CERTIFICATE OF AUTHENTICITY

THIS IS TO CERTIFY THAT THE FOLLOWING ELECTRONIC RECORDS ARE TRUE AND ACCURATE REPRODUCTIONS OF THE ORIGINAL RECORDS OF JAMES CITY COUNTY GENERAL SERVICES DEPARTMENT- STORMWATER DIVISION; WERE SCANNED IN THE REGULAR COURSE OF BUSINESS PURSUANT TO GUIDELINES ESTABLISHED BY THE LIBRARY OF VIRGINIA AND ARCHIVES; AND HAVE BEEN VERIFIED IN THE CUSTODY OF THE INDIVIDUAL LISTED BELOW.

BMP NUMBER: **YR023**

DATE VERIFIED: **April 18, 2012**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

MEMORANDUM

DATE: March 10, 2010

TO: Michael J. Gillis, Virginia Correctional Enterprises Document Management Services

FROM: Jo Anna Ripley, Stormwater

PO: 270712

RE: Files Approved for Scanning

General File ID or BMP ID: YR023

PIN: 2320100071E

Subdivision, Tract, Business or Owner Name (if known): Norge Center

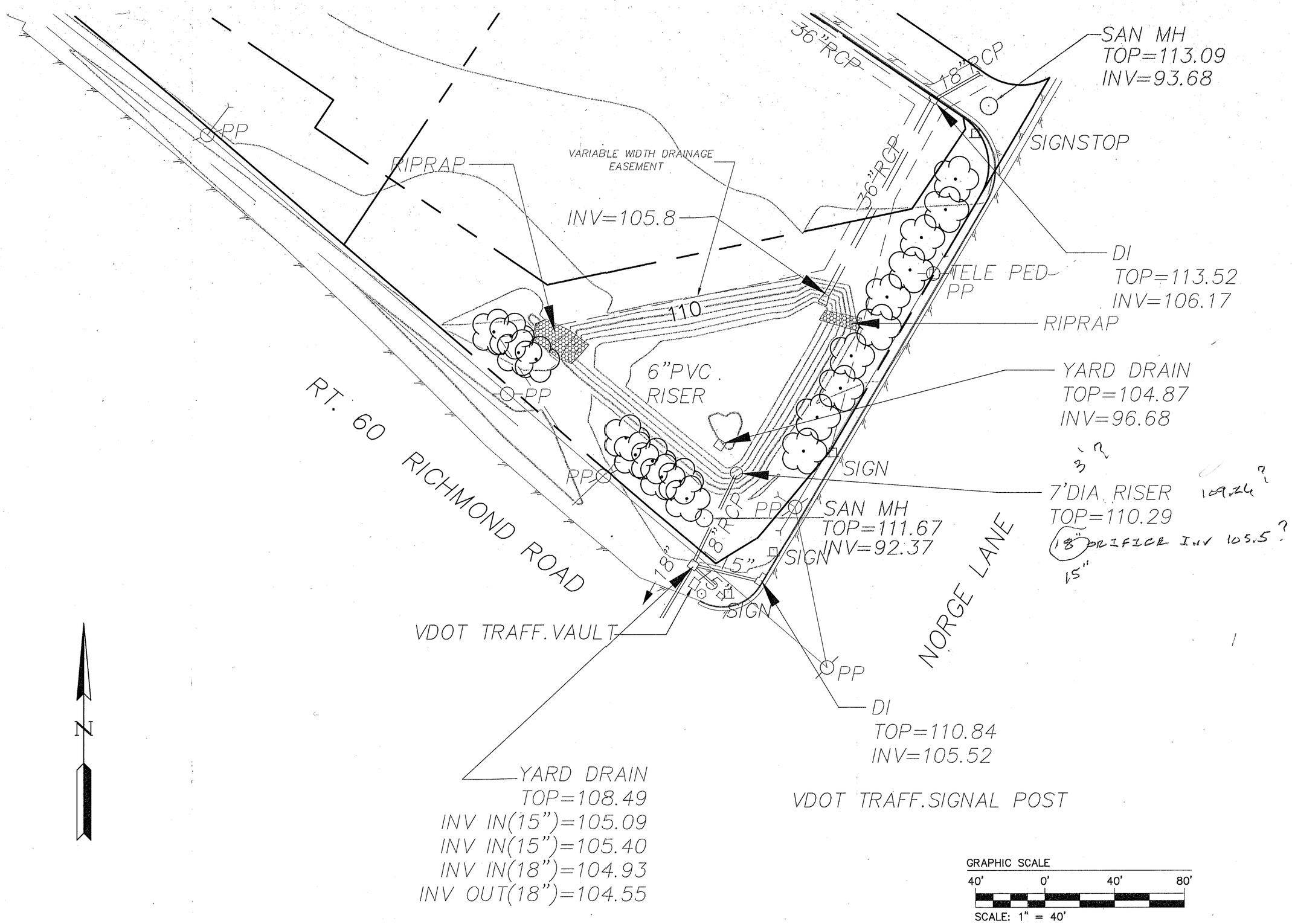
Property Description: Shops at Norge Crossing

Site Address: 7500 Richmond Road

(For internal use only) **Box** 9 **Drawer:** 5

Agreements: (in file as of scan date) **N** **Book or Doc#:** **Page:**

Comments
This is a combined folder with YR011 and YR023



YC 023

AES CONSULTING ENGINEERS
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(757) 253-0040
Fax (757) 220-8994

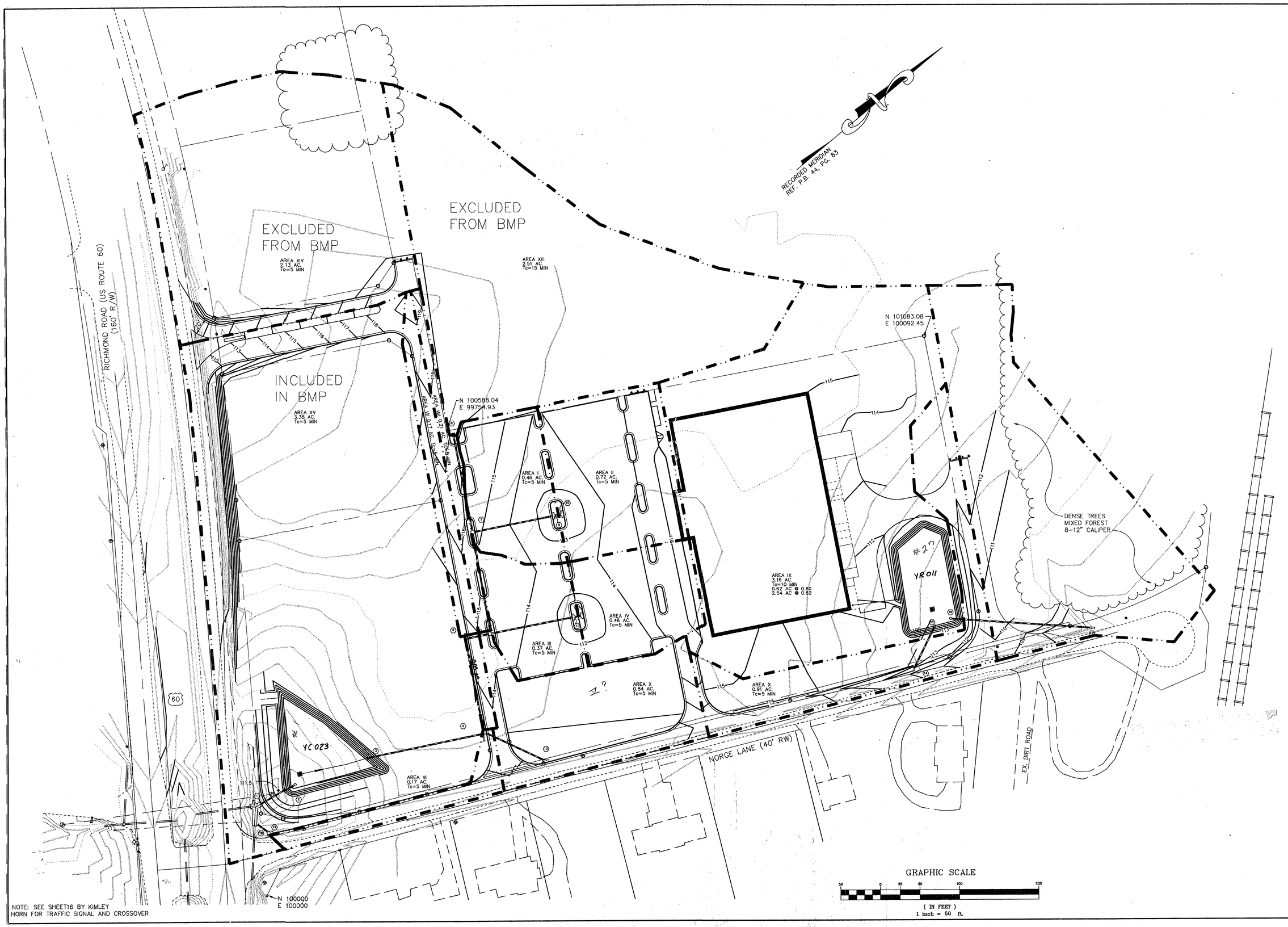
NORGE CENTER, INC.
AS-BUILT LOCATION
STORMWATER FACILITIES

JAMES CITY COUNTY STONEHOUSE DISTRICT VIRGINIA

No.	DATE	REVISION / COMMENT / NOTE	BY

Designed	Drawn
000	TCS
Scale 1"=100'	Date 1/26/98
Project No. 6753-5	
Drawing No. 1 OF 2	

YR023_NORGE_CENTER_FARM_FRESH - 003



NOTE: SEE SHEET16 BY KIMLEY HORN FOR TRAFFIC SIGNAL AND CROSSOVER

Baker
Michael Baker Jr., inc.
Ratcliffe Bldg., Suite 212
8502 Rolling Hills Drive
Richmond, Virginia 23229
(804) 282-1821 fax (804) 285-8530

NORGE SHOPPING CENTER

DRAINAGE AREA MAP

STONEHOUSE MAGISTERIAL DISTRICT
JAMES CITY COUNTY, VIRGINIA

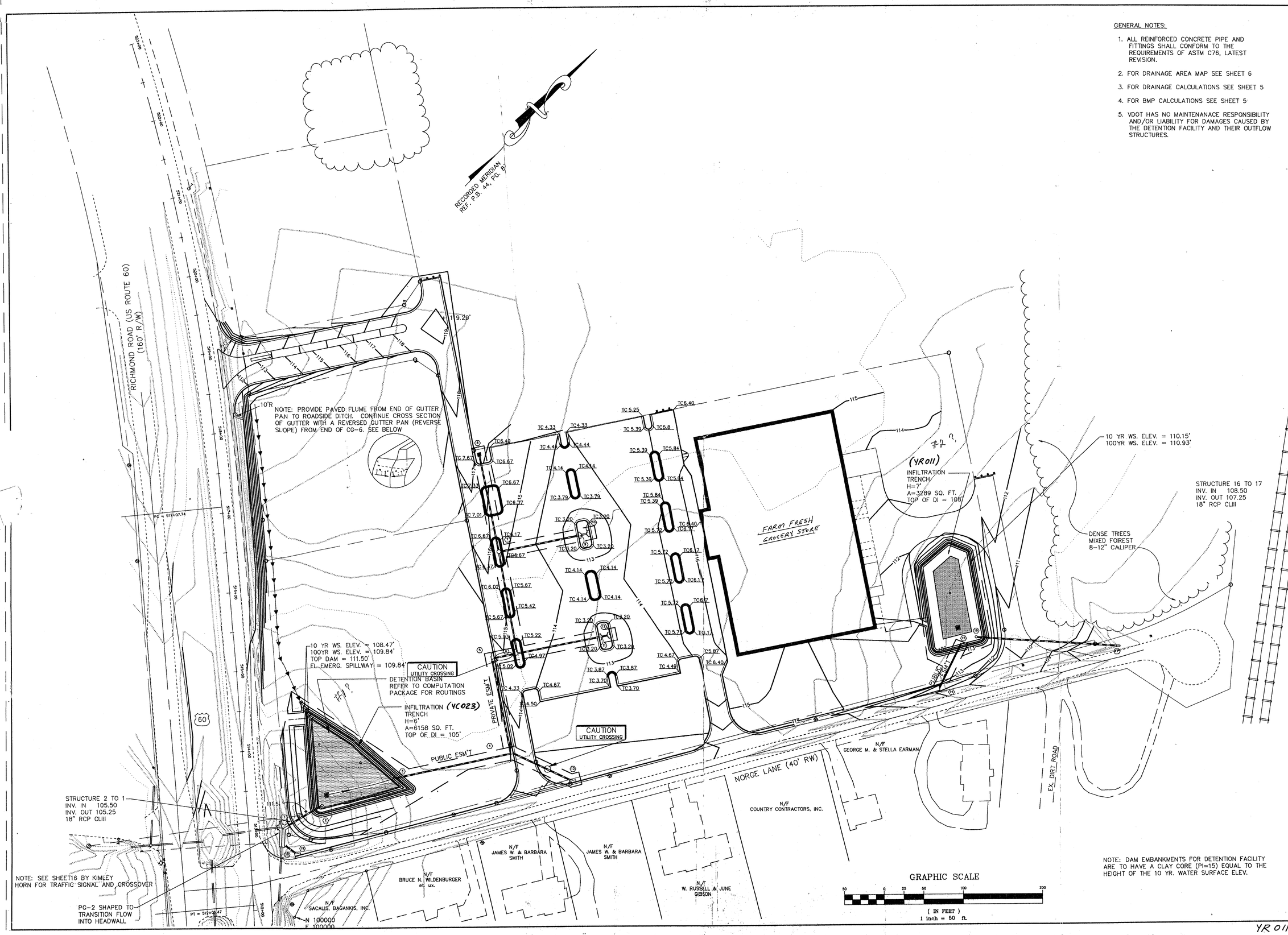
COMMONWEALTH OF VIRGINIA
CARL EDWARD DUNCAN
NO. 21865
PROFESSIONAL ENGINEER

NO.	DATE	REVISIONS
1	10/28/92	REVISED PER COUNTY COMMENTS
2	05/28/93	REVISED PER COUNTY COMMENTS
3	06/22/93	REVISED PER COUNTY COMMENTS

DATE:	08-04-92
SCALE:	GRAPHIC
DESIGN:	CED
CHECK:	CED
DRAWN:	CED
CHECK:	WLS
S.O. NO.:	19700
SHEET	6 OF 15

GENERAL NOTES:

1. ALL REINFORCED CONCRETE PIPE AND FITTINGS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C76, LATEST REVISION.
2. FOR DRAINAGE AREA MAP SEE SHEET 6
3. FOR DRAINAGE CALCULATIONS SEE SHEET 5
4. FOR BMP CALCULATIONS SEE SHEET 5
5. VDOT HAS NO MAINTENANACE RESPONSIBILITY AND/OR LIABILITY FOR DAMAGES CAUSED BY THE DETENTION FACILITY AND THEIR OUTFLOW STRUCTURES.



NOTE: DAM EMBANKMENTS FOR DETENTION FACILITY ARE TO HAVE A CLAY CORE (PI=15) EQUAL TO THE HEIGHT OF THE 10 YR. WATER SURFACE ELEV.

YR 011 & YC 023

Baker
Michael Baker Jr., Inc.
Radcliffe Bldg., Suite 212
1602 Rolling Hills Road
Richmond, Virginia 23229
(804) 282-1821 fax (804) 285-8530

NORGE SHOPPING CENTER
DRAINAGE AND GRADING PLAN
STONEHOUSE MAGISTERIAL DISTRICT
JAMES CITY COUNTY, VIRGINIA

COMMONWEALTH OF VIRGINIA
CARL EDWARD DUNCAN
NO. 21865
PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	
1	10/28/92	REVISED PER COUNTY COMMENTS
2	05/26/93	REVISED PER COUNTY COMMENTS
3	06/22/93	REVISED PER COUNTY COMMENTS

DATE:	08-04-92
SCALE:	GRAPHIC
DESIGN:	CED
CHECK:	CED
DRAWN:	CED
CHECK:	WLS
S.O. NO.:	19700
SHEET	3 OF 15

STORM SEWER DESIGN COMPUTATIONS

PROJECT NORGE COMMERCIAL CENTER
COUNTY JAMES CITY DISTRICT

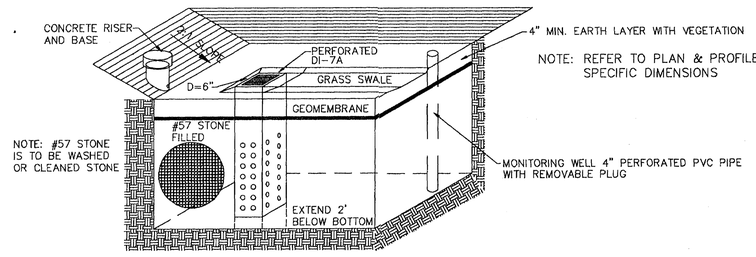
FROM POINT	TO POINT	DA "A" AC.	RUN OFF "C"	CA INCR.	CA ACCUM	Tc MIN	RAIN FALL IN/HR	RUN OFF Q CFS	INVERT ELEVATIONS UPPER	INVERT ELEVATIONS LOWER	LEN. FT.	SLOPE FT/FT	DIA IN.	CAPA CITY CFS	VEL. FPS	FLOW TIME SEC
8	7	2.51	0.62		1.56	15	5.17	8.05	108.12	107.50	125	.005	24	16.0	5.1	
10	9	0.72	0.90	0.65		5	6.95	4.52	108.10	108.05	10	.005	15	4.52	4.20	
9	7	0.46	0.90	0.41	1.06	5	6.95	7.37	108.05	107.50	110	.005	18	7.43	4.79	
7	6					15	5.17	13.54	107.50	106.85	130	.005	24	16.00	5.71	
12	11	0.46	0.90	0.41	0.41	5	6.95	2.85	107.45	107.40	10	.005	15	4.57	3.93	
11	6	0.37	0.90	0.33	0.74	5	6.95	5.14	107.40	106.85	110	.005	18	7.43	4.54	
6	5	0.21	0.90	0.19	3.55	15	5.17	18.35	106.78	106.65	26	.005	36	47.16	6.25	
5	4	0.17	0.90	0.15	3.70	15	5.17	19.13	106.65	106.05	120	.005	36	47.16	6.32	
13	4	0.84	0.50	0.42		5	6.95	2.92	106.50	106.05	90	.005	18	7.43	3.95	
4	3	0.05	0.90	0.04	4.16	15	5.17	21.50	106.05	105.50	109	.005	36	47.16	6.52	
14	15	0.91	0.80	0.73		5	6.95	5.07	110.00	109.67	65	.005	18	7.43	4.52	
19	19	0.17	0.90	0.16		5	6.95	1.07	108.00	107.90	20	.005	15	4.52	4.21	

INLET STATION	OUTLET WATER SURFACE ELEV.	Do	Qo	Lo	Sfo %	Hf	Vo	Ho	Qi	Vi	QiVi	JUNCTION LOSS $\frac{V_i^2}{2g}$	Hi	ANGLE	H_a	Ht	1.3 Ht	0.5 Ht	FINAL H	INLET WATER SURFACE ELEV.	RIM ELEV.
3- 4	108.47	36	19.3	109	0.08	0.08	6.34	0.16	19.13	6.52		0.62	0.22	90	0.43	0.81	-	0.41	0.49	108.96	
4- 5	108.96	36	19.1	120	0.08	0.09	6.52	0.16	18.40	6.25		0.61	0.21	90	0.43	0.80	-	0.40	0.49	109.45	
5- 6	109.45	36	18.4	40	0.08	0.03	6.25	0.15	13.50	5.71		0.51	0.18	90	0.36	0.69	-	0.35	0.38	109.83	
6- 7	109.83	24	13.5	130	0.59	0.77	5.71	0.13	8.05	5.10		0.40	0.14	90	0.28	0.55	-	0.28	1.05	110.88	
7- 9	110.88	18	7.4	110	0.49	0.54	4.79	0.09	4.52	4.20		0.27	0.09		0.19	0.37	-	0.19	0.73	111.61	
9-10	111.61	15	4.5	10	0.50	0.05	4.20	0.07								0.07	-	0.03	0.10	111.71	
6-11	109.83	18	6.9	110	0.44	0.48	4.54	0.09	2.85	3.93		0.24	0.08			0.17	-	0.09	0.57	110.40	
11-12	110.40	15	2.9	10	0.19	0.02	3.93	0.06								0.17	-	0.03	0.22	110.62	
7- 8	110.88	24	8.1	125	0.13	0.16	5.10	0.10								0.10	-	0.05	0.18	111.06	
4-13	108.96	18	6.9	90	0.44	0.40	3.95	0.06								0.06	-	0.03	0.43	109.39	
15-14	110.15	18	5.0	65	0.23	0.08	4.52	0.08								0.08	-	0.04	0.12	110.27	

STORM WATER INLET COMPUTATIONS

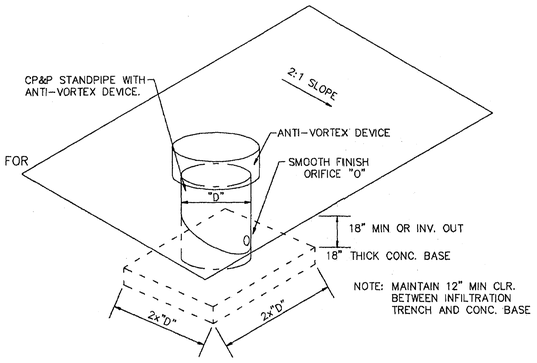
NUMBER	TYPE	LENGTH	STATION	DRAINAGE AREA (AC)	C	CA	CA	I IN/HR	Q INCR	Q CARRYOVER	Qt GUTTER	S GUTTER	Sx CROSS	T (SPREAD)	W (FT)	W/T	Sw (FT/FT)	Sw/Sx	Eo(#10)	a	Sw=a/12W	Se=Sx+SwEo	Lt/Peff	L/Lt	d	E(#16) h	Q INTER. d/h	Qb CARRYOVER	T SPREAD @ SAG
4	4B	4		0.05	0.9	0.04		6.9	0.3	-	0.3	.010	0.02	2	2	1	0.08	4	1.0	3.5	0.14	0.17	4	1.0	1.0	0.3		
5	4B	8		0.17	0.9	0.15		6.9	1.0	-	1.0	.010	0.02	5	2	0.4	0.08	4	0.9	3.5	0.14	0.13	8	1.0	1.0	1.0		
6	4B	8		0.21	0.9	0.19		6.9	1.3	-	1.3	.010	0.02	6	2	0.3	0.08	4	0.8	3.5	0.14	0.13	8	1.0	1.0	1.3		
13	3B	8		0.84	0.5	0.42		3.5	1.5	-	1.5	.010	0.02	6	2	0.3	0.08	4	0.8	3.5	0.14	0.13	8	1.0	1.0	1.5		
19	3B	6		0.17	0.9	0.16		3.5	0.6	-	0.6	.010	0.02	3	2	0.7	0.08	4	0.9	3.5	0.14	0.13	6	1.0	1.0	0.6		
9	3C	16		0.46	0.9	0.41		6.9	2.8	-	2.8	.001	0.01										19	0.15	0.46	0.33		15
10	3C	16		0.72	0.9	0.64		6.9	4.5	-	4.5	.001	0.01										19	0.21	0.46	0.45		21
11	3C	16		0.37	0.9	0.33		6.9	2.3	-	2.3	.001	0.01										19	0.14	0.46	0.30		14
12	3C	16		0.46	0.9	0.41		6.9	2.8	-	2.8	.001	0.01										19	0.15	0.46	0.33		15
8	D7			2.51	0.6	1.56		5.2	8.1	-																		

NOTE: DI-7A TO BE CONCRETE PIPE & PRODUCTS STD. MEDIAN DROP INLET WITH EXTENDED BASE (2' BELOW TRENCH) AND RISER STEPS. PERFORATIONS TO BE ROUGH PUNCHED WITH 2" DIAMETER ROD WHILE CONCRETE IS CURING BY CP&P. PERFORATIONS TO BE 25% OF SURFACE AREA AND CONCENTRATED IN BOTTOM 4' OF STRUCTURE.



BMP SCHEMATIC

NOT TO SCALE



RISER SCHEMATIC

NOT TO SCALE

NORGE COMMERCIAL CENTER INFILTRATION TRENCH #1 (YR011)

Input Parameters

Site Area : 6.670 Acres
Area served by BMP(%) : 100.00
Effective Area of Site : 6.670 Acres
Impervious Cover Pre(%) : 16.00
Impervious Cover Post(%) : 60.00
Development Type : New Development
Average Annual Rainfall(Inches) : 44.0

Output Values

Pre -Development Pollutant Load: 10.19 Lbs/Yr (0.9 Lbs/Ac/Yr Crop)
Post-Development Pollutant Load: 15.93 Lbs/Yr
Required Removal Efficiency(%) : 36.03

NORGE COMMERCIAL CENTER INFILTRATION TRENCH #2 (YC023)

Input Parameters

Site Area : 4.070 Acres
Area served by BMP(%) : 100.00
Effective Area of Site : 4.070 Acres
Impervious Cover Pre(%) : 16.00
Impervious Cover Post(%) : 60.00
Development Type : New Development
Average Annual Rainfall(Inches) : 44.0

Output Values

Pre -Development Pollutant Load: 3.66 Lbs/Yr (0.9 Lbs/Ac/Yr Crop)
Post-Development Pollutant Load: 5.73 Lbs/Yr
Required Removal Efficiency(%) : 36.07

Valid BMP's

BMP TYPE	BMP Points	Removal Efficiency(%)
Infiltration Trench (0.5 IN/AC)	9	(50- 70)
(1.0 IN/AC)	10	
Infiltration Basin (0.5 IN/AC)	9	(50- 70)
(1.0 IN/AC)	10	

NORGE COMMERCIAL CENTER INFILTRATION TRENCH #1 (YR011)

Feasibility Input Parameters

Infiltration Rate(In/Hr): 5.00 *
Maximum Allowable Storage Time of Trench(Hrs): 72
Void Ratio Trench Medium: 0.40
Depth to Seasonal High Groundwater Table(Ft): >15.00
Min. Dist. from Trench bottom to Groundwater Table(Ft): 2.00

Maximum Trench Depth(Ft): 13.00

Design Input Parameters

Increase in Runoff Depth(In): 1.00
Contributing Drainage Area(Sq Ft): 174327
Depth of Trench(Ft): 6.00

Trench Area(Sq Ft): 6158

NORGE COMMERCIAL CENTER INFILTRATION TRENCH #2 (YC023)

Feasibility Input Parameters

Infiltration Rate(In/Hr): 3.50 *
Maximum Allowable Storage Time of Trench(Hrs): 72
Void Ratio Trench Medium: 0.40
Depth to Seasonal High Groundwater Table(Ft): 15.00
Min. Dist. from Trench bottom to Groundwater Table(Ft): 2.00

Maximum Trench Depth(Ft): 13.00

Design Input Parameters

Increase in Runoff Depth(In): 1.00
Contributing Drainage Area(Sq Ft): 106374
Depth of Trench(Ft): 7.00

Trench Area(Sq Ft): 3289

SUMMARY OF POINTS

BMP#1 = 1.0 IN/IMP. AC = 10 POINTS x 0.74% OF SITE = 7.40 POINTS
BMP#2 = 1.0 IN/IMP. AC = 10 POINTS x 0.26% OF SITE = 2.60 POINTS
TOTAL POINTS 10.00 POINTS

* NOTE: SEE GEOTECHNICAL REPORT BY COMBINED TECHNOLOGIES, INC. DATED APRIL, 1992.

SWM FACILITY ROUTING SUMMARY

BASIN 1 (YR011)

	2	10? 20	25	100
PRE	20.04	26.62	34.66	47.49
POST	29.57	38.76	50.37	68.66
ROUTED	10.81	15.10	17.02	21.88
WS. ELEV.	107.58	108.47	109.26	109.84
STORAGE	16075	24068	31758	37804

BASIN 2 (YC023)

	2	10? 20	25	100
PRE	7.92	10.39	13.50	18.40
POST	12.80	16.50	21.40	28.93
ROUTED	5.50	7.26	8.94	12.87
WS. ELEV.	109.83	110.15	110.53	110.93
STORAGE	6098	8276	11326	14810

YR011
NOTE: SWM #1 'D' = 18'
'D' = 36'
YC023
SWM #2 'D' = 15'
'D' =36'

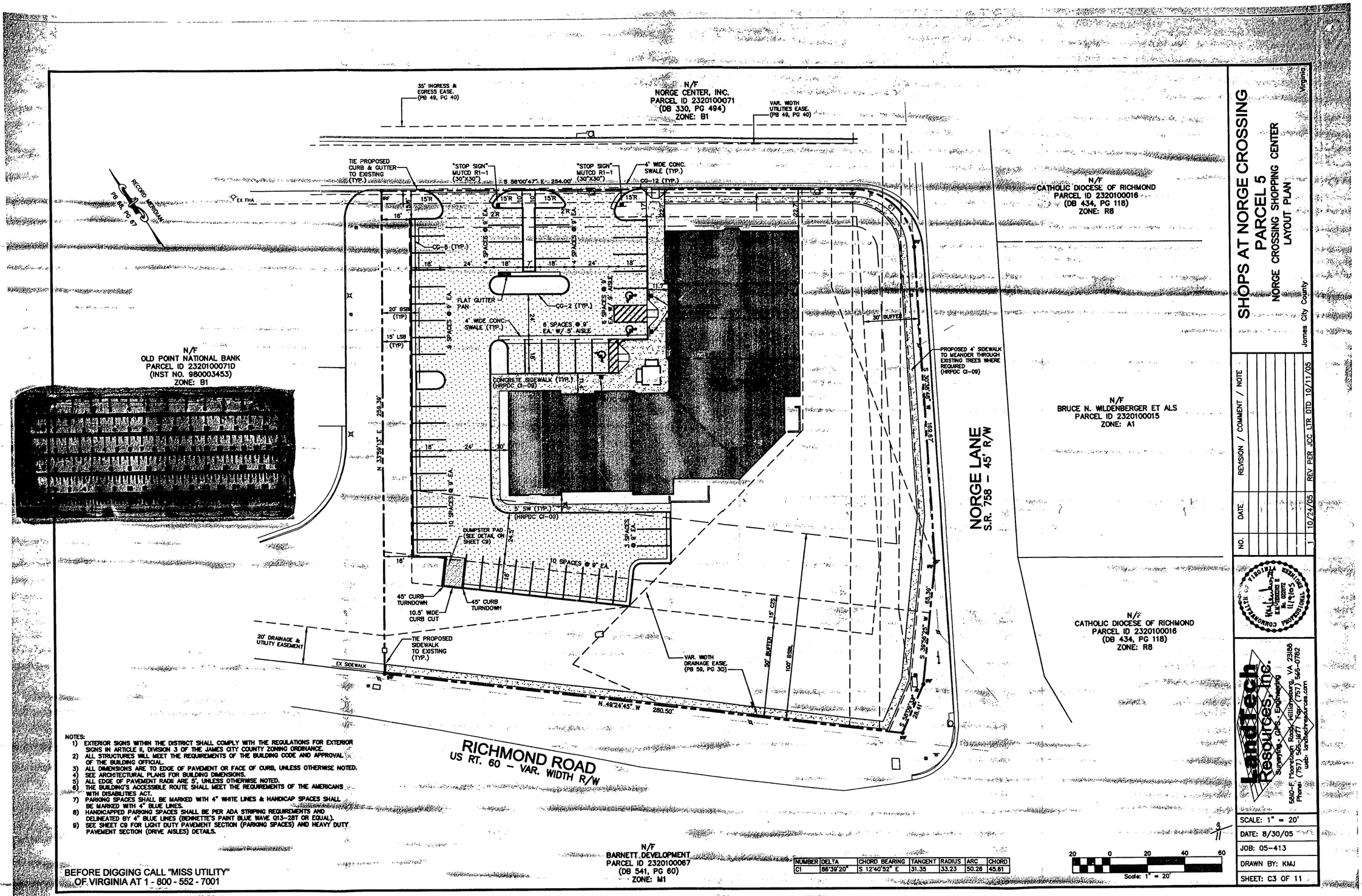
Baker
Michael Baker Jr., inc.
Ratcliffe Bldg., Suite 212
1602 Rolling Hills Drive
Richmond, Virginia 23229
(804) 282-1821 Fax (804) 285-8530

NORGE SHOPPING CENTER
BMP/DRAINAGE CALCULATIONS SHEET
STONEHOUSE MAGISTERIAL DISTRICT
JAMES CITY COUNTY, VIRGINIA

COMMONWEALTH OF VIRGINIA
CARL EDWARD DUNCAN
NO. 21865
PROFESSIONAL ENGINEER

NO.	DATE	REVISIONS
1	10/28/92	REVISED PER COUNTY COMMENTS
2	05/28/93	REVISED PER COUNTY COMMENTS
3	06/22/93	REVISED PER COUNTY COMMENTS

DATE:	08-04-92
SCALE:	GRAPHIC
DESIGN:	CED
CHECK:	CED
DRAWN:	CED
CHECK:	WLS
S.O. NO.:	19700
SHEET	5 OF 15



NOTES:

1) EXTERIOR SIGNS WITHIN THE DISTRICT SHALL COMPLY WITH THE REGULATIONS FOR EXTERIOR SIGNS IN ARTICLE II, DIVISION 3 OF THE JAMES CITY COUNTY ZONING ORDINANCE.
2) ALL STRUCTURES WILL MEET THE REQUIREMENTS OF THE BUILDING CODE AND APPROVAL OF THE BUILDING OFFICIAL.
3) ALL DIMENSIONS ARE TO EDGE OF PAVEMENT OR FACE OF CURB, UNLESS OTHERWISE NOTED.
4) SEE ARCHITECTURAL PLANS FOR BUILDING DIMENSIONS.
5) ALL EDGE OF PAVEMENT RADII ARE 5', UNLESS OTHERWISE NOTED.
6) THE BUILDING'S ACCESSIBLE ROUTE SHALL MEET THE REQUIREMENTS OF THE AMERICANS WITH DISABILITIES ACT.
7) PARKING SPACES SHALL BE MARKED WITH 4" WHITE LINES & HANDICAP SPACES SHALL BE MARKED WITH 4" BLUE LINES.
8) HANDICAPPED PARKING SPACES SHALL BE PER ADA STRIPING REQUIREMENTS AND DELINEATED BY 4" BLUE LINES (BENNETTE'S PAINT BLUE WAVE Q13-28T OR EQUAL).
9) SEE SHEET C9 FOR LIGHT DUTY PAVEMENT SECTION (PARKING SPACES) AND HEAVY DUTY PAVEMENT SECTION (DRIVE AISLES) DETAILS.

NUMBER	DELTA	CHORD BEARING	TANGENT	RADIUS	ARC	CHORD
C1	86°39'20"	S 12°40'52" E	31.35	33.23	50.26	45.61

BEFORE DIGGING CALL "MISS UTILITY" OF VIRGINIA AT 1 - 800 - 552 - 7001

SHOPS AT NORGE CROSSING
PARCEL 5
NORGE CROSSING SHOPPING CENTER
LAYOUT PLAN

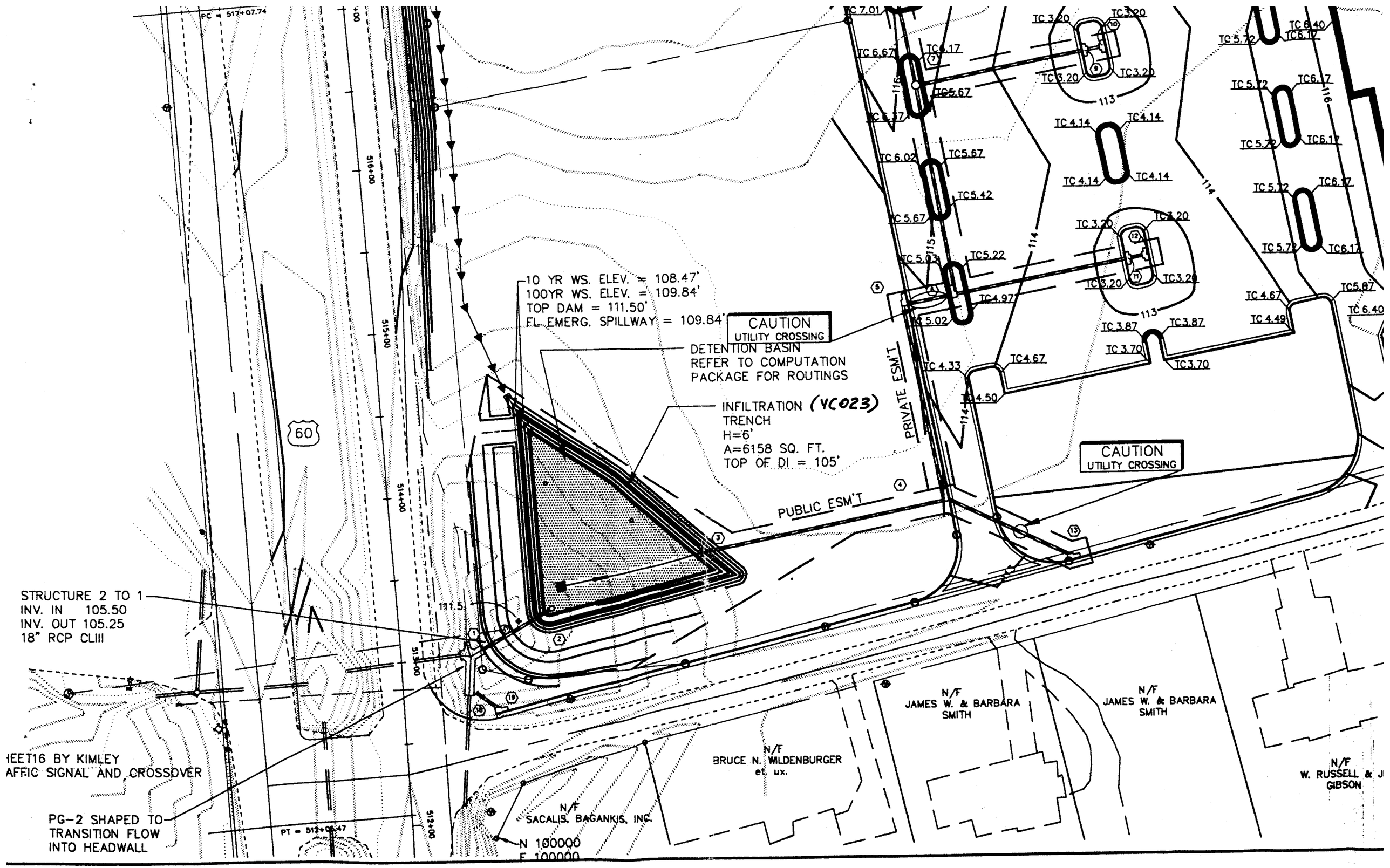
James City County, Virginia

NO.	DATE	REVISION / COMMENT / NOTE
1	10/24/05	REV PER JCC LTR DTD 10/11/05

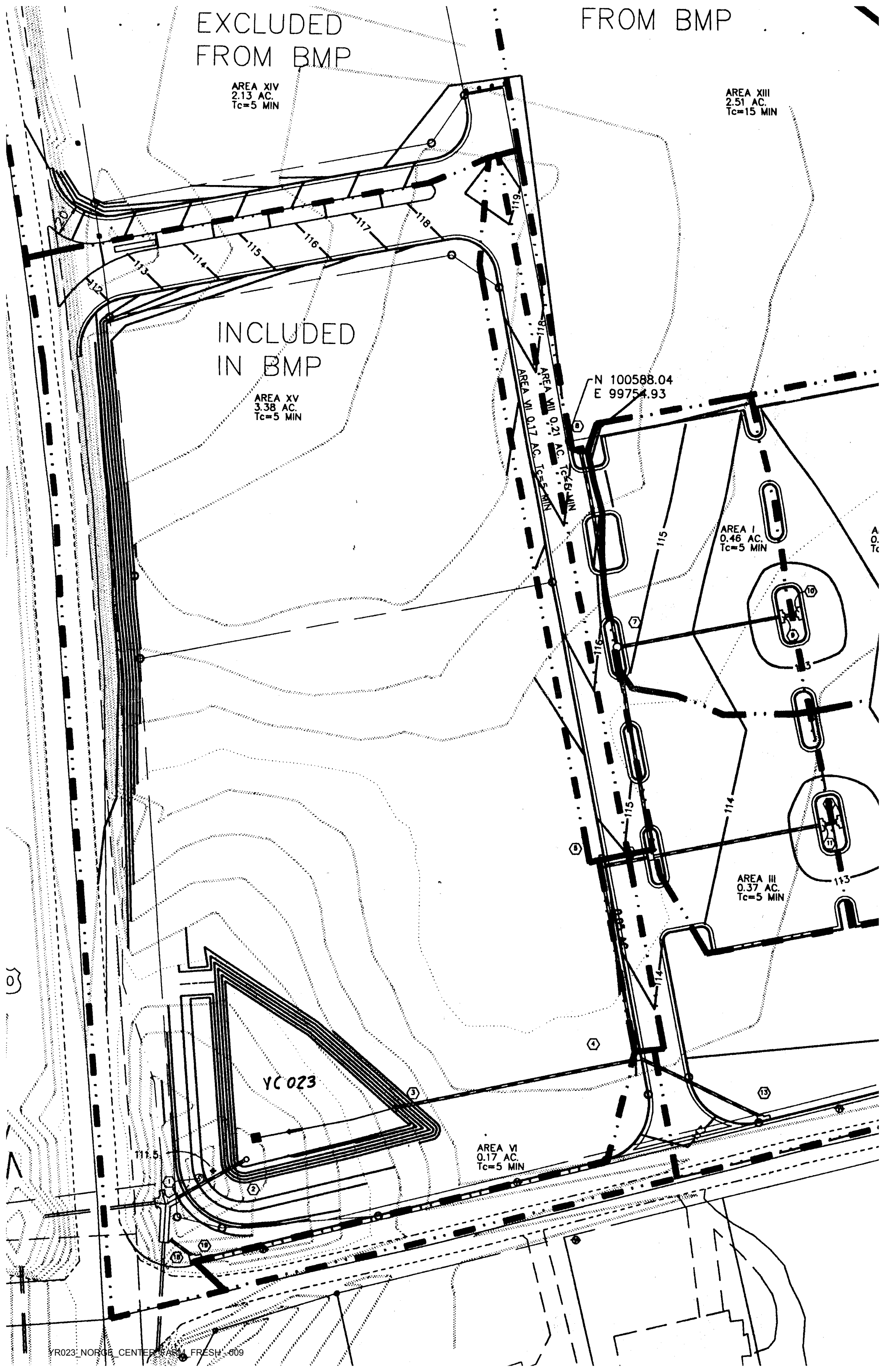
COMMONWEALTH OF VIRGINIA — KIMBERLY M. JONES — LICENSED PROFESSIONAL ENGINEER

Landtech Resources, Inc.
Surveying - GIS - Engineering
5810-F Mooretown Road, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0792
web: landtechresources.com

SCALE: 1" = 20'
DATE: 8/30/05
JOB: 05-413
DRAWN BY: KMJ
SHEET: C3 OF 11

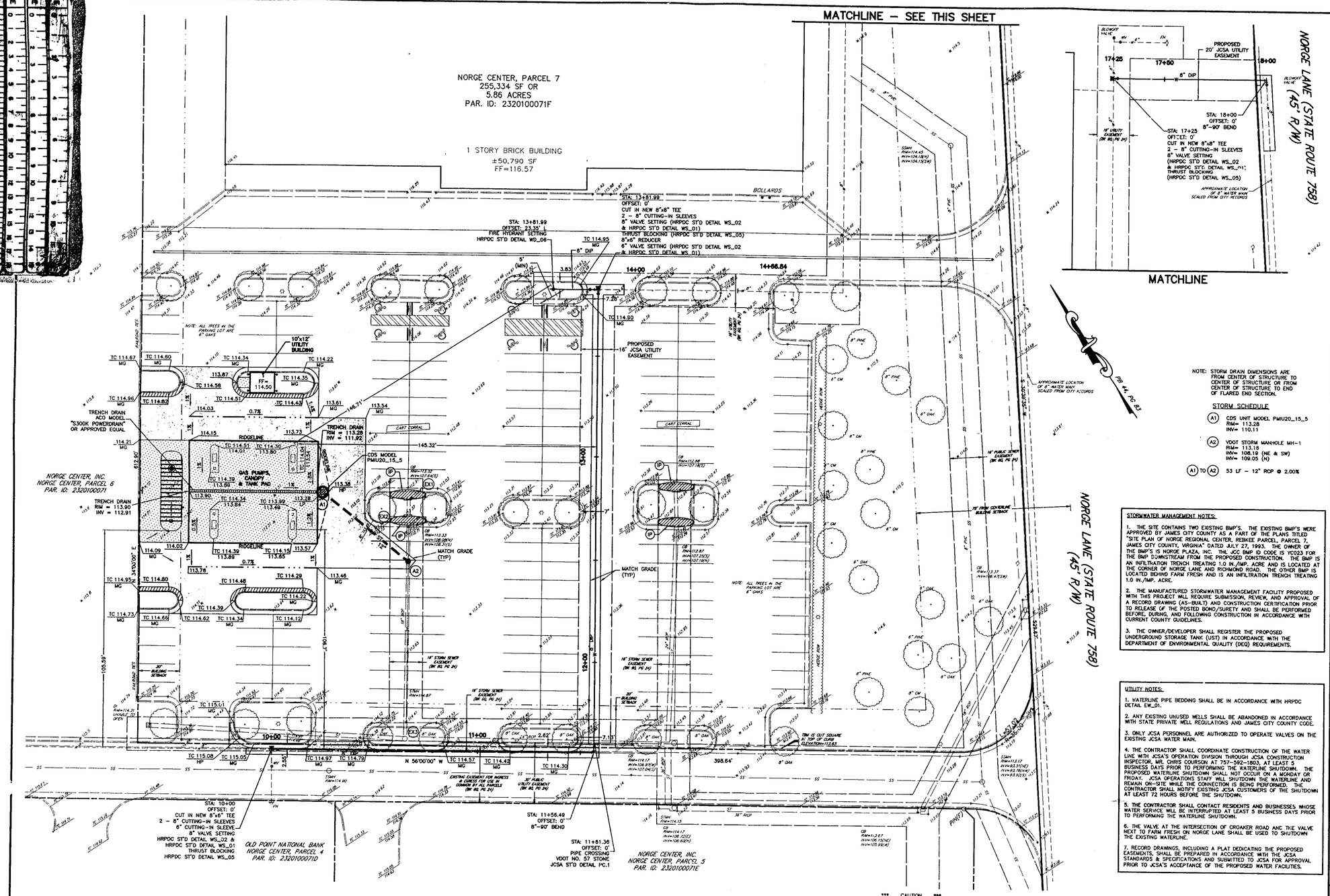


YR023_NORGE_CENTER_FARM_FRESH - 008



YR023_NORGE_CENTER_FARM_FRESH - 009

COPY



STORMWATER MANAGEMENT NOTES:

1. THE SITE CONTAINS TWO EXISTING BMP'S. THE EXISTING BMP'S WERE APPROVED BY JAMES CITY COUNTY AS A PART OF THE PLANS TITLED "SITE PLAN OF NORGE REGIONAL CENTER, REBKEE PARCEL, PARCEL 7, JAMES CITY COUNTY, VIRGINIA" DATED JULY 27, 1993. THE OWNER OF THE BMP'S IS NORGE PLAZA, INC. THE JCC BMP ID CODE IS YC023 FOR THE BMP DOWNSTREAM FROM THE PROPOSED CONSTRUCTION. THE BMP IS AN INFILTRATION TRENCH TREATING 1.0 IN./IMP. ACRE AND IS LOCATED AT THE CORNER OF NORGE LANE AND RICHMOND ROAD. THE OTHER BMP IS LOCATED BEHIND FARM FRESH AND IS AN INFILTRATION TRENCH TREATING 1.0 IN./IMP. ACRE.

2. THE MANUFACTURED STORMWATER MANAGEMENT FACILITY PROPOSED WITH THIS PROJECT WILL REQUIRE SUBMISSION, REVIEW, AND APPROVAL OF A RECORD DRAWING (AS-BUILT) AND CONSTRUCTION CERTIFICATION PRIOR TO RELEASE OF THE POSTED BOND/SURETY AND SHALL BE PERFORMED BEFORE, DURING, AND FOLLOWING CONSTRUCTION IN ACCORDANCE WITH CURRENT COUNTY GUIDELINES.

3. THE OWNER/DEVELOPER SHALL REGISTER THE PROPOSED UNDERGROUND STORAGE TANK (UST) IN ACCORDANCE WITH THE DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ) REQUIREMENTS.

UTILITY NOTES:

1. WATERLINE PIPE BEDDING SHALL BE IN ACCORDANCE WITH HRPDC DETAIL EW_01.

2. ANY EXISTING UNUSED WELLS SHALL BE ABANDONED IN ACCORDANCE WITH STATE PRIVATE WELL REGULATIONS AND JAMES CITY COUNTY CODE.

3. ONLY JCSA PERSONNEL ARE AUTHORIZED TO OPERATE VALVES ON THE EXISTING JCSA WATER MAIN.

4. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION OF THE WATER LINE WITH JCSA'S OPERATION DIVISION THROUGH JCSA CONSTRUCTION INSPECTOR, MR. CHRIS COURSON AT 757-592-1803, AT LEAST 5 BUSINESS DAYS PRIOR TO PERFORMING THE WATERLINE SHUTDOWN. THE PROPOSED WATERLINE SHUTDOWN SHALL NOT OCCUR ON A MONDAY OR FRIDAY. JCSA OPERATIONS STAFF WILL SHUTDOWN THE WATERLINE AND REMAIN ON-SITE WHILE THE CONNECTION IS BEING PERFORMED. THE CONTRACTOR SHALL NOTIFY EXISTING JCSA CUSTOMERS OF THE SHUTDOWN AT LEAST 72 HOURS BEFORE THE SHUTDOWN.

5. THE CONTRACTOR SHALL CONTACT RESIDENTS AND BUSINESSES WHOSE WATER SERVICE WILL BE INTERRUPTED AT LEAST 5 BUSINESS DAYS PRIOR TO PERFORMING THE WATERLINE SHUTDOWN.

6. THE VALVE AT THE INTERSECTION OF CROAKER ROAD AND THE VALVE NEXT TO FARM FRESH ON NORGE LANE SHALL BE USED TO SHUTDOWN THE EXISTING WATERLINE.

7. RECORD DRAWINGS, INCLUDING A PLAT DEDICATING THE PROPOSED EASEMENTS, SHALL BE PREPARED IN ACCORDANCE WITH THE JCSA STANDARDS & SPECIFICATIONS AND SUBMITTED TO JCSA FOR APPROVAL PRIOR TO JCSA'S ACCEPTANCE OF THE PROPOSED WATER FACILITIES.

MSA, P.C.
Environmental Sciences • Geosciences • Planning
Surveying • Engineering • Landscape Architecture
5033 Rouse Drive, Virginia Beach, VA 23462
757-490-9264 (Ofc) 757-490-0634 (Fax)
www.msaonline.com
Offices in Virginia Beach & Eastville, VA

THIS DOCUMENT IS THE SOLE PROPERTY OF MSA, P.C. LOCATED IN VIRGINIA BEACH, VA. THE REPRODUCTION, IN WHOLE OR PART, OR USE OF THIS DETAIL, OR DESIGN ON THIS DOCUMENT FOR ANY PURPOSE NOT SPECIFICALLY INTENDED BY MSA, P.C. IS PROHIBITED WITHOUT THE EXPRESS WRITTEN CONSENT OF MSA, P.C.

DESIGNED	NAH	
DRAWN	NAH	
CHECKED	GBH	
APPROVED	GBH	
DATE	3/23/06	

COMMONWEALTH OF VIRGINIA
GREGORY B. HAYES
No. 036291
3-23-06
PROFESSIONAL ENGINEER

GRADING, DRAINAGE AND UTILITIES PLAN
OF
FARM FRESH FUEL EXPRESS
NORGE SHOPPING CENTER
JAMES CITY COUNTY VIRGINIA

5/12

SHEET
C5.0
5 of 12 Sheets

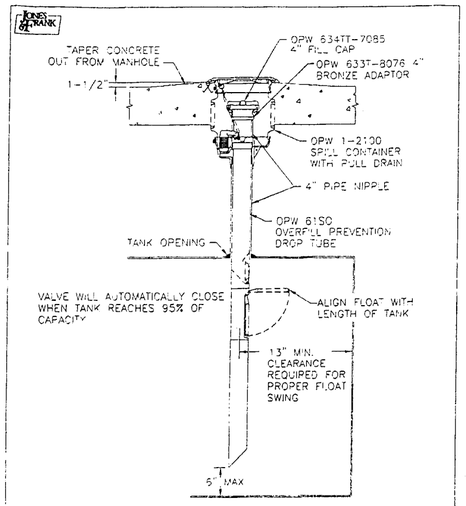
SCALE: GRAPHIC

PROJ. NO.: 03102C

t:\Projects\03102C_Engineering\DWG\03102C-SP.dwg, C5.0-GRADING, 3/23/2006 2:22:27 PM, nathan_190

YR023_NORGE_CENTER_FARM_FRESH - 010

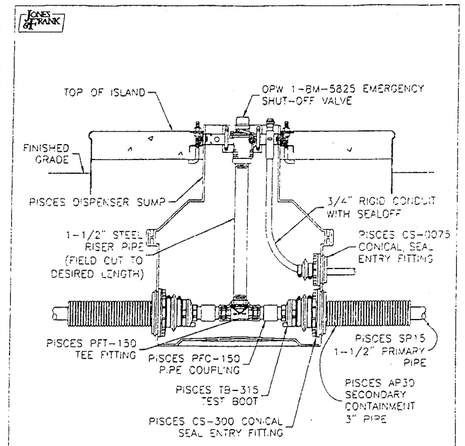
COPY



FILL WITH SPILL CONTAINER AND OVERFILL PREVENTION

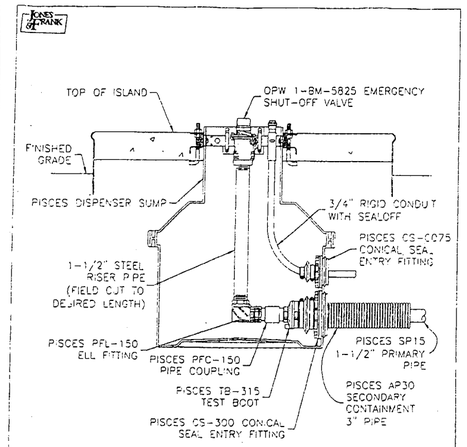
STATE CARB APPROVED IF NOTE NEEDED

DRAWING NO.: 21105
DATE: 4/15/98



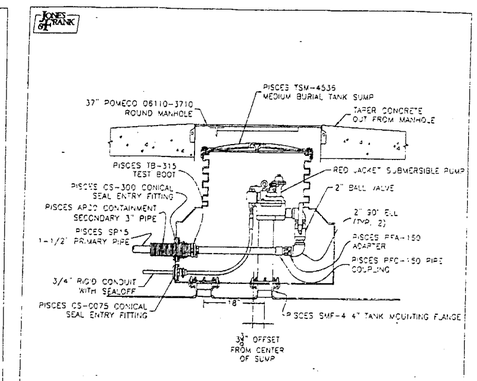
PISCES 1-1/2" PRIMARY PIPE IN 3" RETRACTABLE SECONDARY CONTAINMENT PIPE CONTINUING THROUGH A DISPENSER SUMP

DRAWING NO.: 31410
DATE: 9/30/98



PISCES 1-1/2" PRIMARY PIPE IN 3" RETRACTABLE SECONDARY CONTAINMENT PIPE TERMINATING IN A DISPENSER SUMP

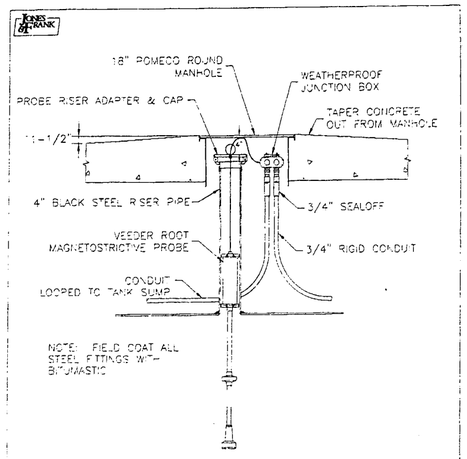
DRAWING NO.: 31415
DATE: 9/30/98



TSM-4536 PISCES TANK SUMP WITH SUBMERSIBLE PUMP AND 1-1/2" RETRACTABLE PIPING (TWO OPENING MOUNTED)

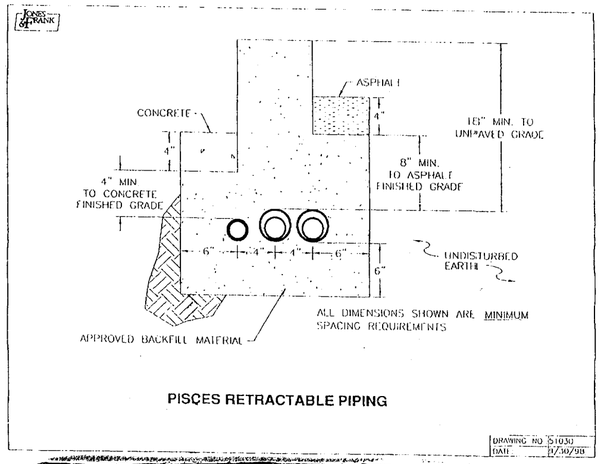
RED JACKET & FE PETRO LAYERS

DRAWING NO.: 33410
DATE: 9/30/98



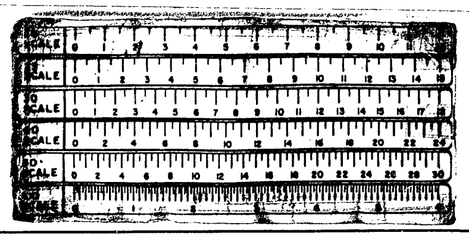
VEEDER ROOT MAGNETOSTRICTIVE TANK PROBE

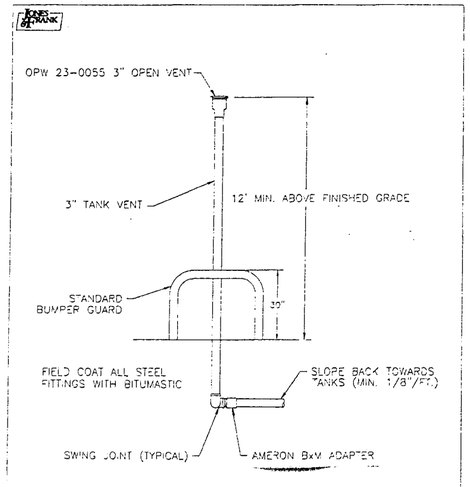
DRAWING NO.: 141810
DATE: 4/15/98



PISCES RETRACTABLE PIPING

DRAWING NO.: 51030
DATE: 9/30/98





VENT RISER INSTALLATION DETAIL

SPECIFY VENT TYPE (PRESSURE OR OPEN)

DRAWING NO.: 81001
DATE: 4/15/98

EXCAVATION AND BEDDING NOTES

1. THE BOTTOM OF THE EXCAVATION SHALL BE COVERED WITH A MINIMUM OF 12 INCHES OF BEDDING. SUITABLY GRADED AND LEVELED. BEDDING AND BACKFILL MATERIAL SURROUNDING THE TANK, TO A WIDTH AND DEPTH OF 12 INCHES ALL AROUND THE TANK, SHALL BE CLEAN MATERIAL.

2. WHERE ANCHORING BY MEANS OF A CONCRETE PAD, THE TANK SHALL BE PLACED DIRECTLY ON THE PAD. BEDDING MATERIAL AS LEAST 6 INCHES DEEP MUST BE SPREAD EVENLY OVER THE DIMENSIONS OF THE PAD TO SEPARATE THE TANK FROM THE PAD.

3. BEDDING AND BACKFILL MATERIAL SHALL CONSIST OF HOMOGENOUS PEA GRAVEL, CRUSHED STONE, CLEAN SAND, OR NATURAL EARTHEN MATERIALS. CRUSHED STONE, CLEAN SAND, AND NATURAL EARTHEN MATERIALS SHALL BE CAPABLE OF PASSING 100% THROUGH A 1/2-INCH SIEVE AND NO MORE THAN 12% BY DRY WEIGHT THROUGH A #200 SIEVE (0.0029 INCH). PEA GRAVEL SHALL BE NO LARGER THAN 3/4-INCH. THE MATERIALS SHALL BE FREE OF ALL FOREIGN MATERIALS, SUCH AS BUT NOT LIMITED TO, BRICKS, METALS, CONCRETE, AND PLASTICS.

4. THE BACKFILL MATERIAL MAY BE FROM THE TANK SITE IF IT MEETS THIS DESCRIPTION, OR IT MAY BE DELIVERED TO THE SITE FROM ANOTHER SOURCE.

5. SAND OR NATURAL EARTHEN MATERIALS USED AS BACKFILL SHALL BE PLACED INTO THE EXCAVATION IN 12-18 INCH VERTICAL LIFTS, COMPACTED AFTER EACH LIFT, AT LEAST 60% UP THE VERTICAL HEIGHT OF THE TANK.

MSA, P.C.
Environmental Sciences • Geosciences • Planning
Surveying • Engineering • Landscape Architecture
5033 Rouse Drive, Virginia Beach, VA 23462
757-490-9264 (Ofc) 757-490-0634 (Fax)
www.msaonline.com
Offices in Virginia Beach & Eastville, VA

THIS DOCUMENT IS THE PROPERTY OF MSA, P.C. VIRGINIA BEACH, VA. ANY REPRODUCTION OF THIS DETAIL OR DESIGN OR USE FOR ANY PURPOSE OTHER THAN THAT INTENDED BY MSA, P.C. IS PROHIBITED WITHOUT THE EXPRESS WRITTEN CONSENT OF MSA, P.C.

DESIGNED
DRAWN
CHECKED
APPROVED
DATE 3/23/06

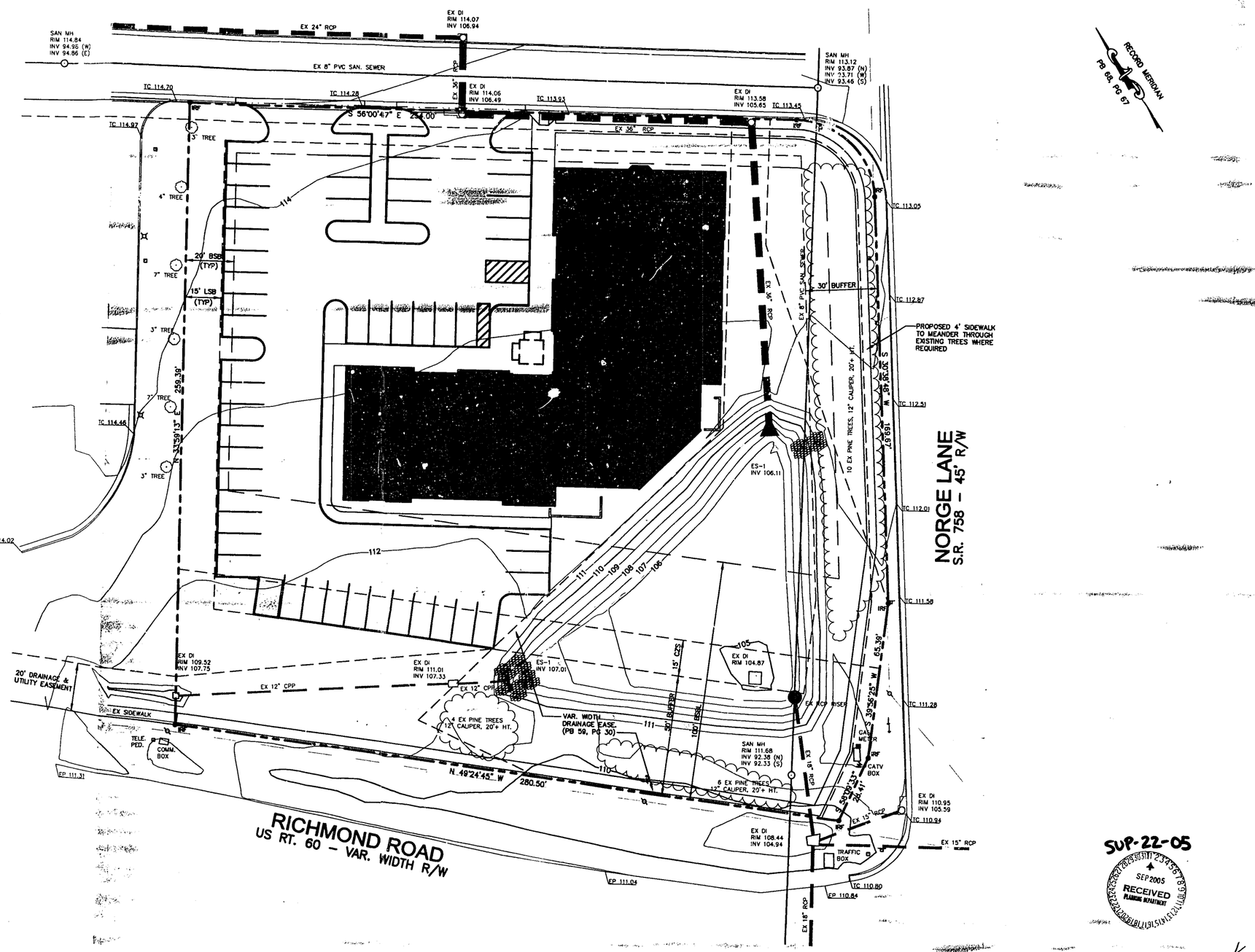
DETAILS OF
FARM FRESH FUEL EXPRESS
NORGE SHOPPING CENTER
JAMES CITY COUNTY VIRGINIA

10/12

SHEET
C7.2
10 of 12 Sheets

SCALE: AS NOTED
PROJ. NO.: 03102C

I:\Projects\03102C_Engineering\DWG\03102C-SP.dwg, C7.2, 3/23/2006 11:39:41 AM, nathan_190



BEFORE DIGGING CALL "MISS UTILITY" OF VIRGINIA AT 1 - 800 - 552 - 7001

(28-2)(01-71E) SUP-22-05 Hope at Range Crossing LLC

NORGE CENTER, INC.
PARCEL 5
SPECIAL USE PERMIT SUBMISSION

James City County — Virginia

NO.	DATE	REVISION / COMMENT / NOTE
1	7/25/05	REV PER JCC E-MAIL DTD 7/22/05

LandTech Resources, Inc.
Surveying • GPS • Engineering
5810-F Thorncliff Road, Williamsburg, VA 23188
Phone: (757) 565-0877 Fax: (757) 565-0782
web: landtechresources.com

SCALE: 1" = 20'
DATE: 6/16/05
JOB: 05-413
DRAWN BY: KMJ
SHEET: P1 OF 1

LOW ME	
EC	

INAL H	INLET WATER SURFACE ELEV.	RIM ELEV.
0.49	108.96	
0.49	109.45	
0.38	109.83	
1.05	110.88	
0.73	111.61	
0.10	111.71	
0.57	110.40	
0.22	110.62	
0.18	111.06	
0.43	109.39	
0.12	110.27	

NORGE COMMERCIAL CENTER INFILTRATION TRENCH #1 (YR011)

Input Parameters

Site Area	: 6.670 Acres
Area served by BMP(%)	: 100.00
Effective Area of Site	: 6.670 Acres
Impervious Cover Pre(%)	: 16.00
Impervious Cover Post(%)	: 60.00
Development Type	: New Development
Average Annual Rainfall(Inches)	: 44.0

Output Values

Pre -Development Pollutant Load	: 10.19 Lbs/Yr (0.9 Lbs/Ac/Yr Crop)
Post-Development Pollutant Load	: 15.93 Lbs/Yr
Required Removal Efficiency(%)	: 36.03

NORGE COMMERCIAL CENTER INFILTRATION TRENCH #2 (YC023)

Input Parameters

Site Area	: 4.070 Acres
Area served by BMP(%)	: 100.00
Effective Area of Site	: 4.070 Acres
Impervious Cover Pre(%)	: 16.00
Impervious Cover Post(%)	: 60.00
Development Type	: New Development
Average Annual Rainfall(Inches)	: 44.0

Output Values

Pre -Development Pollutant Load	: 3.66 Lbs/Yr (0.9 Lbs/Ac/Yr Crop)
Post-Development Pollutant Load	: 5.73 Lbs/Yr
Required Removal Efficiency(%)	: 36.07

Valid BMP's

BMP TYPE		BMP Points	Removal Efficiency(%)
Infiltration Trench	(0.5 IN/AC)	9	(50- 70)
	(1.0 IN/AC)	10	
Infiltration Basin	(0.5 IN/AC)	9	(50- 70)
	(1.0 IN/AC)	10	

NORGE COMMERCIAL CENTER INFILTRATION TRENCH #1 (YR011)

Feasibility Input Parameters

Infiltration Rate(In/Hr): 5.00 *
Maximum Allowable Storage Time of Trench(Hrs): 72
Void Ratio Trench Medium: 0.40
Depth to Seasonal High Groundwater Table(Ft): >15.00
Min. Dist. from Trench bottom to Groundwater Table(Ft): 2.00

Maximum Trench Depth(Ft): 13.00

Design Input Parameters

SWM FACILITY ROUTING SUMMARY

BASIN 1 (YR011)

	2	~~20~~ 10?	25	100
PRE	20.04	26.62	34.66	47.49
POST	29.57	38.76	50.37	68.66
ROUTED	10.81	15.10	17.02	21.88
WS. ELEV.	107.58	108.47	109.26	109.84
STORAGE	16075	24068	31758	37804

BASIN 2 (YC023)

	2	~~20~~ 10?	25	100
PRE	7.92	10.39	13.50	18.40
POST	12.80	16.50	21.40	28.93
ROUTED	5.50	7.26	8.94	12.87
WS. ELEV.	109.83	110.15	110.53	110.93
STORAGE	6098	8276	11326	14810

NUMBER	TYPE	LENGTH	STATION	DRAINAGE AREA (AC)	C	CA	CA	I IN/HR	Q INCR	Q CARRYOV	Qt GUTTER	S GUTTER	Sx CROSS	T (SPREAD)	W (FT)	W/T	Sw (FT/FT)	Sw/Sx	Eo(#10)	a	Sw=a/12	Se=Sx+Sw	Lt/Peff	L/Lt	d	E(#16)	h	Q INTER.	d/h	Qb CARR	T SPREAD
4	4B	4		0.05	0.9	0.04		6.9	0.3	-	0.3	.010	0.02	2	2	1	0.08	4	1.0	3.5	0.14	0.17	4	1.0		1.0		0.3			
5	4B	8		0.17	0.9	0.15		6.9	1.0	-	1.0	.010	0.02	5	2	0.4	0.08	4	0.9	3.5	0.14	0.13	8	1.0		1.0		1.0			
6	4B	8		0.21	0.9	0.19		6.9	1.3	-	1.3	.010	0.02	6	2	0.3	0.08	4	0.8	3.5	0.14	0.13	8	1.0		1.0		1.3			
13	3B	8		0.84	0.5	0.42		3.5	1.5	-	1.5	.010	0.02	6	2	0.3	0.08	4	0.8	3.5	0.14	0.13	8	1.0		1.0		1.5			
19	3B	6		0.17	0.9	0.16		3.5	0.6	-	0.6	.010	0.02	3	2	0.7	0.08	4	0.9	3.5	0.14	0.13	6	1.0		1.0		0.6			
9	3C	16		0.46	0.9	0.41		6.9	2.8	-	2.8	.001	0.01										19	0.15		0.46		0.33		15	
10	3C	16		0.72	0.9	0.64		6.9	4.5	-	4.5	.001	0.01										19	0.21		0.46		0.45		21	
11	3C	16		0.37	0.9	0.33		6.9	2.3	-	2.3	.001	0.01										19	0.14		0.46		0.30		14	
12	3C	16		0.46	0.9	0.41		6.9	2.8	-	2.8	.001	0.01										19	0.15		0.46		0.33		15	
8	D7			2.51	0.6	1.56		5.2	8.1	-																					

Depth to Seasonal High Ground
Min. Dist. from Trench bottom

Maximum Trench Depth(Ft

Design Input Param

Increase in Runoff Depth(In):
Contributing Drainage Area(Sq
Depth of Trench(Ft): 7.00

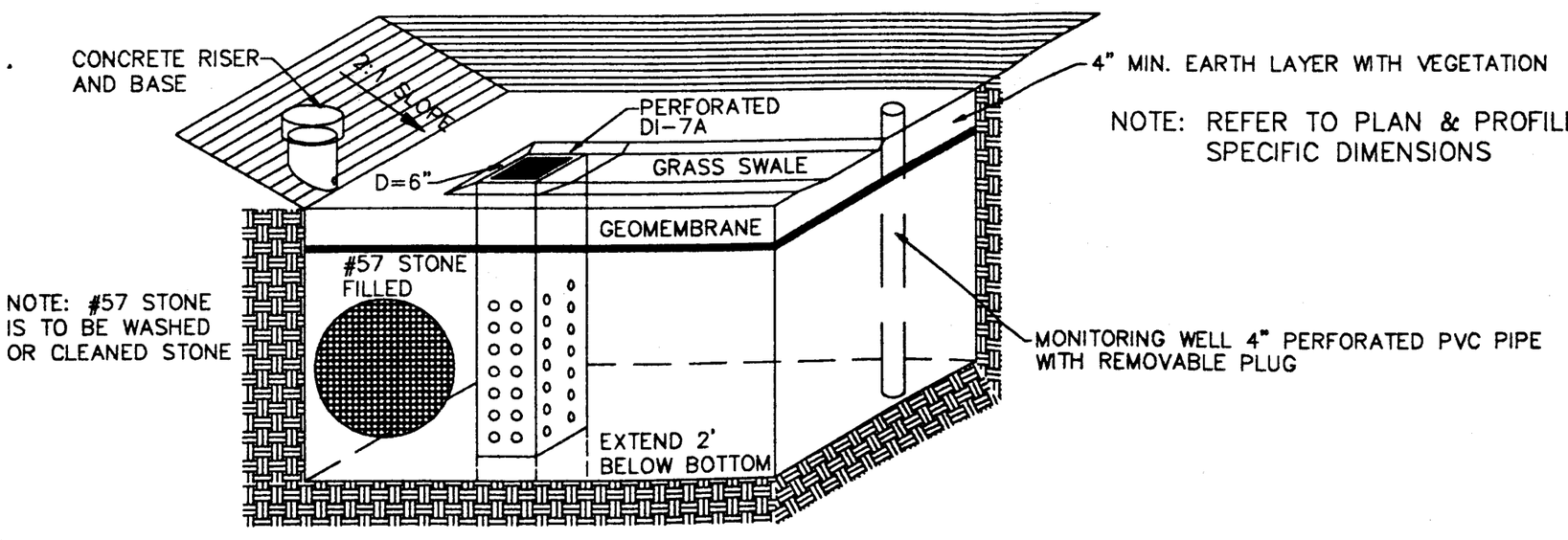
Trench Area(Sq Ft): 328

SUMMARY OF POINTS

BMP#1 = 1.0 IN/IMP. AC = 10 P
BMP#2 = 1.0 IN/IMP. AC = 10 P

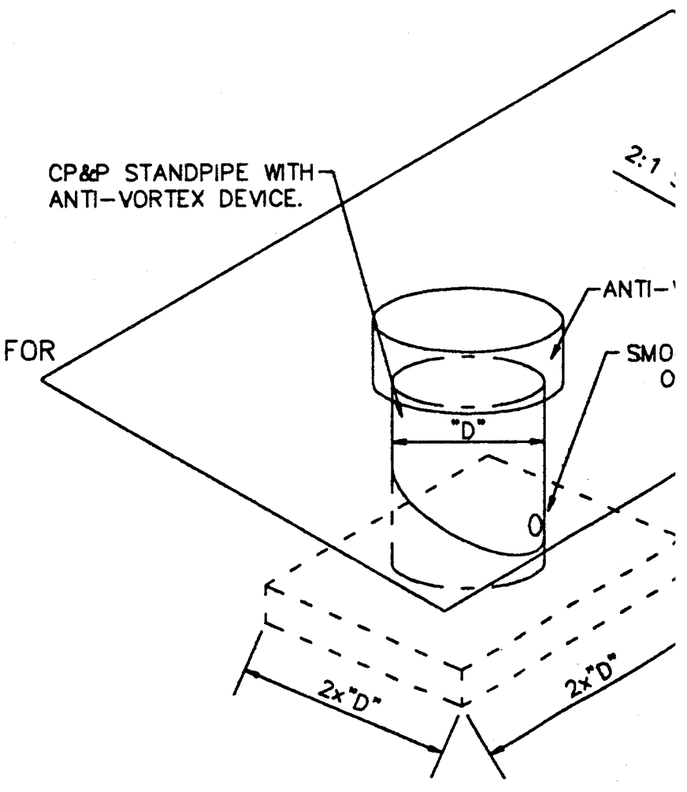
* NOTE: SEE GEOTECHNICAL REPC

NOTE: DI-7A TO BE CONCRETE PIPE & PRODUCTS STD. MEDIAN DROP INLET WITH EXTENDED BASE (2' BELOW TRENCH) AND RISER STEPS. PERFORATIONS TO BE ROUGH PUNCHED WITH 2" DIAMETER ROD WHILE CONCRETE IS CURING BY CP&P. PERFORATIONS TO BE 25% OF SURFACE AREA AND CONCENTRATED IN BOTTOM 4' OF STRUCTURE.



BMP SCHEMATIC

NOT TO SCALE



RISER SCHEM

NOT TO SCALE

Design Input Parameters

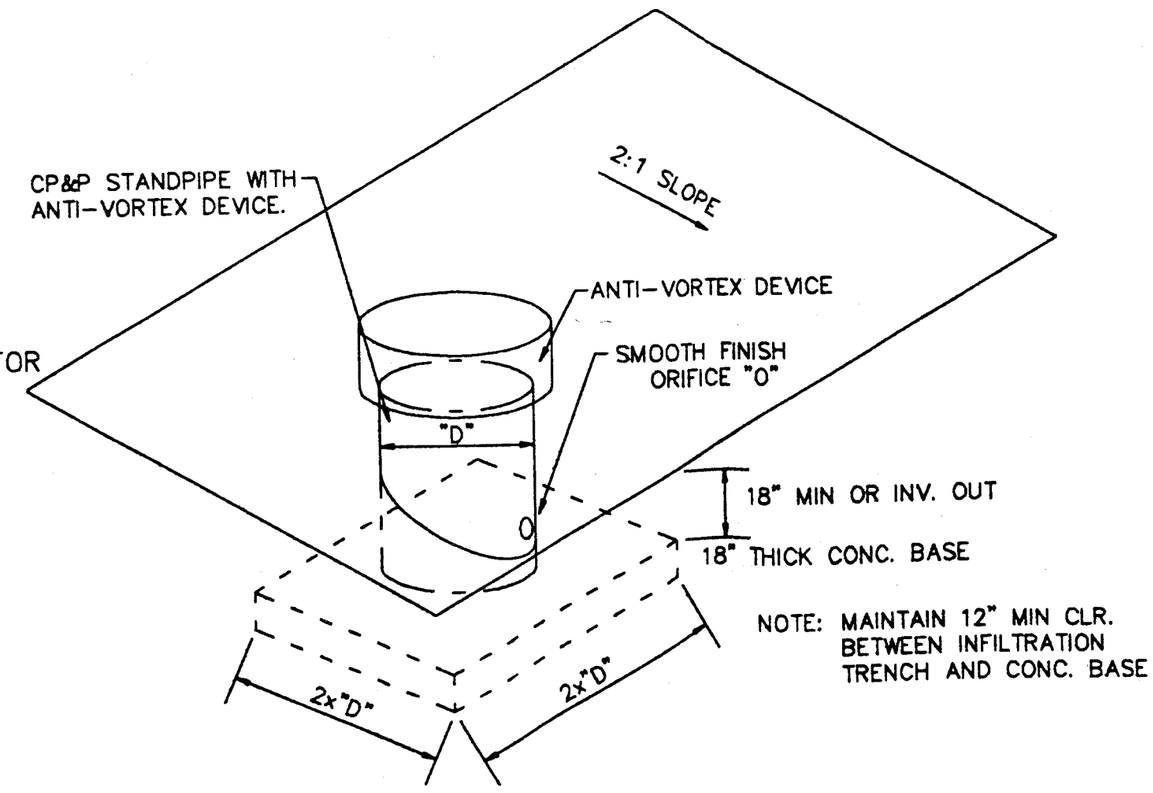
Increase in Runoff Depth(In): 1.00
Contributing Drainage Area(Sq Ft): 106374
Depth of Trench(Ft): 7.00

Trench Area(Sq Ft): 3289

SUMMARY OF POINTS

BMP#1 = 1.0 IN/IMP. AC = 10 POINTS x 0.74% OF SITE = 7.40 POINTS
BMP#2 = 1.0 IN/IMP. AC = 10 POINTS x 0.26% OF SITE = 2.60 POINTS
TOTAL POINTS 10.00 POINTS

* NOTE: SEE GEOTECHNICAL REPORT BY COMBINED TECHNOLOGIES, INC. DATED APRIL, 1992.

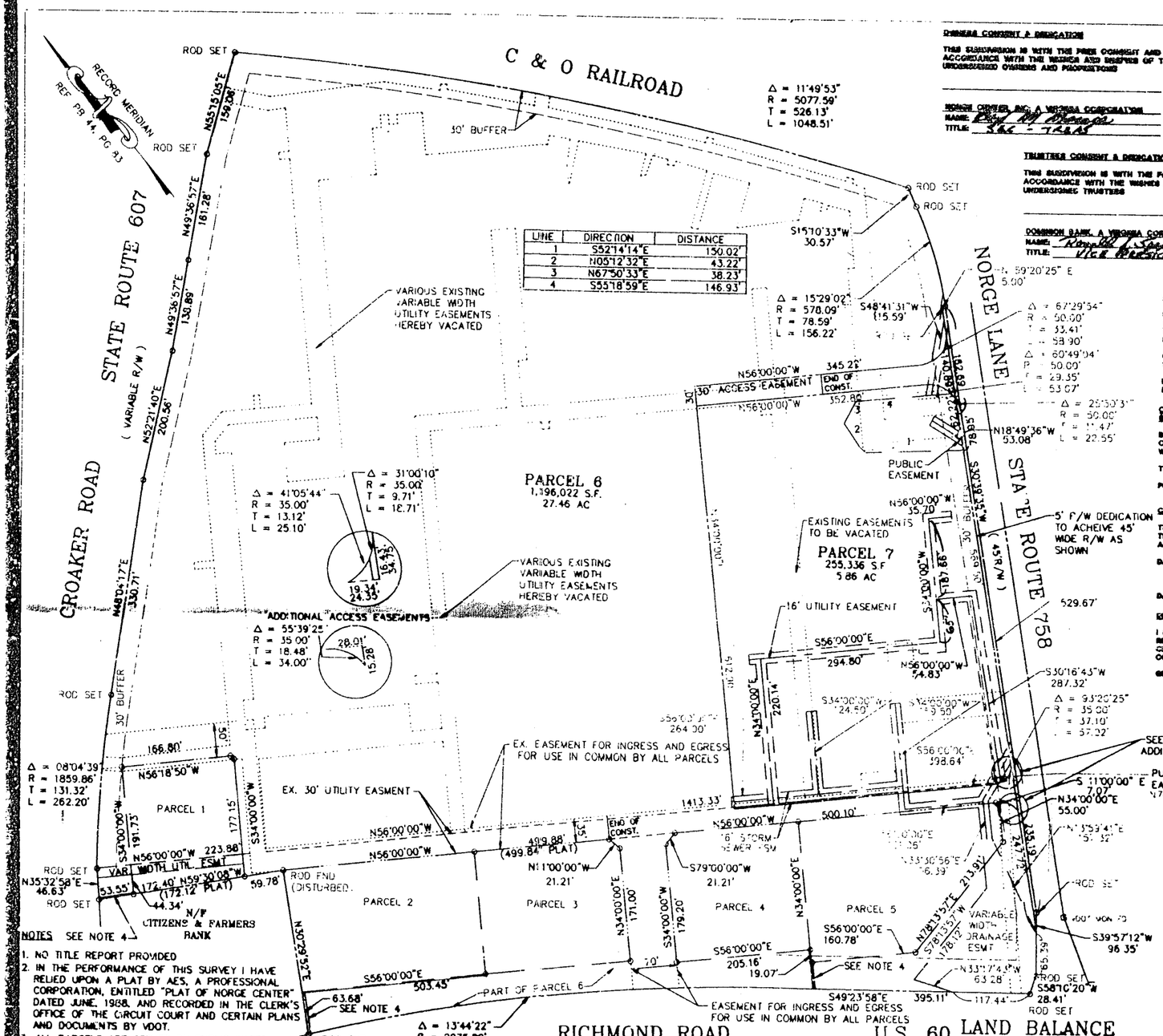


NOTE: MAINTAIN 12" MIN CLR. BETWEEN INFILTRATION TRENCH AND CONC. BASE

RISER SCHEMATIC

NOT TO SCALE

NOTE: YR011 SWM #1 'O' = 18' 'D' = 36'
YC023 SWM #2 'O' = 15' 'D' =36'



LINE	DIRECTION	DISTANCE
1	S52°14'14"E	150.02'
2	N05°12'32"E	43.22'
3	N67°50'33"E	38.23'
4	S55°18'59"E	146.93'

OWNERS CONSENT & DEDICATION

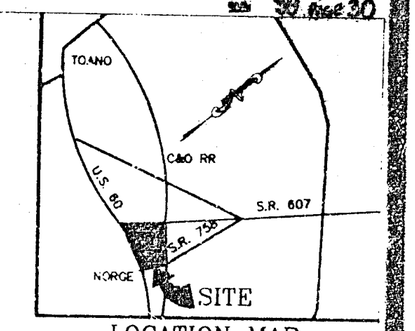
THIS SUBDIVISION IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE WISHES AND DESIRES OF THE UNDERSIGNED OWNERS AND PROPRIETORS

NORGE CENTER, INC. A VIRGINIA CORPORATION
NAME: [signature]
TITLE: SEC - TREAS

TRUSTEES CONSENT & DEDICATION

THIS SUBDIVISION IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE WISHES AND DESIRES OF THE UNDERSIGNED TRUSTEES

DOMINION BANK, A VIRGINIA CORPORATION
NAME: [signature]
TITLE: VICE PRESIDENT



LOCATION MAP
N.T.S.

STATE OF VIRGINIA

I, [signature], A NOTARY PUBLIC DO CERTIFY THAT THE PERSONS WHOSE NAMES ARE SIGNED TO THE FOREGOING WRITING HAVE ACKNOWLEDGED THE SAME BEFORE ME IN MY CITY AND STATE FORESAID

GIVEN UNDER MY HAND THIS 17 DAY OF February 1994

MY COMMISSION EXPIRES July 31, 1994
BY [signature]

CLERK'S CERTIFICATE
STATE OF VIRGINIA, COUNTY OF JAMES CITY

IN THE CLERK'S OFFICE OF THE CIRCUIT COURT FOR THE COUNTY OF JAMES CITY THIS 5 DAY OF May, 1994 THIS MAP WAS PRESENTED AND ADMITTED TO THE RECORDS AS THE LAW DIRECTS.

TESTE: _____, CLERK

PLAT BOOK: 55 PAGE: 30

CERTIFICATE OF APPROVAL

THIS SUBDIVISION KNOWN AS PARCEL 6, NORGE REGIONAL CENTER IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING SUBDIVISION REGULATIONS AND MAY BE COMMITTED TO RECORD.

DATE 2/24/94 [signature] HIGHWAY ENGINEER

DATE 2/25/94 [signature] AGENT OF GOVERNING BODY

ENGINEER'S STATEMENT

I HEREBY CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL OF THE REQUIREMENTS OF THE BOARD OF SUPERVISORS AND ORDINANCES OF THE COUNTY OF JAMES CITY, VIRGINIA, GOVERNING THE PLATTING OF SUBDIVISIONS WITHIN THE COUNTY, HAVE BEEN COMPLIED WITH

GIVEN UNDER MY HAND THIS 21st DAY OF DECEMBER, 1993

BY: [signature]
CARL E. DUNCAN, P.E.

A SUBDIVISION OF PARCEL 6 & VARIOUS EASEMENTS

OF THE PROPERTY OF

NORGE CENTER, INC.

DEED BOOK 333 PAGE 75
DEED BOOK 330 PAGE 494

SCALE: 1"=100' DATE: APRIL 9,1993

1 OF 1

GRAPHIC SCALE

(IN FEET)
1 inch = 100 ft.

NOTES SEE NOTE 4

1. NO TITLE REPORT PROVIDED
2. IN THE PERFORMANCE OF THIS SURVEY I HAVE RELIED UPON A PLAT BY AES, A PROFESSIONAL CORPORATION, ENTITLED "PLAT OF NORGE CENTER" DATED JUNE, 1988, AND RECORDED IN THE CLERK'S OFFICE OF THE CIRCUIT COURT AND CERTAIN PLANS AND DOCUMENTS BY VDOT.
3. ALL PARCELS ARE SERVED BY PUBLIC WATER & SEWER SYSTEMS
4. 1' WIDE FEE SIMPLE STRIP EXTENDED TO VDOT R/W SEE PLAT FOR NORGE REGIONAL CENTER BY AES
5. UTILITY EASEMENTS CREATED UNDER "PLAT OF NORGE CENTER" DATED JUNE 1988 BY AES, A PROFESSIONAL CORPORATION, AS INDICATED ON THIS PLAT ARE HEREBY VACATED.
6. THIS PROPERTY IS ENCUMBERED BY A DEED OF TRUST TO DOMINION BANK A VIRGINIA CORPORATION, AS RECORDED IN DB 333, PG 77. ALSO ENCUMBERED BY A LOAN MODIFICATION RECORDED IN DB 598 PG 405

Recorded 5th day of May 1994
DB 598 PG 892
Clerk

SOURCE OF TITLE

TITLE TO THE LAND SHOWN HEREON IS VESTED IN THE NAME OF NORGE CENTER INC. BY DEEDS RECORDED IN THE CLERKS OFFICE OF JAMES CITY COUNTY, VIRGINIA IN DEED BOOK 333 PAGE 75 AND DEED BOOK 330 PAGE 494.

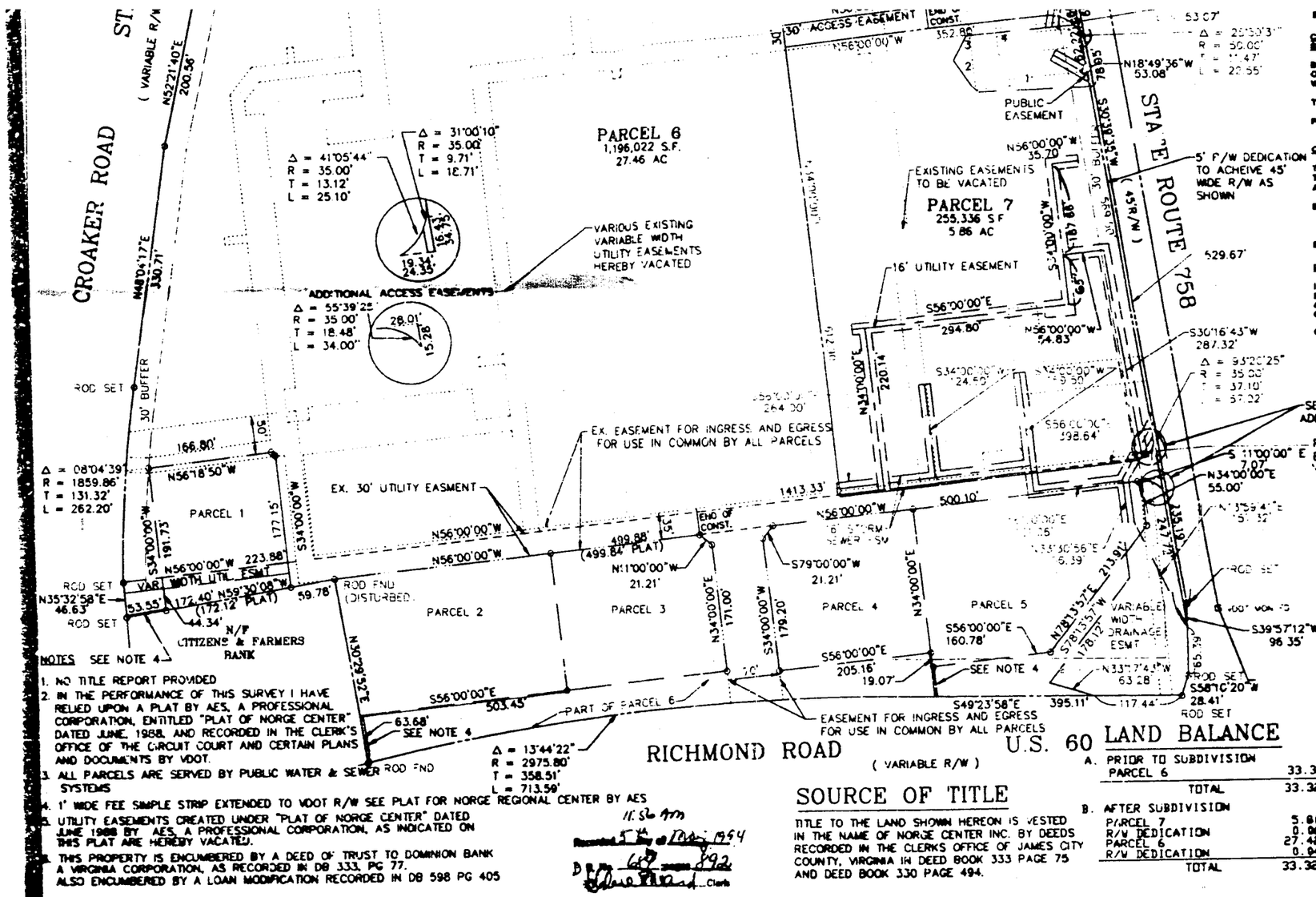
LAND BALANCE

A. PRIOR TO SUBDIVISION	
PARCEL 6	33.32 AC
TOTAL	33.32 AC
B. AFTER SUBDIVISION	
PARCEL 7	5.80 AC
R/W DEDICATION	0.06 AC
PARCEL 6	27.42 AC
R/W DEDICATION	0.04 AC
TOTAL	33.32 AC

COMMONWEALTH OF VIRGINIA
CARL EDWARD DUNCAN
NO. 21865
PROFESSIONAL ENGINEER
12-21-93

No.	REVISION	DATE

Baker
Ratcliffe Bldg., Suite 212
1602 Rolling Hills Road
Richmond, Virginia 23229
(804) 282-1821 fax (804) 285-8530



NOTES SEE NOTE 4

1. NO TITLE REPORT PROVIDED
2. IN THE PERFORMANCE OF THIS SURVEY I HAVE RELIED UPON A PLAT BY AES, A PROFESSIONAL CORPORATION, ENTITLED "PLAT OF NORGE CENTER" DATED JUNE, 1988, AND RECORDED IN THE CLERK'S OFFICE OF THE CIRCUIT COURT AND CERTAIN PLANS AND DOCUMENTS BY VDOT.
3. ALL PARCELS ARE SERVED BY PUBLIC WATER & SEWER SYSTEMS
4. 1' WIDE FEE SIMPLE STRIP EXTENDED TO VDOT R/W SEE PLAT FOR NORGE REGIONAL CENTER BY AES
5. UTILITY EASEMENTS CREATED UNDER "PLAT OF NORGE CENTER" DATED JUNE 1988 BY AES, A PROFESSIONAL CORPORATION, AS INDICATED ON THIS PLAT ARE HEREBY VACATED.
6. THIS PROPERTY IS ENCUMBERED BY A DEED OF TRUST TO DOMINION BANK A VIRGINIA CORPORATION, AS RECORDED IN DB 333, PG 77. ALSO ENCUMBERED BY A LOAN MODIFICATION RECORDED IN DB 598 PG 405

11:56 Am
Recorded 5th day of May 1994
DB 667 PG 892
Clerk

SOURCE OF TITLE

TITLE TO THE LAND SHOWN HEREON IS VESTED IN THE NAME OF NORGE CENTER INC. BY DEEDS RECORDED IN THE CLERKS OFFICE OF JAMES CITY COUNTY, VIRGINIA IN DEED BOOK 333 PAGE 75 AND DEED BOOK 330 PAGE 494.

LAND BALANCE

A. PRIOR TO SUBDIVISION	
PARCEL 6	33.32 AC
TOTAL	33.32 AC
B. AFTER SUBDIVISION	
PARCEL 7	5.80 AC
R/W DEDICATION	0.06 AC
PARCEL 6	27.42 AC
R/W DEDICATION	0.04 AC
TOTAL	33.32 AC

BY: [illegible]

CLERK'S CERTIFICATE
STATE OF VIRGINIA, COUNTY OF JAMES CITY

IN THE CLERK'S OFFICE OF THE CIRCUIT COURT FOR THE COUNTY OF JAMES CITY THE 5 DAY OF May 1994 THIS MAP WAS PRESENTED AND ADMITTED TO THE RECORDS AS THE LAW DIRECTS.

TESTE: _____ CLERK

PLAT BOOK: 55 PAGE: 30

CERTIFICATE OF APPROVAL

THIS SUBDIVISION KNOWN AS PARCEL 6, NORGE REGIONAL CENTER IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING SUBDIVISION REGULATIONS AND MAY BE CONSTRUED TO ENGINE.

DATE 2/24/94 [illegible] for HIGHWAY ENGINEER

DATE 2/24/94 [illegible] AGENT OF GOVERNING BODY

ENGINEER'S STATEMENT

I HEREBY CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL OF THE REQUIREMENTS OF THE PLANS OF SUBDIVISION AND ORDINANCES OF THE COUNTY OF JAMES CITY, VIRGINIA, GOVERNING THE PLATTING OF SUBDIVISIONS WITHIN THE COUNTY HAVE BEEN COMPLIED WITH.

GIVEN UNDER MY HAND THIS 21 DAY OF DECEMBER 1993

BY: Carl E. Duncan
CARL E. DUNCAN, P.E.

A SUBDIVISION OF PARCEL 6 & VARIOUS EASEMENTS

OF THE PROPERTY OF

NORGE CENTER, INC.

DEED BOOK 333 PAGE 75
DEED BOOK 330 PAGE 494

SCALE: 1"=100' DATE: APRIL 9,1993

1 OF 1

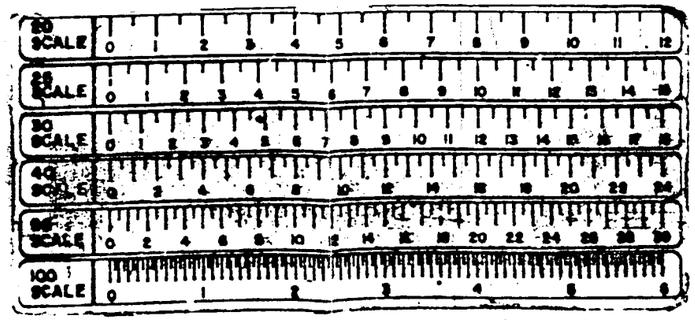
GRAPHIC SCALE

(IN FEET)
1 inch = 100 ft.

COMMONWEALTH OF VIRGINIA
CARL EDWARD DUNCAN
NO. 21885
12-21-93
PROFESSIONAL ENGINEER

No.	REVISION	DATE

Baker
Ratcliffe Bldg., Suite 212
1602 Rolling Hills Road
Richmond, Virginia 23229
(804) 282-1821 fax (804) 285-8530



NORGE SHOPPING CENTER
REBKEE PARCEL

STORMWATER MANAGEMENT FACILITY # 1
AT
U.S. ROUTE 60 AND NORGE LANE

SO. NO. 19700

Note:
Routing Results do NOT match graphic.

Prepared By

Michael Baker Jr., Inc.
1602 Rolling Hills Drive
Richmond, Virginia 23229

Baker
Michael Baker Jr., Inc.

CHECKLIST OF SITE PLAN CONTENTS

I. GENERAL INFORMATION REQUIRED ON PLAN

(✓) A. Title of Project
(20-39(a))

(✓) B. Names of engineer, architect, landscape architect and/or surveyor
(20-39(b))

(✓) C. Location map with scale no less than 1" = 2,000'
(20-39(c))

(✓) D. North arrow
(20-39(d))

(✓) E. Graphic and written scale
(20-39(d))

(✓) F. Boundary survey of site
(20-39(e))

II. EXISTING FEATURES TO BE SHOWN ON PLAN

(✓) A. Streets: Name and route number, width of right-of-way and width of road surface
(20-39(f))

(✓) B. Streams, bodies of water, watercourses, on this and adjacent property
(20-39(d))

(✓) C. Easements: Type, ownership, and dimensions
(20-39(f))

N/A ( ) D. Septic tank, distribution tank size and type
(20-39(f))

N/A ( ) E. Water Supply: well and/or tank capacity
(20-39(f))

(✓) F. Water mains on and nearby site with sizes indicated
(20-39(f)&(m))

(✓) G. Location of all underground utilities, i.e., compressed gas lines, petroleum lines, electricity, etc.
(20-39(f))

(✓) H. Culverts and underground structures on or adjacent to the property (fuel tanks, etc.)
(20-39(f))

(✓) I. Location, type and size of all entrances to the site
(20-39(g))

(✓) J. Topography intervals (minimum five feet) existing contours
(20-39(h))

(✓) K. Woodline before site preparation with predominant species and average diameter of trees indicated. Also, approximate location, type and diameter of single trees in open areas. Average size and predominant species of trees to be removed having a diameter of 12-inches or greater.
(20-39(i))

(✓) L. Provisions for off-street parking, loading spaces and pedestrian walkways, including sidewalks.
(20-39(j))

(✓) M. Sanitary and storm sewers on and adjacent to site (size and type)
(20-39(m))

(✓) N. Fire hydrants, sizes, and types
(20-39(m))

(✓) O. Location of Fire Department connections and underground fire service lines (valve pit details, where appropriate)
(20-39(m))

N/A ( ) P. Indication of 100 year flood plain and flood elevation noted
(20-549)

III. <u>PROPOSED PROJECT: FEATURES TO BE SHOWN ON PLAN</u>

(✓) A. Underground utilities indicated
(20-39(f))

(✓) B. Proposed street names and street width; proposed easements and width
(20-39(f))

(✓) C. Entrances designed to standards as set forth in VDH&T <u>Minimum Standards of Entrances to State Highways</u> manual, with indication as to which standard is applicable, and details of entrance
(20-39(g))

(✓) D. Proposed finished contours where regrading is necessary indicated at intervals of no more than 2 feet
(20-39(h))

(✓) E. Areas to be landscaped with approximate arrangements, plant types, and sizes
(20-39(i))

N/A ( ) F. Areas to be screened, fenced, walled with heights indicated, and location of gates and openings
(20-39(i))

(✓) G. Seeding specifications
(20-39(h))

(✓) H. Provisions for pedestrian and vehicular circulation and parking
(20-39(i))
1. Location of pedestrian walkways, sidewalks and bike paths
2. Dimensions of parking spaces, traffic aisles, medians and sidewalks
3. Location of curbs and bumpers
4. Type of parking surface with detail of cross-section
5. Loading spaces

(✓) I. Solid waste disposal facilities (dry and wet)
(20-39(m))
1. If dumpsters are to be used, location of dumpster pad.
2. If dumpsters are used for wet garbage
   . drain with a drainfield, as per Health Department specifications
   . dumpsters may not be connected to the sanitary sewer
   . type of material of the dumpster pad

(✓) J. Storm drainage system shown with calculations and drainage area map of contributing drainage areas
(20-39(n))

NONE ( ) K. Drainage ways in excess of 3% grade and type of erosion control necessary.
(20-39(n))

(✓) L. Location, type, and details of sedimentation and erosion control devices to be used during and after construction, e.g., perimeter dike with outfall structure or straw bale installation
(20-39(n))

(✓) M. Water Supply
(20-39(m))

1. Well: Location, type, size, as per Health Department specifications
2. Water lines
   - on-site line and size (include standpipe size if applicable)
   - public water main location and size at location of connection
   - meter location and size

   Required if lines are to be dedicated to the County:
   - profiles, plan view
   - materials list/specifications

(✓) N. Sanitary waste disposal facilities:
(20-39(m))

1. Septic tank and drainfield; or
2. Sewer line
   - location of grease trap
   - on-site line and size, laterals, cleanouts
   - public line location and size
   - elevation of connection at building and at public line

   Required if lines are to be dedicated to the County:
   - profiles, Y's (slope, pipe size, type and manhole rim and invert elevations)
   - connection at building and at public line
   - details of any new manholes and pump stations
   - materials list/specifications

IV. LAND USE SUMMARY TABLE

A. Zoning of Site (20-39(d)) :

B. Calculation for Parking Requirements
   - Use category (as defined by Section 20-12.D.) (20-39(j)) :
   - Number of spaces required :
   - Number of handicapped spaces required (marked by sign) :
   - Number of spaces provided :

C. Open Space Data (20-39(o))
   - Total Site Area :
   - Total Amount of Site Covered by Buildings :
   - Percent of Site Covered by Buildings :
   - Amount of Site Covered by Open Space :
   - Percent of Site Covered by Open Space :

D. Building Data (Existing and Proposed)
(20-39(k))
Total Floor Area of Each Building :
Height of Each Building :
Number of Floors in Each Building :
Type (classification use group and construction type as per the Virginia Uniform Statewide Building Code) :

V. ADDITIONAL REQUIREMENTS FOR MULTI-FAMILY DEVELOPMENTS

( ) A. Dwelling units
(20-39(l))
1. Number, size and type of dwelling units
2. Units per developable acre
(20-39(o))
3. Numbers on buildings

( ) B. Recreation facilities
(20-39(l))
1. Type of equipment
2. List of equipment, if playground
(20-39(l))
3. Recreation area as percent of total site acreage

( ) C. Open space (as defined by Section 20-2 of the Zoning Ordinance)
(20-39(l))
1. Number of acres
2. Percent of site

( ) D. By-laws of Homeowners Association (where applicable)

VI. OTHER INFORMATION TO BE SUBMITTED WITH SITE PLANS

( ) A. Land Disturbing Permit Application, Surety and Siltation Agreement
( ) B. Water and Sewer Data Sheets
( ) C. Certificate to Construct public water and/or sewer facilities
( ) D. Public Improvements (water, sewer and roads) to be constructed or bonded prior to issuance of temporary Certificate of Occupancy for buildings
N/A ( ) E. Kitchen plans must be submitted to and approved by the Health Department if structure will contain food preparation/serving areas
N/A ( ) F. Traffic Impact Analysis as required by the Director of Planning

KR/mfr
0369A

FINAL PLANS AND REVISED FINAL PLANS

Project Name NORGE SHOPPING CENTER, REBKEE PARCEL

	Plan Sheet to Include:	Yes	No	N/A
1	All items that were required of preliminary plans need to be included	✓		
2	Stamped copy of rezoning proffers and proffer analysis if applicable (shown on plans)			
3	Special use permit conditions and analysis shown on the plans (include board of county supervisors resolution)			✓
4	Table on the cover sheet showing the project name, must be same as approved preliminary, owner's name and address, parcel identification, zoning of parcel, date of plans, no. of sheets and index. Total site acreage and acreage of disturbed area	✓		
5	Any waivers or variances granted for the project shown on the plans			✓
6	Erosion control sheet completed in its entirety. Symbols shall conform to the Virginia uniform coding system	✓		
7	Calculations for drainage, stormwater management ditches, pipes, structures, retention, detention, ponds and outfall ditches	✓		
8	Provide profiles on outfall ditches and pipe and indicate natural drainage	✓		
9	Show all proposed drainage ditches for full length in all easements. Furnish detailed typical section and type of stabilization to be provided.	✓		
10	10-yr. and 100-yr. elevations shown on detention ponds with distance to property line	✓		
11	100-yr. flood area boundaries shown and square footage noted			✓
12	Existing and proposed easements including deed and page number, width and use. Note certifying that applicant has a right to use existing ingress egress easements to make any proposed improvements			✓
13	Grading plan showing existing and proposed grading	✓		
14	Buffer area and screening requirements	✓		

Project Name _____

		Yes	No	N/A
15	Landscape plan including open space tabulation	✓		
16	Phasing plan if applicable with written project description			✓
17	Revision block on each sheet specifically identifying what is being revised on each sheet	✓		
18	Indicate length of existing and proposed deceleration and left and right turn storage lanes.	✓		
19	Traffic analysis for site development on existing and proposed facility. Level of service with and without proposed development			✓
20	Intersection analysis including need for signalization, channelization, turn lanes and modification of existing signals			✓
21	Recommendations for roadway improvements to accommodate existing traffic and proposed traffic generated by the development			✓
22	Indicate any notes or information necessary to explain the intent and purpose of the proposed traffic analysis			✓
23	Show commercial entrances in accordance to current VDOT standards and specifications. Minimum Standards of Entrances to State Highways	✓		
24	VDOT standard stop signs are required at entrance connections and/or street connections. Add a note "to be furnished and installed by developer."	✓		
25	With installation of additional lanes, existing pavement markings are to be eradicated and new markings installed or replaced in kind. Add note "to be furnished and installed by developer."	✓		
26	Show sight distance at all street intersections and landscaping, sign placement and all obstructions that may affect or obstruct sight distance	✓		
27	Show pavement typical section and design	✓		
28	Show entrance typical section and design	✓		

Project Name _____

		Yes	No	N/A
29	Show any notes on information necessary to explain the intent and purpose of proposed utilities or adjustments of existing utilities	✓		
30	Show all proposed water mains, their sizes, valves and fire hydrants and typical section	✓		
31	A written description of all plan revisions shall accompany all revised plans submitted for reevaluation and approval			✓
32	Plans should show proposed roadway striping or pavement markings	✓		

I hereby certify that the above stated information is included in the attached plans.

Edward Duncan

Engineer's Signature

9/2/92

Date

3-STEP BMP EVALUATION PROCEDURE

Step 1: Determine Site Characteristics

Step 2: Determine BMP Options

Step 3: BMP Worksheet

STEP 1

(a) Determine if structural BMPs are required. Single family subdivisions with a density of 0.5 DU/ac would not require structural BMPs nor would other development sites not exceeding 10% impervious cover. (b) Evaluate the potential for adequately covering the site with BMPs taken from Table 1. Site constraints (e.g., soil permeability, water table depth, topography) which rule out the use of certain BMPs on portions of the site should be identified.

STEP 2

Compliance with NSP control requirements for Chesapeake Bay Preservation areas is based on the BMP points in Table 2. The point system is a tool for screening a BMP plan to ensure that the site is adequately covered by preferred BMPs. The points assigned to each BMP on the site should be weighted by the proportion of the site served by the BMP. Sufficient coverage of the site with acceptable BMPs will result in a total point score of 10.

STEP 3

The BMP point system contains a credit for the preservation of natural open space which will not exceed predevelopment NSP loadings. This credit should be restricted to perpetually undisturbed "common" areas, conservation easements, and the like (i.e., open space areas on private property should not be eligible for a credit). As indicated in Table 4, the credit can be based on some fraction of a BMP point for every percent of the development site maintained in natural open space, with 0.1 points per 1% of the site recommended in the table. For example, a development site which preserves natural vegetation within a conservation easement covering 20% of the site would be assigned 2 points.

Table 3 shows a worksheet for evaluating a BMP plan for a development site. It includes entries to calculate weighted BMP points for structural BMPs, the natural open space credit, and total weighted points.

Table 4 shows a completed worksheet for a sample BMP plan serving a 40-acre single family residential subdivision on 0.25-acre lots. The final total of the weighted BMP points should equal or exceed the specified target (in this case 10 points) for the BMP plan to be in compliance.

Table 5 shows relationships between impervious cover, NSP leadings, undeveloped land conditions and BMP phosphorous removal efficiency.

TABLE 1

ACCEPTABLE STRUCTURAL BMPS FOR CHESAPEAKE BAY PRESERVATION AREAS

	ACCEPTABLE BMP	AVERAGE TOTAL % REMOVAL EFFICIENCY
A.	EXTENDED DRY DETENTION	
	(1) Design 2 (6-12 hrs):	20%
	(2) Design 3 (24 hrs):	30%
	(3) Design 4 (shallow marsh):	50%
B.	WET POND	
	(1) Design 5 (o.5 in/imp. ac):	35%
	(2) Design 6 (2.5 V):	40%-45%
	(3) Design 7 (4.0 V):	50%
C.	INFILTRATION (TRENCH, BASIN, POROUS PAVEMENT)	
	(1) Design 8 (0.5 in/imp. ac):	50%
	(2) Design 9 (1.o in/imp. ac):	65%
	(3) Design 10 (2-yr storm):	70%
D.	GRASSED SWALE	
	Design 15 (check dams)	10%-20%

TABLE 2

BMP POINT SYSTEM FOR EVALUATION ACCEPTABLE STRUCTURAL BMPS

	Acceptable BMP	Average Total P Removal Efficiency	BMP Points
A.	EXTENDED DRY DETENTION		
	(1) Design 2 (6-12 hrs):	20%	4
	(2) Design 3 (24 hrs):	30%	6
	(3) Design 4 (shallow marsh):	50%	9
B.	WET POND		
	(1) Design 5 (0.5 in/imp. ac):	35%	6
	(2) Design 6 (2.5 V):	40%-45%	8
	(3) Design 7 (4.0 V):	50%	9
C.	INFILTRATION (TRENCH, BASIN, POROUS PAVEMENT)		
	(1) Design 8 (0.5 in/imp. ac):	50%	9
	(2) Design 9 (1.0 in/imp. ac):	65%	10
	(3) Design 10 (2-yr storm):	70%	11
D.	GRASSED SWALE		
	(1) Design 15 (check dams)	10%-20%	2
E.	WATER QUALITY INLET		
	(1) Design 11 (400 cu ft/imp. ac):	*	2

* To be used upstream of dentention basin or infiltration system to enhance pollutant removal.

NOTE: A weighted total of 10 points is required for the development plan to achieve BMP compliance.

TABLE 3

WORKSHEET FOR BMP POINT SYSTEM

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
Basin # 1	10	x	0.74	=	7.40
Basin # 2	10	x	0.26	=	2.60
		x		=	
		x		=	

TOTAL WEIGHTED STRUCTURAL BMP POINTS: 10.00

B. NATURAL OPEN SPACE CREDIT

Fraction of Site		Natural Open Space Credit (0.1 per 1%)		Points for Natural Open Space
	x		=	

C. TOTAL WEIGHTED POINTS

10.00	+	0	=	10.00
Structural BMP Points		Natural Open Space Points		TOTAL

TABLE 4

WORKSHEET FOR BMP POINT SYSTEM

EXAMPLE BMP PLAN FOR 40-ACRE
SINGLE FAMILY RESIDENTIAL SUBDIVISION
(0.25-AC LOTS)

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
Wet Pond (#3)	9	x	70%	=	6.3
Grass Swale (#15)	2	x	40%	=	0.8
		x		=	
		x		=	

TOTAL WEIGHTED STRUCTURAL BMP POINTS: 7.1

B. NATURAL OPEN SPACE CREDIT

Fraction of Site		Natural Open Space Credit		Points for Natural Open Space
30%	x	0.1 per 1%	=	3.0

C. TOTAL WEIGHTED POINTS

7.1	+	3.0	=	10.1
Structural BMP Points		Natural Open Space Points		TOTAL

TABLE 5

REQUIRED BMP EFFICIENCY FOR DIFFERENT UNDEVELOPED LAND CONDITIONS: TOTAL P LOADINGS

LAND USE	Percent Impervious	NSP Load (Lbs/Ac/Yr)	Required BMP Efficiency For Undeveloped Land Conditons			
			Forest	Pasture	Crop	0.25 lbs/ Ac/Yr*
SF Resid. (5-ac. lot)	4%	0.2	---	---	---	---
SF Resid. (2-ac. lot)	10%	0.3	67%	---	---	17%
SF Resid. (1-ac. lot)	20%	0.5	80%	---	---	50%
SF Resid. (0.25-ac. lot)	35%	0.9	89%	44%	---	72%
Townhouse/Apt.	50%	1.2	92%	58%	25%	79%
Office	70%	1.8	94%	72%	50%	86%
Commercial	90%	2.0	95%	75%	55%	88%

AVG BMP EFFICIE

*Predevelopment condition which is the basis for 3-step BMP evaluation procedure.

NOTES:
1. Based on annual rainfall of 44 inches(Southeastern Virginia) and a Total P EMC of 0.26 mg/L for urban land uses.
2. Predevelopment loading rates for BMP efficiency requirements are 0.1 Lbs/Ac/Yr for "Forest," 0.5 Lbs/Ac/Yr for "Pasture," and 0.9 Lbs/Ac/Yr for "Crop."

PREDEVELOPED HYDROGRAPHS

Baker

Michael Baker Jr., Inc.

Quick TR-55 Ver.5.46 S/N:
Executed: 14:30:42 05-08-1992

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

NORGE COMMERCIAL CENTER PRE-DEVELOPED CONDITIONS

RETURN FREQUENCY: 2 yr	Allowable Outflow: [redacted]
'C' Adjustment: 1.000	Required Storage: [redacted]
Peak Inflow: 13.91 cfs	Inflow .HYD stored: PRE2 .HYD

Td = 37 minutes
Approx. Duration for Max. Storage

Return Freq: 2 yr
C adj.factor: 1.00

Tc= 20.00 minutes
I = 3.384 in/hr
Q = 20.04 cfs

Area (ac): 11.05
Weighted C: 0.54
Adjusted C: 0.54

[redacted]

Td= 37 minutes
I = 2.349 in/hr
Q = 13.91 cfs

[redacted]

FLOW cfs

MOST CRITICAL DURATION

NOT TO SCALE

35.01 minutes

49.81 minutes

$\frac{6.78}{11.05} = 60\%$

WHY 11.05 Ac?
PLANS SHOW
POND #1 6.78
POND #2 4.07

Quick TR-55 Ver.5.46 S/N:
Executed: 14:30:42 05-08-1992

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

NORGE COMMERCIAL CENTER PRE-DEVELOPED CONDITIONS

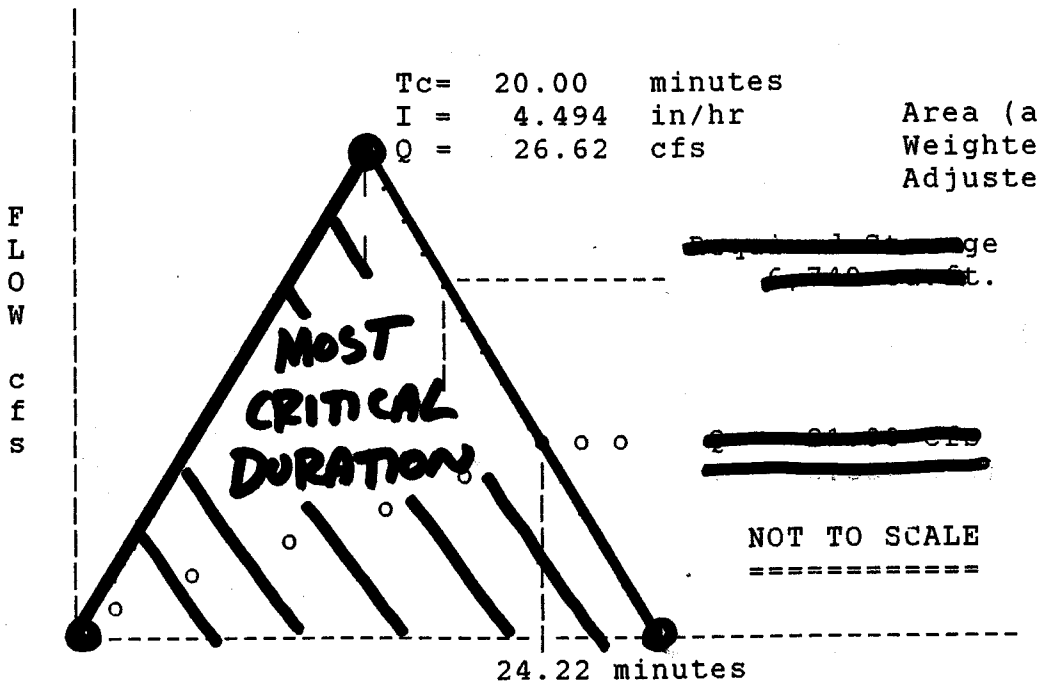
RETURN FREQUENCY: 10 yr	Allowable Outflow: [redacted]
'C' Adjustment: 1.000	Required Storage: [redacted]

STORM DURATION = Tc for Max.Storage

Peak Inflow: 26.62 cfs Inflow .HYD stored: PRE10 .HYD

Tc= 20.00 minutes
I = 4.494 in/hr
Q = 26.62 cfs

Area (ac): 11.05
Weighted C: 0.54
Adjusted C: 0.54



Quick TR-55 Ver.5.46 S/N:
Executed: 14:30:42 05-08-1992

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

NORGE COMMERCIAL CENTER PRE-DEVELOPED CONDITIONS

RETURN FREQUENCY: 25 yr	Allowable Outflow: [redacted]
'C' Adjustment: 1.100	Required Storage: [redacted]
Peak Inflow: 33.88 cfs	Inflow .HYD stored: PRE25 .HYD

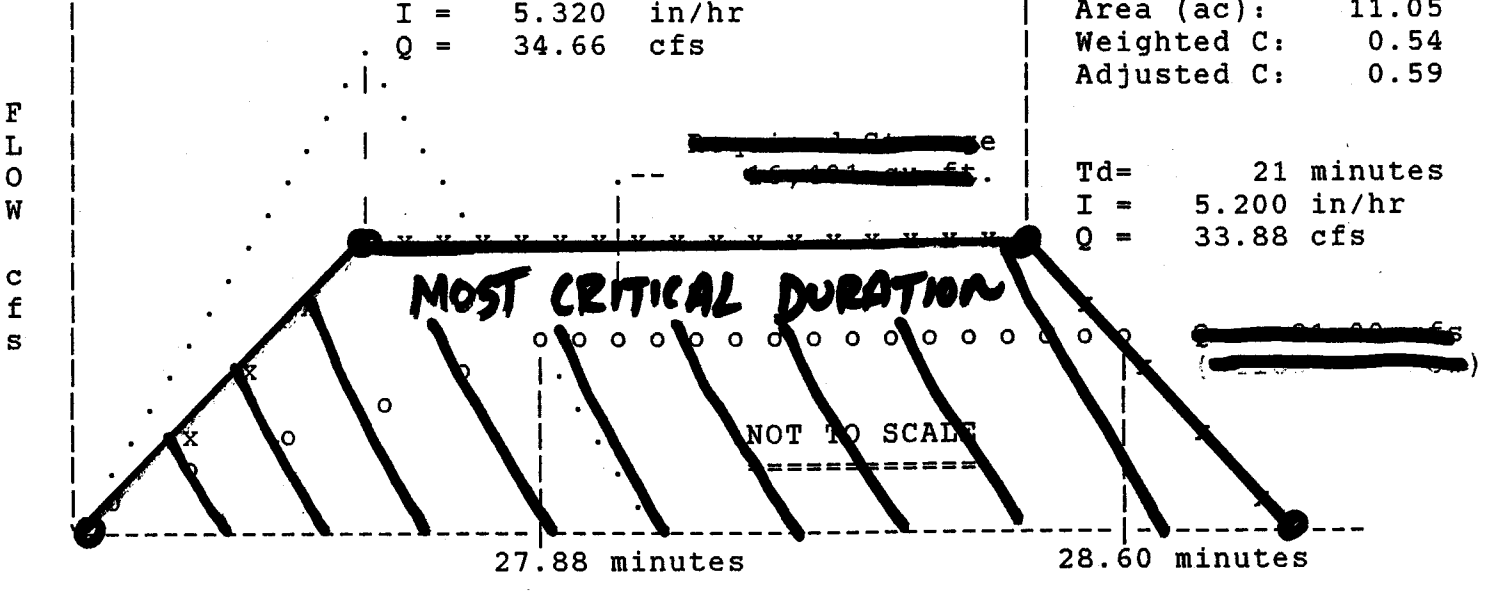
Td = 21 minutes
Approx. Duration for Max. Storage

Return Freq: 25 yr
C adj.factor: 1.10

Tc= 20.00 minutes
I = 5.320 in/hr
Q = 34.66 cfs

Area (ac): 11.05
Weighted C: 0.54
Adjusted C: 0.59

Td= 21 minutes
I = 5.200 in/hr
Q = 33.88 cfs



Quick TR-55 Ver.5.46 S/N:
Executed: 14:30:42 05-08-1992

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

NORGE COMMERCIAL CENTER PRE-DEVELOPED CONDITIONS

RETURN FREQUENCY: 100 yr	Allowable Outflow: [redacted] cfs
'C' Adjustment: 1.250	Required Storage: [redacted] cu.ft.
Peak Inflow: 41.06 cfs	Inflow .HYD stored: PRE100 .HYD

Td = 27 minutes
Approx. Duration for Max. Storage

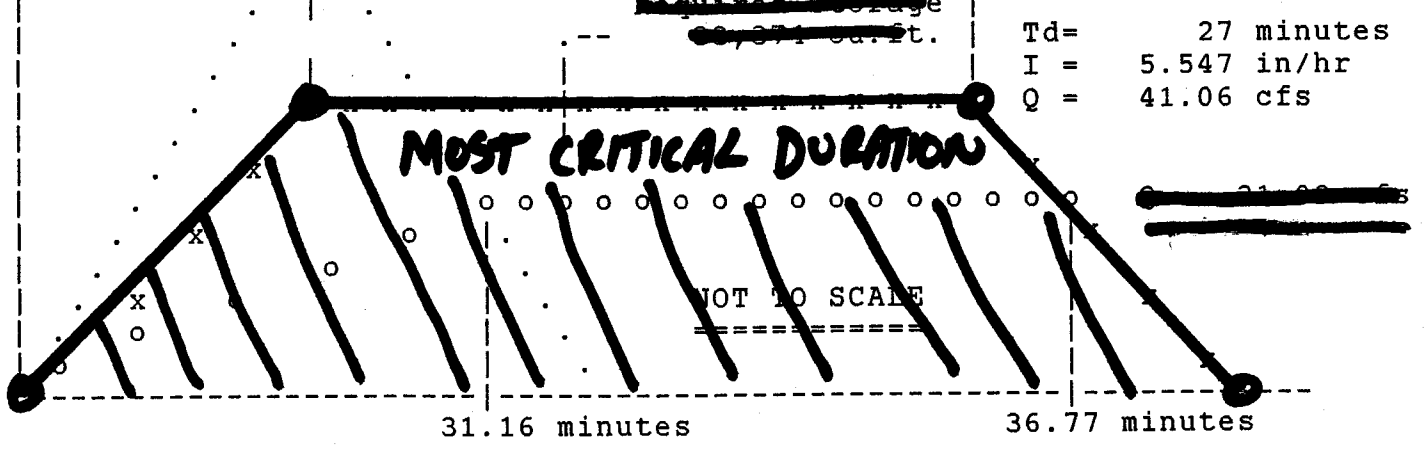
Return Freq: 100 yr
C adj.factor: 1.25

Tc= 20.00 minutes
I = 6.415 in/hr
Q = 47.49 cfs

Area (ac): 11.05
Weighted C: 0.54
Adjusted C: 0.67

[redacted]

Td= 27 minutes
I = 5.547 in/hr
Q = 41.06 cfs



Quick TR-55 Ver.5.46 S/N:
Executed: 14:30:42 05-08-1992

NORGE COMMERCIAL CENTER PRE-DEVELOPED CONDITIONS

**** Modified Rational Hydrograph *****

Weighted C = 0.536 Area= 11.045 acres Tc = 20.00 minutes

Adjusted C = 0.536 Td= 37.00 min. I= 2.35 in/hr Qp= 13.91 cfs

RETURN FREQUENCY: 2 year storm Adj.factor = 1.00
Output file: PRE2 .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 2 Year Storm

Time increment = 0.033 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.000	0.00	1.39	2.78	4.17	5.56	6.95	8.35
0.233	9.74	11.13	12.52	13.91	13.91	13.91	13.91
0.467	13.91	13.91	13.91	13.91	13.91	13.21	11.82
0.700	10.43	9.04	7.65	6.26	4.87	3.48	2.09
0.933	0.70						

Quick TR-55 Ver.5.46 S/N:
Executed: 14:30:42 05-08-1992

NORGE COMMERCIAL CENTER PRE-DEVELOPED CONDITIONS

**** Modified Rational Hydrograph *****

Weighted C = 0.536 Area= 11.045 acres Tc = 20.00 minutes

Adjusted C = 0.536 Td= 20.00 min. I= 4.49 in/hr Qp= 26.62 cfs

RETURN FREQUENCY: 10 year storm Adj.factor = 1.00
Output file: PRE10 .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 10 Year Storm

Time increment = 0.033 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.000	0.00	2.66	5.32	7.98	10.65	13.31	15.97
0.233	18.63	21.29	23.95	26.62	23.95	21.29	18.63
0.467	15.97	13.31	10.65	7.98	5.32	2.66	0.00

Quick TR-55 Ver.5.46 S/N:
Executed: 14:30:42 05-08-1992

NORGE COMMERCIAL CENTER PRE-DEVELOPED CONDITIONS

**** Modified Rational Hydrograph *****

Weighted C = 0.536 Area= 11.045 acres Tc = 20.00 minutes

Adjusted C = 0.590 Td= 21.00 min. I= 5.20 in/hr Qp= 33.88 cfs

RETURN FREQUENCY: 25 year storm Adj.factor = 1.10
Output file: PRE25 .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 25 Year Storm

Time increment = 0.033 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.000	0.00	3.39	6.78	10.16	13.55	16.94	20.33
0.233	23.71	27.10	30.49	33.88	32.18	28.80	25.41
0.467	22.02	18.63	15.24	11.86	8.47	5.08	1.69

Quick TR-55 Ver.5.46 S/N:
Executed: 14:30:42 05-08-1992

NORGE COMMERCIAL CENTER PRE-DEVELOPED CONDITIONS

**** Modified Rational Hydrograph *****

Weighted C = 0.536 Area= 11.045 acres Tc = 20.00 minutes

Adjusted C = 0.670 Td= 27.00 min. I= 5.55 in/hr Qp= 41.06 cfs

RETURN FREQUENCY: 100 year storm Adj.factor = 1.25
Output file: PRE100 .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 100 Year Storm

Time increment = 0.033 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.000	0.00	4.11	8.21	12.32	16.43	20.53	24.64
0.233	28.74	32.85	36.96	41.06	41.06	41.06	41.06
0.467	39.01	34.90	30.80	26.69	22.58	18.48	14.37
0.700	10.27	6.16	2.05				

Quick TR-55 Ver.5.46 S/N:
Executed: 14:30:42 05-08-1992

NORGE COMMERCIAL CENTER PRE-DEVELOPED CONDITIONS

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
CROPLAND	0.500	8.78						
DITCH	0.500	1.26						
ROAD	0.900	1.00						
			20.00	0.536	0.536	3.384	11.05	20.04

Quick TR-55 Ver.5.46 S/N:
Executed: 14:30:42 05-08-1992

NORGE COMMERCIAL CENTER PRE-DEVELOPED CONDITIONS

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 10 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
CROPLAND	0.500	8.78						
DITCH	0.500	1.26						
ROAD	0.900	1.00						
			20.00	0.536	0.536	4.494	11.05	26.62

Quick TR-55 Ver.5.46 S/N:
Executed: 14:30:42 05-08-1992

NORGE COMMERCIAL CENTER PRE-DEVELOPED CONDITIONS

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 25 years
'C' adjustment, k = 1.1
Adj. 'C' = Wtd.'C' x 1.1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
CROPLAND	0.500	8.78						
DITCH	0.500	1.26						
ROAD	0.900	1.00						
			20.00	0.536	0.590	5.320	11.05	34.66

Quick TR-55 Ver.5.46 S/N:
Executed: 14:30:42 05-08-1992

NORGE COMMERCIAL CENTER PRE-DEVELOPED CONDITIONS

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
'C' adjustment, k = 1.25
Adj. 'C' = Wtd.'C' x 1.25

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
CROPLAND	0.500	8.78						
DITCH	0.500	1.26						
ROAD	0.900	1.00						
			20.00	0.536	0.670	6.415	11.05	47.49

Quick TR-55 Ver.5.46 S/N:
Executed: 14:30:42 05-08-1992

```
*****************************************************************************
*****************************************************************************
*                                                                           *
*                                                                           *
*                                                                           *
*                        MODIFIED RATIONAL METHOD                           *
*            ---- Grand Summary For All Storm Frequencies ----              *
*                                                                           *
*                                                                           *
*****************************************************************************
*****************************************************************************
```

First peak outflow point assumed to occur at Tc hydrograph recession leg.

NORGE COMMERCIAL CENTER PRE-DEVELOPED CONDITIONS

Area = 11.05 acres Tc = 20.00 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (cu.ft.)	VOLUMES Storage (cu.ft.)
2	0.536	37	2.349	13.91	5.00	30,878	20,108
10	0.536	20	4.494	26.62	21.00	31,940	6,740
25	0.590	21	5.200	33.88	21.00	42,685	16,401
100	0.670	27	5.547	41.06	21.00	66,522	33,374

Quick TR-55 Ver.5.46 S/N:
Executed: 14:30:42 05-08-1992

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

NORGE COMMERCIAL CENTER PRE-DEVELOPED CONDITIONS

RETURN FREQUENCY: 2 yr 'C' Adjustment = 1.000 Allowable Q = 5.00 cfs

Hydrograph file duration= 37.00 minutes Tc = 20.00 minutes
Hydrograph file: PRE2 .HYD

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.536	0.536	20	3.384	11.05	20.04	24,053	18,053
0.536	0.536	30	2.687	11.05	15.91	28,641	19,835
0.536	0.536	37	2.349	11.05	13.91	30,878	Storage Maximum 20,108
0.536	0.536	40	2.227	11.05	13.19	31,659	20,048
0.536	0.536	50	1.902	11.05	11.27	33,797	19,380
0.536	0.536	60	1.660	11.05	9.83	35,391	18,168
0.536	0.536	120	0.941	11.05	5.57	40,118	6,061

Quick TR-55 Ver.5.46 S/N:
Executed: 14:30:42 05-08-1992

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

NORGE COMMERCIAL CENTER PRE-DEVELOPED CONDITIONS

RETURN FREQUENCY: 10 yr 'C' Adjustment = 1.000 Allowable Q = 21.00 cfs

Hydrograph file duration= 20.00 minutes Tc = 20.00 minutes
Hydrograph file: PRE10 .HYD

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
						Storage	Maximum
0.536	0.536	20	4.494	11.05	26.62	31,940	6,740
0.536	0.536	30	3.632	11.05	21.51	38,714	3,275
0.536	0.536	40	3.047	11.05	18.04	Qpeak < Qallow	

Quick TR-55 Ver.5.46 S/N:
Executed: 14:30:42 05-08-1992

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

NORGE COMMERCIAL CENTER PRE-DEVELOPED CONDITIONS

RETURN FREQUENCY: 25 yr 'C' Adjustment = 1.100 Allowable Q = 21.00 cfs

Hydrograph file duration= 21.00 minutes Tc = 20.00 minutes
Hydrograph file: PRE25 .HYD

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.536	0.590	20	5.320	11.05	34.66	41,590	16,390
**********						Storage	Maximum
0.536	0.590	21	5.200	11.05	33.88	42,685	16,401
**********							
0.536	0.590	30	4.310	11.05	28.08	50,541	14,530
0.536	0.590	40	3.620	11.05	23.58	56,600	9,785
0.536	0.590	50	3.130	11.05	20.39	Qpeak < Qallow	

Quick TR-55 Ver.5.46 S/N:
Executed: 14:30:42 05-08-1992

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

NORGE COMMERCIAL CENTER PRE-DEVELOPED CONDITIONS

RETURN FREQUENCY: 100 yr 'C' Adjustment = 1.250 Allowable Q = 21.00 cfs

Hydrograph file duration= 27.00 minutes
Hydrograph file: PRE100 .HYD
Tc = 20.00 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.536	0.670	20	6.415	11.05	47.49	56,987	31,787
**********	**********	**********	**********	**********	**********	Storage	Maximum
0.536	0.670	27	5.547	11.05	41.06	66,522	33,374
**********	**********	**********	**********	**********	**********	**********	**********
0.536	0.670	30	5.240	11.05	38.79	69,825	33,274
0.536	0.670	40	4.429	11.05	32.79	78,689	30,787
0.536	0.670	50	3.835	11.05	28.39	85,175	25,923
0.536	0.670	60	3.382	11.05	25.04	90,129	19,526
0.536	0.670	120	1.979	11.05	14.65	Qpeak < Qallow	

POSTDEVELOPED HYDROGRAPHS

Baker

Michael Baker Jr., Inc.

1 HR USE 2.5 in/HR

7 x .7 x 2.5 = 12 cfs

= 12 AC IN

= 44,000 CU FT

Q = 7 x .7 x 3.9 = 18 cfs

R = 7 x .7 x 3.9 = 18 AC in

÷ 12 = 1.5 AC FT

= 65000 CU FT

2 HR USE 3"/HR

18 x 3/3.9 = 14 cfs

= 14 AC IN

~~= 60,000 CU FT~~

51,000 CU FT

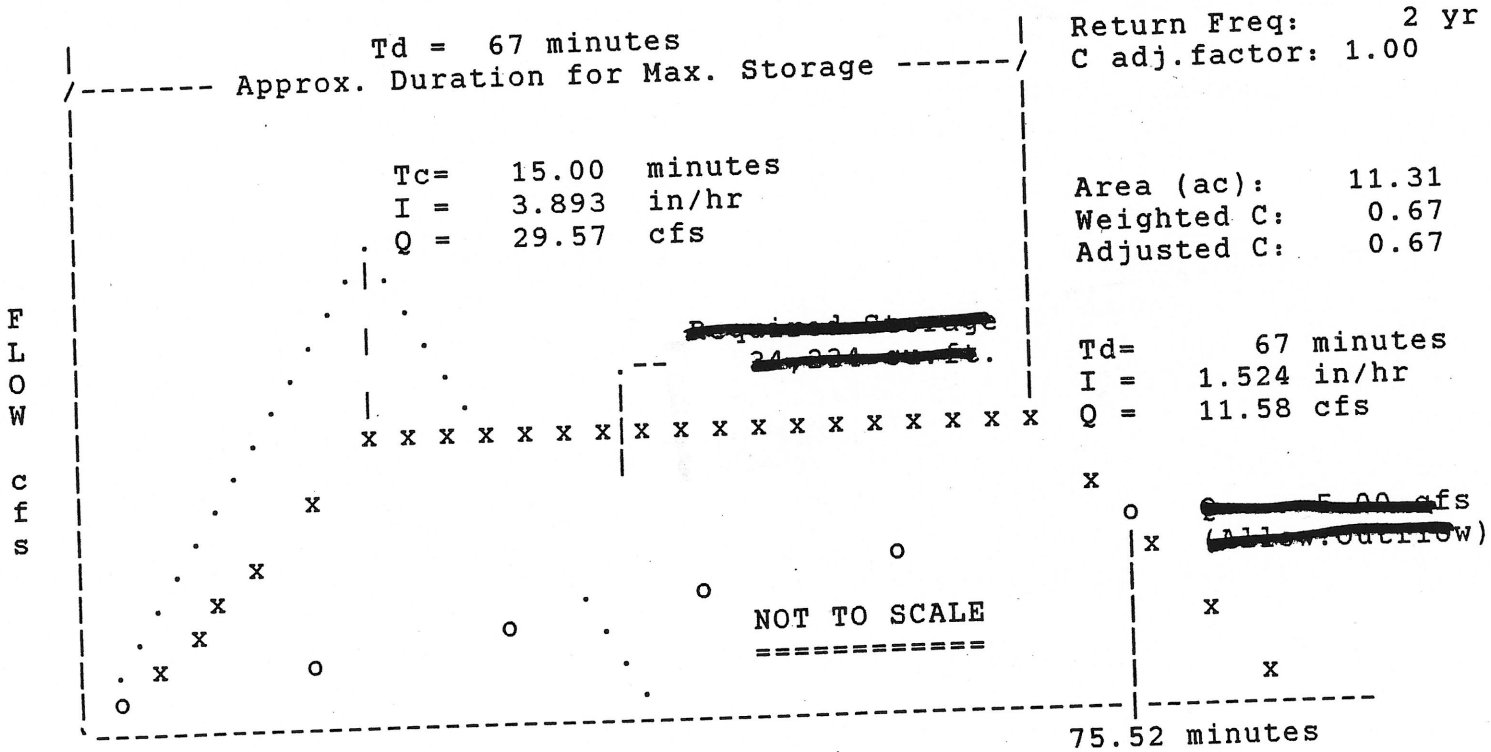
Quick TR-55 Ver.5.46 S/N:
Executed: 13:47:11 05-11-1992

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE TO US RT 60 AT FRONT OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #1

```
*****************************************************************
*  RETURN FREQUENCY:    2 yr     |  Allowable Outflow:   [redacted]  *
*  'C' Adjustment: 1.000         |  Required Storage:    [redacted]. *
*---------------------------------------------------------------*
*  Peak Inflow:    11.58 cfs        Inflow .HYD stored: 2YR1    .HYD  *
*****************************************************************
```



$V_S = \frac{1}{12} \times 6.67 \times .6 = 0.33$ acft $= 14{,}527\ ft^3$ ~ ok 10 pt

Q=AIR
11 x .7 x 3
2.1
21
23 cfs

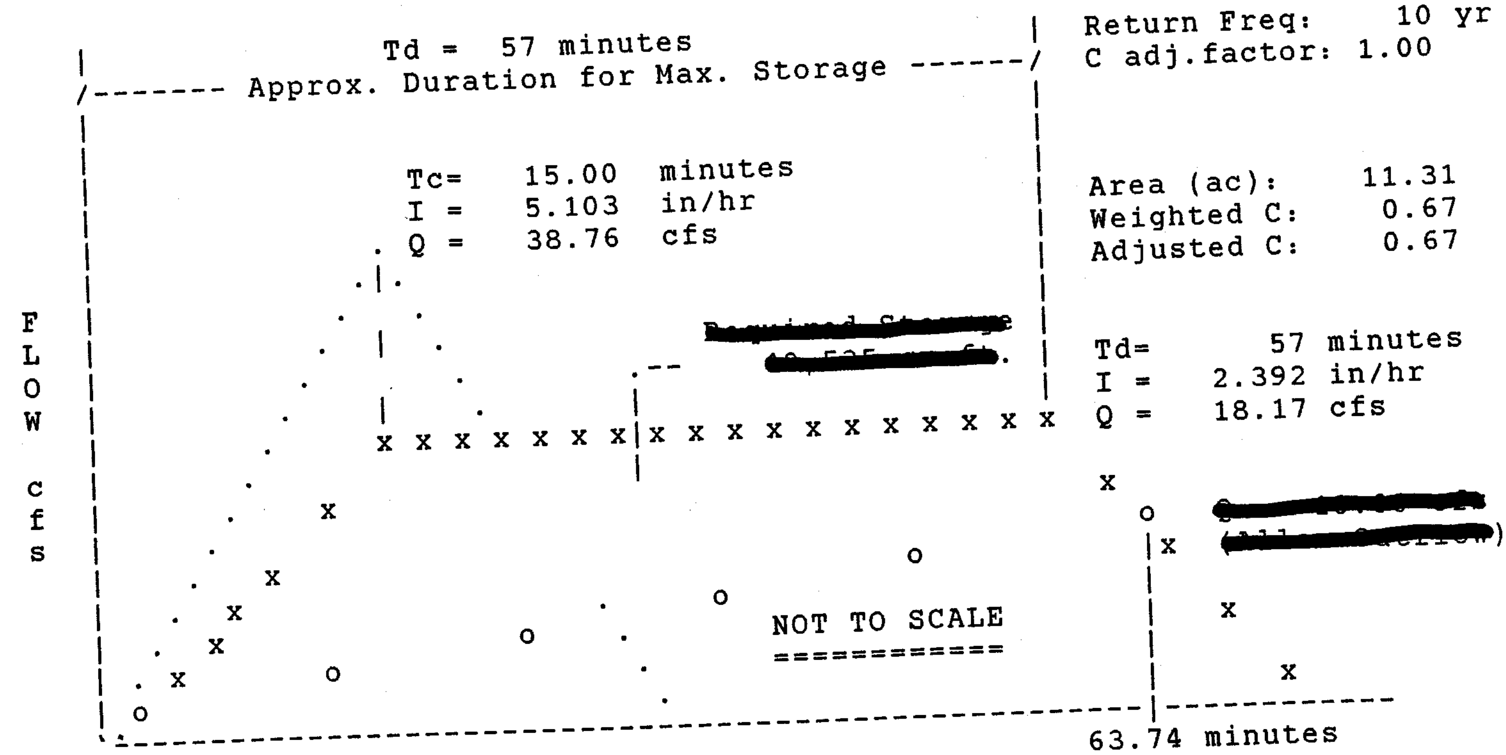
Quick TR-55 Ver.5.46   S/N:
Executed: 13:47:11   05-11-1992

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE TO US RT 60 AT FRONT OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #1

RETURN FREQUENCY: 10 yr	Allowable Outflow: [redacted]
'C' Adjustment: 1.000	Required Storage: [redacted]
Peak Inflow: 18.17 cfs	Inflow .HYD stored: 10YR1 .HYD



Quick TR-55 Ver.5.46 S/N:
Executed: 13:47:11 05-11-1992

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE TO US RT 60 AT FRONT OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #1

```
*****************************************************************
*  RETURN FREQUENCY:  25 yr     |  Allowable Outflow:      [redacted]  *
*  'C' Adjustment: 1.100        |  Required Storage:       [redacted]  *
*---------------------------------------------------------------*
*  Peak Inflow:   20.97 cfs     Inflow .HYD stored: 25YR1   .HYD   *
*****************************************************************
```

```
|                Td =  68 minutes                    |  Return Freq:     25 yr
/------- Approx. Duration for Max. Storage ------/    C adj.factor: 1.10
|                                                    |
|                                                    |
|                Tc=    15.00  minutes               |
|                I =    6.030  in/hr                 |  Area (ac):     11.31
|                Q =    50.37  cfs                   |  Weighted C:     0.67
|              . |.                                  |  Adjusted C:     0.74
F|            .   .                                  |
L|           .  |  .                [redacted]e      |
O|          .    .        .--       [redacted].      |  Td=      68 minutes
W|         .    |  .                                |  I =   2.510 in/hr
|        .      x x x x x x x|x x x x x x x x x x x  |  Q =   20.97 cfs
c|       .                    |                      |
f|      .    x                                       |  x
s|     .                                   o        |    o   [redacted]fs
|    .   x                                           |x  ([redacted]w)
|   .  x                  .      o                   |
|  .  x                o    .      NOT TO SCALE      |   x
| . x        o                .    ============      |
|o                                  .                |       x
\-------------------------------------------------------|------------
                                                      75.85 minutes
```

Quick TR-55 Ver.5.46   S/N:
Executed: 13:47:11   05-11-1992

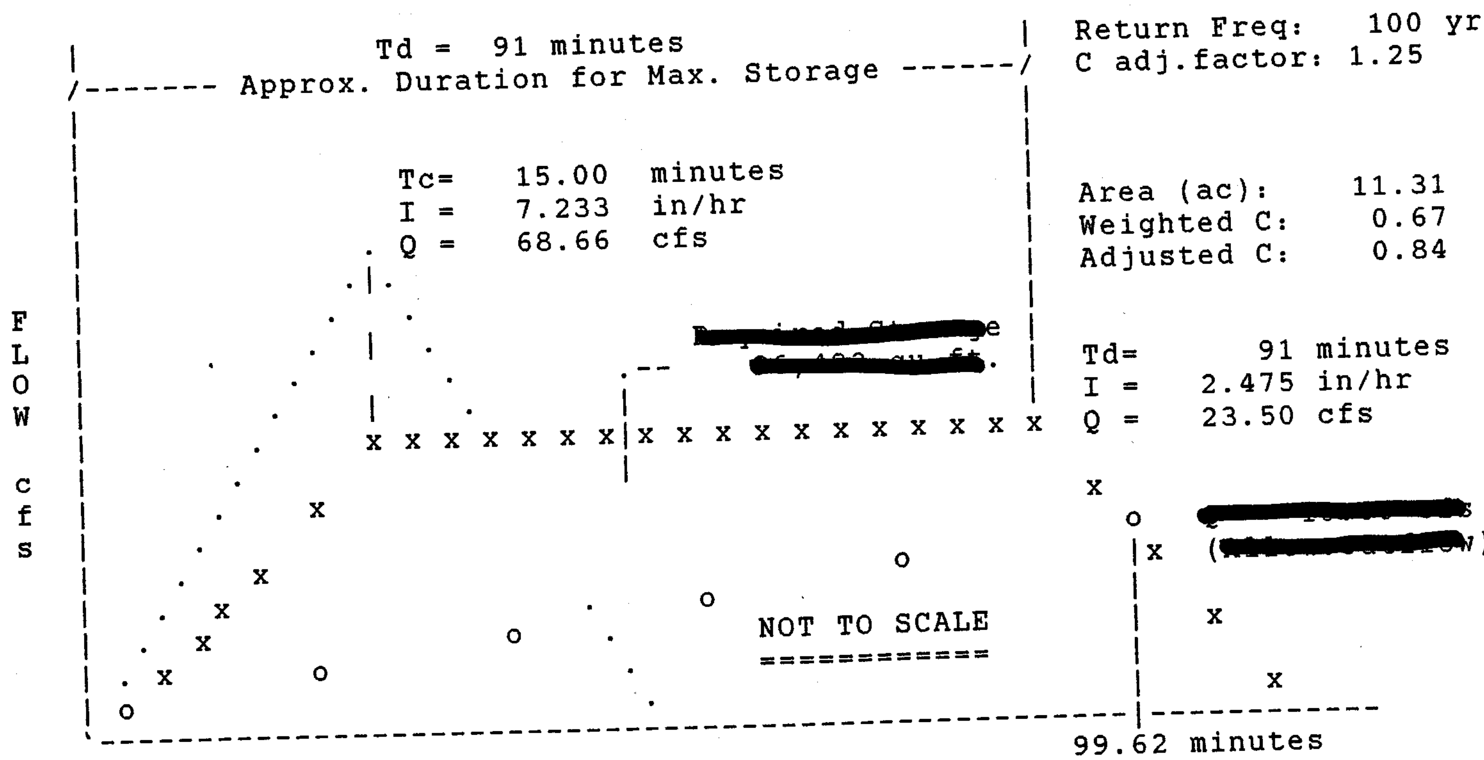
MODIFIED RATIONAL METHOD

---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE TO US RT 60 AT FRONT OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #1

```
****************************************************************************
*  RETURN FREQUENCY: 100 yr      |  Allowable Outflow:   [redacted]        *
*  'C' Adjustment: 1.250         |  Required Storage:    [redacted]        *
*--------------------------------------------------------------------------*
*  Peak Inflow:   23.50 cfs         Inflow .HYD stored: 100YR1    .HYD     *
****************************************************************************
```



Quick TR-55 Ver.5.46 S/N:
Executed: 13:47:11 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE TO US RT 60 AT FRONT OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #1

**** Modified Rational Hydrograph *****

Weighted C = 0.671 Area= 11.310 acres Tc = 15.00 minutes

Adjusted C = 0.671 Td= 67.00 min. I= 1.52 in/hr Qp= 11.58 cfs

RETURN FREQUENCY: 2 year storm Adj.factor = 1.00
Output file: 2YR1 .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 2 Year Storm

Time increment = 0.033 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.017	0.77	2.32	3.86	5.40	6.95	8.49	10.03
0.250	11.58	11.58	11.58	11.58	11.58	11.58	11.58
0.483	11.58	11.58	11.58	11.58	11.58	11.58	11.58
0.717	11.58	11.58	11.58	11.58	11.58	11.58	11.58
0.950	11.58	11.58	11.58	11.58	11.58	11.58	10.03
1.183	8.49	6.95	5.40	3.86	2.32	0.77	0.00

Quick TR-55 Ver.5.46 S/N:
Executed: 13:47:11 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE TO US RT 60 AT FRONT OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #1

**** Modified Rational Hydrograph *****

Weighted C = 0.671 Area= 11.310 acres Tc = 15.00 minutes

Adjusted C = 0.671 Td= 57.00 min. I= 2.39 in/hr Qp= 18.17 cfs

RETURN FREQUENCY: 10 year storm Adj.factor = 1.00
Output file: 10YR1 .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 10 Year Storm

Time increment = 0.033 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.017	1.21	3.63	6.06	8.48	10.90	13.32	15.75
0.250	18.17	18.17	18.17	18.17	18.17	18.17	18.17
0.483	18.17	18.17	18.17	18.17	18.17	18.17	18.17
0.717	18.17	18.17	18.17	18.17	18.17	18.17	18.17
0.950	18.17	15.75	13.32	10.90	8.48	6.06	3.63
1.183	1.21	0.00					

Quick TR-55 Ver.5.46 S/N:
Executed: 13:47:11 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE TO US RT 60 AT FRONT OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #1

**** Modified Rational Hydrograph *****

Weighted C = 0.671 Area= 11.310 acres Tc = 15.00 minutes

Adjusted C = 0.739 Td= 68.00 min. I= 2.51 in/hr Qp= 20.97 cfs

RETURN FREQUENCY: 25 year storm Adj.factor = 1.10
Output file: 25YR1 .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 25 Year Storm

Time increment = 0.033 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.017	1.40	4.19	6.99	9.79	12.58	15.38	18.17
0.250	20.97	20.97	20.97	20.97	20.97	20.97	20.97
0.483	20.97	20.97	20.97	20.97	20.97	20.97	20.97
0.717	20.97	20.97	20.97	20.97	20.97	20.97	20.97
0.950	20.97	20.97	20.97	20.97	20.97	20.97	19.57
1.183	16.77	13.98	11.18	8.39	5.59	2.80	0.00

Quick TR-55 Ver.5.46 S/N:
Executed: 13:47:11 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE TO US RT 60 AT FRONT OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #1

**** Modified Rational Hydrograph *****

Weighted C = 0.671 Area= 11.310 acres Tc = 15.00 minutes

Adjusted C = 0.839 Td= 91.00 min. I= 2.48 in/hr Qp= 23.50 cfs

RETURN FREQUENCY: 100 year storm Adj.factor = 1.25
Output file: 100YR1 .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 100 Year Storm

Time increment = 0.033 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.017	1.57	4.70	7.83	10.97	14.10	17.23	20.36
0.250	23.50	23.50	23.50	23.50	23.50	23.50	23.50
0.483	23.50	23.50	23.50	23.50	23.50	23.50	23.50
0.717	23.50	23.50	23.50	23.50	23.50	23.50	23.50
0.950	23.50	23.50	23.50	23.50	23.50	23.50	23.50
1.183	23.50	23.50	23.50	23.50	23.50	23.50	23.50
1.417	23.50	23.50	23.50	23.50	20.36	17.23	14.10
1.650	10.97	7.83	4.70	1.57	0.00		

Quick TR-55 Ver.5.46 S/N:
Executed: 13:47:11 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE TO US RT 60 AT FRONT OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #1

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
AREA 1	0.900	0.46						
AREA 2	0.900	0.72						
AREA 3	0.900	0.37						
AREA 4	0.900	0.46						
AREA 5	0.500	0.84						
AREA 6	0.900	0.05						
AREA 7	0.900	0.17						
AREA 8	0.900	0.21						
AREA 13	0.620	2.51						
AREA 14	0.620	5.52						
Area 15		3.38	15.00	0.671	0.671	3.893	11.31	29.57

1 - 8 + 15 = 6.67 ac

Quick TR-55 Ver.5.46 S/N:
Executed: 13:47:11 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE TO US RT 60 AT FRONT OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #1

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 10 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
AREA 1	0.900	0.46						
AREA 2	0.900	0.72						
AREA 3	0.900	0.37						
AREA 4	0.900	0.46						
AREA 5	0.500	0.84						
AREA 6	0.900	0.05						
AREA 7	0.900	0.17						
AREA 8	0.900	0.21						
AREA 13	0.620	2.51						
AREA 14	0.620	5.52						
			15.00	0.671	0.671	5.103	11.31	38.76

Quick TR-55 Ver.5.46 S/N:
Executed: 13:47:11 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE TO US RT 60 AT FRONT OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #1

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 25 years
'C' adjustment, k = 1.1
Adj. 'C' = Wtd.'C' x 1.1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
AREA 1	0.900	0.46						
AREA 2	0.900	0.72						
AREA 3	0.900	0.37						
AREA 4	0.900	0.46						
AREA 5	0.500	0.84						
AREA 6	0.900	0.05						
AREA 7	0.900	0.17						
AREA 8	0.900	0.21						
AREA 13	0.620	2.51						
AREA 14	0.620	5.52						
			15.00	0.671	0.739	6.030	11.31	50.37

Quick TR-55 Ver.5.46 S/N:
Executed: 13:47:11 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE TO US RT 60 AT FRONT OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #1

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
'C' adjustment, k = 1.25
Adj. 'C' = Wtd.'C' x 1.25

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
AREA 1	0.900	0.46						
AREA 2	0.900	0.72						
AREA 3	0.900	0.37						
AREA 4	0.900	0.46						
AREA 5	0.500	0.84						
AREA 6	0.900	0.05						
AREA 7	0.900	0.17						
AREA 8	0.900	0.21						
AREA 13	0.620	2.51						
AREA 14	0.620	5.52						
			15.00	0.671	0.839	7.233	11.31	68.66

Quick TR-55 Ver.5.46 S/N:
Executed: 13:47:11 05-11-1992

```
*************************************************************************
*************************************************************************
*                                                                       *
*                                                                       *
*                        MODIFIED RATIONAL METHOD                       *
*            ---- Grand Summary For All Storm Frequencies ----          *
*                                                                       *
*                                                                       *
*************************************************************************
*************************************************************************
```

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE TO US RT 60 AT FRONT OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #1

Area = 11.31 acres Tc = 15.00 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (cu.ft.)	VOLUMES Storage (cu.ft.)
2	0.671	67	1.524	11.58	5.00	46,534	34,234
10	0.671	57	2.392	18.17	10.00	62,135	40,535
25	0.739	68	2.510	20.97	10.00	85,552	60,652
100	0.839	91	2.475	23.50	10.00	128,292	96,492

Quick TR-55 Ver.5.46 S/N:
Executed: 13:47:11 05-11-1992

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE TO US RT 60 AT FRONT OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #1

RETURN FREQUENCY: 2 yr 'C' Adjustment = 1.000 Allowable Q = 5.00 cfs

Hydrograph file duration= 67.00 minutes
Hydrograph file: 2YR1 .HYD Tc = 15.00 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.671	0.671	15	3.893	11.31	29.57	26,609	22,109
0.671	0.671	20	3.384	11.31	25.70	30,844	25,594
0.671	0.671	30	2.687	11.31	20.40	36,727	29,977
0.671	0.671	40	2.227	11.31	16.92	40,597	32,347
0.671	0.671	50	1.902	11.31	14.45	43,339	33,589
0.671	0.671	60	1.660	11.31	12.61	45,383	34,133
**********						Storage	Maximum
0.671	0.671	67	1.524	11.31	11.58	46,534	34,234
**********							
0.671	0.671	120	0.941	11.31	7.14	51,444	31,194

Quick TR-55 Ver.5.46 S/N:
Executed: 13:47:11 05-11-1992

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE TO US RT 60 AT FRONT OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #1

RETURN FREQUENCY: 10 yr 'C' Adjustment = 1.000 Allowable Q = 10.00 cfs

Hydrograph file duration= 57.00 minutes
Hydrograph file: 10YR1 .HYD Tc = 15.00 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.671	0.671	15	5.103	11.31	38.76	34,883	25,883
0.671	0.671	20	4.494	11.31	34.13	40,957	30,457
0.671	0.671	30	3.632	11.31	27.58	49,644	36,144
0.671	0.671	40	3.047	11.31	23.14	55,532	39,032
0.671	0.671	50	2.624	11.31	19.93	59,787	40,287
********** Storage Maximum							
0.671	0.671	57	2.392	11.31	18.17	62,135	40,535
0.671	0.671	60	2.305	11.31	17.50	63,006	40,506
0.671	0.671	120	1.332	11.31	10.11	72,808	32,308

Quick TR-55 Ver.5.46 S/N:
Executed: 13:47:11 05-11-1992

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE TO US RT 60 AT FRONT OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #1

RETURN FREQUENCY: 25 yr 'C' Adjustment = 1.100 Allowable Q = 10.00 cfs

Hydrograph file duration= 68.00 minutes
Hydrograph file: 25YR1 .HYD Tc = 15.00 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.671	0.739	15	6.030	11.31	50.37	45,337	36,337
0.671	0.739	20	5.320	11.31	44.44	53,332	42,832
0.671	0.739	30	4.310	11.31	36.01	64,811	51,311
0.671	0.739	40	3.620	11.31	30.24	72,580	56,080
0.671	0.739	50	3.130	11.31	26.15	78,445	58,945
0.671	0.739	60	2.750	11.31	22.97	82,705	60,205
**********						Storage	Maximum
0.671	0.739	68	2.510	11.31	20.97	85,552	60,652
**********							
0.671	0.739	120	1.590	11.31	13.28	95,637	55,137

Quick TR-55 Ver.5.46 S/N:
Executed: 13:47:11 05-11-1992

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE TO US RT 60 AT FRONT OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #1

RETURN FREQUENCY: 100 yr 'C' Adjustment = 1.250 Allowable Q = 10.00 cfs

Hydrograph file duration= 91.00 minutes
Hydrograph file: 100YR1 .HYD Tc = 15.00 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.671	0.839	15	7.233	11.31	68.66	61,797	52,797
0.671	0.839	20	6.415	11.31	60.90	73,077	62,577
0.671	0.839	30	5.240	11.31	49.74	89,539	76,039
0.671	0.839	40	4.429	11.31	42.04	100,905	84,405
0.671	0.839	50	3.835	11.31	36.41	109,223	89,723
0.671	0.839	60	3.382	11.31	32.10	115,575	93,075
**********						Storage	Maximum
0.671	0.839	91	2.475	11.31	23.50	128,292	96,492
**********							
0.671	0.839	120	1.979	11.31	18.78	135,240	94,740

POND STORAGE

Baker

Michael Baker Jr., Inc.

POND-2 Version: 5.17
S/N:

NORGE COMMERCIAL CENTER
VOLUME COMPUTATION FOR INFILTRATION BASIN
AT INTERSECTION OF NORGE LANE & RICHMOND ROAD

CALCULATED 05-07-1992 14:41:03
DISK FILE: C:\ENGINEER\PONDPACK\NORGE\NORGE .VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	* Volume (cubic-ft)	Volume Sum (cubic-ft)
105.50	6,594.17	6,594	0	0	0
106.00	7,346.20	7,346	20,900	3,483	3,483
107.00	8,136.80	8,137	23,214	7,738	11,222
108.00	8,965.97	8,966	25,644	8,548	19,770
109.00	9,830.60	9,831	28,185	9,395	29,165
110.00	10,727.53	10,728	30,827	10,276	39,440
111.00	11,656.75	11,657	33,567	11,189	50,629
112.00	12,618.28	12,618	36,403	12,134	62,764
113.00	13,612.10	13,612	39,336	13,112	75,876
113.90	14,123.37	14,123	41,601	12,480	88,356

IA = (sq.rt(Area1) + ((Ei-E1)/(E2-E1))*(sq.rt(Area2)-sq.rt(Area1)))^2

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1,Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

STRUCTURE RATING CURVES

Baker

Michael Baker Jr., Inc.

Outlet Structure File: NORGE1 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

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

Elevation (ft)	Q (cfs)	Contributing Structures
105.50	0.0	4
106.00	1.0	4
106.50	3.2	4
107.00	6.7	4
107.50	10.3	4
108.00	13.6	4
108.50	15.2	1
109.00	16.4	1
109.50	20.5	1 +2
110.00	22.5	4
110.50	24.2	4
111.00	25.7	4
111.50	27.3	4
112.00	28.7	4
112.50	30.0	4
113.00	31.3	4
113.50	32.6	4
113.90	33.6	4

Outlet Structure File: NORGE1 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

Outlet Structure File: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .STR
Planimeter Input File: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .VOL
Rating Table Output File: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND

Min. Elev.(ft) = 105.5 Max. Elev.(ft) = 113.9 Incr.(ft) = .5

Additional elevations (ft) to be included in table:
* *

****
SYSTEM CONNECTIVITY
****

Structure	No.		Q Table		Q Table
ORIFICE-VC	1			->	1
STAND PIPE	2	+	1	->	3
CULVERT-CR	4	?	3	->	5

Outflow rating table summary was stored in file:
C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND

Appendix 11C-1 Equivalent Runoff Curve Number (RCN) for Rational 'C'

RATIONAL METHOD "C" VALUES		N.R.C.S. "TR-55" METHOD "CN" VALUES					
LAND COVER	RUNOFF COEFICIENT "C"	COVER TYPE & HYDROLOGIC CONDITION	Avg.% Imp.	Curve Numbers for Hydrologic Soil Group*			
				A	B	C	D
Business, industrial and commercial	0.80 to 0.90	Commercial and business	85	89	92	94	95
		Industrial	72	81	88	91	93
Residential	0.40 to 0.50	Residential area by lot size:					
		1/8 acre or less (town houses)	65	77	85	90	92
lots 10,000 sq. ft.	0.40 to 0.45	¼ acre	38	61	75	83	87
- lots 12,000 sq. ft.		1/3 acre	30	57	72	81	86
- lots 17,000 sq. ft.	0.35 to 0.45	½ acre	25	54	70	80	85
- lots ½ ac. or more		1 acre	20	51	68	79	84
	0.30 to 0.40	2 acres	12	46	65	77	82
		Farmsteads – buildings, lanes, driveways, and surrounding lots	n.a.	59	74	82	86
Parks, cemeteries and unimproved areas	0.20 to 0.35	Open space (lawns, parks, golf courses Cemeteries, etc.) grass cover > 75%	n.a.	39	61	74	80
Lawns	0.20 to 0.40						
Paved and roof areas	0.9	Streets & roads:					
		Paved parking lots, roofs, driveways, etc.	n.a.	98	98	98	98
		Paved: open ditches (excluding R/W)	n.a.	83	89	92	93
		Gravel (including R/W)	n.a.	76	85	89	91
		Dirt (including R/W)	n.a.	72	82	87	89
Cultivated areas	0.50 to 0.70	Cultivated areas (combination of straight & Row crops)	n.a.	71	80	87	90
Pasture	0.35 to 0.45	Pasture, grassland, or range	n.a.	39	61	74	80
		Meadow – continuous grass	n.a.	30	58	71	78
		Brush-brush-weed-grass mixture with brush the major element	n.a.	30	48	65	73
Forest	0.20 to 0.30	Woods	n.a.	30	55	70	77
		Woods/grass combination	n.a.	32	58	72	79

If the accurate soil information is not available use Soil Group B.

YR023_NORGE_CENTER_FARM_FRESH - 074

TABLE OF CONTENTS

SECTION **PAGE**

Executive Summary 3

1.0 INTRODUCTION 4

2.0 EXISTING DATA REVIEW 7

~~2.1 SOILS~~ 7

~~2.2 CHESAPEAKE BAY PRESERVATION AREAS~~ 7

2.3 ~~WATER QUALITY DE~~SIGN 7

~~2.4 WATER QUANTITY DESIG~~N 7

3.0 RECOMMENDED MAINTENANCE ACTIVITIES 7

4.0 BMP ENHANCEMENTS 7

5.0 RETROFIT RECOMMENDATIONS 7

~~5.1~~ COSTS 7

Appendix A – BMP Performance Inspection and Checklists

Map Pocket - Drainage Area Map (Color) 24x36
11x17 inset graphics (riser modifications) or Figures photos.

Initial Stormwater Plan
→ Quality
→ Quantity
~~Supplemental BMPs~~
As-Built Surveys

Site visit

Supplemental BMPs
→ grassed swales
→ pretreatment @ Gas Station

BMP Inspections

Bypass Drainage

Outfall Erosion

Recommendations

- Maint.
- BMP retrofits
  outlet structure opt.
- ~~[illegible]~~
- ~~[illegible]~~ pickup
  bypass
- outlet protection
- off site treatment

YR023_NORGE_CENTER_FARM_FRESH_1073

Outlet Structure File: NORGE1 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

>>>>>> Structure No. 1 <<<<<<
(Input Data)

ORIFICE-VC
Orifice - Vertical Circular

E1 elev.(ft)?	107.5
E2 elev.(ft)?	113.901
Orifice coeff.?	0.62
Invert elev.(ft)?	105.5
Datum elev.(ft)?	105.5
Diameter (ft)?	1.50

Outlet Structure File: NORGE1 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

>>>>>> Structure No. 2 <<<<<<
(Input Data)

STAND PIPE
Stand Pipe with weir or orifice flow

E1 elev.(ft)? 109.26
E2 elev.(ft)? 113.901
Crest elev.(ft)? 109.26
Diameter (ft)? 3.0
Weir coefficient? 2.67
Orifice coefficient? 0.62
Start transition elev.(ft) @ ? 112.0
Transition height (ft)? .5

Outlet Structure File: NORGE1 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

>>>>>> Structure No. 4 <<<<<<
(Input Data)

CULVERT-CR
Circular Culvert (With Inlet Control)

E1 elev.(ft)?	105.5
E2 elev.(ft)?	113.901
Diam. (ft)?	1.5
Inv. el.(ft)?	105.5
Slope (ft/ft)?	0.005
T1 ratio?	
T2 ratio?	
K Coeff.?	0.534
M Coeff.?	0.555
c Coeff.?	0.0196
Y Coeff.?	0.89
Form 1 or 2?	2
Slope factor?	

Outlet Structure File: NORGE1 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

Outflow Rating Table for Structure #1
ORIFICE-VC Orifice - Vertical Circular D=18" ?

Elevation (ft)	Q (cfs) 18" 15"	Computation Messages
105.50 12"	0.0	E < E1=107.5
106.00	0.0	E < E1=107.5
106.50	0.0	E < E1=107.5
107.00	0.0	E < E1=107.5
107.50 6	12.4 8.5	H =2.0
108.00	13.9	H =2.5
108.50	15.2	H =3.0
109.00 8	16.4 11.5	H =3.5
109.50	17.6	H =4.0
110.00	18.7	H =4.5
110.50	19.7	H =5.0
111.00	20.6	H =5.5
111.50	21.5	H =6.0
112.00	22.4	H =6.5
112.50	23.3	H =7.0
113.00	24.1	H =7.5
113.50	24.9	H =8.0
113.90	25.5	H =8.400

C = .62 A = 1.767146 sq.ft.
H (ft) = Table elev. - Datum elev. (105.5 ft)
Q (cfs) = C * A * sqr(2g * H)

D	R	R^2	π	A
18"	$\frac{1.5}{2}$	0.563		1.764 sf
15"	$\frac{1.25}{2}$	0.39		1.22 sf
12"	$\frac{1.0}{2}$	0.25		0.79 sf
10"	5/12	0.174		0.55 sf
		81		
		56		
		36		

Outlet Structure File: NORGE1 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

Outflow Rating Table for Structure #2
STAND PIPE Stand Pipe with weir or orifice flow

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
105.50	0.0	E < Inv.El.= 109.26
106.00	0.0	E < El= 109.26
106.50	0.0	E < El= 109.26
107.00	0.0	E < El= 109.26
107.50	0.0	E < El= 109.26
108.00	0.0	E < El= 109.26
108.50	0.0	E < El= 109.26
109.00	0.0	E < El= 109.26
109.50	3.0	Weir: H =.24
110.00	16.0	Weir: H =.74
110.50	34.7	Weir: H =1.24
111.00	46.4	Orifice: H =1.74
111.50	52.6	Orifice: H =2.24
112.00	58.2	Orifice: H =2.74
112.50	63.3	Orifice: H =3.24
113.00	68.0	Orifice: H =3.74
113.50	72.4	Orifice: H =4.24
113.90	75.8	Orifice: H =4.64

Weir Cw = 2.67 Weir length = 9.424779 ft
Orifice Co = .62 Orifice area = 7.068584 sq.ft.
Q (cfs) = (Cw * L * H**1.5) or (Co * A * sqr(2*g*H))
No transition used, transition zone begins above 110.6576 ft
Weir equation = Orifice equation @ elev.= 110.6576 ft

Outlet Structure File: NORGE1 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

Outflow Rating Table for Structure #4
CULVERT-CR Circular Culvert (With Inlet Control)

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
105.50	0.0	No headwater
106.00	1.0	Equ.2: HW =.5
106.50	3.2	Equ.2: HW =1.0
107.00	6.7	Equ.2: HW =1.5
107.50	10.3	Submerged: HW =2.0
108.00	13.6	Submerged: HW =2.5
108.50	16.3	Submerged: HW =3.0
109.00	18.6	Submerged: HW =3.5
109.50	20.6	Submerged: HW =4.0
110.00	22.5	Submerged: HW =4.5
110.50	24.2	Submerged: HW =5.0
111.00	25.7	Submerged: HW =5.5
111.50	27.3	Submerged: HW =6.0
112.00	28.7	Submerged: HW =6.5
112.50	30.0	Submerged: HW =7.0
113.00	31.3	Submerged: HW =7.5
113.50	32.6	Submerged: HW =8.0
113.90	33.6	Submerged: HW =8.400

Used Unsubmerged Equ. Form (2) for elev. less than 107.11 ft
Used Submerged Equation for elevations greater than 107.31 ft
HW=Headwater (ft)

Transition flows interpolated from the following values:
E1=107.11 ft; Q1=7.58 cfs; E2=107.31 ft; Q2=8.66 cfs

Outlet Structure File: NORGE1 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

Outflow Rating Table 3
Table 3 = 1 + 2

Elevation (ft)	Q (cfs)	Contributing Structures
105.50	0.0	-
106.00	0.0	-
106.50	0.0	-
107.00	0.0	-
107.50	12.4	1
108.00	13.9	1
108.50	15.2	1
109.00	16.4	1
109.50	20.5	1 +2
110.00	34.7	1 +2
110.50	54.4	1 +2
111.00	67.0	1 +2
111.50	74.2	1 +2
112.00	80.6	1 +2
112.50	86.6	1 +2
113.00	92.1	1 +2
113.50	97.3	1 +2
113.90	101.2	1 +2

Outlet Structure File: NORGE1 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

Outflow Rating Table 5
Table 5 = 3 ? 4

Elevation (ft)	Q (cfs)	Contributing Structures
105.50	0.0	4
106.00	1.0	4
106.50	3.2	4
107.00	6.7	4
107.50	10.3	4
108.00	13.6	4
108.50	15.2	1
109.00	16.4	1
109.50	20.5	1 +2
110.00	22.5	4
110.50	24.2	4
111.00	25.7	4
111.50	27.3	4
112.00	28.7	4
112.50	30.0	4
113.00	31.3	4
113.50	32.6	4
113.90	33.6	4

STORM ROUTING

Baker

Michael Baker Jr., Inc.

POND-2 Version: 5.17 S/N:
EXECUTED: 05-11-1992 14:04:59 2YR Return Freq: 2 years

```
*****************************
*                           *
* NORGE COMMERCIAL CENTER   *
*   BASIN # 1 AT US RT 60   *
*                           *
*                           *
*                           *
*****************************
```

Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\2YR1 .HYD
Rating Table file: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND

----INITIAL CONDITIONS----
Elevation = 105.50 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)
105.50	0.0	0
106.00	1.0	3,483
106.50	3.2	7,254
107.00	6.7	11,221
107.50	10.3	15,392
108.00	13.6	19,770
108.50	15.2	24,359
109.00	16.4	29,165
109.50	17.6	34,190
110.00	18.7	39,441
110.50	19.7	44,919
111.00	20.6	50,629
111.50	21.5	56,576
112.00	22.6	62,763
112.50	30.0	69,195
113.00	31.3	75,876
113.50	32.6	82,752
113.90	33.6	88,356

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
58.1	59.1
120.9	124.1
187.0	193.7
256.6	266.9
329.5	343.1
406.0	421.2
486.1	502.5
569.9	587.5
657.4	676.1
748.7	768.4
843.9	864.5
943.0	964.5
1046.2	1068.8
1153.4	1183.4
1264.7	1296.0
1379.3	1411.9
1472.7	1506.3

Time increment (t) = 0.033 hrs.

EXECUTED: 05-11-1992 14:04:59 2YR Return Freq: 2 years

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\2YR1 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\2OUT1 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.017	0.77	-----	0.0	0.0	0.00	105.50
0.050	2.32	3.1	3.0	3.1	0.05	105.53
0.083	3.86	6.2	8.9	9.2	0.16	105.58
0.117	5.40	9.3	17.5	18.1	0.31	105.65
0.150	6.95	12.4	28.8	29.9	0.51	105.75
0.183	8.49	15.4	42.8	44.3	0.75	105.87
0.217	10.03	18.5	59.2	61.3	1.08	106.02
0.250	11.58	21.6	77.3	80.8	1.73	106.17
0.283	11.58	23.2	95.7	100.5	2.40	106.32
0.317	11.58	23.2	112.8	118.8	3.02	106.46
0.350	11.58	23.2	128.3	135.9	3.79	106.58
0.383	11.58	23.2	142.3	151.5	4.58	106.70
0.417	11.58	23.2	154.9	165.5	5.28	106.80
0.450	11.58	23.2	166.3	178.1	5.91	106.89
0.483	11.58	23.2	176.5	189.4	6.48	106.97
0.517	11.58	23.2	185.7	199.6	6.99	107.04
0.550	11.58	23.2	193.9	208.8	7.44	107.10
0.583	11.58	23.2	201.4	217.1	7.85	107.16
0.617	11.58	23.2	208.1	224.5	8.22	107.21
0.650	11.58	23.2	214.2	231.3	8.55	107.26
0.683	11.58	23.2	219.6	237.3	8.85	107.30
0.717	11.58	23.2	224.6	242.8	9.12	107.34
0.750	11.58	23.2	229.0	247.7	9.36	107.37
0.783	11.58	23.2	233.0	252.2	9.58	107.40
0.817	11.58	23.2	236.6	256.2	9.77	107.43
0.850	11.58	23.2	239.9	259.8	9.95	107.45
0.883	11.58	23.2	242.8	263.1	10.11	107.47
0.917	11.58	23.2	245.5	266.0	10.26	107.49
0.950	11.58	23.2	247.9	268.6	10.38	107.51
0.983	11.58	23.2	250.1	271.0	10.48	107.53
1.017	11.58	23.2	252.1	273.2	10.58	107.54
1.050	11.58	23.2	253.9	275.2	10.66	107.55
1.083	11.58	23.2	255.6	277.1	10.74	107.57
1.117	11.58	23.2	257.1	278.8	10.81	107.58
1.150	10.03	21.6	257.1	278.7	10.81	107.58
1.183	8.49	18.5	254.3	275.6	10.68	107.56
1.217	6.95	15.4	248.9	269.7	10.42	107.52
1.250	5.40	12.4	241.2	261.2	10.02	107.46
1.283	3.86	9.3	231.4	250.4	9.49	107.39
1.317	2.32	6.2	219.9	237.6	8.86	107.30
1.350	0.77	3.1	206.7	223.0	8.14	107.20
1.383	0.00	0.8	192.7	207.5	7.38	107.09

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\2YR1 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\2OUT1 .HYD

Starting Pond W.S. Elevation = 105.50 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 11.58 cfs
Peak Outflow = 10.81 cfs
Peak Elevation = 107.58 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 0 cu-ft
Peak Storage From Storm = 16,075 cu-ft

Total Storage in Pond = 16,075 cu-ft

Warning: Inflow hydrograph truncated on left side.

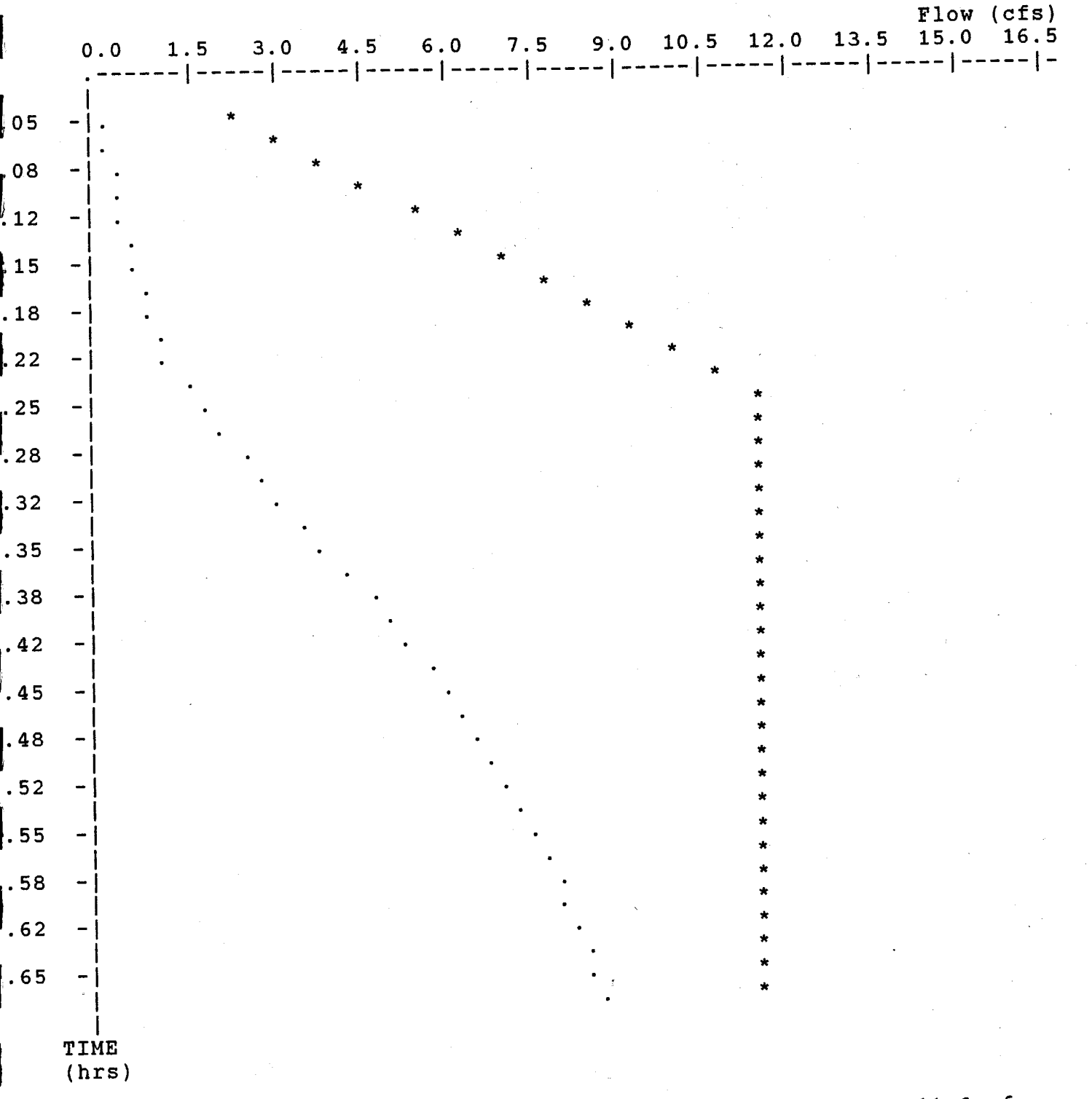
POND-2 Version: 5.17 S/N:

2YR Return Freq: 2 years

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\2YR1 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\2OUT1 .HYD

EXECUTED: 05-11-1992
14:04:59

Peak Inflow = 11.58 cfs
Peak Outflow = 10.81 cfs
Peak Elevation = 107.58 ft



* File: C:\ENGINEER\PONDPACK\NORGE\2YR1 .HYD Qmax = 11.6 cfs
. File: C:\ENGINEER\PONDPACK\NORGE\2OUT1 .HYD Qmax = 10.8 cfs

POND-2 Version: 5.17 S/N:
EXECUTED: 05-11-1992 14:04:59 10YR Return Freq: 10 years

```
*****************************
*                           *
* NORGE COMMERCIAL CENTER   *
*   BASIN # 1 AT US RT 60   *
*                           *
*                           *
*                           *
*****************************
```

Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\10YR1 .HYD
Rating Table file: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND

----INITIAL CONDITIONS----
Elevation = 105.50 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)
105.50	0.0	0
106.00	1.0	3,483
106.50	3.2	7,254
107.00	6.7	11,221
107.50	10.3	15,392
108.00	13.6	19,770
108.50	15.2	24,359
109.00	16.4	29,165
109.50	17.6	34,190
110.00	18.7	39,441
110.50	19.7	44,919
111.00	20.6	50,629
111.50	21.5	56,576
112.00	22.6	62,763
112.50	30.0	69,195
113.00	31.3	75,876
113.50	32.6	82,752
113.90	33.6	88,356

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
58.1	59.1
120.9	124.1
187.0	193.7
256.6	266.9
329.5	343.1
406.0	421.2
486.1	502.5
569.9	587.5
657.4	676.1
748.7	768.4
843.9	864.5
943.0	964.5
1046.2	1068.8
1153.4	1183.4
1264.7	1296.0
1379.3	1411.9
1472.7	1506.3

Time increment (t) = 0.033 hrs.

POND-2 Version: 5.17 S/N:
EXECUTED: 05-11-1992 14:04:59 10YR Return Freq: 10 years

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\10YR1 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\10OUT1 .HYD

INFLOW HYDROGRAPH

TIME (hrs)	INFLOW (cfs)
0.017	1.21
0.050	3.63
0.083	6.06
0.117	8.48
0.150	10.90
0.183	13.32
0.217	15.75
0.250	18.17
0.283	18.17
0.317	18.17
0.350	18.17
0.383	18.17
0.417	18.17
0.450	18.17
0.483	18.17
0.517	18.17
0.550	18.17
0.583	18.17
0.617	18.17
0.650	18.17
0.683	18.17
0.717	18.17
0.750	18.17
0.783	18.17
0.817	18.17
0.850	18.17
0.883	18.17
0.917	18.17
0.950	18.17
0.983	15.75
1.017	13.32
1.050	10.90
1.083	8.48
1.117	6.06
1.150	3.63
1.183	1.21
1.217	0.00

ROUTING COMPUTATIONS

I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
-----	0.0	0.0	0.00	105.50
4.8	4.7	4.8	0.08	105.54
9.7	13.9	14.4	0.24	105.62
14.5	27.5	28.4	0.48	105.74
19.4	45.3	46.8	0.79	105.90
24.2	66.8	69.5	1.35	106.08
29.1	91.3	95.8	2.24	106.28
33.9	118.8	125.3	3.26	106.51
36.3	145.6	155.1	4.76	106.72
36.3	169.7	181.9	6.11	106.92
36.3	191.4	206.0	7.31	107.08
36.3	211.0	227.8	8.38	107.23
36.3	228.7	247.4	9.34	107.37
36.3	244.6	265.0	10.21	107.49
36.3	259.1	280.9	10.91	107.59
36.3	272.4	295.5	11.54	107.69
36.3	284.5	308.7	12.11	107.77
36.3	295.6	320.8	12.64	107.85
36.3	305.7	331.9	13.11	107.93
36.3	314.9	342.0	13.55	107.99
36.3	323.7	351.3	13.77	108.05
36.3	332.2	360.1	13.95	108.11
36.3	340.3	368.5	14.12	108.16
36.3	348.0	376.6	14.29	108.21
36.3	355.5	384.4	14.45	108.26
36.3	362.6	391.8	14.60	108.31
36.3	369.5	399.0	14.74	108.36
36.3	376.1	405.8	14.88	108.40
36.3	382.4	412.4	15.02	108.44
33.9	386.1	416.3	15.10	108.47
29.1	385.0	415.2	15.08	108.46
24.2	379.3	409.2	14.95	108.42
19.4	369.2	398.7	14.74	108.36
14.5	354.9	383.8	14.43	108.26
9.7	336.5	364.6	14.04	108.14
4.8	314.3	341.3	13.52	107.99
1.2	290.7	315.5	12.40	107.82

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\10YR1 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\10OUT1 .HYD

Starting Pond W.S. Elevation = 105.50 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 18.17 cfs
Peak Outflow = 15.10 cfs
Peak Elevation = 108.47 ft

***** Summary of Approximate Peak Storage *****

Initial Storage	=	0 cu-ft
Peak Storage From Storm	=	24,068 cu-ft
Total Storage in Pond	=	24,068 cu-ft

Warning: Inflow hydrograph truncated on left side.

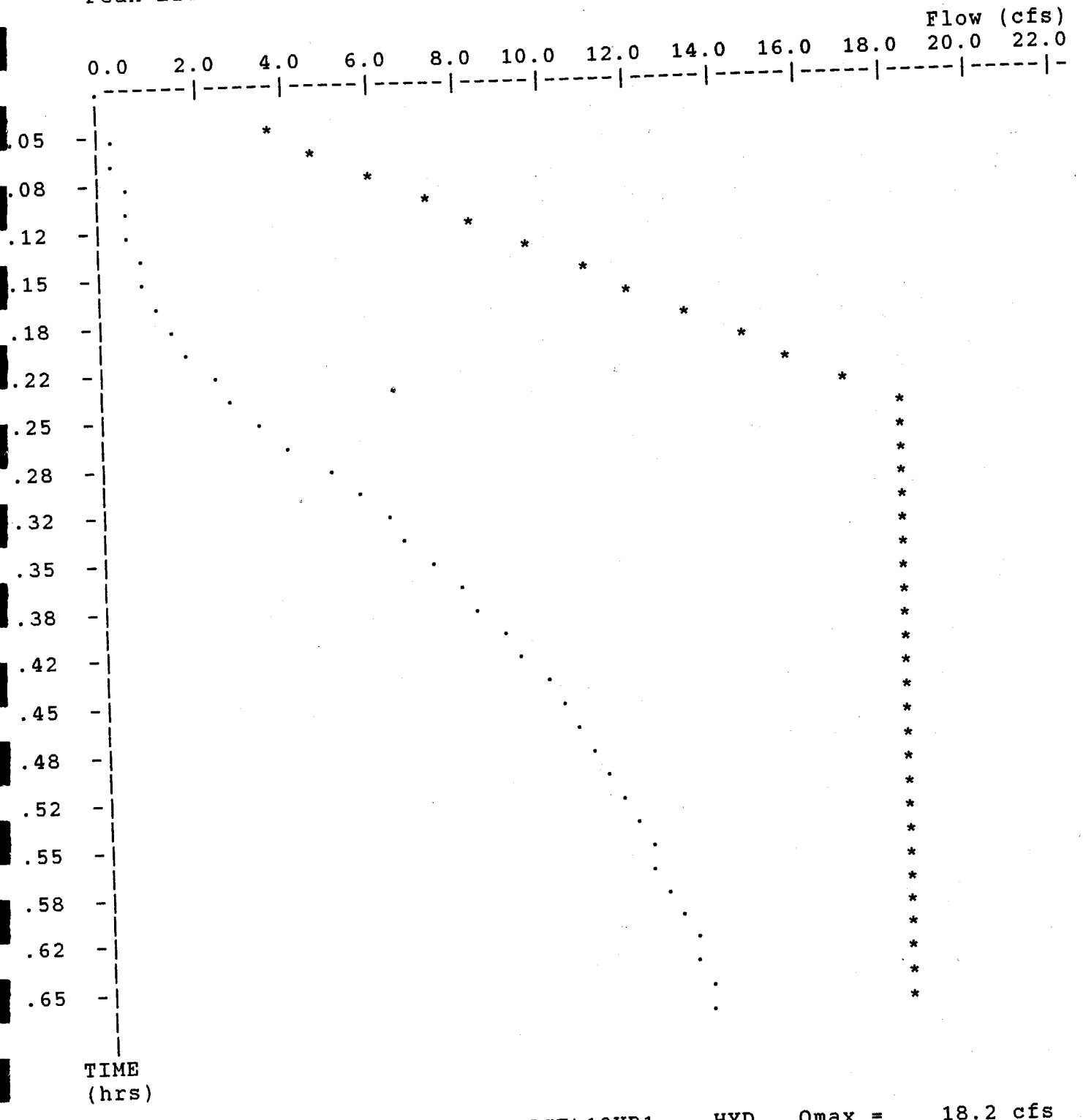
POND-2 Version: 5.17 S/N:

10YR Return Freq: 10 years

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\10YR1 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\10OUT1 .HYD

EXECUTED: 05-11-1992
14:04:59

Peak Inflow = 18.17 cfs
Peak Outflow = 15.10 cfs
Peak Elevation = 108.47 ft



* File: C:\ENGINEER\PONDPACK\NORGE\10YR1 .HYD Qmax = 18.2 cfs
. File: C:\ENGINEER\PONDPACK\NORGE\10OUT1 .HYD Qmax = 15.1 cfs

```
*****************************
*                           *
* NORGE COMMERCIAL CENTER   *
*   BASIN # 1 AT US RT 60   *
*                           *
*                           *
*                           *
*****************************
```

Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\25YR1 .HYD
Rating Table file: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND

----INITIAL CONDITIONS----
Elevation = 105.50 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)
105.50	0.0	0
106.00	1.0	3,483
106.50	3.2	7,254
107.00	6.7	11,221
107.50	10.3	15,392
108.00	13.6	19,770
108.50	15.2	24,359
109.00	16.4	29,165
109.50	17.6	34,190
110.00	18.7	39,441
110.50	19.7	44,919
111.00	20.6	50,629
111.50	21.5	56,576
112.00	22.6	62,763
112.50	30.0	69,195
113.00	31.3	75,876
113.50	32.6	82,752
113.90	33.6	88,356

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
58.1	59.1
120.9	124.1
187.0	193.7
256.6	266.9
329.5	343.1
406.0	421.2
486.1	502.5
569.9	587.5
657.4	676.1
748.7	768.4
843.9	864.5
943.0	964.5
1046.2	1068.8
1153.4	1183.4
1264.7	1296.0
1379.3	1411.9
1472.7	1506.3

Time increment (t) = 0.033 hrs.

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\25YR1 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\25OUT1 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.017	1.40	-----	0.0	0.0	0.00	105.50
0.050	4.19	5.6	5.4	5.6	0.09	105.55
0.083	6.99	11.2	16.0	16.6	0.28	105.64
0.117	9.79	16.8	31.7	32.8	0.56	105.78
0.150	12.58	22.4	52.2	54.1	0.92	105.96
0.183	15.38	28.0	76.8	80.2	1.71	106.16
0.217	18.17	33.6	104.8	110.3	2.73	106.39
0.250	20.97	39.1	135.6	144.0	4.20	106.64
0.283	20.97	41.9	165.8	177.5	5.88	106.88
0.317	20.97	41.9	192.9	207.7	7.39	107.10
0.350	20.97	41.9	217.4	234.9	8.72	107.28
0.383	20.97	41.9	239.5	259.4	9.93	107.45
0.417	20.97	41.9	259.6	281.4	10.93	107.60
0.450	20.97	41.9	277.9	301.5	11.80	107.73
0.483	20.97	41.9	294.7	319.9	12.59	107.85
0.517	20.97	41.9	310.0	336.6	13.32	107.96
0.550	20.97	41.9	324.4	351.9	13.78	108.06
0.583	20.97	41.9	338.1	366.3	14.07	108.15
0.617	20.97	41.9	351.4	380.1	14.36	108.24
0.650	20.97	41.9	364.1	393.3	14.63	108.32
0.683	20.97	41.9	376.2	406.0	14.89	108.40
0.717	20.97	41.9	387.9	418.2	15.14	108.48
0.750	20.97	41.9	399.2	429.8	15.33	108.55
0.783	20.97	41.9	410.1	441.1	15.49	108.62
0.817	20.97	41.9	420.8	452.1	15.66	108.69
0.850	20.97	41.9	431.1	462.7	15.81	108.76
0.883	20.97	41.9	441.1	473.0	15.96	108.82
0.917	20.97	41.9	450.8	483.0	16.11	108.88
0.950	20.97	41.9	460.2	492.7	16.26	108.94
0.983	20.97	41.9	469.4	502.2	16.39	109.00
1.017	20.97	41.9	478.3	511.3	16.52	109.05
1.050	20.97	41.9	486.9	520.2	16.65	109.10
1.083	20.97	41.9	495.3	528.8	16.77	109.15
1.117	20.97	41.9	503.5	537.2	16.89	109.20
1.150	19.57	40.5	510.0	544.0	16.99	109.24
1.183	16.77	36.3	512.3	546.4	17.02	109.26
1.217	13.98	30.8	509.1	543.1	16.97	109.24
1.250	11.18	25.2	500.6	534.3	16.85	109.19
1.283	8.39	19.6	486.9	520.2	16.65	109.10
1.317	5.59	14.0	468.1	500.9	16.38	108.99
1.350	2.80	8.4	444.5	476.5	16.02	108.84
1.383	0.00	2.8	416.1	447.3	15.58	108.66

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\25YR1 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\25OUT1 .HYD

Starting Pond W.S. Elevation = 105.50 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 20.97 cfs
Peak Outflow = 17.02 cfs
Peak Elevation = 109.26 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 0 cu-ft
Peak Storage From Storm = 31,758 cu-ft

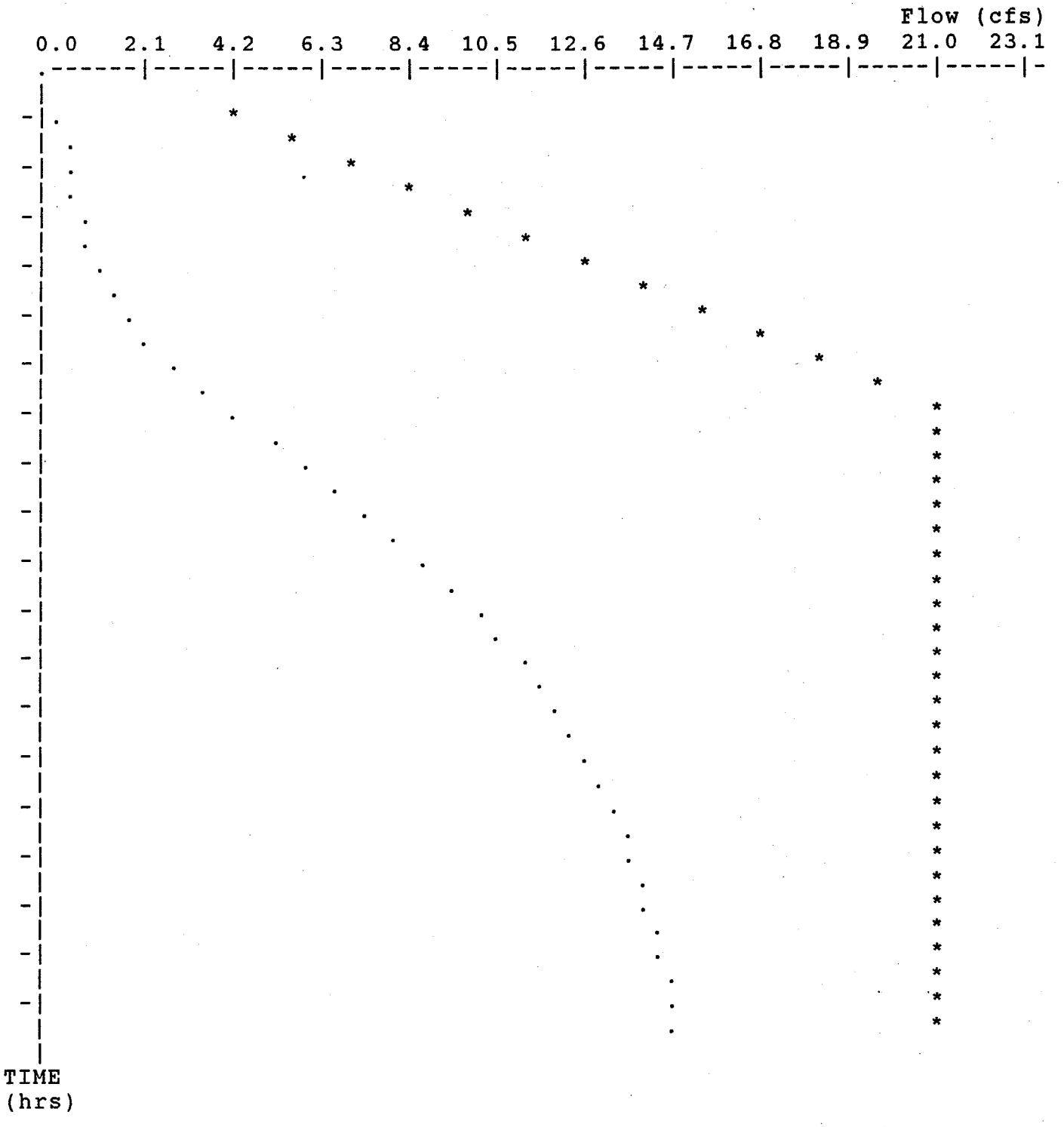
Total Storage in Pond = 31,758 cu-ft

Warning: Inflow hydrograph truncated on left side.

25YR Return Freq: 25 years

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\25YR1 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\25OUT1 .HYD
EXECUTED: 05-11-1992
14:04:59

Peak Inflow = 20.97 cfs
Peak Outflow = 17.02 cfs
Peak Elevation = 109.26 ft



* File: C:\ENGINEER\PONDPACK\NORGE\25YR1 .HYD Qmax = 21.0 cfs
. File: C:\ENGINEER\PONDPACK\NORGE\25OUT1 .HYD Qmax = 17.0 cfs

```
*****************************************************
*                                                   *
*  NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY   *
*                      BASIN # 1                    *
*                                                   *
*                                                   *
*                                                   *
*****************************************************
```

Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\100YR1 .HYD
Rating Table file: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND

----INITIAL CONDITIONS----
Elevation = 105.50 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
105.50	0.0	0	0.0	0.0
106.00	1.0	3,483	58.1	59.1
106.50	3.2	7,254	120.9	124.1
107.00	6.7	11,221	187.0	193.7
107.50	10.3	15,392	256.6	266.9
108.00	13.6	19,770	329.5	343.1
108.50	15.2	24,359	406.0	421.2
109.00	16.4	29,165	486.1	502.5
109.50	20.5	34,190	569.9	590.4
110.00	22.5	39,441	657.4	679.9
110.50	24.2	44,919	748.7	772.9
111.00	25.7	50,629	843.9	869.6
111.50	27.3	56,576	943.0	970.3
112.00	28.7	62,763	1046.2	1074.9
112.50	30.0	69,195	1153.4	1183.4
113.00	31.3	75,876	1264.7	1296.0
113.50	32.6	82,752	1379.3	1411.9
113.90	33.6	88,356	1472.7	1506.3

Time increment (t) = 0.033 hrs.

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\100YR1 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.017	1.57	-----	0.0	0.0	0.00	105.50
0.050	4.70	6.3	6.1	6.3	0.11	105.55
0.083	7.83	12.5	18.0	18.6	0.31	105.66
0.117	10.97	18.8	35.5	36.8	0.62	105.81
0.150	14.10	25.1	58.5	60.6	1.05	106.01
0.183	17.23	31.3	85.7	89.8	2.04	106.24
0.217	20.36	37.6	117.0	123.3	3.17	106.49
0.250	23.50	43.9	150.7	160.8	5.05	106.76
0.283	23.50	47.0	183.9	197.7	6.90	107.03
0.317	23.50	47.0	213.9	230.9	8.53	107.25
0.350	23.50	47.0	240.9	260.9	10.01	107.46
0.383	23.50	47.0	265.5	287.9	11.21	107.64
0.417	23.50	47.0	287.9	312.5	12.27	107.80
0.450	23.50	47.0	308.4	334.9	13.24	107.95
0.483	23.50	47.0	327.7	355.4	13.85	108.08
0.517	23.50	47.0	346.2	374.7	14.25	108.20
0.550	23.50	47.0	364.0	393.2	14.63	108.32
0.583	23.50	47.0	381.0	411.0	14.99	108.43
0.617	23.50	47.0	397.4	428.0	15.30	108.54
0.650	23.50	47.0	413.3	444.4	15.54	108.64
0.683	23.50	47.0	428.8	460.3	15.78	108.74
0.717	23.50	47.0	443.7	475.8	16.00	108.84
0.750	23.50	47.0	458.3	490.7	16.23	108.93
0.783	23.50	47.0	472.2	505.3	16.53	109.02
0.817	23.50	47.0	484.9	519.2	17.18	109.10
0.850	23.50	47.0	496.3	531.9	17.77	109.17
0.883	23.50	47.0	506.7	543.3	18.30	109.23
0.917	23.50	47.0	516.1	553.7	18.79	109.29
0.950	23.50	47.0	524.7	563.1	19.23	109.34
0.983	23.50	47.0	532.4	571.7	19.63	109.39
1.017	23.50	47.0	539.5	579.4	19.99	109.44
1.050	23.50	47.0	545.8	586.5	20.32	109.48
1.083	23.50	47.0	551.7	592.8	20.55	109.51
1.117	23.50	47.0	557.3	598.7	20.69	109.55
1.150	23.50	47.0	562.7	604.3	20.81	109.58
1.183	23.50	47.0	567.9	609.7	20.93	109.61
1.217	23.50	47.0	572.8	614.9	21.05	109.64
1.250	23.50	47.0	577.5	619.8	21.16	109.66
1.283	23.50	47.0	581.9	624.5	21.26	109.69
1.317	23.50	47.0	586.2	628.9	21.36	109.72
1.350	23.50	47.0	590.3	633.2	21.46	109.74
1.383	23.50	47.0	594.2	637.3	21.55	109.76
1.417	23.50	47.0	597.9	641.2	21.64	109.78
1.450	23.50	47.0	601.5	644.9	21.72	109.80
1.483	23.50	47.0	604.9	648.5	21.80	109.82

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\100YR1 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1.517	23.50	47.0	608.1	651.9	21.87	109.84
1.550	20.36	43.9	608.3	652.0	21.88	109.84
1.583	17.23	37.6	602.4	645.8	21.74	109.81
1.617	14.10	31.3	590.8	633.7	21.47	109.74
1.650	10.97	25.1	573.7	615.8	21.07	109.64
1.683	7.83	18.8	551.4	592.5	20.55	109.51
1.717	4.70	12.5	525.4	563.9	19.27	109.35
1.750	1.57	6.3	496.2	531.7	17.76	109.17
1.783	0.00	1.6	465.1	497.7	16.33	108.97

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\100YR1 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\OUT .HYD

Starting Pond W.S. Elevation = 105.50 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 23.50 cfs
Peak Outflow = 21.88 cfs
Peak Elevation = 109.84 ft

***** Summary of Approximate Peak Storage *****

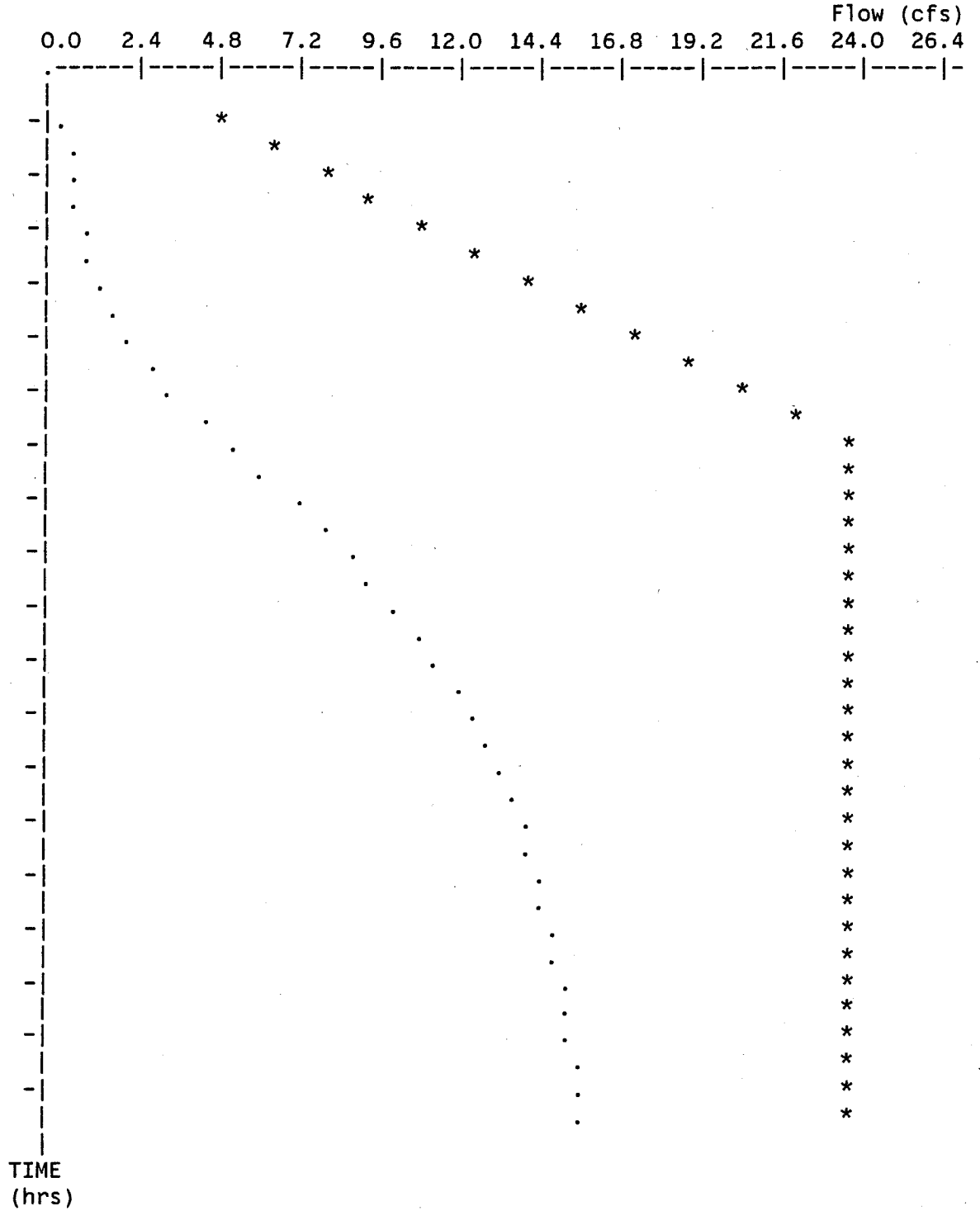
Initial Storage = 0 cu-ft
Peak Storage From Storm = 37,804 cu-ft

Total Storage in Pond = 37,804 cu-ft

Warning: Inflow hydrograph truncated on left side.

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE1 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\100YR1 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\OUT .HYD
EXECUTED: 05-13-1992
11:47:33

Peak Inflow = 23.50 cfs
Peak Outflow = 21.88 cfs
Peak Elevation = 109.84 ft



* File: C:\ENGINEER\PONDPACK\NORGE\100YR1 .HYD Qmax = 23.5 cfs
. File: C:\ENGINEER\PONDPACK\NORGE\OUT .HYD Qmax = 21.9 cfs

NORGE SHOPPING CENTER
REBKEE PARCEL

STORMWATER MANAGEMENT FACILITY # 2
AT
NORGE LANE

SO. NO. 19700

Prepared By

Michael Baker Jr., Inc.
1602 Rolling Hills Drive
Richmond, Virginia 23229

Baker
Michael Baker Jr., Inc.

PREDEVELOPED HYDROGRAPHS

Baker

Michael Baker Jr., Inc.

Quick TR-55 Ver.5.46 S/N:
Executed: 16:59:47 05-11-1992

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

RETURN FREQUENCY: 2 yr	Allowable Outflow: [redacted]
'C' Adjustment: 1.000	Required Storage: [redacted]
Peak Inflow: 6.10 cfs	Inflow .HYD stored: 2YR2PRE .HYD

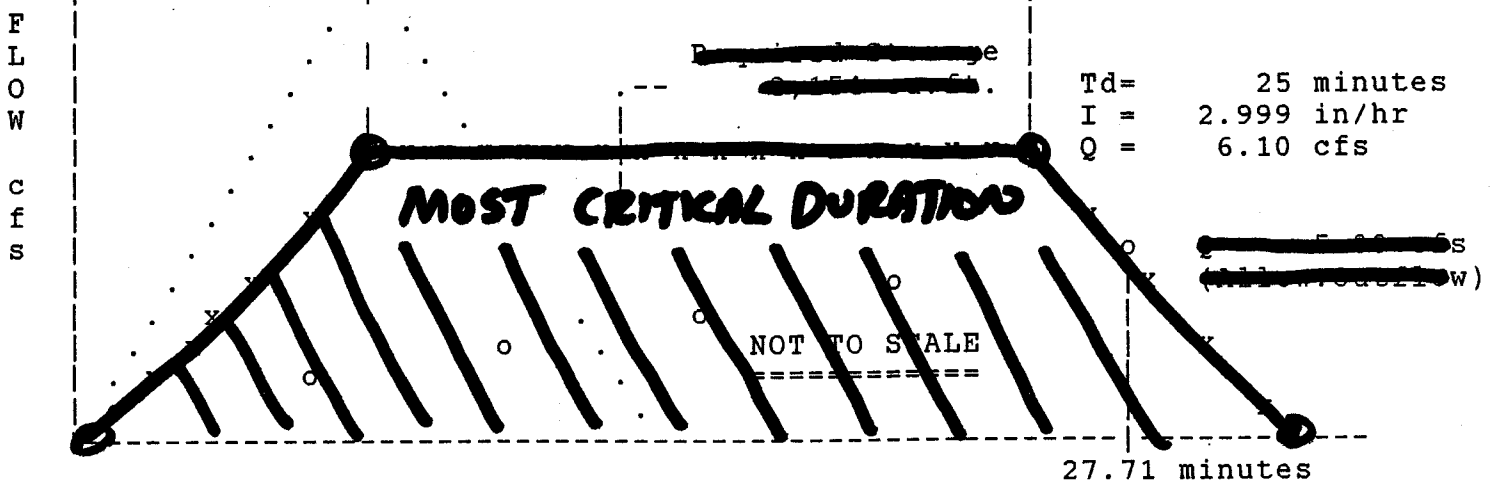
Td = 25 minutes
Approx. Duration for Max. Storage

Return Freq: 2 yr
C adj.factor: 1.00

Tc= 15.00 minutes
I = 3.893 in/hr
Q = 7.92 cfs

Area (ac): 4.07
Weighted C: 0.50
Adjusted C: 0.50

Td= 25 minutes
I = 2.999 in/hr
Q = 6.10 cfs



Quick TR-55 Ver.5.46 S/N:
Executed: 16:59:47 05-11-1992

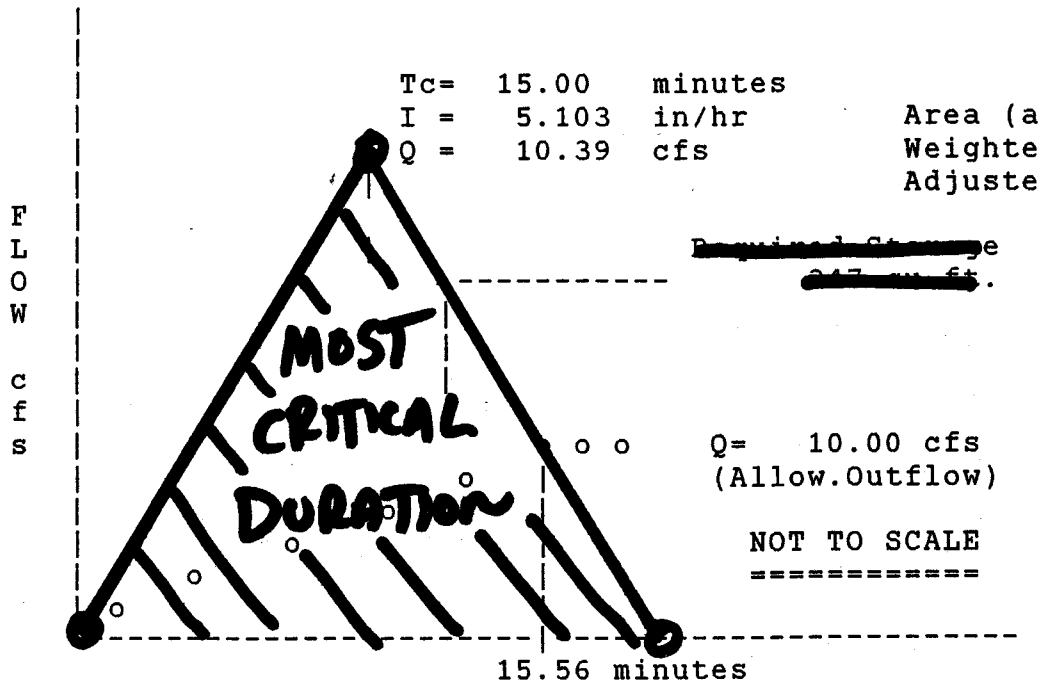
MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

RETURN FREQUENCY: 10 yr	Allowable Outflow: [redacted]
'C' Adjustment: 1.000	Required Storage: [redacted]
STORM DURATION = Tc for Max.Storage	
Peak Inflow: 10.39 cfs	Inflow .HYD stored: 10YR2PRE.HYD

Tc= 15.00 minutes
I = 5.103 in/hr
Q = 10.39 cfs

Area (ac): 4.07
Weighted C: 0.50
Adjusted C: 0.50



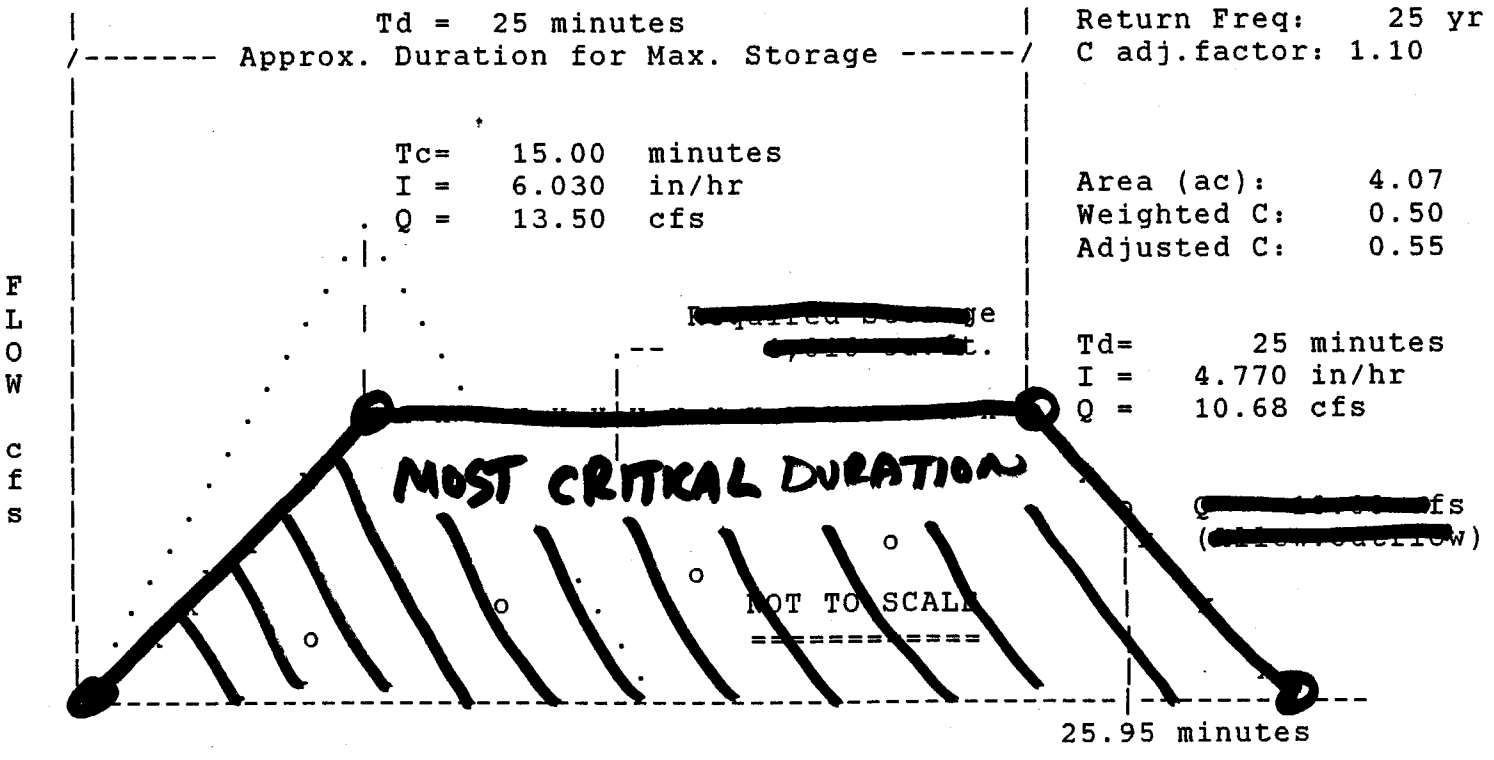
Quick TR-55 Ver.5.46 S/N:
Executed: 16:59:47 05-11-1992

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

RETURN FREQUENCY: 25 yr	Allowable Outflow: [redacted]
'C' Adjustment: 1.100	Required Storage: [redacted]
Peak Inflow: 10.68 cfs	Inflow .HYD stored: 25YR2PRE.HYD



Quick TR-55 Ver.5.46 S/N:
Executed: 16:59:47 05-11-1992

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

RETURN FREQUENCY: 100 yr	Allowable Outflow: [redacted]
'C' Adjustment: 1.250	Required Storage: [redacted]
Peak Inflow: 12.21 cfs	Inflow .HYD stored: 100YR2PR.HYD

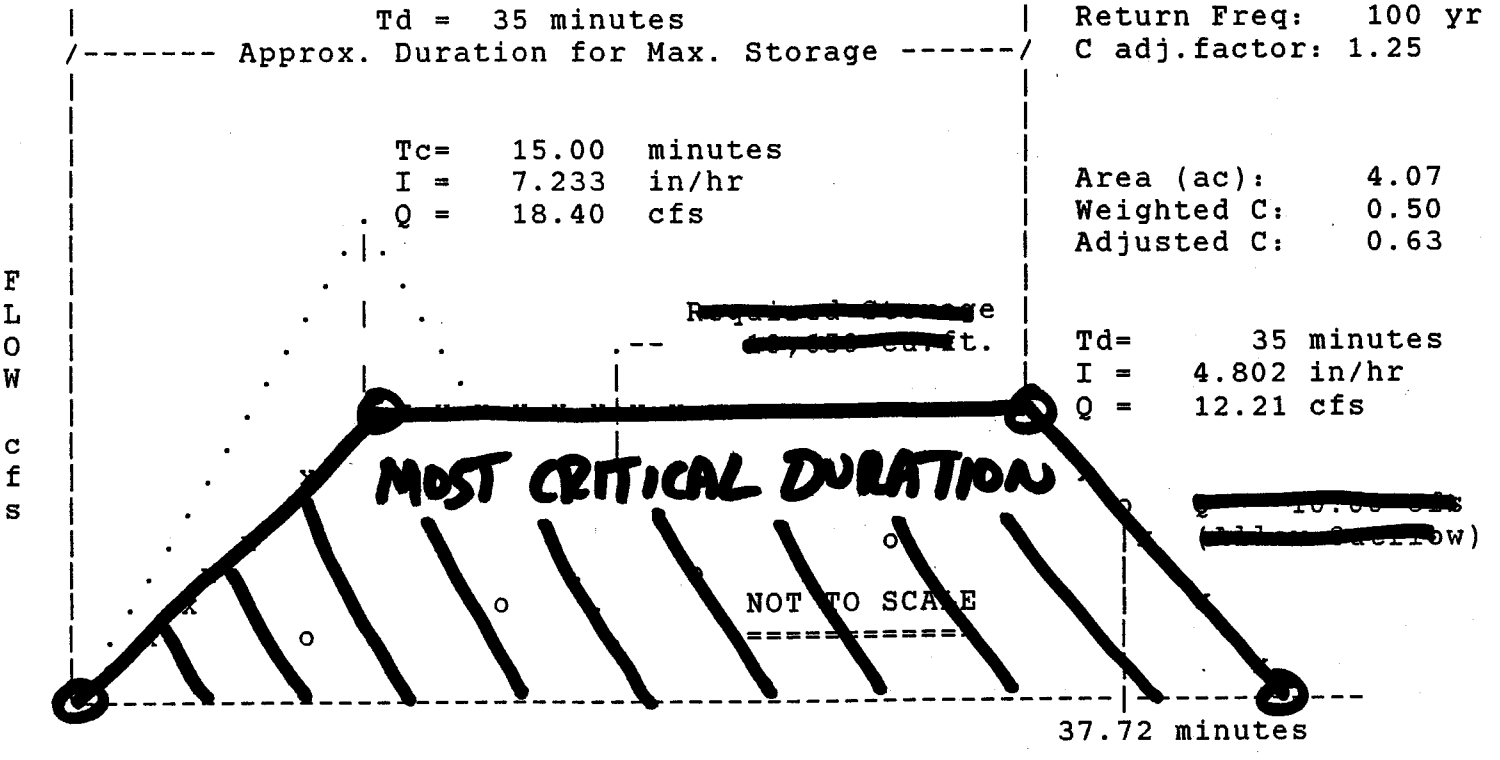
Td = 35 minutes
Approx. Duration for Max. Storage

Return Freq: 100 yr
C adj.factor: 1.25

Tc= 15.00 minutes
I = 7.233 in/hr
Q = 18.40 cfs

Area (ac): 4.07
Weighted C: 0.50
Adjusted C: 0.63

Td= 35 minutes
I = 4.802 in/hr
Q = 12.21 cfs



Quick TR-55 Ver.5.46 S/N:
Executed: 16:59:47 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

**** Modified Rational Hydrograph *****

Weighted C = 0.500 Area= 4.070 acres Tc = 15.00 minutes

Adjusted C = 0.500 Td= 25.00 min. I= 3.00 in/hr Qp= 6.10 cfs

RETURN FREQUENCY: 2 year storm Adj.factor = 1.00
Output file: 2YR2PRE .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 2 Year Storm

Time increment = 0.033 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.017	0.41	1.22	2.03	2.85	3.66	4.48	5.29
0.250	6.10	6.10	6.10	6.10	6.10	6.10	5.29
0.483	4.48	3.66	2.85	2.03	1.22	0.41	0.00

Quick TR-55 Ver.5.46 S/N:
Executed: 16:59:47 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

**** Modified Rational Hydrograph *****

Weighted C = 0.500 Area= 4.070 acres Tc = 15.00 minutes

Adjusted C = 0.500 Td= 15.00 min. I= 5.10 in/hr Qp= 10.39 cfs

RETURN FREQUENCY: 10 year storm Adj.factor = 1.00
Output file: 10YR2PRE.HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 10 Year Storm

Time increment = 0.033 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.017	0.69	2.08	3.46	4.85	6.23	7.62	9.00
0.250	10.39	9.00	7.62	6.23	4.85	3.46	2.08
0.483	0.69	0.00					

Quick TR-55 Ver.5.46 S/N:
Executed: 16:59:47 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

**** Modified Rational Hydrograph *****

Weighted C = 0.500 Area= 4.070 acres Tc = 15.00 minutes

Adjusted C = 0.550 Td= 25.00 min. I= 4.77 in/hr Qp= 10.68 cfs

RETURN FREQUENCY: 25 year storm Adj.factor = 1.10
Output file: 25YR2PRE.HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 25 Year Storm

Time increment = 0.033 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.017	0.71	2.14	3.56	4.98	6.41	7.83	9.25
0.250	10.68	10.68	10.68	10.68	10.68	10.68	9.25
0.483	7.83	6.41	4.98	3.56	2.14	0.71	0.00

Quick TR-55 Ver.5.46 S/N:
Executed: 16:59:47 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

**** Modified Rational Hydrograph *****

Weighted C = 0.500 Area= 4.070 acres Tc = 15.00 minutes

Adjusted C = 0.625 Td= 35.00 min. I= 4.80 in/hr Qp= 12.21 cfs

RETURN FREQUENCY: 100 year storm Adj.factor = 1.25
Output file: 100YR2PR.HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 100 Year Storm

Time increment = 0.033 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.017	0.81	2.44	4.07	5.70	7.33	8.96	10.59
0.250	12.21	12.21	12.21	12.21	12.21	12.21	12.21
0.483	12.21	12.21	12.21	12.21	10.59	8.96	7.33
0.717	5.70	4.07	2.44	0.81	0.00		

Quick TR-55 Ver.5.46 S/N:
Executed: 16:59:47 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
AREA 9	0.500	0.62						
AREA 10	0.500	0.91						
AREA 11	0.500	2.54						
			15.00	0.500	0.500	3.893	4.07	7.92

Quick TR-55 Ver.5.46 S/N:
Executed: 16:59:47 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 10 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
AREA 9	0.500	0.62						
AREA 10	0.500	0.91						
AREA 11	0.500	2.54						
			15.00	0.500	0.500	5.103	4.07	10.39

Quick TR-55 Ver.5.46 S/N:
Executed: 16:59:47 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 25 years
'C' adjustment, k = 1.1
Adj. 'C' = Wtd.'C' x 1.1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
AREA 9	0.500	0.62						
AREA 10	0.500	0.91						
AREA 11	0.500	2.54						
			15.00	0.500	0.550	6.030	4.07	13.50

Quick TR-55 Ver.5.46 S/N:
Executed: 16:59:47 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
'C' adjustment, k = 1.25
Adj. 'C' = Wtd.'C' x 1.25

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
AREA 9	0.500	0.62						
AREA 10	0.500	0.91						
AREA 11	0.500	2.54						
			15.00	0.500	0.625	7.233	4.07	18.40

Quick TR-55 Ver.5.46 S/N:
Executed: 16:59:47 05-11-1992

```
*************************************************************************
*************************************************************************
*                                                                       *
*                                                                       *
*                        MODIFIED RATIONAL METHOD                       *
*            ---- Grand Summary For All Storm Frequencies ----          *
*                                                                       *
*                                                                       *
*************************************************************************
*************************************************************************
```

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

Area = 4.07 acres Tc = 15.00 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
2	0.500	25	2.999	6.10	5.00	9,154	3,154
10	0.500	15	5.103	10.39	10.00	9,347	347
25	0.550	25	4.770	10.68	10.00	16,016	4,016
100	0.625	35	4.802	12.21	10.00	25,650	10,650

Quick TR-55 Ver.5.46 S/N:
Executed: 16:59:47 05-11-1992

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

RETURN FREQUENCY: 2 yr 'C' Adjustment = 1.000 Allowable Q = 5.00 cfs

Hydrograph file duration= 25.00 minutes
Hydrograph file: 2YR2PRE .HYD Tc = 15.00 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.500	0.500	15	3.893	4.07	7.92	7,130	2,630
0.500	0.500	20	3.384	4.07	6.89	8,265	3,015
0.500	0.500	25	2.999	4.07	6.10	9,154	3,154
0.500	0.500	30	2.687	4.07	5.47	9,841	3,091
0.500	0.500	40	2.227	4.07	4.53	Qpeak < Qallow	

Storage Maximum

Quick TR-55 Ver.5.46 S/N:
Executed: 16:59:47 05-11-1992

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

RETURN FREQUENCY: 10 yr 'C' Adjustment = 1.000 Allowable Q = 10.00 cfs

Hydrograph file duration= 15.00 minutes
Hydrograph file: 10YR2PRE.HYD Tc = 15.00 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
**********						Storage	Maximum
0.500	0.500	15	5.103	4.07	10.39	9,347	347
**********							
0.500	0.500	20	4.494	4.07	9.15	Qpeak < Qallow	

Quick TR-55 Ver.5.46 S/N:
Executed: 16:59:47 05-11-1992

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

RETURN FREQUENCY: 25 yr 'C' Adjustment = 1.100 Allowable Q = 10.00 cfs

Hydrograph file duration= 25.00 minutes
Hydrograph file: 25YR2PRE.HYD Tc = 15.00 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.500	0.550	15	6.030	4.07	13.50	12,148	3,148
0.500	0.550	20	5.320	4.07	11.91	14,291	3,791
0.500	0.550	25	4.770	4.07	10.68	16,016	4,016
0.500	0.550	30	4.310	4.07	9.65	Qpeak < Qallow	

Storage Maximum

Quick TR-55 Ver.5.46 S/N:
Executed: 16:59:47 05-11-1992

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

RETURN FREQUENCY: 100 yr 'C' Adjustment = 1.250 Allowable Q = 10.00 cfs

Hydrograph file duration= 35.00 minutes
Hydrograph file: 100YR2PR.HYD Tc = 15.00 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.500	0.625	15	7.233	4.07	18.40	16,559	7,559
0.500	0.625	20	6.415	4.07	16.32	19,581	9,081
0.500	0.625	30	5.240	4.07	13.33	23,992	10,492
**********						Storage	Maximum
0.500	0.625	35	4.802	4.07	12.21	25,650	10,650
**********							
0.500	0.625	40	4.429	4.07	11.27	27,038	10,538
0.500	0.625	50	3.835	4.07	9.76	Qpeak < Qallow	

POSTDEVELOPED HYDROGRAPHS

Baker

Michael Baker Jr., Inc.

Quick TR-55 Ver.5.46 S/N:
Executed: 13:57:20 05-11-1992

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

```
*****************************************************************
*  RETURN FREQUENCY:    2 yr     |  Allowable Outflow:      [redacted]  *
*  'C' Adjustment: 1.000         |  Required Storage:       [redacted]  *
*---------------------------------------------------------------*
*  Peak Inflow:     7.08 cfs        Inflow .HYD stored: 2YR2    .HYD   *
*****************************************************************
```

```
|                Td =  33 minutes                    |  Return Freq:      2 yr
/------- Approx. Duration for Max. Storage ------/    C adj.factor: 1.00
|                                                    |
|                                                    |
|                 Tc=   10.00  minutes               |
|                 I =   4.572  in/hr                 |  Area (ac):      4.07
|               . Q =   12.80  cfs                   |  Weighted C:     0.69
|             .|.                                    |  Adjusted C:     0.69
F             .   .                                  |
L            .  |  .              [redacted]e        |
O          .       .         .--     [redacted]t.    |  Td=       33 minutes
W         .    |   .        |                       |  I =    2.531 in/hr
         .     x x x x x x x|x x x x x x x x x x x   |  Q =     7.08 cfs
c       .                   |                        |
f     .    x                                         x
s    .                                                 o   [redacted]s
    .   x                                o            |x  ([redacted]w)
   .  x                  .     o                      |
  .  x               o    .       NOT TO SCALE        |   x
 . x       o                .      ============       |
 o                          .                        |       x
`-----------------------------------------------------|------------
                                                     35.94 minutes
```

A = 4.07
I = 60%
$4.07 \times .6 \times \frac{1}{12} = 8864\ ft^3 =$ 10 pt BMP

Quick TR-55 Ver.5.46 S/N:
Executed: 13:57:20 05-11-1992

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

```
*****************************************************************
*  RETURN FREQUENCY:  10 yr     |  Allowable Outflow:      [redacted]  *
*  'C' Adjustment: 1.000        |  Required Storage:       [redacted]t. *
*---------------------------------------------------------------*
*  Peak Inflow:   10.79 cfs     Inflow .HYD stored: 10YR2   .HYD  *
*****************************************************************
```

```
|                Td =  27 minutes                  |  Return Freq:    10 yr
/------- Approx. Duration for Max. Storage ------/  C adj.factor: 1.00
|                                                  |
|                                                  |
|                Tc=   10.00  minutes              |
|                I =   5.894  in/hr                |  Area (ac):      4.07
|              . Q =   16.50  cfs                  |  Weighted C:     0.69
|            .|.                                   |  Adjustment C:   0.69
F|          .   .                                  |
L|         .  |  .                [redacted]ge     |
O|        .       .        .--     [redacted]t.     |  Td=       27 minutes
W|       .    |   .       |                       |  I =    3.855 in/hr
|      .     x x x x x x x|x x x x x x x x x x x  Q =    10.79 cfs
c|     .                   |
f|    .    x                                       x
s|   .                                               o   [redacted]fs
|  .   x                                 o          |x  ([redacted]w)
|  .  x                    .     o                  |
|  .  x               o    .        NOT TO SCALE    |   x
| . x       o               .       ============    |
| o                          .                      |       x
`-----------------------------------------------------|------------
                                                   27.73 minutes
```

Quick TR-55 Ver.5.46 S/N:
Executed: 13:57:20 05-11-1992

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

```
*****************************************************************************
*  RETURN FREQUENCY:  25 yr     |  Allowable Outflow:     [redacted]        *
*  'C' Adjustment: 1.100        |  Required Storage:     [redacted]t.  *
*---------------------------------------------------------------------------*
*  Peak Inflow:   12.35 cfs        Inflow .HYD stored: 25YR2   .HYD        *
*****************************************************************************
```

```
|                Td =  34 minutes                    |  Return Freq:    25 yr
/------- Approx. Duration for Max. Storage ------/  C adj.factor: 1.10
|                                                   |
|                                                   |
|                Tc=   10.00  minutes               |
|                I =   6.950  in/hr                 |  Area (ac):      4.07
|              . Q =   21.40  cfs                   |  Weighted C:     0.69
|            .|.                                    |  Adjusted C:     0.76
F           .   .                                   |
L          .  |  .              [redacted]          |
O         .       .        .--   [redacted]t.       |  Td=       34 minutes
W        .    |   .        |                       |  I =    4.010 in/hr
        .     x x x x x x x|x x x x x x x x x x x  Q =    12.35 cfs
c      .                   |
f     .    x                                        x
s    .                                                o   [redacted]s
    .   x                                 o          |x  ([redacted])
   .  x                 .     o                      |
  .  x              o    .       NOT TO SCALE        |   x
 . x       o                .      ============      |
o                           .                        |      x
-----------------------------------------------------|------------
                                                 35.90 minutes
```

Quick TR-55 Ver.5.46 S/N:
Executed: 13:57:20 05-11-1992

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

```
*****************************************************************************
*  RETURN FREQUENCY: 100 yr     |  Allowable Outflow:     [redacted]      *
*  'C' Adjustment: 1.250        |  Required Storage:      [redacted]t.    *
*---------------------------------------------------------------------------*
*  Peak Inflow:   14.38 cfs        Inflow .HYD stored: 100YR2  .HYD        *
*****************************************************************************
```

```
|                Td =  45 minutes                    |  Return Freq:    100 yr
/------- Approx. Duration for Max. Storage ------/  C adj.factor: 1.25
|                                                   |
|                                                   |
|                Tc=   10.00  minutes               |
|                I =   8.269  in/hr                 |  Area (ac):      4.07
|              . Q =   28.93  cfs                   |  Weighted C:     0.69
|            .|.                                    |  Adjusted C:     0.86
F|          .   .                                   |
L|         .  |  .              [redacted]e         |
O|        .       .        .--   [redacted]t.       |  Td=       45 minutes
W|       .    |   .        |                        |  I =    4.111 in/hr
|      .     x x x x x x x|x x x x x x x x x x x    Q =    14.38 cfs
c|     .                   |
f|    .    x                                        x
s|   .                                                o   [redacted]s
|  .   x                              o              |x  [redacted]
|  .  x                   .     o                   |
|  .  x               o    .        NOT TO SCALE    |   x
| . x       o               .       ============    |
| o                          .                       |       x
`-----------------------------------------------------|------------
                                                   48.05 minutes
```

Quick TR-55 Ver.5.46 S/N:
Executed: 13:57:20 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

**** Modified Rational Hydrograph *****

Weighted C = 0.688 Area= 4.070 acres Tc = 10.00 minutes

Adjusted C = 0.688 Td= 33.00 min. I= 2.53 in/hr Qp= 7.08 cfs

RETURN FREQUENCY: 2 year storm Adj.factor = 1.00
Output file: 2YR2 .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 2 Year Storm

Time increment = 0.033 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.000	0.00	1.42	2.83	4.25	5.67	7.08	7.08
0.233	7.08	7.08	7.08	7.08	7.08	7.08	7.08
0.467	7.08	7.08	7.08	6.38	4.96	3.54	2.13
0.700	0.71						

Quick TR-55 Ver.5.46 S/N:
Executed: 13:57:20 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

**** Modified Rational Hydrograph *****

Weighted C = 0.688 Area= 4.070 acres Tc = 10.00 minutes

Adjusted C = 0.688 Td= 27.00 min. I= 3.85 in/hr Qp= 10.79 cfs

RETURN FREQUENCY: 10 year storm Adj.factor = 1.00
Output file: 10YR2 .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 10 Year Storm

Time increment = 0.033 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.000	0.00	2.16	4.32	6.47	8.63	10.79	10.79
0.233	10.79	10.79	10.79	10.79	10.79	10.79	10.79
0.467	9.71	7.55	5.39	3.24	1.08		

Quick TR-55 Ver.5.46 S/N:
Executed: 13:57:20 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

**** Modified Rational Hydrograph *****

Weighted C = 0.688 Area= 4.070 acres Tc = 10.00 minutes

Adjusted C = 0.756 Td= 34.00 min. I= 4.01 in/hr Qp= 12.35 cfs

RETURN FREQUENCY: 25 year storm Adj.factor = 1.10
Output file: 25YR2 .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 25 Year Storm

Time increment = 0.033 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.000	0.00	2.47	4.94	7.41	9.88	12.35	12.35
0.233	12.35	12.35	12.35	12.35	12.35	12.35	12.35
0.467	12.35	12.35	12.35	12.35	9.88	7.41	4.94
0.700	2.47	0.00					

Quick TR-55 Ver.5.46 S/N:
Executed: 13:57:20 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

**** Modified Rational Hydrograph *****

Weighted C = 0.688 Area= 4.070 acres Tc = 10.00 minutes

Adjusted C = 0.860 Td= 45.00 min. I= 4.11 in/hr Qp= 14.38 cfs

RETURN FREQUENCY: 100 year storm Adj.factor = 1.25
Output file: 100YR2 .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 100 Year Storm

Time increment = 0.033 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.000	0.00	2.88	5.75	8.63	11.51	14.38	14.38
0.233	14.38	14.38	14.38	14.38	14.38	14.38	14.38
0.467	14.38	14.38	14.38	14.38	14.38	14.38	14.38
0.700	14.38	14.38	12.95	10.07	7.19	4.32	1.44

Quick TR-55 Ver.5.46 S/N:
Executed: 13:57:20 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
AREA 9	0.800	0.62	3.16					
AREA 10	0.800	0.91						
[redacted]	0.620	2.54						
			10.00	0.688	0.688	4.572	4.07	12.80

Quick TR-55 Ver.5.46 S/N:
Executed: 13:57:20 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 10 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
AREA 9	0.800	0.62	3.16					
AREA 10	0.800	0.91						
[redacted]	0.620	2.54						
			10.00	0.688	0.688	5.894	4.07	16.50

Quick TR-55 Ver.5.46 S/N:
Executed: 13:57:20 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 25 years
'C' adjustment, k = 1.1
Adj. 'C' = Wtd.'C' x 1.1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
AREA 9	0.800	0.62	3.16					
AREA 10	0.800	0.91						
[redacted]	0.620	2.54						
			10.00	0.688	0.756	6.950	4.07	21.40

Quick TR-55 Ver.5.46 S/N:
Executed: 13:57:20 05-11-1992

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
'C' adjustment, k = 1.25
Adj. 'C' = Wtd.'C' x 1.25

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
AREA 9	0.800	0.62	3.16					
AREA 10	0.800	0.91						
[redacted]	0.620	2.54						
			10.00	0.688	0.860	8.269	4.07	28.93

Quick TR-55 Ver.5.46 S/N:
Executed: 13:57:20 05-11-1992

```
*************************************************************************
*************************************************************************
*                                                                       *
*                                                                       *
*                                                                       *
*                        MODIFIED RATIONAL METHOD                       *
*              ---- Grand Summary For All Storm Frequencies ----        *
*                                                                       *
*                                                                       *
*************************************************************************
*************************************************************************
```

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

Area = 4.07 acres Tc = 10.00 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (cu.ft.)	VOLUMES Storage (cu.ft.)
2	0.688	33	2.531	7.08	5.00	14,026	7,576
10	0.688	27	3.855	10.79	10.00	17,478	6,378
25	0.756	34	4.010	12.35	10.00	25,185	11,985
100	0.860	45	4.111	14.38	10.00	38,837	22,337

Quick TR-55 Ver.5.46 S/N:
Executed: 13:57:20 05-11-1992

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

RETURN FREQUENCY: 2 yr 'C' Adjustment = 1.000 Allowable Q = 5.00 cfs

Hydrograph file duration= 33.00 minutes
Hydrograph file: 2YR2 .HYD Tc = 10.00 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.688	0.688	10	4.572	4.07	12.80	7,677	4,677
0.688	0.688	15	3.893	4.07	10.90	9,806	6,056
0.688	0.688	20	3.384	4.07	9.47	11,367	6,867
0.688	0.688	30	2.687	4.07	7.52	13,535	7,535
********** Storage Maximum							
0.688	0.688	33	2.531	4.07	7.08	14,026	7,576
0.688	0.688	40	2.227	4.07	6.23	14,961	7,461
0.688	0.688	50	1.902	4.07	5.32	15,972	6,972
0.688	0.688	60	1.660	4.07	4.65	Qpeak < Qallow	

Quick TR-55 Ver.5.46 S/N:
Executed: 13:57:20 05-11-1992

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

RETURN FREQUENCY: 10 yr 'C' Adjustment = 1.000 Allowable Q = 10.00 cfs

Hydrograph file duration= 27.00 minutes
Hydrograph file: 10YR2 .HYD Tc = 10.00 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.688	0.688	10	5.894	4.07	16.50	9,898	3,898
0.688	0.688	15	5.103	4.07	14.28	12,855	5,355
0.688	0.688	20	4.494	4.07	12.58	15,094	6,094
********** Storage Maximum							
0.688	0.688	27	3.855	4.07	10.79	17,478	6,378
0.688	0.688	30	3.632	4.07	10.16	18,295	6,295
0.688	0.688	40	3.047	4.07	8.53	Qpeak < Qallow	

Quick TR-55 Ver.5.46 S/N:
Executed: 13:57:20 05-11-1992

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

RETURN FREQUENCY: 25 yr 'C' Adjustment = 1.100 Allowable Q = 10.00 cfs

Hydrograph file duration= 34.00 minutes
Hydrograph file: 25YR2 .HYD Tc = 10.00 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.688	0.756	10	6.950	4.07	21.40	12,838	6,838
0.688	0.756	15	6.030	4.07	18.56	16,708	9,208
0.688	0.756	20	5.320	4.07	16.38	19,654	10,654
0.688	0.756	30	4.310	4.07	13.27	23,884	11,884
********** Storage Maximum							
0.688	0.756	34	4.010	4.07	12.35	25,185	11,985
0.688	0.756	40	3.620	4.07	11.14	26,748	11,748
0.688	0.756	50	3.130	4.07	9.64	Qpeak < Qallow	

Quick TR-55 Ver.5.46 S/N:
Executed: 13:57:20 05-11-1992

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

NORGE RETAIL CENTER HYDROLOGIC DATA
DRAINAGE AREA TO RR AT REAR OF SITE
DRAINAGE BASIN/INFILTRATION BASIN #2

RETURN FREQUENCY: 100 yr 'C' Adjustment = 1.250 Allowable Q = 10.00 cfs

Hydrograph file duration= 45.00 minutes
Hydrograph file: 100YR2 .HYD Tc = 10.00 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.688	0.860	10	8.269	4.07	28.93	17,357	11,357
0.688	0.860	15	7.233	4.07	25.30	22,774	15,274
0.688	0.860	20	6.415	4.07	22.44	26,931	17,931
0.688	0.860	30	5.240	4.07	18.33	32,997	20,997
0.688	0.860	40	4.429	4.07	15.49	37,186	22,186
0.688	0.860	45	4.111	4.07	14.38	38,837	Storage Maximum 22,337
0.688	0.860	50	3.835	4.07	13.42	40,251	22,251
0.688	0.860	60	3.382	4.07	11.83	42,592	21,592
0.688	0.860	120	1.979	4.07	6.92	Qpeak < Qallow	

POND STORAGE

Baker

Michael Baker Jr., Inc.

POND-2 Version: 5.17
S/N:

NORGE COMMERCIAL CENTER

CALCULATED 05-11-1992 13:12:29
DISK FILE: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	* Volume (cubic-ft)	Volume Sum (cubic-ft)
109.00	6,937.53	6,938	0	0	0
110.00	7,642.69	7,643	21,862	7,287	7,287
111.00	8,372.99	8,373	24,015	8,005	15,292
112.00	9,128.41	9,128	26,244	8,748	24,040
113.00	9,908.97	9,909	28,548	9,516	33,556
113.50	9,908.97	9,909	29,727	4,954	38,511
Elevations With Areas Interpolated From The Closest Two Planimeter Readings					
109.50	-----	7,286	21,333	3,555	3,555
110.50	-----	8,004	23,467	3,911	11,199
111.50	-----	8,747	25,677	4,280	19,572
112.50	-----	9,515	27,963	4,660	28,701

IA = (sq.rt(Area1) + ((Ei-E1)/(E2-E1))*(sq.rt(Area2)-sq.rt(Area1)))^2

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1,Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

STRUCTURE RATING CURVES

Baker

Michael Baker Jr., Inc.

Outlet Structure File: NORGE2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

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

Elevation (ft)	Q (cfs)	Contributing Structures
109.00	1.0	4
109.50	3.2	4
110.00	6.7	4
110.50	8.6	1 +2
111.00	13.6	4
111.50	16.3	4
112.00	18.6	4
112.50	20.6	4
113.00	22.5	4

Outlet Structure File: NORGE2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

Outlet Structure File: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .STR
Planimeter Input File: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .VOL
Rating Table Output File: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .PND

Min. Elev.(ft) = 109 Max. Elev.(ft) = 113 Incr.(ft) = .5

Additional elevations (ft) to be included in table:
* *

****
SYSTEM CONNECTIVITY
****

Structure	No.	Q Table		Q Table
ORIFICE-VC	1		->	1
STAND PIPE	2	+ 1	->	3
CULVERT-CR	4	? 3	->	5

Outflow rating table summary was stored in file:
C:\ENGINEER\PONDPACK\NORGE\NORGE2 .PND

Outlet Structure File: NORGE2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

>>>>>> Structure No. 1 <<<<<<
(Input Data)

ORIFICE-VC
Orifice - Vertical Circular

E1 elev.(ft)?	110.0
E2 elev.(ft)?	113.001
Orifice coeff.?	0.62
Invert elev.(ft)?	108.5
Datum elev.(ft)?	108.5
Diameter (ft)?	1.25

Outlet Structure File: NORGE2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

>>>>>> Structure No. 2 <<<<<<
(Input Data)

STAND PIPE
Stand Pipe with weir or orifice flow

E1 elev.(ft)? 110.5
E2 elev.(ft)? 113.001
Crest elev.(ft)? 110.50
Diameter (ft)? 3.0
Weir coefficient? 2.67
Orifice coefficient? 0.62
Start transition elev.(ft) @ ? 111.0
Transition height (ft)? .5

Outlet Structure File: NORGE2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

>>>>>> Structure No. 4 <<<<<<
(Input Data)

CULVERT-CR
Circular Culvert (With Inlet Control)

E1 elev.(ft)?	108.5
E2 elev.(ft)?	113.001
Diam. (ft)?	1.5
Inv. el.(ft)?	108.5
Slope (ft/ft)?	0.0025
T1 ratio?	
T2 ratio?	
K Coeff.?	0.534
M Coeff.?	0.555
c Coeff.?	0.0196
Y Coeff.?	0.89
Form 1 or 2?	2
Slope factor?	

Outlet Structure File: NORGE2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

Outflow Rating Table for Structure #1
ORIFICE-VC Orifice - Vertical Circular

Elevation (ft)	Q (cfs)	Computation Messages
109.00	0.0	E < E1=110.0
109.50	0.0	E < E1=110.0
110.00	7.5	H =1.5
110.50	8.6	H =2.0
111.00	9.7	H =2.5
111.50	10.6	H =3.0
112.00	11.4	H =3.5
112.50	12.2	H =4.0
113.00	13.0	H =4.5

C = .62 A = 1.227185 sq.ft.
H (ft) = Table elev. - Datum elev. (108.5 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: NORGE2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

Outflow Rating Table for Structure #2
STAND PIPE Stand Pipe with weir or orifice flow

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
109.00	0.0	E < Inv.El.= 110.5
109.50	0.0	E < El= 110.5
110.00	0.0	E < El= 110.5
110.50	0.0	Weir: H =0.0
111.00	8.9	Weir: H =.5
111.50	25.2	Weir: H =1.0
112.00	43.1	Orifice: H =1.5
112.50	49.7	Orifice: H =2.0
113.00	55.6	Orifice: H =2.5

Weir Cw = 2.67 Weir length = 9.424779 ft
Orifice Co = .62 Orifice area = 7.068584 sq.ft.
Q (cfs) = (Cw * L * H**1.5) or (Co * A * sqr(2*g*H))
No transition used, transition zone ends below 111.8976 ft
Weir equation = Orifice equation @ elev.= 111.8976 ft

Outlet Structure File: NORGE2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

Outflow Rating Table for Structure #4
CULVERT-CR Circular Culvert (With Inlet Control)

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation	Messages
109.00	1.0	Equ.2:	HW =.5
109.50	3.2	Equ.2:	HW =1.0
110.00	6.7	Equ.2:	HW =1.5
110.50	10.3	Submerged:	HW =2.0
111.00	13.6	Submerged:	HW =2.5
111.50	16.3	Submerged:	HW =3.0
112.00	18.6	Submerged:	HW =3.5
112.50	20.6	Submerged:	HW =4.0
113.00	22.5	Submerged:	HW =4.5

Used Unsubmerged Equ. Form (2) for elev. less than 110.11 ft
Used Submerged Equation for elevations greater than 110.31 ft
HW=Headwater (ft)

Transition flows interpolated from the following values:
E1=110.11 ft; Q1=7.58 cfs; E2=110.31 ft; Q2=8.66 cfs

Outlet Structure File: NORGE2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

Outflow Rating Table 3
Table 3 = 1 + 2

Elevation (ft)	Q (cfs)	Contributing Structures
109.00	0.0	-
109.50	0.0	-
110.00	7.5	1
110.50	8.6	1 +2
111.00	18.6	1 +2
111.50	35.7	1 +2
112.00	54.5	1 +2
112.50	61.9	1 +2
113.00	68.6	1 +2

Outlet Structure File: NORGE2 .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
NORGE COMMERCIAL CENTER BMP/DETENTION FACILITY

****

Outflow Rating Table 5
Table 5 = 3 ? 4

Elevation (ft)	Q (cfs)	Contributing Structures
109.00	1.0	4
109.50	3.2	4
110.00	6.7	4
110.50	8.6	1 +2
111.00	13.6	4
111.50	16.3	4
112.00	18.6	4
112.50	20.6	4
113.00	22.5	4

STORM ROUTING

Baker

Michael Baker Jr., Inc.

```
*****************************
*                           *
* NORGE COMMERCIAL CENTER   *
*         BASIN #2          *
*                           *
*                           *
*                           *
*****************************
```

Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\2YR2 .HYD
Rating Table file: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .PND

----INITIAL CONDITIONS----
Elevation = 109.00 ft
Outflow = 1.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
109.00	1.0	0.000	0.0	1.0
109.50	3.2	0.082	59.3	62.5
110.00	6.7	0.167	121.5	128.2
110.50	8.6	0.257	186.7	195.3
111.00	13.6	0.351	254.9	268.5
111.50	16.3	0.449	326.2	342.5
112.00	18.6	0.552	400.7	419.3
112.50	20.6	0.659	478.4	499.0
113.00	22.5	0.770	559.3	581.8

Time increment (t) = 0.033 hrs.

ECUTED: 10-27-1992 09:26:25 2YR Return Freq: 2 years

d File: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .PND
flow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\2YR2 .HYD
flow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\2OUT2 .HYD

IFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
IME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
.000	0.00	-----	-1.0	1.0	1.00	109.00
.033	1.42	1.4	-0.4	0.4	0.42	109.00
0.067	2.83	4.3	1.6	3.8	1.10	109.02
.100	4.25	7.1	6.2	8.7	1.28	109.06
.133	5.67	9.9	13.0	16.1	1.54	109.12
0.167	7.08	12.8	22.0	25.7	1.89	109.20
.200	7.08	14.2	31.6	36.1	2.26	109.29
.233	7.08	14.2	40.6	45.8	2.60	109.36
0.267	7.08	14.2	48.9	54.7	2.92	109.44
0.300	7.08	14.2	56.6	63.0	3.23	109.50
.333	7.08	14.2	63.5	70.7	3.64	109.56
.367	7.08	14.2	69.6	77.6	4.01	109.62
0.400	7.08	14.2	75.1	83.8	4.33	109.66
.433	7.08	14.2	80.0	89.3	4.63	109.70
.467	7.08	14.2	84.4	94.2	4.89	109.74
0.500	7.08	14.2	88.3	98.5	5.12	109.77
.533	7.08	14.2	91.8	102.5	5.33	109.80
.567	6.38	13.5	94.3	105.3	5.48	109.83
0.600	4.96	11.3	94.6	105.6	5.50	109.83
0.633	3.54	8.5	92.4	103.1	5.37	109.81
.667	2.13	5.7	87.9	98.1	5.10	109.77
.700	0.71	2.8	81.3	90.7	4.71	109.72

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\2YR2 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\2OUT2 .HYD

Starting Pond W.S. Elevation = 109.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 7.08 cfs
Peak Outflow = 5.50 cfs
Peak Elevation = 109.83 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 0.14 ac-ft

Total Storage in Pond = 0.14 ac-ft

Warning: Inflow hydrograph truncated on right side.

>>>>> Warning, initial pond outflow > 1st inflow ordinate. <<<<<

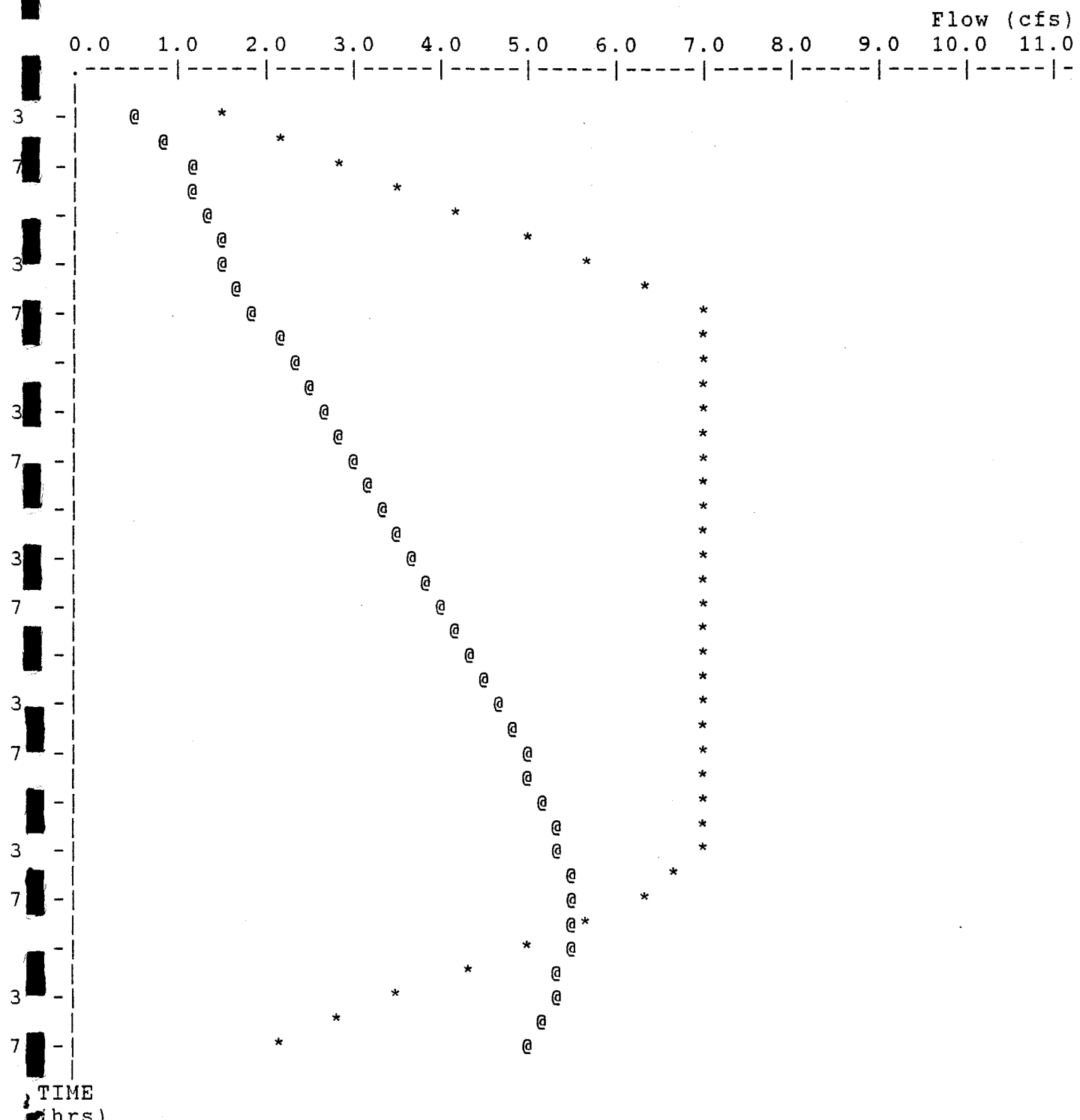
POND-2 Version: 5.17 S/N:

2YR Return Freq: 2 years

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\2YR2 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\2OUT2 .HYD

EXECUTED: 10-27-1992
09:26:25

Peak Inflow = 7.08 cfs
Peak Outflow = 5.50 cfs
Peak Elevation = 109.83 ft



* File: C:\ENGINEER\PONDPACK\NORGE\2YR2 .HYD Qmax = 7.1 cfs
@ File: C:\ENGINEER\PONDPACK\NORGE\2OUT2 .HYD Qmax = 5.5 cfs

```
*****************************
*                           *
* NORGE COMMERCIAL CENTER   *
*         BASIN #2          *
*                           *
*                           *
*                           *
*****************************
```

Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\10YR2 .HYD
Rating Table file: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .PND

----INITIAL CONDITIONS----
Elevation = 109.00 ft
Outflow = 1.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
109.00	1.0	0.000	0.0	1.0
109.50	3.2	0.082	59.3	62.5
110.00	6.7	0.167	121.5	128.2
110.50	8.6	0.257	186.7	195.3
111.00	13.6	0.351	254.9	268.5
111.50	16.3	0.449	326.2	342.5
112.00	18.6	0.552	400.7	419.3
112.50	20.6	0.659	478.4	499.0
113.00	22.5	0.770	559.3	581.8

Time increment (t) = 0.033 hrs.

ECUTED: 10-27-1992 09:26:25 10YR Return Freq: 10 years

d File: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .PND
flow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\10YR2 .HYD
flow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\10OUT2 .HYD

FLOW HYDROGRAPH		ROUTING COMPUTATIONS				
IME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
.000	0.00	-----	-1.0	1.0	1.00	109.00
.033	2.16	2.2	-0.9	1.2	1.01	109.00
0.067	4.32	6.5	3.3	5.6	1.17	109.04
.100	6.47	10.8	11.2	14.1	1.47	109.11
.133	8.63	15.1	22.4	26.3	1.90	109.21
0.167	10.79	19.4	36.9	41.9	2.46	109.33
.200	10.79	21.6	52.4	58.5	3.06	109.47
.233	10.79	21.6	66.4	74.0	3.81	109.59
0.267	10.79	21.6	78.8	87.9	4.56	109.69
0.300	10.79	21.6	90.0	100.4	5.22	109.79
.333	10.79	21.6	99.9	111.5	5.81	109.87
.367	10.79	21.6	108.8	121.5	6.34	109.95
0.400	10.79	21.6	116.9	130.4	6.76	110.02
.433	10.79	21.6	124.5	138.4	6.99	110.08
.467	9.71	20.5	130.6	145.0	7.18	110.13
0.500	7.55	17.3	133.3	147.9	7.26	110.15
.533	5.39	12.9	131.9	146.3	7.21	110.14
.567	3.24	8.6	126.4	140.5	7.05	110.09
0.600	1.08	4.3	117.2	130.7	6.77	110.02

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\10YR2 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\10OUT2 .HYD

Starting Pond W.S. Elevation = 109.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 10.79 cfs
Peak Outflow = 7.26 cfs
Peak Elevation = 110.15 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 0.19 ac-ft

Total Storage in Pond = 0.19 ac-ft

Warning: Inflow hydrograph truncated on right side.

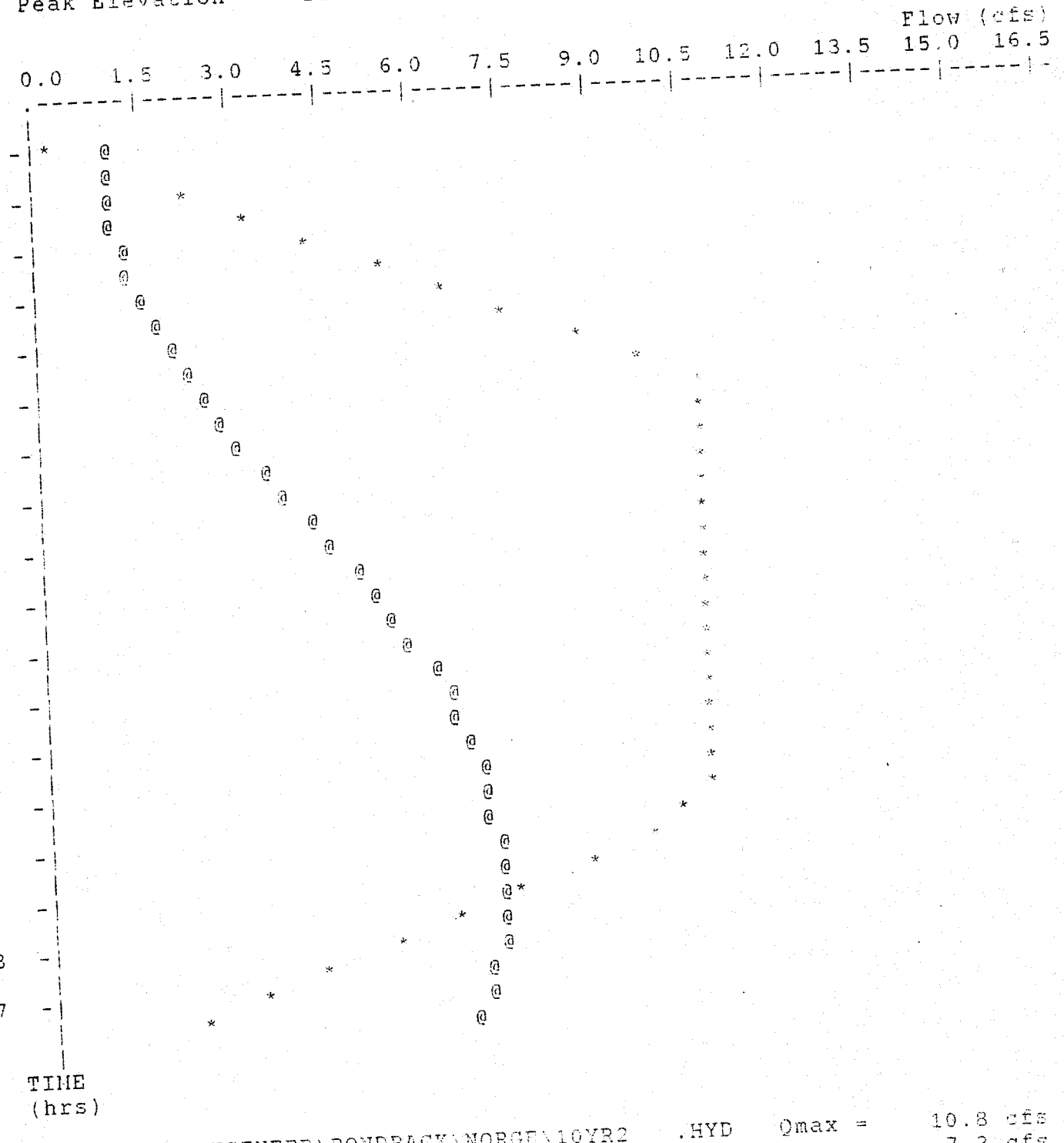
>>>>> Warning, initial pond outflow > 1st inflow ordinate. <<<<<

POND-2 Version: 5.17 S/N: Return Freq: 10 years

10YR

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\10YR2 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\10OUT2 .HYD
EXECUTED: 10-27-1992
09:26:25

Peak Inflow = 10.79 cfs
Peak Outflow = 7.26 cfs
Peak Elevation = 110.15 ft



* File: C:\ENGINEER\PONDPACK\NORGE\10YR2 .HYD Qmax = 10.8 cfs
@ File: C:\ENGINEER\PONDPACK\NORGE\10OUT2 .HYD Qmax = 7.3 cfs

ND-2 Version: 5.17 S/N:
CUTED: 10-27-1992 09:26:25 25YR Return Freq: 25 years

```
*****************************
*                           *
* NORGE COMMERCIAL CENTER   *
*        BASIN #2           *
*                           *
*                           *
*                           *
*****************************
```

Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\25YR2 .HYD
Rating Table file: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .PND

----INITIAL CONDITIONS----
Elevation = 109.00 ft
Outflow = 1.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
109.00	1.0	0.000
109.50	3.2	0.082
110.00	6.7	0.167
110.50	8.6	0.257
111.00	13.6	0.351
111.50	16.3	0.449
112.00	18.6	0.552
112.50	20.6	0.659
113.00	22.5	0.770

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	1.0
59.3	62.5
121.5	128.2
186.7	195.3
254.9	268.5
326.2	342.5
400.7	419.3
478.4	499.0
559.3	581.8

Time increment (t) = 0.033 hrs.

PND-2 Version: 5.17 S/N:
EXECUTED: 10-27-1992 09:26:25 25YR Return Freq: 25 years

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\25YR2 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\25OUT2 .HYD

INFLOW HYDROGRAPH

TIME (hrs)	INFLOW (cfs)
0.000	0.00
0.033	2.47
0.067	4.94
0.100	7.41
0.133	9.88
0.167	12.35
0.200	12.35
0.233	12.35
0.267	12.35
0.300	12.35
0.333	12.35
0.367	12.35
0.400	12.35
0.433	12.35
0.467	12.35
0.500	12.35
0.533	12.35
0.567	12.35
0.600	9.88
0.633	7.41
0.667	4.94
0.700	2.47
0.733	0.00

ROUTING COMPUTATIONS

I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
-----	-1.0	1.0	1.00	109.00
2.5	-0.6	1.5	1.02	109.00
7.4	4.4	6.8	1.21	109.05
12.4	13.6	16.8	1.56	109.13
17.3	26.8	30.9	2.07	109.24
22.2	43.6	49.0	2.72	109.39
24.7	61.3	68.3	3.51	109.54
24.7	77.1	86.0	4.45	109.68
24.7	91.2	101.8	5.29	109.80
24.7	103.8	115.9	6.05	109.91
24.7	115.1	128.5	6.71	110.00
24.7	125.7	139.8	7.03	110.09
24.7	135.7	150.4	7.33	110.17
24.7	145.2	160.4	7.61	110.24
24.7	154.2	169.9	7.88	110.31
24.7	162.6	178.9	8.14	110.38
24.7	170.5	187.3	8.37	110.44
24.7	178.0	195.2	8.60	110.50
24.7	182.4	200.3	8.94	110.53
22.2	181.9	199.7	8.90	110.53
17.3	177.1	194.2	8.57	110.49
12.4	167.9	184.5	8.30	110.42
7.4	154.6	170.4	7.90	110.31
2.5				

ND-2 Version: 5.17 S/N:
CUTED: 10-27-1992 09:26:25 25YR Return Freq: 25 years

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\25YR2 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\25OUT2 .HYD

Starting Pond W.S. Elevation = 109.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 12.35 cfs
Peak Outflow = 8.94 cfs
Peak Elevation = 110.53 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 0.26 ac-ft

Total Storage in Pond = 0.26 ac-ft

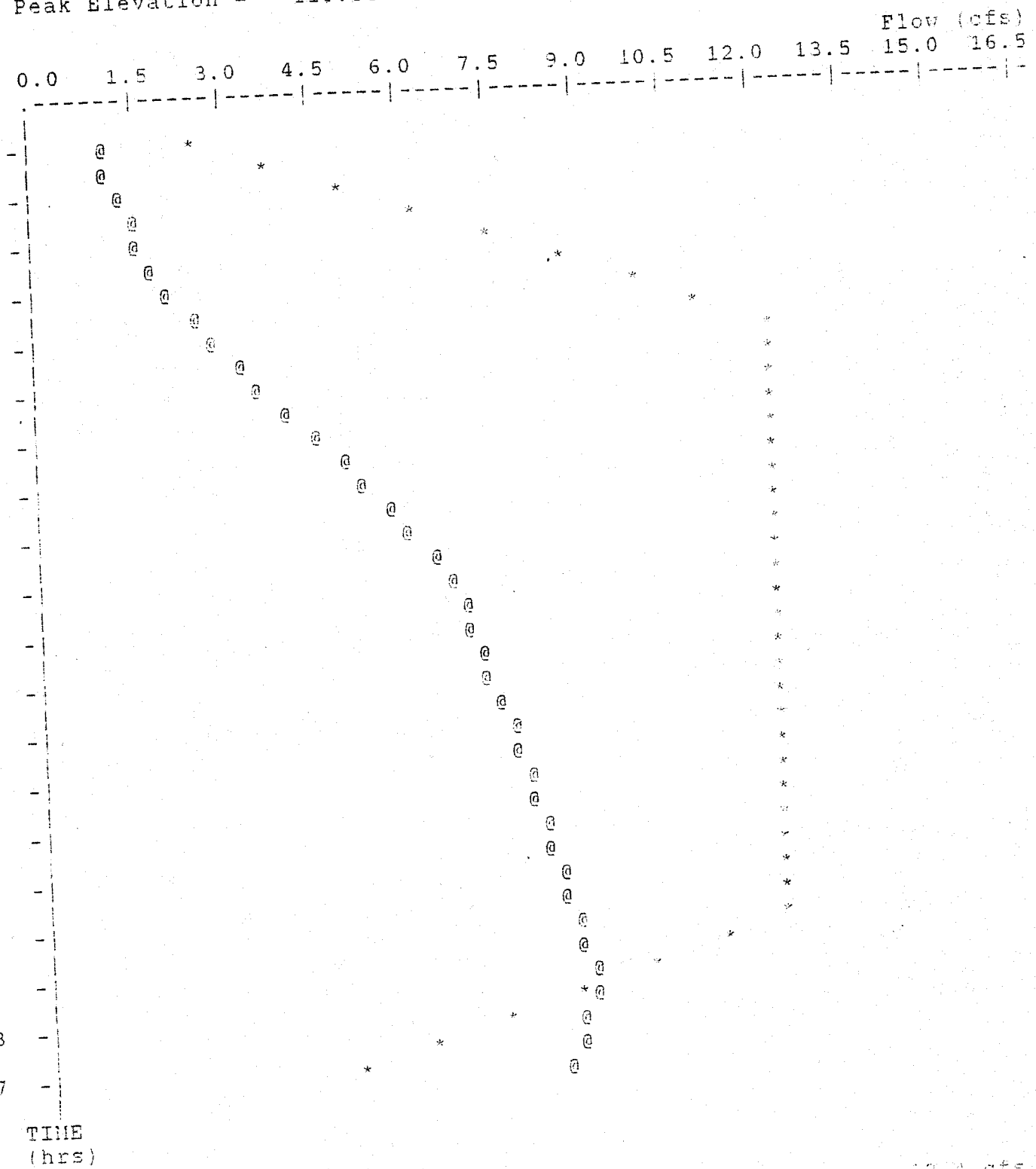
>>>>> Warning, initial pond outflow > 1st inflow ordinate. <<<<<

POND-2 Version: 5.17 S/N: Return Freq: 25 years

25YR

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\25YR2 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\25OUT2 .HYD
EXECUTED: 10-27-1992
09:26:25

Peak Inflow = 12.35 cfs
Peak Outflow = 8.94 cfs
Peak Elevation = 110.53 ft



* File: C:\ENGINEER\PONDPACK\NORGE\25YR2 .HYD Qmax = 12.4 cfs
* File: C:\ENGINEER\PONDPACK\NORGE\25OUT2 .HYD Qmax = 8.9 cfs

ND-2 Version: 5.17 S/N:
XECUTED: 10-27-1992 09:26:25 100YR Return Freq: 100 years

```
*****************************
*                           *
* NORGE COMMERCIAL CENTER   *
*        BASIN #2           *
*                           *
*                           *
*                           *
*****************************
```

Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\100YR2 .HYD
Rating Table file: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .PND

----INITIAL CONDITIONS----
Elevation = 109.00 ft
Outflow = 1.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
109.00	1.0	0.000
109.50	3.2	0.082
110.00	6.7	0.167
110.50	8.6	0.257
111.00	13.6	0.351
111.50	16.3	0.449
112.00	18.6	0.552
112.50	20.6	0.659
113.00	22.5	0.770

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	1.0
59.3	62.5
121.5	128.2
186.7	195.3
254.9	268.5
326.2	342.5
400.7	419.3
478.4	499.0
559.3	581.8

Time increment (t) = 0.033 hrs.

ND-2 Version: 5.17 S/N:
CUTED: 10-27-1992 09:26:25 100YR Return Freq: 100 years

nd File: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .PND
flow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\100YR2 .HYD
flow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\100OUT2 .HYD

NFLOW HYDROGRAPH

ROUTING COMPUTATIONS

TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
.000	0.00	-----	-1.0	1.0	1.00	109.00
0.033	2.88	2.9	-0.2	1.9	1.03	109.01
.067	5.75	8.6	5.9	8.4	1.27	109.06
.100	8.63	14.4	16.9	20.3	1.69	109.16
0.133	11.51	20.1	32.5	37.1	2.29	109.29
.167	14.38	25.9	52.3	58.4	3.05	109.47
.200	14.38	28.8	72.6	81.0	4.19	109.64
.233	14.38	28.8	90.9	101.4	5.27	109.80
0.267	14.38	28.8	107.1	119.6	6.24	109.93
.300	14.38	28.8	122.0	135.9	6.92	110.06
.333	14.38	28.8	136.1	150.8	7.34	110.17
0.367	14.38	28.8	149.4	164.9	7.74	110.27
.400	14.38	28.8	161.9	178.2	8.12	110.37
.433	14.38	28.8	173.7	190.7	8.47	110.47
0.467	14.38	28.8	184.3	202.5	9.10	110.55
.500	14.38	28.8	193.4	213.1	9.82	110.62
.533	14.38	28.8	201.3	222.2	10.44	110.68
.567	14.38	28.8	208.1	230.1	10.98	110.74
0.600	14.38	28.8	214.0	236.9	11.44	110.78
.633	14.38	28.8	219.1	242.8	11.84	110.82
.667	14.38	28.8	223.5	247.8	12.19	110.86
0.700	14.38	28.8	227.2	252.2	12.49	110.89
.733	14.38	28.8	230.5	256.0	12.75	110.91
.767	12.95	27.3	232.1	257.8	12.87	110.93
0.800	10.07	23.0	229.7	255.1	12.69	110.91
.833	7.19	17.3	222.7	247.0	12.13	110.85
.867	4.32	11.5	211.7	234.2	11.26	110.77
0.900	1.44	5.8	197.2	217.5	10.12	110.65

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\100YR2 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\100OUT2 .HYD

Starting Pond W.S. Elevation = 109.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 14.38 cfs
Peak Outflow = 12.87 cfs
Peak Elevation = 110.93 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 0.34 ac-ft

Total Storage in Pond = 0.34 ac-ft

Warning: Inflow hydrograph truncated on right side.

>>>>> Warning, initial pond outflow > 1st inflow ordinate. <<<<<

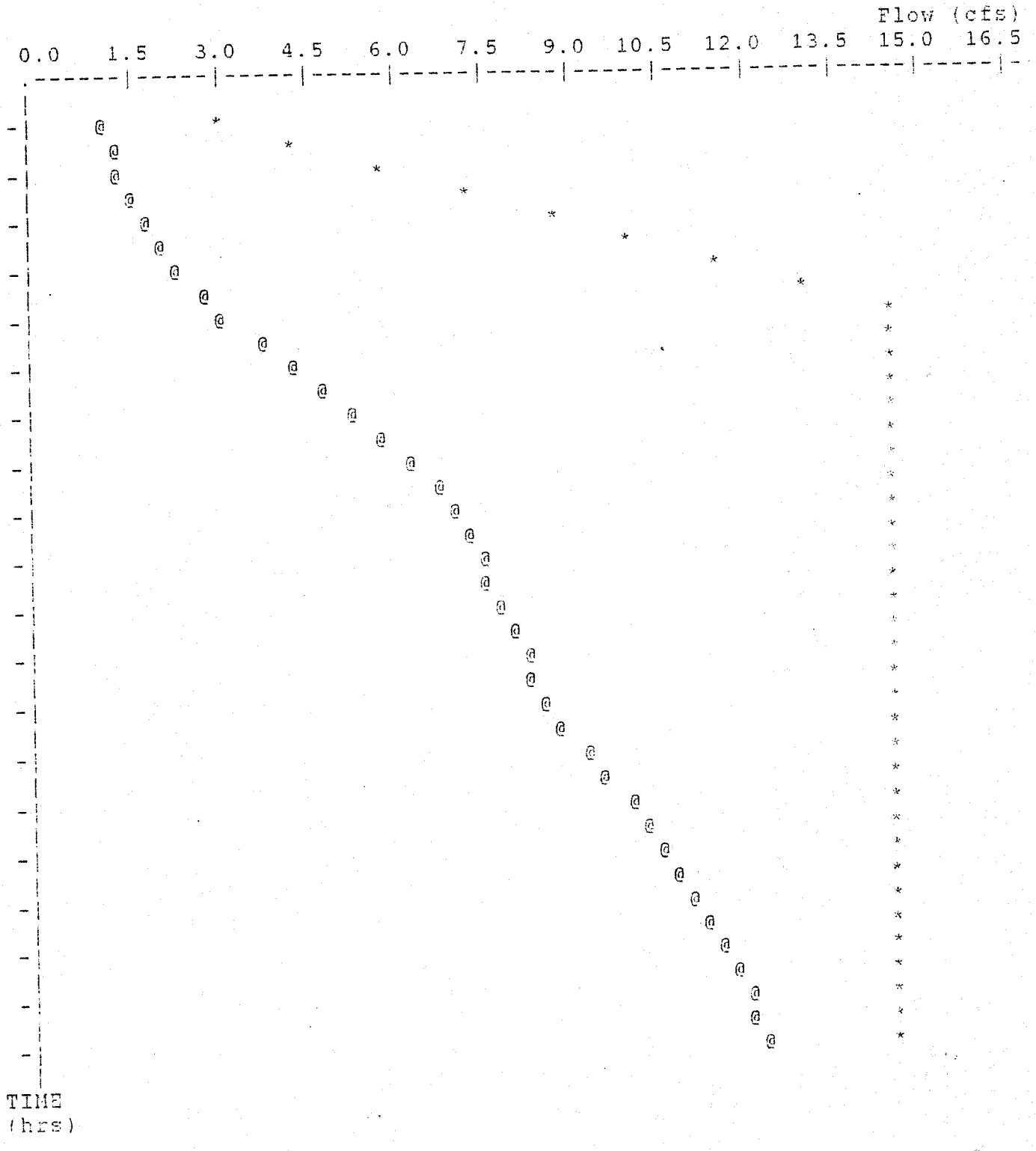
POND-2 Version: 5.17 S/N:

100YR Return Freq: 100 years

Pond File: C:\ENGINEER\PONDPACK\NORGE\NORGE2 .PND
Inflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\100YR2 .HYD
Outflow Hydrograph: C:\ENGINEER\PONDPACK\NORGE\100OUT2 .HYD

EXECUTED: 10-27-1992
09:26:25

Peak Inflow = 14.38 cfs
Peak Outflow = 12.87 cfs
Peak Elevation = 110.93 ft



File: C:\ENGINEER\PONDPACK\NORGE\100YR2 .HYD Qmax = 14.4 cfs
File: C:\ENGINEER\PONDPACK\NORGE\100OUT2 .HYD Qmax = 12.9 cfs

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 8 TO 7

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	2.00 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	16.00 cfs

Computed Results:

Full Flow Capacity.....	16.00 cfs
Full Flow Depth.....	2.00 ft
Velocity.....	5.09 fps
Flow Area.....	3.14 sf
Critical Depth....	1.44 ft
Critical Slope....	0.0066 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	16.00 cfs
QMAX @.94D.....	17.21 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 8 TO 7

Solve For Actual Depth

Given Input Data:

Diameter.....	2.00 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	8.05 cfs

Computed Results:

Depth.....	1.00 ft
Velocity.....	5.10 fps
Flow Area.....	1.58 sf
Critical Depth....	1.01 ft
Critical Slope....	0.0049 ft/ft
Percent Full.....	50.19 %
Full Capacity.....	16.00 cfs
QMAX @.94D.....	17.21 cfs
Froude Number.....	1.01 (flow is Supercritical)

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 10 TO 9

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	1.25 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	4.57 cfs

Computed Results:

Full Flow Capacity.....	4.57 cfs
Full Flow Depth.....	1.25 ft
Velocity.....	3.72 fps
Flow Area.....	1.23 sf
Critical Depth....	0.87 ft
Critical Slope....	0.0073 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	4.57 cfs
QMAX @.94D.....	4.91 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 10 TO 9

Solve For Actual Depth

Given Input Data:

Diameter.....	1.25 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	4.52 cfs

Computed Results:

Depth.....	1.01 ft
Velocity.....	4.24 fps
Flow Area.....	1.07 sf
Critical Depth....	0.86 ft
Critical Slope....	0.0073 ft/ft
Percent Full.....	81.03 %
Full Capacity.....	4.57 cfs
QMAX @.94D.....	4.91 cfs
Froude Number.....	0.72 (flow is Subcritical)

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 9 TO 7

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	7.43 cfs

Computed Results:

Full Flow Capacity.....	7.43 cfs
Full Flow Depth.....	1.50 ft
Velocity.....	4.20 fps
Flow Area.....	1.77 sf
Critical Depth....	1.06 ft
Critical Slope....	0.0070 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	7.43 cfs
QMAX @.94D.....	7.99 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 9 TO 7

Solve For Actual Depth

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	7.37 cfs

Computed Results:

Depth.....	1.22 ft
Velocity.....	4.79 fps
Flow Area.....	1.54 sf
Critical Depth....	1.05 ft
Critical Slope....	0.0070 ft/ft
Percent Full.....	81.27 %
Full Capacity.....	7.43 cfs
QMAX @.94D.....	7.99 cfs
Froude Number.....	0.74 (flow is Subcritical)

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 7 TO 6

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	2.00 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	16.00 cfs

Computed Results:

Full Flow Capacity.....	16.00 cfs
Full Flow Depth.....	2.00 ft
Velocity.....	5.09 fps
Flow Area.....	3.14 sf
Critical Depth....	1.44 ft
Critical Slope....	0.0066 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	16.00 cfs
QMAX @.94D.....	17.21 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 7 TO 6

Solve For Actual Depth

Given Input Data:

Diameter.....	2.00 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	13.54 cfs

Computed Results:

Depth.....	1.41 ft
Velocity.....	5.71 fps
Flow Area.....	2.37 sf
Critical Depth....	1.33 ft
Critical Slope....	0.0059 ft/ft
Percent Full.....	70.59 %
Full Capacity.....	16.00 cfs
QMAX @.94D.....	17.21 cfs
Froude Number.....	0.88 (flow is Subcritical)

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 12 TO 11

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	1.25 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	4.57 cfs

Computed Results:

Full Flow Capacity.....	4.57 cfs
Full Flow Depth.....	1.25 ft
Velocity.....	3.72 fps
Flow Area.....	1.23 sf
Critical Depth....	0.87 ft
Critical Slope....	0.0073 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	4.57 cfs
QMAX @.94D.....	4.91 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 12 TO 11

Solve For Actual Depth

Given Input Data:

Diameter.....	1.25 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	2.85 cfs

Computed Results:

Depth.....	0.72 ft
Velocity.....	3.93 fps
Flow Area.....	0.73 sf
Critical Depth....	0.68 ft
Critical Slope....	0.0059 ft/ft
Percent Full.....	57.22 %
Full Capacity.....	4.57 cfs
QMAX @.94D.....	4.91 cfs
Froude Number.....	0.90 (flow is Subcritical)

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 11 TO 6

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	7.43 cfs

Computed Results:

Full Flow Capacity.....	7.43 cfs
Full Flow Depth.....	1.50 ft
Velocity.....	4.20 fps
Flow Area.....	1.77 sf
Critical Depth....	1.06 ft
Critical Slope....	0.0070 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	7.43 cfs
QMAX @.94D.....	7.99 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 11 TO 6

Solve For Actual Depth

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	5.14 cfs

Computed Results:

Depth.....	0.92 ft
Velocity.....	4.54 fps
Flow Area.....	1.13 sf
Critical Depth....	0.87 ft
Critical Slope....	0.0058 ft/ft
Percent Full.....	61.18 %
Full Capacity.....	7.43 cfs
QMAX @.94D.....	7.99 cfs
Froude Number.....	0.91 (flow is Subcritical)

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 6 TO 5

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	3.00 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	47.16 cfs

Computed Results:

Full Flow Capacity.....	47.16 cfs
Full Flow Depth.....	3.00 ft
Velocity.....	6.67 fps
Flow Area.....	7.07 sf
Critical Depth....	2.24 ft
Critical Slope....	0.0061 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	47.16 cfs
QMAX @.94D.....	50.73 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 6 TO 5

Solve For Actual Depth

Given Input Data:

Diameter.....	3.00 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	18.35 cfs

Computed Results:

Depth.....	1.30 ft
Velocity.....	6.25 fps
Flow Area.....	2.93 sf
Critical Depth....	1.37 ft
Critical Slope....	0.0041 ft/ft
Percent Full.....	43.31 %
Full Capacity.....	47.16 cfs
QMAX @.94D.....	50.73 cfs
Froude Number.....	1.11 (flow is Supercritical)

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 5 TO 4

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	3.00 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	47.16 cfs

Computed Results:

Full Flow Capacity.....	47.16 cfs
Full Flow Depth.....	3.00 ft
Velocity.....	6.67 fps
Flow Area.....	7.07 sf
Critical Depth....	2.24 ft
Critical Slope....	0.0061 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	47.16 cfs
QMAX @.94D.....	50.73 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 5 TO 4

Solve For Actual Depth

Given Input Data:

Diameter.....	3.00 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	19.13 cfs

Computed Results:

Depth.....	1.33 ft
Velocity.....	6.32 fps
Flow Area.....	3.03 sf
Critical Depth....	1.40 ft
Critical Slope....	0.0041 ft/ft
Percent Full.....	44.33 %
Full Capacity.....	47.16 cfs
QMAX @.94D.....	50.73 cfs
Froude Number.....	1.11 (flow is Supercritical)

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 13 TO 4

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	7.43 cfs

Computed Results:

Full Flow Capacity.....	7.43 cfs
Full Flow Depth.....	1.50 ft
Velocity.....	4.20 fps
Flow Area.....	1.77 sf
Critical Depth....	1.06 ft
Critical Slope....	0.0070 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	7.43 cfs
QMAX @.94D.....	7.99 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 13 TO 4

Solve For Actual Depth

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	2.92 cfs

Computed Results:

Depth.....	0.65 ft
Velocity.....	3.95 fps
Flow Area.....	0.74 sf
Critical Depth....	0.65 ft
Critical Slope....	0.0051 ft/ft
Percent Full.....	43.56 %
Full Capacity.....	7.43 cfs
QMAX @.94D.....	7.99 cfs
Froude Number.....	0.99 (flow is Subcritical)

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 4 TO 3

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	3.00 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	47.16 cfs

Computed Results:

Full Flow Capacity.....	47.16 cfs
Full Flow Depth.....	3.00 ft
Velocity.....	6.67 fps
Flow Area.....	7.07 sf
Critical Depth....	2.24 ft
Critical Slope....	0.0061 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	47.16 cfs
QMAX @.94D.....	50.73 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 4 TO 3

Solve For Actual Depth

Given Input Data:

Diameter.....	3.00 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	21.50 cfs

Computed Results:

Depth.....	1.42 ft
Velocity.....	6.52 fps
Flow Area.....	3.30 sf
Critical Depth....	1.49 ft
Critical Slope....	0.0042 ft/ft
Percent Full.....	47.38 %
Full Capacity.....	47.16 cfs
QMAX @.94D.....	50.73 cfs
Froude Number.....	1.09 (flow is Supercritical)

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 14 TO 15

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	7.43 cfs

Computed Results:

Full Flow Capacity.....	7.43 cfs
Full Flow Depth.....	1.50 ft
Velocity.....	4.20 fps
Flow Area.....	1.77 sf
Critical Depth....	1.06 ft
Critical Slope....	0.0070 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	7.43 cfs
QMAX @.94D.....	7.99 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: NORGE

Comment: STORM SEWER FROM 14 TO 15

Solve For Actual Depth

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0050 ft/ft
Manning's n.....	0.013
Discharge.....	5.07 cfs

Computed Results:

Depth.....	0.91 ft
Velocity.....	4.52 fps
Flow Area.....	1.12 sf
Critical Depth....	0.87 ft
Critical Slope....	0.0058 ft/ft
Percent Full.....	60.63 %
Full Capacity.....	7.43 cfs
QMAX @.94D.....	7.99 cfs
Froude Number.....	0.91 (flow is Subcritical)

Open Channel Flow Module, Version 3.41 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

GEOTECHNICAL ENGINEERING STUDY
NORGE CENTER FOOD LION STORE
JAMES CITY COUNTY, VIRGINIA

Prepared for

Michael Baker, Jr., Inc.

by

Combined Technologies, Inc.
510 Eastpark Court, Suite 120
Sandston, Virginia 23150

April, 1992

COMBINED TECHNOLOGIES, INC.

Suite 120
510 Eastpark Court
Sandston, Virginia 23150
Phone (804) 737-0076
FAX (804) 737-4932

April 30, 1992

Michael Baker Jr., Inc.
Ratcliffe Bldg., Suite 212
1602 Rolling Hills Drive
Richmond, Virginia 23229

Subject: Report of Geotechnical Engineering Study
Proposed Norge Center Food Lion Store
James City County, Virginia
CTI Project No. R-3300-92

Gentlemen:

We have completed a geotechnical study for proposed development of the Norge Center Food Lion store in James City County, Virginia. Our report of this study is attached. Since a considerable amount of detailed information is presented in the body of the report, the following brief abstract is given here for your convenience.

ABSTRACT OF THE REPORT

The subsurface conditions observed during the course of our geotechnical study are described as competent with respect to providing support to the proposed structure. The observed substrate is composed of sand with generally a loose consistency. We recommend a maximum bearing pressure of 2,500 pounds per square foot for design of foundations, and placement of foundations a minimum of 36 inches below finished grade to enhance stability and minimize settlement. A pavement section consisting of 2-1/2 inches of asphalt over 6 inches of stone base is recommended. A heavier section consisting of 8 inches of stone base, 2-1/2 inches of asphalt base, and 1-1/2 inches of asphalt surface is recommended in drive lanes and roadways utilized by trucks. These pavement sections reflect relatively high California Bearing Ratio values observed during laboratory analysis of the soils near the ground surface. An alternative section using a geotextile is provided due to the relatively sandy nature of the soils. Concrete approaches to relatively heavily loaded pavement areas, including dumpsters and loading docks, are also provided. Results of field percolation testing is presented.

Combined Technologies, Inc. appreciates the opportunity to be of service to you on this project. If we may be of further service as your project develops, please call us at your convenience.

Very truly yours,

COMBINED TECHNOLOGIES, INC.

Malcolm D. Barrett, P.E.
Project Engineer

COMMONWEALTH OF VIRGINIA
MDB
5/4/92
MALCOLM D. BARRETT
CERTIFICATE No.
016220
CERTIFIED PROFESSIONAL ENGINEER

John H. Brewer,Ph.D., P.E
Project Engineer

MDB/JHB/fih
3300-01.rep

1.0 INTRODUCTION

In accordance with our proposal and contract dated March 16, 1992, Combined Technologies, Inc. has completed a geotechnical engineering study for a Norge Center Food Lion store proposed for a site in James City County, Virginia. The site is located in the northern quadrant of the intersection of U.S. Route 60 and Norge Lane in James City County. The property is bounded on the east by the CSX railroad and on the south by a residential area. The site location is depicted on a Site Location map in the Appendix to this report.

The project will include a 31,762 square foot Food Lion store, a 6,720 square foot Rite Aid store, and approximately 10,000 square feet of retail shops. We understand construction will be one story slab on grade.

At the time of our geotechnical exploration services, the site was being used for agricultural purposes and was planted in rye. The purpose of this geotechnical report is to present recommendations with respect to foundations and earth structures for final design of the project.

2.0 SUBSURFACE EXPLORATION

Subsurface exploration of the site included visual reconnaissance of the site and performance of 11 test borings. In addition to the test borings, four hand auger borings were performed and percolation testing was performed in these hand auger borings. The borings were drilled at the approximate locations indicated on the Boring Location Plan, presented in the Appendix to this report. The test borings were located in the field using a tape, estimating right angles, and using existing structures as reference points. A reconnaissance of the site was performed by a member of CTI's engineering staff.

The soil borings were advanced with a drill rig mounted on a four wheel drive vehicle using hollow stem augers to advance the boreholes. Representative soil samples were obtained at selected intervals by means of the split barrel sampling procedure, ASTM D-1586. Soil samples were classified in the field and returned to our office for visual examination and reclassification.

The soil samples will be retained at the office of CTI for a period of 60 days after completion of our final report on the project, after which they will be discarded unless other instructions as to their disposition are received.

2.1 Subsurface Conditions

The site lies in the eastern coastal plain in an area geologically mapped as the Coastal Plain Physiographic Province of Virginia. The soils encountered in the test borings are typical of this geologic regime and are described as relatively loose, silty to clayey sands deposited in a marine environment.

surface was covered with approximately 12 inches of topsoil described as "silty SAND containing humus". Below this material, and extending to depths between 13 feet and depths below the base of the boreholes, material described as "loose to firm, damp, brown, SAND with varying concentrations of clay" was encountered. Standard Penetration Resistance values on the order of 4 to 9 blows per foot were observed in this soil layer. Below this strata in borings B-1 to B-5, soil generally described as "firm, moist, brown and gray sandy CLAY" exhibiting Standard Penetration Resistance values on the order of 9 blows per foot was encountered. Soils described as "loose, wet, brown, silty SAND" were encountered in the base of boreholes B-2 and B-4. Standard Penetration Resistance values on the order of 6 blows per foot were observed in this soil layer.

The test borings were monitored to obtain groundwater information during and after their completion. Groundwater was observed at depths between 14 and 18 feet below the ground surface in borings B-1 through B-5. Observed groundwater levels are well below the influence of proposed construction operations and are not expected to interfere with construction operations.

3.0 GEOTECHNICAL RECOMMENDATIONS

3.1 Site Preparation and Structural Backfill Installation

Initial site preparation should include stripping the construction area of all vegetation, topsoil, and otherwise unsuitable material. The upper 12 inches of material should be examined to assess the concentrations of organic material. Depending upon concentrations of organic material, this material may require stripping from the building area prior to commencement of construction operations. Following stripping operations, the site should be proofrolled to determine the location and extent of any soft zones in the subgrade. Such soft zones should be removed prior to installation of structural backfill. Following proofrolling operations, we recommend densification of the undisturbed soils using a heavy vibratory roller prior to installation of structural fill.

Following stripping and proofrolling, the site should be built up to the desired grade using clean structural backfill compacted to a minimum of 97 percent of the maximum dry density as determined by ASTM D-698 (the Standard Proctor) or equivalent. On site soils appear to be suitable for use as structural backfill. Moisture density relationship curves, in accordance with ASTM D-698, for soils sampled from the CBR borings, are included in the Appendix to this report.

Compacted soils should be tested during their installation to confirm the minimum compaction requirements. Fill pads should be installed in six to eight inch thick layers, or lifts. In-place density tests should be performed on each lift of fill placed. A minimum of one test per each 5,000 square feet of each lift area is recommended.

3.2 Foundation Support Recommendations

The proposed building will be supported on a system of strip and shallow spread foundation elements. Maximum and minimum column loads of 90 and 40 kips, respectively are anticipated. Strip loads, beneath bearing wall foundations, are not expected to exceed 4,000 pounds per square foot.

We recommend foundations for the proposed structure be proportioned to transfer maximum bearing pressures of 2,500 pounds per square foot to the supporting soils, and that foundations bear at a minimum depth of 3.0 feet below finished grades on naturally occurring soils below any fill installed on the site. Footing structures should have a least plan dimension of 36 inches to enhance stability. Foundation settlements of up to 1-1/4 inches should be anticipated with approximately 80 percent of this settlement occurring during the construction process. Differential settlements on the order of 1/2 to 3/4 inches should be anticipated over the extent of the project.

3.3 Pavement Section Recommendations

California Bearing Ratio testing was performed on remolded grab samples obtained from the borings designated CBR-1 and CBR-2. In each instance, a CBR value of 25 was determined. A minimum pavement section recommendation, based upon this CBR value and the anticipated usage of the parking lot, has been developed. This recommendation consists of 6 inches of stone base material conforming to VDOT No. 21 A Crushed Stone under 2-1/2 inches of asphalt concrete surface material. A pavement section consisting of 8 inches of VDOT size No. 21-A crushed stone under 5-1/2 inches of B-3 base material, and surfaced with 1-1/2 inches of S-5 surface is recommended in drive lanes, and roadways utilized by trucks. The long term performance of the pavement may be enhanced by placing a layer of geotextile between the stone and the relatively sandy subgrade. Selection of a geotextile should be based upon resistance to abrasion and ability to provide separation. A fabric similar to Amoco Product 2002 is recommended in the event a fabric is used.

Failure of pavements at approach areas to dumpsters and loading docks may be minimized through installation of concrete pavements in these areas. Concrete slabs should be installed over a 4 inch layer of load leveling stone conforming to the requirements of VDOT Size No. 57 building stone. We recommend a 6-inch slab reinforced with 10 ga., 10 by 10 welded wire fabric. A design compressive strength of 3,000 psi with 5 percent entrained air is recommended.

Prior to installation of base or load leveling stone, areas to be paved should be stripped and proofrolled as previously described in this report. The prepared subgrade should be built up to the desired grade using backfill compacted in accordance with the recommendations presented previously in this report, and contoured to assure water will not collect between the pavement and the subgrade. Base stone should be compacted to a minimum of 97 percent of the maximum

density as determined by ASTM D-698 (Standard Proctor) or equivalent. Asphaltic concrete should be installed in accordance with the specifications of the Virginia Department of Transportation.

3.4 Results of Field Percolation Testing

Field percolation tests were performed as part of the geotechnical reconnaissance at this site. Percolation tests locations are depicted on the boring location plan as Perc 1 and Perc 2. The percolation tests were performed in 3-1/2 inch hand auger borings. Two tests were performed at each location; one test in a 30 inch hole and one in a 60 inch hole. Soil profiles and test data from each set of percolation tests are presented below:

Percolation Test No. 1

Soil Profile: 30" Hole

0"-12"	Damp, brown, silty SAND with humus.
12"-24"	Damp, brown, fine SAND.
24"-30"	Moist, red-brown, SAND with clay.

Soil Profile: 60" Hole:

0"-12"	Damp, brown, silty SAND with humus.
12"-24"	Damp, brown, fine SAND.
24"-30"	Moist, red-brown, SAND with clay.
30"-60"	Moist, brown, fine SAND with silt.

Percolation Test Data:

Time (min)	Water Level (Depth from surface) 30" Hole*	60" Hole**
0	0"	0"
10	3"	12"
20	4"	19"
30	5"	20"
60	9"	29"
90	10.5"	31.5"
120	12"	36"
150	13"	38"
180	15.5"	39"

* 30" hole caved in @ 24".
** 60" hole caved in @ 48".

Percolation Test No. 2

Soil Profile: 30" Hole

0"-12"	Damp, brown, SAND with silt and humus.
12"-30"	Damp, brown, fine SAND.

Soil Profile: 60" Hole:

0"-12"	Damp, brown, fine SAND with silt and humus.
12"-48"	Damp, brown, fine SAND.
48"-60"	Damp, brown, SAND with clay.

Percolation Test Data:

Time (min)	Water Level (Depth from surface) 30" Hole*	60" Hole**
0	0"	0"
30	9.5"	19.5"
60	17"	24"
90	19"	27.5"
120	21.5"	28"
150	24"	29"

* 30" hole remained open.
** 60" hole caved in @ 40".

4.0 GENERAL COMMENTS

This report has been prepared for the purpose of providing foundation design and construction recommendations for the proposed Norge Center Food Lion in James City County, Virginia. The information and recommendations reported herein are presented to assist the architect/engineer in the layout and design of the project. The General Conditions included in the Appendix of this report are an integral part of this report.

APPENDIX

General Conditions

Site Map and Boring Location Plan

Boring Logs B-1 through B-9, CBR-1, CBR-2

Notes to Boring Logs

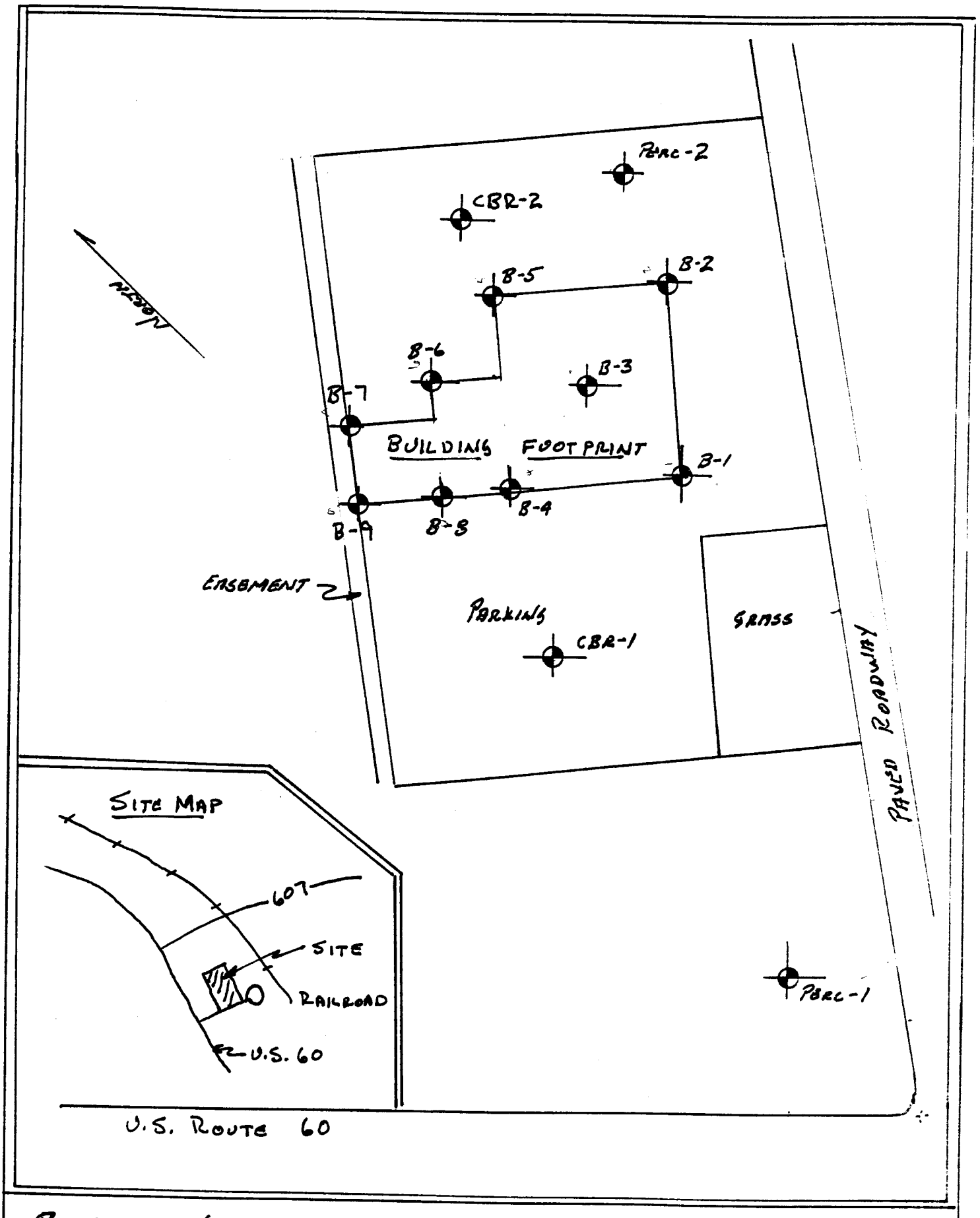
Summary of Laboratory Test Results

GENERAL CONDITIONS

The analysis, conclusions and recommendations submitted in this report are based on the evaluation previously outlined and the data was collected at the points shown on the attached location plan. This report does not reflect specific variations that may occur between test locations. The borings were located where site conditions permitted and where it is believed that representative conditions occur but the full nature and extent of variations between borings and of subsurface conditions not encountered by any boring may not become evident until the course of construction. If variations become evident at any time before or during the course of construction it will be necessary to make a re-evaluation of the conclusions and recommendations of this report and further exploration, observation and/or testing may be required.

This report has been prepared in accordance with generally accepted soil and foundation engineering practices and makes no other warranties, either expressed or implied, as to the professional advice under the terms of our agreement and included in this report. The recommendations contained herein are made with the understanding that the contract documents between the owner and foundation or earthwork contractor; or between the owner and the general contractor and between the general contractor and the caisson, foundation, excavating and earthwork subcontractors, if any, shall require that the contractor certify that all work in connection with foundations, piles, caissons, compacted fills and other elements of the foundation or other support components are in place at the locations, with proper dimensions and plumb, as shown on the plans and specifications for this project. Further, that the contractor shall certify that the materials used are of the types, quantity and quality required by the plans and specifications for the project.

Further, it is understood that the contract documents will specify that the contractor will, upon becoming aware of apparent or latent subsurface conditions differing from those disclosed by the original soil investigation work, promptly notify the owner, both verbally to permit immediate verification of the change and in writing, as to the nature and extent of the differing conditions and that no claim by the contractor for any conditions differing from those anticipated in the plans and specifications and disclosed by the soil studies will be allowed under the contract unless the contractor has so notified the owner both verbally and in writing, as required above, of such changed conditions. The owner will, in turn, promptly notify this firm of the existence of such unanticipated conditions and will authorize such further investigation as may be required to properly evaluate these conditions.



PROPOSED NORGE CENTER FOOD LION - JAMES CITY COUNTY, VA
SITE MAP & BORING LOCATION PLAN - NOT TO SCALE
MALCOLM D. BARRETT, P.E. 4/30/92

Proposed Norge Center Food Lion
James City County, Virginia
CTI Job No. R-3300-92

BORING LOG

PROJECT: Norge Center Food Lion Store	TOTAL DEPTH 20.0 ft.	ELEVATION **	BORING B-1

SIZE & BIT	JOB NO.	WATER LEVEL DATA	DATE STARTED
6" Cutter Head	R-3300-92	Observed @ 18.0 ft.	April 14, 1992
DRILLING METHOD	DRILLER		DATE COMPLETED
Hollow Stem Auger	J. Ayers		April 14, 1992

DEPTH in FEET	CLASSIFICATION	SAMPLE NUMBER	FROM TO	BLOWS per FOOT*	REMARKS
1.0	Damp, brown, silty SAND with humus.	1	0.5′		
			1.5′	5	
		2	2.5′		
	Loose to firm, damp, brown SAND with clay.		3.5′	5	
5		3	4.5′		
			5.5′	6	
		4	7.5′		
			8.5′	7	
		5	9.5′		
10			10.5′	14	
13.0					
	Firm, damp to wet, brown, SAND.	6	14.5′		
15			15.5′	13	
			10.0′		
20		7	20.0′	7	
	Boring terminated @ 20.0 ft.				
25					
30					
35					

* ASTM 1586 ** Datum site survey

Proposed Norge Center Food Lion
James City County, Virginia
CTI Job No. R-3300-92

BORING LOG

PROJECT: Norge Center Food Lion Store			TOTAL DEPTH 20.0 ft.	ELEVATION **	BORING B-2
SIZE & BIT 6" Cutter Head	JOB NO. R-3300-92	WATER LEVEL DATA Water observed @ 16.0'.		DATE STARTED April 14, 1992	
DRILLING METHOD Hollow Stem Auger	DRILLER J. Ayers			DATE COMPLETED April 14, 1992	

DEPTH in FEET	CLASSIFICATION	SAMPLE NUMBER	FROM TO	BLOWS per FOOT*	REMARKS
1.0	Damp, brown, silty SAND with with humus.	1	0.5' 1.5'	4	
	Loose to firm, damp, brown SAND with silt.	2	2.5' 3.5'	3	
5		3	4.5' 5.5'	9	
		4	7.5' 8.5'	9	
10		5	9.5' 10.5'	13	
13.0	Firm, moist, gray, silty SAND.	6	14.5' 15.5'	10	
15					
18.0	Loose, wet, brown, silty SAND.		10.0'	5	
20	Boring terminated @ 20.0 ft.	7	20.0'		
25					
30					
35					

* ASTM 1586 ** Datum site survey

Proposed Norge Center Food Lion
James City County, Virginia
CTI Job No. R-3300-92

BORING LOG

PROJECT: Norge Center Food Lion Store			TOTAL DEPTH 20.0 ft.	ELEVATION	BORING B-3
SIZE & BIT 6" Cutter Head	JOB NO. R-3300-92	WATER LEVEL DATA Water observed @ 14.0'.		DATE STARTED April 14, 1992	
DRILLING METHOD Hollow Stem Auger	DRILLER J. Ayers			DATE COMPLETED April 14, 1992	

DEPTH in FEET	CLASSIFICATION	SAMPLE NUMBER	FROM TO	BLOWS per FOOT*	REMARKS
	Damp, brown, silty SAND with humus.	1	0.5' 1.5'	7	
	Loose, damp, brown, SAND with clay.	2	2.5' 3.5'	5	
5		3	4.5' 5.5'	6	
		4	7.5' 8.5'	11	
10		5	9.5' 10.5'	9	
	Loose, moist, gray, clayey SAND.	6	14.5' 15.5'	4	
15					
20		7	10.0' 20.0'	8	
	Boring terminated @ 20.0 ft.				
25					
30					
35					

* ASTM 1586 ** Datum site survey

Proposed Norge Center Food Lion
James City County, Virginia
CTI Job No. R-3300-92

BORING LOG

PROJECT: Norge Center Food Lion Store	TOTAL DEPTH 20.0 ft.	ELEVATION	BORING B-4
SIZE & BIT 6" Cutter Head	JOB NO. R-3300-92	WATER LEVEL DATA Water observed @ 18.0'.	DATE STARTED April 14, 1992
DRILLING METHOD Hollow Stem Auger	DRILLER J. Ayers		DATE COMPLETED April 14, 1992

DEPTH in FEET	CLASSIFICATION	SAMPLE NUMBER	FROM TO	BLOWS per FOOT*	REMARKS
	Damp, brown, silty SAND with humus.	1	0.5' 1.5'	6	
	Loose, moist, brown, SAND with clay.	2	2.5' 3.5'	8	
5		3	4.5' 5.5'	8	
		4	7.5' 8.5'	9	
10		5	9.5' 10.5'	9	
15	Firm, moist, brown and gray mottled, sandy CLAY.	6	14.5' 15.5'	10	
20	Loose, wet, brown, SAND with silt.	7	10.0' 20.0'	5	
	Boring terminated @ 20.0 ft.				
25					
30					
35					

* ASTM 1586 ** Datum site survey

Proposed Norge Center Food Lion
James City County, Virginia
CTI Job No. R-3300-92

BORING LOG

PROJECT: Norge Center Food Lion Store	TOTAL DEPTH 20.0 ft.	ELEVATION **	BORING B-5

SIZE & BIT	JOB NO.	WATER LEVEL DATA	DATE STARTED
6" Cutter Head	R-3300-92	Water observed @ 20.0′.	April 14, 1992
DRILLING METHOD	DRILLER		DATE COMPLETED
Hollow Stem Auger	J. Ayers		April 14, 1992

DEPTH in FEET	CLASSIFICATION	SAMPLE NUMBER	FROM TO	BLOWS per FOOT*	REMARKS
	Moist, brown, silty SAND with humus.	1	0.5′ 1.5′	5	
	Loose, damp, brown, SAND with clay.	2	2.5′ 3.5′	3	
5		3	4.5′ 5.5′	7	
		4	7.5′ 8.5′	9	
10		5	9.5′ 10.5′	9	
	Stiff to firm, moist, brown and gray, sandy CLAY.	6	14.5′ 15.5′	10	
15					
20		7	10.0′ 20.0′	5	
	Boring terminated @ 20.0 ft.				
25					
30					
35					

* ASTM 1586 ** Datum site survey

Proposed Norge Center Food Lion
James City County, Virginia
CTI Job No. R-3300-92

BORING LOG

PROJECT: Norge Center Food Lion Store	TOTAL DEPTH 15.0 ft.	ELEVATION **	BORING B-6
SIZE & BIT 6" Cutter Head	JOB NO. R-3300-92	WATER LEVEL DATA No water encountered.	DATE STARTED April 14, 1992
DRILLING METHOD Hollow Stem Auger	DRILLER J. Ayers		DATE COMPLETED April 14, 1992

DEPTH in FEET	CLASSIFICATION	SAMPLE NUMBER	FROM TO	BLOWS per FOOT*	REMARKS
	Damp, brown, silty SAND with humus.	1	0.5′ 1.5′	7	
		2	2.5′ 3.5′	4	
5	Loose to firm, damp, brown SAND with clay.	3	4.5′ 5.5′	5	
		4	7.5′ 8.5′	7	
10		5	9.5′ 10.5′	10	
			14.0′		
15		6	15.0′	9	
	Boring terminated @ 15.0 ft.				
20					
25					
30					
35					

* ASTM 1586 ** Datum site survey

Proposed Norge Center Food Lion
James City County, Virginia
CTI Job No. R-3300-92

BORING LOG

PROJECT: Norge Center Food Lion Store			TOTAL DEPTH 15.0 ft.	ELEVATION **	BORING B-7
SIZE & BIT 6" Cutter Head	JOB NO. R-3300-92	WATER LEVEL DATA No water encountered.		DATE STARTED April 14, 1992	
DRILLING METHOD Hollow Stem Auger	DRILLER J. Ayers			DATE COMPLETED April 14, 1992	

DEPTH in FEET	CLASSIFICATION	SAMPLE NUMBER	FROM TO	BLOWS per FOOT*	REMARKS
	Damp, brown, silty SAND with humus.	1	0.5′ 1.5′	6	
		2	2.5′ 3.5′	4	
5	Loose, moist, brown, SAND with clay.	3	4.5′ 5.5′	7	
		4	7.5′ 8.5′	9	
10		5	9.5′ 10.5′	8	
15		6	14.0′ 15.0′	7	
	Boring terminated @ 15.0 ft.				
20					
25					
30					
35					

* ASTM 1586 ** Datum site survey

Proposed Norge Center Food Lion
James City County, Virginia
CTI Job No. R-3300-92

BORING LOG

PROJECT: Norge Center Food Lion Store	TOTAL DEPTH 15.0 ft.	ELEVATION **	BORING B-8

SIZE & BIT	JOB NO.	WATER LEVEL DATA	DATE STARTED
6" Cutter Head	R-3300-92	No water encountered.	April 14, 1992
DRILLING METHOD	**DRILLER**		**DATE COMPLETED**
Hollow Stem Auger	J. Ayers		April 14, 1992

DEPTH in FEET	CLASSIFICATION	SAMPLE NUMBER	FROM TO	BLOWS per FOOT*	REMARKS
	Damp, brown silty SAND with humus.	1	0.5′ 1.5′	5	
	Loose, damp, brown SAND with CLAY.	2	2.5′ 3.5′	3	
5		3	4.5′ 5.5′	5	
		4	7.5′ 8.5′	8	
10		5	9.5′ 10.5′	5	
15		6	14.0′ 15.0′	6	
	Boring terminated @ 15.0 ft.				
20					
25					
30					
35					

* ASTM 1586 ** Datum site survey

Proposed Norge Center Food Lion
James City County, Virginia
CTI Job No. R-3300-92

BORING LOG

PROJECT: Norge Center Food Lion Store	TOTAL DEPTH 15.0 ft.	ELEVATION **	BORING B-9

SIZE & BIT	JOB NO.	WATER LEVEL DATA	DATE STARTED
6" Cutter Head	R-3300-92	No water encountered.	April 14, 1992
DRILLING METHOD	**DRILLER**		**DATE COMPLETED**
Hollow Stem Auger	J. Ayers		April 14, 1992

DEPTH in FEET	CLASSIFICATION	SAMPLE NUMBER	FROM TO	BLOWS per FOOT*	REMARKS
	Damp, brown, silty SAND with humus.	1	0.5′ 1.5′	6	
		2	2.5′ 3.5′	4	
5	Loose, damp, brown, SAND with clay.	3	4.5′ 5.5′	5	
	Loose to firm, damp, gray SAND.	4	7.5′ 8.5′	8	
10		5	9.5′ 10.5′	9	
15		6	14.0′ 15.0′	10	
	Boring terminated @ 15.0 ft.				
20					
25					
30					
35					

* ASTM 1586 ** Datum site survey

Proposed Norge Center Food Lion
James City County, Virginia
CTI Job No. R-3300-92

BORING LOG

PROJECT: Norge Center Food Lion Store	TOTAL DEPTH 5.0 ft.	ELEVATION **	BORING CBR-2

SIZE & BIT	JOB NO.	WATER LEVEL DATA	DATE STARTED
6" Cutter Head	R-3300-92	No water encountered.	April 14, 1992
DRILLING METHOD	DRILLER		DATE COMPLETED
Hollow Stem Auger	J. Ayers		April 14, 1992

DEPTH in FEET	CLASSIFICATION	SAMPLE NUMBER	FROM TO	BLOWS per FOOT*	REMARKS
	Damp, brown, silty SAND with humus.	1	0.5′ 1.5′	8	
		2	2.5′ 3.5′	6	
5	Loose, damp, brown, clayey SAND.	3	4.0′ 5.0′	9	
	Boring terminated @ 5.0 ft.				
10					
15					
20					
25					
30					
35					

* ASTM 1586 ** Datum site survey

Proposed Norge Center Food Lion
James City County, Virginia
CTI Job No. R-3300-92

BORING LOG

PROJECT: Norge Center Food Lion Store	TOTAL DEPTH 5.0 ft.	ELEVATION **	BORING CBR-1
SIZE & BIT 6" Cutter Head	JOB NO. R-3300-92	WATER LEVEL DATA No water encountered.	DATE STARTED April 14, 1992
DRILLING METHOD Hollow Stem Auger	DRILLER J. Ayers		DATE COMPLETED April 14, 1992

DEPTH in FEET	CLASSIFICATION	SAMPLE NUMBER	FROM TO	BLOWS per FOOT*	REMARKS
	Damp, brown, silty SAND with humus.	1	0.5′ 1.5′	6	
		2	2.5′ 3.5′	6	
5	Loose, damp, brown, SAND with clay.	3	4.0′ 5.0′	6	
	Boring terminated @ 5.0 ft.				
10					
15					
20					
25					
30					
35					

* ASTM 1586 ** Datum site survey

COMBINED TECHNOLOGIES, INC.

NOTES

GRADATION DESCRIPTION & TERMINOLOGY:

Coarse Grained or Granular soils have more than 50% of their dry weight retained on a #200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained soils have less than 50% of their dry weight retained on a #200 sieve; they are described as: clays or clayey silts if they are cohesive and silts if they are non-cohesive. In addition to gradation, granular soils are defined on the basis of their relative in-place density and fine grained soils on the basis of their strength or consistency and their plasticity.

Major Component Of Sample	Size Range	Descriptive Term Of Components Also Present in Sample	Percent Of Dry Weight
Boulders	Over 8 in. (200 mm)	Trace	1 - 9
Cobbles	8 inches to 3 inches (200 mm to 75 mm)	Little	10 - 19
Gravel	3 inches to #4 sieve (75 mm to 4.76 mm)	Some	20 - 34
Sand	#4 to #200 sieve (4.76 mm to 0.074 mm)	And	35 - 50
Silt	Passing #200 sieve (0.074 mm to 0.005 mm)		
Clay	Smaller than 0.005 mm		

CONSISTENCY OF COHESIVE SOILS:

Unconfined Compressive Strength Qu, tsf	Consistency
<0.25	Very Soft
0.25 - 0.49	Soft
0.30 - 0.99	Medium (Firm)
1.00 - 1.99	Stiff
2.00 - 3.99	Very Stiff
4.00 - 8.00	Hard
>8.00	Very Hard

CORRELATION OF PENETRATION RESISTANCE WITH RELATIVE DENSITY AND CONSISTENCY

	NO. OF BLOWS, N	RELATIVE DENSITY
SANDS	0-3	VERY LOOSE
	4-9	LOOSE
	10-19	FIRM
	20-29	VERY FIRM
	30-50	DENSE
	OVER 50	VERY DENSE
		CONSISTENCY
SILTS AND CLAYS	0-2	VERY SOFT
	3-4	SOFT
	5-8	FIRM
	9-15	STIFF
	16-30	VERY STIFF
	30-50	HARD
	OVER 50	VERY HARD

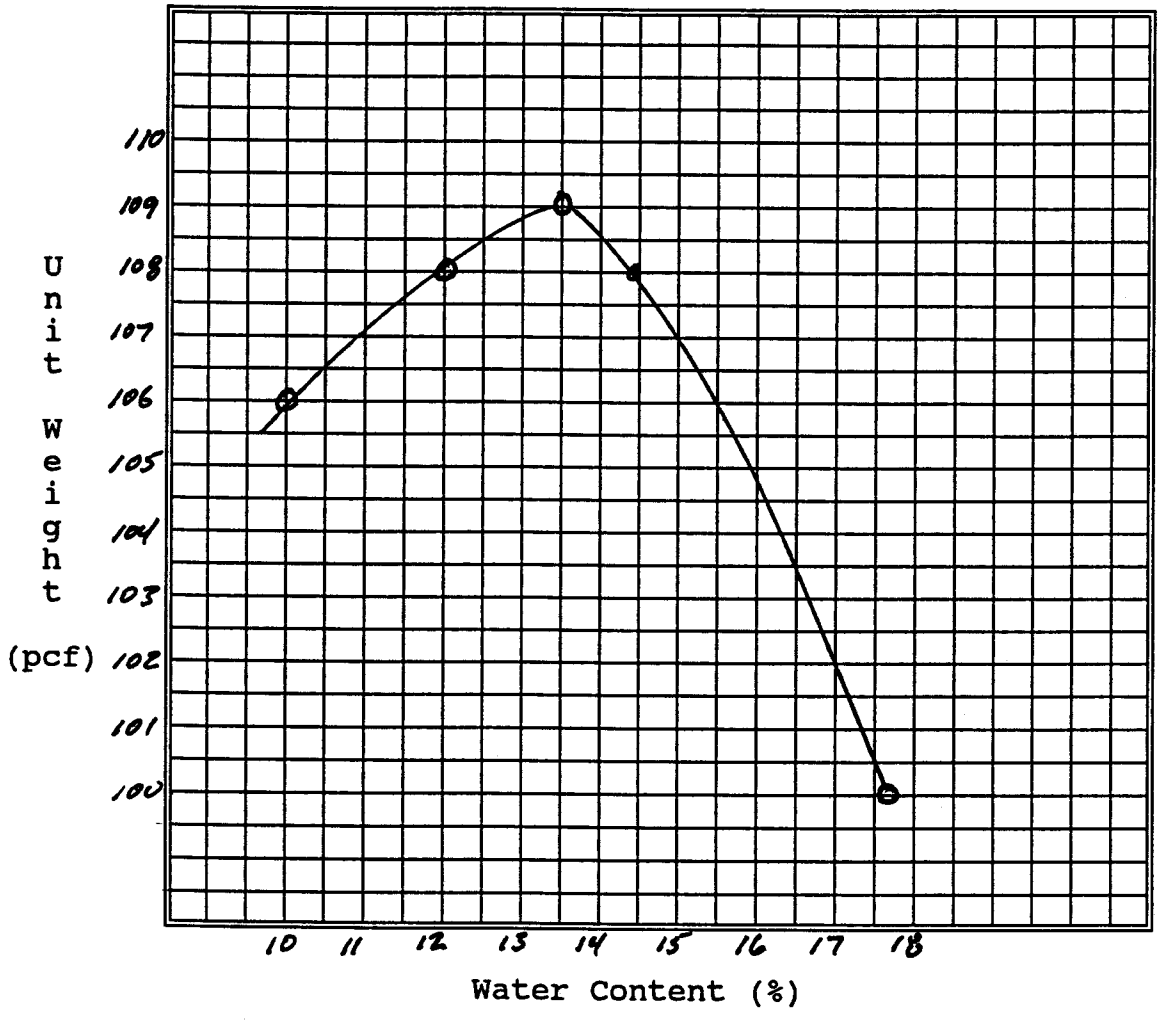
DRILLING PROCEDURES

Soil sampling and penetration testing performed in accordance with ASTM D 1586. The standard penetration resistance is the number of blows of a 140 pound hammer falling 30 inches to drive a 2 inch O.D. 1.4 inch I.D. split spoon sampler one foot. Core drilling in accordance with ASTM designation D 2113-70. The undisturbed sampling procedure is described by ASTM specification D 1587.

MOISTURE DENSITY (Proctor) CURVE ASTM D-698

Borrow Site: NORGE CENTER FOOD LION - CBR-1

Soil Description: _____



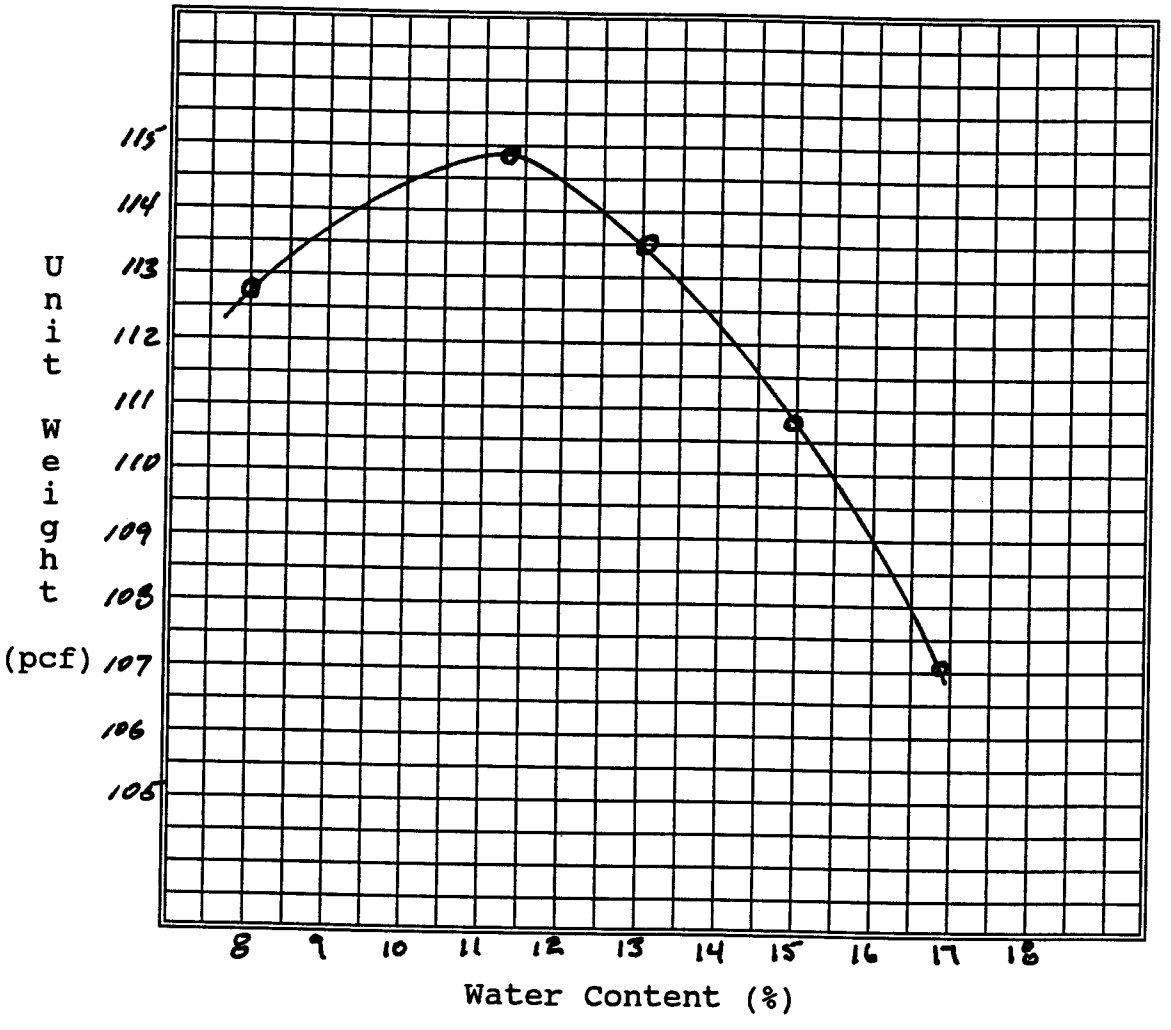
Optimum Moisture Content: 13.5 %

Maximum Dry Density: 108.8 pcf

MOISTURE DENSITY (Proctor) CURVE ASTM-D-698

Borrow Site: NORGE CENTER FOOD LION CBR-2

Soil Description: _____



Optimum Moisture Content: 11.6 %

Maximum Dry Density: 114.9 pcf

NORGE COMMERCIAL CENTER INFILTRATION TRENCH #1 (YR011)

Input Parameters

Site Area	6.670 Acres
Area served by BMP(%)	100.00
Effective Area of Site	6.670 Acres
Impervious Cover Pre(%)	16.00
Impervious Cover Post(%)	60.00
Development Type	New Development
Average Annual Rainfall(Inches)	44.0

Output Values

Pre -Development Pollutant Load	10.19 Lbs/Yr (0.9 Lbs/Ac/Yr Crop)
Post-Development Pollutant Load	15.93 Lbs/Yr
Required Removal Efficiency(%)	36.03

NORGE COMMERCIAL CENTER INFILTRATION TRENCH #2 (YC023)

Input Parameters

Site Area	4.070 Acres
Area served by BMP(%)	100.00
Effective Area of Site	4.070 Acres
Impervious Cover Pre(%)	16.00
Impervious Cover Post(%)	60.00
Development Type	New Development
Average Annual Rainfall(Inches)	44.0

Output Values

Pre -Development Pollutant Load	3.66 Lbs/Yr (0.9 Lbs/Ac/Yr Crop)
Post-Development Pollutant Load	5.73 Lbs/Yr
Required Removal Efficiency(%)	36.07

Valid BMP's

BMP TYPE		BMP Points	Removal Efficiency(%)
Infiltration Trench	(0.5 IN/AC)	9	(50- 70)
	(1.0 IN/AC)	10	
Infiltration Basin	(0.5 IN/AC)	9	(50- 70)
	(1.0 IN/AC)	10	

NORGE COMMERCIAL CENTER INFILTRATION TRENCH #1 (YR011)

Feasibility Input Parameters

Infiltration Rate(In/Hr): 5.00 *
Maximum Allowable Storage Time of Trench(Hrs): 72
Void Ratio Trench Medium: 0.40
Depth to Seasonal High Groundwater Table(Ft): >15.00
Min. Dist. from Trench bottom to Groundwater Table(Ft): 2.00

Maximum Trench Depth(Ft): 13.00

Design Input Parameters

Increase in Runoff Depth(In): 1.00
Contributing Drainage Area(Sq Ft): 174327
Depth of Trench(Ft): 6.00

Trench Area(Sq Ft): 6158

NORGE COMMERCIAL CENTER INFILTRATION TRENCH #2 (YC023)

Feasibility Input Parameters

Infiltration Rate(In/Hr): 3.50 *
Maximum Allowable Storage Time of Trench(Hrs): 72
Void Ratio Trench Medium: 0.40
Depth to Seasonal High Groundwater Table(Ft): 15.00
Dist. from Trench bottom to Groundwater Table(Ft): 2.00

m Trench Depth(Ft): 13.00

Design Input Parameters

Increase in Runoff Depth(In): 1.00
Contributing Drainage Area(Sq Ft): 106374
Depth of Trench(Ft): 7.00

Trench Area(Sq Ft): 3289

SUMMARY OF POINTS

BMP#1 = 1.0 IN/IMP. AC = 10 POINTS x 0.74% OF SITE = 7.40 POINTS
BMP#2 = 1.0 IN/IMP. AC = 10 POINTS x 0.26% OF SITE = 2.60 POINTS
TOTAL POINTS 10.00 POINTS

* NOTE: SEE GEOTECHNICAL REPORT BY COMBINED TECHNOLOGIES, INC. DATED APRIL, 1992.

SWM FA

BASIN 1 (Y

PRE
POST
ROUTED
WS. ELEV.
STORAGE

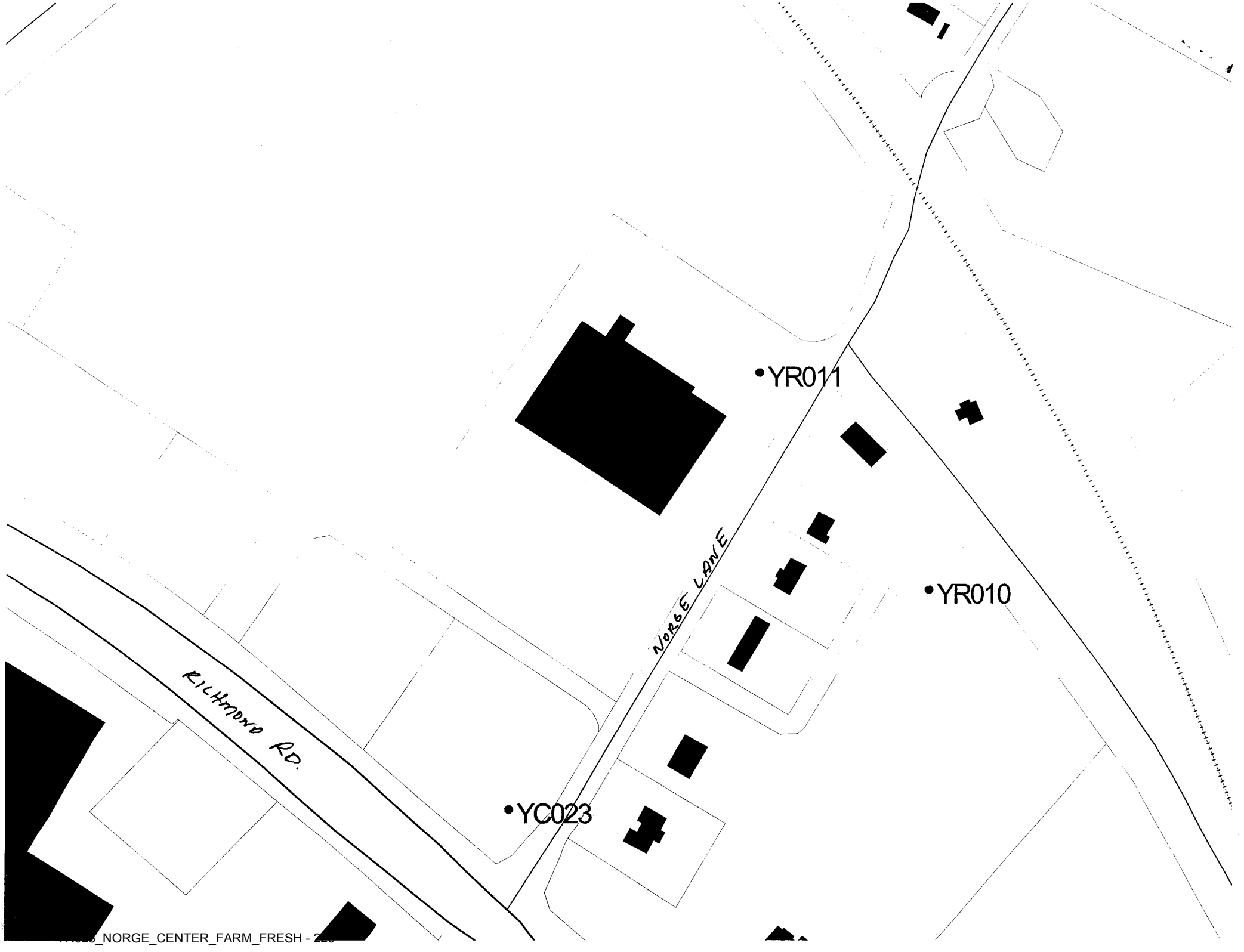
BASIN 2 (Y

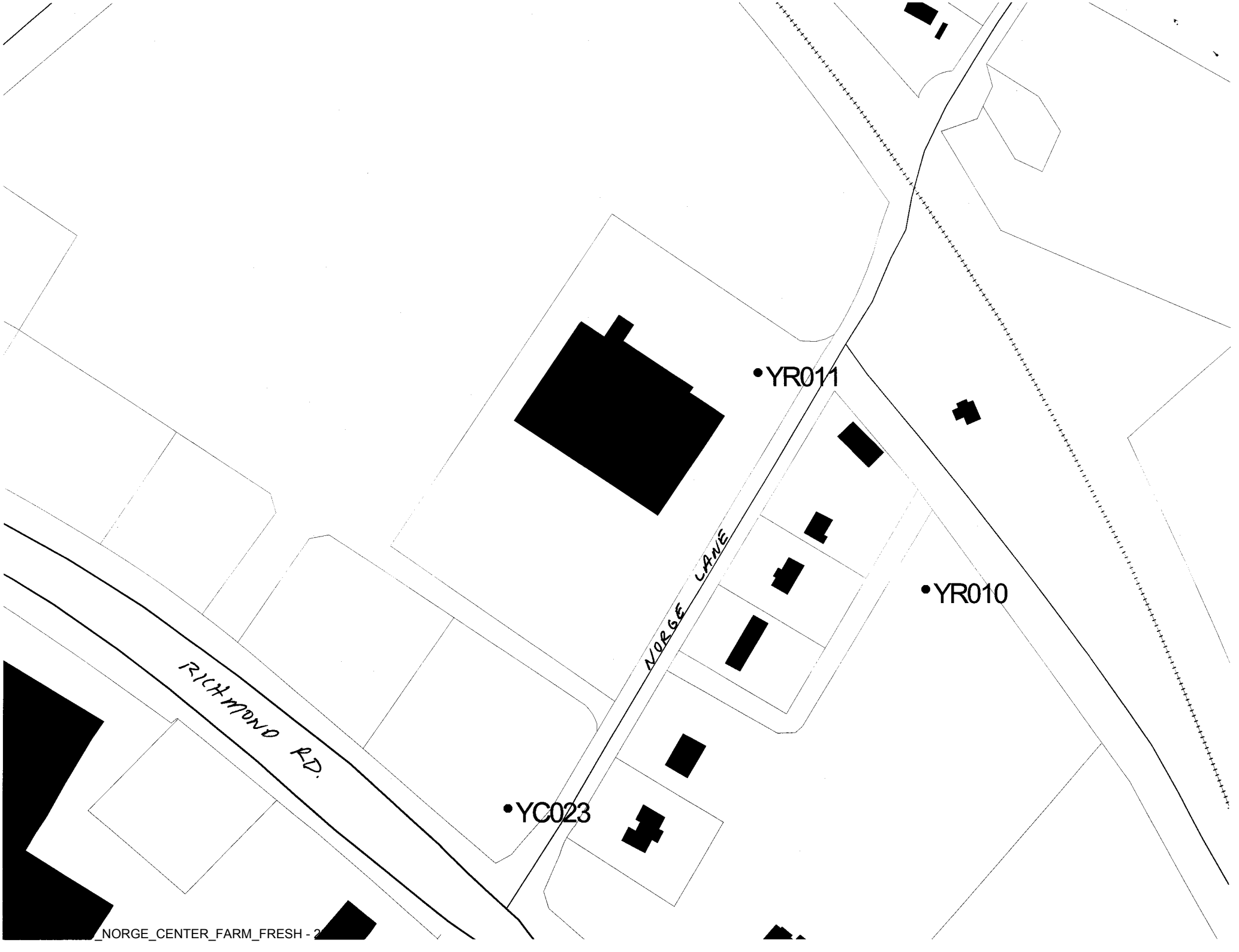
PRE
POST
ROUTED
WS. ELEV.
STORAGE

WATERSHED	YC	MAINTENANCE PLAN	No	CTRL STRUC DESC	RCP Riser
BMP ID NO	023	SITE AREA acre	4.07	CTRL STRUC SIZE inches	36
PLAN NO	Unknown	LAND USE	Gen Business	OTLT BARRL DESC	RCP Barrel
TAX PARCEL	(23-2)(01-71E)	old BMP TYP	Infiltration Trench	OTLT BARRL SIZE inch	15 (6"
PIN NO	2320100071E	JCC BMP CODE			
CONSTRUCTION DATE	1/1/1993	POINT VALUE	10	EMERG SPILLWAY	No
PROJECT NAME	Norge Shopping Center			DESIGN HW ELEV	110.9
FACILITY LOCATION	BMP # 2-7500 Richmond Road			PERM POOL ELEV	na
CITY-STATE	Williamsburg, Va. 23168	SVC DRAIN AREA acres	4.07	2-YR OUTFLOW cfs	5.50
CURRENT OWNER	Norge Center, Inc.			10-YR OUTFLOW cfs	7.26
OWNER ADDRESS	3900 Cokes Lane			REC DRAWING	Yes
OWNER ADDRESS 2		SERVICE AREA DESCRI	Frontage Road & Outparcels		
CITY-STATE-ZIP CODE	Williamsburg, Va. 23188	IMPERV AREA acres	2.44	CONSTR CERTI	No
OWNER PHONE		RECV STREAM	UT of Yarmouth Creek		
MAINT AGREEMENT	Yes	EXT DET-WQ-CTRL	Yes	LAST INSP DATE	11/1/2000
EMERG ACTION PLAN	No	WTR QUAL VOL acre-ft	0	INTERNAL RATING	4
		CHAN PROT CTRL	No	MISC/COMMENTS	
		CHAN PROT VOL acre-ft	0	Infil trench w/ DI-7 box. Parcel 1 at Rich Rd. F=3.5 in/hr. Also see YR 011.	
		SW/FLOOD CONTROL	Yes		
		GEOTECH REPORT	Yes		

Get Last BMP No

Return to Menu


YR011
YR010
YC023
NORGE LANE
RICHMOND RD.


YR011
YR010
YC023
NORGE LANE
RICHMOND RD.

THE SHOPS @ BARN'S NORTH
4250 FT

YC023 EA #1?

AREA	
I	0.46
II	0.72
III	0.37
IV	0.44
X? V ?	0.84
VI	0.17
VII	0.17
VIII	0.21
XV	3.38
	6.78

grading
outlet pipe
riprap
making
sparks