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MEMORANDUM

PROJECT NUMBER: 2080143.00 DATE: May 8, 2008
PROJECT NAME: Sherwood Industrial Park –Pad 'A'

TO: File
FROM: rlf

SUBJECT: Sherwood Industrial Park – Stormwater Update

The Sherwood Industrial Park regional Stormwater facility was designed per the Water Quality, Detention and Pipe Sizing calculations revised February 28, 2006 (see attached). The original calculations were sized per City of Sherwood and Clean Water Services requirements. The water quality event was the "summer" storm or the first 0.36" falling in a 4 hour period. Detention was sized to match existing runoff rates for storms up to the 25-yr event.

Attached also is a Stormwater Allocations to Existing Pond Table. The purpose of the table is to track original assumptions in site and impervious area with proposed conditions as the park is developed to ensure original assumptions in areas are being met. If the areas are being met then the Stormwater Pond should function as designed and constructed. The following documents are included with the Pad A stormwater calculations:

-Memorandum
-Stormwater Allocations Worksheet
-Pipe Sizing – Pad A
-Sub-Basin Areas
-Basin Map (1"=50' scale)
-Sherwood Industrial Park Water Quality, Detention and Pipe Sizing Calculations

Sherwood Industrial Park

Stormwater Allocations to Existing Pond

25yr Storm Event

Project:2080143.00

4/27/2009

Description	Original Area (ac)	Original Impervious Area (ac)	Original Pervious Area (ac)	Orginal WQ Volume (cf)	Proposed Area (ac)	Proposed Impervious Area (ac)	Proposed Pervious Area (ac)	Proposed WQ Volume (cfs)	Net Difference WQ (cf)	Net Difference Imper. Area (cf)
PAD 'A'	7.56	6.05	1.51	7906	6.15	5.10	1.06	6665	-1241	-0.95
PAD 'B'	4.06	3.25	0.81	4247						
PAD 'C'	3.35	2.68	0.67	3502						
PAD 'D'	3.61	2.75	0.86	3594						
PAD 'E'	4.02	3.13	0.89	4090						
PAD 'F'	4.15	2.25	1.90	2940						
PAD 'G'	2.53	1.95	0.58	2548						
ROAD	2.34	2.11	0.23	2757	2.34	2.11	0.23	2757	0	0.00
POND	0.94	0.70	0.24	1	0.94	0.70	0.24	1	0	0.00
TOTAL	**32.56**	**24.87**	**7.69**	**31,586**						
				NET=	-1.41	-0.95	-0.45	-1241	-1241.36	-0.95

Pipe Sizing Calculation

Based on SCS flow inputs
(Flows calculated in "Hydrocad")

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Project: Sherwood Industrial Park - Pad A
By: rlf
Date: 4/27/2009
Job: 2080143
Storm event: CWS 25-yr (3.90")
Mannings n= 0.013

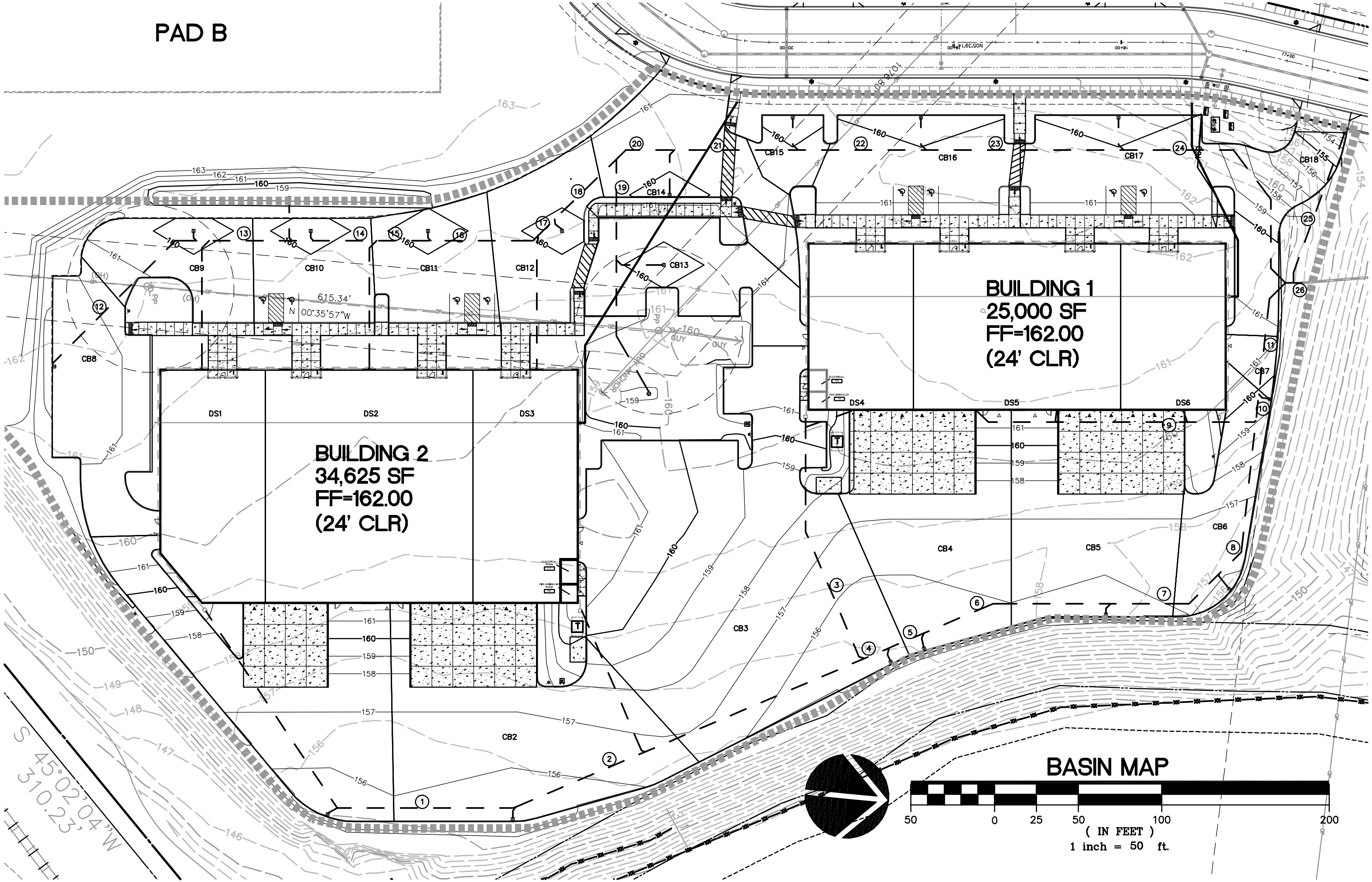
Link #	Storm Input Descriptions	Incremental Flow (cfs)	Total Flow (cfs)	Pipe Slope (%)	Pipe Diameter (inches)	Pipe Capacity (cfs)	Pipe Velocity (fps)	
Branch 1								
1	CB1	0.286	0.286	0.5	6	0.40	2.02	OK
2	CB2	0.348	0.634	0.5	8	0.85	2.45	OK
3	DS4	0.126	0.126	1	6	0.56	2.85	OK
4	2+3	0.000	0.760	0.5	10	1.55	2.84	OK
5	CB3	0.594	1.354	0.5	10	1.55	2.84	OK
6	CB4	0.248	1.602	0.5	12	2.52	3.20	OK
7	CB5	0.257	1.858	0.5	12	2.52	3.20	OK
8	CB6	0.092	1.950	0.5	12	2.52	3.20	OK
9	DS5, DS6	0.376	0.376	1	8	1.21	3.46	OK
10	8+9	0.000	2.326	1	12	3.56	4.53	OK
11	CB7	0.017	2.343	1	12	3.56	4.53	OK
Branch 2								
12	CB8	0.154	0.154	0.5	6	0.40	2.02	OK
13	CB9, DS1	0.271	0.425	0.5	8	0.85	2.45	OK
14	CB10+PAD B	0.387	0.812	0.5	10	1.55	2.84	OK
15	DS2	0.352	1.164	0.5	10	1.55	2.84	OK
16	CB11	0.119	1.282	0.5	12	2.52	3.20	OK
17	DS3	0.177	1.459	0.5	12	2.52	3.20	OK
18	CB12	0.131	1.590	0.5	12	2.52	3.20	OK
19	CB13+AREA DRAIN	0.191	0.191	0.5	6	0.40	2.02	OK
20	18+19	0.000	1.781	0.5	12	2.52	3.20	OK
21	CB14	0.141	1.923	0.5	12	2.52	3.20	OK
22	CB15	0.033	1.956	0.5	12	2.52	3.20	OK
23	CB16	0.169	2.125	0.5	12	2.52	3.20	OK
24	CB17	0.160	2.286	1	12	3.56	4.53	OK
25	CB18	0.102	0.102	1	6	0.56	2.85	OK
26	11+24+25	0.000	4.731	3	12	6.16	7.85	OK

Sherwood Industrial Park - Pad A
Sub-Basin Areas

	Basins	Areas (SF)	Areas (ac)	Runoff (cfs)
Branch 1	CB1	13964	0.321	0.286
	CB2	17036	0.391	0.348
	DS4	6150	0.141	0.126
	CB3	29034	0.667	0.594
	CB4	12123	0.278	0.248
	CB5	12547	0.288	0.257
	CB6	4488	0.103	0.092
	DS5	12235	0.281	0.250
	DS6	6150	0.141	0.126
	CB7	812	0.019	0.017
Branch 2	CB8	7549	0.173	0.154
	CB9	4950	0.114	0.101
	DS1	8282	0.190	0.169
	CB10	5439	0.125	0.111
	PAD B	28000	0.643	0.276
	DS2	17195	0.395	0.352
	CB11	5807	0.133	0.119
	DS3	8644	0.198	0.177
	CB12	6407	0.147	0.131
	CB13	6311	0.145	0.129
	AREA DRAIN	4800	0.110	0.062
	CB14	6910	0.159	0.141
	CB15	1634	0.038	0.033
	CB16	8280	0.190	0.169
	CB17	7832	0.180	0.160
	CB18	4994	0.115	0.102

Runoff per impervious acreage, 5-min Tc
0.890912388 cfs/ac

AREA DRAIN and PAD B were calculated using a CN of 82.
All others were impervious CN of 98.


PAD B
BUILDING 1
25,000 SF
FF=162.00
(24' CLR)
BUILDING 2
34,625 SF
FF=162.00
(24' CLR)
DS1
DS2
DS3
DS4
DS5
DS6
CB2
CB3
CB4
CB5
CB6
CB7
CB8
CB9
CB10
CB11
CB12
CB13
CB14
CB15
CB16
CB17
CB18
615.34'
N 00°35'57"W
S 45°02'04"W
310.23'
BASIN MAP
50 0 25 50 100 200
(IN FEET)
1 inch = 50 ft.

GROUP MACKENZIE

STORMWATER CALCULATIONS

Sherwood Industrial Park

Sherwood, Oregon

WATER QUALITY, DETENTION, & PIPE SIZING

REGISTERED PROFESSIONAL ENGINEER
18,178
OREGON
JULY 15, 1997
ROBERT L. RIENTHRESS JR.

EXPIRES: 12/31/05

PROJECT # 2040263.00

October 7, 2004
Revised 12–28–05
Revised 2-28-06

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-SCS Soils Map
-SCS Soils Hydrologic Group
-Off-site flows
-SCS projected flow rate
-Pipe sizing (off-site) flows
-Off-site basin map
-Friction loss in pipe between pond and control manhole

Project Narrative

The following report provides detailed stormwater information and calculations to fulfill a site development requirement to create water quality and detention for the proposed Sherwood Industrial Park development. The required detention will help prevent potential downstream flooding of Rock Creek. The purpose of the calculations is to show also that water quality meets the City of Sherwood and Clean Water Services requirements and can be accomplished for the proposed development. The developable portion of the proposed Sherwood Industrial Park is approximately 32-acres located south of Tualatin/Sherwood Road and west of Rock Creek. The site drains easterly to Rock Creek, which flows through the eastern undeveloped portion of the site. Phase one of the proposed development consists of one flex light industrial building with associated parking, drive isles and truck docks along with a propose public road to the pad. The Stormwater facilities have been designed to accommodate not only phase one, but also the full build out of the park.

Storm Water Detention

Flood storage detention is proposed to be located in a proposed pond designed to detain phase one and two of the proposed development (see attached plan). The existing run-off drainage area around Rock Creek was previously approved and constructed via a separate permit Corps and DSL permit. The proposed pond is located in an existing BPA easement.

The off-site area to the west of the site is proposed to be by-passed around the site and thus will not be routed through the water quality and detention pond. Calculations for by-passing off-site storm water will be provided at the time of phase two submittal.

It is proposed that a control structure will be constructed to meter flows out of the detention basin. Flows up to 25-yr storm event will be released at the pre-developed runoff rate. The control system has been designed to release at or below the existing 2, 10, and 25-year runoff rates. The flood storage will accumulate to the 145.74-ft level. An armored overflow has been designed in to the pond to provide maximum flow during major events exceeding the 25-year storm or if orifices become plugged. Access to the orifice structure will be provided for maintenance of the structure will be provided ultimately through Pad ‘G’.

The detention and routing calculations were accomplished using an SCS based software package “Stormshed” assuming a type 1a rainfall distribution and a Santa Barbara Urban Huydrograph. The pond has been designed to accommodate full build out of the Park, which has been assume to consist of 24.87 acres of impervious area which includes the pond area. The calculations show that the total storage volume provided in the detention area is 69,791-cf.

Storm Water Conveyance

Pipes in Century drive will be designed to accommodate the undetained 25yr flows from the project and route them to the pond. Pipes stubbed to each building pad have been sized to accommodate the 25year storm event as calculated using the SCS based software package “StormShed”.

Water Quality

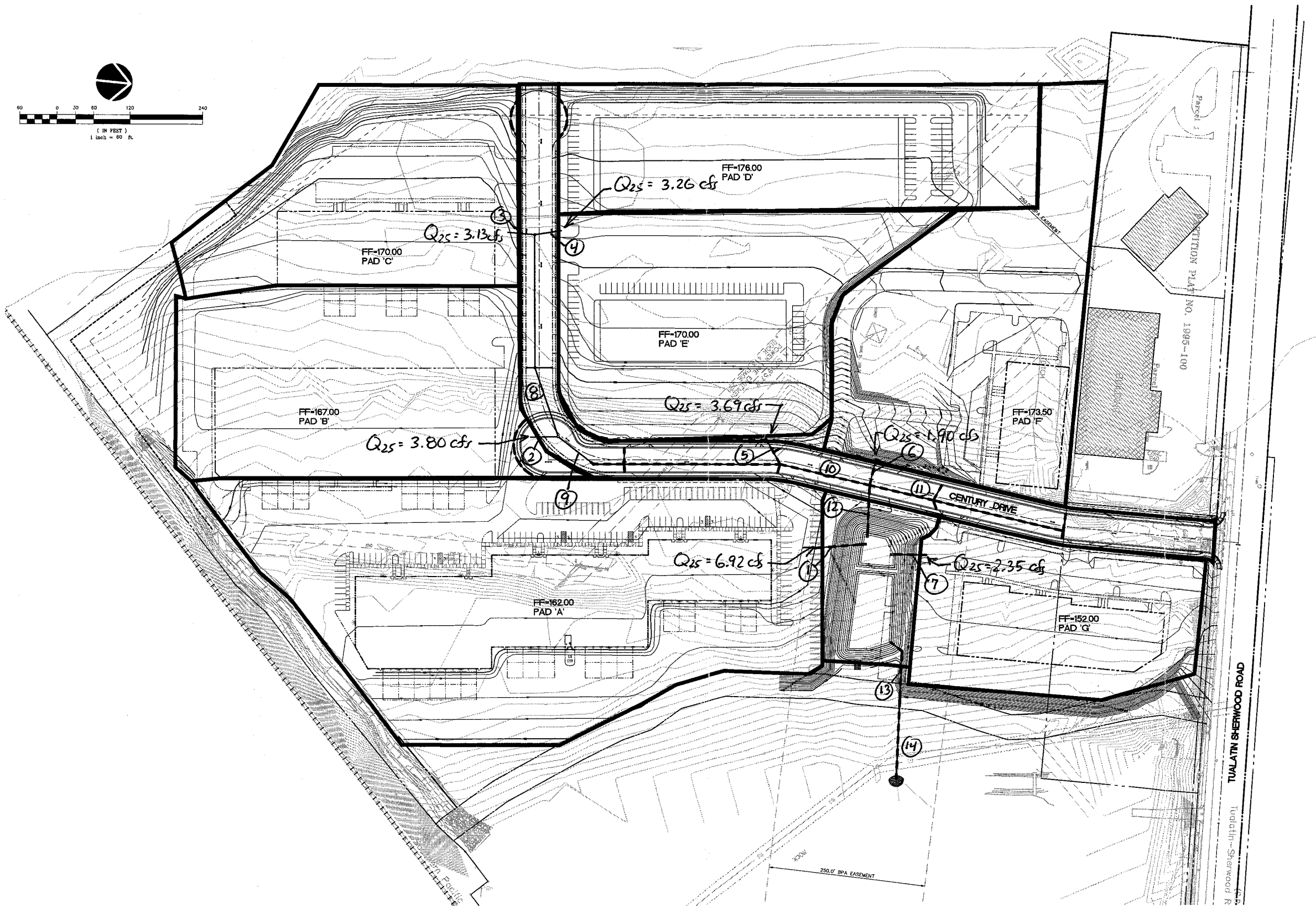
Per the City of Sherwood and Clean Water Services standards, water quality treatment of storm runoff is required for all new development. All hardscape areas including the parking area, drive isles, loading docks, roofs and sidewalks will be collected via trapped and sumped catch basins. This is the first line of defense to trap oil and grease and to settle out heavy metals and sediments. The catch basins are designed to allow for periodic scheduled maintenance for initial cleansing and vacuuming post summer storm events. Storm water from the catch basins will be routed via a storm pipe collection system to a "dry" detention pond centrally located in the BPA easement to serve the entire development. The pond has been designed to treat the "summer" storm event as defined as the first 0.36" of rainfall falling in a four hour period. The proposed pond will incorporate a two-cell design. The pond has been designed with one foot of permanent water to help maintain an appropriate variety of wetland type plant materials to help provide water quality benefits.

The pond has been designed to provide for both water quality and detention.

The attached water quality and detention calculations are intended to show that the pond has been designed to conform to the City of Sherwood and Clean Water Services requirements.

Off-Site Flows

Upstream flows will be conveyed around the proposed project. An 18" pipe has been stubbed to the west end of Century Drive and has been designed to accommodate upstream flows. The by-pass pipe was designed to accommodate the 10yr existing runoff rate from the upstream basin. The upstream basin consists of approximately 33 acres and it has been assumed that future build out upstream will accommodate storm water detention.



LEDGEND

PROPOSED CONTOUR	141
EXISTING CONTOUR	141
COMPOST BERM	
SEDIMENT FENCING	

NOTES

1. SEE SHEET R9.0 FOR POND DESIGN AND DETAILS
2. THIS STORMWATER PLAN IS INTENDED TO PROVIDE AN OVERALL PICTURE OF STORMWATER FOR THIS SITE. SEE CONSTRUCTION DOCUMENTS FOR DETAILS.
3. LATERALS SIZED TO ACCOMODATE THE 25YR STORM.
4. POND SIZED TO ACCOMODATE FULL BUILD OUT OF SITE.
5. UPSTREAM FLOWS WILL BY-PASS THE DETETNION AND WATER QUALITY POND.

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Project
SHERWOOD INDUSTRIAL PARK
SITE IMPROVEMENTS

Surveyor
WELIGN ENGINEERING, PC
8000 SW PFAFFLE STREET
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Phone: (503)598-1868

REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 13, 1982
ANDREW L. FREDRICKS JR.
EXPIRES 12/31/05

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REVISIONS:

REVISION DELTA CLOUD	REVISIONS THIS SHEET	REVISION DELTA CLOSING DATE

SHEET TITLE:
STORM BASIN PLAN

DRAWN BY:

CHECKED BY:

SHEET
STRM

JOB NO. 2040263.00

2040263.00\DWG\2K357-1.DWG 4320 RLF 10/07/04 11:22 1:50

POND BASIN AREA

			CN
TOTAL AREA	=	32.56 Ac	
IMPER. AREA	=	24.87 Ac	98
PERVIOUS AREA	=	7.69 Ac	86

EXISTING

			CN
AREA	=	32.56 Ac	86

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POND BASIN AREA

	AREA	IMPER AREA	PER AREA
PAD 'A'	7.56 Ac	6.05 Ac	1.51 Ac
PAD 'B'	4.06 Ac	3.25 Ac	0.81 Ac
PAD 'C'	3.35 Ac	2.68 Ac	0.67 Ac
PAD 'D'	3.61 Ac	2.75 Ac	0.86 Ac
PAD 'E'	4.62 Ac	3.43 Ac	0.89 Ac
✓ PAD 'F'	4.15 Ac	2.25 Ac	1.90 Ac
PAD 'G'	2.53 Ac	1.95 Ac	0.58 Ac
ROAD	2.34 Ac	2.11 Ac	0.23 Ac
POND	0.94 Ac	0.70 Ac	0.24 Ac
	32.56 Ac	24.87	7.69 Ac

By _____

Date _____

Job # _____

Sht. _____ of _____

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Pipe Sizing Calculation

Based on SCS flow inputs

(Flows calculated in "Stormshed")

GROUP MACKENZIE

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Project: Sherwood Industrial Park
By: rlf
Date: 10/7/2004
Job: 2040263

Mannings n= 0.013

Link #	Storm Input Descriptions	Incremental Flow (cfs)	Total Flow (cfs)	Pipe Slope (%)	Pipe Diameter (inches)	Pipe Capacity (cfs)	Pipe Velocity (fps)
1	Pad 'A'		6.93	0.5	18	7.42	4.20
2	Pad 'B'		3.8	0.5	15	4.56	3.72
3	Pad 'C'		3.13	0.5	15	4.56	3.72
4	Pad 'D'		3.26	0.5	15	4.56	3.72
5	Pad 'E'		3.69	0.5	15	4.56	3.72
6	Pad 'F'		3.6	0.5	15	4.56	3.72
7	Pad 'G'		2.35	0.5	15	4.56	3.72
8	Pad 'C', Pad 'D' & Road		7.84	0.5	24	15.98	5.09
9	Pad 'B'	3.8	11.64	1.3	24	25.76	8.20
10	Pad ' E'	3.69	15.33	4	24	45.19	14.39
11	Road		0.71	0.5	12	2.52	3.20
12	6+10+11		19.64	3.25	24	40.74	12.97
13	1+7+12+pond	0.9	29.82	8.8	24	67.03	21.35
14			29.82	1.1	24	23.70	7.55

SIZING FOR STORM STUB

DESCRIPTION	AREA	IMP.	PER	Q_{25}	SIZE @ 0.5%
AREA 'A'	7.56	6.05	1.51	6.92	18"
AREA 'B'	4.06	3.25	0.81	3.80	15"
AREA 'C'	3.35	2.68	0.67	3.13	15"
AREA 'D'	3.61	2.75	0.86	3.26	15"
AREA 'E'	4.02	3.13	0.89	3.69	15"
AREA 'F'	4.15	2.25	1.90	3.60	15"
AREA 'G'	2.53	1.95	0.58	2.35	15"
AREA 'R'	2.34	2.11	0.23	2.17	12"
POND	0.94	0.7	0.24	0.90	

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Storm Stub Sizing

A Event Summary:

BasinID	Peak Q Event	Peak T	Peak Vol	Area	Method	Raintype	
-------	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
A	6.92	8.00	2.5275	7.56	SBUH/SCS	TYPE1A	25 yr

Drainage Area: A

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	1.5100 ac	86.00	0.18 hrs	
Impervious	6.0500 ac	98.00	0.18 hrs	
Total	7.5600 ac			

Supporting Data:

Pervious CN Data:

landscape	86.00	1.5100 ac

Impervious CN Data:

None Entered	98.00	6.0500 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	LANDSCAPE	20.00 ft	2.00%	0.2000	3.85 min
Sheet	AC	250.00 ft	2.00%	0.0110	2.85 min
Channel	PIPE	700.00 ft	0.50%	42.0000	3.93 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	None Entered	20.00 ft	2.00%	0.2000	3.85 min
Sheet	AC	250.00 ft	2.00%	0.0110	2.85 min
Channel	PIPE	700.00 ft	0.50%	42.0000	3.93 min

B Event Summary:

BasinID	Peak Q Event	Peak T	Peak Vol	Area	Method	Raintype	
-------	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
B	3.80	8.00	1.3574	4.06	SBUH/SCS	TYPE1A	25 yr

Drainage Area: B

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	0.8100 ac	86.00	0.15 hrs	
Impervious	3.2500 ac	98.00	0.15 hrs	
Total	4.0600 ac			

Supporting Data:

Pervious CN Data:

Prototype subarea	86.00	0.8100 ac

Impervious CN Data:

None Entered	98.00	3.2500 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	LANDSCAPE	20.00 ft	2.00%	0.2000	3.85 min

Sheet	AC	250.00 ft	2.00%	0.0110	2.85 min
Channel	PIPE	450.00 ft	0.50%	42.0000	2.53 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	None Entered	20.00 ft	2.00%	0.2000	3.85 min
Sheet	AC	250.00 ft	2.00%	0.0110	2.85 min
Channel	PIPE	450.00 ft	0.50%	42.0000	2.53 min

C Event Summary:

BasinID	Peak Q Event	Peak T	Peak Vol	Area	Method	Raintype	
-------	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
C	3.13	8.00	1.1199	3.35	SBUH/SCS	TYPE1A	25 yr

Drainage Area: C

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	0.6700 ac	86.00	0.15 hrs	
Impervious	2.6800 ac	98.00	0.15 hrs	
Total	3.3500 ac			

Supporting Data:

Pervious CN Data:

Prototype subarea	86.00	0.6700 ac

Impervious CN Data:

None Entered	98.00	2.6800 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	LANDSCAPE	20.00 ft	2.00%	0.2000	3.85 min
Sheet	AC	250.00 ft	2.00%	0.0110	2.85 min
Channel	PIPE	450.00 ft	0.50%	42.0000	2.53 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	None Entered	20.00 ft	2.00%	0.2000	3.85 min
Sheet	AC	250.00 ft	2.00%	0.0110	2.85 min
Channel	PIPE	450.00 ft	0.50%	42.0000	2.53 min

D Event Summary:

BasinID	Peak Q Event	Peak T	Peak Vol	Area	Method	Raintype	
-------	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
D	3.26	8.00	1.1923	3.61	SBUH/SCS	TYPE1A	25 yr

Drainage Area: D

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	0.8600 ac	86.00	0.18 hrs	
Impervious	2.7500 ac	98.00	0.18 hrs	
Total	3.6100 ac			

Supporting Data:

Pervious CN Data:

Prototype subarea	86.00	0.8600 ac

Impervious CN Data:

None Entered	98.00	2.7500 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	LANDSCAPE	20.00 ft	2.00%	0.2000	3.85 min
Sheet	AC	250.00 ft	2.00%	0.0110	2.85 min
Channel	PIPE	720.00 ft	0.50%	42.0000	4.04 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	None Entered	20.00 ft	2.00%	0.2000	3.85 min
Sheet	AC	250.00 ft	2.00%	0.0110	2.85 min
Channel	PIPE	720.00 ft	0.50%	42.0000	4.04 min

E Event Summary:

BasinID	Peak Q Event	Peak T	Peak Vol	Area	Method	Raintype	
-------	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
E	3.69	8.00	1.3348	4.02	SBUH/SCS	TYPE1A	25 yr

Drainage Area: E

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	0.8900 ac	86.00	0.17 hrs	
Impervious	3.1300 ac	98.00	0.17 hrs	
Total	4.0200 ac			

Supporting Data:

Pervious CN Data:

Prototype subarea	86.00	0.8900 ac

Impervious CN Data:

None Entered	98.00	3.1300 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	LANDSCAPE	20.00 ft	2.00%	0.2000	3.85 min
Sheet	AC	250.00 ft	2.00%	0.0110	2.85 min
Channel	PIPE	600.00 ft	0.50%	42.0000	3.37 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	None Entered	20.00 ft	2.00%	0.2000	3.85 min
Sheet	AC	250.00 ft	2.00%	0.0110	2.85 min
Channel	PIPE	600.00 ft	0.50%	42.0000	3.37 min

F Event Summary:

BasinID	Peak Q Event	Peak T	Peak Vol	Area	Method	Raintype	
-------	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
F	3.59	8.00	1.2749	4.15	SBUH/SCS	TYPE1A	25 yr

Drainage Area: F

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	1.9000 ac	86.00	0.15 hrs	

Impervious	2.2500 ac	98.00	0.15 hrs
Total	4.1500 ac		

Supporting Data:

Pervious CN Data:

Prototype subarea	86.00	1.9000 ac

Impervious CN Data:

None Entered	98.00	2.2500 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	LANDSCAPE	20.00 ft	2.00%	0.2000	3.85 min
Sheet	AC	250.00 ft	2.00%	0.0110	2.85 min
Channel	PIPE	400.00 ft	0.50%	42.0000	2.24 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	None Entered	20.00 ft	2.00%	0.2000	3.85 min
Sheet	AC	250.00 ft	2.00%	0.0110	2.85 min
Channel	PIPE	400.00 ft	0.50%	42.0000	2.24 min

G Event Summary:

BasinID	Peak Q Event	Peak T	Peak Vol	Area	Method	Raintype	
-------	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
G	2.35	8.00	0.8380	2.53	SBUH/SCS	TYPE1A	25 yr

Drainage Area: G

Hyd Method:	SBUH Hyd	Loss Method:	SCS CN Number
Peak Factor:	484.00	SCS Abs:	0.20
Storm Dur:	24.00 hrs	Intv:	10.00 min

	Area	CN	TC
Pervious	0.5800 ac	86.00	0.15 hrs
Impervious	1.9500 ac	98.00	0.15 hrs
Total	2.5300 ac		

Supporting Data:

Pervious CN Data:

Prototype subarea	86.00	0.5800 ac

Impervious CN Data:

None Entered	98.00	1.9500 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	LANDSCAPE	20.00 ft	2.00%	0.2000	3.85 min
Sheet	AC	250.00 ft	2.00%	0.0110	2.85 min
Channel	PIPE	450.00 ft	0.50%	42.0000	2.53 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	None Entered	20.00 ft	2.00%	0.2000	3.85 min
Sheet	AC	250.00 ft	2.00%	0.0110	2.85 min
Channel	PIPE	450.00 ft	0.50%	42.0000	2.53 min

R Event Summary:

BasinID	Peak Q Event	Peak T	Peak Vol	Area	Method	Raintype	
-------	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
R	2.17	8.00	0.8072	2.34	SBUH/SCS	TYPE1A	25 yr

Drainage Area: R

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	0.2300 ac	86.00	0.20 hrs	
Impervious	2.1100 ac	98.00	0.20 hrs	
Total	2.3400 ac			

Supporting Data:

Pervious CN Data:

Prototype subarea	86.00	0.2300 ac

Impervious CN Data:

None Entered	98.00	2.1100 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	LANDSCAPE	20.00 ft	2.00%	0.2000	3.85 min
Sheet	AC	250.00 ft	2.00%	0.0110	2.85 min
Channel	PIPE	900.00 ft	0.50%	42.0000	5.05 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	None Entered	20.00 ft	2.00%	0.2000	3.85 min
Sheet	AC	250.00 ft	2.00%	0.0110	2.85 min
Channel	PIPE	900.00 ft	0.50%	42.0000	5.05 min

pond Event Summary:

BasinID	Peak Q Event	Peak T	Peak Vol	Area	Method	Raintype	
-------	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
pond	0.90	8.00	0.3088	0.94	SBUH/SCS	TYPE1A	25 yr

Drainage Area: pond

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	0.2400 ac	86.00	0.08 hrs	
Impervious	0.7000 ac	98.00	0.08 hrs	
Total	0.9400 ac			

Supporting Data:

Pervious CN Data:

Prototype subarea	86.00	0.2400 ac

Impervious CN Data:

pond	98.00	0.7000 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Fixed	None Entered	0.00 ft	0.00%	5.0000	5.00 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Fixed	None Entered	0.00 ft	0.00%	5.0000	5.00 min

WQ VOL.

	IMPER AREA (Ac)
PAD 'A'	6.05
PAD 'B'	3.25
PAD 'C'	2.68
PAD 'D'	2.75
PAD 'E'	3.13
PAD 'F'	2.25
PAD 'G'	1.95
ROAD	2.11
POND	—

TOTAL IMPER. = 24.17 Ac

$$WQ\ VOL = 24.17\ Ac \times 0.36\ in \times \frac{43{,}560\ ft^2}{1\ Ac} \times \frac{1\ ft}{12\ in} = \underline{\underline{31{,}585\ ft^3}}$$

$$Q_{rel} = \frac{31{,}585\ ft^3}{48\ HRS} \times \frac{1\ HR}{3600\ s} = \underline{\underline{0.20\ cfs}}$$ 0.18

By _____

Date _____

Job # _____

Sht. _____ of _____

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TOTAL POND VOLUME

ELEV (ft)	AREA (SF)	VOL (CF)	CUMM VOL (CF)
139.50	10,641		
140	11,295	5484	5484
141	13,631	12,463	17,947
142	15,175	14,403	32,350
143	16,857	16,016	48,366
144	18,600	17,728	66,095
145	20,404	19,502	85,597
146	22,267	21,336	106,932

← WQ VOL 31,585 ft^3 @ ELEV. = 141.95'

By

Date

Job #

Sht. of

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ORIFICE SIZING (WATER QUALITY)

$Q = 0.20$ cfs

$g = 32.2$

$h = \frac{141.95 + 139.50}{2} - 139.50 = 1.23'$

$c = 0.62$

$A = \frac{\pi d^2}{4}$

$d = \sqrt{\frac{4A}{\pi}}$

$Q = CA\sqrt{2gh}$

$A = \frac{Q}{C\sqrt{2gh}}$

$A = \frac{0.20}{0.62\sqrt{2 \times 32.2 \times 1.23}}$

$A = 0.0362$

$d = \sqrt{\frac{4A}{\pi}}$

$d = 0.215' = 2.58''$

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DETENTION SUMMARY

	INFLOW (cfs)	EXIST. RUNOFF (cfs)	RELEASE RATE (cfs)	PEAK STAGE (ft)
Q_2	14.84	6.06	6.05	144.05
Q_{10}	21.58	10.86	10.79	144.89
Q_{25}	29.11	16.53	15.82	145.74

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DETENTION VOLUME

ELEV (FT)	AREA (SF)	VOL (CF)	CUMM VOL (CF)
141.95	15,097		
142	15,175	756	756
143	16,857	16,016	16,773
144	18,600	17,728	34,501
145	20,404	19,502	54,003
146	22,267	21,335	75,338

By

Date

Job #

Sht. of

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Pond Design
Sherwood Industrial Park
Project 2040263.00
February 28, 2006

RLPCOMPUTE [FACILITIES] SUMMARY

2 yr	Match Q: 6.0575 cfs Peak Out Q: 6.0533 cfs - Peak Stg: 144.05 ft - Active Vol: 1.5408 acft
10 yr	Match Q: 10.8600 cfs Peak Out Q: 10.7863 cfs - Peak Stg: 144.89 ft - Active Vol: 1.9153 acft
25 yr	Match Q: 16.5265 cfs Peak Out Q: 15.8192 cfs - Peak Stg: 145.74 ft - Active Vol: 2.3296 acft

RLPCOMPUTE [FACILITIES] DETAILED

2 yr event

Time	I1	I2	2S	Sum I+2S	O1	O2S	Elev
70.00	0.04	0.04	105.43	105.62	0.00	105.62	141.95
80.00	0.15	0.15	105.31	105.74	0.31	105.43	141.95
90.00	0.28	0.28	105.12	105.82	0.31	105.51	141.94
100.00	0.42	0.42	105.20	106.17	0.31	105.86	141.95
110.00	0.55	0.55	105.46	106.70	0.41	106.29	141.95
120.00	0.69	0.69	105.69	107.18	0.60	106.58	141.96
130.00	0.80	0.80	105.89	107.61	0.69	106.91	141.96
140.00	0.92	0.92	106.13	108.08	0.78	107.30	141.96
150.00	1.03	1.03	106.43	108.58	0.87	107.71	141.97
160.00	1.12	1.12	106.75	109.06	0.96	108.11	141.98
170.00	1.20	1.20	107.08	109.53	1.03	108.50	141.98
180.00	1.26	1.26	107.40	109.97	1.10	108.87	141.99
190.00	1.32	1.32	107.71	110.40	1.16	109.23	142.00
200.00	1.37	1.37	108.02	110.80	1.21	109.59	142.00
210.00	1.41	1.41	108.32	111.19	1.26	109.93	142.01
220.00	1.45	1.45	108.62	111.59	1.30	110.29	142.01
230.00	1.52	1.52	108.94	112.05	1.35	110.70	142.02
240.00	1.59	1.59	109.30	112.54	1.40	111.14	142.03
250.00	1.64	1.64	109.69	113.07	1.45	111.62	142.03
260.00	1.74	1.74	110.12	113.72	1.50	112.22	142.04
270.00	1.86	1.86	110.65	114.43	1.56	112.87	142.05
280.00	1.92	1.92	111.24	115.19	1.63	113.56	142.06
290.00	2.03	2.03	111.87	116.07	1.70	114.37	142.08
300.00	2.17	2.17	112.60	117.02	1.77	115.25	142.09
310.00	2.25	2.25	113.40	118.02	1.85	116.17	142.10
320.00	2.37	2.37	114.25	119.13	1.93	117.21	142.12
330.00	2.51	2.51	115.20	120.31	2.01	118.30	142.14
340.00	2.59	2.59	116.21	121.52	2.09	119.43	142.16
350.00	2.72	2.72	117.25	122.84	2.18	120.67	142.18
360.00	2.87	2.87	118.40	124.22	2.26	121.96	142.20
370.00	2.95	2.95	119.61	125.71	2.35	123.36	142.22
380.00	3.15	3.15	120.92	127.48	2.44	125.04	142.25
390.00	3.41	3.41	122.49	129.43	2.55	126.89	142.27
400.00	3.53	3.53	124.23	131.60	2.66	128.95	142.31
410.00	3.84	3.84	126.17	134.24	2.77	131.47	142.34
420.00	4.22	4.22	128.56	137.18	2.91	134.27	142.39
430.00	4.40	4.40	131.21	140.40	3.06	137.34	142.44
440.00	4.78	4.78	134.14	144.17	3.21	140.96	142.49
450.00	5.25	5.25	137.58	148.29	3.38	144.92	142.56
460.00	5.46	5.46	141.36	155.49	3.55	151.94	142.63
470.00	8.66	8.66	148.09	169.85	3.84	166.01	142.75
480.00	13.09	13.09	161.64	189.69	4.37	185.32	143.01
490.00	14.96	14.96	180.38	208.49	4.94	203.55	143.32
500.00	13.15	13.15	198.12	221.16	5.43	215.73	143.62
510.00	9.88	9.88	210.00	228.56	5.73	222.83	143.83
520.00	8.67	8.67	216.93	233.16	5.90	227.26	143.94
530.00	7.56	7.56	221.26	235.30	6.00	229.30	144.01
540.00	6.48	6.48	223.26	235.83	6.04	229.78	144.05
550.00	6.08	6.08	223.73	235.30	6.05	229.25	144.05

560.00	5.49	5.49	223.21	233.52	6.04	227.48	144.04
570.00	4.82	4.82	221.47	230.86	6.01	224.86	144.02
580.00	4.57	4.57	218.91	227.83	5.95	221.88	143.98
590.00	4.35	4.35	216.00	224.47	5.88	218.60	143.93
600.00	4.13	4.13	212.80	220.98	5.80	215.18	143.87
610.00	4.05	4.05	209.46	217.39	5.72	211.68	143.82
620.00	3.89	3.89	206.05	213.62	5.63	207.99	143.76
630.00	3.69	3.69	202.45	209.76	5.54	204.22	143.70
640.00	3.62	3.62	198.77	205.90	5.45	200.45	143.64
650.00	3.50	3.50	195.10	201.97	5.35	196.63	143.57
660.00	3.37	3.37	191.38	198.07	5.25	192.82	143.51
670.00	3.32	3.32	187.67	194.25	5.15	189.11	143.45
680.00	3.26	3.26	184.06	190.51	5.05	185.46	143.39
690.00	3.19	3.19	180.52	186.88	4.95	181.93	143.33
700.00	3.17	3.17	177.09	183.37	4.85	178.53	143.27
710.00	3.12	3.12	173.78	179.95	4.75	175.20	143.21
720.00	3.05	3.05	170.55	176.63	4.65	171.98	143.16
730.00	3.03	3.03	167.43	173.43	4.55	168.88	143.11
740.00	2.97	2.97	164.42	170.31	4.46	165.85	143.05
750.00	2.91	2.91	161.49	167.29	4.36	162.93	143.00
760.00	2.89	2.89	158.67	164.39	4.26	160.13	142.95
770.00	2.83	2.83	155.97	161.57	4.16	157.42	142.90
780.00	2.77	2.77	153.36	158.87	4.06	154.81	142.85
790.00	2.74	2.74	150.86	156.34	3.96	152.38	142.81
800.00	2.74	2.74	148.52	153.99	3.86	150.13	142.76
810.00	2.73	2.73	146.36	151.83	3.77	148.06	142.72
820.00	2.74	2.74	144.38	149.80	3.68	146.12	142.68
830.00	2.69	2.69	142.51	147.83	3.60	144.23	142.65
840.00	2.63	2.63	140.71	145.94	3.52	142.41	142.62
850.00	2.60	2.60	138.97	144.17	3.44	140.73	142.58
860.00	2.60	2.60	137.37	142.56	3.37	139.19	142.55
870.00	2.59	2.59	135.90	141.09	3.29	137.79	142.53
880.00	2.60	2.60	134.57	139.71	3.23	136.48	142.50
890.00	2.55	2.55	133.32	138.35	3.17	135.19	142.48
900.00	2.49	2.49	132.08	137.03	3.10	133.93	142.45
910.00	2.46	2.46	130.89	135.81	3.04	132.77	142.43
920.00	2.45	2.45	129.79	134.70	2.98	131.72	142.41
930.00	2.45	2.45	128.79	133.70	2.92	130.77	142.39
940.00	2.45	2.45	127.90	132.76	2.87	129.88	142.38
950.00	2.41	2.41	127.06	131.81	2.83	128.98	142.36
960.00	2.34	2.34	126.21	130.86	2.78	128.09	142.34
970.00	2.32	2.32	125.36	129.99	2.73	127.26	142.33
980.00	2.31	2.31	124.59	129.20	2.68	126.53	142.31
990.00	2.31	2.31	123.89	128.50	2.63	125.87	142.30
1000.00	2.31	2.31	123.27	127.89	2.60	125.29	142.29
1010.00	2.31	2.31	122.73	127.35	2.56	124.79	142.28
1020.00	2.31	2.31	122.26	126.87	2.53	124.34	142.27
1030.00	2.31	2.31	121.84	126.41	2.50	123.91	142.26
1040.00	2.26	2.26	121.43	125.90	2.48	123.42	142.25
1050.00	2.20	2.20	120.97	125.35	2.44	122.90	142.25
1060.00	2.17	2.17	120.49	124.83	2.41	122.42	142.24
1070.00	2.17	2.17	120.04	124.37	2.38	121.99	142.23
1080.00	2.16	2.16	119.63	123.96	2.35	121.61	142.22
1090.00	2.16	2.16	119.28	123.56	2.33	121.23	142.21
1100.00	2.12	2.12	118.93	123.10	2.30	120.80	142.21
1110.00	2.05	2.05	118.52	122.60	2.27	120.33	142.20
1120.00	2.03	2.03	118.09	122.13	2.24	119.89	142.19
1130.00	2.02	2.02	117.68	121.71	2.21	119.51	142.18
1140.00	2.01	2.01	117.33	121.35	2.18	119.17	142.18
1150.00	2.01	2.01	117.02	120.99	2.16	118.84	142.17
1160.00	1.97	1.97	116.70	120.57	2.13	118.44	142.17
1170.00	1.90	1.90	116.34	120.11	2.10	118.01	142.16
1180.00	1.88	1.88	115.94	119.68	2.07	117.61	142.15
1190.00	1.87	1.87	115.57	119.30	2.04	117.26	142.14
1200.00	1.86	1.86	115.25	118.97	2.01	116.96	142.14
1210.00	1.86	1.86	114.97	118.70	1.99	116.71	142.13
1220.00	1.86	1.86	114.74	118.46	1.97	116.49	142.13
1230.00	1.86	1.86	114.54	118.27	1.95	116.32	142.13
1240.00	1.86	1.86	114.38	118.11	1.94	116.17	142.12
1250.00	1.86	1.86	114.25	117.97	1.93	116.05	142.12

1260.00	1.86	1.86	114.13	117.86	1.92	115.95	142.12
1270.00	1.87	1.87	114.04	117.77	1.91	115.87	142.12
1280.00	1.87	1.87	113.97	117.70	1.90	115.80	142.11
1290.00	1.87	1.87	113.90	117.64	1.89	115.74	142.11
1300.00	1.87	1.87	113.85	117.59	1.89	115.70	142.11
1310.00	1.87	1.87	113.81	117.55	1.89	115.66	142.11
1320.00	1.87	1.87	113.78	117.52	1.88	115.63	142.11
1330.00	1.87	1.87	113.75	117.44	1.88	115.56	142.11
1340.00	1.82	1.82	113.69	117.26	1.87	115.39	142.11
1350.00	1.76	1.76	113.53	117.01	1.86	115.15	142.11
1360.00	1.73	1.73	113.31	116.77	1.84	114.93	142.10
1370.00	1.72	1.72	113.11	116.54	1.82	114.72	142.10
1380.00	1.72	1.72	112.92	116.36	1.80	114.55	142.10
1390.00	1.72	1.72	112.77	116.20	1.79	114.41	142.09
1400.00	1.72	1.72	112.64	116.07	1.77	114.30	142.09
1410.00	1.72	1.72	112.53	115.97	1.76	114.20	142.09
1420.00	1.72	1.72	112.45	115.88	1.76	114.13	142.09
1430.00	1.72	1.72	112.38	115.81	1.75	114.06	142.09
1440.00	1.72	1.72	112.32	115.76	1.74	114.02	142.08
1450.00	1.72	1.72	112.28	115.18	1.74	113.44	142.08
1460.00	1.19	1.19	111.76	113.40	1.69	111.71	142.07
1470.00	0.45	0.45	110.20	110.82	1.51	109.31	142.04
1480.00	0.17	0.17	108.09	108.32	1.22	107.10	142.00
1490.00	0.07	0.07	106.27	106.36	0.83	105.54	141.97
1500.00	0.02	0.02	105.23	105.26	0.31	104.95	141.95
1510.00	0.01	0.01	104.64	104.65	0.31	104.35	141.93
1520.00	0.00	0.00	104.04	104.04	0.31	103.73	141.92
1530.00	0.00	0.00	103.43	103.43	0.31	103.12	141.91
1540.00	0.00	0.00	102.81	102.81	0.31	102.50	141.90
1550.00	0.00	0.00	102.20	102.20	0.31	101.89	141.88
1560.00	0.00	0.00	101.59	101.59	0.31	101.28	141.87
1570.00	0.00	0.00	100.97	100.97	0.31	100.67	141.86
1580.00	0.00	0.00	100.36	100.36	0.30	100.06	141.84
1590.00	0.00	0.00	99.76	99.76	0.30	99.45	141.83
1600.00	0.00	0.00	99.15	99.15	0.30	98.85	141.82
1610.00	0.00	0.00	98.54	98.54	0.30	98.24	141.81
1620.00	0.00	0.00	97.94	97.94	0.30	97.64	141.79
1630.00	0.00	0.00	97.33	97.33	0.30	97.03	141.78
1640.00	0.00	0.00	96.73	96.73	0.30	96.43	141.77
1650.00	0.00	0.00	96.13	96.13	0.30	95.83	141.76
1660.00	0.00	0.00	95.53	95.53	0.30	95.23	141.74
1670.00	0.00	0.00	94.94	94.94	0.30	94.64	141.73
1680.00	0.00	0.00	94.34	94.34	0.30	94.04	141.72
1690.00	0.00	0.00	93.74	93.74	0.30	93.45	141.71
1700.00	0.00	0.00	93.15	93.15	0.30	92.85	141.69
1710.00	0.00	0.00	92.56	92.56	0.30	92.26	141.68
1720.00	0.00	0.00	91.97	91.97	0.30	91.67	141.67
1730.00	0.00	0.00	91.38	91.38	0.29	91.08	141.66
1740.00	0.00	0.00	90.79	90.79	0.29	90.50	141.64
1750.00	0.00	0.00	90.20	90.20	0.29	89.91	141.63
1760.00	0.00	0.00	89.62	89.62	0.29	89.32	141.62
1770.00	0.00	0.00	89.03	89.03	0.29	88.74	141.61
1780.00	0.00	0.00	88.45	88.45	0.29	88.16	141.60
1790.00	0.00	0.00	87.87	87.87	0.29	87.58	141.58
1800.00	0.00	0.00	87.29	87.29	0.29	87.00	141.57
1810.00	0.00	0.00	86.71	86.71	0.29	86.42	141.56
1820.00	0.00	0.00	86.13	86.13	0.29	85.84	141.55
1830.00	0.00	0.00	85.56	85.56	0.29	85.27	141.54
1840.00	0.00	0.00	84.98	84.98	0.29	84.70	141.52
1850.00	0.00	0.00	84.41	84.41	0.29	84.12	141.51
1860.00	0.00	0.00	83.84	83.84	0.29	83.55	141.50
1870.00	0.00	0.00	83.27	83.27	0.28	82.98	141.49

10 yr event

Time	**I1**	**I2**	**2S**	**Sum I+2S**	**O1**	**O2S**	**Elev**
50.00	0.01	0.01	105.43	105.54	0.00	105.54	141.95
60.00	0.10	0.10	105.23	105.60	0.31	105.29	141.95
70.00	0.27	0.27	104.98	105.73	0.31	105.42	141.94
80.00	0.49	0.49	105.11	106.32	0.31	106.01	141.94
90.00	0.72	0.72	105.52	107.17	0.48	106.69	141.95

100.00	0.92	0.92	105.96	108.01	0.72	107.29	141.96
110.00	1.12	1.12	106.42	108.85	0.87	107.98	141.97
120.00	1.31	1.31	106.98	109.75	1.01	108.74	141.98
130.00	1.46	1.46	107.60	110.67	1.14	109.53	142.00
140.00	1.62	1.62	108.28	111.66	1.25	110.41	142.01
150.00	1.77	1.77	109.05	112.70	1.36	111.33	142.02
160.00	1.88	1.88	109.86	113.72	1.47	112.25	142.04
170.00	1.97	1.97	110.68	114.69	1.57	113.13	142.05
180.00	2.05	2.05	111.47	115.63	1.66	113.97	142.07
190.00	2.11	2.11	112.24	116.51	1.73	114.77	142.08
200.00	2.16	2.16	112.97	117.34	1.81	115.53	142.10
210.00	2.21	2.21	113.66	118.13	1.87	116.26	142.11
220.00	2.26	2.26	114.33	118.93	1.93	117.00	142.12
230.00	2.35	2.35	115.01	119.82	1.99	117.83	142.13
240.00	2.46	2.46	115.77	120.77	2.06	118.72	142.15
250.00	2.54	2.54	116.59	121.83	2.12	119.70	142.16
260.00	2.70	2.70	117.51	123.09	2.19	120.89	142.18
270.00	2.88	2.88	118.61	124.48	2.28	122.20	142.20
280.00	2.99	2.99	119.84	125.98	2.37	123.61	142.22
290.00	3.16	3.16	121.16	127.67	2.46	125.21	142.25
300.00	3.35	3.35	122.65	129.47	2.56	126.91	142.28
310.00	3.46	3.46	124.25	131.35	2.66	128.69	142.31
320.00	3.63	3.63	125.93	133.40	2.76	130.64	142.34
330.00	3.84	3.84	127.78	135.56	2.87	132.69	142.37
340.00	3.94	3.94	129.72	137.78	2.97	134.81	142.41
350.00	4.12	4.12	131.72	140.17	3.08	137.09	142.45
360.00	4.33	4.33	133.90	142.66	3.19	139.46	142.49
370.00	4.43	4.43	136.16	145.32	3.31	142.01	142.53
380.00	4.73	4.73	138.59	148.42	3.42	144.99	142.58
390.00	5.10	5.10	141.44	151.80	3.55	148.25	142.63
400.00	5.27	5.27	144.56	155.53	3.69	151.84	142.69
410.00	5.71	5.71	148.00	159.98	3.84	156.14	142.75
420.00	6.26	6.26	152.13	164.91	4.01	160.90	142.83
430.00	6.51	6.51	156.72	170.28	4.18	166.10	142.92
440.00	7.06	7.06	161.73	176.50	4.37	172.14	143.01
450.00	7.72	7.72	167.58	183.31	4.56	178.76	143.11
460.00	8.01	8.01	174.00	194.68	4.75	189.93	143.22
470.00	12.67	12.67	184.86	216.59	5.07	211.53	143.40
480.00	19.07	19.07	205.90	246.67	5.63	241.04	143.76
490.00	21.71	21.71	233.47	274.21	7.58	266.63	144.20
500.00	19.04	19.04	257.09	290.40	9.55	280.85	144.57
510.00	14.27	14.27	270.49	297.25	10.36	286.89	144.77
520.00	12.49	12.49	276.20	299.57	10.68	288.89	144.86
530.00	10.87	10.87	278.10	298.29	10.79	287.50	144.89
540.00	9.31	9.31	276.78	294.82	10.72	284.11	144.87
550.00	8.73	8.73	273.57	290.17	10.54	279.63	144.82
560.00	7.87	7.87	269.33	284.11	10.30	273.81	144.75
570.00	6.90	6.90	263.84	277.28	9.97	267.31	144.67
580.00	6.54	6.54	257.72	270.47	9.59	260.89	144.58
590.00	6.21	6.21	251.71	263.82	9.18	254.64	144.48
600.00	5.90	5.90	245.89	257.58	8.75	248.83	144.39
610.00	5.78	5.78	240.53	251.86	8.30	243.56	144.31
620.00	5.55	5.55	235.73	246.54	7.83	238.71	144.24
630.00	5.27	5.27	231.40	241.82	7.31	234.51	144.17
640.00	5.16	5.16	227.85	238.01	6.66	231.34	144.12
650.00	4.99	4.99	225.26	235.05	6.09	228.97	144.08
660.00	4.80	4.80	222.93	232.46	6.04	226.43	144.04
670.00	4.73	4.73	220.44	229.82	5.98	223.83	144.00
680.00	4.64	4.64	217.91	227.09	5.92	221.17	143.96
690.00	4.54	4.54	215.31	224.36	5.86	218.50	143.92
700.00	4.51	4.51	212.70	221.64	5.80	215.85	143.87
710.00	4.43	4.43	210.11	218.88	5.73	213.15	143.83
720.00	4.34	4.34	207.48	216.12	5.67	210.46	143.78
730.00	4.30	4.30	204.85	213.39	5.60	207.78	143.74
740.00	4.23	4.23	202.25	210.61	5.54	205.08	143.69
750.00	4.13	4.13	199.61	207.84	5.47	202.37	143.65
760.00	4.10	4.10	196.98	205.10	5.40	199.70	143.61
770.00	4.02	4.02	194.37	202.32	5.33	196.99	143.56
780.00	3.93	3.93	191.73	199.55	5.26	194.29	143.52
790.00	3.89	3.89	189.11	196.88	5.19	191.69	143.47

800.00	3.88	3.88	186.58	194.33	5.12	189.22	143.43
810.00	3.88	3.88	184.17	191.93	5.05	186.88	143.39
820.00	3.88	3.88	181.89	189.58	4.98	184.60	143.35
830.00	3.81	3.81	179.68	187.21	4.92	182.29	143.31
840.00	3.72	3.72	177.44	184.85	4.86	179.99	143.27
850.00	3.69	3.69	175.20	182.57	4.79	177.78	143.24
860.00	3.68	3.68	173.06	180.41	4.73	175.68	143.20
870.00	3.67	3.67	171.02	178.37	4.66	173.71	143.17
880.00	3.67	3.67	169.10	176.39	4.60	171.78	143.13
890.00	3.61	3.61	167.24	174.36	4.55	169.82	143.10
900.00	3.52	3.52	165.33	172.33	4.49	167.85	143.07
910.00	3.48	3.48	163.42	170.38	4.42	165.96	143.04
920.00	3.47	3.47	161.59	168.53	4.36	164.17	143.01
930.00	3.47	3.47	159.87	166.80	4.30	162.50	142.97
940.00	3.47	3.47	158.26	165.13	4.24	160.89	142.94
950.00	3.40	3.40	156.70	163.41	4.18	159.23	142.92
960.00	3.31	3.31	155.11	161.69	4.12	157.57	142.89
970.00	3.28	3.28	153.51	160.05	4.06	155.99	142.86
980.00	3.26	3.26	151.99	158.51	4.00	154.51	142.83
990.00	3.26	3.26	150.57	157.09	3.94	153.14	142.80
1000.00	3.26	3.26	149.25	155.77	3.89	151.88	142.78
1010.00	3.26	3.26	148.04	154.56	3.84	150.72	142.75
1020.00	3.26	3.26	146.93	153.45	3.79	149.66	142.73
1030.00	3.26	3.26	145.91	152.36	3.75	148.61	142.71
1040.00	3.20	3.20	144.91	151.20	3.71	147.50	142.69
1050.00	3.10	3.10	143.84	150.01	3.66	146.35	142.67
1060.00	3.07	3.07	142.74	148.86	3.61	145.25	142.65
1070.00	3.06	3.06	141.68	147.79	3.57	144.23	142.63
1080.00	3.05	3.05	140.71	146.81	3.52	143.29	142.62
1090.00	3.05	3.05	139.81	145.84	3.48	142.36	142.60
1100.00	2.98	2.98	138.92	144.80	3.44	141.36	142.58
1110.00	2.89	2.89	137.97	143.72	3.39	140.32	142.56
1120.00	2.86	2.86	136.98	142.68	3.35	139.33	142.55
1130.00	2.84	2.84	136.03	141.71	3.30	138.41	142.53
1140.00	2.84	2.84	135.15	140.83	3.26	137.58	142.51
1150.00	2.84	2.84	134.36	139.97	3.22	136.75	142.50
1160.00	2.77	2.77	133.57	139.02	3.18	135.84	142.48
1170.00	2.68	2.68	132.71	138.03	3.13	134.89	142.47
1180.00	2.64	2.64	131.81	137.08	3.09	133.99	142.45
1190.00	2.63	2.63	130.95	136.21	3.04	133.17	142.43
1200.00	2.63	2.63	130.17	135.42	3.00	132.42	142.42
1210.00	2.62	2.62	129.46	134.71	2.96	131.75	142.41
1220.00	2.62	2.62	128.82	134.07	2.93	131.14	142.39
1230.00	2.62	2.62	128.25	133.50	2.89	130.61	142.38
1240.00	2.62	2.62	127.74	132.99	2.86	130.13	142.37
1250.00	2.63	2.63	127.29	132.54	2.84	129.70	142.36
1260.00	2.63	2.63	126.89	132.14	2.82	129.32	142.36
1270.00	2.63	2.63	126.53	131.78	2.79	128.99	142.35
1280.00	2.63	2.63	126.21	131.47	2.78	128.69	142.34
1290.00	2.63	2.63	125.93	131.19	2.76	128.43	142.34
1300.00	2.63	2.63	125.68	130.94	2.74	128.20	142.33
1310.00	2.63	2.63	125.47	130.72	2.73	127.99	142.33
1320.00	2.63	2.63	125.27	130.53	2.72	127.81	142.33
1330.00	2.63	2.63	125.10	130.30	2.71	127.59	142.32
1340.00	2.56	2.56	124.89	129.92	2.70	127.22	142.32
1350.00	2.47	2.47	124.55	129.45	2.68	126.78	142.31
1360.00	2.43	2.43	124.13	128.98	2.65	126.33	142.31
1370.00	2.42	2.42	123.71	128.55	2.62	125.92	142.30
1380.00	2.42	2.42	123.32	128.15	2.60	125.56	142.29
1390.00	2.41	2.41	122.98	127.81	2.58	125.23	142.28
1400.00	2.41	2.41	122.67	127.50	2.56	124.94	142.28
1410.00	2.41	2.41	122.40	127.23	2.54	124.69	142.27
1420.00	2.41	2.41	122.17	127.00	2.52	124.47	142.27
1430.00	2.42	2.42	121.96	126.79	2.51	124.28	142.26
1440.00	2.42	2.42	121.78	126.62	2.50	124.12	142.26
1450.00	2.42	2.42	121.63	125.71	2.49	123.22	142.26
1460.00	1.67	1.67	120.79	123.09	2.43	120.66	142.24
1470.00	0.63	0.63	118.40	119.27	2.26	117.01	142.20
1480.00	0.24	0.24	115.02	115.35	1.99	113.36	142.13
1490.00	0.09	0.09	111.68	111.81	1.68	110.13	142.07

1500.00	0.03	0.03	108.80	108.85	1.33	107.52	142.02
1510.00	0.01	0.01	106.60	106.62	0.92	105.70	141.97
1520.00	0.01	0.01	105.39	105.39	0.31	105.08	141.95
1530.00	0.00	0.00	104.77	104.78	0.31	104.47	141.94
1540.00	0.00	0.00	104.16	104.16	0.31	103.85	141.92
1550.00	0.00	0.00	103.54	103.54	0.31	103.23	141.91
1560.00	0.00	0.00	102.93	102.93	0.31	102.62	141.90
1570.00	0.00	0.00	102.31	102.31	0.31	102.01	141.89
1580.00	0.00	0.00	101.70	101.70	0.31	101.39	141.87
1590.00	0.00	0.00	101.09	101.09	0.31	100.78	141.86
1600.00	0.00	0.00	100.48	100.48	0.30	100.17	141.85
1610.00	0.00	0.00	99.87	99.87	0.30	99.57	141.83
1620.00	0.00	0.00	99.26	99.26	0.30	98.96	141.82
1630.00	0.00	0.00	98.66	98.66	0.30	98.35	141.81
1640.00	0.00	0.00	98.05	98.05	0.30	97.75	141.80
1650.00	0.00	0.00	97.45	97.45	0.30	97.15	141.78
1660.00	0.00	0.00	96.85	96.85	0.30	96.54	141.77
1670.00	0.00	0.00	96.24	96.24	0.30	95.94	141.76
1680.00	0.00	0.00	95.65	95.65	0.30	95.35	141.75
1690.00	0.00	0.00	95.05	95.05	0.30	94.75	141.73
1700.00	0.00	0.00	94.45	94.45	0.30	94.15	141.72
1710.00	0.00	0.00	93.86	93.86	0.30	93.56	141.71
1720.00	0.00	0.00	93.26	93.26	0.30	92.96	141.70
1730.00	0.00	0.00	92.67	92.67	0.30	92.37	141.68
1740.00	0.00	0.00	92.08	92.08	0.30	91.78	141.67
1750.00	0.00	0.00	91.49	91.49	0.29	91.19	141.66
1760.00	0.00	0.00	90.90	90.90	0.29	90.61	141.65
1770.00	0.00	0.00	90.31	90.31	0.29	90.02	141.64
1780.00	0.00	0.00	89.73	89.73	0.29	89.43	141.62
1790.00	0.00	0.00	89.14	89.14	0.29	88.85	141.61
1800.00	0.00	0.00	88.56	88.56	0.29	88.27	141.60
1810.00	0.00	0.00	87.98	87.98	0.29	87.69	141.59
1820.00	0.00	0.00	87.40	87.40	0.29	87.11	141.57
1830.00	0.00	0.00	86.82	86.82	0.29	86.53	141.56
1840.00	0.00	0.00	86.24	86.24	0.29	85.95	141.55
1850.00	0.00	0.00	85.66	85.66	0.29	85.38	141.54
1860.00	0.00	0.00	85.09	85.09	0.29	84.80	141.53
1870.00	0.00	0.00	84.52	84.52	0.29	84.23	141.51

25 yr event

Time	**I1**	**I2**	**2S**	**Sum I+2S**	**O1**	**O2S**	**Elev**
50.00	0.10	0.10	105.43	105.87	0.00	105.87	141.95
60.00	0.34	0.34	105.46	106.44	0.41	106.03	141.95
70.00	0.63	0.63	105.53	107.13	0.49	106.63	141.95
80.00	0.96	0.96	105.93	108.19	0.71	107.49	141.96
90.00	1.30	1.30	106.58	109.45	0.91	108.53	141.97
100.00	1.57	1.57	107.43	110.82	1.11	109.72	141.99
110.00	1.83	1.83	108.44	112.33	1.28	111.05	142.01
120.00	2.07	2.07	109.61	113.93	1.44	112.49	142.03
130.00	2.24	2.24	110.89	115.58	1.59	113.98	142.06
140.00	2.44	2.44	112.25	117.31	1.74	115.57	142.08
150.00	2.63	2.63	113.70	119.08	1.88	117.20	142.11
160.00	2.76	2.76	115.20	120.80	2.01	118.80	142.14
170.00	2.85	2.85	116.67	122.46	2.13	120.33	142.17
180.00	2.94	2.94	118.09	124.04	2.24	121.80	142.19
190.00	3.02	3.02	119.47	125.58	2.34	123.25	142.22
200.00	3.10	3.10	120.81	127.09	2.43	124.66	142.24
210.00	3.18	3.18	122.13	128.56	2.52	126.04	142.27
220.00	3.25	3.25	123.43	130.06	2.61	127.45	142.29
230.00	3.38	3.38	124.76	131.67	2.69	128.98	142.32
240.00	3.53	3.53	126.21	133.37	2.78	130.59	142.34
250.00	3.63	3.63	127.73	135.18	2.86	132.32	142.37
260.00	3.83	3.83	129.37	137.28	2.96	134.33	142.40
270.00	4.08	4.08	131.27	139.57	3.06	136.51	142.44
280.00	4.22	4.22	133.35	142.00	3.17	138.84	142.48
290.00	4.44	4.44	135.56	144.71	3.28	141.43	142.52
300.00	4.71	4.71	138.03	147.58	3.40	144.18	142.57
310.00	4.84	4.84	140.66	150.57	3.52	147.05	142.61
320.00	5.07	5.07	143.41	153.82	3.64	150.18	142.67
330.00	5.34	5.34	146.41	157.22	3.77	153.45	142.72

340.00	5.48	5.48	149.55	160.74	3.90	156.83	142.78
350.00	5.71	5.71	152.80	164.49	4.03	160.46	142.84
360.00	5.98	5.98	156.29	168.39	4.17	164.22	142.91
370.00	6.12	6.12	159.92	172.55	4.30	168.24	142.98
380.00	6.51	6.51	163.80	177.32	4.44	172.88	143.04
390.00	7.00	7.00	168.30	182.53	4.58	177.95	143.12
400.00	7.23	7.23	173.22	188.27	4.73	183.54	143.20
410.00	7.82	7.82	178.65	195.03	4.89	190.13	143.29
420.00	8.56	8.56	185.06	202.50	5.07	197.43	143.40
430.00	8.88	8.88	192.16	210.65	5.27	205.38	143.52
440.00	9.61	9.61	199.90	220.01	5.47	214.54	143.65
450.00	10.50	10.50	208.83	230.21	5.70	224.51	143.81
460.00	10.88	10.88	218.57	246.59	5.94	240.66	143.97
470.00	17.14	17.14	233.12	276.01	7.54	268.47	144.20
480.00	25.75	25.75	258.81	313.79	9.66	304.14	144.59
490.00	29.23	29.23	291.57	346.40	12.56	333.83	145.09
500.00	25.59	25.59	319.19	363.93	14.65	349.28	145.48
510.00	19.15	19.15	333.73	369.63	15.55	354.07	145.68
520.00	16.74	16.74	338.25	369.55	15.82	353.73	145.74
530.00	14.55	14.55	337.93	364.93	15.80	349.13	145.74
540.00	12.45	12.45	333.59	357.70	15.54	342.15	145.68
550.00	11.66	11.66	327.01	349.18	15.14	334.04	145.59
560.00	10.51	10.51	319.38	339.09	14.66	324.44	145.48
570.00	9.21	9.21	310.39	328.32	14.05	314.27	145.35
580.00	8.72	8.72	300.92	317.93	13.35	304.58	145.22
590.00	8.28	8.28	291.97	308.12	12.60	295.51	145.09
600.00	7.86	7.86	283.78	299.35	11.73	287.62	144.98
610.00	7.70	7.70	276.90	291.99	10.72	281.27	144.87
620.00	7.39	7.39	270.88	285.28	10.39	274.89	144.78
630.00	7.01	7.01	264.86	278.73	10.03	268.70	144.69
640.00	6.87	6.87	259.03	272.54	9.67	262.87	144.60
650.00	6.64	6.64	253.56	266.59	9.31	257.28	144.51
660.00	6.38	6.38	248.34	261.02	8.93	252.08	144.43
670.00	6.29	6.29	243.53	255.99	8.56	247.43	144.36
680.00	6.17	6.17	239.25	251.45	8.18	243.27	144.29
690.00	6.04	6.04	235.47	247.49	7.81	239.69	144.23
700.00	5.99	5.99	232.26	244.13	7.43	236.71	144.18
710.00	5.89	5.89	229.66	241.31	7.04	234.27	144.14
720.00	5.76	5.76	227.66	239.13	6.61	232.53	144.11
730.00	5.71	5.71	226.42	237.74	6.11	231.63	144.09
740.00	5.61	5.61	225.54	236.64	6.09	230.54	144.08
750.00	5.49	5.49	224.48	235.40	6.07	229.33	144.06
760.00	5.44	5.44	223.29	234.06	6.04	228.02	144.05
770.00	5.33	5.33	222.00	232.54	6.02	226.53	144.03
780.00	5.21	5.21	220.54	230.91	5.99	224.93	144.00
790.00	5.16	5.16	218.98	229.29	5.95	223.34	143.98
800.00	5.15	5.15	217.43	227.71	5.91	221.80	143.95
810.00	5.14	5.14	215.93	226.21	5.88	220.33	143.93
820.00	5.14	5.14	214.49	224.69	5.84	218.84	143.90
830.00	5.05	5.05	213.04	223.03	5.81	217.22	143.88
840.00	4.93	4.93	211.45	221.27	5.77	215.51	143.85
850.00	4.89	4.89	209.78	219.54	5.73	213.82	143.82
860.00	4.87	4.87	208.13	217.87	5.68	212.19	143.79
870.00	4.87	4.87	206.54	216.28	5.64	210.63	143.77
880.00	4.87	4.87	205.03	214.67	5.61	209.07	143.74
890.00	4.78	4.78	203.50	212.93	5.57	207.37	143.72
900.00	4.66	4.66	201.84	211.11	5.52	205.59	143.69
910.00	4.61	4.61	200.11	209.32	5.48	203.84	143.66
920.00	4.60	4.60	198.40	207.59	5.44	202.15	143.63
930.00	4.59	4.59	196.76	205.94	5.39	200.55	143.60
940.00	4.59	4.59	195.19	204.29	5.35	198.93	143.57
950.00	4.50	4.50	193.63	202.51	5.31	197.20	143.55
960.00	4.38	4.38	191.93	200.65	5.26	195.38	143.52
970.00	4.33	4.33	190.17	198.82	5.22	193.60	143.49
980.00	4.32	4.32	188.43	197.06	5.17	191.89	143.46
990.00	4.31	4.31	186.77	195.39	5.12	190.27	143.43
1000.00	4.31	4.31	185.19	193.81	5.08	188.73	143.41
1010.00	4.31	4.31	183.70	192.32	5.04	187.28	143.38
1020.00	4.31	4.31	182.29	190.91	5.00	185.91	143.36
1030.00	4.31	4.31	180.96	189.49	4.96	184.53	143.33

1040.00	4.22	4.22	179.61	187.94	4.92	183.02	143.31
1050.00	4.10	4.10	178.15	186.30	4.88	181.43	143.29
1060.00	4.06	4.06	176.60	184.69	4.83	179.86	143.26
1070.00	4.04	4.04	175.07	183.15	4.79	178.36	143.23
1080.00	4.03	4.03	173.62	181.68	4.74	176.94	143.21
1090.00	4.03	4.03	172.24	180.22	4.70	175.52	143.19
1100.00	3.94	3.94	170.86	178.62	4.66	173.96	143.16
1110.00	3.82	3.82	169.35	176.94	4.61	172.33	143.14
1120.00	3.77	3.77	167.77	175.30	4.56	170.74	143.11
1130.00	3.76	3.76	166.22	173.73	4.51	169.21	143.08
1140.00	3.75	3.75	164.75	172.25	4.47	167.78	143.06
1150.00	3.75	3.75	163.36	170.76	4.42	166.34	143.04
1160.00	3.66	3.66	161.97	169.16	4.38	164.78	143.01
1170.00	3.54	3.54	160.46	167.48	4.32	163.16	142.99
1180.00	3.49	3.49	158.89	165.85	4.27	161.59	142.96
1190.00	3.47	3.47	157.38	164.32	4.21	160.11	142.93
1200.00	3.47	3.47	155.95	162.88	4.16	158.72	142.90
1210.00	3.46	3.46	154.62	161.55	4.10	157.44	142.88
1220.00	3.46	3.46	153.39	160.31	4.06	156.26	142.85
1230.00	3.46	3.46	152.25	159.17	4.01	155.16	142.83
1240.00	3.46	3.46	151.19	158.12	3.97	154.15	142.81
1250.00	3.46	3.46	150.22	157.15	3.93	153.22	142.79
1260.00	3.46	3.46	149.33	156.26	3.89	152.37	142.78
1270.00	3.47	3.47	148.51	155.44	3.86	151.58	142.76
1280.00	3.47	3.47	147.75	154.68	3.83	150.85	142.75
1290.00	3.47	3.47	147.06	153.99	3.80	150.19	142.73
1300.00	3.47	3.47	146.42	153.35	3.77	149.58	142.72
1310.00	3.47	3.47	145.83	152.77	3.75	149.02	142.71
1320.00	3.47	3.47	145.30	152.23	3.72	148.51	142.70
1330.00	3.47	3.47	144.81	151.65	3.70	147.95	142.69
1340.00	3.38	3.38	144.27	150.91	3.68	147.23	142.68
1350.00	3.26	3.26	143.58	150.04	3.65	146.39	142.67
1360.00	3.21	3.21	142.78	149.18	3.61	145.57	142.65
1370.00	3.19	3.19	141.99	148.37	3.58	144.79	142.64
1380.00	3.19	3.19	141.24	147.61	3.55	144.07	142.63
1390.00	3.18	3.18	140.55	146.92	3.51	143.40	142.61
1400.00	3.18	3.18	139.92	146.28	3.49	142.80	142.60
1410.00	3.18	3.18	139.34	145.71	3.46	142.25	142.59
1420.00	3.18	3.18	138.82	145.18	3.43	141.75	142.58
1430.00	3.18	3.18	138.34	144.71	3.41	141.29	142.57
1440.00	3.18	3.18	137.90	144.27	3.39	140.88	142.56
1450.00	3.18	3.18	137.51	142.89	3.37	139.52	142.56
1460.00	2.20	2.20	136.21	139.24	3.31	135.93	142.53
1470.00	0.84	0.84	132.80	133.95	3.14	130.81	142.47
1480.00	0.32	0.32	127.93	128.37	2.88	125.50	142.38
1490.00	0.12	0.12	122.92	123.09	2.57	120.52	142.28
1500.00	0.05	0.05	118.27	118.33	2.25	116.08	142.20
1510.00	0.02	0.02	114.16	114.18	1.92	112.27	142.12
1520.00	0.01	0.01	110.70	110.71	1.57	109.14	142.05
1530.00	0.00	0.00	107.94	107.94	1.20	106.74	142.00
1540.00	0.00	0.00	106.00	106.01	0.73	105.27	141.96
1550.00	0.00	0.00	104.96	104.96	0.31	104.65	141.94
1560.00	0.00	0.00	104.34	104.34	0.31	104.03	141.93
1570.00	0.00	0.00	103.73	103.73	0.31	103.42	141.91
1580.00	0.00	0.00	103.11	103.11	0.31	102.80	141.90
1590.00	0.00	0.00	102.49	102.49	0.31	102.19	141.89
1600.00	0.00	0.00	101.88	101.88	0.31	101.57	141.88
1610.00	0.00	0.00	101.27	101.27	0.31	100.96	141.86
1620.00	0.00	0.00	100.66	100.66	0.30	100.35	141.85
1630.00	0.00	0.00	100.05	100.05	0.30	99.74	141.84
1640.00	0.00	0.00	99.44	99.44	0.30	99.14	141.83
1650.00	0.00	0.00	98.83	98.83	0.30	98.53	141.81
1660.00	0.00	0.00	98.23	98.23	0.30	97.93	141.80
1670.00	0.00	0.00	97.63	97.63	0.30	97.32	141.79
1680.00	0.00	0.00	97.02	97.02	0.30	96.72	141.77
1690.00	0.00	0.00	96.42	96.42	0.30	96.12	141.76
1700.00	0.00	0.00	95.82	95.82	0.30	95.52	141.75
1710.00	0.00	0.00	95.22	95.22	0.30	94.93	141.74
1720.00	0.00	0.00	94.63	94.63	0.30	94.33	141.72
1730.00	0.00	0.00	94.03	94.03	0.30	93.73	141.71

1740.00	0.00	0.00	93.44	93.44	0.30	93.14	141.70
1750.00	0.00	0.00	92.84	92.84	0.30	92.55	141.69
1760.00	0.00	0.00	92.25	92.25	0.30	91.96	141.68
1770.00	0.00	0.00	91.66	91.66	0.29	91.37	141.66
1780.00	0.00	0.00	91.07	91.07	0.29	90.78	141.65
1790.00	0.00	0.00	90.49	90.49	0.29	90.19	141.64
1800.00	0.00	0.00	89.90	89.90	0.29	89.61	141.63
1810.00	0.00	0.00	89.31	89.31	0.29	89.02	141.61
1820.00	0.00	0.00	88.73	88.73	0.29	88.44	141.60
1830.00	0.00	0.00	88.15	88.15	0.29	87.86	141.59
1840.00	0.00	0.00	87.57	87.57	0.29	87.28	141.58
1850.00	0.00	0.00	86.99	86.99	0.29	86.70	141.57
1860.00	0.00	0.00	86.41	86.41	0.29	86.12	141.55
1870.00	0.00	0.00	85.83	85.83	0.29	85.55	141.54
1880.00	0.00	0.00	85.26	85.26	0.29	84.97	141.53

2 yr Match Q: 6.0575 cfs Peak Out Q: 6.0533 cfs - Peak Stg: 144.05 ft - Active Vol: 1.5408 acft
10 yr Match Q: 10.8600 cfs Peak Out Q: 10.7863 cfs - Peak Stg: 144.89 ft - Active Vol: 1.9153 acft
25 yr Match Q: 16.5265 cfs Peak Out Q: 15.8192 cfs - Peak Stg: 145.74 ft - Active Vol: 2.3296 acft

Running H:\PROJECTS\204026300\CALCS\FACILITIES Report.pgm on Tuesday, February 28, 2006

Summary Report of all RLPool Data

Project Precips

[2 yr]	2.50 in
[10 yr]	3.45 in
[25 yr]	4.50 in

BASLIST2

[EXISTING] Using [TYPE1A] As [2 yr]
[EXISTING] Using [TYPE1A] As [10 yr]
[EXISTING] Using [TYPE1A] As [25 yr]
[DEVELOPED] Using [TYPE1A] As [2 yr]
[DEVELOPED] Using [TYPE1A] As [10 yr]
[DEVELOPED] Using [TYPE1A] As [25 yr]

LSTEND

BasinID	Peak Q	Peak T	Peak Vol	Area	Method	Raintype	Event
-------	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
EXISTING	6.0575	8.17	3.3736	32.56	SBUH/SCS	TYPE1A	2 yr
EXISTING	10.8600	8.17	5.5736	32.56	SBUH/SCS	TYPE1A	10 yr
EXISTING	16.5265	8.17	8.1487	32.56	SBUH/SCS	TYPE1A	25 yr
DEVELOPED	14.9581	8.00	5.5025	32.56	SBUH/SCS	TYPE1A	2 yr
DEVELOPED	21.7069	8.00	7.9827	32.56	SBUH/SCS	TYPE1A	10 yr
DEVELOPED	29.2338	8.00	10.7609	32.56	SBUH/SCS	TYPE1A	25 yr

BASLIST [TYPE1A] AS [2 yr] DETAILED

[EXISTING] [DEVELOPED]

LSTEND

Drainage Area: EXISTING

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	32.5600 ac	86.00	0.53 hrs	
Impervious	0.0000 ac	0.00	0.00 hrs	
Total	32.5600 ac			

Supporting Data:

Pervious CN Data:

EXISTING	86.00	32.5600 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	GRASS	300.00 ft	5.00%	0.2000	23.29 min
Shallow	GRASS	250.00 ft	5.00%	10.0000	1.86 min
Channel	GRASS	870.00 ft	5.00%	10.0000	6.48 min

Drainage Area: DEVELOPED

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	7.6900 ac	86.00	0.19 hrs	
Impervious	24.8700 ac	98.00	0.19 hrs	
Total	32.5600 ac			

Supporting Data:

Pervious CN Data:

LANDSCAPE	86.00	7.6900 ac

Impervious CN Data:

IMPERVIOUS	98.00	24.8700 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	LANDSCAPE	30.00 ft	10.00%	0.2000	2.80 min
Sheet	AC	200.00 ft	2.00%	0.0110	2.39 min
Channel	PIPE	1500.00 ft	1.00%	42.0000	5.95 min

Impervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	LANDSCAPE	30.00 ft	10.00%	0.2000	2.80 min
Sheet	AC	200.00 ft	2.00%	0.0110	2.39 min
Channel	PIPE	1500.00 ft	1.00%	42.0000	5.95 min

HYDLIST SUMMARY

[OUT2] [OUT10] [OUT25]

LSTEND

HydID	Peak Q	Peak T	Peak Vol	Cont Area
-------	(cfs)	(hrs)	(ac-ft)	(ac)
OUT2	6.05	9.00	5.6589	32.5600
OUT10	10.79	8.67	8.1306	32.5600
OUT25	15.82	8.50	10.9030	32.5600

STORLIST
[pond]
LSTEND

Node ID: pond

Desc:	Manhole structure			
Start El:	139.5000 ft		Max El:	146.0000 ft
Contrib Basin:			Contrib Hyd:	

Stage	Input	Volume	Volume
139.50	0.00 cf	0.00 cf	0.0000 acft
140.00	5484.00 cf	5484.00 cf	0.1259 acft
141.00	17947.00 cf	17947.00 cf	0.4120 acft
142.00	32350.00 cf	32350.00 cf	0.7427 acft
143.00	48366.00 cf	48366.00 cf	1.1103 acft
144.00	66095.00 cf	66095.00 cf	1.5173 acft
145.00	85597.00 cf	85597.00 cf	1.9650 acft
146.00	106932.00 cf	106932.00 cf	2.4548 acft

DISCHLIST
[orifice]
LSTEND

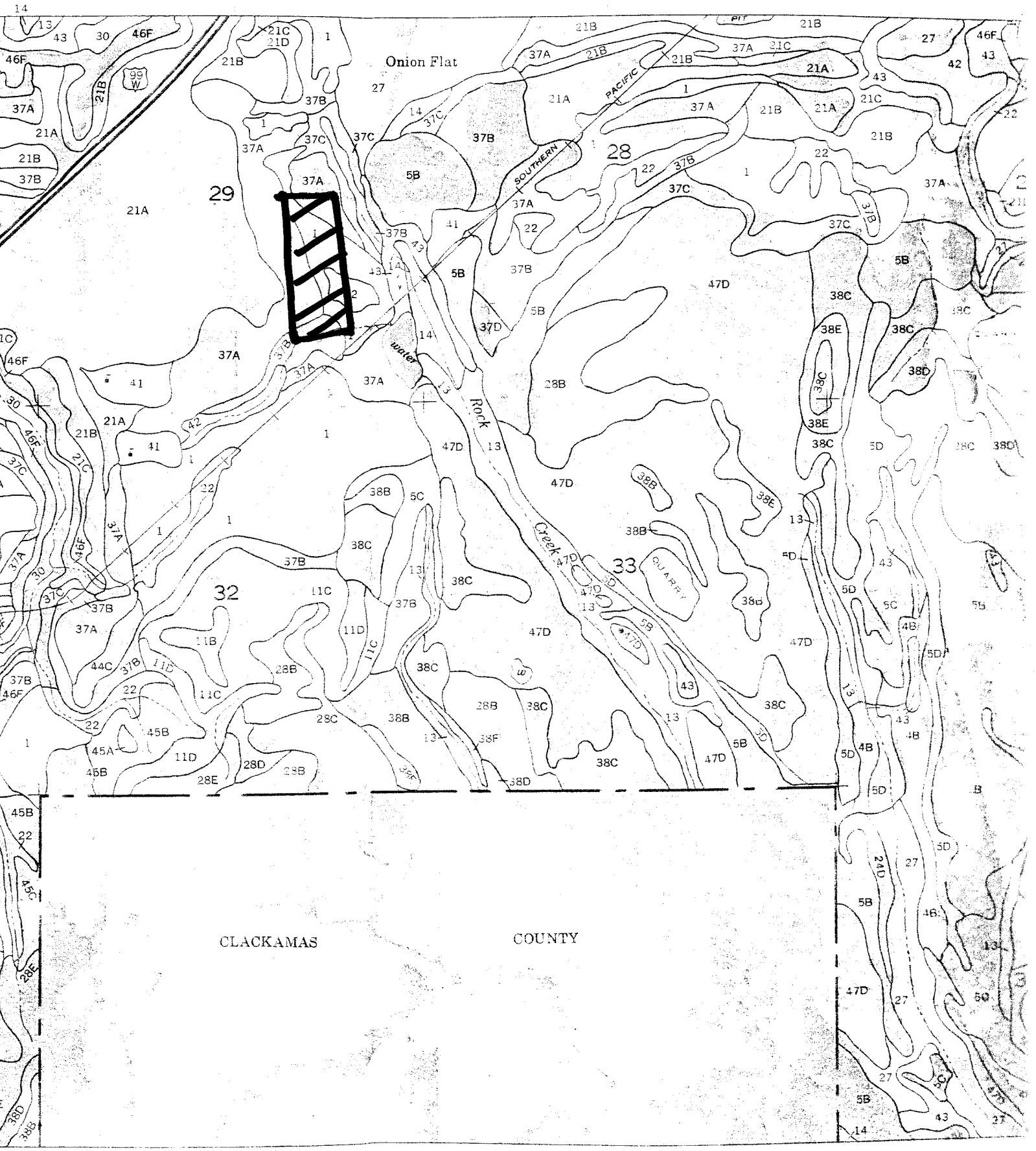
Control Structure ID: orifice - Multiple Orifice Structure

Descrip:	Multiple Orifice			
Start El	Max El	Increment		
139.0000 ft	146.5000 ft	0.10		
Orif Coeff:	0.62		Bottom El:	139.00 ft
			Lowest Diam:	2.5800 in
out to 2nd:	2.9500 ft		Diam:	11.9800 in
2nd to 3rd:	2.1500 ft		Diam:	12.3413 in
3rd to 4th:	0.8200 ft		Diam:	10.0000 in

Table III-1.3 SCS Western Washington Runoff Curve Numbers
(Published by SCS in 1982) Runoff curve numbers for selected agricultural, suburban and urban land use for Type 1A rainfall distribution, 24-hour storm duration.

LAND USE DESCRIPTION		CURVE NUMBERS BY HYDROLOGIC SOIL GROUP A	B	C	D
Cultivated land(1):	winter condition	86	91	94	95
Mountain open areas:	low growing brush & grasslands	74	82	89	92
Meadow or pasture:		65	78	85	89
Wood or forest land:	undisturbed	42	64	76	81
Wood or forest land:	young second growth or brush	55	72	81	86
Orchard:	with cover crop	81	88	92	94
Open spaces, lawns, parks, golf courses, cemeteries, landscaping.					
Good condition:	grass cover on ≥75% of the area	68	80	86	90
Fair condition:	grass cover on 50-75% of the area	77	85	90	92
Gravel roads & parking lots:		76	85	89	91
Dirt roads & parking lots:		72	82	87	89
Impervious surfaces, pavement, roofs etc.		98	98	98	98
Open water bodies:	lakes, wetlands, ponds etc.	100	100	100	100
Single family residential(2):					
Dwelling Unit/Gross Acre	%Impervious(3)				
1.0 DU/GA	15				
1.5 DU/GA	20				
2.0 DU/GA	25				
2.5 DU/GA	30				
3.0 DU/GA	34				
3.5 DU/GA	38				
4.0 DU/GA	42				
4.5 DU/GA	46				
5.0 DU/GA	48				
5.5 DU/GA	50				
6.0 DU/GA	52				
6.5 DU/GA	54				
7.0 DU/GA	56				
PUD's, condos, apartments, commercial businesses & industrial areas	%impervious must be computed	Separate curve number shall be selected for pervious & impervious portions of the site or basin			

(1) For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Sec. 4, Hydrology, Chapter 9, August 1972.
(2) Assumes roof and driveway runoff is directed into street/storm system.
(3) The remaining pervious areas (lawn) are considered to be in good condition for these curve numbers.



Scale 1:20000

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		

TABLE 13.—*Soil and*

Soil name and map symbol	Hydrologic group	Flooding		
		Frequency	Duration	Months
Klickitat: 25E, 25F, 25G	B	None		
Knappa: 26	B	None		
Labish: 27	D	Frequent	Very long	Dec-Apr
Laurelwood: 28B, 28C, 28D, 28E, 29E, 29F	B	None		
McBee: 30	B	Frequent	Brief	Nov-May
Melbourne: 31B, 31C, 31D, 31E, 31F	B	None		
Melby: 32C, 32D, 32E, 33E, 33F, 33G	C	None		
Olyic: 34C, 34D, 34E, 35E, 35F, 35G	B	None		
Pervina: 36C, 36D, 36E, 36F	C	None		
* Quatama: 37A, 37B, 37C, 37D	C	None		
Saum: 38B, 38C, 38D, 38E, 38F	C	None		
Tolke: 39E, 39F	B	None		
Udifluvents: 40	B	Frequent	Very brief	Nov-Apr
Verboort: 42	D	Frequent	Brief	Dec-Apr
Wapato: 43	D	Frequent	Brief	Dec-Apr
Willamette: 44A, 44B, 44C, 44D	B	None		
Woodburn: 45A, 45B, 45C, 45D	C	None		
Xerochrepts: [1] 46F:				
Xerochrepts part	B	None		
Haploxerolls part	C	None		
[1] 47D:				
Xerochrepts part	D	None		
Rock outcrop part.				

[1] This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

OFF-SITE FLOWS

			CN
OFF-SITE AREA	=	33 Ac	86

THE ASSUMPTION IS THAT THE UPSTREAM BASIN COMPRISING ~33 Ac WILL PROVIDE DETENTION PRIOR TO DISCHARGING TO THE PROPOSED 18" PIPE. THEREFORE THE PIPE HAS BEEN DESIGNED TO ACCOMODATE EXISTING NON DEVELOPED FLOW RATES.

By _____

Date _____

Job # _____

Sht. _____ of _____

GROUP MACKENZIE

Portland, Oregon | Seattle, Washington | Vancouver, Washington
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Off-site flows

Sherwood Industrial Project
January 6, 2006
Project #2040263

Off-site Event Summary:

BasinID	Peak Q Event	Peak T	Peak Vol	Area	Method	Raintype	
-------	(cfs)	(hrs)	(ac-ft)	ac	/Loss		
Off-site	9.66	8.17	5.6489	33.00	SBUH/SCS	TYPE1A	10 yr

Drainage Area: Off-site

Hyd Method:	SBUH Hyd		Loss Method:	SCS CN Number
Peak Factor:	484.00		SCS Abs:	0.20
Storm Dur:	24.00 hrs		Intv:	10.00 min
	Area	CN	TC	
Pervious	33.0000 ac	86.00	0.73 hrs	
Impervious	0.0000 ac	0.00	0.00 hrs	
Total	33.0000 ac			

Supporting Data:

Pervious CN Data:

Off-site contributing area	86.00	33.0000 ac

Pervious TC Data:

Flow type:	Description:	Length:	Slope:	Coeff:	Travel Time
Sheet	Sheet flow	300.00 ft	2.00%	0.2400	38.88 min
Shallow	overland flow	300.00 ft	2.00%	10.0000	3.54 min
Channel	grass	200.00 ft	2.00%	17.0000	1.39 min

Pipe Sizing Calculation

Based on SCS flow inputs
(Flows calculated in "Stormshed")

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Project: Sherwood Industrial Park -Offsite
By: rlf
Date: 1/6/2006
Job: 2040263

Mannings n= 0.012

Link #	Storm Input Descriptions	Incremental Flow (cfs)	Total Flow (cfs)	Pipe Slope (%)	Pipe Diameter (inches)	Pipe Capacity (cfs)	Pipe Velocity (fps)
1	Off-site	9.66	9.66	1.11	18	11.97	6.78

0 150 300 600 Feet

SCALE

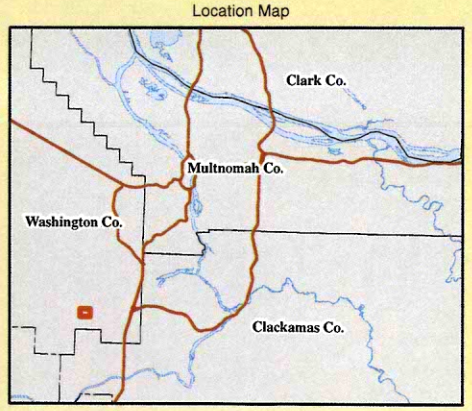
Source Data

Base Data, Metro RLIS Lite, November 2005

Geographic Projection Information

NAD 83 HARN, Oregon North
Lambert Conformal Conic

Location Map



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Date: 1/05/06
File: Sherwood_riff.mxd

Map Created by: RK
Project No:

FRICTION LOSS IN PIPE

h_f = SLOPE REQUIRED

$$AR^{2/3} = \frac{Qn}{1.486\ (s)^{1/2}}$$

$$s^{1/2} = \frac{Qn}{1.486\ AR^{2/3}}$$

$$s = \left[\frac{Qn}{1.486\ AR^{2/3}}\right]^2$$

$$s = \left[\frac{16.52 * 0.012}{1.486 * 3.141\left[0.5\right]^{2/3}}\right]^2$$

$$s = 0.0045\ ft/ft$$

$$h_f = 0.0045 \times 22' = 0.10' = 1.20''$$

$Q = 16.52$ cfs (25 YR)

$A = 3.141\ ft^2$

$R = \frac{A}{P} = \frac{3.141}{6.282} = 0.5$

$n = 0.012$

By

Date

Job #

Sht. of

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