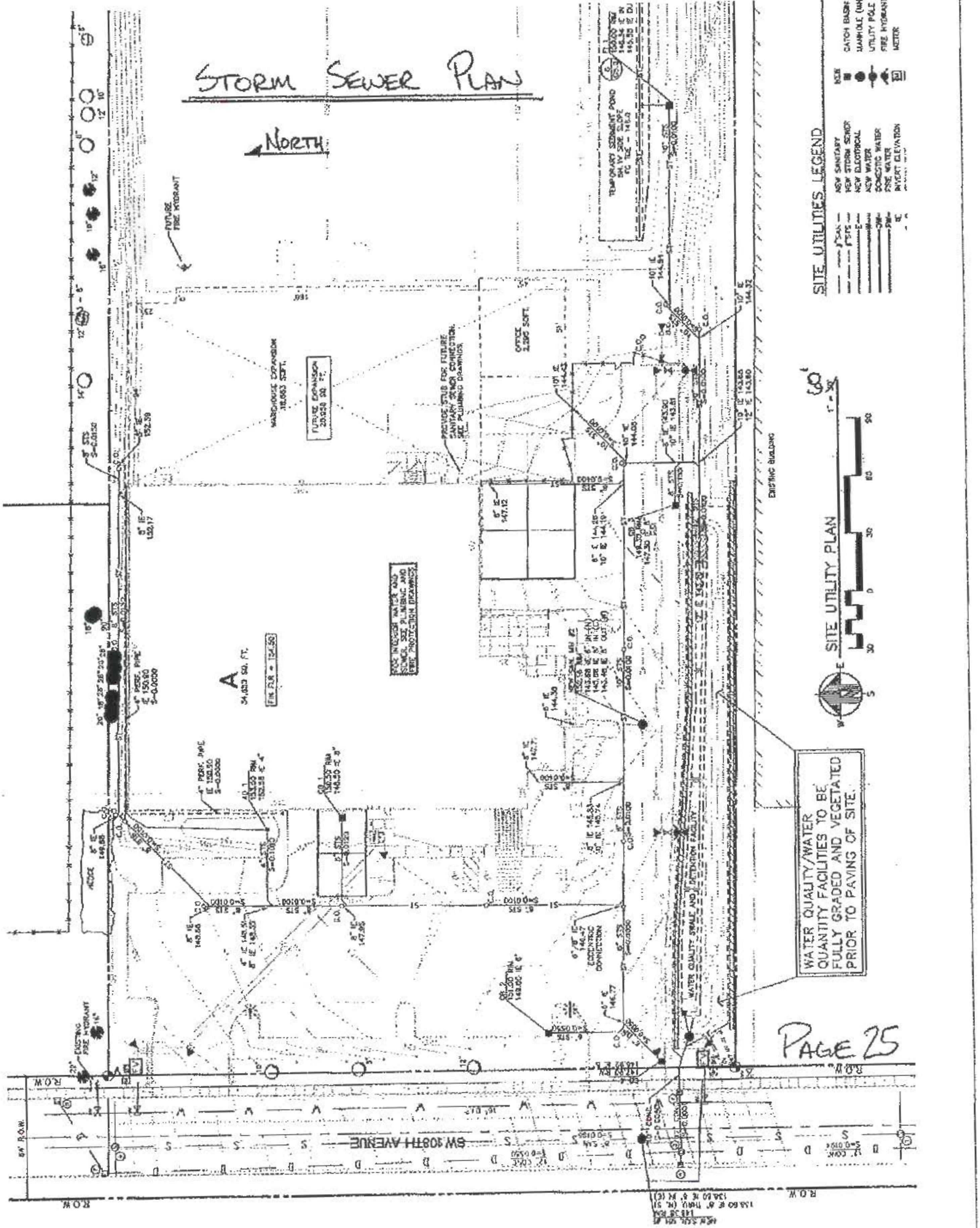
WATER QUALITY SWALE / WATER QUANTITY CONTROL POND

Basin 1 (1st Cell)						
Stage (ft)	Elevation (ft)	Area (sf)	Volume (cf)	(Ac-ft)	Storage (cf)	
0.45	141.50	51	0	0.00	0	BOTTOM OF POND
0.95	142.00	981	258	0.01	258	LIVE STORAGE
1.45	142.50	1846	707	0.02	965	LIVE STORAGE
1.95	143.00	2589	1109	0.03	2,073	LIVE STORAGE
2.45	143.50	3,020	1402	0.03	3,476	LIVE STORAGE
2.95	144.00	3,440	1616	0.04	5,091	LIVE STORAGE
3.45	144.50	3,867	1827	0.04	6,918	LIVE STORAGE
3.95	145.00	4,301	2042	0.05	8,960	LIVE STORAGE
4.45	145.50	4,742	2261	0.05	**11,221**	**LIVE STORAGE** PROVIDED
4.95	146.00	5,190	2483	0.06	13,704	0.5' FREEBOARD
5.45	146.50	5,638	2707	0.06	16,411	1.0' FREEBOARD

DETENTION REQUIRED = **11,129** cf at 4.0' storage depth

STAGE ELEVATIONS REFERENCE ROUTING CALCULATIONS:			
STAGE	**0.00**	**= C.L. BOTTOM ORIFICE =**	**141.05**
STAGE	**4.45**	**= TOP OF LIVE STORAGE =**	**145.50**

STORM SEWER PLAN



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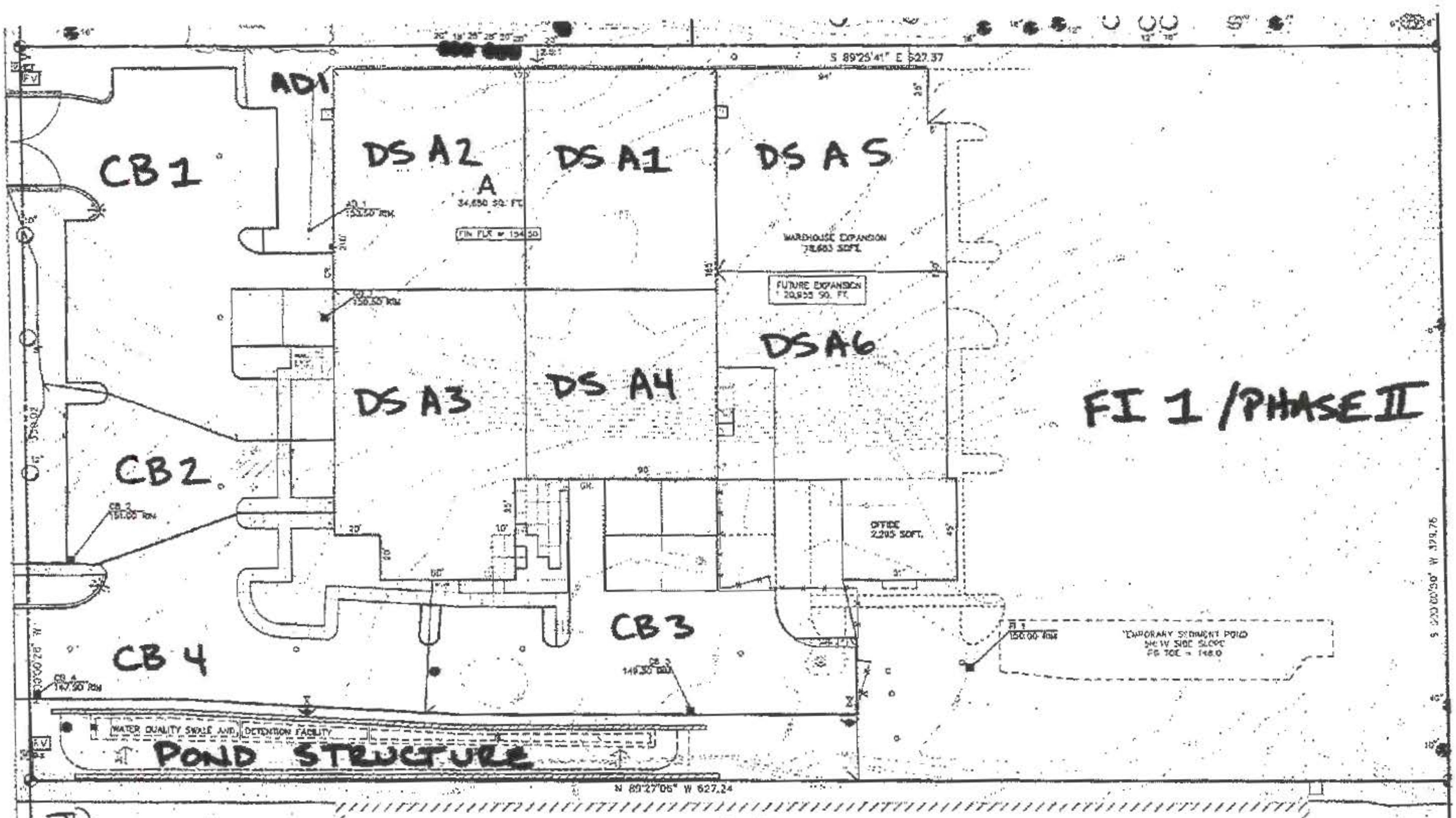
PACIFIC CORNETTA
204440

DRAINAGE BASIN MAP

NORTH 1"=60'



PACIFIC CORNETTA - TUALATIN
204440 Date: February 8, 2005

DRAINAGE BASIN AREAS

Basin	Basin Area (acres)	Pervious Area (acres)	Impervious Area (acres)
CB 1	0.460	0.069	0.391
CB 2	0.182	0.027	0.154
CB 3	0.411	0.062	0.350
CB 4	0.285	0.043	0.243
AD 1	0.122	0.018	0.103
FI I / PHASE II	1.748	0.262	1.486
POND STRUCTURE	0.267	0.040	0.227
DS A1	0.195	0.029	0.166
DS A2	0.195	0.029	0.166
DS A3	0.239	0.036	0.203
DS A4	0.166	0.025	0.141
DS A5	0.210	0.032	0.179
DS A6	0.271	0.041	0.230
TOTAL	**4.752**	**0.713**	**4.039**

Project No. 204440 Designed by: RJL Date: February 8, 2005

Project Name PACIFIC CORNETTA - TUALATIN

DESIGN SECTION	SBUH PIPE CONVEYANCE CALCULATIONS										PIPE INFORMATION				
M.H. to M.H. or ST. to ST.	Total Area acres	Total Cumulative Area acres	Pervious Area acres	Pervious Area CN	Impervious Area acres	Impervious Area CN	Cumulative Pervious Area acres	Cumulative Impervious Area acres	Time of Conc. minutes	RUNOFF Q cfs	SLOPE S %	DIA d inches	CAPA-CITY Qmax cfs	VELOC. Vf fps	PERCENT FULL %
DS A5 (FUTURE) TO DS A1	0.210	0.210	0.032	61	0.179	98	0.032	0.179	5.00	0.18	1.50	8	2.07	3.48	20.7
DS A1 TO DS A2	0.195	0.406	0.029	61	0.166	98	0.061	0.345	5.00	0.36	1.50	8	2.07	4.22	29.3
DS A2 TO AD 1	0.195	0.601	0.029	61	0.166	98	0.090	0.511	5.00	0.53	1.00	6	1.69	4.06	40.0
AD 1 TO CB 1	0.122	0.722	0.018	61	0.103	98	0.108	0.614	5.00	0.63	1.00	8	1.69	4.25	44.1
CB 1 TO JUNCTION 1	0.460	1.182	0.069	61	0.391	98	0.177	1.005	5.00	1.04	1.00	8	1.69	4.81	59.4
JUNCTION 1 TO DS A3	0.000	1.182	0.000	61	0.000	98	0.247	1.402	5.00	1.45	1.00	8	1.69	5.11	75.8
DS A3 TO DS A4	0.239	1.422	0.036	61	0.203	98	0.283	1.605	5.00	1.66	1.00	10	3.06	5.42	54.8
DS A4 TO JUNCTION 2 (FUTURE)	0.166	1.587	0.025	61	0.141	98	0.308	1.746	5.00	1.80	1.00	10	3.06	5.52	57.7
JUNCTION 2 TO CB 3	0.000	1.587	0.000	61	0.000	98	0.349	1.975	5.00	2.04	1.00	10	3.05	5.68	62.6
CB 3 TO JUNCTION 3	0.411	1.999	0.062	61	0.350	98	0.410	2.325	5.00	2.40	1.00	10	3.06	5.85	70.4
JUNCTION 3 TO POND	0.000	1.999	0.000	61	0.000	98	0.673	3.812	5.00	3.93	1.00	12	4.98	6.62	70.7
CB 2 TO CB 4	0.182	0.182	0.027	61	0.154	98	0.027	0.154	5.00	0.16	5.50	6	1.84	5.46	20.7
CB 4 TO JUNCTION 1	0.285	0.467	0.043	61	0.243	98	0.070	0.397	5.00	0.41	0.50	6	0.55	2.91	67.4
DS A6 (FUTURE) TO JUNCTION 2	0.271	0.271	0.041	61	0.230	98	0.041	0.230	5.00	0.24	1.00	10	3.06	3.18	19.6
FI 1 TO JUNCTION 3	1.748	1.748	0.262	61	1.486	98	0.262	1.486	5.00	1.53	1.00	10	3.05	5.32	52.2
CB 1 TO LINE	0.460	0.460	0.069	61	0.391	98	0.069	0.391	5.00	0.40	1.20	8	1.85	4.02	32.8
CB 4 TO LINE	0.285	0.285	0.043	61	0.243	98	0.043	0.243	5.00	0.25	0.50	6	0.55	2.61	49.1
POND TO EXISTING 10" CONC. (DETAINED 25-YR. EVENT)	0.267	0.267	0.040	61	0.227	98	0.713	4.039	5.00	1.64	0.50	10	1.67	3.21	88.7

CONVEYANCE CALCULATIONS

DESIGN EVENT: 25-YR., 24-HR., 3.90"

MANNINGS COEFFICIENT, n: 0.010 (PVC PIPE)

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10" N12 @1% = 2.56 max
12" N12 - ok,
* Conc/DIP n=0.013

n-12 used on
10", 12" PIPES

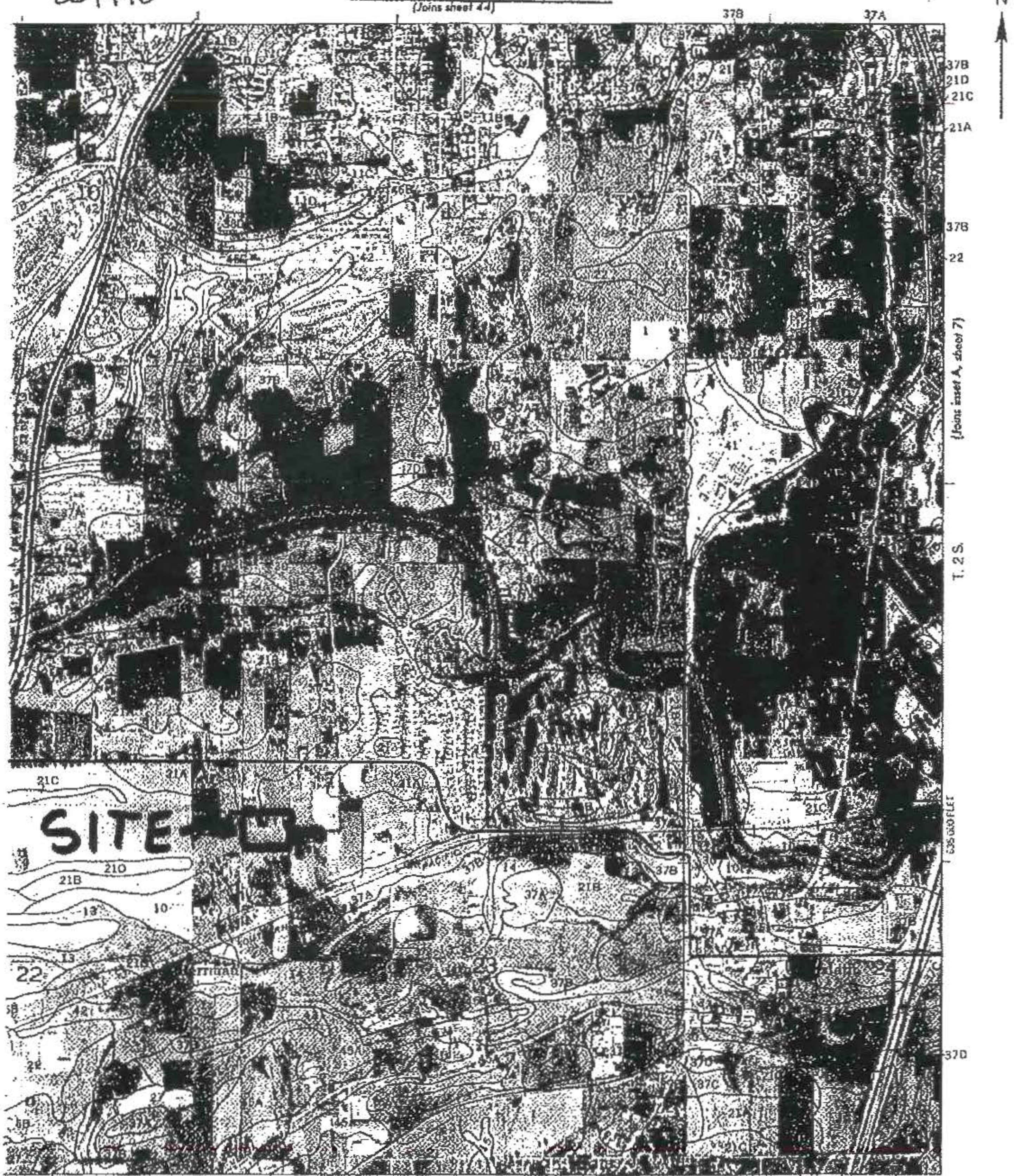
* n=0.013 (conc)

APPENDIX

PACIFIC CORNETTA
204440

USDA SOIL MAP

(47)



A1

PACIFIC CORNETTA
204440

TABLE 13.—*Soil and*

[Absence of an entry indicates the feature is not a concern. See Glossary for descriptions of such

Soil name and map symbol	Hydrologic group	Flooding		
		Frequency	Duration	Months
Aloha:				
1	C	None		
Amity:				
2	C	None		
Astoria:				
3E, 3F	B	None		
Briedwell:				
4B, 5B, 5C, 5D	B	None		
Carlton:				
6B, 6C	B	None		
Cascade:				
7B, 7C, 7D, 7E, 7F	C	None		
Chehalem:				
8C	C	None		
Chehalis:				
9, 10	B	Common	Brief	Nov-Mar
Cornelius:				
[1]11B, [1]11C, [1]11D, [1]11E, [1]11F:				
Cornelius part	C	None		
Kinton part	C	None		
Cornelius Variant:				
12A, 12B, 12C	C	None		
Cove:				
13, 14	D	Common	Brief	Dec-Apr
Dayton:				
15	D	None		
Delena:				
16C	D	None		
Goble:				
17B, 17C, 17D, 17E, 18E, 18F	C	None		
Helvetia:				
19B, 19C, 19D, 19E	C	None		
Hembre:				
20E, 20F, 20G	B	None		
Hillsboro:				
21A, 21B, 21C, 21D	B	None		
Huberly:				
22	D	None		
Jory:				
23B, 23C, 23D, 23E, 23F	C	None		
Kilchis:				
[1]24G:				
Kilchis part	C	None		
Klickitat part	B	None		

A2

PACIFIC CORNETTA
204440

Table 2-2c.—Runoff curve numbers for other agricultural lands[1]

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition	A	B	C	D
Pasture, grassland, or range—continuous forage for grazing.[2]	Poor	68	79	86	89
	Fair	49	[illegible]	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element.[3]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	[4]30	48	65	73
Woods—grass combination (orchard or tree farm).[5]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods.[6]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	[4]30	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

PRE-DEVELOPMENT PERVIOUS AREA

[1] Average runoff condition, and $I_a = 0.2S$.

[2] *Poor:* <50% ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: >75% ground cover and lightly or only occasionally grazed.

[3] *Poor:* <50% ground cover.
Fair: 50 to 75% ground cover.
Good: >75% ground cover.

[4] Actual curve number is less than 30; use CN = 30 for runoff computations.

[5] CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.

[6] *Poor:* Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

B1

PACIFIC CORNETTA
204440

Table 2-2a.--Runoff curve numbers for urban areas[1]

Cover description		Curve numbers for hydrologic soil group--			
Cover type and hydrologic condition	Average percent impervious area[2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.)[3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	[illegible]	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	[illegible]	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)[5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

POST-DEVELOPMENT PERVIOUS AREA

PRE-DEV/POST-DEV. IMPERVIOUS AREA

PRE-DEV. IMPERV. AREA

[1]Average runoff condition, and $I_a = 0.2S$.
[2]The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.
[3]CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.
[4]Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.
[5]Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4, based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

B2

PACIFIC CORNETTA
204440

b. The Design Storm

1) Return frequency and duration specify the design storm event. The design storms shall be based on two parameters:

a) Total rainfall (depth in inches).
b) Rainfall distribution (dimensionless).

c. Design Storm Distribution

1) The rainfall distribution to be used within the District is the design storm of 24-hour duration based on the standard NRCS Type 1A rainfall distribution using the chart on the following page. The total depth of rainfall for storms of 24-hour duration and 2, 5, 10, 25, 50 and 100 year recurrence are 2.50, 3.10, 3.45, 3.90, 4.20, 4.50 inches respectively.

Recurrence Interval (years)	Total Precipitation Depth (in)
2	2.50
5	3.10
10	3.45
25	3.90
50	4.20
100	4.50

SBUH CONVEYANCE CALCULATIONS

KING COUNTY DEPARTMENT OF PUBLIC WORKS
Surface Water Management Division

HYDROGRAPH PROGRAMS
Version 4.21B

1 - INFO ON THIS PROGRAM
2 - SBUHYD
3 - MODIFIED SBUHYD
4 - ROUTE
5 - ROUTE2
6 - ADDHYD
7 - BASEFLOW
8 - PLOTHYD
9 - DATA
10 - RDFAC
11 - 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
```

DS A5 (FUTURE) TO DS A1

```
S.C.S. TYPE-1A RAINFALL DISTRIBUTION
ENTER: FREQ(YEAR), DURATION(HOUR), PRECIP(INCHES)
25,24,3.90
--------------------------------------------------------------------
******************** 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
0.032,61,0.179,98,5.0

DATA PRINT-OUT:
  AREA(ACRES)    PERVIOUS     IMPERVIOUS    TC(MINUTES)
                 A     CN     A     CN
       .2        .0   61.0    .2   98.0          5.0

  PEARK-Q(CFS)   T-PEAK(HRS)    VOL(CU-FT)
      .18          7.67           2470
```

D1

204440 PACIFIC CORNETTA - TUALATIN

DS A1 TO DS A2

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.061,61,0.345,98,5.0

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS A	PERVIOUS CN	IMPERVIOUS A	IMPERVIOUS CN	TC(MINUTES)
.4	.1	61.0	.3	98.0	5.0

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
.36	7.67	4759

DS A2 TO AD 1

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.090,61,0.511,98,5.0

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS A	PERVIOUS CN	IMPERVIOUS A	IMPERVIOUS CN	TC(MINUTES)
.6	.1	61.0	.5	98.0	5.0

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
.53	7.67	7047

AD 1 TO CB 1

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.108,61,0.614,98,5.0

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS A	PERVIOUS CN	IMPERVIOUS A	IMPERVIOUS CN	TC(MINUTES)
.7	.1	61.0	.6	98.0	5.0

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
.63	7.67	8468

CB 1 TO JUNCTION 1

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.177,61,1.005,98,5.0

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS A	PERVIOUS CN	IMPERVIOUS A	IMPERVIOUS CN	TC(MINUTES)
1.2	.2	61.0	1.0	98.0	5.0

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
1.04	7.67	13861

D2

204440 PACIFIC CORNETTA - TUALATIN

JUNCTION 1 TO DS A3

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.247,61,1.402,98,5.0

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS A	PERVIOUS CN	IMPERVIOUS A	IMPERVIOUS CN	TC(MINUTES)
1.6	.2	61.0	1.4	98.0	5.0

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
1.45	7.67	19337

DS A3 TO DS A4

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.283,61,1.605,98,5.0

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS A	PERVIOUS CN	IMPERVIOUS A	IMPERVIOUS CN	TC(MINUTES)
1.9	.3	61.0	1.6	98.0	5.0

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
1.66	7.67	22137

DS A4 TO JUNCTION 2 (FUTURE)

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.308,61,1.746,98,5.0

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS A	PERVIOUS CN	IMPERVIOUS A	IMPERVIOUS CN	TC(MINUTES)
2.1	.3	61.0	1.7	98.0	5.0

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
1.80	7.67	24083

JUNCTION 2 TO CB 3

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.349,61,1.976,98,5.0

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS A	PERVIOUS CN	IMPERVIOUS A	IMPERVIOUS CN	TC(MINUTES)
2.3	.3	61.0	2.0	98.0	5.0

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
2.04	7.67	27256

D3

204440 PACIFIC CORNETTA - TUALATIN

CB 3 TO JUNCTION 3

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.410,61,2.326,98,5.0

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
2.7	.4	61.0	2.3	98.0	5.0

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
2.40	7.67	32082

JUNCTION 3 TO POND

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.673,61,3.812,98,5.0

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
4.5	.7	61.0	3.8	98.0	5.0

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
3.93	7.67	52581

CB 2 TO CB 4

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.027,61,0.154,98,5.0

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
.2	.0	61.0	.2	98.0	5.0

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
.16	7.67	2123

CB 4 TO JUNCTION 1

ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.070,61,0.397,98,5.0

DATA PRINT-OUT:

AREA(ACRES)	PERVIOUS		IMPERVIOUS		TC(MINUTES)
	A	CN	A	CN	
.5	.1	61.0	.4	98.0	5.0

PEAK-Q(CFS)	T-PEAK(HRS)	VOL(CU-FT)
.41	7.67	5475

D4

204440 PACIFIC CORNETTA - TUALATIN

LATERALS:

DA A6 (FUTURE) TO JUNCTION 2

```
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.041,61,0.230,98,5.0

DATA PRINT-OUT:
  AREA(ACRES)     PERVIOUS     IMPERVIOUS    TC(MINUTES)
                  A     CN     A     CN
       .3         .0  61.0     .2  98.0          5.0

  PEAK-Q(CFS)   T-PEAK(HRS)    VOL(CU-FT)
      .24           7.67          3173
```

FI 1 TO JUNCTION 3

```
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.262,61,1.486,98,5.0

DATA PRINT-OUT:
  AREA(ACRES)     PERVIOUS     IMPERVIOUS    TC(MINUTES)
                  A     CN     A     CN
      1.7         .3  61.0    1.5  98.0          5.0

  PEAK-Q(CFS)   T-PEAK(HRS)    VOL(CU-FT)
     1.53           7.67         20496
```

CB 1 TO LINE

```
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.069,61,0.391,98,5.0

DATA PRINT-OUT:
  AREA(ACRES)     PERVIOUS     IMPERVIOUS    TC(MINUTES)
                  A     CN     A     CN
       .5         .1  61.0     .4  98.0          5.0

  PEAK-Q(CFS)   T-PEAK(HRS)    VOL(CU-FT)
      .40           7.67          5393
```

CB 4 TO LINE

```
ENTER: A(PERV), CN(PERV), A(IMPERV), CN(IMPERV), TC
0.043,61,0.243,98,5.0

DATA PRINT-OUT:
  AREA(ACRES)     PERVIOUS     IMPERVIOUS    TC(MINUTES)
                  A     CN     A     CN
       .3         .0  61.0     .2  98.0          5.0

  PEAK-Q(CFS)   T-PEAK(HRS)    VOL(CU-FT)
      .25           7.67          3352
```

DS

STORMWATER MANAGEMENT FACILITIES OPERATIONS & MAINTENANCE AGREEMENT

FOR

Pacific
CORNETTA

(LOTS 1 & 2)

18280 SW 108TH AVENUE
Tualatin, Oregon

Washington County

February 18, 2005

Prepared by: Robert Léger, VLMK Consulting Engineers

RECORDING REQUESTED BY AND
AFTER RECORDING, RETURN TO:

PACIFIC CORNETTA
25999 SW Canyon Creek Road, Suite C
Wilsonville, Oregon 97070
Attention: Alex Liu

STORMWATER MANAGEMENT FACILITIES MAINTENANCE AGREEMENT

THIS STORMWATER MANAGEMENT FACILITIES MAINTENANCE AGREEMENT (this "agreement") is executed by ________________________: **PACIFIC CORNETTA**, an Oregon corporation and is dated for reference purposes only this ______ day of ________________, 2005.

RECITALS

A. **PACIFIC CORNETTA** is the owner of the property described as Lot 8, "Glenmorag Park," located in the NE ¼ of Section 22, Township 2 South, Range 1 West, Willamette Meridian, at 18280 SW 108th Avenue, City of Tualatin, Washington County, Oregon (the "property").

B. **PACIFIC CORNETTA** is seeking a building permit from The City of Tualatin (the "City"), which will enable **PACIFIC CORNETTA** to construct one 34,650 s.f. building on the property. A future building expansion and an additional building has been planned for with the design of the stormwater management facility.

C. **PACIFIC CORNETTA** will create a water quality/water quantity facility for the lot as defined with the final Stormwater Calculations for Pacific Cornetta, Tualatin Site. The facility is located along the southwest property line. The facility consists of a vegetated swale with extended detention that promotes the settling of solids from stormwater. The facility will meet the standards set forth by Clean Water Services (CWS). Once the buildings are complete, the only storm water to be treated in the facility will be the stormwater from the surface areas. During storm events in excess of the water quality event, runoff will be detained above the vegetated swale.

D. Prior to issuance of a building permit for the Project, The City of Tualatin requires that this Agreement be executed and recorded.

NOW, THEREFORE, in anticipation of City approval of a building permit for the project, **PACIFIC CORNETTA**, the owner of the Property, for itself and all successors-in-interest of the property, hereby agree to the following:

The storm water and sanitary sewer systems will be operated and maintained by PACIFIC CORNETTA at all times in accordance with the guidelines set forth below.

At all times, the responsible organization shall perform the following tasks to maintain proper functioning of the storm water management facilities as shown in Exhibit A:

PARKING LOT MAINTENANCE

a) The parking lot shall be swept at least once per month to collect dirt, waste, and debris. The parking lot shall not be hosed down to a storm drain.

PIPES & FITTINGS

a) Ensure that flow passes uninhibited through conveyance pipes.
b) Ensure that there are no cracks or dropped joints, infiltration or exfiltration or sags in the conveyance system.

TRAPPED AREA DRAINS, CATCH BASINS, AND FIELD INLETS

a) Ensure that sediment accumulation does not block flow or inhibit facility operation. Sediment shall be removed at least annually.
b) Removal of flammable chemicals or vapors which are present in amounts that would present a fire hazard, or exceed pollution control requirements. Removal shall occur annually or sooner if performance requirements are not satisfied.
c) Seal all joints between inlets and outlet to ensure that no material is allowed to enter or exit the facility through the joints.

WATER QUALITY VEGETATED SWALE

- Keep inspection and maintenance records to track the development of the system over time. The inspection records shall include:
    a) General Condition of water quality system and control structures.
    b) Sediment condition and depth in swale areas and flow control structures.
    c) Water elevation and observations (sheen, smell, etc.)
    d) Condition of the inlets, outlets, trash grates, and swale.
    e) Unscheduled maintenance needs.
    f) General observations and aesthetic conditions.
- Ensure that flow passes uninhibited through swale, inlet, outlet pipes and outlet control standpipe.
- Sediment Management:
    a) Remove sediment when accumulations reach approximately 2-Inches in depth, and/or if sediment accumulations inhibit the facility operation. Sediment removal is to be done by a qualified/licensed vendor.
    b) Transport and material/sediment removed to an approved treatment and disposal facility.

MAINTENANCE SCHEDULE

First Year: Clean Parking lot monthly. Inspect area drains, catch basins, and field inlets monthly. Remove sediment and oils as necessary (at least annually). Use maintenance procedures outlined above.

Second Year: Maintain schedule for first year, except to revise area drain, catch basin, and field inlet cleaning schedule based on required frequency noted in first year to reflect actual need.

Third and Subsequent Years: Maintain schedule for second year.

FINANCIAL RESPONSIBILITY AND ENFORCEMENT

1. This total costs associated with the maintenance and repairs required by this agreement shall be borne by the owner/operator of this site; provided, however, that in the event any repair is required solely as a direct result of an act or omission by the owner/operator, their tenants, invitees or licensees, the owner/operator of the site shall have the right to seek reimbursement from the responsible party for such costs

2. This agreement shall be a covenant running with the land and shall be binding on all current and subsequent owners of the Property at such times as the parties have an ownership interest in the property.

3. This agreement is intended to benefit the City. Accordingly, this Agreement shall not be amended without prior written consent of the City.

4. This agreement shall be recorded in the Deed Records of Washington County, Oregon.

IN WITNESS WHEREOF, **PACIFIC CORNETTA** has executed this Agreement as of the date first written above.

By: **PACIFIC CORNETTA .**
25999 SW Canyon Creek Road, Suite C
Wilsonville, Oregon 97070

By: ______________________________

It's: ______________________________

State of Oregon)
)ss
Washington County)

The foregoing instrument was acknowledged before me on this ________ day of ________________,

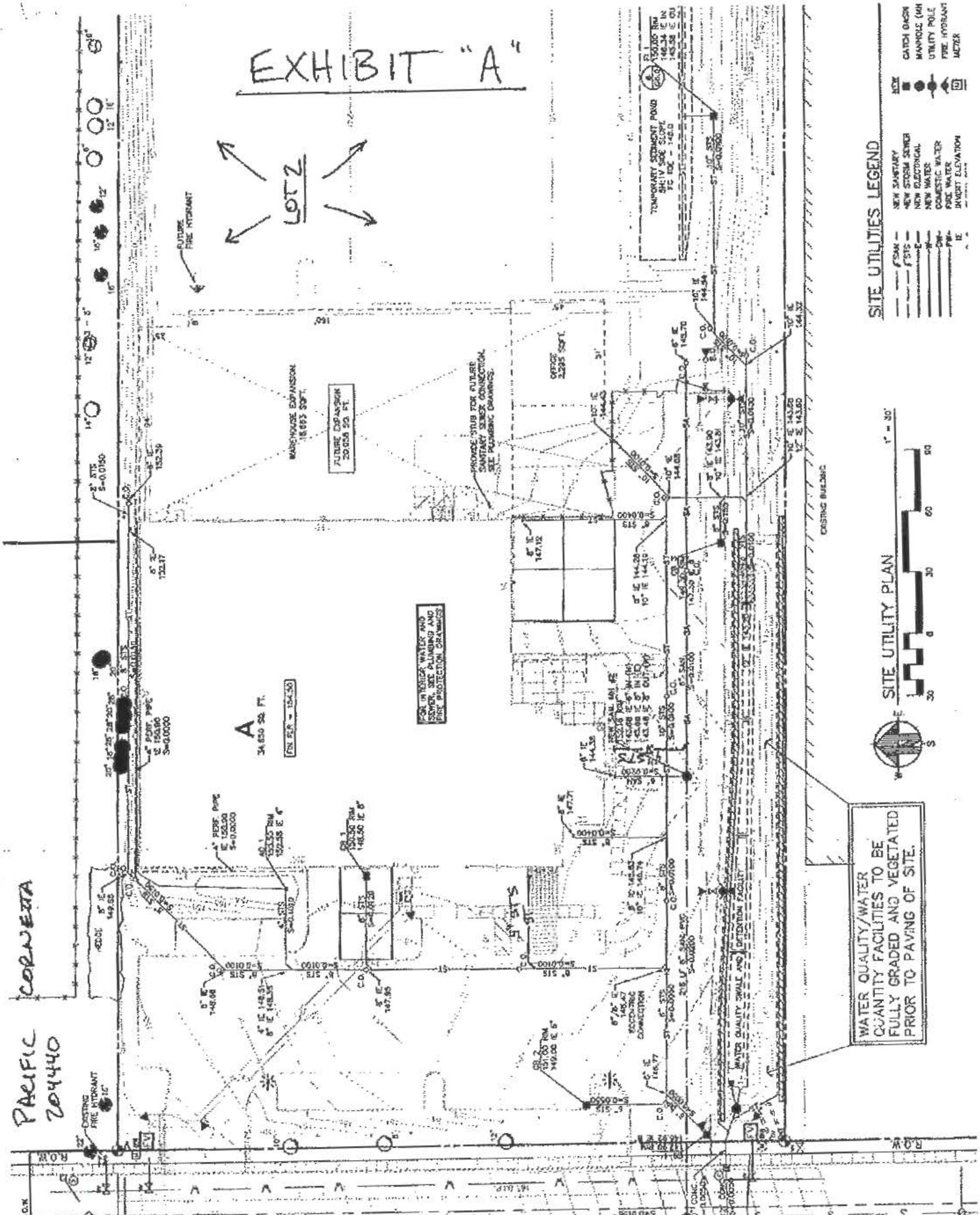
2005, by ______________________________ the ______________________________ (title) of

PACIFIC CORNETTA, an Oregon corporation, on behalf of corporation.

____
Signature

My Commission Expires ________________

EXHIBIT "A"


LOT 2
PACIFIC 204440
CORNETTA
FUTURE FIRE HYDRANT
EXISTING FIRE HYDRANT
A
34,650 SQ. FT.
FIN. FLR. = 154.50
FOR INTERIOR WATER AND SEWER, SEE PLUMBING AND FIRE PROTECTION DRAWINGS.
FUTURE EXPANSION
WAREHOUSE EXPANSION
OFFICE
PROVIDE STUB FOR FUTURE SANITARY SEWER CONNECTION. SEE PLUMBING DRAWINGS.
TEMPORARY SEDIMENT POND
EXISTING BUILDING
WATER QUALITY SWALE AND DETENTION FACILITY
SW 108TH AVENUE
R.O.W.
SITE UTILITY PLAN
1" = 30'
SITE UTILITIES LEGEND
NEW SANITARY
NEW STORM SEWER
NEW ELECTRICAL
NEW WATER
DOMESTIC WATER
FIRE WATER
INVERT ELEVATION
CATCH BASIN
MANHOLE
UTILITY POLE
FIRE HYDRANT
METER
WATER QUALITY/WATER QUANTITY FACILITIES TO BE FULLY GRADED AND VEGETATED PRIOR TO PAVING OF SITE.

LANCE MUELLER & ASSOCIATES

ARCHITECTS · AIA

Job: **Leveton** DRAFT Revised February 22, 2016

SW Leveton Drive at SW 180th Avenue

Tualatin, OR

Architectural Review Narrative:

Leveton is two new two-story building "shells" intended for the high-tech market on undeveloped land in Leveton Business Park. Projected mixed uses include office, light manufacturing, and storage. Uses proposed meet current MG (General Manufacturing) zoning. Interior tenant improvements are required for the buildings to be occupied, but the exterior will be complete with utilities, parking, sidewalks, exterior lighting, and landscaping finished and ready for move-in.

The buildings are known as North Wing and South Wing, and both are two story concrete and steel structures to serve the high-tech industry. They can be occupied by separate tenants or connected on both floors for a single tenant. The building shells are sized and designed to be quality lease space with built-in flexibility to serve this industry long term. Functionally they have large capacity floor loading on the first and second floors (125psf), high clearance between floors (20' floor height at 2nd floor), extensive glass for natural light, screened service areas with truck docks and on-grade truck doors, and appropriate parking ratios. The preference is for a single high-tech tenant, but there are secondary entries to serve other tenants for flexible leasing options over time.

This 2009 example in Wilsonville is a high-tech building with similar materials, scale, and rustication as proposed at Leveton by the same development team. A visit to this building would define the aesthetic essence of the Leveton proposal. DW Fritz Precision Automation is at 27200 SW Parkway Ave., Wilsonville, OR 97070.

As the picture suggests the building exteriors are simple palettes of rusticated stained concrete, green tint high performance glazing, neutral colors for the exterior metal, and cast aluminum exterior lighting fixtures of a scale and quality appropriate for the better class-A office buildings. The site is complete with landscaped parking areas, logically located pedestrian paths, and high quality LED exterior lighting fixtures. Compared to a typical market rate development, ours will be more extensive and of a larger scale when installed. If you visit the DW Fritz building pictured you will notice the concrete walls are unusually substantial (11.25" thick) with the windows set at the back for strong shadow lines at openings, as also proposed at Leveton. The stained concrete will have deep reveals and inset transom panels reducing the scale with shadow lines and variation in thickness. All metal is painted or prefinished in medium bronze, and the storefront is painted in light metallic bronze. In short this has a simple neutral warm palette of materials that patina well over time.

A portion of the proposed building is shown in the prelim drawing below:

TMC 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. Our civil drawings define our sanitary system proposal and we will obtain permits before the work begins so this criterion is met.

TMC 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. [Ord. 839-91 §10, 7/22/91] Our civil drawings define our water system proposal and we will obtain permits before the work begins so this criterion is met.

TMC 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.
(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.
We will go through the erosion control process as part of obtaining a building permit before the work begins so this criterion is met.

TMC 3-5-160 Historical and Archeological Areas. When burial sites, buried camp areas, or village sites, and other distinctive archeological or historical items are uncovered, or other items suspected of being of historical or archeological significance are encountered, the contractor shall report the matter to the City and the state liaison officer. Construction operations shall be stopped until the appropriate authorities can examine the area and give clearance to proceed with the work. Under the Natural Historical Preservation Act, state liaison officers shall be notified when historical or archeological items are unearthed. [Ord. 846-91 §16, 10/28/1991] We acknowledge this requirement, and at this time the team is unaware of any distinctive archeological or historical items on site.

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. [Ord. 846-91 §18, 10/28/1991]* We acknowledge this requirement, and at this time the team is unaware of any contaminated soil on this undeveloped site.

TDC Section 3.080 Public Facilities and Services.
(2) Sewer service areas. To assist in determining areas most suited to urban development, a sewer service area overlay was prepared to illustrate the feasibility of providing sewer service throughout the Tualatin Planning Area. The Study Area was divided into 4 categories of sewer service availability in order of increasing complexity and expense of service. In addition, properties that can be served by existing pumping stations are considered to have gravity-flow service available. We propose a code complying gravity system connecting to existing sanitary stubs in SW 108th Avenue, which has an existing public gravity sewer line.
(3) Water service areas. As in the case of sewer service, the Tualatin Study Area was divided into 4 categories of water service availability. The 4 categories agreed closely with the 4 categories of sewer service. In addition to showing the degree of water service complexity and expense, the water service overlay depicts main trans-mission lines, reservoirs, water supply

sources, and the approximate dividing line between the City's upper and lower water service levels. Like sewers, we propose a code complying water system connecting to existing public water service lines in SW 108th Avenue.
(4) Storm drainage. The Tualatin Drainage Plan defines and describes areas of inadequate drainage throughout the Tualatin Study Area. The Plan, which was originally prepared in 1972, will need to be updated as part of the City's planning revision work, but the overall drainage patterns have not changed. The City's core area and the area along Boones Ferry Road, south of the core area, are the most critical from the standpoint of drainage. The former will be dealt with in conjunction with Urban Renewal Area improvements. The pipe that the site will discharge to, Pipe 5, has adequate capacity for the site per VLMK, our civil engineer. A rough rule of thumb in Tualatin is 1.0 cfs of runoff per 1.0 acre of developed land. The downstream conveyance system has adequate capacity for runoff from this site without detention (approximately 4 cfs more peak flow). VLMK noted that the site areas are not significantly different enough to warrant reproducing/revising these calculations given the excess capacity in the street to carry the site runoff without detention. Upsizing of our downstream pipes is not necessary because the criterion is satisfied – see drawing C2.0 by VLMK for additional information, including our proposed on-site water quality system.

TMC 3-2-160 Construction Standards. All sewer 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 sewer line, the extension shall be carried to the opposite property line or to such other point as determined by the Public Works Director. [Ord. 496-80 §18, 1/14/80] It is understood with our Leveton development team that we will meet Tualatin construction Standards, and our building permit documents will also reflect those standards. Sewer extensions already exist for our adjacent properties so we are not adding an additional extension because the criterion is already met.

TMC 3-5-280 Placement of Water Quality Facilities. Title III specifies that certain properties shall install water quality facilities for the purpose of removing phosphorous. No such water quality facilities shall be constructed within the defined area of existing or created wetlands unless a mitigation action, approved by the City, is constructed to replace the area used for the water quality facility. [Ord. 846-91 §28, 10/28/1991; Ord. 972-97 § 3, 2/24/1997; Ord. 1068-01 §2, 3/26/2001; Ord. 1068-01, 03/26/2001] An underground water quality facility is proposed – see attached civil drawing. The criterion is satisfied.

TMC 4-1-010 Standards Applicable to Building.
(a) The Oregon Structural Specialty Code, 2014 edition, adopted by the State in OAR 918-460-0010 to 918-460-0015 (2014);
(j) The Oregon Fire Code, 2014 edition, adopted by the State in OAR 837-040-0140 (2014), and as adopted and amended by Tualatin Valley Fire and Rescue District Ordinance No. 14-02. Regarding life-safety our buildings are designed to both of these referenced codes. Noted the building shell is concrete and steel and glass (non-combustible materials) and includes a sprinkler system. Documentation that we meet these standards is partially included on our AR documents, and will be further defined on our Building Permit documents so this criterion is met.

TMC 4-1-030 Grading. A person seeking a grading permit must submit a soil report with the permit application. The soils report submitted must be signed and sealed by an Oregon-certified soils engineer and comply with Appendix J of the Oregon Structural Specialty Code, 2014 edition. No grading activities may occur unless and until a person receives a grading permit and complies with this section. [Ord. 509-80 §5, 5/12/80; Ord. 600-83 §2, 7/25/83; Ord. 801-90, 3/26/90; Ord. 886-93 §2, 2/22/93; Ord. 980-97 §2, 7/14/97; Ord. 1011-98 §2, 12/14/98; Ord. 1178-05, 1/24/05; Ord. 1235-07 §2, 4/9/07; Ord. 1383-15, 07/27/2015] We have submitted a geotechnical report as part of AR submittal package and it will be part of our building permit submittal.

4-2-010 Hydrants and Water Supply for Fire Protection.
(1) Every application for a building permit and accompanying plans shall be submitted to the Building Division for review of water used for fire protection, the approximate location and size of hydrants to be connected, and the provisions for access and egress for firefighting equipment. If upon such review it is determined that the fire protection facilities are not required or that they are adequately provided for in the plans, the Fire and Life Safety Reviewer shall recommend approval to the City Building Official. We have proposed locations for new public fire hydrants adjacent to public streets as part of our AR submittal and these will be reviewed in due course by TVF&R and Public Works. We will work with those agencies and seek approval through the usual permit processes. Of course we will do no work on these systems without building permits.

TDC Section 7.040 Manufacturing Planning District Objectives.
(2) Light Manufacturing Planning District (ML).
(a) Suitable for warehousing, wholesaling and light manufacturing processes that are not hazardous and that do not create undue amounts of noise, dust, odor, vibration, or smoke. Acknowledge, this describes our anticipated High-Tech uses. We anticipate no retail and there is no rail service here.
(b) The following uses within the Light Manufacturing District shall comply with the following size limits established by Metro. Retail sale, retail service and professional service uses shall be no greater than 5,000 square feet of sales or service area per outlet, or not greater than 20,000 square feet of sales or service area for multiple outlets in a single building or in multiple buildings that are part of tlhe same development project, with the following exceptions. We do not anticipate any of these uses.
(i) Application of the Industrial Business Park Overlay District (TDC Chapter 69). NA -we are not in this overlay.
(ii) The retail sale of products manufactured, assembled, packaged or wholesaled on the site is allowed provided the retail sale area, including the showroom area, is no more than 5% of the gross floor area of the building not to exceed 1,500 square feet. Acknowledge.
(iii) Within the Special Commercial Setback from arterial streets (TDC 60.035) the retail sale of home improvement materials and supplies is allowed provided it is not greater than 60,000 square feet of gross floor area per building or business and subject to the Special Commercial Setback from arterial streets as generally illustrated in Map 9-5 and specifically set forth in TDC 60.035. NA - we are not in this overlay.
(c) The purpose of this district is to provide sites for manufacturing uses that are more compatible with adjacent commercial and residential uses and would serve to buffer heavy manufacturing uses. Acknowledge.
(d) In accordance with the Industrial Business Park Overlay District, TDC Chapter 69, selected office and retail uses are allowed to provide services to businesses and employees. The purpose is also to allow certain commercial service uses in the Commercial Services Overlay shown in the specific areas illustrated on Map 9-5 and selected commercial uses subject to distance restrictions from residential areas and subject to the Special Commercial Setback from arterial streets as generally illustrated in Map 9-5 and specifically set forth in TDC 60.035. NA - we are not in this overlay.

TDC Section 34.270 Tree Protection During Construction.
(1) Any tree required to be retained either through Architectural Review, Subdivision or Partition Review, or permit process that will be impacted by nearby construction activities must be protected in accordance with the TDC 73.250(2).
Acknowledge. We are preserving five significant trees in the SW 108th Avenue ROW, and will implement these preservations standards on each tree. The site now also has many newer trees planted by the owner at all our internal property line setbacks, where we will also implement these preservation standards.

TDC Section 34.330 Fence Standards. The following standards are minimum requirements for fences in a RL (Low Density Residential) or a RML (Medium Low Density Residential) Planning District, where an access-restricted lot line or property line abuts a public street classified as a major arterial, minor arterial, major collector, minor collector, or expressway by the Tualatin Functional Classification Plan, or abuts a state-owned interstate highway (I-5 or I-205). Acknowledge. We are proposing no new fencing at this time.

TDC Section 36.090 Issuance of Building Permits.
(1) Except as provided in subsection (5) of this section no building permit or permits to connect to City utility services shall be is-sued for lots within a subdivision or partition plat until the City Engineer has determined that the corresponding public improvements are substantially complete to assure that the health and safety of the citizens will not be endangered from inadequate public facilities.
(2) Subject to submittal and approval of, and compliance with, the subdivision plan, as well as sufficient security to assure completion of the public portions of the subdivision, the applicant or individual lot owners within the subdivision may receive a building permit or utility service for not more than 50 percent of the platted lots within the subdivision prior to:
(a) the completion of all required public improvements in accordance with the Public Works Construction Code; and
(b) the acceptance of the public improvements by resolution of the City Council.
(3) No building permits shall be issued or utility service approved for any lot which together with previously approved lots would exceed 50 percent of the platted lots within the subdivision until:
(a) all required public improvements have been completed in accordance with the Public Works Construction Code; and
(b) the public improvements have been accepted by resolution of the City Council.

(4) City approval for use of a public improvement prior to the final approval and acceptance by the City of the subdivision plat shall not be construed as a release or waiver of any security which has been filed to assure compliance with the subdivision plan approval or any related agreements.
(5) For a subdivision or partition in commercial, institutional, or manufacturing planning districts or multi-family residential developments which require Architectural Review approval, the City Engineer may authorize building permits to be issued prior to the public improvements being substantially complete provided the following conditions are satisfied:
(a) A Public Works Permit for the public improvements has been issued;
(b) An Architectural Review for the development has been approved;
(c) The subdivision or partition plat is recorded;
(d) All easements and dedications required of any development approval have been recorded; and
(e) Such building permits are conditioned to deny occupancy until the public improvements in the subdivision are complete and are accepted by resolution of the City Council. [Ord. 590-83 §1, 4/11/83. by Ord. 1016-99 §1, 4/12/99; Ord. 1216-06, 7/24/o06] Acknowledge that we have these approval processes prior to construction..

TDC Chapter 60: Light Manufacturing Planning District (ML)
Section 60.010 Purpose The purpose of this district is to provide areas of the City that are suitable for industrial uses and compatible with adjacent commercial and residential uses. The district serves to buffer heavy manufacturing uses from commercial and residential areas. The district 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 district is also suitable for retail sale of products manufactured, assembled, packaged or wholesaled on the site provided the retail sale area, including the showroom area, is no more than 5% of the gross floor area of the building not to exceed 1,500 square feet and, with appropriate restrictions, for retail sale of products not allowed for sale in General Commercial Planning Districts, and office commercial uses where any portion of a legally created lot is within 60 feet of a CO Planning District boundary. Our listed anticipated uses for this building "shell" comply with the purpose of this zone.
The purpose is also to allow certain commercial service uses in the Commercial Services Overlay shown in the specific areas illustrated on Map 9-5 and selected commercial uses subject to distance restrictions from residential areas and subject to the Special Commercial Setback from arterial streets as generally illustrated in Map 9-5 and specifically set forth in TDC 60.035. Commercial services uses are not anticipated, and for the record we are outside Map 9-5.

Section 60.060 Lot Size. Except for lots for public utility facilities, natural gas pumping stations and a wireless communication facility which shall be established through the Subdivision, Partition or Lot Line Adjustment process, the following requirements shall apply:

(1) The minimum lot area shall be 20,000 square feet. We comply.
(2) The minimum average lot width shall be 100 feet. We comply.
(3) The minimum lot width at the street shall be 100 feet. We comply.

Section 60.070 Setback Requirements.

(1) Front yard. The minimum setback is 30 feet. When the front yard is across the street from a residential or Manufacturing Park (MP) district, a front yard setback of 50 feet is required. When a fish and wildlife habitat area is placed in a Tract and dedicated to the City at the City's option, dedicated in a manner approved by the City to a non-profit conservation organization or is retained in private ownership by the developer, the minimum setback is 10 – 30 feet, as determined in the Architectural Review process, with the exception of front yards across the street from a residential or MP District, provided the buildings are located farther away from fish and wildlife habitat areas. Our setbacks are much greater than the minimum.
(2) Side yard. The minimum setback is 0 to 50 feet, as determined in the Architectural Review process. When the side yard is adjacent to a property line or across the street from a residential or Manufacturing Park (MP) district, a side yard setback of 50 feet is required. Our setbacks are much greater than the minimum.
(3) Rear yard. The minimum setback is 0 to 50 feet, as determined in the Architectural Review process. When the rear yard is adjacent to a property line or across the street from a residential or Manufacturing Park (MP) district, a rear yard setback of 50 feet is required. Our setbacks are much greater than the minimum.
(4) Corner lot yards. The minimum setback is the maximum setback prescribed for each yard for a sufficient distance from the street intersections and driveways to provide adequate sight distance for vehicular and pedestrian traffic at intersections and driveways, as determined in the Architectural Review process. Acknowledge, we meet the standard.

(5) The minimum parking and circulation area setback is 5 feet, except when a yard is adjacent to public streets or residential or Manufacturing Park District, the minimum setback is 10 feet. We are generous with landscaping and greatly exceed the setback in all areas, except the 10' minimum at ROWs. With generous planting proposed in the ROW on Leveton and 108th (that is greater than 10'),we are choosing to place the parking at the lot line so can add to the already generous planting surrounding the building. This allows a more campus aesthetic for the project similar to the picture on page one. The owner discussed this with Planning and received informal support before we finalized the drawings.

(8) No fence shall be constructed within 10 feet of a public right-of-way. No fences proposed.

Section 60.090 Structure Height.

(1) Except as provided in TDC 60.090(2), (3) or (4), no structure shall exceed a height of 50 feet and flagpoles which display the flag of the United States of America either alone or with the State of Oregon flag shall not exceed 100 feet above grade provided that the setbacks are not less than a distance equal to one and one-half times the flagpole height. Acknowledge, we meet the standard.

(2) The maximum permitted structure height provided in TDC 60.090(1) may be increased to no more than 85 feet, provided that all yards adjacent to the structure are not less than a distance equal to one and one-half times the height of the structure. Not required.

TDC Chapter 73: Community Design Standards

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; Acknowledge this overall requirement, and yes we meet code to the best of our knowledge.

(b) The proposed design of the development is compatible with the design of other developments in the general vicinity; and Acknowledge this overall requirement, and yes we are compatible. We are also a dramatic aesthetic upgrade.

(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. Yes.

(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. Acknowledge.

(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. We are removing no existing trees.

(5) Conflicting Standards. In addition to the MUCOD requirements, the requirements in TDC Chapter 73 (Community Design Standards) and other applicable Chapters apply. If TDC Chapters 57, 73 and other applicable Chapters, conflict or are different, they shall be resolved in accordance with TDC 57.200(2). [Ord. 637-84, §5, 6/11/84; Ord. 725-87, §2, 6/22/87; Ord. 743-88, §33, 3/28/88; Ord. 862-92, §51, 3/23/1992; Ord. 864-92, §14, 4/13/82; Ord. 963-96, §5, 6/24/96; Ord. 1025-99, §32, 7/26/99; Ord. 1062.00, §22, 12/11/00; Ord. 1062-00, 1/3/01; Ord. 1227-07 §12, 2/12/07] Acknowledge.

Section 73.150 Design Standard 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 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. Accomplished, see site plan.

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

(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. Accomplished, see landscape plan.

(6) Provide vehicular connections to adjoining sites. Accomplished, we propose to maintain the existing drive connection to the adjacent site, see site plan.

(7) Emphasize entry drives into commercial complexes and industrial park developments with special design features, such as landscaped medians, water features and sculptures. Our entry drives off SW 108th are located between large 3' and 4' diameter existing fir trees in the ROW, and these sentinels framing our entries are excellent special design features.

(8) Locate, within parking lots, pedestrian amenities and/or landscaping in areas which are not used for vehicle maneuvering and parking. Accomplished, see landscape plan.

(9) 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. (10) Create opportunities for, or areas of, visual and aesthetic interest for occupants and visitors to the site. We provide two pedestrian plazas at our building entries planned to receive these features in final design. We also provide a pocket park at the south edge of our site that will include a basketball court and other amenities to be determined.

(11) Conserve, protect and restore fish and wildlife habitat areas, and maintain or create visual and physical corridors to adjacent fish and wildlife habitat areas. Extensive landscape areas are created providing wildlife habitat.

(12) Provide safe pathways for pedestrians to move from parking areas to building entrances. Accomplished, see site plan.

(13) 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. Accomplished, our two buildings can connect on the first and second floor and they share a service dock, see site and floor plans.

(17) Provide preferential parking for carpool and vanpools to encourage employees to participate in carpools and vanpools. This will be accomplished at tenant improvement approvals with the tenant on board, currently this is a non-occupied building "shell". The important thing here is ample parking well distributed.

(18) Screen elements such as mechanical and electrical equipment, above ground sewer or water pump stations, pressure reading stations and water reservoirs from view. We are providing Electrical and Sprinkler Riser room space so much of this equipment is inside the buildings. M and E on-site equipment will be screened by landscaping. There is no roof mounted HVAC equipment in this "shell" but we accommodate the future TI roof equipment in the roof structure near the building centers where it is easiest to screen if needed.

Section 73.160 Design 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:

(i) a walkway shall be provided between the main entrance to the building and any abutting public right-of-way of an arterial or collector street where a transit stop is designated or provided. The walkway shall be a minimum of 6 feet wide and shall be 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; Accomplished, including ADA compliance - see site plan.

(iii) walkways through parking areas, drive aisles, and loading areas shall be visibly raised and of a different appearance than the adjacent paved vehicular areas; Accomplished, see site plan.

(v) fences or gates which prevent pedestrian and bike access shall not be allowed at the entrance to or exit from any accessway. No fencing is planned, see site plan.

(vii) 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. Accomplished, see site plan.

(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. ADA access is anticipated in this design, see site plan.

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. This is a flat grassy site providing us flexibility in layout, but we have located our access drives between existing trees.

(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. We believe we have accomplished these objectives in our design with a distinctive sense of place enhanced by a limited palette of timeless materials such as semi-transparent stained concrete, generous green tint glass, and strong metal cornice and canopy elements.

(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. Our service dock is inward and well screened by the buildings from public ROW. The buildings are further softened in the service area by climbing plant material on the stained concrete walls. Our goal is a very soft and green service area that is also functional.

(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. Our 11.25" concrete walls provide a thermal mass for energy efficiency as well as aesthetics. Our glass height is tall on both floors (11.5' at 1st floor and 10' at second) to bring natural light deep into the buildings.

(5) Locate and design entries and loading/service areas in consideration of climatic conditions such as prevailing winds, sun and driving rains. All portals have generous canopies for functional and aesthetic reasons.

(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. Accomplished, see drawings.

(7) Select building materials which contribute to the project's identity, form and function, as well as to the surrounding environment. Our limited palette is concrete steel and glass, and the image on the first page of this narrative is the general aesthetic we propose. It is well received by our high-tech tenants as well as their employees.

(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). We seek neutral colors in our concrete stain that go well with our green-tint glass and darker steel elements.

(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. Accomplished, see drawings.

(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. Accomplished, see drawings.

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. We propose conventional lighting fixtures with glare cut-off features limiting the light at ROWs, and we have good lighting distribution in the circulations areas.

(b) Provide an identification system which clearly identifies and locates buildings and their entries. Signing is as TI when the tenant is known, but the architectural language makes entries a natural focal point in this design.

(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. Acknowledge. We will trim the existing fir trees to the 8' limit with City permission.

Section 73.225 Mixed Solid Waste and Source Separated Recyclables 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:
(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. Our solid waste/recyclable storage areas are shown in the rear service areas on our site plan and they are thoughtfully placed to be functional and not visible to the public. Our calculations are on the site plan showing how we comply.

LANDSCAPING
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, except within the Core Area Parking District, where the minimum area requirement for landscaping shall be 10 percent. When a dedication is granted in accordance with the planning district provisions on the subject property for a fish and wildlife habitat area, the minimum area requirement for landscaping may be reduced by 2.5 percent from the minimum area requirement as determined through the AR process. We significantly exceed the 15% minimum landscaping area requirement, see site plan notes.
(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.). Acknowledge.
(13) Landscape plans for required landscaped areas that include fences should carefully integrate any fencing into the plan to guide wild animals toward animal crossings under, over, or around transportation corridors. No fencing proposed.

Section 73.290 Re-vegetation in Un-landscaped Areas. The purpose of this section is to ensure erosion protection, and in appropriate areas to encourage soil amendment, for those areas not included within the landscape percentage requirements so native plants will be established, and trees will not be lost.
(1) Where vegetation has been removed or damaged in areas not affected by the landscaping requirements and that are not to be occupied by structures or other improvements, vegetation shall be replanted. Acknowledge. Our proposal fully landscapes our site, which is currently in natural grass.
(2) Plant materials shall be watered at intervals sufficient to ensure survival and growth for a minimum of two growing seasons. Acknowledge.
(3) The use of native plant materials is encouraged to reduce irrigation and maintenance demands. Acknowledge.
(4) Disturbed soils should be amended to an original or higher level of porosity to regain infiltration and stormwater storage capacity. [Ord. 1224-06 §27, 11/13/06] Acknowledge.

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. We greatly exceed the minimum 5' landscape requirement on all building sides, except at the fire access lane on the east side of the North Wing where it is 3.5' (this is not viewable from public roads). Here we move the fire lane closer to the building to allow more landscape area (17' setback of dense planting) at the lot line to better screen the adjacent Tofle Building.
(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. We have not included our plazas with pedestrian amenities as landscape area already significantly exceeds the minimum requirement.
(3) All areas not occupied by buildings, parking spaces, driveways, drive aisles, pedestrian areas or undisturbed natural areas shall be landscaped. Accomplished, see landscape plan.

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. Accomplished, see site plan.
(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). The project greatly exceeds landscaping minimums at the owner's request, and will present itself as a heavily landscaped suburban campus from public roads. For example, in front of South Wing there is over 40' of landscaping from our parking curb to the street curb, and in addition there is another 40' of landscaping from parking curb to the building.

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 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. Accomplished, see landscape plan.
(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). Accomplished, see site plan.
(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). Accomplished, see landscape plan.
(4) Landscape islands shall be utilized at aisle ends to protect parked vehicles from moving vehicles and emphasize vehicular circulation patterns. Accomplished, see landscape plan.
(5) Required plant material in landscape islands shall achieve 90 percent coverage within three years. Native shrubs and trees are encouraged. Acknowledge. The owner is personally involved in plant selection at the nurseries on his projects, and he generally exceeds code minimum size. See the first picture in this narrative, which is an example of a similar building by the owner one year after completion.
(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. Acknowledge. Our ROW curb to interior curb landscape depth extends 60'±, which well exceeds minimum.

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 case of conflicts between guidelines or objectives in TDC Chapter 73, the proposal shall provide a balance.
This project cannot be occupied without a tenant improvement permit. We propose that off-street vanpool and carpool parking spaces be established with the tenant at that time.
(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. Acknowledge.
(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. Acknowledge, see our project statistics on the site plan.
(ii) The total number of parking spaces meets the standards for the sum of the number of spaces which would be separately required for each use. Acknowledge, see our project statistics on the site plan.
(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. Accomplished, see site plan.

(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. Accomplished, see site plan.
(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. Accomplished, see site plan.
(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. Accomplished, see site plan.
(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. Acknowledge there is no cost for bike parking. The owner would like to advise Planning that in his experience the bike riders using his buildings tend towards expensive bikes that they store inside near their desks.
(x) Required vanpool and carpool parking shall meet the 9-foot parking stall standards in Figure 73-1 and be identified with appropriate signage. Acknowledge.
(2) Off-Street Parking Provisions.

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. Accomplished, see site plan.
(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. Acknowledge, and you can see from our calculations we are near the max for compacts allowed because cars are getting smaller.
(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. Acknowledge this rigid requirement.
(6) Artificial lighting, which may be provided, 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. Acknowledge.
(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. Accomplished, see site plan.
(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. Accomplished, see site plan.
(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. Accomplished, see site plan.

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
5,000 - 25,000 1
25,000 - 60,000 2
60,000 and over 3 To best fit our high-tech tenant's needs, we propose two (2) shared full size loading berths and two (2) smaller on-grade van berths. The owner has learned over time this building type uses the smaller van service doors much more frequently than the 12' x 60' loading berths. We also provide built-in flexibility in our architecture to easily add more on-grade van service doors in existing glass openings if needed. Flexibility to adapt is key in this design, and for aesthetics we infill our van service doors openings with glass/aluminum doors.
(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'. We provide three (2) - 12' x 25' on-grade drive-in service doors, with the ability to add more relatively easily if needed.
(b) Industrial uses - 12' x 60' We are designing to 12' x 60' loading berths on our (2) shared 4' docks.
(c) Berths shall have an unobstructed height of 14' Accomplished.

(d) Loading berths shall not use the public right-of-way as part of the required off-street loading area. Accomplished, the service area is well screened by buildings in the rear area away from Public ROWs.
(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. Accomplished, we are screened from the public roads by buildings, including the neighbors building.
(4) Required loading facilities shall be installed prior to final building inspection and shall be permanently maintained as a condition of use. Agreed.
(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. Accomplished.

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. Acknowledge.

(2) Owners of two or more uses, structures, or parcels of land may agree to utilize jointly the same ingress and egress when the combined ingress and egress of both uses, structures, or parcels of land satisfies their combined requirements as designated in this code; provided that satisfactory legal evidence is presented to the City Attorney in the form of deeds, easements, leases or contracts to establish joint use. Copies of said deeds, easements, leases or contracts shall be placed on permanent file with the City Recorder. Acknowledge. The owner intends to establish joint use of all our drives and site amenities via easements as part of development of this property, as he has done previously on his similar projects.

(3) Joint and Cross Access.
(a) Adjacent commercial uses may be required to provide cross access drive and pedestrian access to allow circulation between sites. Acknowledge, we propose to continue with the existing easement with Tofle.
(12) Minimum Access Requirements for Industrial Uses. Per the table in this section we fall in the category of 1- 249 req'd parking spaces, so our requirement is minimum 1 access drive. But we propose an actual 336 stalls based upon the owner's experience with Hi-Tech tenants and market demand. The number of actual stalls suggests more than one drive is useful here. The Fire Marshall requires a minimum two access drives for this size of project and use. We request City Engineer approval for two access drives proposed in this submittal.
(14) Maximum Driveway Widths and Other Requirements.
(a) Unless otherwise provided in this chapter, maximum driveway widths shall not exceed 40 feet. We easily meet this requirement, see site plan.
(b) Except for townhouse lots, no driveways shall be constructed within 5 feet of an adjacent property line, except when two adjacent property owners elect to provide joint access to their respective properties, as provided by Subsection (2). We meet this requirement.
(c) There shall be a minimum distance of 40 feet between any two adjacent driveways on a single property unless a lesser distance is approved by the City Engineer. We meet this requirement.
(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. We meet this requirement, see site plan.
(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 73-2 for illustration). Acknowledge.
(b) Collector Streets - A vision clearance area for all collector/arterial street intersections, collector/arterial street and local street intersections, and collector/arterial street 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 25 feet from the intersection point of the right-of-way lines, as measured along such lines. Where a driveway intersects with a collector/arterial street, the distance measured along the driveway line for the triangular area shall be 10 feet (see Figure 73-2 for illustration). Acknowledge.
(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). Acknowledge.

TDC 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. Acknowledge, see landscape plan.

TDC 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. Acknowledge.
(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. [Ord. 1224-06 §35, 11/13/06] Acknowledge.

TDC 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. Acknowledge.

Section 74.610 Water Service. (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. Water service extensions already exist for our adjacent properties so we are not adding an additional extension. This requirement is already met.

Section 74.620 Sanitary Sewer Service. (2) If there are undeveloped properties adjacent to the proposed development site which can be served by the gravity sewer system on the proposed development site, the applicant shall extend public sanitary sewer lines to the common boundary line with these properties. The lines shall be sized to convey flows to include all future development from all up stream areas that can be expected to drain through the lines on the site, in accordance with the City's Sanitary Sewer System Master Plan, TDC Chapter 13. [Ord. 933-94, § 60, 11/28/94] Sanitary Sewer extensions already exist for our adjacent properties so we are not adding an additional extension. This requirement is already met.

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. We are in Zone 2 per Street Tree Map 74-1, see landscape plan.

Section 75.030 Freeways and Arterials Defined. (2) Freeways and Arterials Designated. For the purposes of this chapter the following are freeways and arterials: We acknowledge that the streets we front on, Leveton Drive and SW 108th Avenue, are designated arterials, although very lightly used arterials at this time.

Section 75.050 Approval Process For Access Onto Arterials, and Appeal Provisions. (1) All requests for access onto arterials shall be reviewed by the City Engineer and follow the process described in TDC 31.074 through TDC 31.078 unless it is processed in conjunction with an application requiring a public hearing by the City Council. Based on provisions of this chapter and of the procedure described in TDC 31.074 through TDC 31.078, the City Engineer shall approve, approve with conditions, or reject the request for access in writing, stating the reasons for his or her decision. We request City Engineer approval on our proposed relocation of the two existing driveways to our property as shown on our site plan. Supporting our request the Fire Marshall also requires two access drives for our size project. Our parking stall count also suggests two driveways are appropriate.

GENERAL COMMENTS:

1. Site Configuration/Parking: The buildings are placed so they work well as a single or two tenants. If two tenants they share the entry canopy with two plazas and covered service docks. If a single tenant they have the option to get a permit to relatively inexpensively enclose the entry canopy and 2nd floor bridge so the two wings are connected on both floors. Parking surrounds the buildings and is double loaded for efficiency. Service is hidden from the public streets in back screened by the buildings. Pedestrian routes to entry portals are logical and defined in concrete, and separated from vehicles.

2. Landscaping: Landscape area is generous as the number show, and for a quick visual sense look at the photo on page 1 is an example the quality and quantity proposed. Also compare the extent of our landscaping areas with our NW neighbor the Tofle building on our plan. We propose significantly more landscaping areas than our adjacent neighbors:
    a. Frontage landscaping is unusually generous, largely because of the significant ROW setbacks from curb to add planting. We integrate our entry drives between the five large existing fir trees, and at these big firs planting is more natural in native varieties. The hornbeam street trees are lineally configured per code, and on SW 108th we have taken advantage of the width to install double rows of street trees.
    b. Perimeter landscaping is typically double rows of trees in wide setbacks to screen our project from the neighbors. We also have added a private pocket park at the south lot line for our employees. We know the park will include a basketball court. We haven't determined yet if the balance of the park will be for passive activities or more active with a fitness station circuit.
    c. Building landscaping is particularly generous at SW 108th and generous elsewhere. Planting is a mix of various groundcovers, shrubs, and trees. Columnar tree forms are integrated in a rhythm at the building face.

3. Entry Plazas and Entry Canopy: These are key design elements for the entry progression that are place-markers until final design is resolved. The owner's intent is high design here, with better plazas than shown on the picture on page 1 of this narrative.

4. Exterior Lighting: We will use LED lamps in cast aluminum housings that are of high quality and appropriate for their placement. All fixtures have glare cut-off features built in. The photo on page 1 is an example the quality of the exterior lighting proposed, which include building sconce lights, bollard fixtures, pedestrian scale pole fixtures and parking lot pole lighting. Or better yet, visit the building on the first page and see the quality of the lighting fixtures and how they enhance the building even in daylight.

5. Screening of unsightly things:
    a. There is no roof equipment in this building shell, but the structure is designed to accommodate the required roof units during the TI permit process. These HVAC units are located centrally, and from a line-of-sight study they are not quite visible from the SW 108th curb because view is blocked by the building. We assume 12' HVAC units with curb, and this is our prelim finding only.
    b. Some site utilities, like fire hydrants, must remain visible and accessible for life-safety reasons, and we will follow code in those cases. Other utilities can be screened, and our plan is to employ thoughtful placement then planting to make them less visible.
    c. Dumpster/Recycle enclosures are proposed to be placed in the service area. They will be surrounded by concrete walls with doors as visual screens and then planting to soften the appearance.

KITTELSON & ASSOCIATES, INC.
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April 4, 2016 Project #: 18697

Mr. Jack Martin
Martin Real Estate Development
3955 South Trail Drive
Jackson, WY 83001

Subject: Supplemental Traffic Assessment for Leveton Industrial Building– Tualatin, OR

Dear Mr. Martin,

This letter presents the results of a supplemental analysis prepared by Kittelson & Associates Inc.'s for the proposed Leveton Industrial Building Development in Tualatin, Oregon. The analysis contained herein concludes that the proposed south site access to SW 108th Avenue can be developed while maintaining acceptable levels of traffic operation and bicycle safety along the adjacent street. This assessment builds upon the previous traffic profile letter dated January 20, 2016 and now contains a recommendation to maintain the current lane and bicycle striping configuration along the site frontage on SW 108th Avenue at the location of the south site access, including maintaining the double yellow median lane lines along the roadway in front of the site access and the bicycle lane striping north of the site access. The remaining sections of this letter summarize the analysis, findings, and recommendations for maintaining the current striping along SW 108th Avenue in front of the south site access. For further information on the project including the site plan, existing roadway conditions, and our prior review of site access and circulation, including sight distance analysis, refer to the traffic profile letter.

Project Description

Martin Real Estate Development is proposing to develop a new 86,100 square foot industrial office building on the vacant property located on the southwest corner of the SW 108th Avenue/SW Leveton Drive intersection in Tualatin, Oregon. Access to the site will be maintained by two proposed full access driveways along SW 108th Avenue and a shared access to SW Leveton Drive. The south site access to SW 108th Avenue is the subject of this study.

Supplemental Analysis Scope

This supplemental analysis focuses on the operational and vehicle queuing-related impacts of maintaining the current traffic and bicycle lane striping configurations along SW 108th Avenue at the location of the proposed south site access. The analysis scope was based on a consultation meeting with City of Tualatin staff on March 18, 2016. Based on this meeting, weekday a.m. peak hour operational and vehicle queuing analyses were performed at the following intersections:

- SW 108th Avenue/SW Herman Road (signalized)
- Proposed south site access to SW 108th Avenue (unsignalized)

This report specifically evaluates the following transportation items:

- Year 2016 existing traffic conditions (i.e. LOS and vehicle queuing) at the two subject intersections during the weekday a.m. peak hour;
- Weekday a.m. peak hour site trip generation and distribution estimates for the two subject intersections; and
- Year 2016 total traffic conditions during the weekday a.m. peak hour at the two subject intersections.

Analysis Methodology

All level-of-service (LOS) and volume-to-capacity (v/c) ratio analyses described in this report were performed in accordance with the procedures stated in the 2000 *Highway Capacity Manual* (Reference 1). *A description of level of service and the criteria by which it is determined is presented in Appendix "A".* Appendix "A" also explains how level of service is measured and what is generally considered the acceptable range of level of service.

All intersection level-of-service evaluations used the peak 15-minute flow rate during the weekday a.m. peak hour. Using the peak 15-minute flow rate ensures that the analysis is based on a reasonable worst-case scenario. For this reason, the analysis reflects conditions that are only likely to occur for 15 minutes out of each average peak hour. The transportation system will likely operate under conditions better than those described in this report during all other time periods.

Operating Standards

The study intersections are located within the City of Tualatin are subject to the following adopted LOS standards:

- LOS "D" is considered acceptable at signalized intersections.
- LOS "E" is considered acceptable at all unsignalized, stop-controlled, intersections.

Existing Traffic Volumes

A manual turning movement count was obtained at the existing study intersection of SW 108th Avenue/SW Herman Road on Tuesday, March 29th, 2016 during the morning (7:00 to 9:00 a.m.) peak period. Based on our meeting with City staff, this period was seen as the most critical analysis period for the south site access to SW 108th Avenue, given the morning peaking characteristics of inbound traffic demand associated with this project. *Appendix "B" contains the traffic count worksheet collected for this study.*

Site Trip Generation and Distribution

As summarized in the prior traffic profile letter, a trip generation estimate was prepared for the proposed site development based on information provided in the standard reference manual, *Trip Generation, 9th Edition*, published by the Institute of Transportation Engineers. Based on the proposed development plan and considering the *Light Manufacturing (ML)* zoning of the property, ITE Code 130 (Industrial Park) was selected as the appropriate land use to estimate trips. Table 1 summarizes the daily and weekday a.m. and p.m. peak hour trips expected for the proposed development (daily trips have been rounded to the nearest ten).

Table 1 Trip Generation Estimate

Land Use	ITE LU	Size (sf)	Weekday Daily Trips	Weekday AM Peak Hour Trips			Weekday PM Peak Hour Trips		
				Total	In	Out	Total	In	Out
Industrial Park	130	86,100	590	71	58	13	73	15	58

As shown in Table 1, the proposed warehouse expansion is forecast to generate approximately 590 net new weekday daily trips, with 71 (58 in, 13 out) forecast to occur during the weekday a.m. peak hour and 73 (15 in, 58 out) forecast to occur during the weekday p.m. peak hour. As noted in the table above, inbound traffic demand is most critical during the morning peak hour.

Site Trip Distribution/Trip Assignment

The distribution of overall site-generated trips was determined based on a review of the existing turning movement volumes recorded from the March 2016 count at the intersection of SW 108th Avenue/SW Herman Road, observed major travel corridors in the area, the site's location relative to other land uses in the area, and expected patterns at the three external site accesses. This overall distribution is described as follows:

- 20% of site-generated trips travel to/from north of site on 108th Avenue or Leveton Drive,
- 45% of site-generated trips travel to/from SW Herman Road to the east, and
- 35% of site-generated trips travel to/from SW Herman Road to the west.

Site-generated trips originating from or destined to SW Herman Road are expected to use the south site access to SW 108th Avenue, with minor trips expected to travel to/from the north on SW 108th Avenue.

Tables 2 and 3 summarize the existing, estimated site-generated, and resulting total traffic volumes for the two study intersections during the weekday a.m. peak hour.

Table 2: Estimated Turn Movement Traffic Volumes at SW 108th Avenue/SW Herman Road

	Southbound		Eastbound		Westbound	
	Left	Right	Left	Thru	Thru	Right
Existing traffic volumes	41	4	6	551	297	172
Site generated traffic volumes	6	5	20	0	0	26
Total traffic volumes	47	9	26	551	297	198

Table 3: Estimated Turn Movement Traffic Volumes at South Site Access to SW 108th Avenue

	Northbound		Southbound		Eastbound	
	Left	Thru	Thru	Right	Left	Right
Existing traffic volumes	-	178	45	-	-	-
Site generated traffic volumes	46	0	0	12	2	11
Total traffic volumes	46	178	45	12	2	11

Weekday AM Peak Hour Traffic Conditions

The weekday AM peak hour traffic conditions analysis compares the traffic operations and vehicle queueing characteristics at the two subject intersections under current and total traffic conditions with the development in place.

Existing Traffic Level of Service

Based on existing counts, traffic operations at the existing SW 108th Avenue/SW Herman Road intersection are adequate at LOS B during the weekday a.m. peak hour and meet the governing agency standards. A more detailed LOS summary is provided in Table 4. *Appendix "C" also includes the level-of-service worksheets for the existing traffic condition.*

Year 2016 Total Traffic Level Of Service

The total traffic conditions analysis reflects the forecast traffic conditions with the proposed site development and site accesses in place. As shown in Table 4, the proposed site access to SW 108th Avenue as well as the SW 108th Avenue/SW Herman Road intersection are forecast to operate at acceptable levels during the weekday a.m. peak hour, at LOS A and LOS C, respectively. *Appendix "D" contains the year 2016 total traffic level-of-service worksheets. A*lso, as shown in Table 4, operations for both the critical eastbound stop-controlled approach from the site access and the shared left-through lane on northbound approach both operate acceptably.

Table 4: Weekday AM Peak Hour Traffic Operations Results

Intersection	Existing Conditions			Total Traffic Conditions		
	LOS	V/C	Delay (sec)	LOS	V/C	Delay (sec)
SW 108th Ave/SW Herman Rd	B	0.43	19.8	C	0.46	20.6
South Site Access to SW 108th Ave: *Critical eastbound approach*	-	-	-	A	0.02	8.9
Minor northbound approach (left-through)	-	-	-	A	0.03	1.7

Vehicle Queuing Conditions

A 95th percentile vehicle queuing analysis was completed for the weekday a.m. peak hour at both study intersections along SW 108th Avenue. The intersection of SW 108th Avenue/SW Herman Road was analyzed under both existing and total traffic conditions, while the southern site access was only analyzed for total traffic conditions with the site development in place. Tables 5 and 6 summarize the queuing analysis for both intersections. All lengths are rounded to the nearest 25 feet. *Appendices "C" and "D" also contain the respective existing year and year 2016 total traffic queuing worksheets.*

Table 5: Weekday AM Peak Hour Vehicle Queuing Results (SW 108th Avenue/SW Herman Road)

	Southbound		Eastbound		Westbound
	Left (ft)	Right (ft)	Left (ft)	Thru (ft)	Shared Thru-Right (ft)
Available lane storage	150	150	100	Continuous	Continuous
Existing traffic conditions *Is available storage adequate?*	50 *Yes*	<25 *Yes*	<25 *Yes*	325 *Yes*	300 *Yes*
Total traffic conditions *Is available storage adequate?*	50 *Yes*	25 *Yes*	25 *Yes*	325 *Yes*	350 *Yes*

Table 6: Weekday AM Peak Hour Vehicle Queuing Results (South Site Access to SW 108th Avenue)

	Northbound Shared Left-Through (ft)	Eastbound Shared Left-Right (ft)
Available lane storage	300*	>50 Proposed
Total traffic conditions *Is available storage adequate?*	<25 *Yes*	<25 *Yes*

* Distance shown reflects available storage distance from location of south site access down to adjacent signalized intersection at SW 108th Avenue/SW Herman Road.

As shown in Tables 5 and 6, the 95th percentile vehicle queues estimated under existing and total traffic conditions will not exceed the available storage length for each approach summarized.

Findings

As noted in the prior traffic analysis letter prepared for the Leveton project, a northbound left turn lane was considered at the proposed south site access to SW 108th Avenue in order to separate vehicles turning left into the site from through traffic. In light of the operational and vehicle queuing analyses presented herein, an exclusive northbound left-turn lane is not needed into the proposed site access from SW 108^{th} Avenue as projected traffic demand will not result in any excessive vehicle queues or delays at the subject intersections under current lane configurations and lane striping. The proposed southern site access is located sufficiently far enough from the adjacent signalized SW 108^{th} Avenue/SW Herman Road intersection, providing 300 feet of storage distance for any northbound queuing potential at the south site access. In addition, southbound volumes approaching the SW 108^{th} Avenue/SW Herman Road intersection are also not forecasted to create long queues to block the northbound left turn movement into the south site access.

Recommendations

The results of this assessment indicate that the proposed industrial office building can be constructed while maintaining acceptable levels of service on the surrounding transportation system. Specific to this analysis letter, a northbound left turn lane on SW 108^{th} Avenue in the location of the south site access is not needed or recommended. The existing lane striping can remain. Furthermore, the availability of a second northerly site access off of SW 108^{th} Avenue provides an alternative entrance for northbound vehicles if traffic conditions make the left turn at the southern access less desirable in a given instant.

We trust this letter adequately addresses the traffic impacts associated with the proposed warehouse development in Tualatin, Oregon. Please contact us if you have any questions or comments regarding the contents of this report or the analysis performed.

Sincerely,
KITTELSON & ASSOCIATES, INC.

Brian J. Dunn, P.E.
Associate Engineer

Molly McCormick
Transportation Analyst

References

1. Transportation Research Board. *Highway Capacity Manual*. 2010.
2. Institute of Transportation Engineers. *Trip Generation, 9^{th} Edition*. 2011.

Appendices

A. Description of Level of Service Methods and Criteria
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C. Year 2016 Existing Conditions Level of Service Worksheets
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Appendix A
Description of Level of Service Methods and Criteria

APPENDIX A LEVEL-OF-SERVICE CONCEPT

Level of service (LOS) is a concept developed to quantify the degree of comfort (including such elements as travel time, number of stops, total amount of stopped delay, and impediments caused by other vehicles) afforded to drivers as they travel through an intersection or roadway segment. Six grades are used to denote the various level of service from “A” to “F”.1

SIGNALIZED INTERSECTIONS

The six level-of-service grades are described qualitatively for signalized intersections in Table A1. Additionally, Table A2 identifies the relationship between level of service and average control delay per vehicle. Control delay is defined to include initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Using this definition, Level of Service “D” is generally considered to represent the minimum acceptable design standard.

Table A-1 Level-of-Service Definitions (Signalized Intersections)[1]

Level of Service	Average Delay per Vehicle
A	Very low average control delay, less than 10 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
B	Average control delay is greater than 10 seconds per vehicle and less than or equal to 20 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for a level of service A, causing higher levels of average delay.
C	Average control delay is greater than 20 seconds per vehicle and less than or equal to 35 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
D	Average control delay is greater than 35 seconds per vehicle and less than or equal to 55 seconds per vehicle. The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle length, or high volume/capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	Average control delay is greater than 55 seconds per vehicle and less than or equal to 80 seconds per vehicle. This is usually considered to be the limit of acceptable delay. These high delay values generally (but not always) indicate poor progression, long cycle lengths, and high volume/capacity ratios. Individual cycle failures are frequent occurrences.
F	Average control delay is in excess of 80 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation. It may also occur at high volume/capacity ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also contribute to such high delay values.

[1] Most of the material in this appendix is adapted from the Transportation Research Board, Highway Capacity Manual, (2000).

Table A2 Level-of-Service Criteria for Signalized Intersections

Level of Service	Average Control Delay per Vehicle (Seconds)
A	<10.0
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

UNSIGNALIZED INTERSECTIONS

Unsignalized intersections include two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections. The 2000 Highway Capacity Manual (HCM) provides models for estimating control delay at both TWSC and AWSC intersections. A qualitative description of the various service levels associated with an unsignalized intersection is presented in Table A3. A quantitative definition of level of service for unsignalized intersections is presented in Table A4. Using this definition, Level of Service "E" is generally considered to represent the minimum acceptable design standard.

Table A3 Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Delay per Vehicle to Minor Street
A	• Nearly all drivers find freedom of operation. • Very seldom is there more than one vehicle in queue.
B	• Some drivers begin to consider the delay an inconvenience. • Occasionally there is more than one vehicle in queue.
C	• Many times there is more than one vehicle in queue. • Most drivers feel restricted, but not objectionably so.
D	• Often there is more than one vehicle in queue. • Drivers feel quite restricted.
E	• Represents a condition in which the demand is near or equal to the probable maximum number of vehicles that can be accommodated by the movement. • There is almost always more than one vehicle in queue. • Drivers find the delays approaching intolerable levels.
F	• Forced flow. • Represents an intersection failure condition that is caused by geometric and/or operational constraints external to the intersection.

Table A4 Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay per Vehicle (Seconds)
A	<10.0
B	>10.0 and ≤ 15.0
C	>15.0 and ≤ 25.0
D	>25.0 and ≤ 35.0
E	>35.0 and ≤ 50.0
F	>50.0

It should be noted that the level-of-service criteria for unsignalized intersections are somewhat different than the criteria used for signalized intersections. The primary reason for this difference is that drivers expect different levels of performance from different kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an unsignalized intersection. Additionally, there are a number of driver behavior considerations that combine to make delays at signalized intersections less galling than at unsignalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, while drivers on the minor street approaches to TWSC intersections must remain attentive to the task of identifying acceptable gaps and vehicle conflicts. Also, there is often much more variability in the amount of delay experienced by individual drivers at unsignalized intersections than signalized intersections. For these reasons, it is considered that the control delay threshold for any given level of service is less for an unsignalized intersection than for a signalized intersection. While overall intersection level of service is calculated for AWSC intersections, level of service is only calculated for the minor approaches and the major street left turn movements at TWSC intersections. No delay is assumed to the major street through movements. For TWSC intersections, the overall intersection level of service remains undefined: level of service is only calculated for each minor street lane.

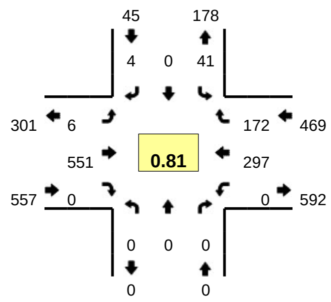
In the performance evaluation of TWSC intersections, it is important to consider other measures of effectiveness (MOEs) in addition to delay, such as v/c ratios for individual movements, average queue lengths, and 95th-percentile queue lengths. By focusing on a single MOE for the worst movement only, such as delay for the minor-street left turn, users may make inappropriate traffic control decisions. The potential for making such inappropriate decisions is likely to be particularly pronounced when the HCM level-of-service thresholds are adopted as legal standards, as is the case in many public agencies.

Appendix B

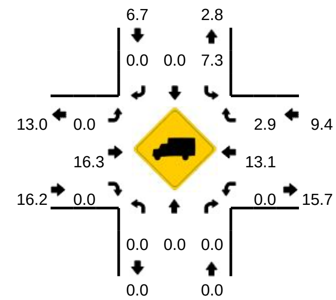
Traffic Count Data

Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

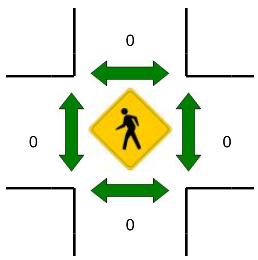
LOCATION: SW 108th Ave -- Herman Rd | **QC JOB #:** 13758101
CITY/STATE: Tualatin, OR | **DATE:** Tue, Mar 29 2016

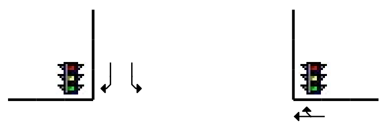


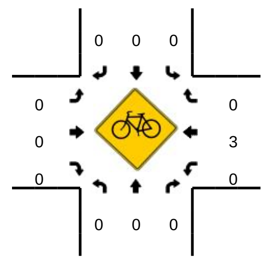
Peak-Hour: 7:20 AM -- 8:20 AM
Peak 15-Min: 7:40 AM -- 7:55 AM

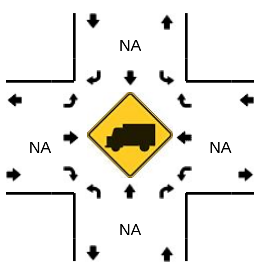


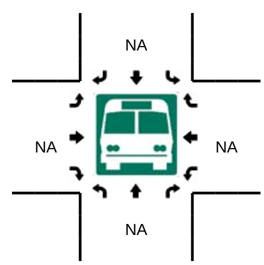
Quality Counts
TRANSPORTATION DATA COLLECTION SERVICES











5-Min Count Period Beginning At	SW 108th Ave (Northbound)				SW 108th Ave (Southbound)				Herman Rd (Eastbound)				Herman Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	0	0	0	0	0	0	0	1	28	0	0	0	40	5	0	74	
7:05 AM	0	0	0	0	2	0	0	0	0	37	0	0	0	28	8	0	75	
7:10 AM	0	0	0	0	3	0	0	0	0	33	0	0	0	13	10	0	59	
7:15 AM	0	0	0	0	6	0	1	0	0	30	0	0	0	17	5	0	59	
7:20 AM	0	0	0	0	4	0	0	0	0	35	0	0	0	26	8	0	73	
7:25 AM	0	0	0	0	7	0	0	0	0	41	0	0	0	16	14	0	78	
7:30 AM	0	0	0	0	3	0	1	0	1	44	0	0	0	28	15	0	92	
7:35 AM	0	0	0	0	5	0	0	0	0	42	0	0	0	17	12	0	76	
7:40 AM	0	0	0	0	1	0	0	0	1	52	0	0	0	30	15	0	99	
7:45 AM	0	0	0	0	2	0	0	0	0	68	0	0	0	32	13	0	115	
7:50 AM	0	0	0	0	5	0	1	0	0	63	0	0	0	30	17	0	116	
7:55 AM	0	0	0	0	4	0	0	0	1	51	0	0	0	21	18	0	95	1011
8:00 AM	0	0	0	0	5	0	1	0	1	48	0	0	0	31	11	0	97	1034
8:05 AM	0	0	0	0	2	0	0	0	1	43	0	0	0	16	20	0	82	1041
8:10 AM	0	0	0	0	2	0	0	0	0	33	0	0	0	26	20	0	81	1063
8:15 AM	0	0	0	0	1	0	1	0	1	31	0	0	0	24	9	0	67	1071
8:20 AM	0	0	0	0	1	0	2	0	0	29	0	0	0	20	18	0	70	1068
8:25 AM	0	0	0	0	2	0	1	0	0	30	0	0	0	20	11	0	64	1054
8:30 AM	0	0	0	0	3	0	0	0	0	28	0	0	0	19	7	0	57	1019
8:35 AM	0	0	0	0	1	0	2	0	0	17	0	0	0	17	15	0	52	995
8:40 AM	0	0	0	0	2	0	0	0	0	24	0	0	0	23	8	0	57	953
8:45 AM	0	0	0	0	2	0	0	0	0	18	0	0	0	14	17	0	51	889
8:50 AM	0	0	0	0	3	0	2	0	0	18	0	0	0	17	13	0	53	826
8:55 AM	0	0	0	0	5	0	0	0	1	15	0	0	0	10	15	0	46	777

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	32	0	4	0	4	732	0	0	0	368	180	0	1320
Heavy Trucks	0	0	0		0	0	0		0	132	0		0	48	8		188
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 3/30/2016 11:06 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Appendix C
Year 2016 Existing Conditions
Level of Service Worksheets

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	6	551	172	297	41	4
Future Volume (vph)	6	551	172	297	41	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.4	5.4	5.4		6.5	6.5
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.91		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1863	1703		1770	1583
Flt Permitted	0.31	1.00	1.00		0.95	1.00
Satd. Flow (perm)	583	1863	1703		1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	599	187	323	45	4
RTOR Reduction (vph)	0	0	61	0	0	3
Lane Group Flow (vph)	7	599	449	0	45	1
Turn Type	pm+pt	NA	NA		Prot	Prot
Protected Phases	5	2	6		4	4
Permitted Phases	2					
Actuated Green, G (s)	60.4	60.4	45.0		30.0	30.0
Effective Green, g (s)	60.4	60.4	45.0		30.0	30.0
Actuated g/C Ratio	0.59	0.59	0.44		0.29	0.29
Clearance Time (s)	5.4	5.4	5.4		6.5	6.5
Lane Grp Cap (vph)	460	1099	749		519	464
v/s Ratio Prot	0.00	c0.32	c0.26		c0.03	0.00
v/s Ratio Perm	0.01					
v/c Ratio	0.02	0.55	0.60		0.09	0.00
Uniform Delay, d1	17.2	12.7	21.8		26.2	25.6
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	1.9	3.5		0.3	0.0
Delay (s)	17.3	14.6	25.3		26.5	25.6
Level of Service	B	B	C		C	C
Approach Delay (s)		14.6	25.3		26.5	
Approach LOS		B	C		C	

Intersection Summary			
HCM 2000 Control Delay	19.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	102.3	Sum of lost time (s)	17.3
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	7	599	510	45	4
v/c Ratio	0.02	0.55	0.63	0.09	0.01
Control Delay	9.0	15.0	21.2	26.9	16.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	9.0	15.0	21.2	26.9	16.5
Queue Length 50th (ft)	2	220	198	21	0
Queue Length 95th (ft)	8	316	310	48	8
Internal Link Dist (ft)		792	1006	784	
Turn Bay Length (ft)				135	
Base Capacity (vph)	460	1099	810	519	467
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.02	0.55	0.63	0.09	0.01

Intersection Summary

Appendix D

Year 2016 Total Conditions

Level of Service Worksheets

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	26	551	198	297	47	9
Future Volume (vph)	26	551	198	297	47	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.4	5.4	5.4		6.5	6.5
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.92		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1863	1712		1770	1583
Flt Permitted	0.29	1.00	1.00		0.95	1.00
Satd. Flow (perm)	538	1863	1712		1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	28	599	215	323	51	10
RTOR Reduction (vph)	0	0	53	0	0	7
Lane Group Flow (vph)	28	599	485	0	51	3
Turn Type	pm+pt	NA	NA		Prot	Prot
Protected Phases	5	2	6		4	4
Permitted Phases	2					
Actuated Green, G (s)	60.4	60.4	45.0		30.0	30.0
Effective Green, g (s)	60.4	60.4	45.0		30.0	30.0
Actuated g/C Ratio	0.59	0.59	0.44		0.29	0.29
Clearance Time (s)	5.4	5.4	5.4		6.5	6.5
Lane Grp Cap (vph)	438	1099	753		519	464
v/s Ratio Prot	0.01	c0.32	c0.28		c0.03	0.00
v/s Ratio Perm	0.03					
v/c Ratio	0.06	0.55	0.64		0.10	0.01
Uniform Delay, d1	18.8	12.7	22.4		26.3	25.6
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.3	1.9	4.2		0.4	0.0
Delay (s)	19.0	14.6	26.6		26.7	25.6
Level of Service	B	B	C		C	C
Approach Delay (s)		14.8	26.6		26.5	
Approach LOS		B	C		C	

Intersection Summary			
HCM 2000 Control Delay	20.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	102.3	Sum of lost time (s)	17.3
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	28	599	538	51	10
v/c Ratio	0.06	0.55	0.67	0.10	0.02
Control Delay	9.7	15.0	23.3	27.1	13.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	9.7	15.0	23.3	27.1	13.8
Queue Length 50th (ft)	7	220	225	24	0
Queue Length 95th (ft)	19	316	347	53	13
Internal Link Dist (ft)		792	1006	287	
Turn Bay Length (ft)				135	
Base Capacity (vph)	438	1099	805	519	471
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.06	0.55	0.67	0.10	0.02

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	11	46	178	45	12
Future Volume (Veh/h)	2	11	46	178	45	12
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	12	50	193	49	13
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				367		
pX, platoon unblocked						
vC, conflicting volume	348	56	62			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	348	56	62			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	97			
cM capacity (veh/h)	628	1011	1541			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	14	243	62
Volume Left	2	50	0
Volume Right	12	0	13
cSH	930	1541	1700
Volume to Capacity	0.02	0.03	0.04
Queue Length 95th (ft)	1	3	0
Control Delay (s)	8.9	1.7	0.0
Lane LOS	A	A	
Approach Delay (s)	8.9	1.7	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	28.6%	ICU Level of Service	A
Analysis Period (min)	15		