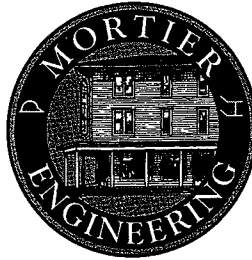


# MORTIER ENGINEERING, P.C.

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STRUCTURAL  
BUILDING DESIGN • FIRE PROTECTION  
CODE CONSULTANT • PLAN CHECKING  
CONSTRUCTION INSPECTION

December 10, 2007

Turnbo Construction  
34132 Del Monte Ave.  
Eugene, OR 97405

RE: 25159 E. Hunter Rd., Veneta, OR; Turnbo Tentative Partition, Stormwater System Study, WO#18751-TJM

As requested, a Stormwater System Study has been performed at the above noted address for the proposed unnamed tentative partition.

The soil at this site is 128B Veneta according to "The Soil Survey of Lane County Area, Oregon"; issued Sept. 1987. This classification appears to be consistent with the soil observed in an approximately 4' deep hole on the site. According to the "Survey" 128B soil has a percolation rate of 0.06-0.2 in/hr at typical drywell depths. Based on this information it was determined that a drywell would not be suitable for this site. The winter high water table in this area is estimated to be 30+ ft based on records from the Oregon Water Resources Department web site. There are no special site features on this site and it is not in the 100 year flood plain. An existing ditch along Hunter Road is approximately 8"-10" deep and serves as the existing stormwater collection system for the existing parcel.

Future plans for the site include one single family dwelling on each of the lots. Each proposed dwelling is to be 1000-1200 sf. A joint use access driveway will serve lots 3 and 4. It is proposed to install vegetated ditches along each side of the access driveway to serve the driveway and each of the dwellings. Stormwater from each dwelling will be collected in gutters and piped to the ditch. The ditch will provide water transport during small storms and water storage during large storms. A 2 inch diameter pipe at the end of the ditch restricts water flowing into the roadside ditch to less than the pre-development flows. Storage capacity of the driveway ditches was based on a 10 year - 5 minute storm. During larger storms overflow would back up on the lawns.

Thank you for this opportunity to be of service. If you have questions regarding this report, please contact me at 484-9080.

Sincerely,



Expires: 12-31-8  
Bradley R. Myers, P.E.  
TJM/tjm



# CALCULATIONS

STRUCTURAL  
BUILDING DESIGN • FIRE PROTECTION  
CODE CONSULTANT • PLAN CHECKING  
CONSTRUCTION INSPECTION

CLIENT TURNBO  
SHEET NO. 2 OF 8  
CALCULATED BY TJM DATE 11/30/07  
CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_  
W.O.# 18751

## EXISTING CONDITION DRAINAGE

$$\text{EXISTING HOUSE} = (40\text{ft})(27\text{ft}) = 1080\text{ft}^2 = 0.025 \text{ acres}$$

$$\text{ENTIRE LOT} = 0.58 \text{ acres}$$

$$\text{PERVIOUS SURFACE} = 0.555 \text{ acres}$$

$$\text{PAVEMENT } \& \text{ ROOF} \quad C = 0.90$$

$$\text{LAWNS} \quad C = 0.17$$

$$10 \text{ yr STORM} \quad C_p = 1.0$$

CONDITION 1: TIME OF CONCENTRATION OCCURS WHEN WATER FROM THE EXISTING HOUSE REACHES THE SWALE ADJACENT TO ROAD

$$\text{INITIAL ASSUMPTION } T_c = 10 \text{ min} \quad i = 2.0 \text{ in} \quad L = 113 \text{ ft} \quad n = 0.080 \quad S = \frac{1.6\text{ft}}{113\text{ft}} = 0.01$$

$$T_{\text{osp}} = \frac{0.93(L^{0.6} n^{0.6})}{(i^{0.4} S^{0.3})} = 11 \text{ min}$$

$$\text{LET } T_c = 11 \text{ min} \quad i = 1.9 \quad T_{\text{osp}} = 11 \text{ min} \quad \therefore \text{O.K.}$$

## CONDITION 2:

TIME OF CONCENTRATION FOR ENTIRE LOT  $L = 195 \text{ ft} \quad n = 0.080 \quad S = 0.01$

$$\text{LET } T_c = 20 \text{ min} \quad i = 1.4 \text{ in/hr} \quad T_{\text{osp}} = 17 \text{ min}$$

$$T_c = 16 \text{ min} \quad i = 1.6 \text{ in/hr} \quad T_{\text{osp}} = 16 \text{ min}$$

## FLOW AT CONDITION 1:

$$A_R = 0.025 \text{ acres} \quad A_L = 0.280$$

$$A_R + A_L = 0.321$$

$$Q = C_p C_i A = 0.13 \text{ cfs}$$

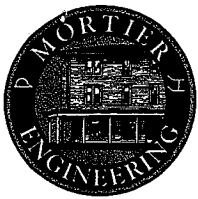
$$C = \frac{C_R A_R + C_L A_L}{A_R + A_L} = 0.218$$

## FLOW AT CONDITION 2:

$$A_R = 0.025 \text{ acres} \quad A_L = 0.555 \text{ acres} \quad A_T = 0.58 \text{ acres}$$

$$C = 0.201 \quad Q = 0.19 \text{ cfs} \leftarrow \text{CONDITION 2 CONTROLS}$$

EXISTING PRE-DEVELOPMENT DRAINAGE FROM SITE  $Q = 0.19 \text{ cfs}$



# CALCULATIONS

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CONSTRUCTION INSPECTION

CLIENT TURNBO  
SHEET NO. 3 OF 8  
CALCULATED BY TJM DATE 11/30/07  
CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_  
W.O.# 18751

## PROPOSED AREAS AFTER DEVELOPMENT

$$\text{JOINT ACCESS RD} = (13.5\text{ft})(150\text{ft}) = 2025\text{ft}^2$$

$$\text{HOUSE ROOFS} = (4)(1.25)(1200\text{ft}^2) = 6000\text{ft}^2$$

$$\text{DRIVEWAYS OFF J.A.R.} = 4(20\text{ft})(30\text{ft}) = 2400\text{ft}^2$$

$$10,425\text{ft}^2 \text{ NEW PERVIOUS SURFACE}$$

DESIGN OPTION 1: SHALLOW TRENCH EACH SIDE OF JOINT ACCESS RD.

1/2 OF AREA ABOVE GOES TO EACH SIDE OF RD.

$$C_{PR} = 0.90 \text{ FOR PAVEMENT AND ROOF}$$

$$C_L = 0.17 \text{ FOR LAWNS}$$

$$C_T = \frac{C_{PR} A_{PR} + C_L A_L}{A_T} = 0.47$$

$$A_{PR} = 10,425\text{ft}^2 = 0.24 \text{ acres}$$

$$A_L = 0.58 - 0.24 = 0.34 \text{ acres}$$

$$A_T = 0.58 \text{ acres}$$

USE TIME OF CONCENTRATION TO FIND DESIGN DENSITY FOR SUBDIVISION

$$L = 195\text{ft} \quad n = 0.080 \quad S = 0.01$$

$$\text{TRY } T_c = 10\text{min} \quad i = 2.0\text{in} \quad T_{\text{scf}} = 15\text{min}$$

$$T_c = 15\text{min} \quad i = 1.65\text{in} \quad T_{\text{scf}} = 16\text{min}$$

$$T_c = 16\text{min} \quad i = 1.6\text{in} \quad T_{\text{scf}} = 16\text{min}$$

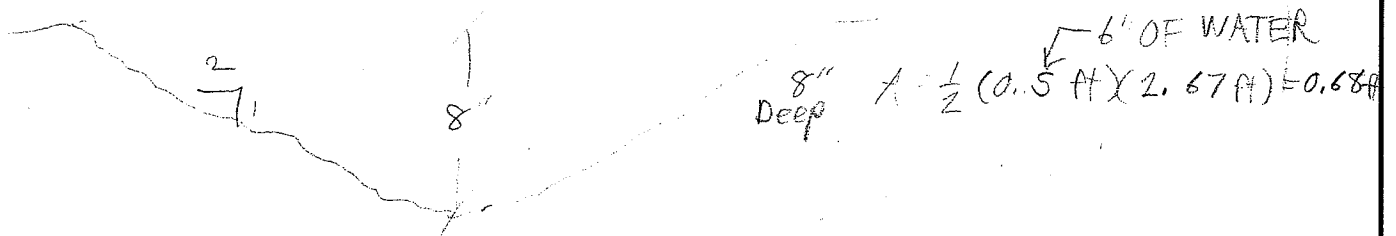
← CONTROLLING INTENSITY FOR ENTIRE SUBDIVISION

TIME OF TRAVEL FOR SHALLOW CONCENTRATED FLOW; LAWNS

FROM ODOT MANUAL PG. 7-F-7 FIG. 1, 1% SLOPE  $V = 0.8\text{ft/s}$   $L = 110\text{ft}$

$$T_{\text{scf}} = \frac{L}{60V} = 2\text{min} \quad \therefore \text{USE } T_c = 5\text{min} \quad i = 2.5\text{in/hr}$$

W/ A  $T_c = 5\text{min}$  - 38ft OF LAWN ALSO DRAINS TO DITCH





# CALCULATIONS

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CONSTRUCTION INSPECTION

CLIENT TURNBO  
SHEET NO. 4 OF 8  
CALCULATED BY TJM DATE 12/3/07  
CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_  
W.O.# 18751

## FALL REQUIRED IN DITCH

DITCH LENGTH = 110 ft

MIN SLOPE 0.006 ft/ft = 0.66 ft ~ 8"

GRADE ADJACENT TO DITCH ALONG HUNTER RD = 425 ft

GRADE IN DITCH ALONG HUNTER RD = 424.34 ft

GRADE REQ'D AT HEAD OF DITCH = 424.34 ft + 0.66 ft + 0.66 ft = 425.66 ft

ACTUAL GRADE 425.7 ft ∴ O.K.

## LIMITING PIPE FOR END OF DRIVEWAY DITCH

MAX FLOW ROADSIDE DITCH = 0.19 cfs

FLOW FROM 38' OF LAWN =

$$A = (38') \times (140') = 5320 \text{ ft}^2 = 0.122 \text{ acres}$$

$$Q = C_p C_i A = (1.0)(0.17)(2.5 \text{ in/hr})(0.122 \text{ acres}) = 0.05 \text{ cfs}$$

ALLOWED OUTFLOW AT DITCHES = 0.19 cfs - 0.05 cfs = 0.14 cfs

TAKE 1/2 TO EACH SIDE = 0.07 cfs

## **FULL FLOW IN A PIPE**

|                     |   |
|---------------------|---|
| Pipe Size           | 2 in                                    |
| Radius - r          | 0.083333333 ft                          |
| Wet Area - A        | 0.022 ft                                |
| Wet Perim - P       | 0.524 ft                                |
| Hydr. Rad. - R      | 0.042                                   |
| Roughness - e       | 5.0E-06 ft                              |
| Relat. Roughness    | 3.0E-05 See Moody Diagram to Determin f |
| Friction Factor - f | 0.025                                   |
| Slope - S           | 6.00E-03 ft/ft                          |
| Gravit. Const. - g  | 32.2 ft/s <sup>2</sup>                  |
| Velocity - V        | 1.605 ft/s                              |
| Reynolds No. - Re   | 2.23E+04 Verify from Moody Diagram      |
| Flow Rate - Q       | 0.035 cfs                               |

Viscosity taken as  $1.2 \times 10^{-5}$  for water at 60°F



# CALCULATIONS

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CONSTRUCTION INSPECTION

CLIENT TURNBO  
SHEET NO. 5 OF 8  
CALCULATED BY TJM DATE 12/3/07  
CHECKED BY \_\_\_\_\_ DATE \_\_\_\_\_  
W.O.# 18751

## DITCH FLOW AT DRIVEWAY CULVERT EACH SIDE

$$A = \frac{0.24}{2} = 0.12 \text{ acres}$$

w/ 5 min Time of Concentration  $t_c = 2.5 \text{ in/hr}$

$$Q = (0.9)(2.5 \text{ in/hr})(0.12 \text{ acres}) = 0.27 \text{ cfs} \therefore$$

CAN NOT ACCOMODATE THIS MUCH FLOW AT ROADSIDE DITCH SINCE IT WOULD EXCEED PRE-DEVELOPMENT FLOWS

USE DITCH AS STORAGE AREA

$$\text{STORAGE VOLUME REQ'D} = (0.27 \text{ cfs})(60 \text{ s/min})(5 \text{ min}) = 81 \text{ ft}^3$$

$$120 \text{ ft OF } 8" \text{ DITCH W/ } 6" \text{ OF WATER} = V = 82 \text{ ft}^3 \therefore \text{O.K.}$$

## CULVERT PIPE SIZE

ONLY ONE MORE PARCEL DRAINS UPSTREAM OF DRIVEWAY CULVERT.  
DRIVEWAY CULVERT TRANSFERS WATER FROM LOTS 1 AND 4 ONLY.

### FULL FLOW IN A PIPE

|                     |   |
|---------------------|---|
| Pipe Size           | 6 in                                    |
| Radius - r          | 0.25 ft                                 |
| Wet Area - A        | 0.196 ft                                |
| Wet Perim - P       | 1.571 ft                                |
| Hydr. Rad. - R      | 0.125                                   |
| Roughness - e       | 5.0E-03 ft CONCRETE PIPE                |
| Relat. Roughness    | 1.0E-02 See Moody Diagram to Determin f |
| Friction Factor - f | 0.05                                    |
| Slope - S           | 6.00E-03 ft/ft                          |
| Gravit. Const. - g  | 32.2 ft/s <sup>2</sup>                  |
| Velocity - V        | 1.966 ft/s                              |
| Reynolds No. - Re   | 8.19E+04 Verify f from Moody Diagram    |
| Flow Rate - Q       | 0.386 cfs                               |

Viscosity taken as  $1.2 \times 10^{-5}$  for water at 60°F

$$\text{EXPECTED FLOW} = 1.5(0.19 \text{ cfs}) = 0.29 \text{ cfs} < Q = 0.386 \text{ cfs Allowed}$$

TABLE 1: INDEX TO RAINFALL INTENSITY-DURATION-RECURRENCE INTERVAL CURVES

| City        | Zone | City    | Zone |
|-------------|------|---------|------|
| -T-         |      | -Y-     |      |
| The Dalles  | 11   | Yachats | 2    |
| Tidewater   | 4    | Yamhill | 8    |
| Tillamook   | 2    |         |      |
| Tiller      | 6    |         |      |
| Toledo      | 2    |         |      |
| -U-         |      |         |      |
| Union       | 13   |         |      |
| Union Creek | 3    |         |      |
| Umatilla    | 13   |         |      |
| -V-         |      |         |      |
| Vale        | 13   |         |      |
| Veneta      | 5    |         |      |
| Vernonia    | 8    |         |      |
| Vida        | 5    |         |      |
| -W-         |      |         |      |
| Wagontire   | 13   |         |      |
| Waldport    | 2    |         |      |
| Wallowa     | 10   |         |      |
| Willamina   | 8    |         |      |
| Wilsonville | 7    |         |      |
| Woodburn    | 7    |         |      |

