ENGINEERING

PLANNING

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STORMWATER DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING

COOL SPRINGS BUSINESS PARK
CITY OF O'FALLON, MISSOURI
BAX PROJECT NO. 99-10639C
November 28, 2007

INTRODUCTION

This tract of land presently consists of four buildings with gravel driveways. The proposed land use for this tract is to demolish all existing improvements and construct a business park consisting of three office/warehouse buildings. The overall area of this tract is approximately 3.76 acres. This tract of land currently has three watersheds as shown on the pre-developed drainage area map included with this report. Two of the watersheds, #1 & #2, are tributary to Belleau Creek which lies to the east of this tract. Watershed #3 discharges at the southwest corner of the site via a roadside ditch along South Cool Springs Road. Watershed #1 is tributary to an unnamed tributary of Belleau Creek.

The purpose of this report is to analyze the existing and proposed site runoff conditions and detail the design of the proposed underground detention facility. The proposed underground detention facility will be constructed to proportion the post-developed runoff from the site to rates that are less than or equal to the existing discharge rates from the site.

The detention requirements for the City of O'Fallon require that all proposed developments provide detention for the 2 yr, 15 yr and 25 yr 20 minute design storms. Sites that are within either the Peruque or Belleau Creek watersheds must also provide detention for the 100 yr, 20 minute design storm.

STATE OF MISSOURI
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GENERAL SITE AND RUNOFF CALCULATIONS

The pre-developed and post-developed P.I. factors used in the analysis are:

LAND USAGE	2 YEAR	15 YEAR	25 YEAR	100 YEAR
OPEN SPACE 5% IMPERVIOUS	1.15 CFS/AC	1.87 CFS/AC	2.31 CFS/AC	2.95 CFS/AC
PAVEMENT/BUILDINGS 100% IMPERVIOUS	2.39 CFS/AC	3.85 CFS/AC	4.75 CFS/AC	6.08 CFS/AC

EXISTING CONDITIONS

Existing site conditions include impervious as well as pervious areas. These conditions will be broken into three watersheds, all with separate discharge points from the existing site.

Watershed #1

Watershed #1 is the largest of the three existing watersheds and includes offsite runoff coming onsite. Watershed #1 discharges at the southeast edge of the property and is tributary to Belleau Creek. The onsite drainage area consists of 3.17 acres, offsite drainage areas include approximately 0.28 acres. Onsite drainage areas include impervious as well as pervious areas. Offsite drainage areas include South Cool Springs Road and its right of way, along with undeveloped areas to the southwest of the site from the property of Richard and Sandra Thompson. Stormwater runoff produced by watershed #1 is calculated as follows:

15 yr, 20 minute storm:

3.01 ac(1.87 cfs/ac) + 0.44 ac(3.85 cfs/ac) = 7.32 cfs

2 yr, 20 minute:	4.51 cfs
15 yr, 20 minute:	7.32 cfs
25 yr, 20 minute:	9.04 cfs
100 yr, 20 minute:	11.55 cfs

Watershed #2

Watershed #2 drains to the north of the site and is tributary to Belleau Creek. Watershed #2 consists of approximately 0.52 acres of onsite runoff that discharges to the north of the

site onto property owned by Buel and Imogene Hudson. This watershed includes impervious as well as pervious areas. Stormwater runoff produced by watershed #2 is calculated as follows:

15 yr, 20 minute storm:

0.47 ac(1.87cfs/ac) + 0.05 ac(3.85 cfs/ac) = 1.07 cfs

2 yr, 20 minute:	0.66 cfs
15 yr, 20 minute:	1.07 cfs
25 yr, 20 minute:	1.32 cfs
100 yr, 20 minute:	1.69 cfs

Watershed #3

Watershed #3 is the smallest of the three watersheds, consisting of approximately 0.07 ac. Watershed #3 includes impervious as well as pervious areas. This watershed discharges to the southwest edge of the property to a roadside ditch along South Cool Springs Rd. This watershed is tributary to an unnamed tributary of Belleau Creek. Stormwater runoff produced by this watershed is calculated as follows:

15 yr, 20 minute storm:

0.05 ac(1.87 cfs/ac) + 0.02 ac(3.85 cfs/ac) = 0.17 cfs

2 yr, 20 minute:	0.11 cfs
15 yr, 20 minute:	0.17 cfs
25 yr, 20 minute:	0.21 cfs
100 yr, 20 minute:	0.27 cfs

PROPOSED CONDITIONS

The proposed site will have two ultimate outfall points, #1 and #2, both of which are tributary to Belleau Creek. Due to the proposed grading in watershed #3, this drainage area will be re-directed to the east and will no longer discharge to the roadside ditch along South Cool Springs Road.

Outfall Point #1

Outfall point #1 includes areas from existing watershed #1, #2 & #3 with an overall area of approximately 3.58 acres. An underground detention basin is proposed to attenuate the differential runoff produced by this watershed.

Proposed Runoff

The proposed runoff to outfall point #1 is calculated as follows:

15 yr, 20 minute storm:

1.14 ac(1.87 cfs/ac) + 2.44 ac(3.85 cfs/ac) = 11.53 cfs

2 yr, 20 minute:	7.39 cfs
15 yr, 20 minute:	11.53 cfs
25 yr, 20 minute:	14.22 cfs
100 yr, 20 minute:	18.20 cfs

Required Attenuation

The required attenuation is the amount of runoff that must be detained in the detention basin to ensure that no increase in runoff to outfall point #1 will occur. The required attenuation is the difference between the proposed runoff to the outfall point and the existing runoff to the outfall point. The required attenuation for outfall point #1 is calculated as follows.

15 yr, 20 minute storm:

11.53 cfs – 7.32 cfs = 4.21 cfs

2 yr, 20 minute:	2.88 cfs
15 yr, 20 minute:	4.21 cfs
25 yr, 20 minute:	5.18 cfs
100 yr, 20 minute:	6.65 cfs

Basin Inflows

Inflows to the detention basin have been estimated from the post-developed drainage area map included with this report. Approximately 2.39 acres are tributary to the detention basin. Total basin inflows are calculated as follows.

15 yr, 20 minute storm:

0.12 ac(1.87 cfs/ac) + 2.27 ac(3.85 cfs/ac) = 8.96 cfs

2 yr, 20 minute:	5.56 cfs
15 yr, 20 minute:	8.96 cfs
25 yr, 20 minute:	11.06 cfs
100 yr, 20 minute:	14.16 cfs

Allowable Release Rate

The allowable release rate is the maximum rate of discharge from the detention basin that will ensure no increase in runoff to outfall point #1. By subtracting the required attenuation from the basin inflow, any direct runoff plus the basin outfall will be less than or equal to the existing discharge to outfall point #1. The allowable release rate is calculated as follows.

15 yr, 2 minute storm:

8.96 cfs – 4.21 cfs = 4.75 cfs

2 yr, 20 minute:	2.68 cfs
15 yr, 20 minute:	4.75 cfs
25 yr, 20 minute:	5.88 cfs
100 yr, 20 minute:	7.51 cfs

Time of Concentration

The time of concentration is the amount of time from the beginning of the storm event until the detention basin will receive peak flow from all contributing drainage areas. The time of concentration flow path is indicated on the post developed drainage area map included with this report. The time of concentration flow path begins offsite to the west at the centerline of South Cool Springs Rd.. Flow proceeds from this point as sheet flow for approximately 286 feet until it enters the storm sewer system at AI 105. See the attached nomograph for a calculation of the time of concentration for sheet flow. From

AI 105 flow continues as channel flow for approximately 304 ft until entering the underground detention basin at MH 102. In order to calculate the travel time in the storm sewer an average velocity of 7 ft./sec has been assumed. The time of concentration for this basin is the sum of the time for the shallow concentrated flow plus the travel time in the storm sewer. This result is presented below.

$T_c = T_{shallow} + T_{sewer}$

$T_{shallow} = 0.90$ minutes

$T_{sewer} = 304$ ft x sec/7 ft x 1 min/60 sec = 0.72 min

$T_c = 0.90$ min + 0.72 min = 1.62 min $\approx$ 2.00 min

Use 2.00 min for Time of Concentration

Routing Results

A computer program, "Pond Pack V.10," has been used to route the required design storms through the proposed underground detention basin. Please see the attached Pond Pack data summary for a detailed calculation, a summary of these results is presented here.

DESIGN STORM	BASIN PEAK INFLOW	ALLOWABLE RELEASE RATE	CALCULATED RELEASE	ELEVATION
2 YR, 20 MIN	5.56 CFS	2.68 CFS	2.61 CFS	473.18 FT
15 YR, 20 MIN	8.96 CFS	4.75 CFS	4.61 CFS	473.68 FT
25 YR, 20 MIN	11.06 CFS	5.88 CFS	5.73 CFS	473.96 FT
100 YR, 20 MIN	14.16 CFS	7.51 CFS	7.46 CFS	474.40 FT

Low Flow Blocked

The proposed detention basin must be capable of providing temporary storage of the 100 yr, 20 minute design storm assuming the low flow slot is blocked with water ponded to the crest of the emergency spillway. Pond Pack V.10 has been used to route the 100 yr, 20 minute storm through the outfall structure assuming water is ponded to crest of the

emergency spillway at 474.00 ft. Please see the attached Pond Pack routing calculations for a detailed calculation, the result of this routing is presented below.

100 yr, 20 minute LFB Highwater = 475.29 ft

Verify Detention

In order to verify the detention basin is providing sufficient attenuation of the differential runoff to outfall point #1 we must add the outflow from the detention basin and any direct runoff to outfall point #1. Direct runoff is shown on the post developed drainage area map included with this report, basin outflows have been calculated using Pond Pack V.10 as shown earlier in this report. By comparing the total proposed runoff with the existing runoff to this point we conclude that the proposed detention basin is providing sufficient detention for the proposed development.

DESIGN STORM	EXISTING RUNOFF	BASIN OUTFLOW	DIRECT RUNOFF	PROPOSED RUNOFF
2 YR, 20 MINUTE	4.51 CFS	2.61 CFS	1.58 CFS	4.19 CFS
15 YR, 20 MINUTE	7.32 CFS	4.61 CFS	2.56 CFS	7.17 CFS
25 YR, 20 MINUTE	9.04 CFS	5.73 CFS	3.16 CFS	8.89 CFS
100 YR, 20 MINUTE	11.55 CFS	7.46 CFS	4.04 CFS	11.50 CFS

Description of Outfall Structure and Detention Basin

The proposed detention basin will consist of 229 StormTech SC-740 underground storage chambers. The stormtech chambers are perforated plastic arches surrounded by ¾" to 2" clean angular stone to provide stability and strength. The chambers and the voids in the surrounding stone matrix provide the temporary storage volume necessary to attenuate the differential runoff produced by development of this site. In addition to providing detention storage, the chambers provide "first flush" treatment of stormwater by temporarily holding the sediment laden runoff in "isolation rows". In order to prevent contamination of the adjacent cells and the surrounding storage media, the isolation rows will have a non-woven geotextile placed between the bottom of the chambers and the stone base as well as wrapping the outside of the isolation row with a non-woven geotextile. Details of the proposed stormwater chamber are included on the construction plans and with this report. The stormwater chambers are allowed to de-water using a 6" PVC underdrain connected to the outfall structure.

The outfall structure will consist of a 10'x 5' concrete box structure with a barrier wall between the outfall pipe and the detention basin. The barrier wall will consist of a series of weirs and orifices which will meter the outflow from the detention basin to acceptable rates for each design storm. The low flow slot will be 11.50"W x 6.00"H with a flow line of 471.65. Above the low flow slot will be an upper flow slot 18.00"W x 5.50"H with a flow line of 473.20. A third slot will be 9.00"W x 4.80"H with a flow line of 474.00. The barrier wall will also include an emergency spillway located above the control features. The emergency spillway will be a 4.25' wide weir with a flow line elevation of 474.40. The emergency spillway will protect the detention basin from damage resulting from extreme flows including the 100 yr, 20 minute low flow blocked routing. A detail of the proposed outfall structure is included on the construction plans as well as with this report.

The outfall pipe will consist of approximately 36 feet of 30" RCP with an upper flow line of 470.36 and a lower flow line of 470.00. The outfall pipe has been sized to handle the runoff produced by the 100 yr, 20 minute design storm.

A profile of the proposed outfall pipe and underground detention basin can be found on the construction plans.

Outfall Point #2

Outfall point #2 includes the remaining areas from watershed #2 that are not being directed to the detention basin. The tributary watershed for outfall point #2 includes approximately 0.36 acres. Detention is not proposed for this outfall point, this analysis will show a decreased rate of runoff to outfall point #2 under post developed site conditions.

Proposed Runoff

Proposed runoff for outfall point #2 has been estimated from the post developed drainage area map included with this report. A summary of these calculations is presented here.

15 yr, 20 minute storm

0.36 ac(1.87 cfs/ac) = 0.67 cfs

2 yr, 20 minute:	0.41 cfs
15 yr, 20 minute:	0.67 cfs
25 yr, 20 minute:	0.83 cfs
100 yr, 20 minute:	1.06 cfs

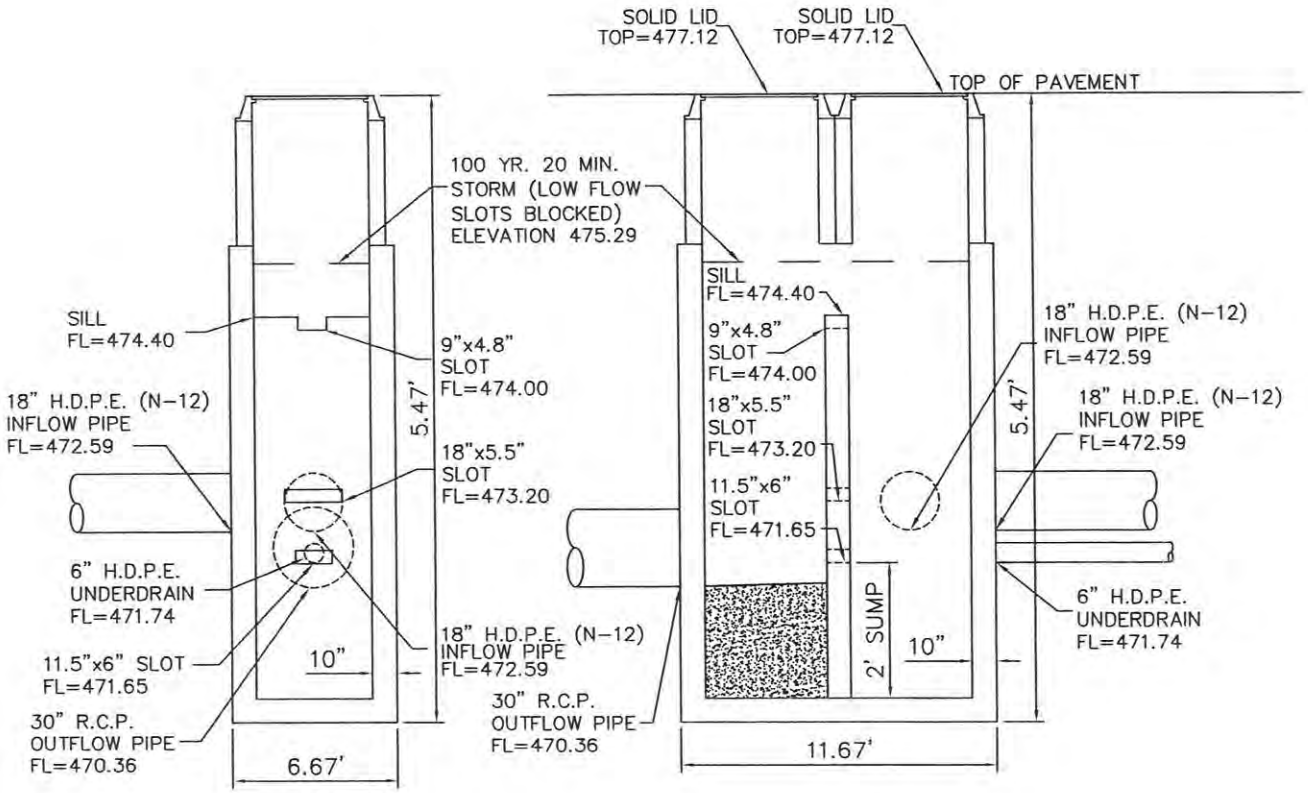
DESIGN STORM	PROPOSED RUNOFF	-	EXISTING RUNOFF	=	DIFFERENTIAL RUNOFF
2 YR, 20 MINUTE	0.41 CFS	-	0.66 CFS	=	- 0.25 CFS
15 YR, 20 MINUTE	0.67 CFS	-	1.07 CFS	=	- 0.40 CFS
25 YR, 20 MINUTE	0.83 CFS	-	1.32 CFS	=	- 0.49 CFS
100 YR, 20 MINUTE	1.06 CFS	-	1.69 CFS	=	- 0.63 CFS

The table shows that the proposed runoff to outfall point #2 is less than the existing runoff to outfall point #2. Based on the decrease in runoff, no detention will be provided for outfall point #2.

SUMMARY

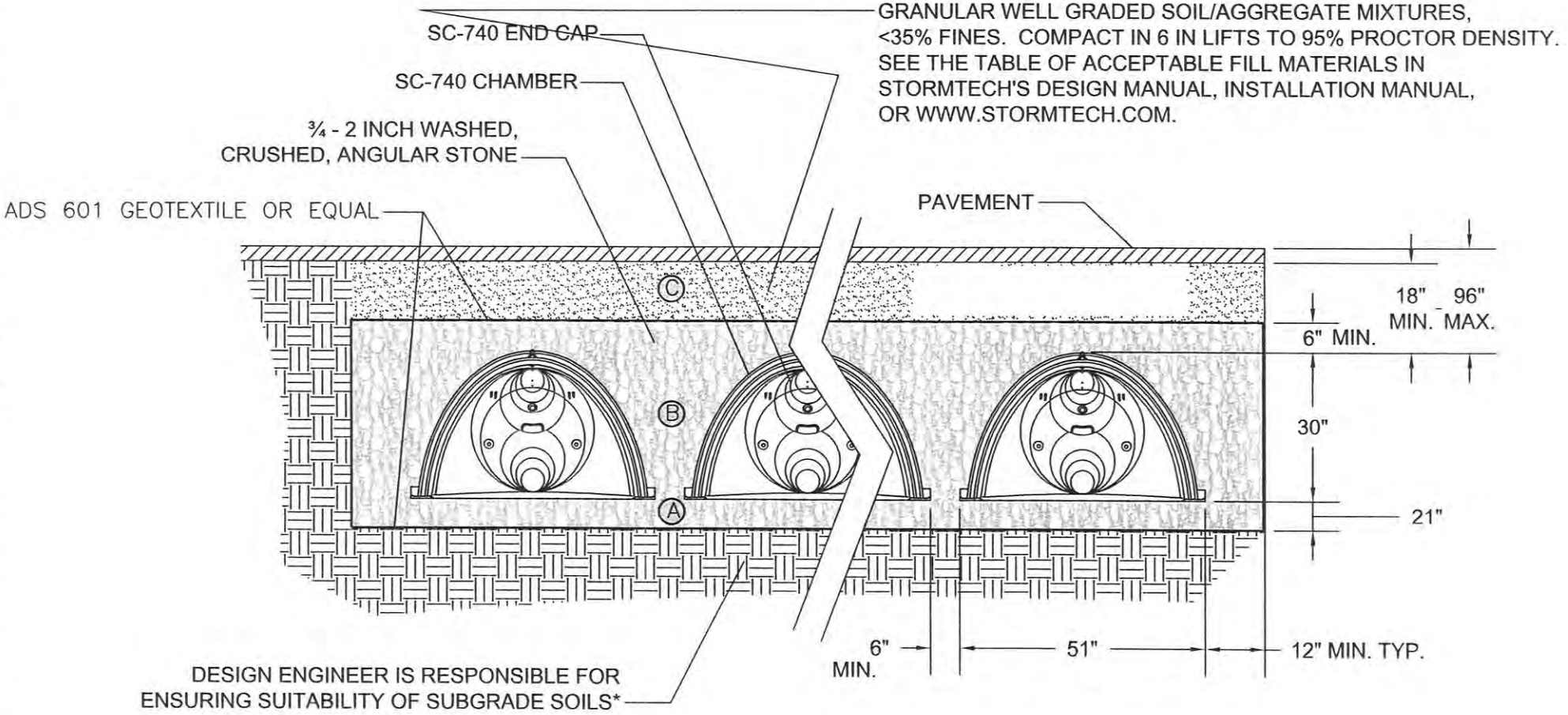
2 yr, 20 min H.W.	473.18 ft.
15 yr, 20 min H.W.	473.68 ft.
25 yr, 20 min H.W.	473.96 ft.
100 yr, 20 min H.W.	474.40 ft.
100 yr, 20 min low flow blocked H.W.	475.29 ft.
LOW-FLOW OUTLET	11.50"W x 6.00"H
LOW-FLOW SILL ELEVATION	471.65 ft.
UPPER-FLOW OUTLET	18.00"W x 5.50"H
UPPER-FLOW SILL ELEVATION	473.20 ft.
UPPER-FLOW OUTLET	9.00"W x 4.80"H
UPPER-FLOW SILL ELEVATION	474.00 ft.
EMERGENCY SPILLWAY	4.25' Wide Weir
EMERGENCY SPILLWAY ELEVATION	474.40 ft.
TOP OF OUTFALL STRUCTURE	477.12 ft.
FREEBOARD (100 yr, 20 min LFB H.W.)	1.83 ft.

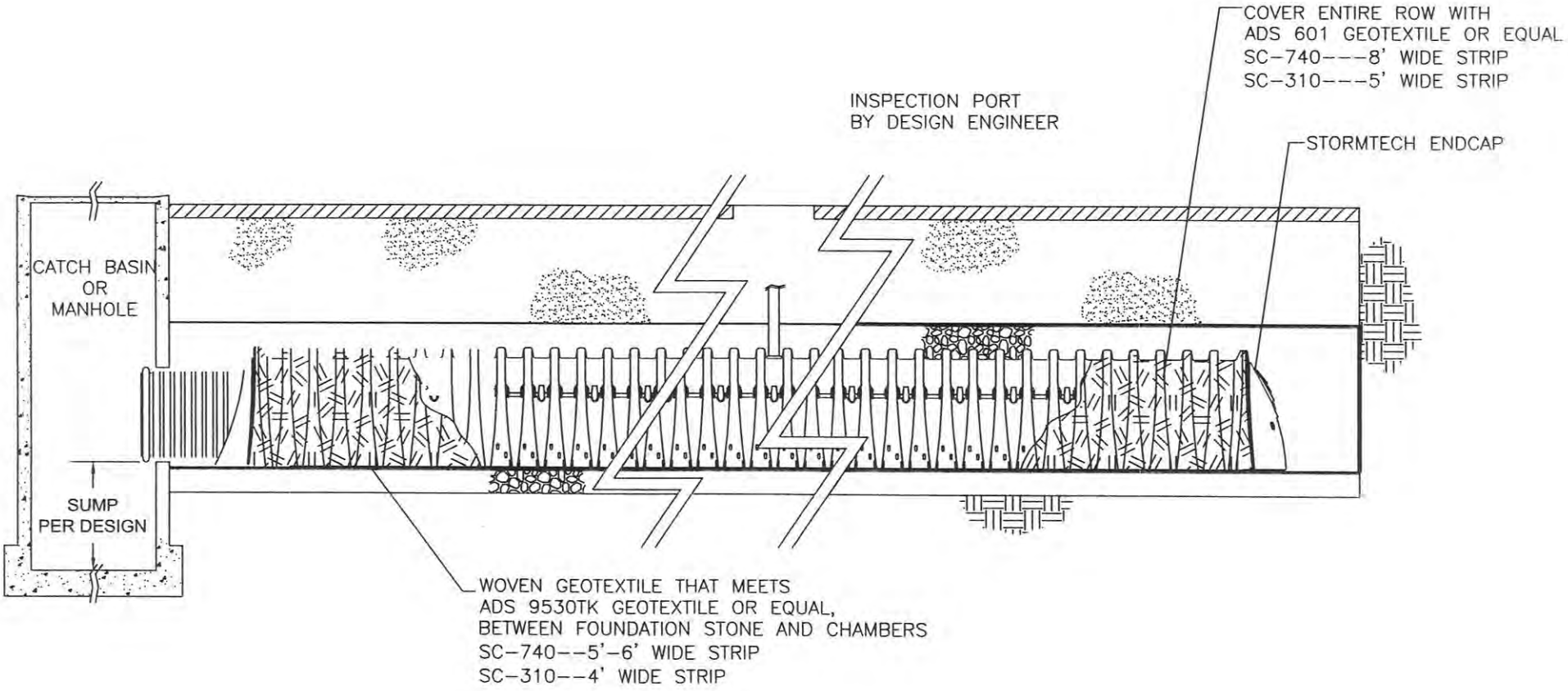
STRUCTURE DETAILS



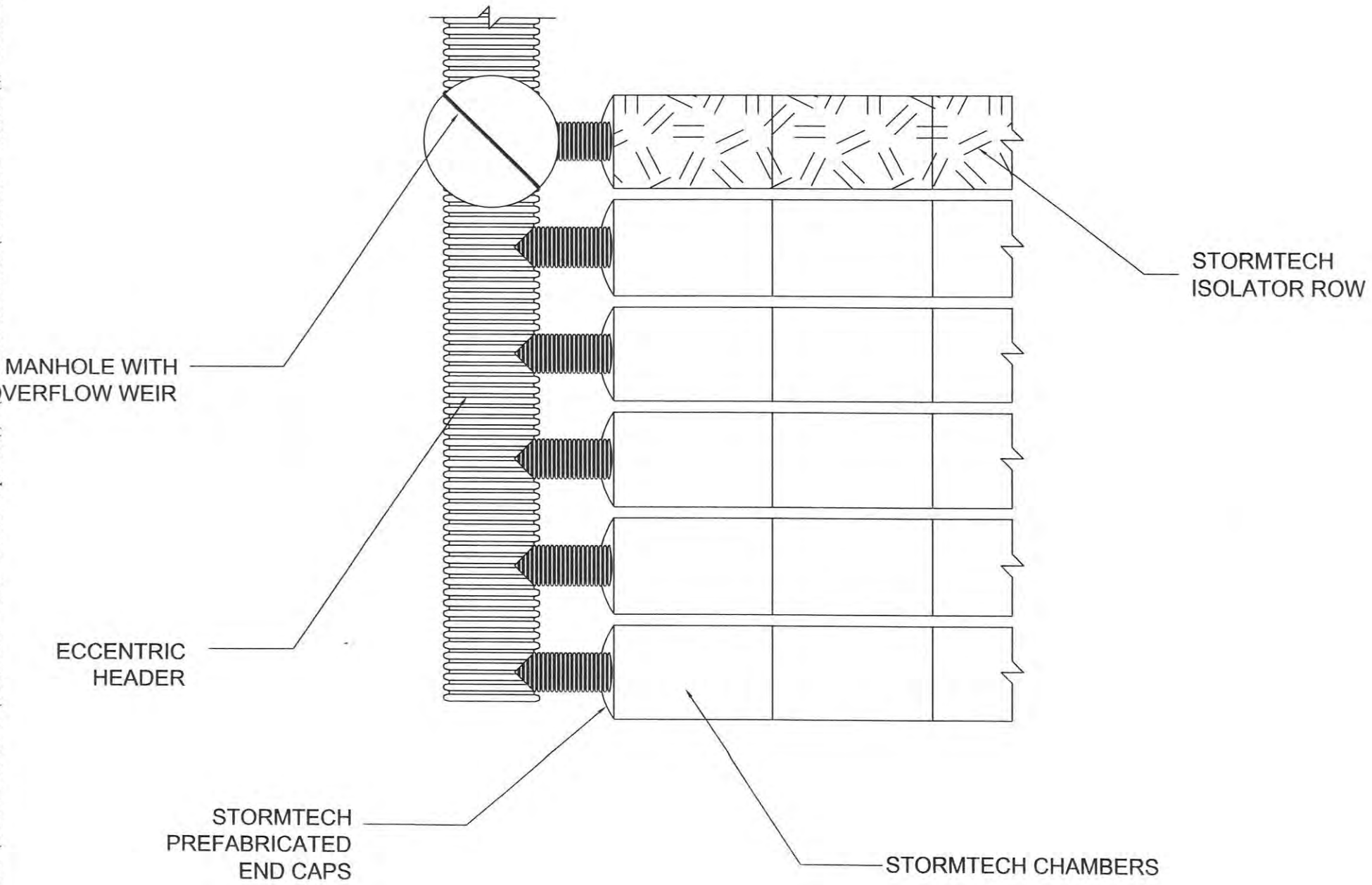
OUTFALL STRUCTURE
SOUTH ELEVATION
NOT TO SCALE

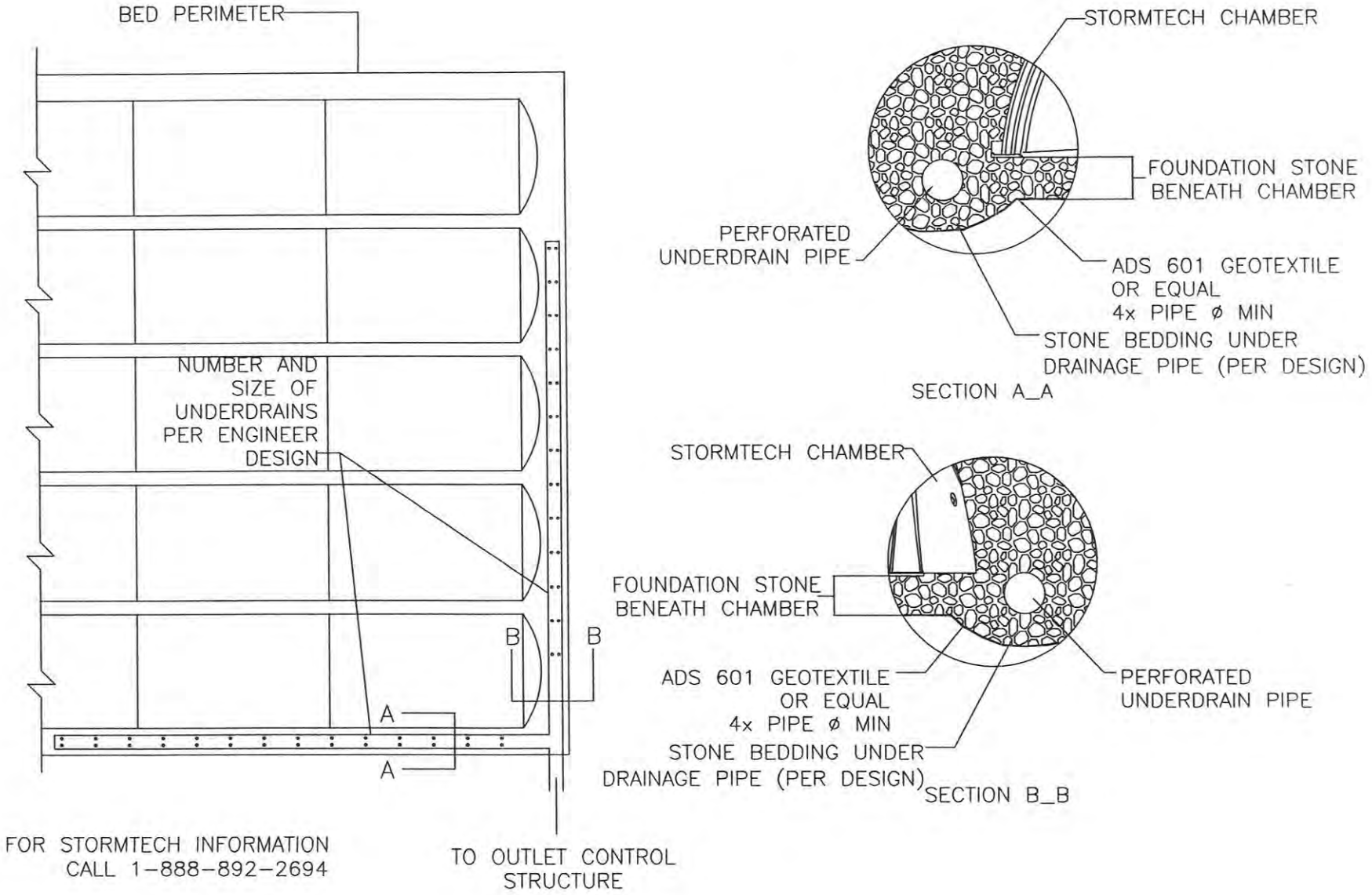
OUTFALL STRUCTURE
EAST ELEVATION
NOT TO SCALE





STORMTECH ISOLATOR ROW DETAIL
N.T.S.





STORMTECH UNDERDRAIN DETAIL
N.T.S.

STORMTECH PRODUCT SPECIFICATIONS

1.0 GENERAL

1.1 STORMTECH CHAMBERS ARE DESIGNED TO CONTROL STORMWATER RUNOFF. AS A SUBSURFACE RETENTION SYSTEM, STORMTECH CHAMBERS RETAIN AND ALLOW EFFECTIVE INFILTRATION OF WATER INTO THE SOIL. AS A SUBSURFACE DETENTION SYSTEM, STORMTECH CHAMBERS DETAIN AND ALLOW FOR THE METERED FLOW OF WATER TO AN OUTFALL.

2.0 CHAMBER PARAMETERS

2.1 THE CHAMBER SHALL BE INJECTION MOLDED OF POLYPROPYLENE RESIN TO BE INHERENTLY RESISTANT TO ENVIRONMENTAL STRESS CRACKING (ESCR), AND TO MAINTAIN ADEQUATE STIFFNESS THROUGH HIGHER TEMPERATURES EXPERIENCED DURING INSTALLATION AND SERVICE.

2.2 THE NOMINAL CHAMBER DIMENSIONS OF THE STORMTECH SC-740 SHALL BE 30.0 INCHES TALL, 51.0 INCHES WIDE AND 90.7 INCHES LONG. THE NOMINAL CHAMBER DIMENSIONS OF THE STORMTECH SC-310 SHALL BE 16.0 INCHES TALL, 34.0 INCHES WIDE AND 90.7 INCHES LONG. THE INSTALLED LENGTH OF A JOINED CHAMBER SHALL BE 85.4 INCHES.

2.3 THE CHAMBER SHALL HAVE A CONTINUOUSLY CURVED SECTION PROFILE.

2.4 THE CHAMBER SHALL BE OPEN-BOTTOMED.

2.5 THE CHAMBER SHALL INCORPORATE AN OVERLAPPING CORRUGATION JOINT SYSTEM TO ALLOW CHAMBER ROWS OF ALMOST ANY LENGTH TO BE CREATED. THE OVERLAPPING CORRUGATION JOINT SYSTEM SHALL BE EFFECTIVE WHILE ALLOWING A CHAMBER TO BE TRIMMED TO SHORTEN ITS OVERALL LENGTH.

2.6 THE NOMINAL STORAGE VOLUME OF A JOINED STORMTECH SC-740 CHAMBER SHALL BE 74.9 CUBIC FEET PER CHAMBER WHEN INSTALLED PER STORMTECH'S TYPICAL DETAILS (INCLUDES THE VOLUME OF CRUSHED ANGULAR STONE WITH AN ASSUMED 40% POROSITY). THIS EQUATES TO 2.2 CUBIC FEET OF STORAGE/SQUARE FOOT OF BED. THE NOMINAL STORAGE VOLUME OF AN INSTALLED STORMTECH SC-310 CHAMBER SHALL BE 31.0 CUBIC FEET PER CHAMBER WHEN INSTALLED PER STORMTECH'S TYPICAL DETAILS (INCLUDES THE VOLUME OF CRUSHED ANGULAR STONE WITH AN ASSUMED 40% POROSITY). THIS EQUATES TO 1.3 CUBIC FEET OF STORAGE/SQUARE FOOT OF BED.

2.7 THE CHAMBER SHALL HAVE FORTY-EIGHT ORIFICES PENETRATING THE SIDEWALLS TO ALLOW FOR LATERAL CONVEYANCE OF WATER.

2.8 THE CHAMBER SHALL HAVE TWO ORIFICES NEAR ITS TOP TO ALLOW FOR EQUALIZATION OF AIR PRESSURE BETWEEN ITS INTERIOR AND EXTERIOR.

2.9 THE CHAMBER SHALL HAVE BOTH OF ITS ENDS OPEN TO ALLOW FOR UNIMPEDED HYDRAULIC FLOWS AND VISUAL INSPECTIONS DOWN A ROW'S ENTIRE LENGTH.

2.10 THE CHAMBER SHALL HAVE 14 CORRUGATIONS.

2.11 THE CHAMBER SHALL HAVE A CIRCULAR, INDENTED, FLAT SURFACE ON THE TOP OF THE CHAMBER FOR AN OPTIONAL 4-INCH INSPECTION PORT OR CLEAN-OUT.

2.12 THE CHAMBER SHALL BE ANALYZED AND DESIGNED USING AASHTO METHODS FOR THERMOPLASTIC CULVERTS CONTAINED IN THE LRFD BRIDGE DESIGN SPECIFICATIONS, 2ND EDITION, INCLUDING INTERIM SPECIFICATIONS THROUGH 2001. DESIGN LIVE LOAD SHALL BE THE AASHTO HS20 TRUCK. DESIGN SHALL CONSIDER EARTH AND LIVE LOADS AS APPROPRIATE FOR THE MINIMUM TO MAXIMUM SPECIFIED DEPTH OF FILL.

2.13 THE CHAMBER SHALL BE MANUFACTURED IN AN ISO 9001:2000 CERTIFIED FACILITY.

3.0 END CAP PARAMETERS

3.1 THE END CAP SHALL BE INJECTION MOLDED OF POLYPROPYLENE RESIN TO BE INHERENTLY RESISTANT TO ENVIRONMENTAL STRESS CRACKING, AND TO MAINTAIN ADEQUATE STIFFNESS THROUGH HIGHER TEMPERATURES EXPERIENCED DURING INSTALLATION AND SERVICE.

3.2 THE END CAP SHALL BE DESIGNED TO FIT INTO ANY CORRUGATION OF A CHAMBER, WHICH ALLOWS: CAPPING A CHAMBER THAT HAS ITS LENGTH TRIMMED; SEGMENTING ROWS INTO STORAGE BASINS OF VARIOUS LENGTHS.

3.3 THE END CAP SHALL HAVE SAW GUIDES TO ALLOW EASY CUTTING FOR VARIOUS DIAMETERS OF PIPE THAT MAY BE USED TO INLET THE SYSTEM.

3.4 THE END CAP SHALL HAVE EXCESS STRUCTURAL ADEQUACIES TO ALLOW CUTTING AN ORIFICE OF ANY SIZE AT ANY INVERT ELEVATION.

3.5 THE PRIMARY FACE OF AN END CAP SHALL BE CURVED OUTWARD TO RESIST HORIZONTAL LOADS GENERATED NEAR THE EDGES OF BEDS.

3.6 THE END CAP SHALL BE MANUFACTURED IN AN ISO 9001:2000 CERTIFIED FACILITY.

STORMTECH GENERAL NOTES

1. STORMTECH LLC ("STORMTECH") REQUIRES INSTALLING CONTRACTORS TO USE AND UNDERSTAND STORMTECH'S LATEST INSTALLATION INSTRUCTIONS PRIOR TO BEGINNING SYSTEM INSTALLATION.

2. OUR TECHNICAL SERVICES DEPARTMENT OFFERS INSTALLATION CONSULTATIONS TO INSTALLING CONTRACTORS. CONTACT OUR TECHNICAL SERVICES REPRESENTATIVE AT LEAST 30 DAYS PRIOR TO SYSTEM INSTALLATION TO ARRANGE A PRE-INSTALLATION CONSULTATION. OUR REPRESENTATIVES CAN THEN ANSWER QUESTIONS OR ADDRESS COMMENTS ON THE STORMTECH CHAMBER SYSTEM AND INFORM THE INSTALLING CONTRACTOR OF THE MINIMUM INSTALLATION REQUIREMENTS BEFORE BEGINNING THE SYSTEM'S CONSTRUCTION. CALL JIM SURRELL AT 1-314-616-1058 FOR PRICING AND/OR INSTALLATION QUESTIONS OR VISIT WWW.STORMTECH.COM TO RECEIVE A COPY OF OUR INSTALLATION INSTRUCTIONS.

3. STORMTECH'S REQUIREMENTS FOR SYSTEMS WITH PAVEMENT DESIGN (ASPHALT, CONCRETE PAVERS, ETC.): MINIMUM COVER IS 18 INCHES NOT INCLUDING PAVEMENT; MAXIMUM COVER IS 96 INCHES INCLUDING PAVEMENT. FOR INSTALLATIONS THAT DO NOT INCLUDE PAVEMENT, WHERE RUTTING FROM VEHICLES MAY OCCUR, MINIMUM REQUIRED COVER IS 24 INCHES, MAXIMUM COVER IS 96 INCHES.

4. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE DESIGN ENGINEER.

5. AASHTO M288 CLASS 2 NON-WOVEN GEOTEXTILE (FILTER FABRIC) MUST BE USED AS INDICATED IN THE PROJECT PLANS.

6. STONE PLACEMENT BETWEEN CHAMBERS ROWS AND AROUND PERIMETER MUST FOLLOW INSTRUCTIONS AS INDICATED IN THE MOST CURRENT VERSION OF STORMTECH'S INSTALLATION INSTRUCTIONS.

7. BACKFILLING OVER THE CHAMBERS MUST FOLLOW REQUIREMENTS AS INDICATED IN THE MOST CURRENT VERSION OF STORMTECH'S INSTALLATION INSTRUCTIONS.

8. THE CONTRACTOR MUST REFER TO STORMTECH'S INSTALLATION INSTRUCTIONS FOR A TABLE OF ACCEPTABLE VEHICLE LOADS AT VARIOUS DEPTHS OF COVER. THIS INFORMATION IS ALSO AVAILABLE AT STORMTECH'S WEBSITE: WWW.STORMTECH.COM. THE CONTRACTOR IS RESPONSIBLE FOR PREVENTING VEHICLES THAT EXCEED STORMTECH'S REQUIREMENTS FROM TRAVELING ACROSS OR PARKING OVER THE STORMWATER SYSTEM. TEMPORARY FENCING, WARNING TAPE AND APPROPRIATELY LOCATED SIGNS ARE COMMONLY USED TO PREVENT UNAUTHORIZED VEHICLES FROM ENTERING SENSITIVE CONSTRUCTION AREAS.

9. THE CONTRACTOR MUST APPLY EROSION AND SEDIMENT CONTROL MEASURES TO PROTECT THE STORMWATER SYSTEM DURING ALL PHASES OF SITE CONSTRUCTION PER LOCAL CODES AND DESIGN ENGINEER'S SPECIFICATIONS.

10. STORMTECH PRODUCT WARRANTY IS LIMITED. SEE CURRENT PRODUCT WARRANTY FOR DETAILS. TO ACQUIRE A COPY CALL STORMTECH AT 1-888-892-2694 OR VISIT WWW.STORMTECH.COM.

POND 10
Routing Calculations for
2, 15, 25 and 100 Year 20 Minute Design Storms

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NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

	Node ID	Type	HYG Vol cu.ft	Trun.	Qpeak min	Qpeak cfs	Max WSEL ft
	HYD QUEUE 20	HYG	6672		2.00	5.56	
Outfall	OUT 10	JCT	6672		21.00	2.61	
	STORM CHAMBERIN	POND	6672		2.00	5.56	
	STORM CHAMBEROUT	POND	6672		21.00	2.61	473.18

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

	Node ID	Type	HYG Vol cu.ft	Trun.	Qpeak min	Qpeak cfs	Max WSEL ft
	HYD QUEUE 20	HYG	10752		2.00	8.96	
Outfall	OUT 10	JCT	10752		21.00	4.58	
	STORM CHAMBERIN	POND	10752		2.00	8.96	
	STORM CHAMBEROUT	POND	10752		21.00	4.58	473.68

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

	Node ID	Type	HYG Vol cu.ft	Trun.	Qpeak min	Qpeak cfs	Max WSEL ft
	HYD QUEUE 20	HYG	13304		19.00	11.60	
Outfall	OUT 10	JCT	13304		21.00	5.73	
	STORM CHAMBERIN	POND	13304		19.00	11.60	
	STORM CHAMBEROUT	POND	13304		21.00	5.73	473.97

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

	Node ID	Type	HYG Vol cu.ft	Trun.	Qpeak min	Qpeak cfs	Max WSEL ft
	HYD QUEUE 20	HYG	16992		2.00	14.16	
Outfall	OUT 10	JCT	16992		21.00	7.46	
	STORM CHAMBERIN	POND	16992		2.00	14.16	
	STORM CHAMBEROUT	POND	16992		21.00	7.46	474.40

HYG file =
HYG ID = 2 yr, 20 min
HYG Tag =

Peak Discharge =	5.56 cfs
Time to Peak =	2.00 min
HYG Volume =	6672 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	2.78	5.56	5.56	5.56
5.00	5.56	5.56	5.56	5.56	5.56
10.00	5.56	5.56	5.56	5.56	5.56
15.00	5.56	5.56	5.56	5.56	5.56
20.00	5.56	2.78	.00		

HYG file =
HYG ID = 2 yr, 20 min
HYG Tag =

Peak Discharge =	5.56 cfs
Time to Peak =	2.00 min
HYG Volume =	6672 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	2.78	5.56	5.56	5.56
5.00	5.56	5.56	5.56	5.56	5.56
10.00	5.56	5.56	5.56	5.56	5.56
15.00	5.56	5.56	5.56	5.56	5.56
20.00	5.56	2.78	.00		

HYG file =
HYG ID = 15 yr, 20 min
HYG Tag =

Peak Discharge =	8.96 cfs
Time to Peak =	2.00 min
HYG Volume =	10752 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	4.48	8.96	8.96	8.96
5.00	8.96	8.96	8.96	8.96	8.96
10.00	8.96	8.96	8.96	8.96	8.96
15.00	8.96	8.96	8.96	8.96	8.96
20.00	8.96	4.48	.00		

HYG file =
HYG ID = 15 yr, 20 min
HYG Tag =

Peak Discharge =	8.96 cfs
Time to Peak =	2.00 min
HYG Volume =	10752 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	4.48	8.96	8.96	8.96
5.00	8.96	8.96	8.96	8.96	8.96
10.00	8.96	8.96	8.96	8.96	8.96
15.00	8.96	8.96	8.96	8.96	8.96
20.00	8.96	4.48	.00		

HYG file =
HYG ID = 25 yr, 20 min
HYG Tag =

Peak Discharge =	11.60 cfs
Time to Peak =	19.00 min
HYG Volume =	13304 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	5.53	11.06	11.06	11.06
5.00	11.06	11.06	11.06	11.06	11.06
10.00	11.06	11.06	11.06	11.06	11.06
15.00	11.06	11.06	11.06	11.06	11.60
20.00	11.06	5.53	.00		

HYG file =
HYG ID = 25 yr, 20 min
HYG Tag =

Peak Discharge =	11.60 cfs
Time to Peak =	19.00 min
HYG Volume =	13304 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	5.53	11.06	11.06	11.06
5.00	11.06	11.06	11.06	11.06	11.06
10.00	11.06	11.06	11.06	11.06	11.06
15.00	11.06	11.06	11.06	11.06	11.60
20.00	11.06	5.53	.00		

HYG file =
HYG ID = 100 yr, 20 min
HYG Tag =

Peak Discharge =	14.16 cfs
Time to Peak =	2.00 min
HYG Volume =	16992 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	7.08	14.16	14.16	14.16
5.00	14.16	14.16	14.16	14.16	14.16
10.00	14.16	14.16	14.16	14.16	14.16
15.00	14.16	14.16	14.16	14.16	14.16
20.00	14.16	7.08	.00		

HYG file =
HYG ID = 100 yr, 20 min
HYG Tag =

Peak Discharge =	14.16 cfs
Time to Peak =	2.00 min
HYG Volume =	16992 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	7.08	14.16	14.16	14.16
5.00	14.16	14.16	14.16	14.16	14.16
10.00	14.16	14.16	14.16	14.16	14.16
15.00	14.16	14.16	14.16	14.16	14.16
20.00	14.16	7.08	.00		

TIME vs. ELEVATION (ft)

Time min	Output Time increment = 1.00 min Time on left represents time for first value in each row.				
.00	471.65	472.11	472.26	472.43	472.55
5.00	472.60	472.65	472.70	472.75	472.79
10.00	472.83	472.87	472.92	472.96	472.99
15.00	473.03	473.06	473.09	473.11	473.14
20.00	473.17	473.18	473.17	473.15	473.12
25.00	473.10	473.08	473.06	473.03	473.00
30.00	472.98	472.95	472.92	472.89	472.86
35.00	472.83	472.80	472.78	472.75	472.72
40.00	472.69	472.67	472.64	472.61	472.58
45.00	472.56	472.51	472.46	472.39	472.33
50.00	472.26	472.21	472.15	472.08	471.68
55.00	471.65				

TIME vs. ELEVATION (ft)

Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	471.65	472.16	472.39	472.58	472.68
5.00	472.77	472.86	472.94	473.02	473.08
10.00	473.14	473.20	473.26	473.31	473.37
15.00	473.42	473.47	473.52	473.57	473.61
20.00	473.66	473.68	473.66	473.62	473.58
25.00	473.54	473.51	473.47	473.44	473.41
30.00	473.38	473.35	473.32	473.30	473.27
35.00	473.25	473.22	473.19	473.17	473.15
40.00	473.12	473.10	473.08	473.06	473.03
45.00	473.00	472.98	472.95	472.92	472.89
50.00	472.86	472.83	472.80	472.78	472.75
55.00	472.72	472.69	472.67	472.64	472.61
60.00	472.58	472.56	472.51	472.46	472.39
65.00	472.33	472.26	472.21	472.15	472.08
70.00	471.68	471.65			

TIME vs. ELEVATION (ft)

Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	471.65	472.18	472.47	472.64	472.76
5.00	472.87	472.98	473.07	473.15	473.23
10.00	473.30	473.38	473.45	473.52	473.59
15.00	473.65	473.71	473.77	473.83	473.88
20.00	473.94	473.97	473.94	473.88	473.83
25.00	473.78	473.73	473.69	473.64	473.60
30.00	473.57	473.53	473.49	473.46	473.43
35.00	473.40	473.37	473.34	473.31	473.29
40.00	473.26	473.24	473.21	473.19	473.16
45.00	473.14	473.12	473.09	473.07	473.05
50.00	473.02	472.99	472.97	472.94	472.91
55.00	472.88	472.85	472.82	472.80	472.77
60.00	472.74	472.71	472.69	472.66	472.63
65.00	472.60	472.57	472.55	472.49	472.44
70.00	472.37	472.31	472.25	472.19	472.13
75.00	472.00	471.65			

TIME vs. ELEVATION (ft)

Time min	Output Time increment = 1.00 min Time on left represents time for first value in each row.				
.00	471.65	472.22	472.55	472.72	472.87
5.00	473.02	473.13	473.23	473.34	473.44
10.00	473.54	473.63	473.72	473.81	473.89
15.00	473.98	474.06	474.14	474.22	474.29
20.00	474.37	474.40	474.36	474.29	474.22
25.00	474.15	474.09	474.03	473.97	473.91
30.00	473.86	473.81	473.76	473.71	473.67
35.00	473.63	473.59	473.55	473.51	473.48
40.00	473.45	473.42	473.39	473.36	473.33
45.00	473.30	473.28	473.25	473.23	473.20
50.00	473.18	473.15	473.13	473.11	473.08
55.00	473.06	473.04	473.01	472.98	472.96
60.00	472.93	472.90	472.87	472.84	472.81
65.00	472.78	472.76	472.73	472.70	472.67
70.00	472.65	472.62	472.59	472.56	472.52
75.00	472.47	472.41	472.34	472.28	472.22
80.00	472.16	472.10	471.83	471.65	

TIME vs. VOLUME (cu.ft)

Output Time increment = 1.00 min

Time min	Time on left represents time for first value in each row.				
.00	0	32	231	477	698
5.00	890	1139	1355	1558	1760
10.00	1963	2167	2369	2546	2700
15.00	2894	3115	3299	3481	3661
20.00	3848	3940	3870	3706	3552
25.00	3400	3249	3100	2922	2751
30.00	2634	2519	2389	2246	2104
35.00	1967	1832	1700	1575	1452
40.00	1331	1210	1075	939	817
45.00	730	581	514	422	327
50.00	239	162	88	1	0
55.00	0				

TIME vs. VOLUME (cu.ft)

Time min	Output Time increment = 1.00 min Time on left represents time for first value in each row.				
.00	0	100	421	818	1278
5.00	1678	2089	2490	2831	3270
10.00	3655	4038	4408	4778	5141
15.00	5499	5809	6122	6439	6729
20.00	7010	7150	7006	6743	6495
25.00	6254	6015	5808	5612	5420
30.00	5221	5029	4848	4671	4499
35.00	4339	4177	4020	3871	3706
40.00	3553	3400	3249	3100	2923
45.00	2751	2634	2519	2389	2246
50.00	2104	1967	1833	1701	1576
55.00	1452	1331	1210	1075	939
60.00	817	730	581	514	422
65.00	327	239	162	88	1
70.00	0	0			

TIME vs. VOLUME (cu.ft)

Time min	Output Time increment = 1.00 min Time on left represents time for first value in each row.				
.00	0	131	525	1084	1625
5.00	2165	2654	3202	3713	4219
10.00	4712	5204	5666	6100	6543
15.00	6951	7345	7702	8059	8425
20.00	8769	8919	8752	8418	8087
25.00	7771	7476	7197	6918	6662
30.00	6417	6175	5948	5743	5553
35.00	5356	5159	4970	4790	4615
40.00	4444	4286	4125	3972	3817
45.00	3656	3503	3351	3201	3051
50.00	2861	2713	2597	2477	2343
55.00	2200	2059	1923	1790	1658
60.00	1536	1413	1292	1167	1031
65.00	896	788	695	559	489
70.00	390	298	214	138	54
75.00	1	0			

TIME vs. VOLUME (cu.ft)

Time min	Output Time increment = 1.00 min Time on left represents time for first value in each row.				
.00	0	175	715	1450	2170
5.00	2823	3574	4266	4944	5609
10.00	6231	6841	7419	7960	8500
15.00	9001	9496	9973	10436	10868
20.00	11290	11484	11254	10823	10422
25.00	10025	9651	9284	8936	8611
30.00	8270	7948	7636	7352	7078
35.00	6804	6554	6313	6070	5857
40.00	5658	5470	5269	5075	4891
45.00	4713	4540	4376	4216	4056
50.00	3907	3744	3590	3437	3286
55.00	3136	2968	2780	2663	2547
60.00	2421	2280	2138	1999	1865
65.00	1732	1603	1482	1360	1240
70.00	1109	972	838	751	621
75.00	530	447	349	260	180
80.00	106	11	0	0	

USER DEFINED VOLUME RATING TABLE

Elevation (ft)	Volume (cu.ft)
471.65	0
472.09	1
472.17	116
472.26	232
472.34	348
472.42	464
472.51	581
472.59	838
472.67	1227
472.76	1616
472.84	2004
472.92	2393
473.01	2780
473.09	3327
473.17	3874
473.26	4418
473.34	4960
473.42	5500
473.51	6038
473.59	6571
473.67	7101
473.76	7627
473.84	8148
473.92	8663
474.01	9173
474.09	9677
474.17	10173
474.26	10661
474.34	11141
474.42	11611
474.51	12070
474.59	12518
474.67	12952
474.76	13370
474.84	13768
474.92	14135
475.01	14478
475.09	14811
475.17	15133
475.26	15438
475.34	15714
475.42	15972
475.51	16230
475.59	16488
475.68	16630
475.76	16771
475.84	16913

USER DEFINED VOLUME RATING TABLE

Elevation (ft)	Volume (cu.ft)
475.93	17055
476.01	17197

USER DEFINED VOLUME RATING TABLE

Elevation (ft)	Volume (cu.ft)
471.65	0
472.09	1
472.17	116
472.26	232
472.34	348
472.42	464
472.51	581
472.59	838
472.67	1227
472.76	1616
472.84	2004
472.92	2393
473.01	2780
473.09	3327
473.17	3874
473.26	4418
473.34	4960
473.42	5500
473.51	6038
473.59	6571
473.67	7101
473.76	7627
473.84	8148
473.92	8663
474.01	9173
474.09	9677
474.17	10173
474.26	10661
474.34	11141
474.42	11611
474.51	12070
474.59	12518
474.67	12952
474.76	13370
474.84	13768
474.92	14135
475.01	14478
475.09	14811
475.17	15133
475.26	15438
475.34	15714
475.42	15972
475.51	16230
475.59	16488
475.68	16630
475.76	16771
475.84	16913

USER DEFINED VOLUME RATING TABLE

Elevation (ft)	Volume (cu.ft)
475.93	17055
476.01	17197

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 471.65 ft
Increment = .10 ft
Max. Elev.= 476.01 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Orifice-Area	O0	--->	C0	472.150	476.010
Weir-Rectangular	W0	--->	C0	471.650	472.150
Orifice-Area	O1	--->	C0	473.658	476.010
Weir-Rectangular	W1	--->	C0	473.200	473.658
Weir-Rectangular	W2	--->	C0	474.000	476.010
Weir-Rectangular	W3	--->	C0	474.400	476.010
Culvert-Circular	C0	--->	TW	470.390	476.010

TW SETUP, DS Channel

OUTLET STRUCTURE INPUT DATA

Structure ID = O0
Structure Type = Orifice-Area

# of Openings	=	1
Invert Elev.	=	471.65 ft
Area	=	.4792 sq.ft
Top of Orifice	=	472.15 ft
Datum Elev.	=	471.90 ft
Orifice Coeff.	=	.600

Structure ID = W0
Structure Type = Weir-Rectangular

# of Openings	=	1
Crest Elev.	=	471.65 ft
Weir Length	=	.96 ft
Weir Coeff.	=	3.000000

Weir TW effects (Use adjustment equation)

Structure ID = O1
Structure Type = Orifice-Area

# of Openings	=	1
Invert Elev.	=	473.20 ft
Area	=	.6875 sq.ft
Top of Orifice	=	473.66 ft
Datum Elev.	=	473.43 ft
Orifice Coeff.	=	.600

OUTLET STRUCTURE INPUT DATA

Structure ID = W1
Structure Type = Weir-Rectangular

# of Openings = 1
Crest Elev. = 473.20 ft
Weir Length = 1.50 ft
Weir Coeff. = 3.000000

Weir TW effects (Use adjustment equation)

Structure ID = W2
Structure Type = Weir-Rectangular

# of Openings = 1
Crest Elev. = 474.00 ft
Weir Length = .75 ft
Weir Coeff. = 3.000000

Weir TW effects (Use adjustment equation)

Structure ID = W3
Structure Type = Weir-Rectangular

# of Openings = 1
Crest Elev. = 474.40 ft
Weir Length = 4.25 ft
Weir Coeff. = 3.000000

Weir TW effects (Use adjustment equation)

OUTLET STRUCTURE INPUT DATA

Structure ID = CO
Structure Type = Culvert-Circular

No. Barrels	=	1	
Barrel Diameter	=	1.7500	ft
Upstream Invert	=	470.39	ft
Dnstream Invert	=	470.00	ft
Horiz. Length	=	39.34	ft
Barrel Length	=	39.34	ft
Barrel Slope	=	.00991	ft/ft

OUTLET CONTROL DATA...

Mannings n	=	.0130	
Ke	=	.2000	(forward entrance loss)
Kb	=	.014830	(per ft of full flow)
Kr	=	.5000	(reverse entrance loss)
HW Convergence	=	.001	+/- ft

INLET CONTROL DATA...

Equation form	=	1	
Inlet Control K	=	.0045	
Inlet Control M	=	2.0000	
Inlet Control c	=	.03170	
Inlet Control Y	=	.6900	
T1 ratio (HW/D)	=	1.090	
T2 ratio (HW/D)	=	1.192	
Slope Factor	=	-.500	

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev = 472.30 ft ---> Flow = 11.14 cfs
At T2 Elev = 472.48 ft ---> Flow = 12.73 cfs

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...

Maximum Iterations=	40		
Min. TW tolerance =	.01	ft	
Max. TW tolerance =	.01	ft	
Min. HW tolerance =	.01	ft	
Max. HW tolerance =	.01	ft	
Min. Q tolerance =	.00	cfs	
Max. Q tolerance =	.00	cfs	

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Notes		
		Converge		
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
471.65	.00	Free Outfall		(no Q: O0,W0,O1,W1,W2,W3,C0)
471.75	.09	Free Outfall		W0,C0 (no Q: O0,O1,W1,W2,W3)
471.85	.26	Free Outfall		W0,C0 (no Q: O0,O1,W1,W2,W3)
471.95	.47	Free Outfall		W0,C0 (no Q: O0,O1,W1,W2,W3)
472.05	.73	Free Outfall		W0,C0 (no Q: O0,O1,W1,W2,W3)
472.15	1.15	Free Outfall		O0,C0 (no Q: W0,O1,W1,W2,W3)
472.25	1.36	Free Outfall		O0,C0 (no Q: W0,O1,W1,W2,W3)
472.35	1.55	Free Outfall		O0,C0 (no Q: W0,O1,W1,W2,W3)
472.45	1.71	Free Outfall		O0,C0 (no Q: W0,O1,W1,W2,W3)
472.55	1.86	Free Outfall		O0,C0 (no Q: W0,O1,W1,W2,W3)
472.65	2.00	Free Outfall		O0,C0 (no Q: W0,O1,W1,W2,W3)
472.75	2.13	Free Outfall		O0,C0 (no Q: W0,O1,W1,W2,W3)
472.85	2.25	Free Outfall		O0,C0 (no Q: W0,O1,W1,W2,W3)
472.95	2.36	Free Outfall		O0,C0 (no Q: W0,O1,W1,W2,W3)
473.05	2.47	Free Outfall		O0,C0 (no Q: W0,O1,W1,W2,W3)
473.15	2.58	Free Outfall		O0,C0 (no Q: W0,O1,W1,W2,W3)
473.20	2.63	Free Outfall		O0,C0 (no Q: W0,O1,W1,W2,W3)
473.25	2.73	Free Outfall		O0,W1,C0 (no Q: W0,O1,W2,W3)
473.35	3.04	Free Outfall		O0,W1,C0 (no Q: W0,O1,W2,W3)
473.45	3.43	Free Outfall		O0,W1,C0 (no Q: W0,O1,W2,W3)
473.55	3.90	Free Outfall		O0,W1,C0 (no Q: W0,O1,W2,W3)
473.65	4.41	Free Outfall		O0,W1,C0 (no Q: W0,O1,W2,W3)
473.75	5.01	Free Outfall		O0,O1,C0 (no Q: W0,W1,W2,W3)
473.85	5.36	Free Outfall		O0,O1,C0 (no Q: W0,W1,W2,W3)
473.95	5.69	Free Outfall		O0,O1,C0 (no Q: W0,W1,W2,W3)
474.00	5.84	Free Outfall		O0,O1,C0 (no Q: W0,W1,W2,W3)
474.05	6.01	Free Outfall		O0,O1,W2,C0 (no Q: W0,W1,W3)
474.15	6.39	Free Outfall		O0,O1,W2,C0 (no Q: W0,W1,W3)
474.25	6.81	Free Outfall		O0,O1,W2,C0 (no Q: W0,W1,W3)
474.35	7.25	Free Outfall		O0,O1,W2,C0 (no Q: W0,W1,W3)
474.40	7.47	Free Outfall		O0,O1,W2,C0 (no Q: W0,W1,W3)
474.45	7.82	Free Outfall		O0,O1,W2,W3,C0 (no Q: W0,W1)
474.55	8.80	Free Outfall		O0,O1,W2,W3,C0 (no Q: W0,W1)
474.65	10.04	Free Outfall		O0,O1,W2,W3,C0 (no Q: W0,W1)
474.75	11.46	Free Outfall		O0,O1,W2,W3,C0 (no Q: W0,W1)
474.85	13.06	Free Outfall		O0,O1,W2,W3,C0 (no Q: W0,W1)
474.95	14.75	Free Outfall		O0,O1,W2,W3,C0 (no Q: W0,W1)
475.05	16.53	Free Outfall		O0,O1,W2,W3,C0 (no Q: W0,W1)

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
475.15	18.38	Free Outfall		O0,O1,W2,W3,C0 (no Q: W0,W1)
475.25	19.95	Free Outfall		O0,O1,W2,W3,C0 (no Q: W0,W1)
475.35	21.50	Free Outfall		O0,O1,W2,W3,C0 (no Q: W0,W1)
475.45	22.89	Free Outfall		O0,O1,W2,W3,C0 (no Q: W0,W1)
475.55	23.84	Free Outfall		O0,O1,W2,W3,C0 (no Q: W0,W1)
475.65	24.61	Free Outfall		O0,O1,W2,W3,C0 (no Q: W0,W1)
475.75	25.30	Free Outfall		O0,O1,W2,W3,C0 (no Q: W0,W1)
475.85	25.89	Free Outfall		O0,O1,W2,W3,C0 (no Q: W0,W1)
475.95	26.47	Free Outfall		O0,O1,W2,W3,C0 (no Q: W0,W1)
476.01	26.79	Free Outfall		O0,O1,W2,W3,C0 (no Q: W0,W1)

LEVEL POOL ROUTING SUMMARY

HYG Dir = H:\PONDPACK\A10500PLUS\10639C\Detention\
Inflow HYG file = NONE STORED - STORM CHAMBERIN 2
Outflow HYG file = NONE STORED - STORM CHAMBEROUT 2

Pond Node Data = STORM CHAMBER
Pond Volume Data = STORM CHAMBER
Pond Outlet Data = OS 101

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	471.65 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	5.56 cfs	at	2.00 min
Peak Outflow	=	2.61 cfs	at	21.00 min
Peak Elevation	=	473.18 ft		
Peak Storage	=	3940 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	6672
- Infiltration	=	0
- HYG Vol OUT	=	6672
- Retained Vol	=	0
Unrouted Vol	=	0 cu.ft (.000% of Outflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = H:\PONDPACK\A10500PLUS\10639C\Detention\
Inflow HYG file = NONE STORED - STORM CHAMBERIN 15
Outflow HYG file = NONE STORED - STORM CHAMBEROUT 15

Pond Node Data = STORM CHAMBER
Pond Volume Data = STORM CHAMBER
Pond Outlet Data = OS 101

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	471.65 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	8.96 cfs	at	2.00 min
Peak Outflow	=	4.58 cfs	at	21.00 min
Peak Elevation	=	473.68 ft		
Peak Storage	=	7150 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	10752
- Infiltration	=	0
- HYG Vol OUT	=	10752
- Retained Vol	=	0
Unrouted Vol	=	0 cu.ft (.000% of Outflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = H:\PONDPACK\A10500PLUS\10639C\Detention\
Inflow HYG file = NONE STORED - STORM CHAMBERIN 25
Outflow HYG file = NONE STORED - STORM CHAMBEROUT 25

Pond Node Data = STORM CHAMBER
Pond Volume Data = STORM CHAMBER
Pond Outlet Data = OS 101

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	471.65 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	11.60 cfs	at	19.00 min
Peak Outflow	=	5.73 cfs	at	21.00 min
Peak Elevation	=	473.97 ft		
Peak Storage	=	8919 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	13304
- Infiltration	=	0
- HYG Vol OUT	=	13304
- Retained Vol	=	0
Unrouted Vol	= -	cu.ft (.000% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = H:\PONDPACK\A10500PLUS\10639C\Detention\
Inflow HYG file = NONE STORED - STORM CHAMBERIN 100
Outflow HYG file = NONE STORED - STORM CHAMBEROUT 100

Pond Node Data = STORM CHAMBER
Pond Volume Data = STORM CHAMBER
Pond Outlet Data = OS 101

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	471.65 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

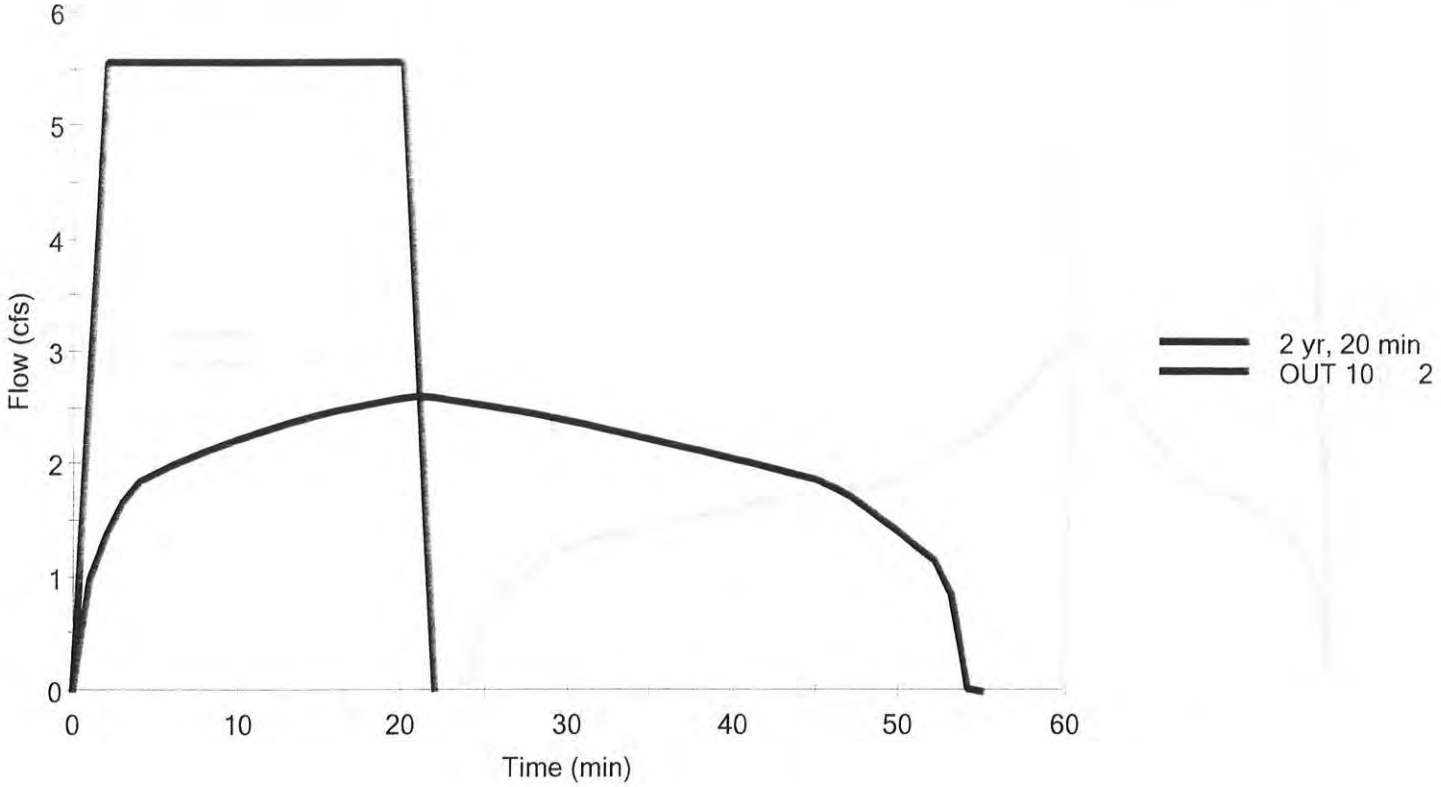
Peak Inflow	=	14.16 cfs	at	2.00 min
Peak Outflow	=	7.46 cfs	at	21.00 min
Peak Elevation	=	474.40 ft		
Peak Storage	=	11484 cu.ft		

MASS BALANCE (cu.ft)

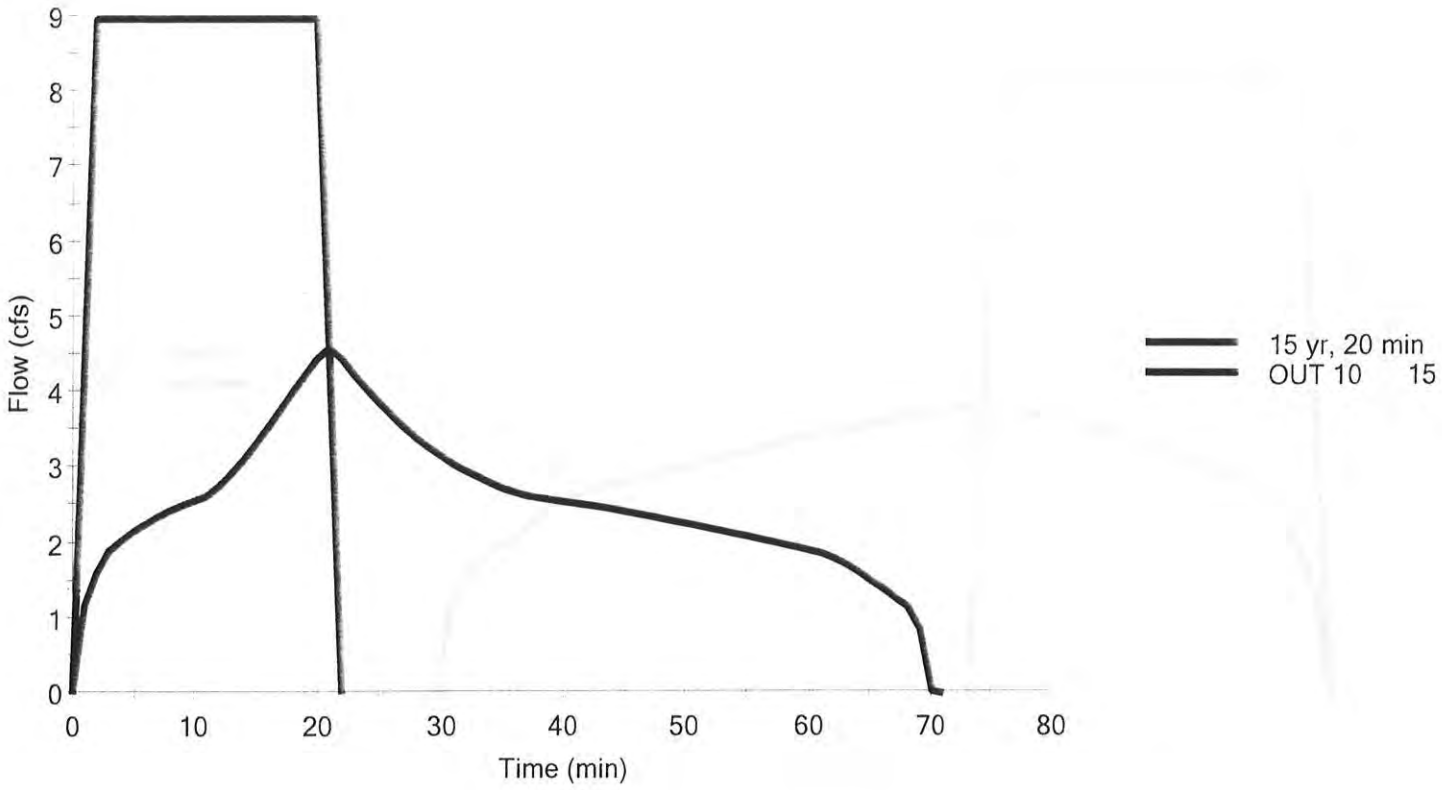
+ Initial Vol	=	0
+ HYG Vol IN	=	16992
- Infiltration	=	0
- HYG Vol OUT	=	16992
- Retained Vol	=	0
Unrouted Vol	=	0 cu.ft (.000% of Outflow Volume)

Index of Starting Page Numbers for ID Names

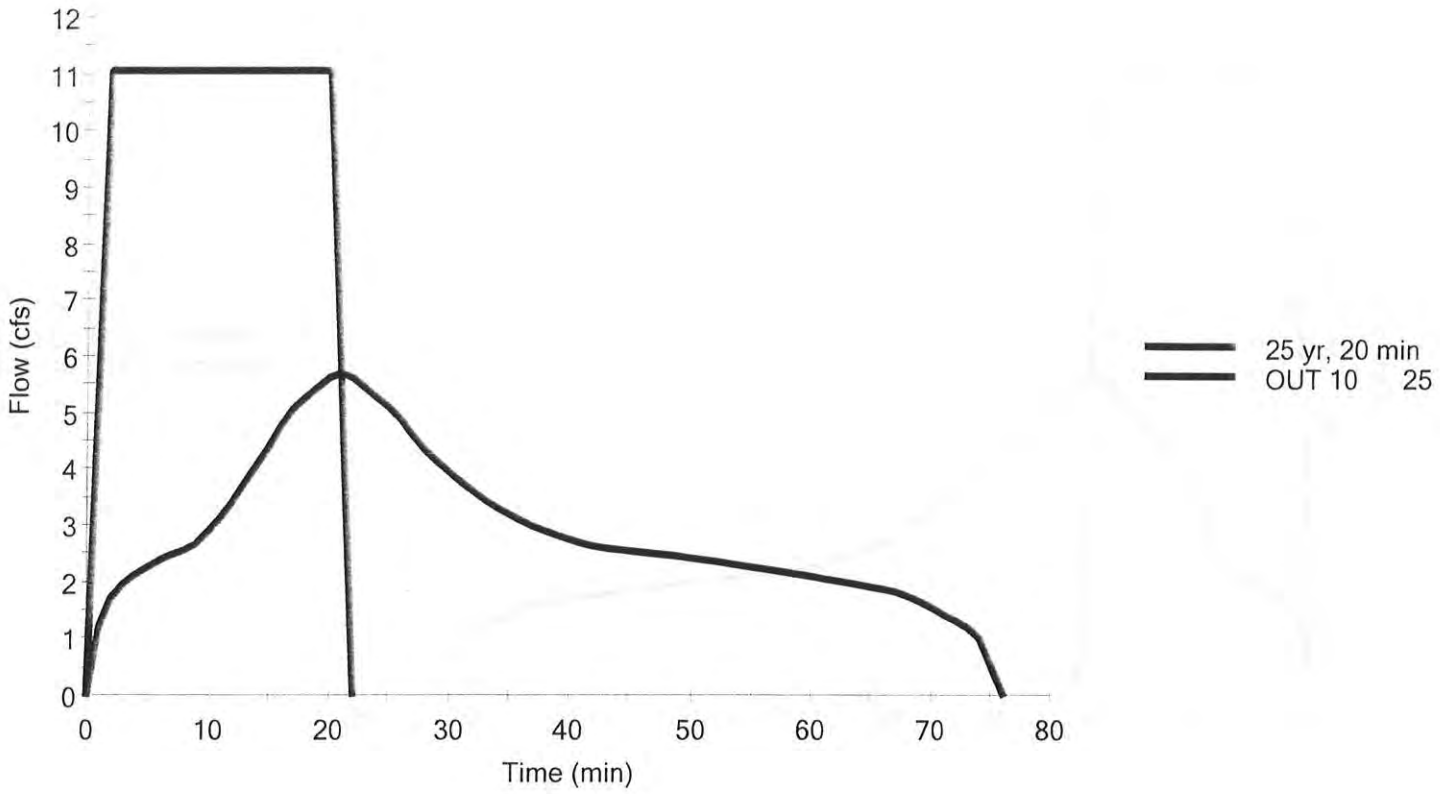
Hydrograph
OUT 10 2



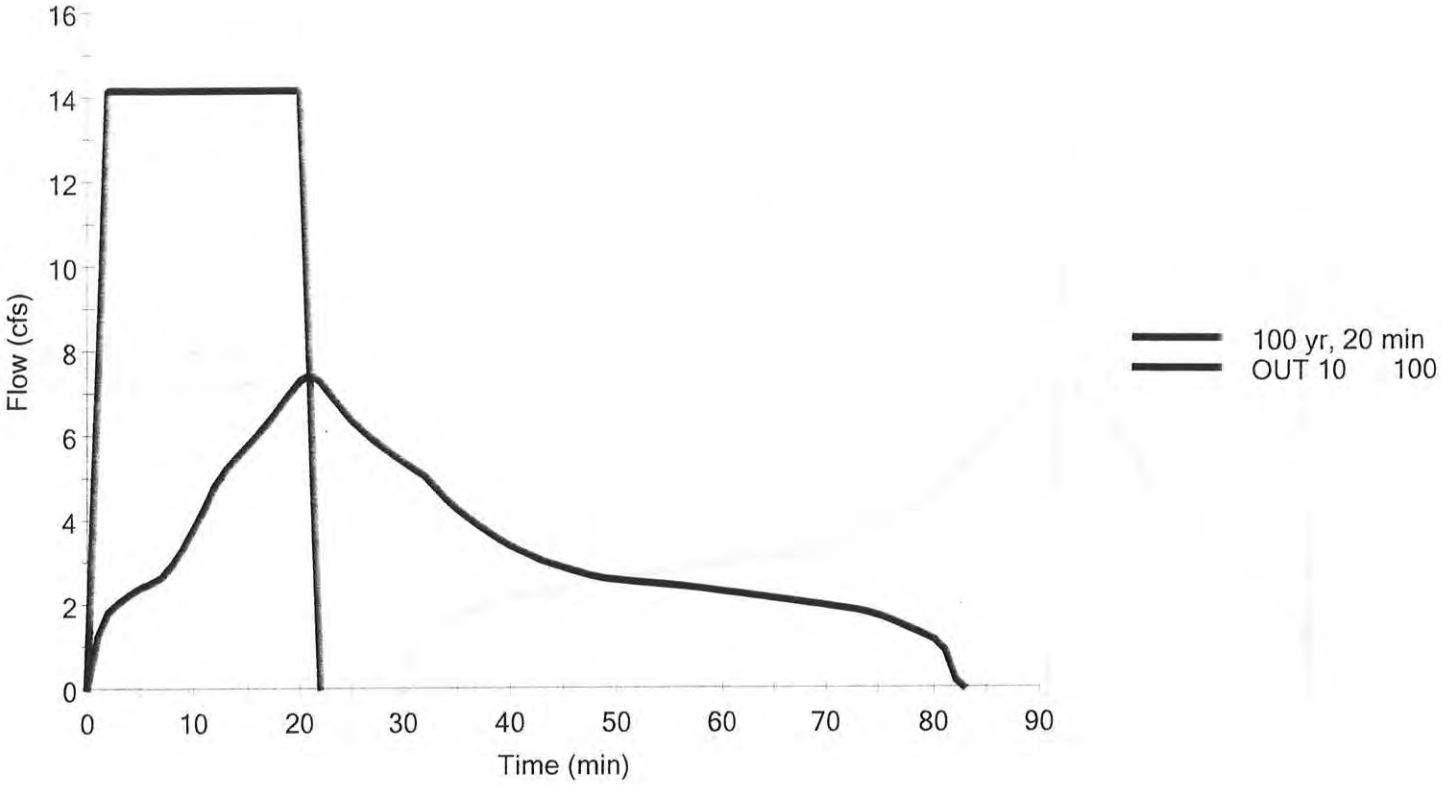
Hydrograph
OUT 10 15



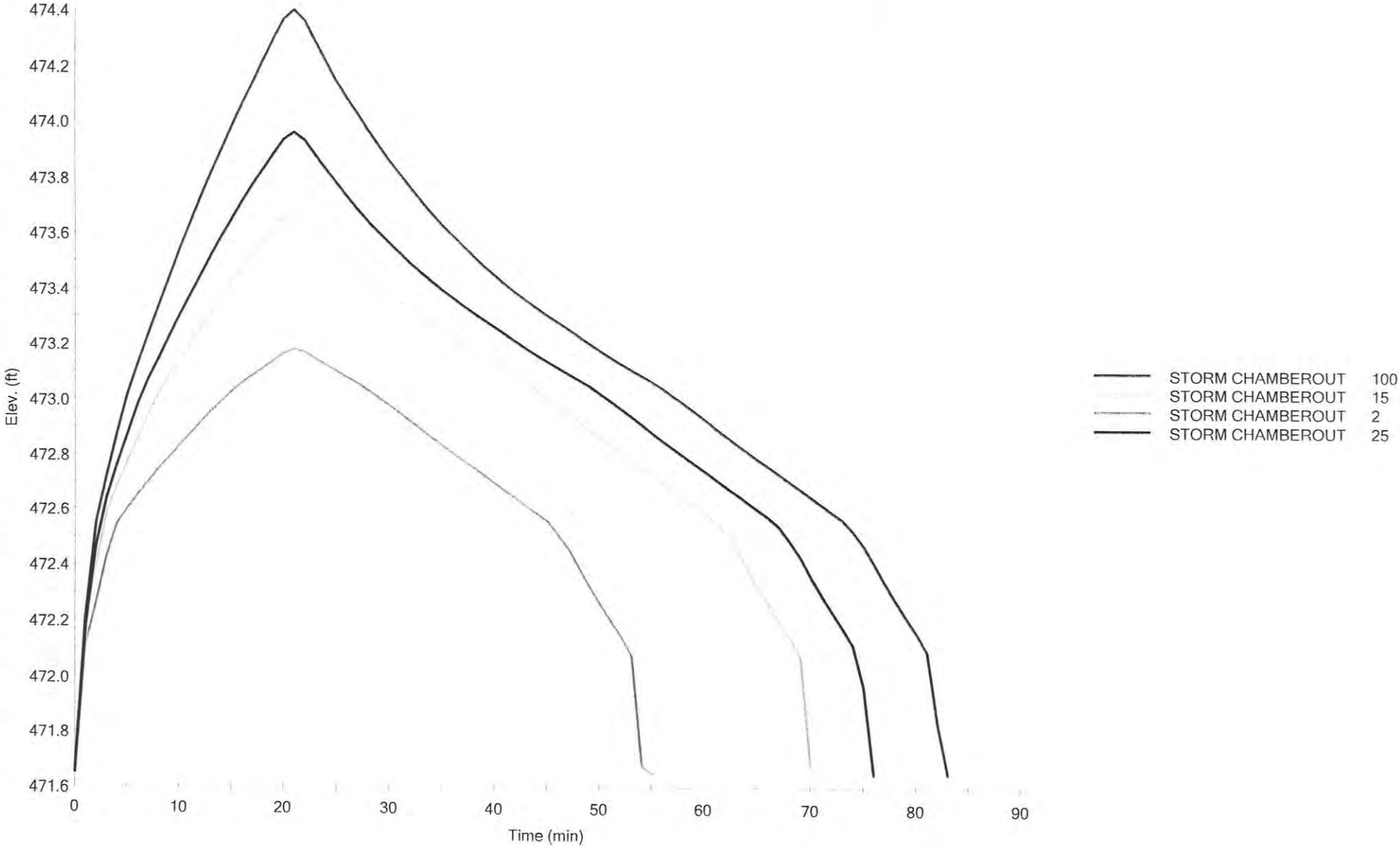
Hydrograph
OUT 10 25



Hydrograph
OUT 10 100



Elev. vs. Time
STORM CHAMBEROUT 25



POND 10
Routing Calculations for
100 Year 20 Minute Design Storm
Low Flow Blocked

Table of Contents

Table of Contents (continued)

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

	Node ID	Type	HYG Vol cu.ft	Trun.	Qpeak min	Qpeak cfs	Max WSEL ft
	HYD QUEUE 20	HYG	16992		2.00	14.16	
Outfall	OUT 10	JCT	16955		20.00	14.06	
	STORM CHAMBERIN	POND	16992		2.00	14.16	
	STORM CHAMBEROUT	POND	16955		20.00	14.06	475.29

HYG file =
HYG ID = 100 yr, 20 min
HYG Tag =

Peak Discharge =	14.16 cfs
Time to Peak =	2.00 min
HYG Volume =	16992 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	7.08	14.16	14.16	14.16
5.00	14.16	14.16	14.16	14.16	14.16
10.00	14.16	14.16	14.16	14.16	14.16
15.00	14.16	14.16	14.16	14.16	14.16
20.00	14.16	7.08	.00		

TIME vs. ELEVATION (ft)

Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	474.00	474.03	474.14	474.28	474.42
5.00	474.57	474.70	474.82	474.93	475.02
10.00	475.10	475.15	475.19	475.23	475.25
15.00	475.26	475.27	475.28	475.29	475.29
20.00	475.29	475.24	475.11	474.98	474.88
25.00	474.81	474.75	474.70	474.66	474.63
30.00	474.61	474.58	474.56	474.54	474.53
35.00	474.51	474.50	474.48	474.47	474.46
40.00	474.45	474.44	474.43	474.42	474.42
45.00	474.41	474.40	474.40	474.39	474.39
50.00	474.38	474.38	474.37	474.37	474.36
55.00	474.36	474.35	474.35	474.34	474.34
60.00	474.33	474.33	474.32	474.32	474.32
65.00	474.31	474.31	474.30	474.30	474.30
70.00	474.29	474.29	474.29	474.28	474.28
75.00	474.27	474.27	474.27	474.27	474.26
80.00	474.26	474.26	474.25	474.25	474.25
85.00	474.24	474.24	474.24	474.24	474.23
90.00	474.23	474.23	474.22	474.22	474.22
95.00	474.22	474.21	474.21	474.21	474.21
100.00	474.21	474.20	474.20	474.20	474.20
105.00	474.19	474.19	474.19	474.19	474.19
110.00	474.18	474.18	474.18	474.18	474.18
115.00	474.17	474.17	474.17	474.17	474.17
120.00	474.17	474.16	474.16	474.16	474.16
125.00	474.16	474.16	474.15	474.15	474.15
130.00	474.15	474.15	474.15	474.15	474.15
135.00	474.14	474.14	474.14	474.14	474.14
140.00	474.14	474.14	474.14	474.14	474.13
145.00	474.13	474.13	474.13	474.13	474.13
150.00	474.13	474.13	474.13	474.12	474.12
155.00	474.12	474.12	474.12	474.12	474.12
160.00	474.12	474.12	474.12	474.12	474.11
165.00	474.11	474.11	474.11	474.11	474.11
170.00	474.11	474.11	474.11	474.11	474.11
175.00	474.10	474.10	474.10	474.10	474.10
180.00	474.10	474.10	474.10	474.10	474.10
185.00	474.10	474.10	474.10	474.10	474.09
190.00	474.09	474.09	474.09	474.09	474.09
195.00	474.09	474.09	474.09	474.09	474.09
200.00	474.09	474.09	474.09	474.09	474.08
205.00	474.08	474.08	474.08	474.08	474.08
210.00	474.08	474.08	474.08	474.08	474.08

TIME vs. ELEVATION (ft)

Time min	Output Time increment = 1.00 min Time on left represents time for first value in each row.				
215.00	474.08	474.08	474.08	474.08	474.08
220.00	474.08	474.08	474.08	474.07	474.07
225.00	474.07	474.07	474.07	474.07	474.07
230.00	474.07	474.07	474.07	474.07	474.07
235.00	474.07	474.07	474.07	474.07	474.07
240.00	474.07	474.07	474.07	474.07	474.07
245.00	474.07	474.06	474.06	474.06	474.06
250.00	474.06	474.06	474.06	474.06	474.06
255.00	474.06	474.06	474.06	474.06	474.06
260.00	474.06	474.06	474.06	474.06	474.06
265.00	474.06	474.06	474.06	474.06	474.06
270.00	474.06	474.06	474.06	474.06	474.06
275.00	474.05	474.05	474.05	474.05	474.05
280.00	474.05	474.05	474.05	474.05	474.05
285.00	474.05	474.05	474.05	474.05	474.05
290.00	474.05	474.05	474.05	474.05	474.05
295.00	474.05	474.05	474.05	474.05	474.05
300.00	474.05	474.05	474.05	474.05	474.05
305.00	474.05	474.05	474.05	474.05	474.05
310.00	474.05	474.05	474.05	474.05	474.05
315.00	474.05	474.05	474.04	474.04	474.04
320.00	474.04	474.04	474.04	474.04	474.04
325.00	474.04	474.04	474.04	474.04	474.04
330.00	474.04	474.04	474.04	474.04	474.04
335.00	474.04	474.04	474.04	474.04	474.04
340.00	474.04	474.04	474.04	474.04	474.04
345.00	474.04	474.04	474.04	474.04	474.04
350.00	474.04	474.04	474.04	474.04	474.04
355.00	474.04	474.04	474.04	474.04	474.04
360.00	474.04	474.04	474.04	474.04	474.04
365.00	474.04	474.04	474.04	474.04	474.03
370.00	474.03	474.03	474.03	474.03	474.03
375.00	474.03	474.03	474.03	474.03	474.03
380.00	474.03	474.03	474.03	474.03	474.03
385.00	474.03	474.03	474.03	474.03	474.03
390.00	474.03	474.03	474.03	474.03	474.03
395.00	474.03	474.03	474.03	474.03	474.03
400.00	474.03	474.03	474.03	474.03	474.03
405.00	474.03	474.03	474.03	474.03	474.03
410.00	474.03	474.03	474.03	474.03	474.03
415.00	474.03	474.03	474.03	474.03	474.03
420.00	474.03	474.03	474.03	474.03	474.03
425.00	474.03	474.03	474.03	474.03	474.03
430.00	474.03	474.03	474.03	474.03	474.03

TIME vs. ELEVATION (ft)

Time min	Output Time increment = 1.00 min Time on left represents time for first value in each row.				
435.00	474.03	474.03	474.03	474.03	474.03
440.00	474.02	474.02	474.02	474.02	474.02
445.00	474.02	474.02	474.02	474.02	474.02
450.00	474.02	474.02	474.02	474.02	474.02
455.00	474.02	474.02	474.02	474.02	474.02
460.00	474.02	474.02	474.02	474.02	474.02
465.00	474.02	474.02	474.02	474.02	474.02
470.00	474.02	474.02	474.02	474.02	474.02
475.00	474.02	474.02	474.02	474.02	474.02
480.00	474.02	474.02	474.02	474.02	474.02
485.00	474.02	474.02	474.02	474.02	474.02
490.00	474.02	474.02	474.02	474.02	474.02
495.00	474.02	474.02	474.02	474.02	474.02
500.00	474.02	474.02	474.02	474.02	474.02
505.00	474.02	474.02	474.02	474.02	474.02
510.00	474.02	474.02	474.02	474.02	474.02
515.00	474.02	474.02	474.02	474.02	474.02
520.00	474.02	474.02	474.02	474.02	474.02
525.00	474.02	474.02	474.02	474.02	474.02
530.00	474.02	474.02	474.02	474.02	474.02
535.00	474.02	474.02	474.02	474.02	474.02
540.00	474.02	474.02	474.02	474.02	474.02
545.00	474.02	474.02	474.01	474.01	474.01
550.00	474.01	474.01	474.01	474.01	474.01
555.00	474.01	474.01	474.01	474.01	474.01
560.00	474.01	474.01	474.01	474.01	474.01
565.00	474.01	474.01	474.01	474.01	474.01
570.00	474.01	474.01	474.01	474.01	474.01
575.00	474.01	474.01	474.01	474.01	474.01
580.00	474.01	474.01	474.01	474.01	474.01
585.00	474.01	474.01	474.01	474.01	474.01
590.00	474.01	474.01	474.01	474.01	474.01
595.00	474.01	474.01	474.01	474.01	474.01
600.00	474.01	474.01	474.01	474.01	474.01
605.00	474.01	474.01	474.01	474.01	474.01
610.00	474.01	474.01	474.01	474.01	474.01
615.00	474.01	474.01	474.01	474.01	474.01
620.00	474.01	474.01	474.01	474.01	474.01
625.00	474.01	474.01	474.01	474.01	474.01
630.00	474.01	474.01	474.01	474.01	474.01
635.00	474.01	474.01	474.01	474.01	474.01
640.00	474.01	474.01	474.01	474.01	474.01
645.00	474.01	474.01	474.01	474.01	474.01
650.00	474.01	474.01	474.01	474.01	474.01

TIME vs. ELEVATION (ft)

Output Time increment = 1.00 min

Time min	Time on left represents time for first value in each row.				
655.00	474.01	474.01	474.01	474.01	474.01
660.00	474.01	474.01	474.01	474.01	474.01
665.00	474.01	474.01	474.01	474.01	474.01
670.00	474.01	474.01	474.01	474.01	474.01
675.00	474.01	474.01	474.01	474.01	474.01
680.00	474.01	474.01	474.01	474.01	474.01
685.00	474.01	474.01	474.01	474.01	474.01
690.00	474.01	474.01	474.01	474.01	474.01
695.00	474.01	474.01	474.01	474.01	474.01
700.00	474.01	474.01	474.01	474.01	474.01
705.00	474.01	474.01	474.01	474.01	474.01
710.00	474.01	474.01	474.01	474.01	474.01
715.00	474.01	474.01	474.01	474.01	474.01
720.00	474.01	474.01	474.01	474.01	474.01
725.00	474.01	474.01	474.01	474.01	474.01
730.00	474.01	474.01	474.01	474.01	474.01
735.00	474.01				

TIME vs. VOLUME (cu.ft)

Time min	Output Time increment = 1.00 min Time on left represents time for first value in each row.				
.00	9116	9326	9962	10794	11625
5.00	12392	13089	13674	14170	14536
10.00	14835	15050	15216	15322	15397
15.00	15450	15487	15512	15529	15540
20.00	15548	15375	14891	14345	13940
25.00	13604	13330	13109	12917	12744
30.00	12601	12473	12356	12252	12155
35.00	12068	11995	11929	11868	11814
40.00	11764	11719	11676	11635	11595
45.00	11553	11514	11478	11445	11412
50.00	11380	11348	11318	11288	11258
55.00	11229	11201	11174	11147	11120
60.00	11093	11067	11042	11017	10992
65.00	10968	10944	10921	10898	10876
70.00	10854	10832	10811	10790	10770
75.00	10750	10730	10711	10692	10673
80.00	10656	10639	10623	10608	10592
85.00	10575	10560	10544	10529	10514
90.00	10499	10484	10470	10456	10442
95.00	10429	10415	10402	10389	10376
100.00	10363	10351	10339	10327	10315
105.00	10304	10292	10281	10270	10259
110.00	10248	10238	10227	10217	10207
115.00	10197	10188	10178	10168	10157
120.00	10147	10137	10127	10117	10107
125.00	10098	10088	10079	10070	10061
130.00	10052	10044	10036	10028	10021
135.00	10013	10006	9999	9991	9984
140.00	9977	9970	9963	9956	9949
145.00	9943	9936	9929	9923	9916
150.00	9910	9904	9897	9891	9885
155.00	9879	9873	9867	9861	9855
160.00	9849	9844	9838	9832	9827
165.00	9821	9816	9810	9805	9800
170.00	9795	9789	9784	9779	9774
175.00	9769	9764	9759	9755	9750
180.00	9745	9741	9736	9731	9727
185.00	9722	9718	9714	9709	9705
190.00	9700	9696	9692	9688	9684
195.00	9680	9676	9672	9668	9664
200.00	9660	9656	9652	9649	9645
205.00	9641	9637	9634	9630	9626
210.00	9623	9620	9616	9613	9609

TIME vs. VOLUME (cu.ft)

Time min	Output Time increment = 1.00 min Time on left represents time for first value in each row.				
215.00	9606	9603	9599	9596	9593
220.00	9590	9586	9583	9580	9577
225.00	9574	9571	9568	9565	9562
230.00	9560	9557	9554	9551	9548
235.00	9545	9543	9540	9537	9535
240.00	9532	9530	9527	9525	9522
245.00	9520	9517	9515	9512	9510
250.00	9508	9505	9503	9501	9499
255.00	9496	9494	9492	9490	9488
260.00	9485	9483	9481	9479	9477
265.00	9475	9473	9471	9469	9467
270.00	9465	9464	9462	9460	9458
275.00	9456	9454	9453	9451	9449
280.00	9447	9446	9444	9442	9440
285.00	9439	9437	9436	9434	9433
290.00	9431	9429	9428	9426	9425
295.00	9423	9422	9420	9419	9417
300.00	9416	9415	9413	9412	9410
305.00	9409	9407	9406	9405	9403
310.00	9402	9400	9399	9398	9396
315.00	9395	9393	9392	9391	9389
320.00	9388	9387	9385	9384	9383
325.00	9381	9380	9379	9378	9376
330.00	9375	9374	9373	9371	9370
335.00	9369	9368	9366	9365	9364
340.00	9363	9361	9360	9359	9358
345.00	9357	9355	9354	9353	9352
350.00	9351	9350	9349	9347	9346
355.00	9345	9344	9343	9342	9341
360.00	9340	9339	9337	9336	9335
365.00	9334	9333	9332	9331	9330
370.00	9329	9328	9327	9326	9325
375.00	9324	9323	9322	9321	9320
380.00	9319	9318	9317	9316	9315
385.00	9314	9313	9312	9311	9310
390.00	9309	9308	9307	9306	9305
395.00	9304	9303	9302	9301	9301
400.00	9300	9299	9298	9297	9296
405.00	9295	9294	9293	9293	9292
410.00	9291	9290	9289	9288	9287
415.00	9287	9286	9285	9284	9283
420.00	9282	9282	9281	9280	9279
425.00	9278	9278	9277	9276	9275
430.00	9274	9274	9273	9272	9271

TIME vs. VOLUME (cu.ft)

Time min	Output Time increment = 1.00 min Time on left represents time for first value in each row.				
435.00	9270	9270	9269	9268	9267
440.00	9267	9266	9265	9264	9264
445.00	9263	9262	9261	9261	9260
450.00	9259	9259	9258	9257	9256
455.00	9256	9255	9254	9254	9253
460.00	9252	9252	9251	9250	9250
465.00	9249	9248	9248	9247	9246
470.00	9246	9245	9244	9244	9243
475.00	9243	9242	9241	9241	9240
480.00	9239	9239	9238	9238	9237
485.00	9236	9236	9235	9235	9234
490.00	9233	9233	9232	9232	9231
495.00	9230	9230	9229	9229	9228
500.00	9228	9227	9226	9226	9225
505.00	9225	9224	9224	9223	9223
510.00	9222	9222	9221	9220	9220
515.00	9220	9219	9218	9218	9217
520.00	9217	9216	9216	9215	9215
525.00	9214	9214	9213	9213	9212
530.00	9212	9211	9211	9210	9210
535.00	9210	9209	9209	9208	9208
540.00	9207	9207	9206	9206	9205
545.00	9205	9204	9204	9203	9203
550.00	9203	9202	9202	9201	9201
555.00	9200	9200	9200	9199	9199
560.00	9198	9198	9197	9197	9197
565.00	9196	9196	9195	9195	9195
570.00	9194	9194	9193	9193	9193
575.00	9192	9192	9191	9191	9190
580.00	9190	9190	9189	9189	9189
585.00	9188	9188	9188	9187	9187
590.00	9186	9186	9186	9185	9185
595.00	9185	9184	9184	9184	9183
600.00	9183	9183	9182	9182	9181
605.00	9181	9181	9180	9180	9180
610.00	9180	9179	9179	9178	9178
615.00	9178	9177	9177	9177	9176
620.00	9176	9176	9176	9175	9175
625.00	9175	9174	9174	9174	9173
630.00	9173	9173	9173	9172	9172
635.00	9172	9171	9171	9171	9171
640.00	9170	9170	9170	9170	9169
645.00	9169	9169	9169	9169	9168
650.00	9168	9168	9167	9167	9167

TIME vs. VOLUME (cu.ft)

Output Time increment = 1.00 min

Time min	Time on left represents time for first value in each row.				
655.00	9167	9166	9166	9166	9166
660.00	9166	9165	9165	9165	9165
665.00	9164	9164	9164	9164	9163
670.00	9163	9163	9163	9163	9162
675.00	9162	9162	9162	9161	9161
680.00	9161	9161	9161	9160	9160
685.00	9160	9160	9160	9159	9159
690.00	9159	9159	9158	9158	9158
695.00	9158	9158	9158	9157	9157
700.00	9157	9157	9157	9156	9156
705.00	9156	9156	9156	9155	9155
710.00	9155	9155	9155	9154	9154
715.00	9154	9154	9154	9154	9153
720.00	9153	9153	9153	9153	9153
725.00	9152	9152	9152	9152	9152
730.00	9152	9151	9151	9151	9151
735.00	9151				

USER DEFINED VOLUME RATING TABLE

Elevation (ft)	Volume (cu.ft)
471.65	0
472.09	1
472.17	116
472.26	232
472.34	348
472.42	464
472.51	581
472.59	838
472.67	1227
472.76	1616
472.84	2004
472.92	2393
473.01	2780
473.09	3327
473.17	3874
473.26	4418
473.34	4960
473.42	5500
473.51	6038
473.59	6571
473.67	7101
473.76	7627
473.84	8148
473.92	8663
474.01	9173
474.09	9677
474.17	10173
474.26	10661
474.34	11141
474.42	11611
474.51	12070
474.59	12518
474.67	12952
474.76	13370
474.84	13768
474.92	14135
475.01	14478
475.09	14811
475.17	15133
475.26	15438
475.34	15714
475.42	15972
475.51	16230
475.59	16488
475.68	16630
475.76	16771
475.84	16913

USER DEFINED VOLUME RATING TABLE

Elevation (ft)	Volume (cu.ft)
475.93	17055
476.01	17197

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 471.65 ft
Increment = .10 ft
Max. Elev.= 476.01 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Weir-Rectangular	W2	--->	C0	474.000	476.010
Weir-Rectangular	W3	--->	C0	474.400	476.010
Culvert-Circular	C0	--->	TW	470.390	476.010

TW SETUP, DS Channel

OUTLET STRUCTURE INPUT DATA

Structure ID = W2
Structure Type = Weir-Rectangular

# of Openings = 1
Crest Elev. = 474.00 ft
Weir Length = .75 ft
Weir Coeff. = 3.000000

Weir TW effects (Use adjustment equation)

Structure ID = W3
Structure Type = Weir-Rectangular

# of Openings = 1
Crest Elev. = 474.40 ft
Weir Length = 4.25 ft
Weir Coeff. = 3.000000

Weir TW effects (Use adjustment equation)

OUTLET STRUCTURE INPUT DATA

Structure ID = C0
Structure Type = Culvert-Circular

No. Barrels	=	1	
Barrel Diameter	=	1.7500	ft
Upstream Invert	=	470.39	ft
Dnstream Invert	=	470.00	ft
Horiz. Length	=	39.34	ft
Barrel Length	=	39.34	ft
Barrel Slope	=	.00991	ft/ft

OUTLET CONTROL DATA...

Mannings n	=	.0130	
Ke	=	.2000	(forward entrance loss)
Kb	=	.014830	(per ft of full flow)
Kr	=	.5000	(reverse entrance loss)
HW Convergence	=	.001	+/- ft

INLET CONTROL DATA...

Equation form	=	1
Inlet Control K	=	.0045
Inlet Control M	=	2.0000
Inlet Control c	=	.03170
Inlet Control Y	=	.6900
T1 ratio (HW/D)	=	1.090
T2 ratio (HW/D)	=	1.192
Slope Factor	=	-.500

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev = 472.30 ft ---> Flow = 11.14 cfs
At T2 Elev = 472.48 ft ---> Flow = 12.73 cfs

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...

Maximum Iterations	=	40
Min. TW tolerance	=	.01 ft
Max. TW tolerance	=	.01 ft
Min. HW tolerance	=	.01 ft
Max. HW tolerance	=	.01 ft
Min. Q tolerance	=	.00 cfs
Max. Q tolerance	=	.00 cfs

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
471.65	.00	Free Outfall		(no Q: W2,W3,C0)
471.75	.00	Free Outfall		(no Q: W2,W3,C0)
471.85	.00	Free Outfall		(no Q: W2,W3,C0)
471.95	.00	Free Outfall		(no Q: W2,W3,C0)
472.05	.00	Free Outfall		(no Q: W2,W3,C0)
472.15	.00	Free Outfall		(no Q: W2,W3,C0)
472.25	.00	Free Outfall		(no Q: W2,W3,C0)
472.35	.00	Free Outfall		(no Q: W2,W3,C0)
472.45	.00	Free Outfall		(no Q: W2,W3,C0)
472.55	.00	Free Outfall		(no Q: W2,W3,C0)
472.65	.00	Free Outfall		(no Q: W2,W3,C0)
472.75	.00	Free Outfall		(no Q: W2,W3,C0)
472.85	.00	Free Outfall		(no Q: W2,W3,C0)
472.95	.00	Free Outfall		(no Q: W2,W3,C0)
473.05	.00	Free Outfall		(no Q: W2,W3,C0)
473.15	.00	Free Outfall		(no Q: W2,W3,C0)
473.25	.00	Free Outfall		(no Q: W2,W3,C0)
473.35	.00	Free Outfall		(no Q: W2,W3,C0)
473.45	.00	Free Outfall		(no Q: W2,W3,C0)
473.55	.00	Free Outfall		(no Q: W2,W3,C0)
473.65	.00	Free Outfall		(no Q: W2,W3,C0)
473.75	.00	Free Outfall		(no Q: W2,W3,C0)
473.85	.00	Free Outfall		(no Q: W2,W3,C0)
473.95	.00	Free Outfall		(no Q: W2,W3,C0)
474.00	.00	Free Outfall		(no Q: W2,W3,C0)
474.05	.02	Free Outfall		W2,C0 (no Q: W3)
474.15	.13	Free Outfall		W2,C0 (no Q: W3)
474.25	.28	Free Outfall		W2,C0 (no Q: W3)
474.35	.47	Free Outfall		W2,C0 (no Q: W3)
474.40	.57	Free Outfall		W2,C0 (no Q: W3)
474.45	.82	Free Outfall		W2,W3,C0
474.55	1.66	Free Outfall		W2,W3,C0
474.65	2.77	Free Outfall		W2,W3,C0
474.75	4.10	Free Outfall		W2,W3,C0
474.85	5.61	Free Outfall		W2,W3,C0
474.95	7.29	Free Outfall		W2,W3,C0
475.05	9.11	Free Outfall		W2,W3,C0
475.15	11.06	Free Outfall		W2,W3,C0

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
475.25	13.14	Free Outfall		W2,W3,C0
475.35	15.33	Free Outfall		W2,W3,C0
475.45	17.64	Free Outfall		W2,W3,C0
475.55	20.06	Free Outfall		W2,W3,C0
475.65	22.40	Free Outfall		W2,W3,C0
475.75	23.81	Free Outfall		W2,W3,C0
475.85	24.80	Free Outfall		W2,W3,C0
475.95	25.59	Free Outfall		W2,W3,C0
476.01	26.01	Free Outfall		W2,W3,C0

LEVEL POOL ROUTING SUMMARY

HYG Dir = H:\PONDPACK\A10500PLUS\10639C\Detention\
Inflow HYG file = NONE STORED - STORM CHAMBERIN 100
Outflow HYG file = NONE STORED - STORM CHAMBEROUT 100

Pond Node Data = STORM CHAMBER
Pond Volume Data = STORM CHAMBER
Pond Outlet Data = LFB

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	474.00 ft
Starting Volume	=	9116 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

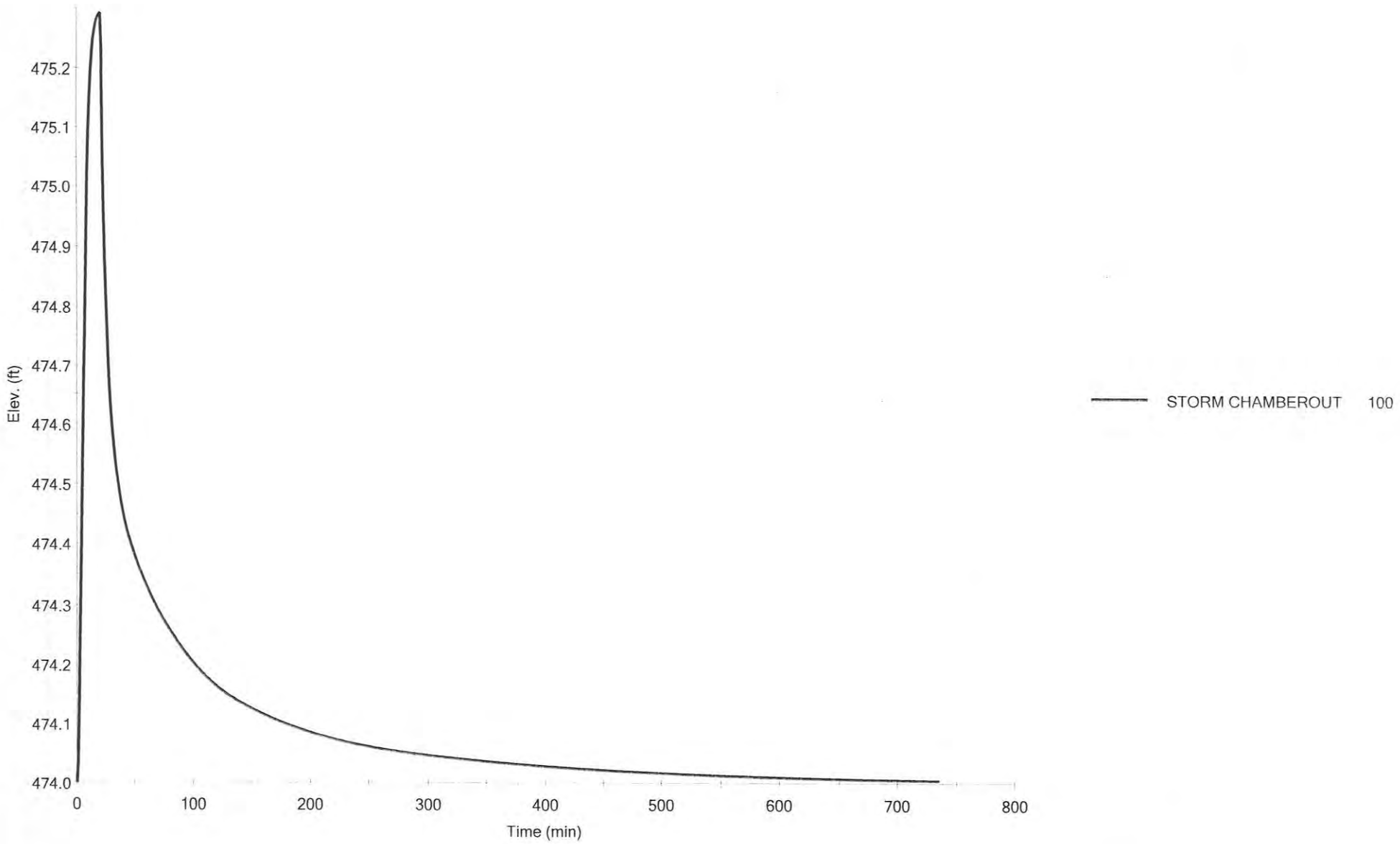
Peak Inflow	=	14.16 cfs	at	2.00 min
Peak Outflow	=	14.06 cfs	at	20.00 min
Peak Elevation	=	475.29 ft		
Peak Storage	=	15548 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	9116
+ HYG Vol IN	=	16992
- Infiltration	=	0
- HYG Vol OUT	=	16955
- Retained Vol	=	9151
Unrouted Vol	=	-3 cu.ft (.018% of Inflow Volume)

Index of Starting Page Numbers for ID Names

Elev. vs. Time
STORM CHAMBEROUT 100



THIS SHEET FOR DRAINAGE AREA PURPOSES ONLY, NOT FOR CONSTRUCTION!!!!

A POST DRAINAGE AREA MAP FOR
COOL SPRINGS
BUSINESS PARK
99-10539C 11/28/07

PROPERTY N/F
CLEAN TEXTILES SERVICES, INC.
1603/1306
ZONED I-1

GRAPHIC SCALE
0 15 30 60
(IN FEET)
1 inch = 30 ft.

PROPERTY N/F
BUEL AND IMOGENE HUDSON
2953/193
ZONED R-1

LOT 1
ON BUSINESS PARK
P.B.34 PAGE 2

OFFSITE TO ONSITE
0.06 ac. @ 3.85
Q = 0.23 c.f.s.

S74°19'34"E
652.19'

ONSITE TO OFFSITE
0.36 ac. @ 1.87
Q = 0.67 c.f.s.

WATERSHED #2

OUTFALL POINT #2

0.10 ac. @ 1.87
0.99 ac. @ 3.85
Q = 4.00 c.f.s.

LOT 1
1.388 Acres

LOT 2
1.212 Acres

WATERSHED #1

0.01 ac. @ 1.87
0.45 ac. @ 3.85
Q = 1.75 c.f.s.

0.21 ac. @ 3.85
Q = 0.81 c.f.s.

PROPOSED
WHOLESALE SALES
OFFICE/ WAREHOUSE BUILDING
(1 STY. W/ 10 FT.)
F.F.=490.00

PROPOSED OFFICE
WAREHOUSE BUILDING
(1 STY. W/ 10 FT.)
F.F.= 485.00

PROPOSED
17,500 SQ.FT.
OFFICE/
WAREHOUSE
BUILDING
(1 STY. W/ 10 FT.)
F.F.=480.00

0.01 ac. @ 1.87
0.56 ac. @ 3.85
Q = 2.17 c.f.s.

OFFSITE TO ONSITE
0.11 ac. @ 1.87
Q = 0.21 c.f.s.

S00°19'00"W
280.40'

N74°16'54"W
650.50'

S00°40'27"W
260.00'

PROPERTY N/F
PEBBLE ACRES NO 1 L.L.C.
2814/152
ZONED I-2

PROPERTY N/F
PEBBLE ACRES NO 1 L.L.C. 2814/152
ZONED I-1

PROPERTY N/F
RICHARD AND SANDRA THOMPSON
1834/1903
ZONED I-2

OUTFALL POINT #1

0.91 ac. @ 1.87
0.17 ac. @ 3.85
Q = 2.36 c.f.s.

SANITARY MANHOLE
TOP=487.33
FL=467.41

SANITARY MANHOLE
TOP=465.89
FL=451.36

SANITARY MANHOLE
TOP=479.68
FL=463.86

SANITARY MANHOLE
TOP=469.59
FL=454.45

ZONE AE - FLOODPLAIN
BASE FLOOD ELEVATION
DETERMINED AS 468.76
LOMA TO BE OBTAINED

PROPOSED UNDERGROUND
100 YEAR STORM DETENTION

ISOLATOR ROW

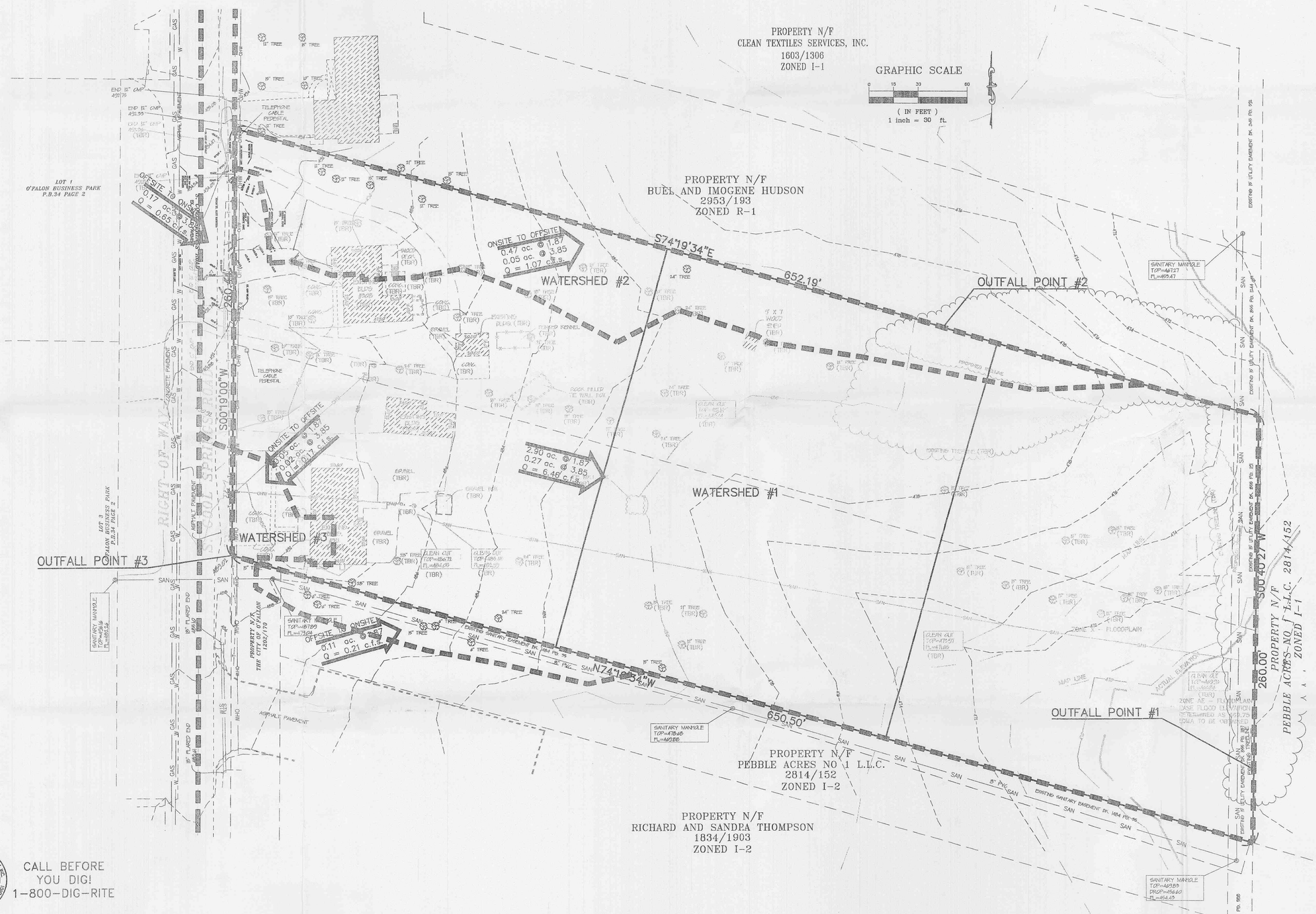
CALL BEFORE
YOU DIG!
1-800-DIG-RITE

UNDERGROUND UTILITIES HAVE BEEN PLOTTED FROM AVAILABLE INFORMATION AND THEREFORE THEIR LOCATIONS SHALL BE CONSIDERED APPROXIMATE ONLY. THE VERIFICATION OF THE LOCATION OF ALL UNDERGROUND UTILITIES, EITHER SHOWN OR NOT SHOWN ON THESE PLANS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR, AND SHALL BE LOCATED PRIOR TO ANY GRADING OR CONSTRUCTION OF THE IMPROVEMENTS.

1
1

THIS SHEET FOR DRAINAGE AREA PURPOSES ONLY, NOT FOR CONSTRUCTION!!!!

A PRE DRAINAGE AREA MAP FOR
COOL SPRINGS
BUSINESS PARK
99-10639C 11/28/07



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