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: **JR052**

DATE VERIFIED: **June 26, 2012**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

MEMORANDUM

DATE: March 11, 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: JR052

PIN: 3630100019

Subdivision, Tract, Business or Owner Name (if known): Williamsburg National

Property Description: Golf Course

Site Address:

(For internal use only) **Box** 14 **Drawer:** 7

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

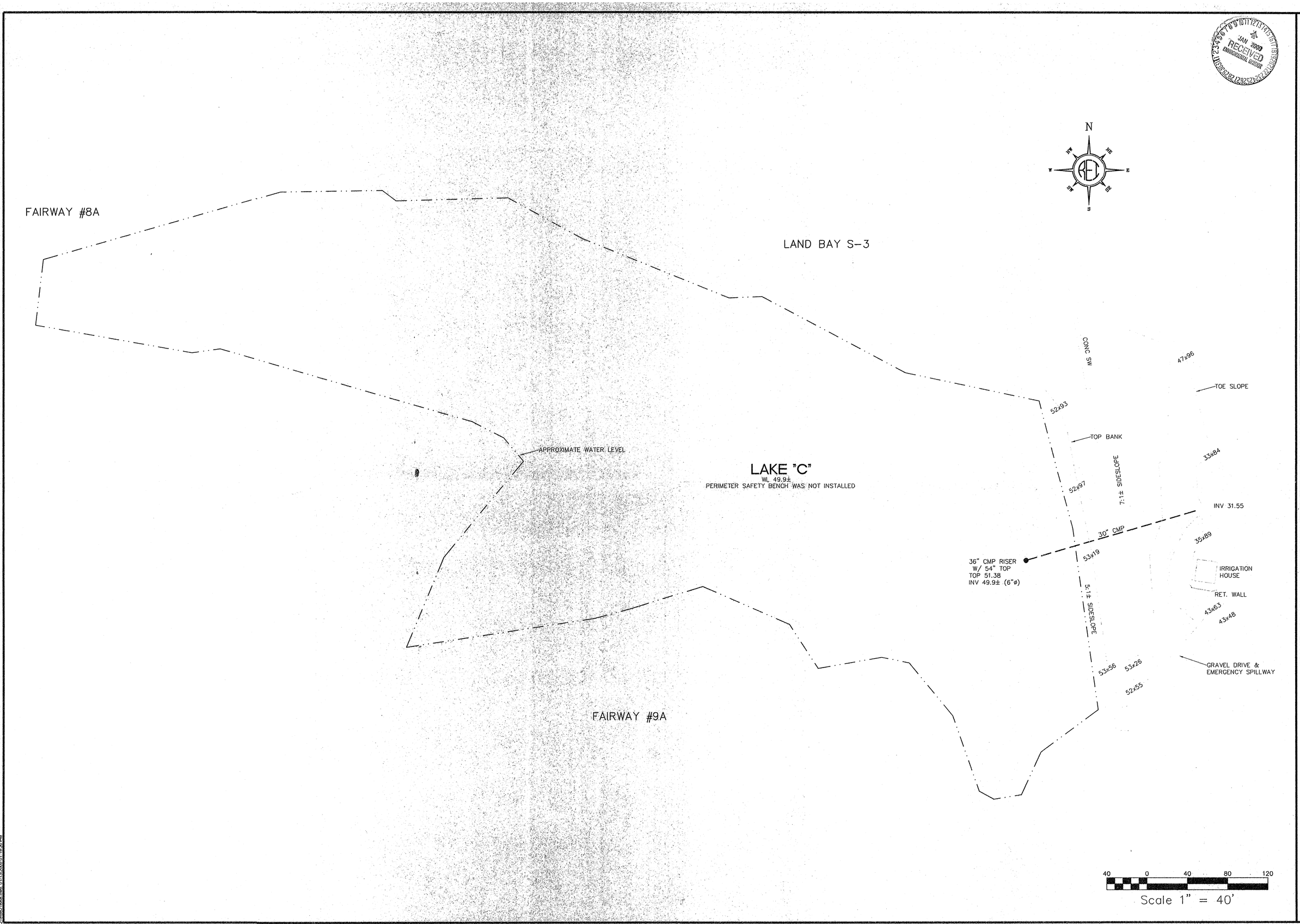
Comments
Parcel C Legacy Golf Links @ Greensprings West

JR-052

Contents for Stormwater Management Facilities As-built Files

Each file is to contain:

1. As-built plan
2. Completed construction certification
3. Construction Plan
4. Design Calculations
5. Watershed Map
6. Maintenance Agreement
7. Correspondence with owners
8. Inspection Records
9. Enforcement Actions



JAN 2000
RECEIVED
ENVIRONMENTAL DIVISION

Rickmond Engineering, Inc.

1643 Merrimac Trail
Williamsburg, VA 23185
Voice: (757)229-1776
Fax No. (757) 229-4683

Engineering
Surveying
Land Planning
www.rickmond.com

Designed By:	Drawn By:	Scale:	Date:	Job No.:
KMJ	KMJ	1" = 40'	12/8/98	98218

COMMONWEALTH OF VIRGINIA
Kevin M. Jones II
No. 022872
PROFESSIONAL ENGINEER

No.	By	Revision	App.	Date
1	KMJ	REV PER COUNTY COMMENTS TELECON 1/4/00	KMJ	1/6/00

GREENSPRINGS PLANTATION RETENTION PONDS

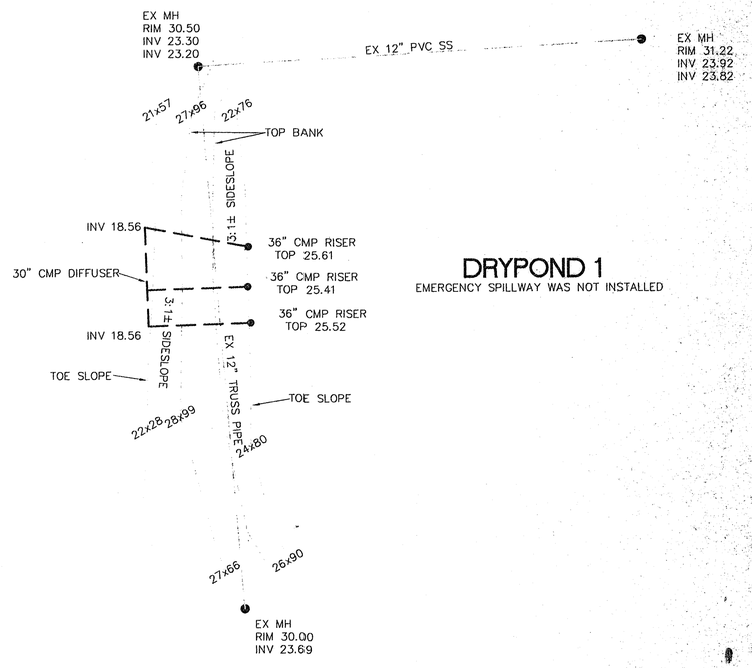
RECORD DRAWINGS

JAMES CITY COUNTY VIRGINIA

Job Number	Sheet No.
98218	C1

JR052_GREENSPRING_LEGACY_GOLF_COURSE - 004

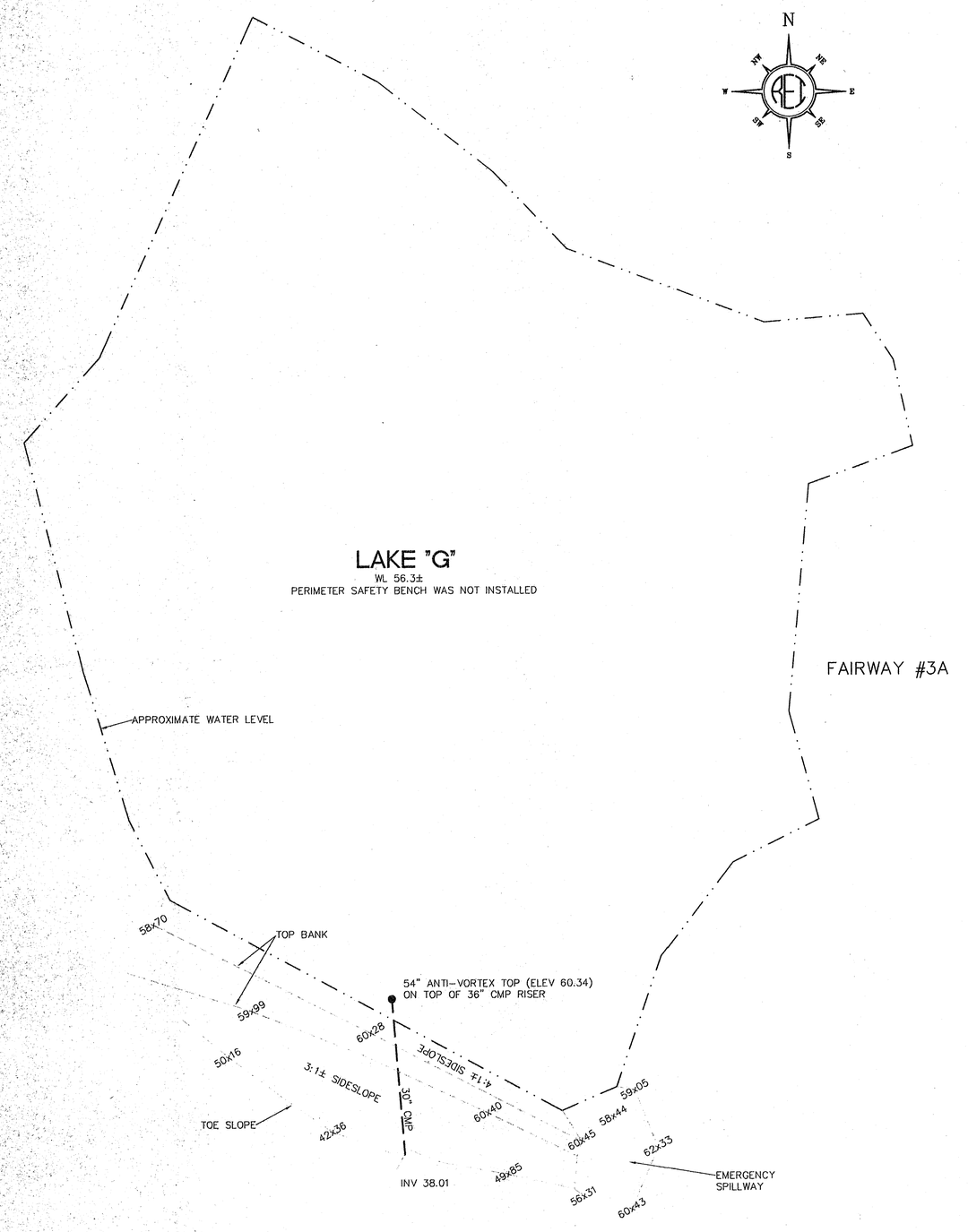
GREENSPRINGS PLANTATION RESORT TIMESHARES



DRYPOND 1

EMERGENCY SPILLWAY WAS NOT INSTALLED

LAND BAY S-3



LAKE "G"

WL 56.3±

PERIMETER SAFETY BENCH WAS NOT INSTALLED

FAIRWAY #3A

40 0 40 80 120

Scale 1" = 40'

40 0 40 80 120

Scale 1" = 40'

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Williamsburg, VA 23185
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Fax No. (757) 229-4683

Designed By:	Drawn By:	Scale:	Date:	Job No.:
KMJ	KMJ	1" = 40'	12/8/98	98218

COMMONWEALTH OF VIRGINIA
KM JENKINS II
No. 022672
PROFESSIONAL ENGINEER

No.	By	Revision	Date
1	KMJ	REV PER COUNTY COMMENTS TELECON 1/4/00	1/6/00

GREENSPRINGS PLANTATION RETENTION PONDS

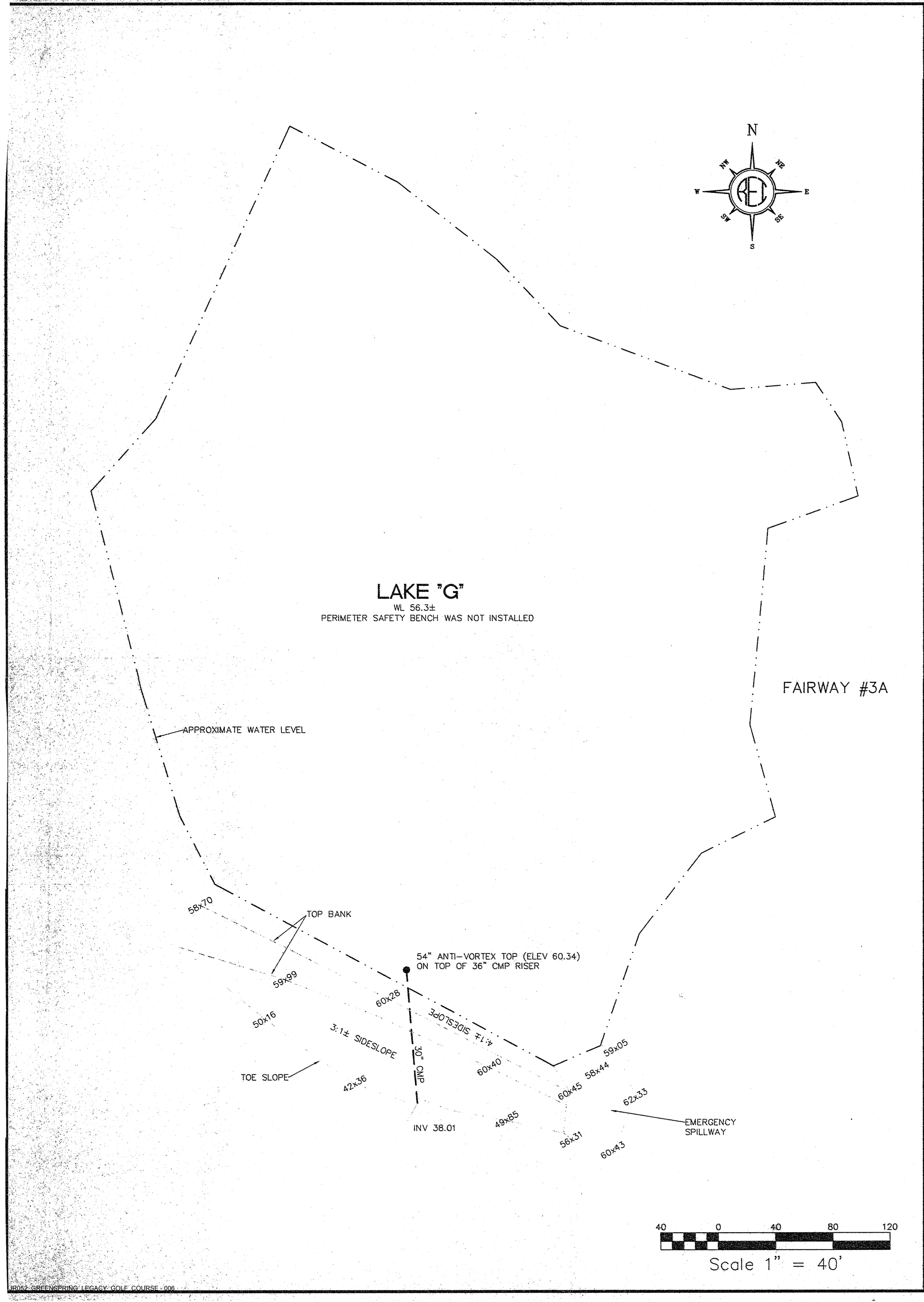
RECORD DRAWINGS

JAMES CITY COUNTY VIRGINIA

Job Number	Sheet No.
98218	C2

1:\98218\98218AB.dwg, 01/13/2000 01:18:27 PM

JR052_GREENSPRING_LEGACY_GOLF_COURSE - 005



JR052 GREENSPRING LEGACY GOLF COURSE - 006

Rickmond Engineering, Inc.

1643 Merrimac Trail
Williamsburg VA 23185
Voice: (757)229-1776
Fax No. (757) 229-4683

Engineering
Surveying
Land Planning
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Designed By:	Drawn By:	Scale:	Date:	Job No.:
KMJ	KMJ	1" = 40'	12/8/98	98218

COMMONWEALTH OF VIRGINIA
K.M. JENKINS II
No. 022872
PROFESSIONAL ENGINEER

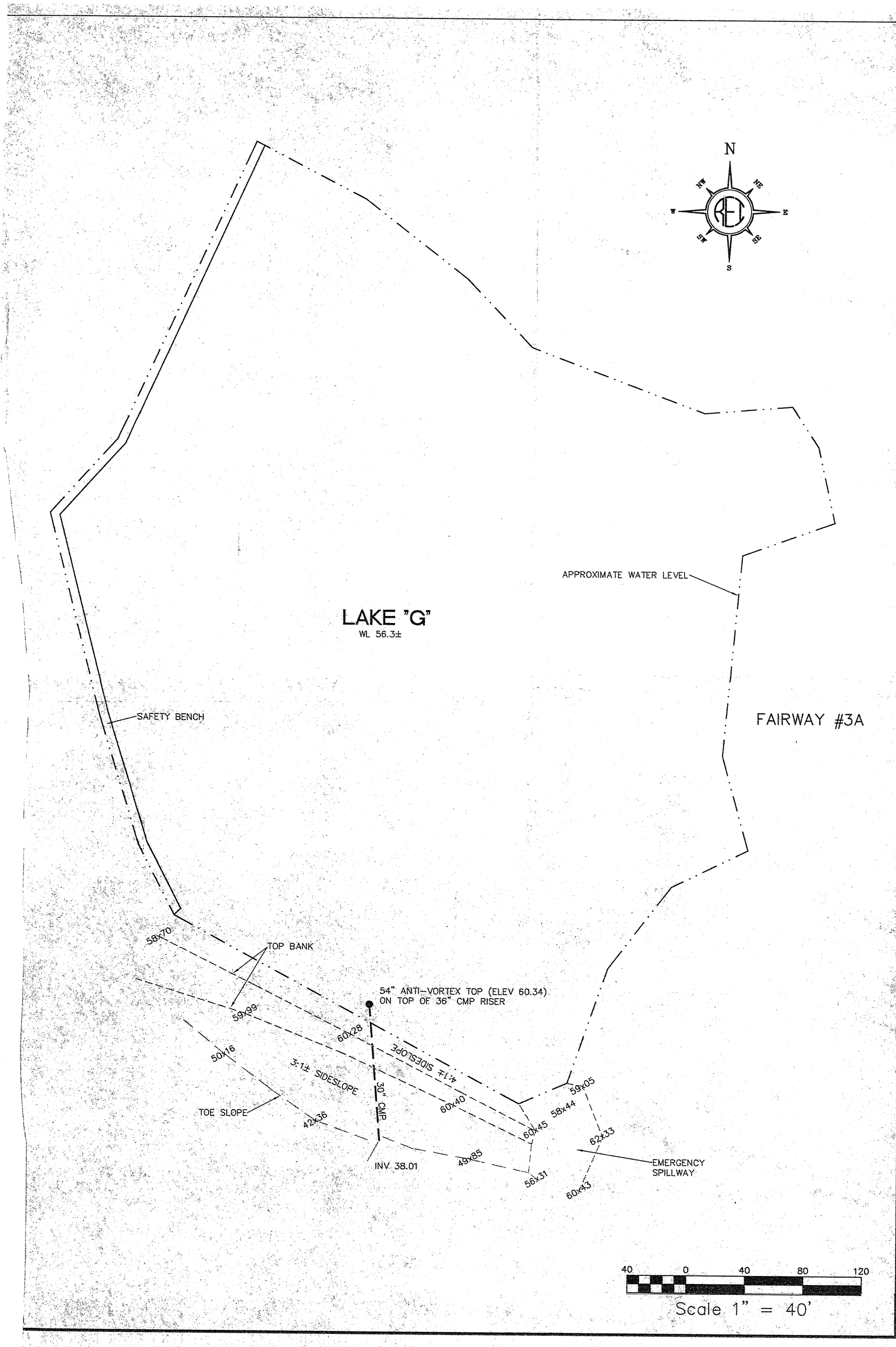
No.	By	Revision	App.	Date
1	KMJ	REV PER COUNTY COMMENTS TELECON 1/4/00	KMJ	1/6/00

GREENSPRINGS PLANTATION RETENTION PONDS

RECORD DRAWINGS

JAMES CITY COUNTY VIRGINIA

Job Number	Sheet No.
98218	C2



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Engineering
Surveying
Land Planning
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Designed By:	Drawn By:	Scale:	Date:	Job No.:
KMJ	KMJ	1" = 40'	12/8/98	98218

COMMONWEALTH OF VIRGINIA
K.M. JENKINS II
No. 022872
PROFESSIONAL ENGINEER
2/4/99

No.	By	Revision	App.	Date
1	KMJ	REV PER COUNTY COMMENTS TELECON 1/4/00	KMJ	1/6/00

GREENSPRINGS PLANTATION RETENTION PONDS

RECORD DRAWINGS

JAMES CITY COUNTY VIRGINIA

Job Number	Sheet No.
98218	C2

JR 052

GOLF COURSE CORRIDOR (TYP.)

CONSTRUCTION LI

3-1

3-4

3-2

GRADE 3:1 TO BOTTOM

55.0

45.0

(TYP.)

SEDIMENT BASIN

BORING LOCATION

EXISTING VEGETATION

3-3

INLET PROTECTION (TYP.)

IP

3-15

3-16

SB

Lake "G" 53.0

LAKE "G"
NORMAL POOL
ELEV. = 55.0 FT.
6' VEGETATIVE BENCH
THEN GRADE 3:1 TO
BOTTOM

DAM DESIGN
SEE DETAIL

FIELD STONE WALL
(5' ABOVE WL)

EMERGENCY SPILLWAY
APPROX. 1 FOOT BELOW
TOP OF EMBANKMENT TO BE
LOCATED ON NATURAL GROUND

3-14

3-13

3-11

3-12

6' VEGETATIVE SAFETY BENCH

WETLANDS,
NOT FLAGGED

NOTES

2. SIZE SHAPES AND NUMBERS OF SAND BUNKERS ARE CONCEPTUAL AND SUBJECT TO SHIFTS AND CHANGES.

100' 0' 50' 100' 200' 300'

LEGAC

COMMONWEALTH OF VIRGINIA

1.	6/30/92	AS PER COUNTY COMMENTS
2.	4-8-93	LAKE "G" - PIPE
3.	5-10-93	REMOVE BRIDGE DESIGN

DRAWN BY:

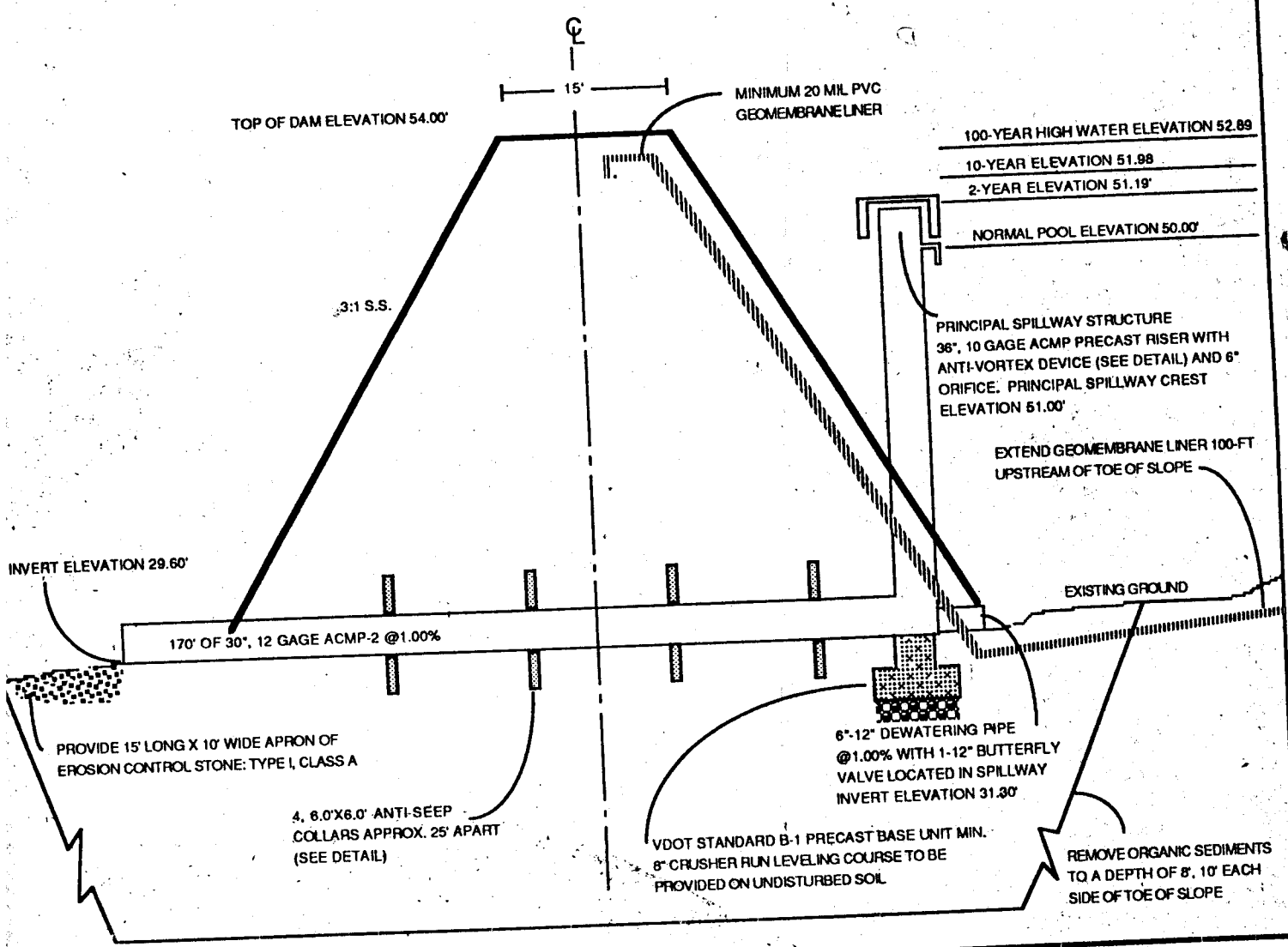
DATE: 4/8/

SHEET

JR052 GREENSPRING LEGACY GOLF COURSE - 008

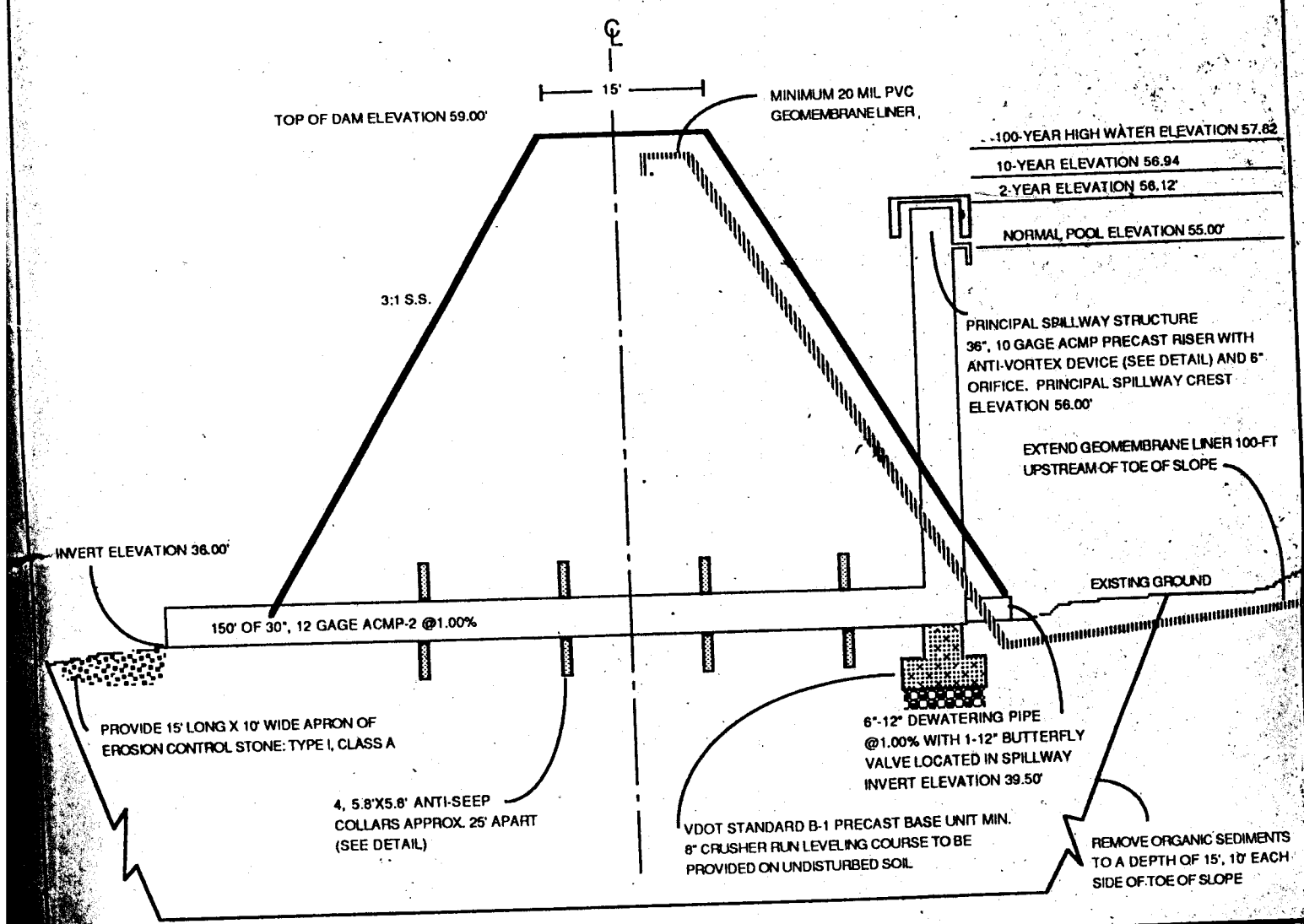
DAM CROSS-SECTION
LAKE C

1"=15' HORIZ.
1"=5' VERT.

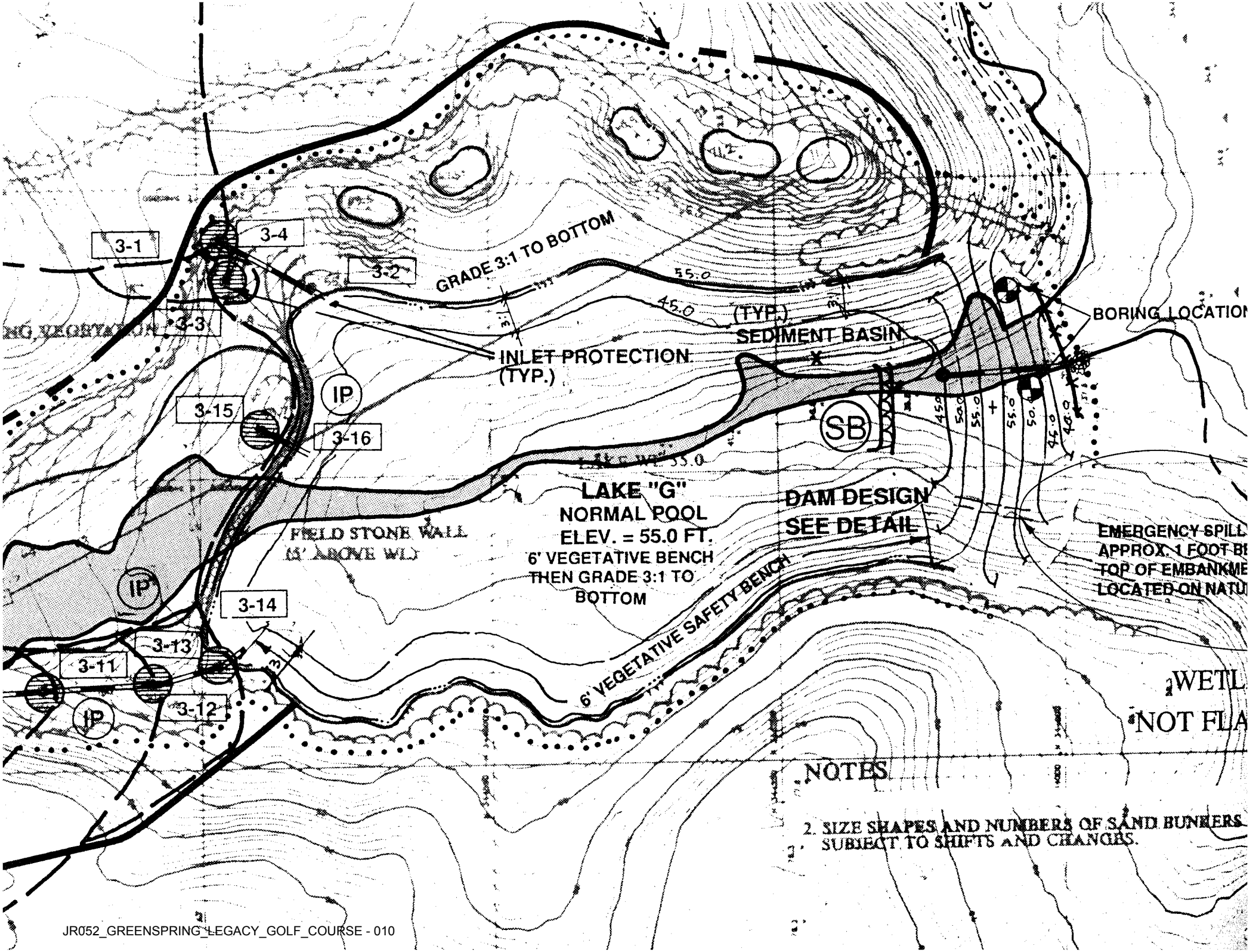


DAM CROSS-SECTION
LAKE G

1"=15' HORIZ.
1"=5' VERT.



[illegible]E AND BMP SPECIFICATIONS: CORRUGATED STEEL PIPE SHALL BE MANUFACTURED IN [illegible]ORDANCE WITH ASTM A760 (AASHTO M36). COATING SHALL BE ALUMINIZED TYPE 2 [illegible]FORMING TO ASTM A819 (AASHTO M274). PIPE SHALL HAVE A MINIMUM OF TWO [illegible]TORY ROLLED ANNULAR CORRUGATIONS AT EACH END. PIPE MAY BE ASPHALT COATED IN [illegible]CCORDANCE WITH AASHTO M190 OR EQUIVALENT. CONNECTING BANDS SHALL BE FURNISHED [illegible]WITH HUGGER RINGS WITH O-RING GASKETS OR FLAT GASKETS.


3-1
3-4
3-2
3-3
3-15
3-16
3-14
3-13
3-11
3-12
IP
IP
IP
SB
GRADE 3:1 TO BOTTOM
55.0
45.0
(TYP.)
SEDIMENT BASIN
INLET PROTECTION
(TYP.)
BORING LOCATION
LAKE "G"
NORMAL POOL
ELEV. = 55.0 FT.
6' VEGETATIVE BENCH
THEN GRADE 3:1 TO
BOTTOM
DAM DESIGN
SEE DETAIL
FIELD STONE WALL
15' ABOVE WL
6' VEGETATIVE SAFETY BENCH
EMERGENCY SPILL
APPROX. 1 FOOT BE
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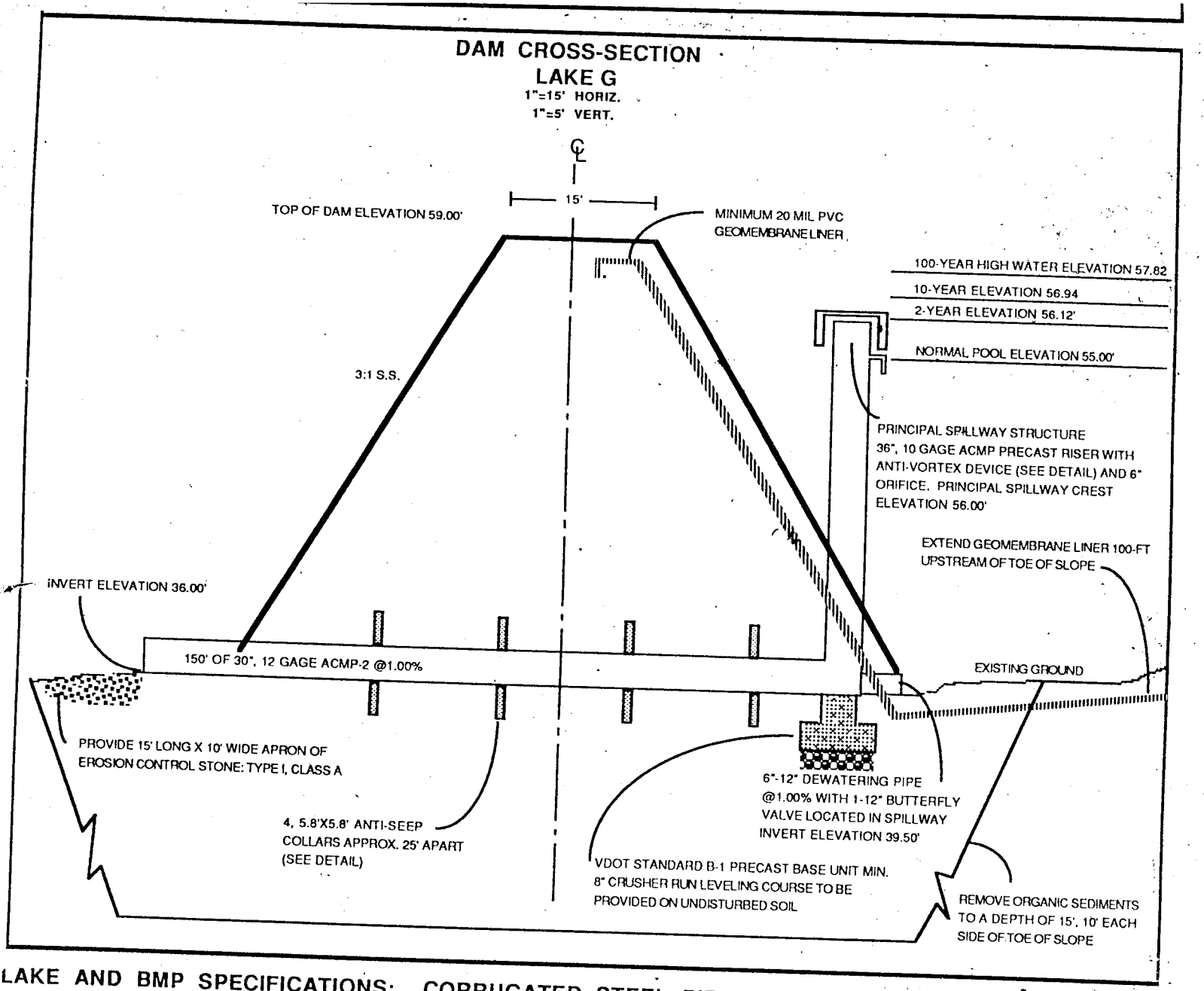
NOTES
2. SIZE SHAPES AND NUMBERS OF SAND BUNKERS
SUBJECT TO SHIFTS AND CHANGES.



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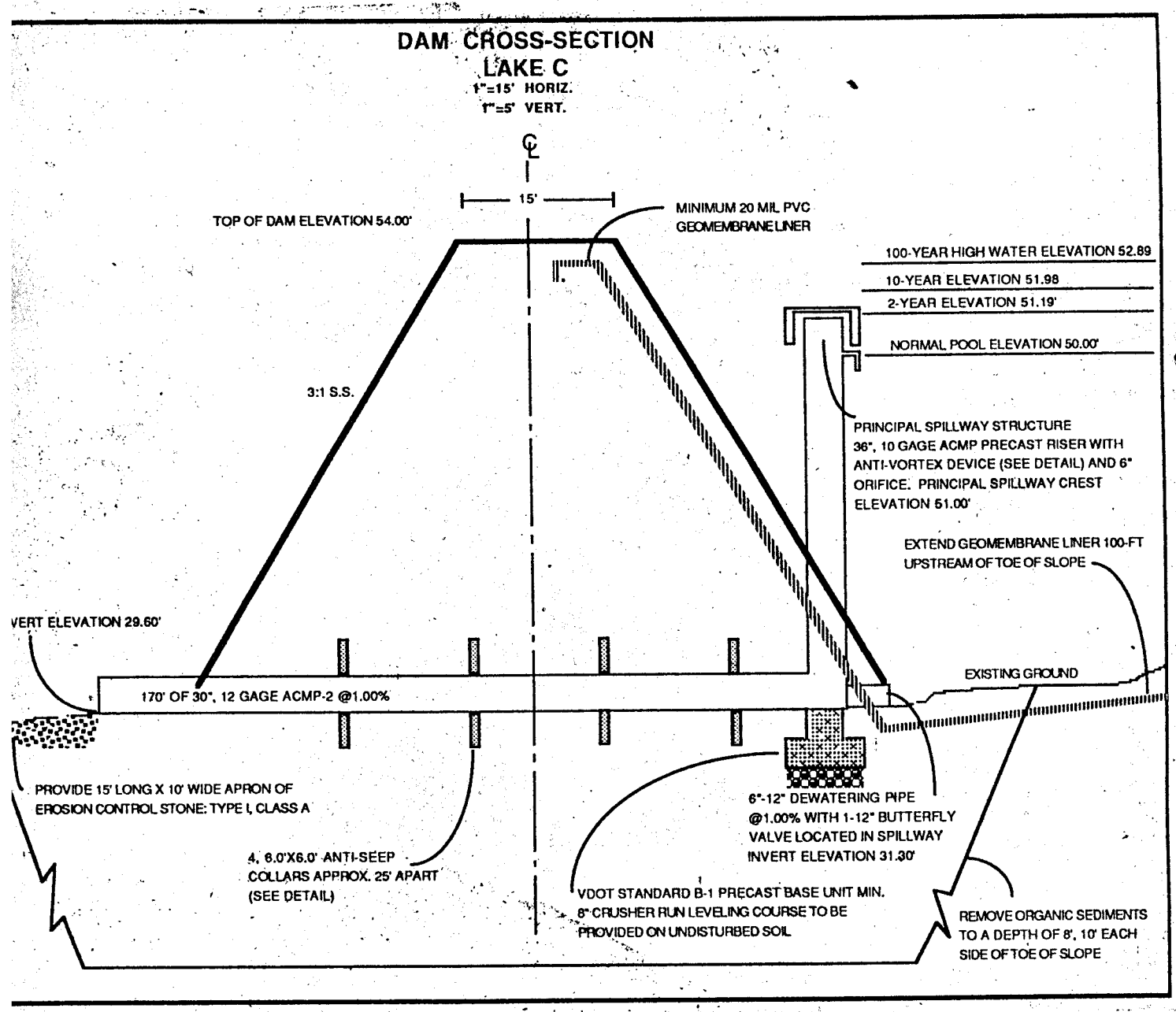
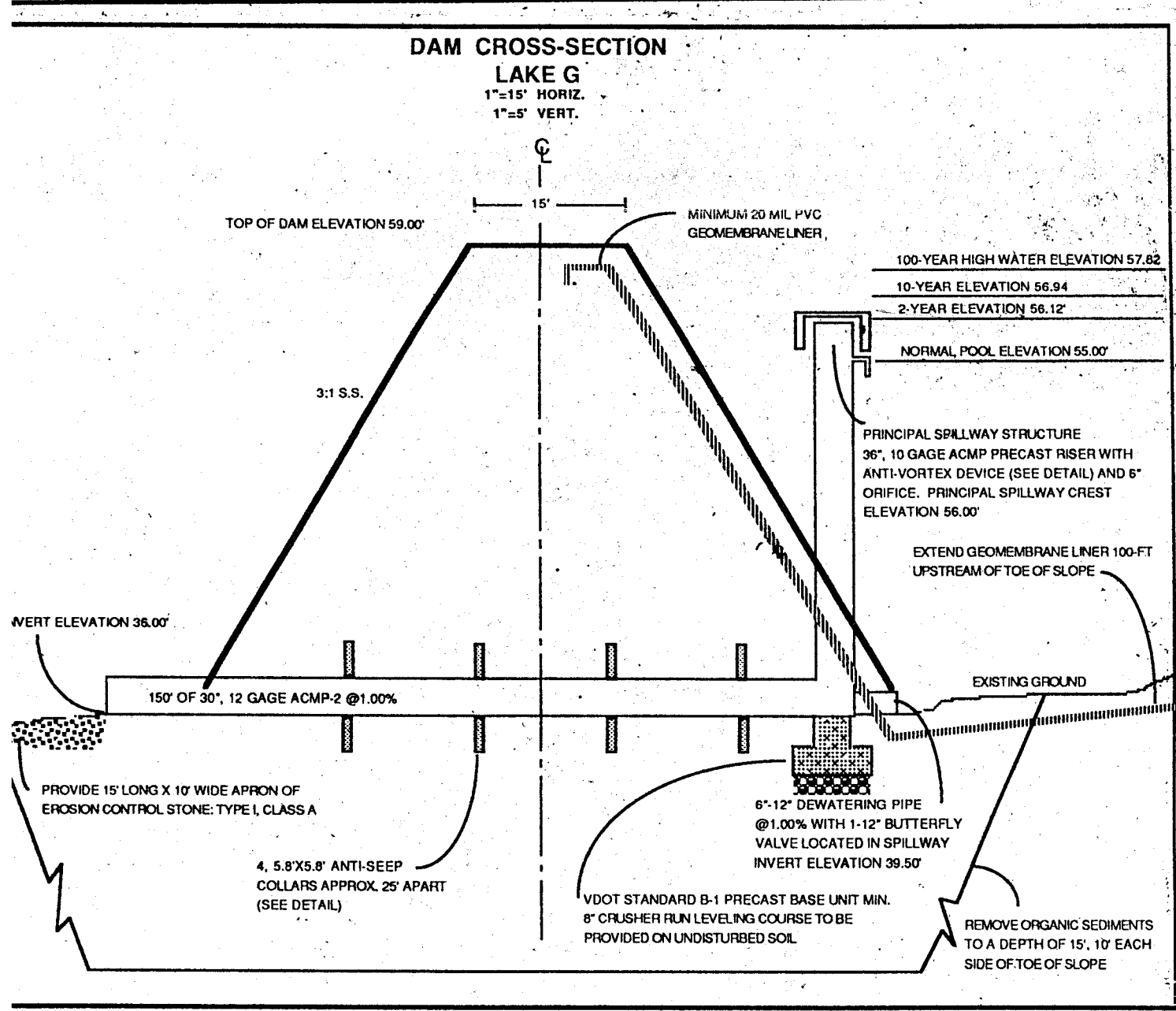
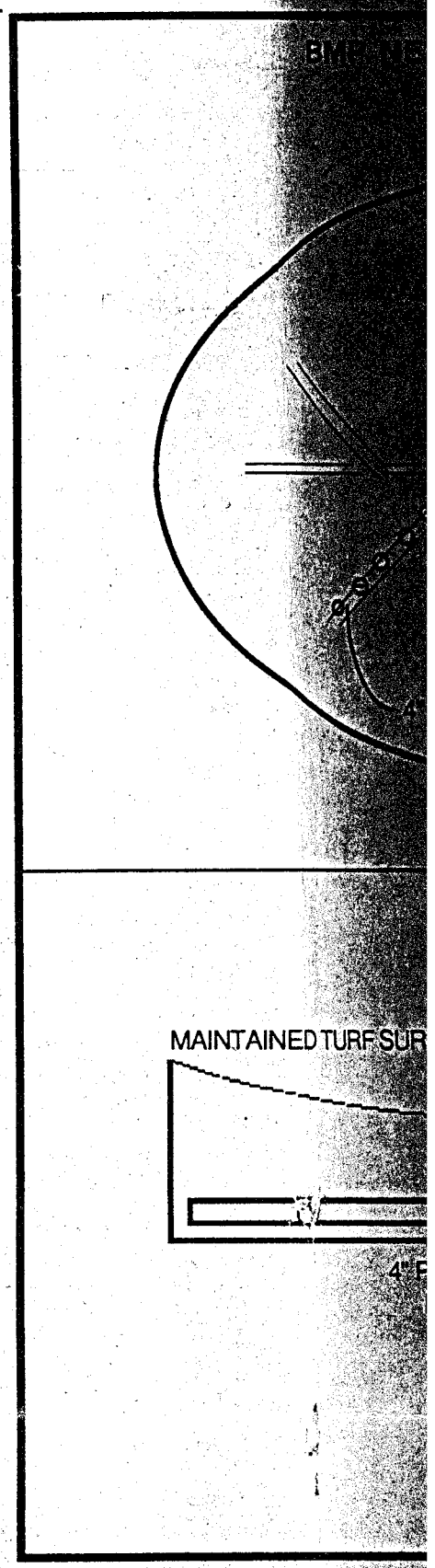
TRASH PROTECTION FOR 6 INCH







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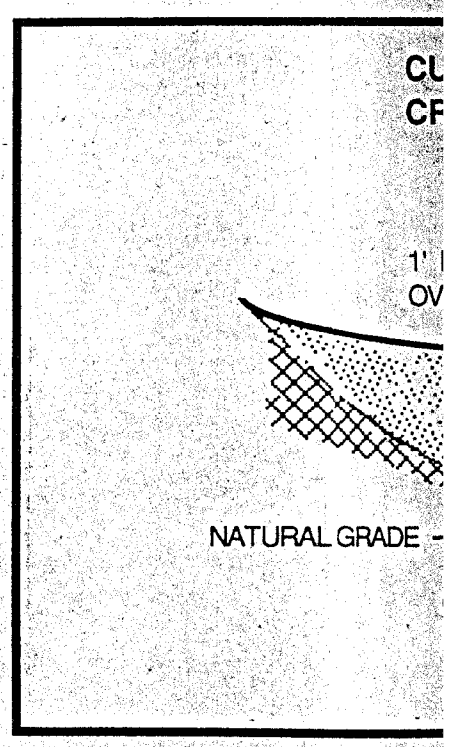

:E AND BMP SPECIFICATIONS: CORRUGATED STEEL PIPE SHALL BE MANUFACTURED IN CORDANCE WITH ASTM A760 (AASHTO M36). COATING SHALL BE ALUMINIZED TYPE 2 NFORMING TO ASTM A819 (AASHTO M274). PIPE SHALL HAVE A MINIMUM OF TWO CTORY ROLLED ANNULAR CORRUGATIONS AT EACH END. PIPE MAY BE ASPHALT COATED IN CORDANCE WITH AASHTO M190 OR EQUIVALENT. CONNECTING BANDS SHALL BE FURNISHED H HUGGER RINGS WITH O-RING GASKETS OR FLAT GASKETS.

ASH PROTECTION FOR 6 INCH IFICE PROVIDED BY SUBMERGED ET. ELBOW IN PIPE ESTABLISHES RMAL POOL ELEVATION WHILE INTAINING APPROXIMATELY 1 OT OF COVERAGE TO AVOID OGGING.

ANTI-

install collar wit
corrugations verti

Continuous
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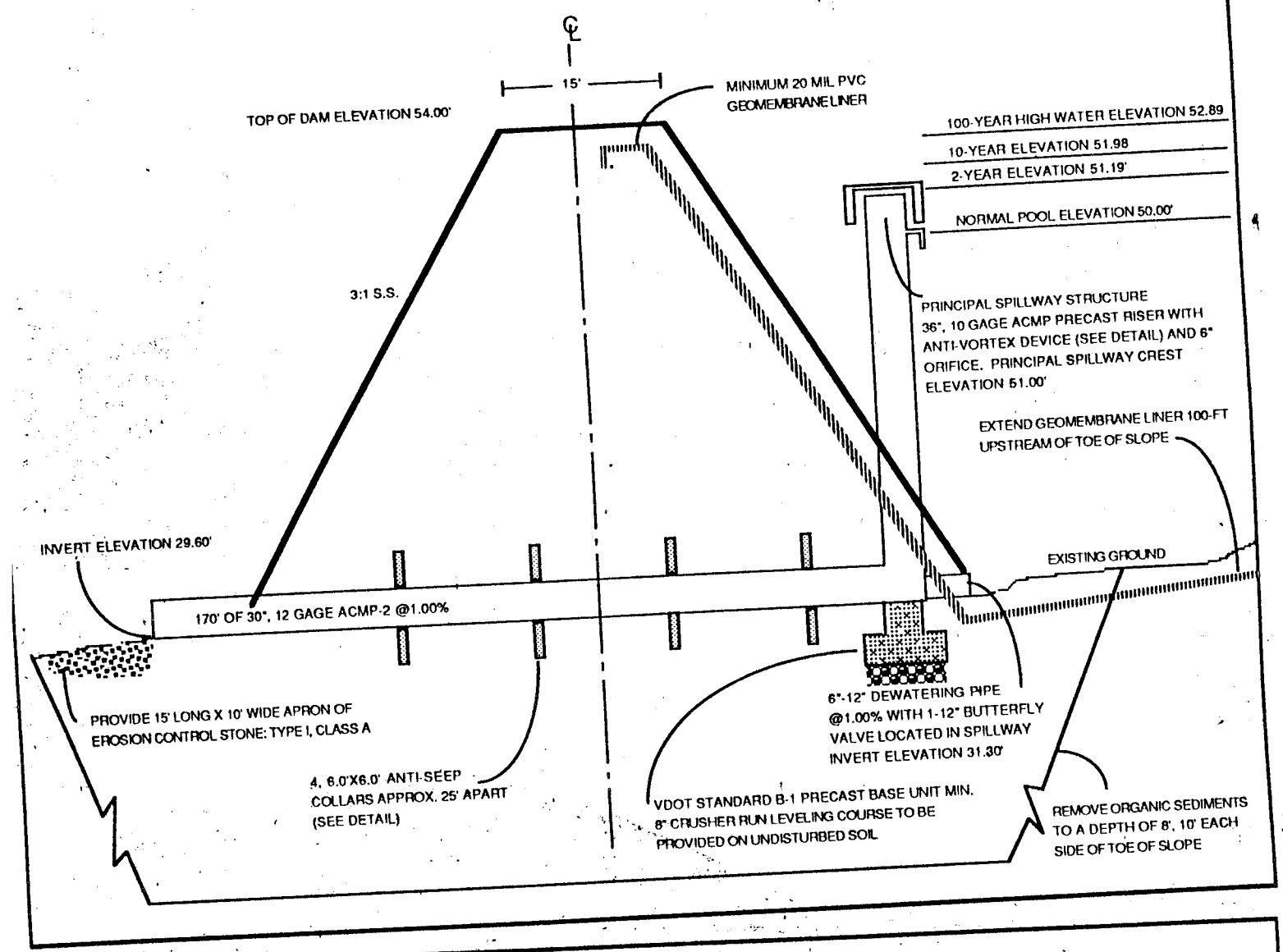
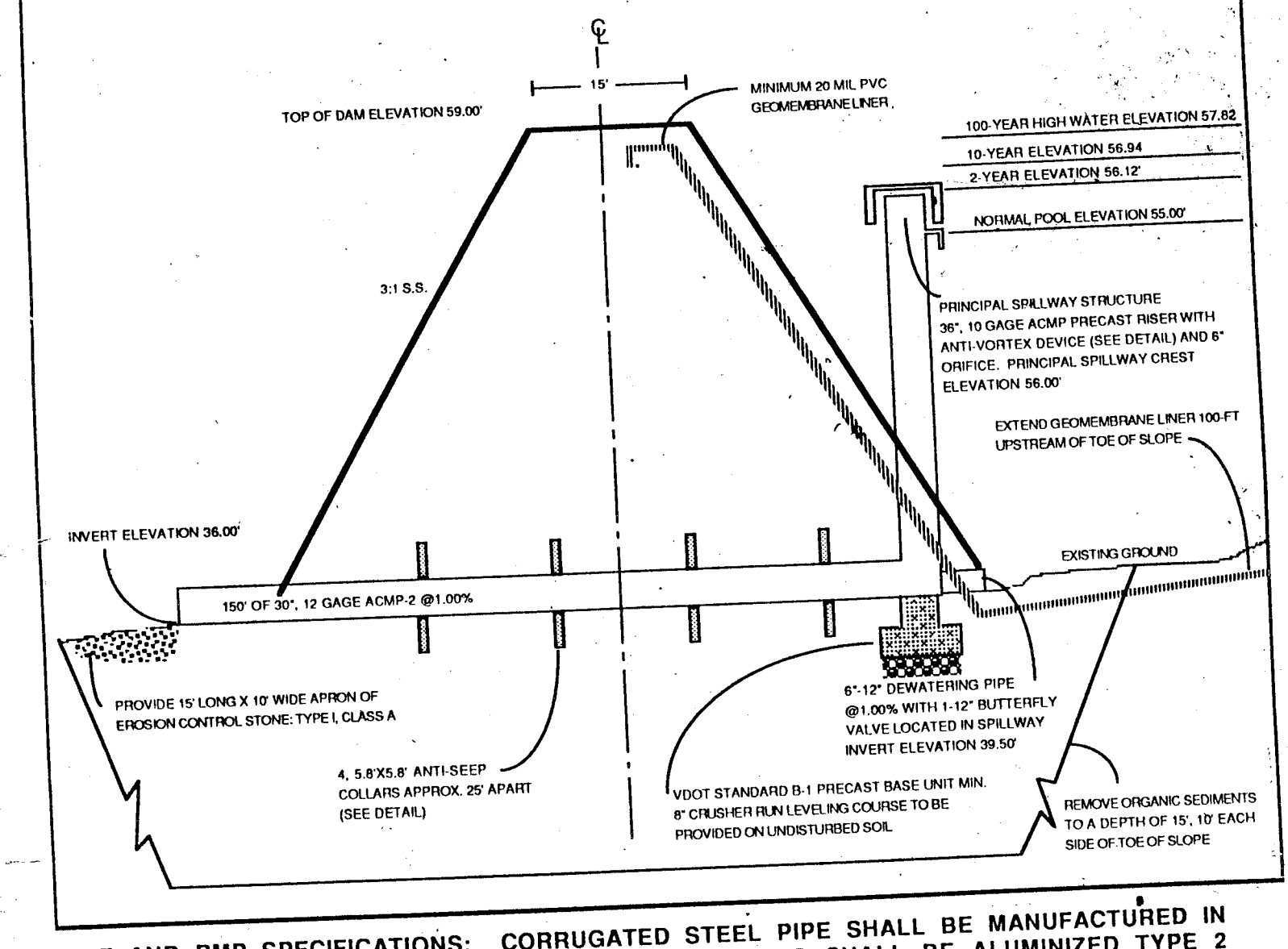
DAM CROSS-SECTION
LAKE C

1"=15' HORIZ.
1"=5' VERT.



DAM CROSS-SECTION
LAKE G

1"=15' HORIZ.
1"=5' VERT.



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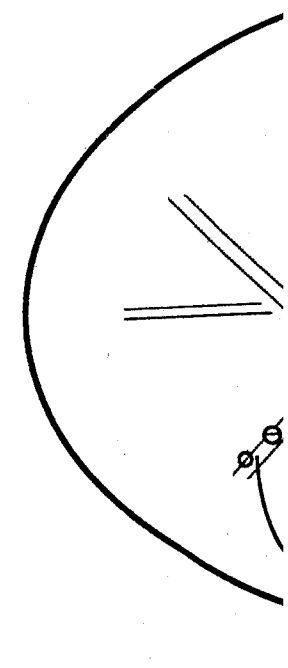
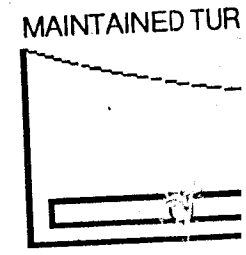
TRASH PROTECTION FOR 6 INCH ORIFICE PROVIDED BY SUBMERGED INLET. ELBOW IN PIPE ESTABLISHES NORMAL POOL ELEVATION WHILE MAINTAINING APPROXIMATELY

BMP



MAINTAINED TUR



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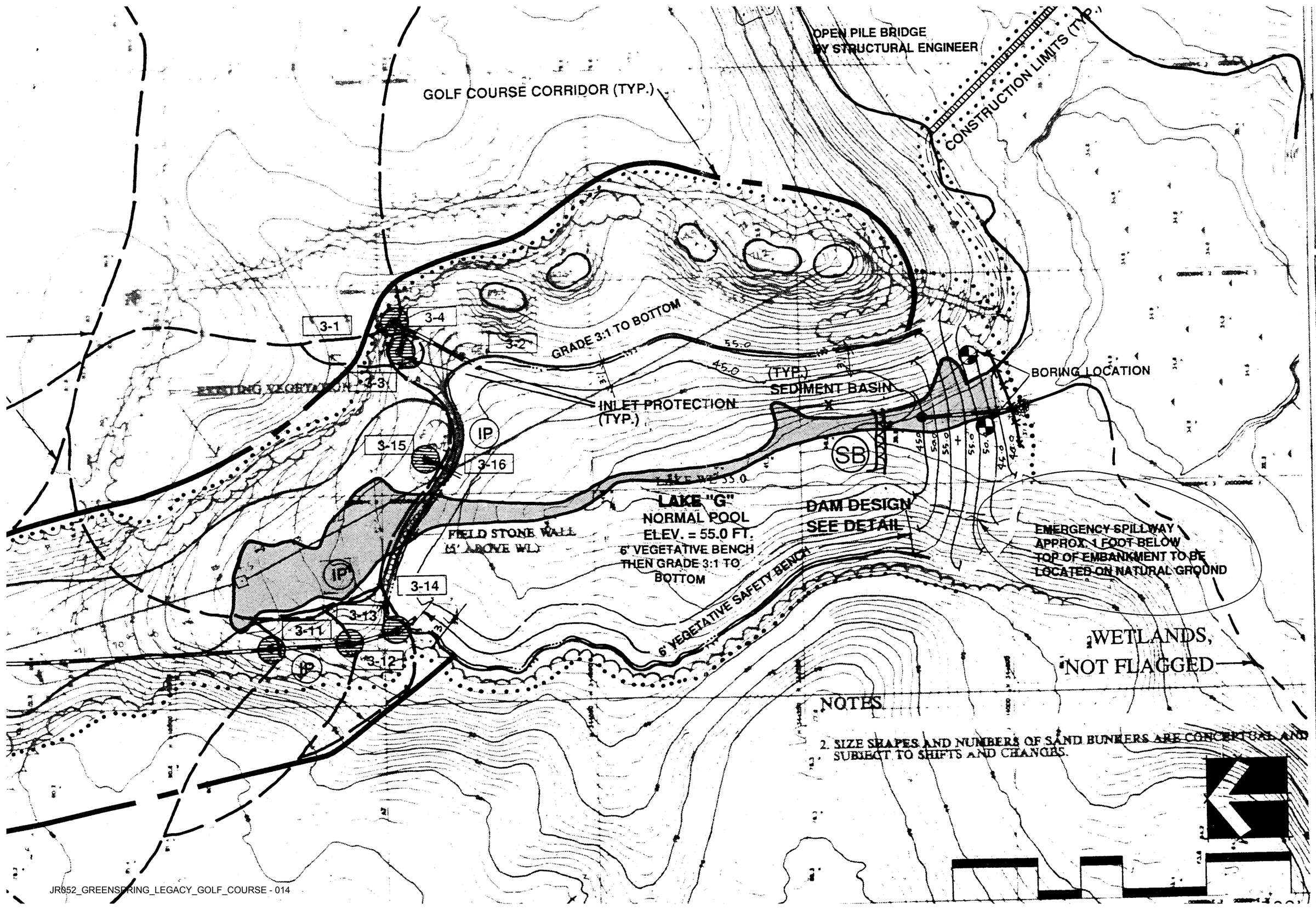


NOTES

2. SIZE SHAPES AND NUMBERS OF SAND BUNKERS ARE CONCEPTUAL AND SUBJECT TO SHIFTS AND CHANGES.

LEGACY
WILLIAMSBURG

COMMONWEALTH OF VIRGINIA
Ronald J. Boyd

1.	6/30/92	AS PER COUNTY COMMENTS
2.	4-8-93	LAKE "G" - PIPE
3	5.10.93	REMOVE BRIDGE DESIGN

DRAWN BY:

DATE: 4/8/92

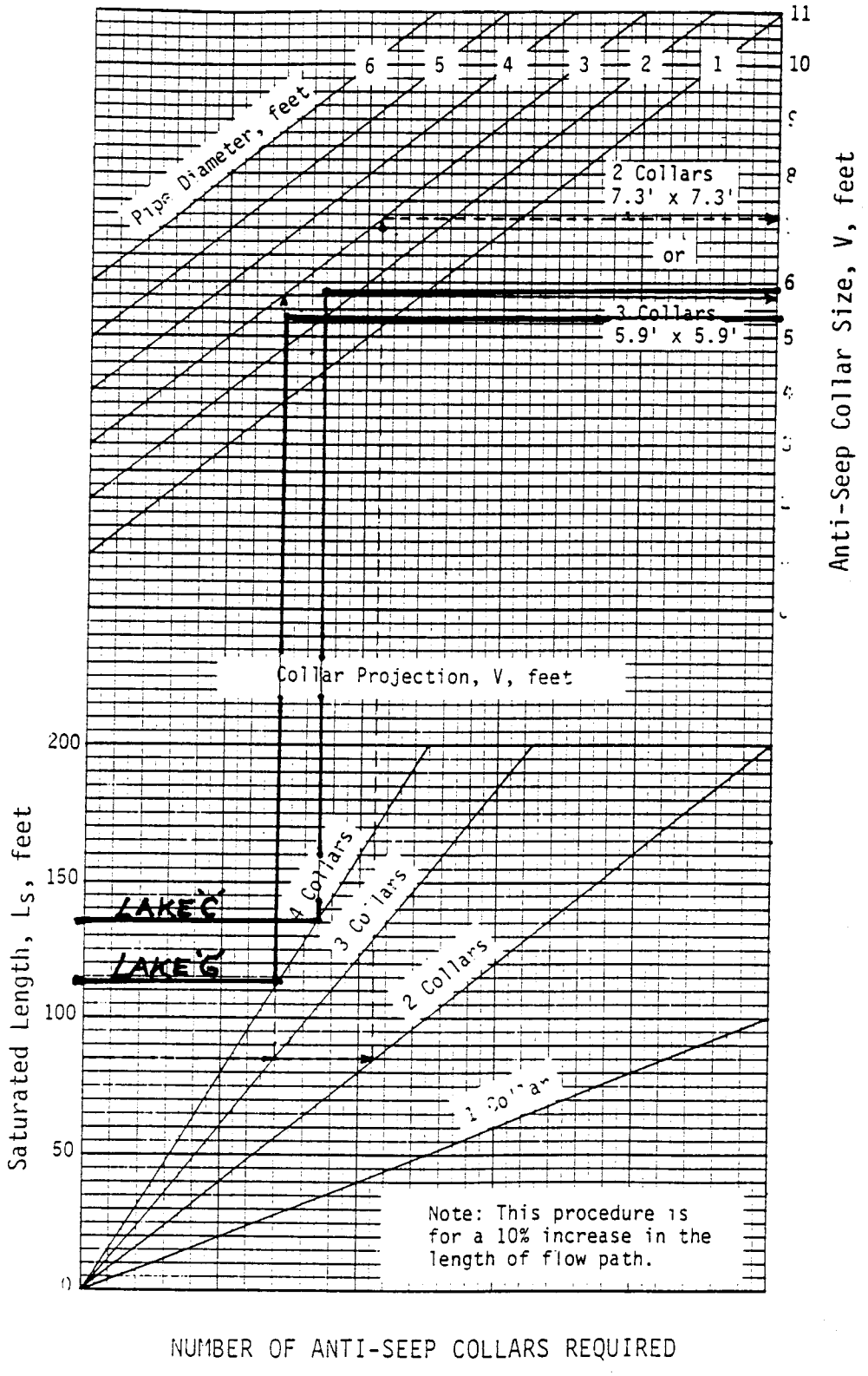
SHEET

Legacy Golf Course
Anti-seep collar calculations
for Lakes C and G

Procedure from the Virginia Erosion Control Handbook
Design to increase length of flow path by 10%
Collars to be the same gage as the barrel
Attached figure from Handbook shows collar dimension calculations

Lake C	Unit	
Barrel length	feet	170
Normal pool	msl	50.0
Invert	msl	31.3
Saturated length	feet	136
Pipe diameter	feet	2.5
# of collars	no.	4
Collar dimensions	feet	6.0 x 6.0
Minimum separatior	feet	24.5

Lake G	Unit	
Barrel length	feet	150
Normal pool	msl	55.0
Invert	msl	39.5
Saturated length	feet	113
Pipe diameter	feet	2.5
# of collars	no.	4
Collar dimensions	feet	5.8 x 5.8
Minimum separatior	feet	23.1



Source: USDA-SCS

Plate 3.14-12

Quick TR-55 Ver.5.44 S/N:1315400034
Executed: 16:08:11 04-13-1992

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
LAKE - G	63.80	78

Quick TR-55 Ver.5.44 S/N:1315400034
Executed: 16:08:11 04-13-1992

RUNOFF CURVE NUMBER DATA

::

Composite Area:

SURFACE DESCRIPTION	AREA (acres)	CN	
RESIDENTIAL- SF LOTS	33.90	81	
GOLF	11.60	74	
OPEN SPACE	18.30	74	
RESIDENTIAL- TIME SHARES	0.00	90	
COMMERCIAL	0.00	94	
COMPOSITE AREA --->	63.80	77.7	(78)

::

```
Quick TR-55 Ver.5.44   S/N:1315400034
Executed: 16:09:32   04-13-1992    b:LAKEG.TCT




                 Tc COMPUTATIONS FOR:

 SHEET FLOW (Applicable to Tc only)
     Segment ID
     Surface description                  Golf
     Manning's roughness coeff., n              0.2400
     Flow length, L (total < or = 300)    ft    300.0
     Two-yr 24-hr rainfall, P2            in    3.500
     Land slope, s                      ft/ft   0.0100
                        0.8
          .007 * (n*L)
     T =  -------------                   hrs     0.72              =  0.72
              0.5     0.4
           P2    *   s

 SHALLOW CONCENTRATED FLOW
     Segment ID
     Surface (paved or unpaved)?               Unpaved
     Flow length, L                       ft    1055.0
     Watercourse slope, s               ft/ft   0.0230

                          0.5
     Avg.V =  Csf *  (s)                 ft/s   2.4469
     where:   Unpaved Csf = 16.1345
              Paved   Csf = 20.3282

     T = L / (3600*V)                     hrs     0.12              =  0.12


 CHANNEL FLOW
     Segment ID
     Cross Sectional Flow Area, a       sq.ft     0.00
     Wetted perimeter, Pw                  ft     0.00
     Hydraulic radius, r = a/Pw            ft    0.000
     Channel slope, s                   ft/ft   0.0000
     Manning's roughness coeff., n              0.0000

                    2/3    1/2
          1.49  *  r   *  s
     V =  -------------------            ft/s   0.0000
                    n

     Flow length, L                        ft        0

     T = L / (3600*V)                     hrs     0.00              =  0.00

    :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                                              TOTAL TIME (hrs)       0.84
```

Quick TR-55 Ver.5.44 S/N:1315400034
Executed: 16:09:32 04-13-1992 b:LAKEG.TCT

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

Subarea descr.	Tc or Tt	Time (hrs)
LAKE-G	Tc	0.84

Outlet Structure File: LAKEG .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

Outlet Structure File: c:\pondfile\LAKEG .STR
Planimeter Input File: c:\pondfile\LAKE-G .VOL
Rating Table Output File: c:\pondfile\LAKEG .PND

Min. Elev.(ft) = 39 Max. Elev.(ft) = 59 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		->	2

Outflow rating table summary was stored in file:
c:\pondfile\LAKEG .PND

Outlet Structure File: LAKEG .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

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

ORIFICE-VC
Orifice - Vertical Circular

E1 elev.(ft)?	55.1
E2 elev.(ft)?	59.001
Orifice coeff.?	.6
Invert elev.(ft)?	55.1
Datum elev.(ft)?	39
Diameter (ft)?	.3

Outlet Structure File: LAKEG .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

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

STAND PIPE
Stand Pipe with weir or orifice flow

E1 elev.(ft)? 56
E2 elev.(ft)? 59.001
Crest elev.(ft)? 56
Diameter (ft)? 3
Weir coefficient? 3.1
Orifice coefficient? .6
Start transition elev.(ft) @ ? 56
Transition height (ft)? 1

Outlet Structure File: LAKEG .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

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

Elevation (ft)	Q (cfs)	Contributing Structures
39.00	0.0	
39.50	0.0	
40.00	0.0	
40.50	0.0	
41.00	0.0	
41.50	0.0	
42.00	0.0	
42.50	0.0	
43.00	0.0	
43.50	0.0	
44.00	0.0	
44.50	0.0	
45.00	0.0	
45.50	0.0	
46.00	0.0	
46.50	0.0	
47.00	0.0	
47.50	0.0	
48.00	0.0	
48.50	0.0	
49.00	0.0	
49.50	0.0	
50.00	0.0	
50.50	0.0	
51.00	0.0	
51.50	0.0	
52.00	0.0	
52.50	0.0	
53.00	0.0	
53.50	0.0	
54.00	0.0	
54.50	0.0	
55.00	0.0	
55.50	1.4	1
56.00	1.4	1 +2
56.50	11.8	1 +2
57.00	30.7	1 +2
57.50	43.1	1 +2
58.00	49.6	1 +2
58.50	55.3	1 +2
59.00	60.5	1 +2

Outlet Structure File: LAKEG .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

Outflow Rating Table for Structure #1
ORIFICE-VC Orifice - Vertical Circular

Elevation (ft)	Q (cfs)	Computation Messages
39.00	0.0	E < E1= 55.1
39.50	0.0	E < E1= 55.1
40.00	0.0	E < E1= 55.1
40.50	0.0	E < E1= 55.1
41.00	0.0	E < E1= 55.1
41.50	0.0	E < E1= 55.1
42.00	0.0	E < E1= 55.1
42.50	0.0	E < E1= 55.1
43.00	0.0	E < E1= 55.1
43.50	0.0	E < E1= 55.1
44.00	0.0	E < E1= 55.1
44.50	0.0	E < E1= 55.1
45.00	0.0	E < E1= 55.1
45.50	0.0	E < E1= 55.1
46.00	0.0	E < E1= 55.1
46.50	0.0	E < E1= 55.1
47.00	0.0	E < E1= 55.1
47.50	0.0	E < E1= 55.1
48.00	0.0	E < E1= 55.1
48.50	0.0	E < E1= 55.1
49.00	0.0	E < E1= 55.1
49.50	0.0	E < E1= 55.1
50.00	0.0	E < E1= 55.1
50.50	0.0	E < E1= 55.1
51.00	0.0	E < E1= 55.1
51.50	0.0	E < E1= 55.1
52.00	0.0	E < E1= 55.1
52.50	0.0	E < E1= 55.1
53.00	0.0	E < E1= 55.1
53.50	0.0	E < E1= 55.1
54.00	0.0	E < E1= 55.1
54.50	0.0	E < E1= 55.1
55.00	0.0	E < E1= 55.1
55.50	1.4	H =16.5

Outlet Structure File: LAKEG .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

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Outflow Rating Table for Structure #1
ORIFICE-VC Orifice - Vertical Circular

Elevation (ft)	Q (cfs)	Computation Messages
56.00	1.4	H =17.0
56.50	1.4	H =17.5
57.00	1.4	H =18.0
57.50	1.5	H =18.5
58.00	1.5	H =19.0
58.50	1.5	H =19.5
59.00	1.5	H =20.0

C = .6 A = 7.068585E-02 sq.ft.
H (ft) = Table elev. - Datum elev. (39 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: LAKEG .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

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

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

Elevation (ft)	Q (cfs)	Computation Messages
39.00	0.0	E < Inv.El.= 56
39.50	0.0	E < E1= 56
40.00	0.0	E < E1= 56
40.50	0.0	E < E1= 56
41.00	0.0	E < E1= 56
41.50	0.0	E < E1= 56
42.00	0.0	E < E1= 56
42.50	0.0	E < E1= 56
43.00	0.0	E < E1= 56
43.50	0.0	E < E1= 56
44.00	0.0	E < E1= 56
44.50	0.0	E < E1= 56
45.00	0.0	E < E1= 56
45.50	0.0	E < E1= 56
46.00	0.0	E < E1= 56
46.50	0.0	E < E1= 56
47.00	0.0	E < E1= 56
47.50	0.0	E < E1= 56
48.00	0.0	E < E1= 56
48.50	0.0	E < E1= 56
49.00	0.0	E < E1= 56
49.50	0.0	E < E1= 56
50.00	0.0	E < E1= 56
50.50	0.0	E < E1= 56
51.00	0.0	E < E1= 56
51.50	0.0	E < E1= 56
52.00	0.0	E < E1= 56
52.50	0.0	E < E1= 56
53.00	0.0	E < E1= 56
53.50	0.0	E < E1= 56
54.00	0.0	E < E1= 56
54.50	0.0	E < E1= 56

Outlet Structure File: LAKEG .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

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

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

Elevation (ft)	Q (cfs)	Computation Messages
55.00	0.0	E < E1= 56
55.50	0.0	E < E1= 56
56.00	0.0	Weir: H =0.0
56.50	10.3	Weir: H =.5
57.00	29.2	Weir: H =1.0
57.50	41.7	Orifice: H =1.5
58.00	48.1	Orifice: H =2.0
58.50	53.8	Orifice: H =2.5
59.00	59.0	Orifice: H =3.0

Weir Cw = 3.1 Weir length = 9.424779 ft
Orifice Co = .6 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 57.16491 ft
Weir equation = Orifice equation @ elev.= 57.16491 ft

Inflow Hydrograph: C:\JOBFILES\LAKEG2 .HYD
Rating Table file: C:\JOBFILES\LAKE G .PND

----INITIAL CONDITIONS----
Elevation = 55.00 ft
Outflow = 0.00 cfs
Storage = 1,203,412 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
39.00	0.0	0	0.0	0.0
39.50	0.0	183	1.0	1.0
40.00	0.0	1,467	8.1	8.1
40.50	0.0	4,132	23.0	23.0
41.00	0.0	7,844	43.6	43.6
41.50	0.0	12,777	71.0	71.0
42.00	0.0	19,102	106.1	106.1
42.50	0.0	26,994	150.0	150.0
43.00	0.0	36,627	203.5	203.5
43.50	0.0	48,172	267.6	267.6
44.00	0.0	61,804	343.4	343.4
44.50	0.0	77,696	431.6	431.6
45.00	0.0	96,022	533.5	533.5
45.50	0.0	116,958	649.8	649.8
46.00	0.0	140,682	781.6	781.6
46.50	0.0	167,368	929.8	929.8
47.00	0.0	197,190	1095.5	1095.5
47.50	0.0	230,324	1279.6	1279.6
48.00	0.0	266,941	1483.0	1483.0
48.50	0.0	307,219	1706.8	1706.8
49.00	0.0	351,330	1951.8	1951.8
49.50	0.0	399,449	2219.2	2219.2
50.00	0.0	451,750	2509.7	2509.7
50.50	0.0	508,081	2822.7	2822.7
51.00	0.0	568,258	3157.0	3157.0
51.50	0.0	632,410	3513.4	3513.4
52.00	0.0	700,663	3892.6	3892.6
52.50	0.0	773,143	4295.2	4295.2
53.00	0.0	849,979	4722.1	4722.1
53.50	0.0	931,296	5173.9	5173.9
54.00	0.0	1,017,223	5651.2	5651.2

Pond File: C:\JOBFILES\LAKE G .PND
Inflow Hydrograph: C:\JOBFILES\LAKEG2 .HYD
Outflow Hydrograph: C:\JOBFILES\LAKEG2 O.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	1.00	-----	6685.6	6685.6	0.00	55.00
11.100	1.00	2.0	6687.6	6687.6	0.01	55.00
11.200	2.00	3.0	6690.6	6690.6	0.01	55.00
11.300	2.00	4.0	6694.5	6694.6	0.02	55.01
11.400	2.00	4.0	6698.5	6698.5	0.03	55.01
11.500	3.00	5.0	6703.4	6703.5	0.05	55.02
11.600	3.00	6.0	6709.3	6709.4	0.06	55.02
11.700	3.00	6.0	6715.1	6715.3	0.07	55.03
11.800	4.00	7.0	6721.9	6722.1	0.09	55.03
11.900	4.00	8.0	6729.7	6729.9	0.11	55.04
12.000	5.00	9.0	6738.4	6738.7	0.13	55.05
12.100	7.00	12.0	6750.1	6750.4	0.16	55.06
12.200	13.00	20.0	6769.7	6770.1	0.21	55.08
12.300	24.00	37.0	6806.1	6806.7	0.31	55.11
12.400	39.00	63.0	6868.1	6869.1	0.46	55.17
12.500	52.00	91.0	6957.8	6959.1	0.69	55.25
12.600	59.00	111.0	7066.8	7068.8	0.97	55.35
12.700	59.00	118.0	7182.3	7184.8	1.26	55.45
12.800	53.00	112.0	7291.5	7294.3	1.40	55.55
12.900	45.00	98.0	7386.7	7389.5	1.40	55.63
13.000	37.00	82.0	7465.9	7468.7	1.40	55.70
13.100	31.00	68.0	7531.1	7533.9	1.40	55.76
13.200	26.00	57.0	7585.3	7588.1	1.40	55.80
13.300	22.00	48.0	7630.5	7633.3	1.40	55.84
13.400	19.00	41.0	7668.7	7671.5	1.40	55.88
13.500	17.00	36.0	7701.9	7704.7	1.40	55.91
13.600	15.00	32.0	7731.1	7733.9	1.40	55.93
13.700	14.00	29.0	7757.3	7760.1	1.40	55.95
13.800	12.00	26.0	7780.5	7783.3	1.40	55.97
13.900	11.00	23.0	7800.7	7803.5	1.40	55.99
14.000	10.00	21.0	7818.6	7821.7	1.56	56.01
14.100	9.00	19.0	7833.9	7837.6	1.84	56.02
14.200	9.00	18.0	7847.8	7851.9	2.08	56.03
14.300	8.00	17.0	7860.1	7864.8	2.31	56.04
14.400	8.00	16.0	7871.1	7876.1	2.50	56.05

Pond File: C:\JOBFILES\LAKE G .PND
Inflow Hydrograph: C:\JOBFILES\LAKEG2 .HYD
Outflow Hydrograph: C:\JOBFILES\LAKEG2 O.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
14.500	7.00	15.0	7880.8	7886.1	2.68	56.06
14.600	7.00	14.0	7889.1	7894.8	2.83	56.07
14.700	7.00	14.0	7897.2	7903.1	2.97	56.08
14.800	6.00	13.0	7904.0	7910.2	3.09	56.08
14.900	6.00	12.0	7909.6	7916.0	3.19	56.09
15.000	6.00	12.0	7915.0	7921.6	3.29	56.09
15.100	6.00	12.0	7920.2	7927.0	3.39	56.10
15.200	6.00	12.0	7925.3	7932.2	3.48	56.10
15.300	5.00	11.0	7929.2	7936.3	3.55	56.10
15.400	5.00	10.0	7932.0	7939.2	3.60	56.11
15.500	5.00	10.0	7934.7	7942.0	3.65	56.11
15.600	5.00	10.0	7937.3	7944.7	3.69	56.11
15.700	5.00	10.0	7939.8	7947.3	3.74	56.11
15.800	5.00	10.0	7942.3	7949.8	3.78	56.11
15.900	5.00	10.0	7944.6	7952.3	3.82	56.12
16.000	5.00	10.0	7946.9	7954.6	3.86	56.12
16.100	5.00	10.0	7949.1	7956.9	3.90	56.12
16.200	5.00	10.0	7951.2	7959.1	3.94	56.12
16.300	4.00	9.0	7952.3	7960.2	3.96	56.12
16.400	4.00	8.0	7952.4	7960.3	3.96	56.12
16.500	4.00	8.0	7952.4	7960.4	3.96	56.12
16.600	4.00	8.0	7952.5	7960.4	3.97	56.12
16.700	4.00	8.0	7952.6	7960.5	3.97	56.12
16.800	4.00	8.0	7952.6	7960.6	3.97	56.12
16.900	4.00	8.0	7952.7	7960.6	3.97	56.12
17.000	4.00	8.0	7952.8	7960.7	3.97	56.12
17.100	4.00	8.0	7952.8	7960.8	3.97	56.12
17.200	4.00	8.0	7952.9	7960.8	3.97	56.12
17.300	3.00	7.0	7952.0	7959.9	3.96	56.12
17.400	3.00	6.0	7950.1	7958.0	3.92	56.12
17.500	3.00	6.0	7948.3	7956.1	3.89	56.12
17.600	3.00	6.0	7946.6	7954.3	3.86	56.12
17.700	3.00	6.0	7945.0	7952.6	3.83	56.12
17.800	3.00	6.0	7943.4	7951.0	3.80	56.12
17.900	3.00	6.0	7941.8	7949.4	3.77	56.11
18.000	3.00	6.0	7940.3	7947.8	3.75	56.11
18.100	3.00	6.0	7938.9	7946.3	3.72	56.11
18.200	3.00	6.0	7937.5	7944.9	3.70	56.11
18.300	3.00	6.0	7936.1	7943.5	3.67	56.11
18.400	3.00	6.0	7934.8	7942.1	3.65	56.11
18.500	3.00	6.0	7933.6	7940.8	3.63	56.11
18.600	3.00	6.0	7932.4	7939.6	3.60	56.11
18.700	3.00	6.0	7931.2	7938.4	3.58	56.10
18.800	3.00	6.0	7930.1	7937.2	3.56	56.10
18.900	3.00	6.0	7929.0	7936.1	3.54	56.10
19.000	3.00	6.0	7928.0	7935.0	3.52	56.10

Pond File: C:\JOBFILES\LAKE G .PND
Inflow Hydrograph: C:\JOBFILES\LAKEG2 .HYD
Outflow Hydrograph: C:\JOBFILES\LAKEG2 O.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
19.100	3.00	6.0	7926.9	7934.0	3.51	56.10
19.200	3.00	6.0	7926.0	7932.9	3.49	56.10
19.300	3.00	6.0	7925.0	7932.0	3.47	56.10
19.400	3.00	6.0	7924.1	7931.0	3.46	56.10
19.500	3.00	6.0	7923.2	7930.1	3.44	56.10
19.600	3.00	6.0	7922.4	7929.2	3.42	56.10
19.700	3.00	6.0	7921.6	7928.4	3.41	56.10
19.800	3.00	6.0	7920.8	7927.6	3.40	56.10
19.900	3.00	6.0	7920.0	7926.8	3.38	56.10
20.000	3.00	6.0	7919.3	7926.0	3.37	56.09
20.100	3.00	6.0	7918.6	7925.3	3.36	56.09
20.200	3.00	6.0	7917.9	7924.6	3.34	56.09
20.300	3.00	6.0	7917.2	7923.9	3.33	56.09
20.400	3.00	6.0	7916.6	7923.2	3.32	56.09
20.500	3.00	6.0	7916.0	7922.6	3.31	56.09
20.600	3.00	6.0	7915.4	7922.0	3.30	56.09
20.700	3.00	6.0	7914.8	7921.4	3.29	56.09
20.800	3.00	6.0	7914.2	7920.8	3.28	56.09
20.900	3.00	6.0	7913.7	7920.2	3.27	56.09
21.000	2.00	5.0	7912.2	7918.7	3.24	56.09
21.100	2.00	4.0	7909.8	7916.2	3.20	56.09
21.200	2.00	4.0	7907.5	7913.8	3.16	56.08
21.300	2.00	4.0	7905.3	7911.5	3.12	56.08
21.400	2.00	4.0	7903.1	7909.3	3.08	56.08
21.500	2.00	4.0	7901.0	7907.1	3.04	56.08
21.600	2.00	4.0	7899.0	7905.0	3.00	56.08
21.700	2.00	4.0	7897.1	7903.0	2.97	56.08
21.800	2.00	4.0	7895.2	7901.1	2.94	56.07
21.900	2.00	4.0	7893.4	7899.2	2.90	56.07
22.000	2.00	4.0	7891.6	7897.4	2.87	56.07
22.100	2.00	4.0	7890.0	7895.6	2.84	56.07
22.200	2.00	4.0	7888.3	7894.0	2.81	56.07
22.300	2.00	4.0	7886.8	7892.3	2.79	56.07
22.400	2.00	4.0	7885.2	7890.8	2.76	56.07
22.500	2.00	4.0	7883.8	7889.2	2.73	56.06
22.600	2.00	4.0	7882.4	7887.8	2.71	56.06
22.700	2.00	4.0	7881.0	7886.4	2.68	56.06
22.800	2.00	4.0	7879.7	7885.0	2.66	56.06
22.900	2.00	4.0	7878.4	7883.7	2.64	56.06
23.000	2.00	4.0	7877.2	7882.4	2.61	56.06
23.100	1.00	3.0	7875.0	7880.2	2.57	56.06
23.200	1.00	2.0	7872.0	7877.0	2.52	56.05
23.300	1.00	2.0	7869.1	7874.0	2.47	56.05
23.400	1.00	2.0	7866.2	7871.1	2.42	56.05
23.500	1.00	2.0	7863.5	7868.2	2.37	56.05
23.600	1.00	2.0	7860.9	7865.5	2.32	56.04

Pond File: C:\JOBFILES\LAKE G .PND
Inflow Hydrograph: C:\JOBFILES\LAKEG2 .HYD
Outflow Hydrograph: C:\JOBFILES\LAKEG2 O.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
23.700	1.00	2.0	7858.3	7862.9	2.27	56.04
23.800	1.00	2.0	7855.8	7860.3	2.23	56.04
23.900	1.00	2.0	7853.5	7857.8	2.19	56.04
24.000	1.00	2.0	7851.2	7855.5	2.15	56.04
24.100	1.00	2.0	7849.0	7853.2	2.11	56.03
24.200	1.00	2.0	7846.8	7851.0	2.07	56.03
24.300	1.00	2.0	7844.8	7848.8	2.03	56.03
24.400	1.00	2.0	7842.8	7846.8	2.00	56.03
24.500	1.00	2.0	7840.9	7844.8	1.96	56.03
24.600	1.00	2.0	7839.0	7842.9	1.93	56.03
24.700	1.00	2.0	7837.2	7841.0	1.90	56.02
24.800	1.00	2.0	7835.5	7839.2	1.86	56.02
24.900	1.00	2.0	7833.8	7837.5	1.83	56.02
25.000	0.00	1.0	7831.2	7834.8	1.79	56.02
25.100	0.00	0.0	7827.8	7831.2	1.73	56.02
25.200	0.00	0.0	7824.4	7827.8	1.67	56.01
25.300	0.00	0.0	7821.2	7824.4	1.61	56.01
25.400	0.00	0.0	7818.1	7821.2	1.55	56.01
25.500	0.00	0.0	7815.1	7818.1	1.50	56.00
25.600	0.00	0.0	7812.2	7815.1	1.45	56.00
25.700	0.00	0.0	7809.4	7812.2	1.40	56.00
25.800	0.00	0.0	7806.6	7809.4	1.40	56.00
25.900	0.00	0.0	7803.8	7806.6	1.40	55.99

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
54.50	0.0	1,107,886	6154.9	6154.9
55.00	0.0	1,203,412	6685.6	6685.6
55.50	1.4	1,303,057	7239.2	7240.6
56.00	1.4	1,405,978	7811.0	7812.4
56.50	11.8	1,512,149	8400.8	8412.6
57.00	30.7	1,621,595	9008.9	9039.6
57.50	43.1	1,734,316	9635.1	9678.2
58.00	49.6	1,850,287	10279.4	10329.0
58.50	55.3	1,968,485	10936.0	10991.3
59.00	60.5	2,087,883	11599.4	11659.9

Time increment (t) = 0.100 hrs.

structure table

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

Pond File: C:\JOBFILES\LAKE G .PND
Inflow Hydrograph: C:\JOBFILES\LAKEG2 .HYD
Outflow Hydrograph: C:\JOBFILES\LAKEG2 O.HYD

Starting Pond W.S. Elevation = 55.00 ft

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

Peak Inflow = 59.00 cfs
Peak Outflow = 3.97 cfs
Peak Elevation = 56.12 ft

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

Initial Storage = 1,203,412 cu-ft
Peak Storage From Storm = 228,821 cu-ft

Total Storage in Pond = 1,432,233 cu-ft

Warning: Inflow hydrograph truncated on left side.

Inflow Hydrograph: C:\JOBFILES\LAKEG10 .HYD
Rating Table file: C:\JOBFILES\LAKE G .PND

----INITIAL CONDITIONS----
Elevation = 55.00 ft
Outflow = 0.00 cfs
Storage = 1,203,412 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
39.00	0.0	0	0.0	0.0
39.50	0.0	183	1.0	1.0
40.00	0.0	1,467	8.1	8.1
40.50	0.0	4,132	23.0	23.0
41.00	0.0	7,844	43.6	43.6
41.50	0.0	12,777	71.0	71.0
42.00	0.0	19,102	106.1	106.1
42.50	0.0	26,994	150.0	150.0
43.00	0.0	36,627	203.5	203.5
43.50	0.0	48,172	267.6	267.6
44.00	0.0	61,804	343.4	343.4
44.50	0.0	77,696	431.6	431.6
45.00	0.0	96,022	533.5	533.5
45.50	0.0	116,958	649.8	649.8
46.00	0.0	140,682	781.6	781.6
46.50	0.0	167,368	929.8	929.8
47.00	0.0	197,190	1095.5	1095.5
47.50	0.0	230,324	1279.6	1279.6
48.00	0.0	266,941	1483.0	1483.0
48.50	0.0	307,219	1706.8	1706.8
49.00	0.0	351,330	1951.8	1951.8
49.50	0.0	399,449	2219.2	2219.2
50.00	0.0	451,750	2509.7	2509.7
50.50	0.0	508,081	2822.7	2822.7
51.00	0.0	568,258	3157.0	3157.0
51.50	0.0	632,410	3513.4	3513.4
52.00	0.0	700,663	3892.6	3892.6
52.50	0.0	773,143	4295.2	4295.2
53.00	0.0	849,979	4722.1	4722.1
53.50	0.0	931,296	5173.9	5173.9
54.00	0.0	1,017,223	5651.2	5651.2

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
54.50	0.0	1,107,886	6154.9	6154.9
55.00	0.0	1,203,412	6685.6	6685.6
55.50	1.4	1,303,057	7239.2	7240.6
56.00	1.4	1,405,978	7811.0	7812.4
56.50	11.8	1,512,149	8400.8	8412.6
57.00	30.7	1,621,595	9008.9	9039.6
57.50	43.1	1,734,316	9635.1	9678.2
58.00	49.6	1,850,287	10279.4	10329.0
58.50	55.3	1,968,485	10936.0	10991.3
59.00	60.5	2,087,883	11599.4	11659.9

Time increment (t) = 0.100 hrs.

Pond File: C:\JOBFILES\LAKE G .PND
Inflow Hydrograph: C:\JOBFILES\LAKEG10 .HYD
Outflow Hydrograph: C:\JOBFILES\LAKEG10O.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	4.00	-----	6685.6	6685.6	0.00	55.00
11.100	5.00	9.0	6694.6	6694.6	0.02	55.01
11.200	5.00	10.0	6704.5	6704.6	0.05	55.02
11.300	6.00	11.0	6715.3	6715.5	0.08	55.03
11.400	7.00	13.0	6728.1	6728.3	0.11	55.04
11.500	7.00	14.0	6741.8	6742.1	0.14	55.05
11.600	8.00	15.0	6756.5	6756.8	0.18	55.06
11.700	9.00	17.0	6773.0	6773.5	0.22	55.08
11.800	11.00	20.0	6792.5	6793.0	0.27	55.10
11.900	12.00	23.0	6814.8	6815.5	0.33	55.12
12.000	16.00	28.0	6842.0	6842.8	0.40	55.14
12.100	23.00	39.0	6880.0	6881.0	0.49	55.18
12.200	39.00	62.0	6940.8	6942.0	0.65	55.23
12.300	66.00	105.0	7043.9	7045.8	0.91	55.32
12.400	100.00	166.0	7207.3	7209.9	1.32	55.47
12.500	129.00	229.0	7433.5	7436.3	1.40	55.67
12.600	144.00	273.0	7703.7	7706.5	1.40	55.91
12.700	139.00	283.0	7977.9	7986.7	4.42	56.15
12.800	125.00	264.0	8224.2	8241.9	8.84	56.36
12.900	105.00	230.0	8428.1	8454.2	13.05	56.53
13.000	85.00	190.0	8582.1	8618.1	17.99	56.66
13.100	71.00	156.0	8694.9	8738.1	21.61	56.76
13.200	58.00	129.0	8775.5	8823.9	24.20	56.83
13.300	50.00	108.0	8831.5	8883.5	25.99	56.88
13.400	42.00	92.0	8869.1	8923.5	27.20	56.91
13.500	37.00	79.0	8892.2	8948.1	27.94	56.93
13.600	32.00	69.0	8904.5	8961.2	28.34	56.94
13.700	28.00	60.0	8907.6	8964.5	28.44	56.94
13.800	25.00	53.0	8904.0	8960.6	28.32	56.94
13.900	23.00	48.0	8895.9	8952.0	28.06	56.93
14.000	21.00	44.0	8884.5	8939.9	27.69	56.92
14.100	20.00	41.0	8871.0	8925.5	27.26	56.91
14.200	18.00	38.0	8855.4	8909.0	26.76	56.90
14.300	17.00	35.0	8838.0	8890.4	26.20	56.88
14.400	16.00	33.0	8819.8	8871.0	25.62	56.87

Pond File: C:\JOBFILES\LAKE G .PND
Inflow Hydrograph: C:\JOBFILES\LAKEG10 .HYD
Outflow Hydrograph: C:\JOBFILES\LAKEG10O.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
14.500	15.00	31.0	8800.8	8850.8	25.01	56.85
14.600	14.00	29.0	8781.0	8829.8	24.38	56.83
14.700	14.00	28.0	8761.5	8809.0	23.75	56.82
14.800	13.00	27.0	8742.3	8788.5	23.13	56.80
14.900	12.00	25.0	8722.3	8767.3	22.49	56.78
15.000	12.00	24.0	8702.6	8746.3	21.86	56.77
15.100	12.00	24.0	8684.0	8726.6	21.26	56.75
15.200	12.00	24.0	8666.6	8708.0	20.71	56.74
15.300	11.00	23.0	8649.3	8689.6	20.15	56.72
15.400	11.00	22.0	8632.1	8671.3	19.60	56.71
15.500	11.00	22.0	8616.0	8654.1	19.08	56.69
15.600	11.00	22.0	8600.8	8638.0	18.59	56.68
15.700	10.00	21.0	8585.6	8621.8	18.11	56.67
15.800	10.00	20.0	8570.3	8605.6	17.62	56.65
15.900	9.00	19.0	8555.1	8589.3	17.13	56.64
16.000	9.00	18.0	8539.8	8573.1	16.64	56.63
16.100	9.00	18.0	8525.4	8557.8	16.18	56.62
16.200	9.00	18.0	8512.0	8543.4	15.74	56.60
16.300	8.00	17.0	8498.3	8529.0	15.31	56.59
16.400	8.00	16.0	8484.6	8514.3	14.87	56.58
16.500	8.00	16.0	8471.7	8500.6	14.45	56.57
16.600	8.00	16.0	8459.6	8487.7	14.06	56.56
16.700	8.00	16.0	8448.2	8475.6	13.70	56.55
16.800	7.00	15.0	8436.5	8463.2	13.32	56.54
16.900	7.00	14.0	8424.7	8450.5	12.94	56.53
17.000	7.00	14.0	8413.5	8438.7	12.58	56.52
17.100	7.00	14.0	8403.0	8427.5	12.25	56.51
17.200	7.00	14.0	8393.1	8417.0	11.93	56.50
17.300	7.00	14.0	8383.7	8407.1	11.70	56.50
17.400	7.00	14.0	8374.6	8397.7	11.54	56.49
17.500	7.00	14.0	8365.9	8388.6	11.38	56.48
17.600	7.00	14.0	8357.4	8379.9	11.23	56.47
17.700	7.00	14.0	8349.2	8371.4	11.09	56.47
17.800	6.00	13.0	8340.4	8362.2	10.93	56.46
17.900	6.00	12.0	8330.9	8352.4	10.76	56.45
18.000	6.00	12.0	8321.7	8342.9	10.59	56.44
18.100	6.00	12.0	8312.8	8333.7	10.43	56.43
18.200	6.00	12.0	8304.3	8324.8	10.28	56.43
18.300	6.00	12.0	8296.0	8316.3	10.13	56.42
18.400	6.00	12.0	8288.0	8308.0	9.99	56.41
18.500	6.00	12.0	8280.3	8300.0	9.85	56.41
18.600	6.00	12.0	8272.9	8292.3	9.72	56.40
18.700	6.00	12.0	8265.7	8284.9	9.59	56.39
18.800	6.00	12.0	8258.8	8277.7	9.46	56.39
18.900	6.00	12.0	8252.1	8270.8	9.34	56.38
19.000	6.00	12.0	8245.7	8264.1	9.23	56.38

Pond File: C:\JOBFILES\LAKE G .PND
Inflow Hydrograph: C:\JOBFILES\LAKEG10 .HYD
Outflow Hydrograph: C:\JOBFILES\LAKEG10O.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
19.100	6.00	12.0	8239.4	8257.7	9.11	56.37
19.200	6.00	12.0	8233.4	8251.4	9.01	56.37
19.300	6.00	12.0	8227.6	8245.4	8.90	56.36
19.400	6.00	12.0	8222.0	8239.6	8.80	56.36
19.500	6.00	12.0	8216.6	8234.0	8.71	56.35
19.600	5.00	11.0	8210.4	8227.6	8.59	56.35
19.700	5.00	10.0	8203.5	8220.4	8.47	56.34
19.800	5.00	10.0	8196.8	8213.5	8.35	56.33
19.900	5.00	10.0	8190.3	8206.8	8.23	56.33
20.000	5.00	10.0	8184.1	8200.3	8.12	56.32
20.100	5.00	10.0	8178.0	8194.1	8.01	56.32
20.200	5.00	10.0	8172.2	8188.0	7.91	56.31
20.300	5.00	10.0	8166.6	8182.2	7.81	56.31
20.400	5.00	10.0	8161.2	8176.6	7.71	56.30
20.500	5.00	10.0	8155.9	8171.2	7.62	56.30
20.600	5.00	10.0	8150.9	8165.9	7.53	56.29
20.700	5.00	10.0	8146.0	8160.9	7.44	56.29
20.800	5.00	10.0	8141.3	8156.0	7.35	56.29
20.900	5.00	10.0	8136.8	8151.3	7.27	56.28
21.000	4.00	9.0	8131.4	8145.8	7.18	56.28
21.100	4.00	8.0	8125.3	8139.4	7.07	56.27
21.200	4.00	8.0	8119.4	8133.3	6.96	56.27
21.300	4.00	8.0	8113.6	8127.4	6.86	56.26
21.400	4.00	8.0	8108.1	8121.6	6.76	56.26
21.500	4.00	8.0	8102.8	8116.1	6.66	56.25
21.600	4.00	8.0	8097.7	8110.8	6.57	56.25
21.700	4.00	8.0	8092.7	8105.7	6.48	56.24
21.800	4.00	8.0	8087.9	8100.7	6.40	56.24
21.900	4.00	8.0	8083.3	8095.9	6.31	56.24
22.000	4.00	8.0	8078.8	8091.3	6.23	56.23
22.100	4.00	8.0	8074.5	8086.8	6.15	56.23
22.200	4.00	8.0	8070.3	8082.5	6.08	56.23
22.300	4.00	8.0	8066.3	8078.3	6.01	56.22
22.400	4.00	8.0	8062.5	8074.3	5.94	56.22
22.500	4.00	8.0	8058.7	8070.5	5.87	56.21
22.600	3.00	7.0	8054.1	8065.7	5.79	56.21
22.700	3.00	6.0	8048.7	8060.1	5.69	56.21
22.800	3.00	6.0	8043.6	8054.7	5.60	56.20
22.900	3.00	6.0	8038.5	8049.6	5.51	56.20
23.000	3.00	6.0	8033.7	8044.5	5.42	56.19
23.100	3.00	6.0	8029.0	8039.7	5.34	56.19
23.200	3.00	6.0	8024.5	8035.0	5.26	56.19
23.300	3.00	6.0	8020.1	8030.5	5.18	56.18
23.400	3.00	6.0	8015.9	8026.1	5.10	56.18
23.500	2.00	5.0	8010.9	8020.9	5.01	56.17
23.600	2.00	4.0	8005.1	8014.9	4.91	56.17

Pond File: C:\JOBFILES\LAKE G .PND
Inflow Hydrograph: C:\JOBFILES\LAKEG10 .HYD
Outflow Hydrograph: C:\JOBFILES\LAKEG10O.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
23.700	2.00	4.0	7999.5	8009.1	4.81	56.16
23.800	2.00	4.0	7994.0	8003.5	4.71	56.16
23.900	2.00	4.0	7988.8	7998.0	4.62	56.15
24.000	2.00	4.0	7983.8	7992.8	4.53	56.15
24.100	2.00	4.0	7978.9	7987.8	4.44	56.15
24.200	2.00	4.0	7974.2	7982.9	4.35	56.14
24.300	2.00	4.0	7969.6	7978.2	4.27	56.14
24.400	2.00	4.0	7965.2	7973.6	4.19	56.13
24.500	2.00	4.0	7961.0	7969.2	4.12	56.13
24.600	1.00	3.0	7956.0	7964.0	4.03	56.13
24.700	1.00	2.0	7950.1	7958.0	3.92	56.12
24.800	1.00	2.0	7944.5	7952.1	3.82	56.12
24.900	1.00	2.0	7939.0	7946.5	3.72	56.11
25.000	1.00	2.0	7933.8	7941.0	3.63	56.11
25.100	1.00	2.0	7928.7	7935.8	3.54	56.10
25.200	1.00	2.0	7923.8	7930.7	3.45	56.10
25.300	1.00	2.0	7919.1	7925.8	3.36	56.09
25.400	1.00	2.0	7914.5	7921.1	3.28	56.09
25.500	0.00	1.0	7909.1	7915.5	3.19	56.09
25.600	0.00	0.0	7903.0	7909.1	3.08	56.08
25.700	0.00	0.0	7897.0	7903.0	2.97	56.08
25.800	0.00	0.0	7891.3	7897.0	2.87	56.07
25.900	0.00	0.0	7885.8	7891.3	2.77	56.07

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

Pond File: C:\JOBFILES\LAKE G .PND
Inflow Hydrograph: C:\JOBFILES\LAKEG10 .HYD
Outflow Hydrograph: C:\JOBFILES\LAKEG10O.HYD

Starting Pond W.S. Elevation = 55.00 ft

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

Peak Inflow = 144.00 cfs
Peak Outflow = 28.44 cfs
Peak Elevation = 56.94 ft

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

Initial Storage = 1,203,412 cu-ft
Peak Storage From Storm = 405,083 cu-ft

Total Storage in Pond = 1,608,494 cu-ft

Warning: Inflow hydrograph truncated on left side.

Inflow Hydrograph: C:\JOBFILES\LAKEG100.HYD
Rating Table file: C:\JOBFILES\LAKE G .PND

----INITIAL CONDITIONS----
Elevation = 55.00 ft
Outflow = 0.00 cfs
Storage = 1,203,412 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
39.00	0.0	0	0.0	0.0
39.50	0.0	183	1.0	1.0
40.00	0.0	1,467	8.1	8.1
40.50	0.0	4,132	23.0	23.0
41.00	0.0	7,844	43.6	43.6
41.50	0.0	12,777	71.0	71.0
42.00	0.0	19,102	106.1	106.1
42.50	0.0	26,994	150.0	150.0
43.00	0.0	36,627	203.5	203.5
43.50	0.0	48,172	267.6	267.6
44.00	0.0	61,804	343.4	343.4
44.50	0.0	77,696	431.6	431.6
45.00	0.0	96,022	533.5	533.5
45.50	0.0	116,958	649.8	649.8
46.00	0.0	140,682	781.6	781.6
46.50	0.0	167,368	929.8	929.8
47.00	0.0	197,190	1095.5	1095.5
47.50	0.0	230,324	1279.6	1279.6
48.00	0.0	266,941	1483.0	1483.0
48.50	0.0	307,219	1706.8	1706.8
49.00	0.0	351,330	1951.8	1951.8
49.50	0.0	399,449	2219.2	2219.2
50.00	0.0	451,750	2509.7	2509.7
50.50	0.0	508,081	2822.7	2822.7
51.00	0.0	568,258	3157.0	3157.0
51.50	0.0	632,410	3513.4	3513.4
52.00	0.0	700,663	3892.6	3892.6
52.50	0.0	773,143	4295.2	4295.2
53.00	0.0	849,979	4722.1	4722.1
53.50	0.0	931,296	5173.9	5173.9
54.00	0.0	1,017,223	5651.2	5651.2

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
54.50	0.0	1,107,886	6154.9	6154.9
55.00	0.0	1,203,412	6685.6	6685.6
55.50	1.4	1,303,057	7239.2	7240.6
56.00	1.4	1,405,978	7811.0	7812.4
56.50	11.8	1,512,149	8400.8	8412.6
57.00	30.7	1,621,595	9008.9	9039.6
57.50	43.1	1,734,316	9635.1	9678.2
58.00	49.6	1,850,287	10279.4	10329.0
58.50	55.3	1,968,485	10936.0	10991.3
59.00	60.5	2,087,883	11599.4	11659.9

Time increment (t) = 0.100 hrs.

Pond File: C:\JOBFILES\LAKE G .PND
Inflow Hydrograph: C:\JOBFILES\LAKEG100.HYD
Outflow Hydrograph: C:\JOBFILES\LAKEG000.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	7.00	-----	6685.6	6685.6	0.00	55.00
11.100	8.00	15.0	6700.5	6700.6	0.04	55.01
11.200	9.00	17.0	6717.4	6717.5	0.08	55.03
11.300	10.00	19.0	6736.1	6736.4	0.13	55.05
11.400	11.00	21.0	6756.8	6757.1	0.18	55.06
11.500	12.00	23.0	6779.3	6779.8	0.24	55.08
11.600	13.00	25.0	6803.7	6804.3	0.30	55.11
11.700	15.00	28.0	6831.0	6831.7	0.37	55.13
11.800	17.00	32.0	6862.1	6863.0	0.45	55.16
11.900	19.00	36.0	6897.0	6898.1	0.54	55.19
12.000	25.00	44.0	6939.7	6941.0	0.64	55.23
12.100	37.00	62.0	7000.1	7001.7	0.80	55.28
12.200	62.00	99.0	7097.0	7099.1	1.04	55.37
12.300	104.00	166.0	7260.2	7263.0	1.40	55.52
12.400	158.00	262.0	7519.4	7522.2	1.40	55.75
12.500	204.00	362.0	7876.2	7881.4	2.60	56.06
12.600	228.00	432.0	8288.2	8308.2	9.99	56.41
12.700	220.00	448.0	8693.1	8736.2	21.56	56.76
12.800	198.00	418.0	9047.0	9111.1	32.09	57.06
12.900	166.00	364.0	9335.1	9411.0	37.91	57.29
13.000	135.00	301.0	9551.6	9636.1	42.28	57.47
13.100	114.00	249.0	9711.9	9800.6	44.32	57.59
13.200	92.00	206.0	9826.9	9917.9	45.49	57.68
13.300	79.00	171.0	9905.3	9997.9	46.29	57.75
13.400	66.00	145.0	9956.7	10050.3	46.82	57.79
13.500	58.00	124.0	9986.5	10080.7	47.12	57.81
13.600	50.00	108.0	10000.0	10094.5	47.26	57.82
13.700	45.00	95.0	10000.4	10095.0	47.26	57.82
13.800	40.00	85.0	9991.1	10085.4	47.17	57.81
13.900	36.00	76.0	9973.1	10067.1	46.98	57.80
14.000	33.00	69.0	9948.7	10042.1	46.73	57.78
14.100	31.00	64.0	9919.8	10012.7	46.44	57.76
14.200	28.00	59.0	9886.6	9978.8	46.10	57.73
14.300	26.00	54.0	9849.1	9940.6	45.72	57.70
14.400	25.00	51.0	9809.5	9900.1	45.32	57.67

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INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
14.500	23.00	48.0	9767.7	9857.5	44.89	57.64
14.600	22.00	45.0	9723.8	9812.7	44.44	57.60
14.700	21.00	43.0	9678.9	9766.8	43.99	57.57
14.800	20.00	41.0	9632.8	9719.9	43.52	57.53
14.900	20.00	40.0	9586.8	9672.8	43.00	57.50
15.000	19.00	39.0	9541.7	9625.8	42.08	57.46
15.100	19.00	38.0	9497.3	9579.7	41.19	57.42
15.200	18.00	37.0	9453.7	9534.3	40.31	57.39
15.300	18.00	36.0	9410.8	9489.7	39.44	57.35
15.400	17.00	35.0	9368.6	9445.8	38.59	57.32
15.500	17.00	34.0	9327.1	9402.6	37.75	57.28
15.600	17.00	34.0	9287.2	9361.1	36.94	57.25
15.700	16.00	33.0	9247.9	9320.2	36.15	57.22
15.800	16.00	32.0	9209.2	9279.9	35.37	57.19
15.900	15.00	31.0	9171.0	9240.2	34.60	57.16
16.000	15.00	30.0	9133.3	9201.0	33.83	57.13
16.100	15.00	30.0	9097.1	9163.3	33.10	57.10
16.200	14.00	29.0	9061.4	9126.1	32.38	57.07
16.300	14.00	28.0	9026.0	9089.4	31.67	57.04
16.400	13.00	27.0	8991.1	9053.0	30.96	57.01
16.500	13.00	26.0	8957.1	9017.1	30.02	56.98
16.600	13.00	26.0	8925.1	8983.1	29.00	56.95
16.700	13.00	26.0	8895.0	8951.1	28.03	56.93
16.800	12.00	25.0	8865.8	8920.0	27.10	56.90
16.900	12.00	24.0	8837.4	8889.8	26.19	56.88
17.000	12.00	24.0	8810.8	8861.4	25.33	56.86
17.100	12.00	24.0	8785.7	8834.8	24.53	56.84
17.200	12.00	24.0	8762.2	8809.7	23.77	56.82
17.300	11.00	23.0	8739.1	8785.2	23.03	56.80
17.400	11.00	22.0	8716.5	8761.1	22.31	56.78
17.500	11.00	22.0	8695.3	8738.5	21.62	56.76
17.600	11.00	22.0	8675.3	8717.3	20.98	56.74
17.700	11.00	22.0	8656.5	8697.3	20.38	56.73
17.800	10.00	21.0	8638.0	8677.5	19.79	56.71
17.900	10.00	20.0	8619.6	8658.0	19.20	56.70
18.000	10.00	20.0	8602.3	8639.6	18.64	56.68
18.100	10.00	20.0	8586.0	8622.3	18.12	56.67
18.200	10.00	20.0	8570.8	8606.0	17.63	56.65
18.300	10.00	20.0	8556.4	8590.8	17.17	56.64
18.400	10.00	20.0	8543.0	8576.4	16.74	56.63
18.500	10.00	20.0	8530.3	8563.0	16.33	56.62
18.600	9.00	19.0	8517.5	8549.3	15.92	56.61
18.700	9.00	18.0	8504.5	8535.5	15.50	56.60
18.800	9.00	18.0	8492.2	8522.5	15.11	56.59
18.900	9.00	18.0	8480.7	8510.2	14.74	56.58
19.000	9.00	18.0	8470.0	8498.7	14.40	56.57

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INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
19.100	9.00	18.0	8459.8	8488.0	14.07	56.56
19.200	9.00	18.0	8450.3	8477.8	13.77	56.55
19.300	9.00	18.0	8441.3	8468.3	13.48	56.54
19.400	9.00	18.0	8432.9	8459.3	13.21	56.54
19.500	8.00	17.0	8424.1	8449.9	12.92	56.53
19.600	8.00	16.0	8414.8	8440.1	12.63	56.52
19.700	8.00	16.0	8406.1	8430.8	12.35	56.51
19.800	8.00	16.0	8397.9	8422.1	12.09	56.51
19.900	8.00	16.0	8390.3	8413.9	11.84	56.50
20.000	8.00	16.0	8382.9	8406.3	11.69	56.49
20.100	8.00	16.0	8375.8	8398.9	11.56	56.49
20.200	8.00	16.0	8368.9	8391.8	11.44	56.48
20.300	8.00	16.0	8362.2	8384.9	11.32	56.48
20.400	8.00	16.0	8355.8	8378.2	11.20	56.47
20.500	8.00	16.0	8349.6	8371.8	11.09	56.47
20.600	7.00	15.0	8342.7	8364.6	10.97	56.46
20.700	7.00	14.0	8335.0	8356.7	10.83	56.45
20.800	7.00	14.0	8327.7	8349.0	10.70	56.45
20.900	7.00	14.0	8320.5	8341.7	10.57	56.44
21.000	7.00	14.0	8313.6	8334.5	10.45	56.43
21.100	7.00	14.0	8307.0	8327.6	10.33	56.43
21.200	7.00	14.0	8300.5	8321.0	10.21	56.42
21.300	7.00	14.0	8294.3	8314.5	10.10	56.42
21.400	7.00	14.0	8288.4	8308.3	9.99	56.41
21.500	6.00	13.0	8281.6	8301.4	9.87	56.41
21.600	6.00	12.0	8274.1	8293.6	9.74	56.40
21.700	6.00	12.0	8266.9	8286.1	9.61	56.39
21.800	6.00	12.0	8259.9	8278.9	9.48	56.39
21.900	6.00	12.0	8253.2	8271.9	9.36	56.38
22.000	6.00	12.0	8246.7	8265.2	9.25	56.38
22.100	6.00	12.0	8240.5	8258.7	9.13	56.37
22.200	6.00	12.0	8234.4	8252.5	9.02	56.37
22.300	6.00	12.0	8228.6	8246.4	8.92	56.36
22.400	5.00	11.0	8222.0	8239.6	8.80	56.36
22.500	5.00	10.0	8214.6	8232.0	8.67	56.35
22.600	5.00	10.0	8207.5	8224.6	8.54	56.34
22.700	5.00	10.0	8200.7	8217.5	8.42	56.34
22.800	5.00	10.0	8194.1	8210.7	8.30	56.33
22.900	5.00	10.0	8187.7	8204.1	8.19	56.33
23.000	4.00	9.0	8180.6	8196.7	8.06	56.32
23.100	4.00	8.0	8172.8	8188.6	7.92	56.31
23.200	4.00	8.0	8165.2	8180.8	7.78	56.31
23.300	4.00	8.0	8157.9	8173.2	7.65	56.30
23.400	4.00	8.0	8150.9	8165.9	7.53	56.29
23.500	4.00	8.0	8144.0	8158.9	7.40	56.29
23.600	4.00	8.0	8137.5	8152.0	7.29	56.28

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INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
23.700	3.00	7.0	8130.2	8144.5	7.15	56.28
23.800	3.00	6.0	8122.2	8136.2	7.01	56.27
23.900	3.00	6.0	8114.4	8128.2	6.87	56.26
24.000	3.00	6.0	8106.9	8120.4	6.74	56.26
24.100	3.00	6.0	8099.7	8112.9	6.61	56.25
24.200	3.00	6.0	8092.8	8105.7	6.48	56.24
24.300	3.00	6.0	8086.0	8098.8	6.36	56.24
24.400	2.00	5.0	8078.6	8091.0	6.23	56.23
24.500	2.00	4.0	8070.4	8082.6	6.08	56.23
24.600	2.00	4.0	8062.5	8074.4	5.94	56.22
24.700	2.00	4.0	8054.9	8066.5	5.80	56.21
24.800	2.00	4.0	8047.6	8058.9	5.67	56.21
24.900	2.00	4.0	8040.5	8051.6	5.54	56.20
25.000	2.00	4.0	8033.7	8044.5	5.42	56.19
25.100	1.00	3.0	8026.1	8036.7	5.29	56.19
25.200	1.00	2.0	8017.8	8028.1	5.14	56.18
25.300	1.00	2.0	8009.8	8019.8	4.99	56.17
25.400	1.00	2.0	8002.1	8011.8	4.86	56.17
25.500	1.00	2.0	7994.7	8004.1	4.72	56.16
25.600	1.00	2.0	7987.5	7996.7	4.59	56.15
25.700	0.00	1.0	7979.6	7988.5	4.45	56.15
25.800	0.00	0.0	7971.0	7979.6	4.30	56.14
25.900	0.00	0.0	7962.7	7971.0	4.15	56.13

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

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Starting Pond W.S. Elevation = 55.00 ft

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

Peak Inflow	=	228.00 cfs
Peak Outflow	=	47.26 cfs
Peak Elevation	=	57.82 ft

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

Initial Storage	=	1,203,412 cu-ft
Peak Storage From Storm	=	605,173 cu-ft
Total Storage in Pond	=	1,808,584 cu-ft

Warning: Inflow hydrograph truncated on left side.

GEOTECHNICAL ANALYSIS

NGINEERING CONSULTING SERVICES, LTD. (1600 MOUNTAIN ROAD, GLEN ALLEN VA 23060) COMPILED A GEOTECHNICAL STUDY FOR THE PROPOSED DAMS FOR LAKES C AND G AT THE LEGACY OF GREENSPRINGS GOLF COURSE NO. 1 IN JAMES CITY COUNTY, VIRGINIA. THIS INVESTIGATION WAS ACCOMPLISHED BY PERFORMING A TOTAL OF TWO BORINGS AT EACH OF THE TWO DAM SITES TO ASCERTAIN FOUNDATION BEARING QUALITY OF THE IN-SITU SOILS. IN ADDITION, HANDAUGER BORINGS WERE PERFORMED AT VARIOUS LOCATIONS AROUND THE IMPOUNDMENTS TO EXPLORE THE QUALITY OF FILL SOILS AVAILABLE FROM CUTS PERFORMED IN THESE AREAS.

HE RESULTS OF THE SOIL TEST BORINGS INDICATE THE SUBSURFACE SOILS ARE PRIMARILY GRANULAR IN ATURE AND THEREFORE HIGHLY PERMEABLE. CONSIDERING THE LOW TOLERANCE FOR SEEPAGE FROM THE MPOUNDMENTS, IT DOES NOT APPEAR THAT TYPICAL DAM CONSTRUCTION EMPLOYING A CLAY CORE WITH LAY KEY WOULD CONSTITUTE AN ACCEPTABLE BARRIER TO WATER LOSS FROM THE IMPOUNDMENTS. HEREFORE, RECOMMENDED DAM DESIGNS INCLUDE TWO METHODS EMPLOYING GROUTED CURTAIN WALLS ND GEOMEMBRANE LINERS.

ROUNDWATER WAS ENCOUNTERED AT BOTH DAM SITES IN THE BOTTOM OF THE IMPOUNDMENT RAVINES. HEREFORE, DEWATERING AND DIVERTING OF WATER WILL BE OF CONCERN DURING CONSTRUCTION. URTHERMORE, THE PRESENCE OF HEAVY ORGANICS WITHIN THE EMBANKMENT BEARING SOILS WILL REQUIRE UBSTANTIAL UNDERCUTTING FROM BELOW BOTH DAMS.

HE CONCLUSIONS AND RECOMMENDATIONS CONTAINED IN THIS REPORT ARE BASED UPON A TOTAL OF FOUR ORINGS (C-1 AND 2, G-1 AND 2) DRILL"D TO DEPTHS OF 25 FEET BELOW THE EXISTING GRADES AND SEVERAL ANDAUGER BORINGS PERFORMED TO DEPTHS OF 4 TO 8 FEET, A SITE RECONNAISSANCE PERFORMED BY THE EOTECHNICAL ENGINEER, LABORATORY TEST RESULTS OF BORING AND BULK SAMPLES, AND SITE PLANS DICATING IMPOUNDMENT BOUNDARIES AND DAM PROFILES. THE PROPOSED FIELD SAMPLING LOCATIONS ERE SELECTED BY THE PROJECT GEOTECHNICAL ENGINEER.

OUNDATION PREPARATION

HE PRESENCE OF SOFT, ORGANIC SEDIMENTS IN THE BOTTOM OF THE RAVINES AT BOTH DAM SITES MAKES OUNDATION CONDITIONS AT BOTH SITES UNSUITABLE FOR SUPPORT OF THE EARTHEN EMBANKMENTS. THESE RGANIC MATERIALS SHOULD BE REMOVED FROM BELOW THE DAMS AND TO A DISTANCE OF AT LEAST 10 FEET YOND THE TOE OF THE EMBANKMENTS. THE SOIL BORINGS PERFORMED AT DAM C INDICATE UNSUITABLE EPOSITS EXTEND AS DEEP AS ABOUT 8 FEET AND LIKELY MORE BELOW THE BOTTOM OF THE RAVINE. AT DAM UNSUITABLE MATERIALS WERE ENCOUNTERED AS DEEP AS ABOUT 15 FEET.

IS RECOMMENDED THAT PROVISIONS FOR DEWATERING BE MADE, THEN THE UNDERCUT PERFORMED TO THE EQUIRED GRADE AND DIMENSIONS. THE EXCAVATION SHOULD BE BACKFILLED UTILIZING AN APPROVED ACKFILL MATERIAL. SUCH A MATERIAL SHOULD CONSIST OF A SOIL CLASSIFIED AS SM, SC, OR CL CONTAINING LEAST 15% BY WEIGHT FINES (SILT OR CLAY) AND HAVING A MAXIMUM PLASTICITY INDEX (PI) OF 30%. THE L SHOULD BE COMPACTED IN MAXIMUM 10 INCH LIFTS TO A DRY DENSITY OF AT LEAST 95% OF THE ANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D698). IN ORDER TO ATTAIN THIS COMPACTION, IT WILL NECESSARY TO EMPLOY HEAVY COMPACTION EQUIPMENT IN THE BASE OF THE CUT. THE CONTRACTOR OULD PROVIDE THE METHODS NECESSARY TO ATTAIN ADEQUATE DEWATERING AND EXCAVATION ABILITY.

M EMBANKMENT AND CORE

CE THE UNSUITABLE DAM BASE SOILS HAVE BEEN REMOVED AND REPLACED, CONSTRUCTION OF THE RTHEN EMBANKMENTS CAN PROCEED. BECAUSE CONSTRUCTION OF THESE DAMS WILL INCLUDE PLACEMENT A FABRIC LINER, THE CONSTRUCTION OF A KEY TRENCH IS NOT CONSIDERED NECESSARY. A CLAY CORE O WILL NOT BE REQUIRED SINCE A FABRIC LINER IS TO BE EMPLOYED IN THE CONSTRUCTION.

OMEMBRANE LINER

IMPOUNDMENT CAN BE CREATED EMPLOYING AN EARTHEN EMBANKMENT COVERED IN A GEOMEMBRANE R. SPECIFIC INSTALLATION METHODS SHOULD BE SPECIFIED BY THE LINER SUPPLIER. THIS WOULD UDE SEAM CONSTRUCTION AND EDGE ANCHORING. IN GENERAL, LINER CONSTRUCTION SHOULD PROCEED OLLOWS:

A) BURY THE LINER AT A DEPTH OF APPROXIMATELY 3 FEET BELOW AND PARALLEL TO THE DAM EMBANKMENT SURFACE. BURY THE LINER AT LEAST 1 FOOT BELOW THE SURFACE NEAR THE IMPOUNDMENT PERIMETER. LINER MAY BE EXPOSED IF SUBMERGED WITHIN THE LAKE BED.

B) WHERE DAM STRUCTURES PENETRATE THE LINER, SUCH AS THE VERTICAL SPILLWAY RISER AND DEWATERING PIPE. THE LINER MUST BE SEALED AROUND THAT STRUCTURE TO PREVENT LEAKAGE.

C) THE LINER SHOULD EXTEND INTO THE IMPOUNDMENT A DISTANCE OF 100 FEET OUTWARD BEYOND THE UPSTREAM TOE OF THE DAM. THE EDGES OF THE LINER SHOULD EXTEND UP THE SIDES OF THE IMPOUNDMENT WITHIN THIS ZONE TO AN ELEVATION AT LEAST 2 FEET ABOVE THE 100 YEAR FLOOD ELEVATION.

UNDWATER SEEPAGE CONTROL

RDER TO CONTROL SEEPAGE IN THE DOWNHILL TOE OF THE DAMS, A DRAINAGE BLANKET SHOULD BE LOYED AT EMBANKMENT SUBGRADE ELEVATIONS; THAT IS, AN ELEVATION CONSISTENT WITH THE GROUND ACE ELEVATION JUST BEYOND THE EMBANKMENT TOE. THIS BLANKET SHOULD EXTEND INTO THE DAM M THE TOE A DISTANCE EQUAL TO ABOUT 20% OF THE EMBANKMENT WIDTH AT ITS BASE. THE DRAINAGE NKET SHOULD EXTEND UP THE SHOULDERS OF THE RAVINE A VERTICAL DISTANCE OF AT LEAST 3 FEET. AGE INTO THIS DRAINAGE BLANKET SHOULD BE COLLECTED IN A TOE DRAIN ALIGNED PARALLEL TO THE NSTREAM TOE OF THE EMBANKMENT WITH DISCHARGE THROUGH A PERPENDICULAR DRAIN INTO THE LET PIPE. THE DRAINAGE BLANKET SHOULD CONSIST OF A 12 INCH THICK LAYER OF COARSE GRADED REGATE SUCH AS VDOT SIZE NO. 57 STONE WRAPPED IN A MEDIUM DUTY, NONWOVEN GEOTEXTILE FILTER RIC. THE TOE DRAIN PIPE SHOULD CONSIST OF A 6 INCH SLOTTED POLYETHYLENE TUBING WHICH SATISFIES REQUIREMENTS OF ASTM F-405.

DER TO MINIMIZE EROSION DUE TO SEEPAGE ALONG THE SPILLWAY CONDUIT, IT IS RECOMMENDED THAT AGE COLLARS BE SPACED AT INTERVALS ALONG THAT PIPE UPSTREAM OF THE DRAINAGE BLANKET. THE HOULD REST DIRECTLY ON THE DRAINAGE BLANKET IN THAT PORTION OF THE EMBANKMENT WHERE THE AGE BLANKET IS EMPLOYED.

TERING DURING CONSTRUCTION WILL BE DIFFICULT, PARTICULARLY IF WORK IS PERFORMED IN OTHER THE DRIER SUMMER MONTHS. SURFACE GRADE STREAM FLOWS ARE RELATIVELY LOW AND TEMPORARY TION OF SURFACIAL FLOWS MIGHT BE ATTAINED BY TEMPORARY BERMS AND DAMS UPSTREAM OF THE AREA. FOR EXCAVATION BELOW GRADE IN ORDER TO REMOVE AND REPLACE ORGANIC DEPOSITS, TERING COULD BE MORE COMPLICATED. IT IS ANTICIPATED THAT STAGED EXCAVATION SUPPORTED BY TERING PUMPS OF SUBSTANTIAL CAPACITY WILL BE REQUIRED TO ACCOMPLISH THE UNDERCUTS, CULARLY AT LAKE G WHERE ORGANIC DEPOSITS EXTEND AS DEEP AS 15 FEET AND POSSIBLY MORE. THE ACTOR SHOULD PROVIDE DEWATERING BY APPROPRIATE METHODS AND HAVE THESE METHODS VED BY THE ENGINEER PRIOR TO CONSTRUCTION. ONCE THE EMBANKMENT BASE ELEVATIONS HAVE ESTABLISHED, THE PRINCIPAL SPILLWAY RISER AND CONDUIT CAN BE INSTALLED AND THE WATER E DIVERTED THROUGH IT.

RUCTION CONTROL

LL SHOULD BE PLACED AND COMPACTED TO A DRY DENSITY OF AT LEAST 95% OF THAT SOIL'S STANDARD OR MAXIMUM DRY DENSITY (ASTM D698). THE COMPACTION SHOULD BE ACCOMPLISHED BY PLACING LL IN 6 TO 10 INCH LOOSE LIFTS AND MECHANICALLY COMPACTING EACH LIFT TO THE REQUIRED TY PRIOR TO PLACEMENT OF SUBSEQUENT LIFTS. AT LEAST A 5 TON DRUM ROLLER SHOULD BE YED TO ATTAIN GENERAL EMBANKMENT COMPACTION. HAND OPERATED EQUIPMENT SHOULD BE YED AROUND AND IMMEDIATELY ABOVE PIPES AND FOUNDATION. SOILS SHOULD BE COMPACTED AT URE CONTENTS WITHIN 3% ABOVE AND 1% BELOW OPTIMUM MOISTURE CONTENT FOR THE MATERIAL

RFACE OF EACH COMPACTED LIFT SHOULD BE SCARIFIED BY BACKDRAGGING TO A DEPTH OF 2 INCHES TO PLACEMENT OF THE NEXT LIFT, THIS TO PREVENT DEVELOPMENT OF HORIZONTAL SEEPAGE PLANES. MENT FILL SHOULD BE PLACED IN HORIZONTAL LIFTS WITH SLOPES NO STEEPER THAN 1 VERTICAL TO 4 TAL. WHERE GREATER SLOPES EXIST, THEY SHOULD BE BENCHED TO RECEIVE FILL. BENCH HEIGHTS

THE PROPOSED DAMS FOR LAKES C AND G AT THE LEGACY OF GREENSPRINGS GOLF COURSE NO. 1 IN JAMES CITY COUNTY, VIRGINIA. THIS INVESTIGATION WAS ACCOMPLISHED BY PERFORMING A TOTAL OF TWO BORINGS AT EACH OF THE TWO DAM SITES TO ASCERTAIN FOUNDATION BEARING QUALITY OF THE IN-SITU SOILS. IN ADDITION, HANDAUGER BORINGS WERE PERFORMED AT VARIOUS LOCATIONS AROUND THE IMPOUNDMENTS TO EXPLORE THE QUALITY OF FILL SOILS AVAILABLE FROM CUTS PERFORMED IN THESE AREAS.

THE RESULTS OF THE SOIL TEST BORINGS INDICATE THE SUBSURFACE SOILS ARE PRIMARILY GRANULAR IN NATURE AND THEREFORE HIGHLY PERMEABLE. CONSIDERING THE LOW TOLERANCE FOR SEEPAGE FROM THE IMPOUNDMENTS, IT DOES NOT APPEAR THAT TYPICAL DAM CONSTRUCTION EMPLOYING A CLAY CORE WITH CLAY KEY WOULD CONSTITUTE AN ACCEPTABLE BARRIER TO WATER LOSS FROM THE IMPOUNDMENTS. THEREFORE, RECOMMENDED DAM DESIGNS INCLUDE TWO METHODS EMPLOYING GROUTED CURTAIN WALLS AND GEOMEMBRANE LINERS.

GROUNDWATER WAS ENCOUNTERED AT BOTH DAM SITES IN THE BOTTOM OF THE IMPOUNDMENT RAVINES. THEREFORE, DEWATERING AND DIVERTING OF WATER WILL BE OF CONCERN DURING CONSTRUCTION. FURTHERMORE, THE PRESENCE OF HEAVY ORGANICS WITHIN THE EMBANKMENT BEARING SOILS WILL REQUIRE SUBSTANTIAL UNDERCUTTING FROM BELOW BOTH DAMS.

THE CONCLUSIONS AND RECOMMENDATIONS CONTAINED IN THIS REPORT ARE BASED UPON A TOTAL OF FOUR BORINGS (C-1 AND 2, G-1 AND 2) DRILLED TO DEPTHS OF 25 FEET BELOW THE EXISTING GRADES AND SEVERAL HANDAUGER BORINGS PERFORMED TO DEPTHS OF 4 TO 8 FEET, A SITE RECONNAISSANCE PERFORMED BY THE GEOTECHNICAL ENGINEER, LABORATORY TEST RESULTS OF BORING AND BULK SAMPLES, AND SITE PLANS INDICATING IMPOUNDMENT BOUNDARIES AND DAM PROFILES. THE PROPOSED FIELD SAMPLING LOCATIONS WERE SELECTED BY THE PROJECT GEOTECHNICAL ENGINEER.

FOUNDATION PREPARATION

THE PRESENCE OF SOFT, ORGANIC SEDIMENTS IN THE BOTTOM OF THE RAVINES AT BOTH DAM SITES MAKES FOUNDATION CONDITIONS AT BOTH SITES UNSUITABLE FOR SUPPORT OF THE EARTHEN EMBANKMENTS. THESE ORGANIC MATERIALS SHOULD BE REMOVED FROM BELOW THE DAMS AND TO A DISTANCE OF AT LEAST 10 FEET BEYOND THE TOE OF THE EMBANKMENTS. THE SOIL BORINGS PERFORMED AT DAM C INDICATE UNSUITABLE DEPOSITS EXTEND AS DEEP AS ABOUT 8 FEET AND LIKELY MORE BELOW THE BOTTOM OF THE RAVINE. AT DAM G, UNSUITABLE MATERIALS WERE ENCOUNTERED AS DEEP AS ABOUT 15 FEET.

IT IS RECOMMENDED THAT PROVISIONS FOR DEWATERING BE MADE, THEN THE UNDERCUT PERFORMED TO THE REQUIRED GRADE AND DIMENSIONS. THE EXCAVATION SHOULD BE BACKFILLED UTILIZING AN APPROVED BACKFILL MATERIAL. SUCH A MATERIAL SHOULD CONSIST OF A SOIL CLASSIFIED AS SM, SC, OR CL CONTAINING AT LEAST 15% BY WEIGHT FINES (SILT OR CLAY) AND HAVING A MAXIMUM PLASTICITY INDEX (PI) OF 30%. THE FILL SHOULD BE COMPACTED IN MAXIMUM 10 INCH LIFTS TO A DRY DENSITY OF AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D698). IN ORDER TO ATTAIN THIS COMPACTION, IT WILL BE NECESSARY TO EMPLOY HEAVY COMPACTION EQUIPMENT IN THE BASE OF THE CUT. THE CONTRACTOR SHOULD PROVIDE THE METHODS NECESSARY TO ATTAIN ADEQUATE DEWATERING AND EXCAVATION STABILITY.

DAM EMBANKMENT AND CORE

ONCE THE UNSUITABLE DAM BASE SOILS HAVE BEEN REMOVED AND REPLACED, CONSTRUCTION OF THE EARTHEN EMBANKMENTS CAN PROCEED. BECAUSE CONSTRUCTION OF THESE DAMS WILL INCLUDE PLACEMENT OF A FABRIC LINER, THE CONSTRUCTION OF A KEY TRENCH IS NOT CONSIDERED NECESSARY. A CLAY CORE ALSO WILL NOT BE REQUIRED SINCE A FABRIC LINER IS TO BE EMPLOYED IN THE CONSTRUCTION.

GEOMEMBRANE LINER

THE IMPOUNDMENT CAN BE CREATED EMPLOYING AN EARTHEN EMBANKMENT COVERED IN A GEOMEMBRANE LINER. SPECIFIC INSTALLATION METHODS SHOULD BE SPECIFIED BY THE LINER SUPPLIER. THIS WOULD INCLUDE SEAM CONSTRUCTION AND EDGE ANCHORING. IN GENERAL, LINER CONSTRUCTION SHOULD PROCEED AS FOLLOWS:

A) BURY THE LINER AT A DEPTH OF APPROXIMATELY 3 FEET BELOW AND PARALLEL TO THE DAM EMBANKMENT SURFACE. BURY THE LINER AT LEAST 1 FOOT BELOW THE SURFACE NEAR THE IMPOUNDMENT PERIMETER. LINER MAY BE EXPOSED IF SUBMERGED WITHIN THE LAKE BED.

B) WHERE DAM STRUCTURES PENETRATE THE LINER, SUCH AS THE VERTICAL SPILLWAY RISER AND DEWATERING PIPE. THE LINER MUST BE SEALED AROUND THAT STRUCTURE TO PREVENT LEAKAGE.

C) THE LINER SHOULD EXTEND INTO THE IMPOUNDMENT A DISTANCE OF 100 FEET OUTWARD BEYOND THE UPSTREAM TOE OF THE DAM. THE EDGES OF THE LINER SHOULD EXTEND UP THE SIDES OF THE IMPOUNDMENT WITHIN THIS ZONE TO AN ELEVATION AT LEAST 2 FEET ABOVE THE 100 YEAR FLOOD ELEVATION.

GROUNDWATER SEEPAGE CONTROL

IN ORDER TO CONTROL SEEPAGE IN THE DOWNHILL TOE OF THE DAMS, A DRAINAGE BLANKET SHOULD BE EMPLOYED AT EMBANKMENT SUBGRADE ELEVATIONS; THAT IS, AN ELEVATION CONSISTENT WITH THE GROUND SURFACE ELEVATION JUST BEYOND THE EMBANKMENT TOE. THIS BLANKET SHOULD EXTEND INTO THE DAM FROM THE TOE A DISTANCE EQUAL TO ABOUT 20% OF THE EMBANKMENT WIDTH AT ITS BASE. THE DRAINAGE BLANKET SHOULD EXTEND UP THE SHOULDERS OF THE RAVINE A VERTICAL DISTANCE OF AT LEAST 3 FEET. SEEPAGE INTO THIS DRAINAGE BLANKET SHOULD BE COLLECTED IN A TOE DRAIN ALIGNED PARALLEL TO THE DOWNSTREAM TOE OF THE EMBANKMENT WITH DISCHARGE THROUGH A PERPENDICULAR DRAIN INTO THE OUTLET PIPE. THE DRAINAGE BLANKET SHOULD CONSIST OF A 12 INCH THICK LAYER OF COARSE GRADED AGGREGATE SUCH AS VDOT SIZE NO. 57 STONE WRAPPED IN A MEDIUM DUTY, NONWOVEN GEOTEXTILE FILTER FABRIC. THE TOE DRAIN PIPE SHOULD CONSIST OF A 6 INCH SLOTTED POLYETHYLENE TUBING WHICH SATISFIES THE REQUIREMENTS OF ASTM F-405.

IN ORDER TO MINIMIZE EROSION DUE TO SEEPAGE ALONG THE SPILLWAY CONDUIT, IT IS RECOMMENDED THAT SEEPAGE COLLARS BE SPACED AT INTERVALS ALONG THAT PIPE UPSTREAM OF THE DRAINAGE BLANKET. THE PIPE SHOULD REST DIRECTLY ON THE DRAINAGE BLANKET IN THAT PORTION OF THE EMBANKMENT WHERE THE DRAINAGE BLANKET IS EMPLOYED.

DEWATERING DURING CONSTRUCTION WILL BE DIFFICULT, PARTICULARLY IF WORK IS PERFORMED IN OTHER THAN THE DRIER SUMMER MONTHS. SURFACE GRADE STREAM FLOWS ARE RELATIVELY LOW AND TEMPORARY RETENTION OF SURFACIAL FLOWS MIGHT BE ATTAINED BY TEMPORARY BERMS AND DAMS UPSTREAM OF THE WORK AREA. FOR EXCAVATION BELOW GRADE IN ORDER TO REMOVE AND REPLACE ORGANIC DEPOSITS, DEWATERING COULD BE MORE COMPLICATED. IT IS ANTICIPATED THAT STAGED EXCAVATION SUPPORTED BY DEWATERING PUMPS OF SUBSTANTIAL CAPACITY WILL BE REQUIRED TO ACCOMPLISH THE UNDERCUTS, PARTICULARLY AT LAKE G WHERE ORGANIC DEPOSITS EXTEND AS DEEP AS 15 FEET AND POSSIBLY MORE. THE CONTRACTOR SHOULD PROVIDE DEWATERING BY APPROPRIATE METHODS AND HAVE THESE METHODS APPROVED BY THE ENGINEER PRIOR TO CONSTRUCTION. ONCE THE EMBANKMENT BASE ELEVATIONS HAVE BEEN ESTABLISHED, THE PRINCIPAL SPILLWAY RISER AND CONDUIT CAN BE INSTALLED AND THE WATER COURSE DIVERTED THROUGH IT.

CONSTRUCTION CONTROL

ALL FILL SHOULD BE PLACED AND COMPACTED TO A DRY DENSITY OF AT LEAST 95% OF THAT SOIL'S STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D698). THE COMPACTION SHOULD BE ACCOMPLISHED BY PLACING THE FILL IN 6 TO 10 INCH LOOSE LIFTS AND MECHANICALLY COMPACTING EACH LIFT TO THE REQUIRED DENSITY PRIOR TO PLACEMENT OF SUBSEQUENT LIFTS. AT LEAST A 5 TON DRUM ROLLER SHOULD BE EMPLOYED TO ATTAIN GENERAL EMBANKMENT COMPACTION. HAND OPERATED EQUIPMENT SHOULD BE EMPLOYED AROUND AND IMMEDIATELY ABOVE PIPES AND FOUNDATION. SOILS SHOULD BE COMPACTED AT MOISTURE CONTENTS WITHIN 3% ABOVE AND 1% BELOW OPTIMUM MOISTURE CONTENT FOR THE MATERIAL USED.

THE SURFACE OF EACH COMPACTED LIFT SHOULD BE SCARIFIED BY BACKDRAGGING TO A DEPTH OF 2 INCHES PRIOR TO PLACEMENT OF THE NEXT LIFT, THIS TO PREVENT DEVELOPMENT OF HORIZONTAL SEEPAGE PLANES. EMBANKMENT FILL SHOULD BE PLACED IN HORIZONTAL LIFTS WITH SLOPES NO STEEPER THAN 1 VERTICAL TO 4 HORIZONTAL. WHERE GREATER SLOPES EXIST, THEY SHOULD BE BENCHED TO RECEIVE FILL. BENCH HEIGHTS SHOULD BE LIMITED TO 4 FEET. THE NATURAL SHOULDERS OF THE RAVINES SHOULD BE CLEARED OF ALL VEGETATION, ROOT MATTER, OR OTHER ORGANIC, UNSTABLE MATERIAL PRIOR TO FILL PLACEMENT. BACKFILL ALONG THE PRINCIPAL SPILLWAY CONDUIT SHOULD BE PLACED EQUALLY ON BOTH SIDES OF THE PIPE DURING FILLING.

WATERSHED	JR	MAINTENANCE PLAN	No	CTRL STRUC DESC	CMP Riser
BMP ID NO	052	SITE AREA acre		CTRL STRUC SIZE inches	36
PLAN NO	SP-85-94	LAND USE		OTLT BARRL DESC	CMP Barrel
TAX PARCEL	(36-03)(01-19)	old BMP TYP	Wet Pond-Lake	OTLT BARRL SIZE inch	30
PIN NO	3630100019	JCC BMP CODE			
CONSTRUCTION DATE	1/1/2000	POINT VALUE	11	EMERG SPILLWAY	Yes
PROJECT NAME	Greensprings Legacy Golf Course			DESIGN HW ELEV	57.82
FACILITY LOCATION	Lake G			PERM POOL ELE	55.0
CITY-STATE	Williamsburg, Va. 23188	SVC DRAIN AREA acres	63.8	2-YR OUTFLOW cfs	3.97
CURRENT OWNER	Legacy Greensprings Limited Partnership			10-YR OUTFLOW cfs	28.44
OWNER ADDRESS	4029 Ironbound Rd.			REC DRAWING	Yes
OWNER ADDRESS 2	Suite 200	SERVICE AREA DESCRI			
CITY-STATE-ZIP CODE	Williamsburg, Va. 23188	IMPERV AREA acres	0.00	CONSTR CERTI	No
OWNER PHONE		RECV STREAM	UT of Shellbank Creek		
MAINT AGREEMENT	Yes	EXT DET-WQ-CTRL	No	LAST INSP DATE	10/29/2001
EMERG ACTION PLAN	No	WTR QUAL VOL acre-ft		INTERNAL RATING	3
		CHAN PROT CTRL	No	MISC/COMMENTS	
		CHAN PROT VOL acre-ft		NW corner of site near Fairway # 3a.	
		SW/FLOOD CONTROL	Yes		
		GEOTECH REPORT	No		

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