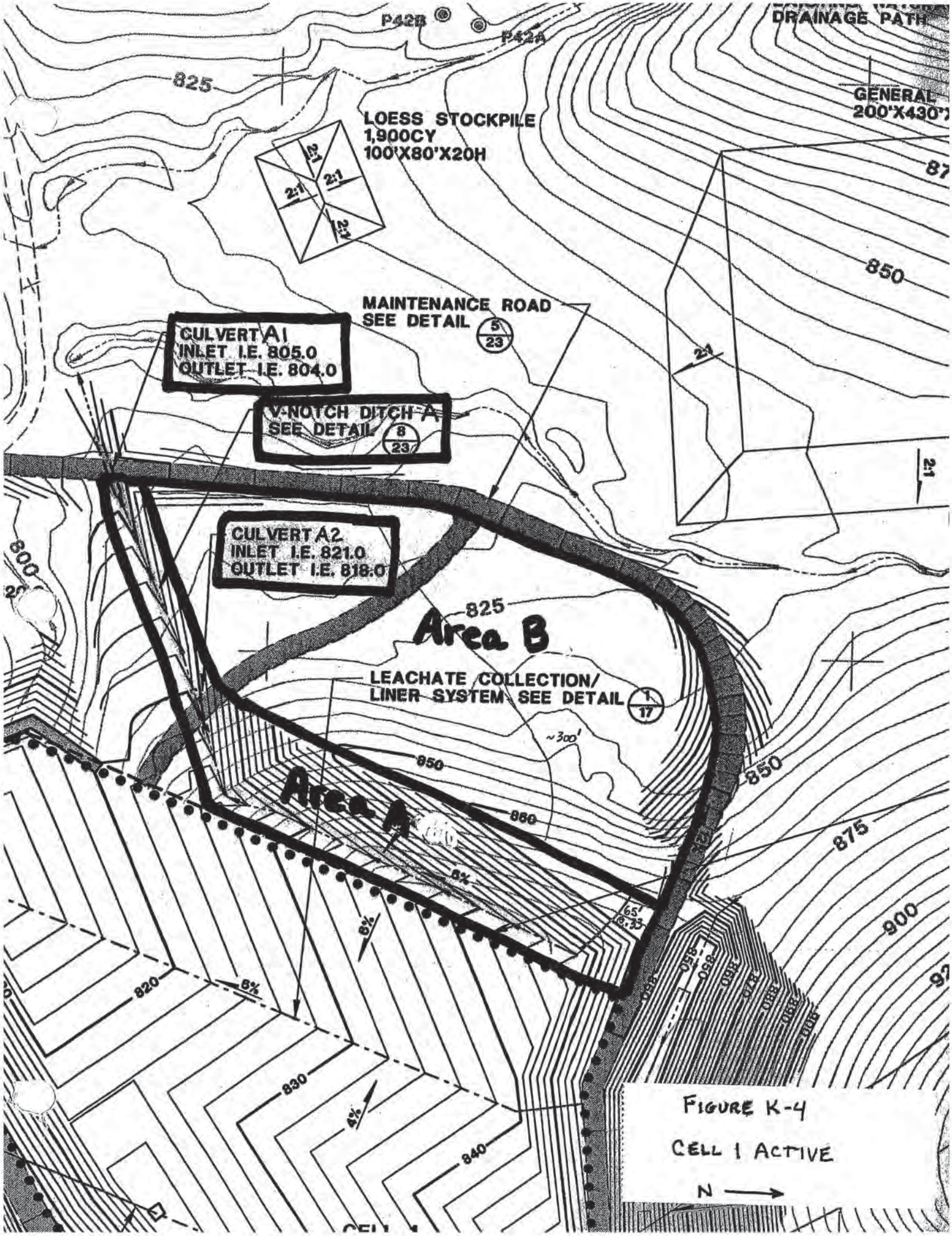
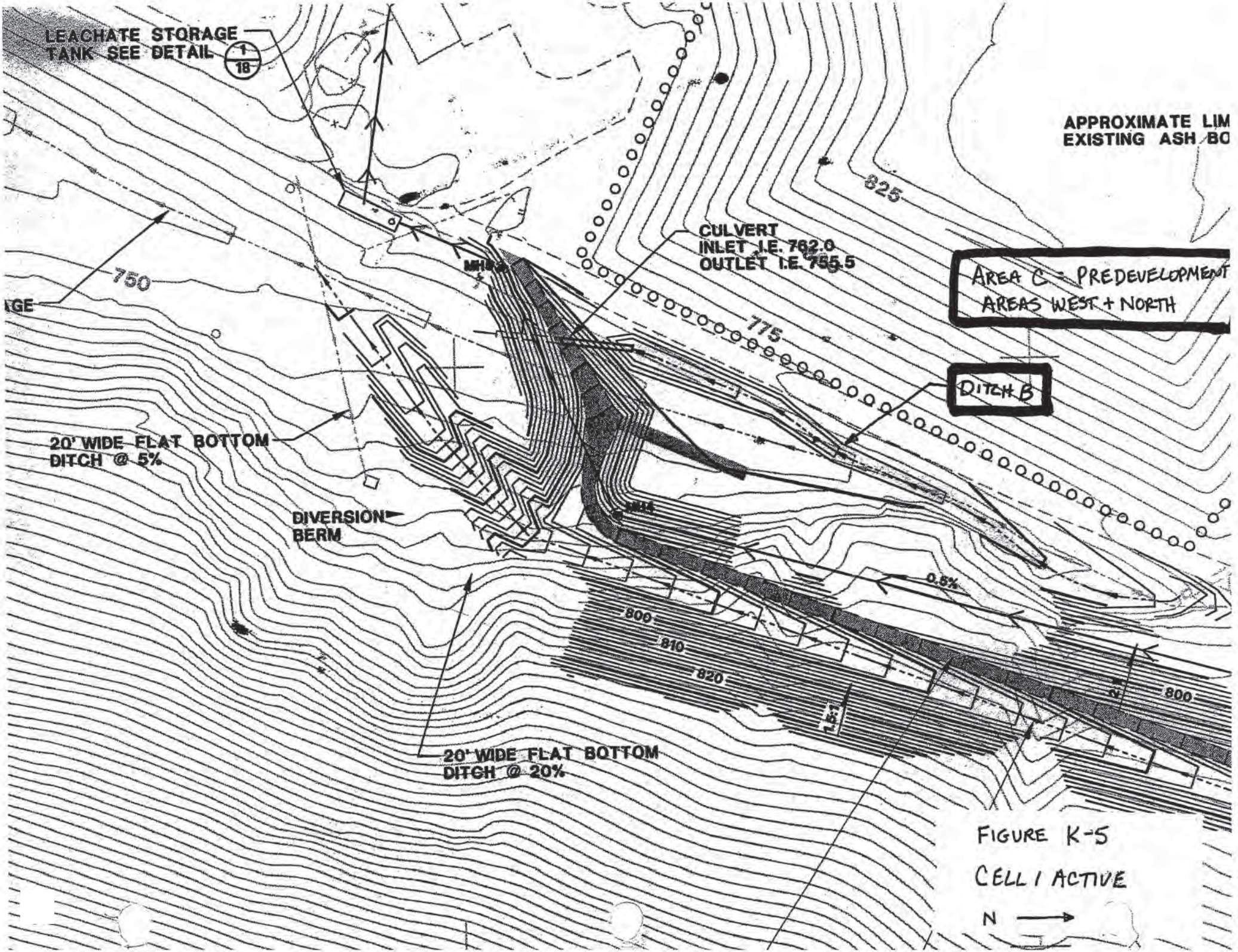
Operational Run-off Calculations


P42B
P42A
DRAINAGE PATH
825
LOESS STOCKPILE
1,900CY
100'X80'X20H
2:1
GENERAL
200'X430'
850
MAINTENANCE ROAD
SEE DETAIL 5/23
CULVERT A1
INLET I.E. 805.0
OUTLET I.E. 804.0
V-NOTCH DITCH A
SEE DETAIL 8/23
CULVERT A2
INLET I.E. 821.0
OUTLET I.E. 818.0
800
825
Area B
LEACHATE COLLECTION/
LINER SYSTEM SEE DETAIL 1/17
~300'
850
Area A
860
8%
875
900
820
830
4%
840
FIGURE K-4
CELL 1 ACTIVE
N


LEACHATE STORAGE TANK SEE DETAIL 1/18
APPROXIMATE LIM
EXISTING ASH BO
825
CULVERT
INLET I.E. 762.0
OUTLET I.E. 755.5
AREA C - PREDEVELOPMENT
AREAS WEST + NORTH
775
750
DITCH B
20' WIDE FLAT BOTTOM
DITCH @ 5%
DIVERSION
BERM
0.5%
800
810
820
3:1
800
20' WIDE FLAT BOTTOM
DITCH @ 20%
FIGURE K-5
CELL I ACTIVE
N

ALL-WEATHER ACCESS/ HAUL ROAD SEE DETAIL 6/23

DE FLAT BOTTOM
%

10' WIDE FLAT BOTTOM DITCH @ 2%

E BERM
784.0

V-NOTCH DITCH @ 6%

(ABANDONED) W14

CULVERT
INLET I.E. 790.0
OUTLET I.E. 780.0

LEACHATE TRANSFER LINE W/INSTALLED TO END OF BERM AND CAPPED FOR FUTURE PIPE CONNECTION

FILL DITCH TO REACH CULVERT ELEVATION

EXISTING ACCESS ROAD TO EXISTING PHASE II LANDFILL

850

EXISTING NATU DRAINAGE DITC

W42

P42B P42A

CULVERT B
INLET I.E. 792.0
OUTLET I.E. 791.5

CULVERT D
INLET I.E. 798.0
OUTLET I.E. 796.0

CONSTRUCT DITCH TO DRAIN

MENTATION
SIN NO. 1
DETAIL 1/22

DITCH C

LEACHATE COLLECTION/ LINER SYSTEM SEE DETAIL 1/17

W41 (ABANDONED)

Area B

DISCHARGE PIPE
INLET I.E. 814.5
OUTLET I.E. 802.0

RELOCATE EXISTING DITCH G DITCH

LEACHATE HEAD MONITORING WELL SEE DETAIL 6/17

LH3

CULVERT C
INLET I.E. 819.0
OUTLET I.E. 818.8

550' @ 5%

150' @ 5%

TOP OF BERM ELEVATION 824.0

MAINTENANC SEE DETAIL

825

Area E

150' @ 5%

TEMPORARY SEDIMENTATION BASIN EL. 816 SEE DETAIL 2/22

230' @ 18%

W105

DITCH @ 2%

20' WIDE FLAT BOTTOM DITCH @ 5% SEE DETAIL 8/23

CAP END OF PIPE FOR FUTURE LH4 CONNECTION

LEACHATE PIPE EXITS PERIMETER BERM SEE DETAILS 2/17 4/17 6/19

CULVERT
INLET I.E. 822.0
OUTLET I.E. 818

W104

MANHOLE SEE DETAIL W104A 2/18

W43

Area F

FIGURE K-6
CELL 2A ACTIVE

N

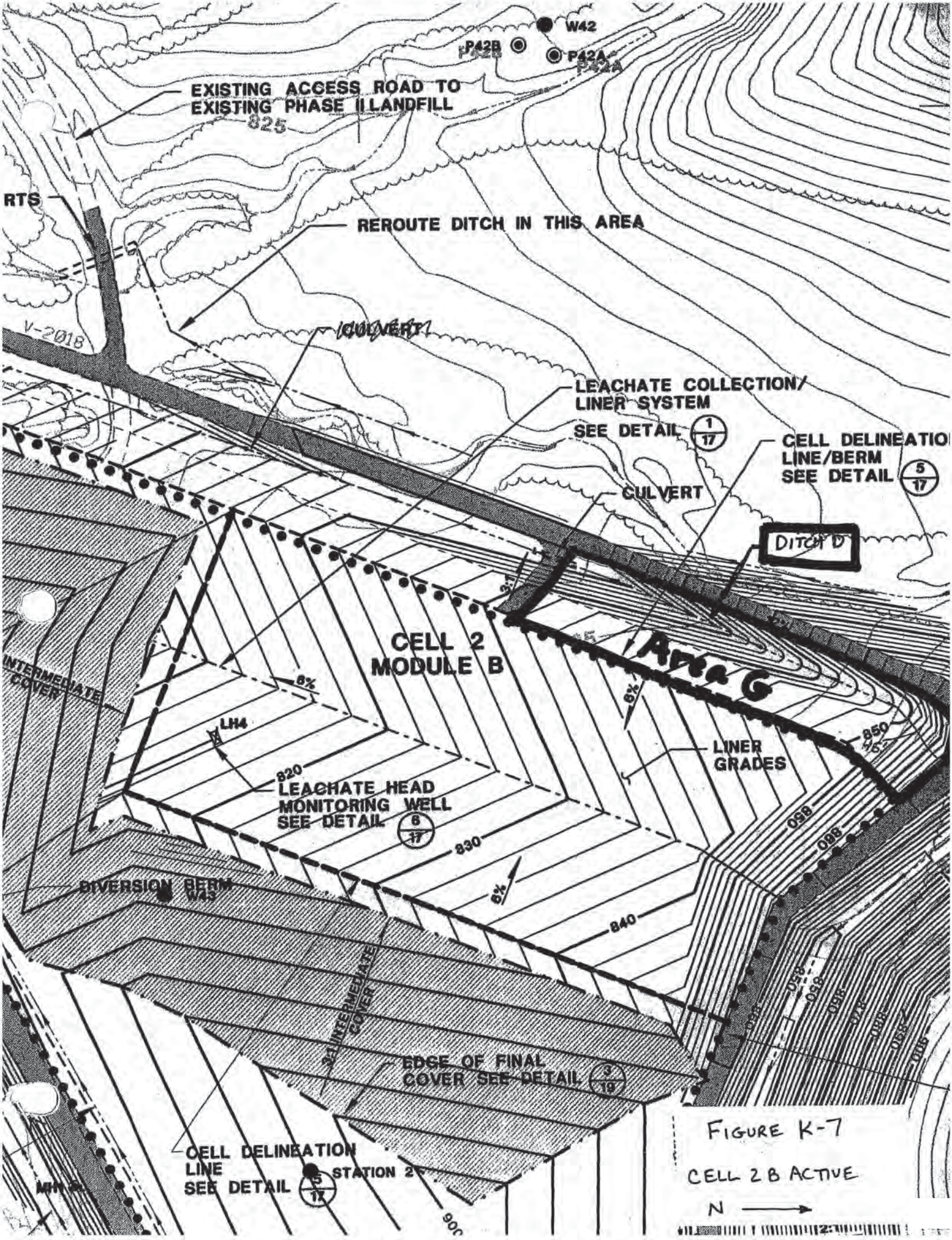


FIGURE K-7

CELL 2B ACTIVE

LANDFILL PERIMETER BERM SEE DETAILS (3/17) (5/19)

10' WIDE FLAT BOTTOM DITCH @ 6%

CULVERT INLET I.E. 812.0 OUTLET I.E. 808.0

CLEANOUT PIPE

TWO LEACHATE TRANSFER PIPES INSTALLED FOR CONNECTION TO FUTURE PHASE 4 MODULE A LEACHATE PIPES

DIVERSION BERM AND DRAINAGE DITCH E SEE DETAIL (9/23)

EL. 831

EL. 832.8

TEPORARY DIVERSION BERM AND RETENTION BASIN FOR ELEVATION 821 A

LEACHATE COLLECTION/ LINER SYSTEM SEE DETAIL (1/17)

CULVERT E INLET I.E. 819.0 OUTLET I.E. 816.5

EL. 836

GENERAL FILL 11,000CY 140'X100'X30'H

LEACHATE HEAD MONITORING WELL SEE DETAIL (6/17)

Area H

CELL 3

LINER GRADES

STATION 1

650' @ 3.5%

EL. 840

CELL LINE SEE

TURN AREA

EDGE OF FINAL COVER SEE DETAIL (9/19)

INTERMEDIATE SLOPE

TEMPORARY DIVERSION BERM

(4/21)

FIGURE K-8
CELL 3 ACTIVE

N

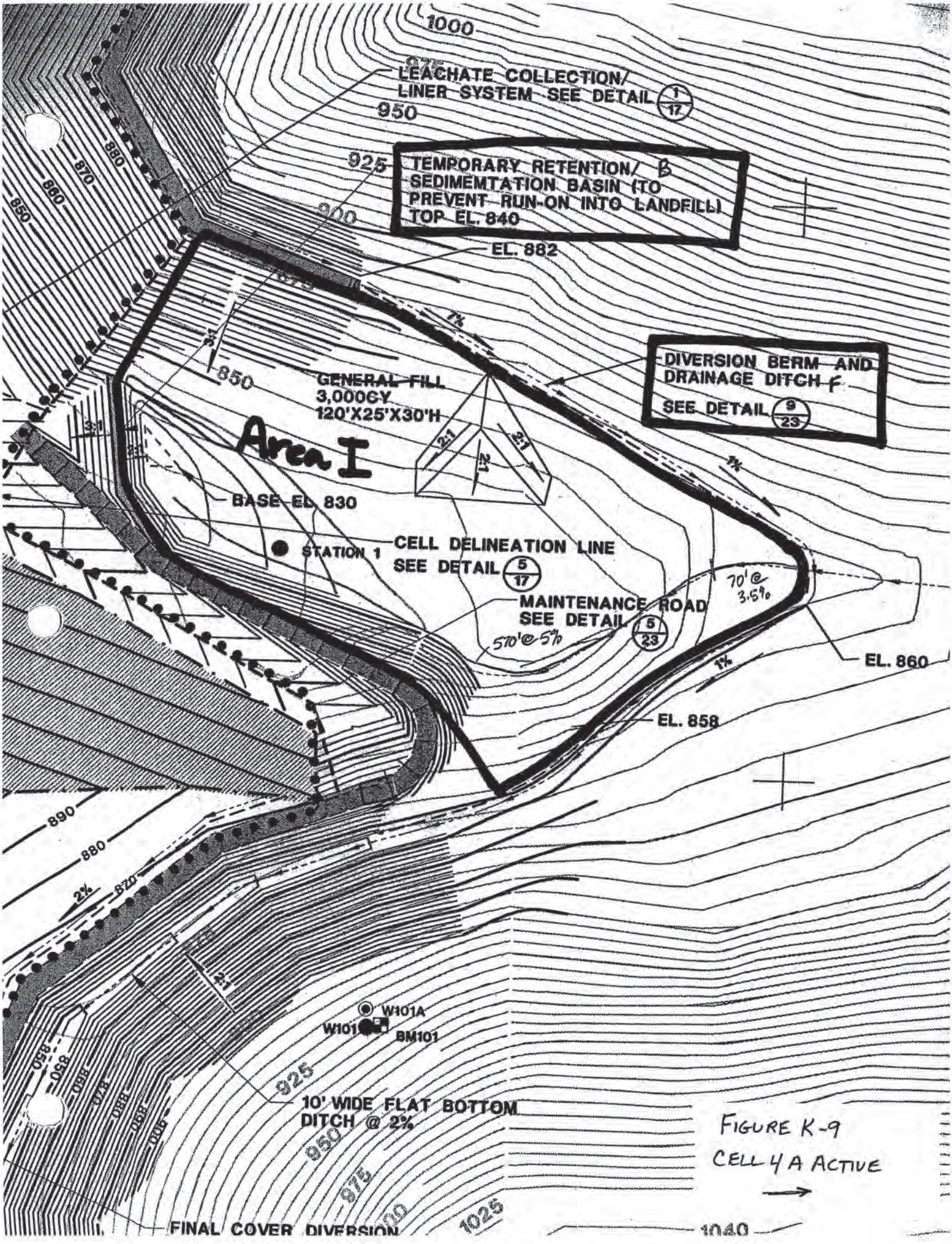


FIGURE K-9
CELL 4A ACTIVE

Quick TR-55 Ver.5.46 S/N:
Executed: 19:42:40 10-12-2000 p:\data\projects\3081\40\sw\op\OPERAT.TCT

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

Dairyland Power Coop.
Plan of Operation
Operational Conditions

Subarea descr.	Tc or Tt	Time (hrs)
Area A	Tc	0.08
Area B	Tc	0.21
Area D	Tc	0.06 – Round to 0.10
Area E	Tc	0.15
Area F	Tc	0.24
Area G	Tc	0.05 – Round to 0.10
Area H	Tc	0.10
Area I	Tc	0.15

Quick TR-55 Ver.5.46 S/N:
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Dairyland Power Coop.
Plan of Operation
Operational Conditions

Tc COMPUTATIONS FOR: Area A

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		grass	
Manning's roughness coeff., n		0.1500	
Flow length, L (total < or = 300)	ft	65.0	
Two-yr 24-hr rainfall, P2	in	2.800	
Land slope, s	ft/ft	0.3330	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.04	= 0.04

SHALLOW CONCENTRATED FLOW

Segment ID		2	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	625.0	
Watercourse slope, s	ft/ft	0.0600	
$Avg.V = Csf * (s)^{0.5}$	ft/s	3.9521	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.04	= 0.04

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	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	0.0000	
Flow length, L	ft	0	
T = L / (3600*V)	hrs	0.00	= 0.00

::

TOTAL TIME (hrs) 0.08

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Dairyland Power Coop.
Plan of Operation
Operational Conditions

Tc COMPUTATIONS FOR: Area B

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		grass	
Manning's roughness coeff., n		0.1500	
Flow length, L (total < or = 300)	ft	300.0	
Two-yr 24-hr rainfall, P2	in	2.800	
Land slope, s	ft/ft	0.1700	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.18	= 0.18

SHALLOW CONCENTRATED FLOW

Segment ID		2	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	220.0	
Watercourse slope, s	ft/ft	0.0200	
$Avg.V = Csf * (s)^{0.5}$	ft/s	2.2818	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.03	= 0.03

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	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	0.0000	
Flow length, L	ft	0	
T = L / (3600*V)	hrs	0.00	= 0.00

::

TOTAL TIME (hrs) 0.21

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Dairyland Power Coop.
Plan of Operation
Operational Conditions

Tc COMPUTATIONS FOR: Area D

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		soil	
Manning's roughness coeff., n		0.0110	
Flow length, L (total < or = 300)	ft	150.0	
Two-yr 24-hr rainfall, P2	in	2.800	
Land slope, s	ft/ft	0.0500	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.02	= 0.02

SHALLOW CONCENTRATED FLOW

Segment ID		2	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	550.0	
Watercourse slope, s	ft/ft	0.0500	
$Avg.V = Csf * (s)^{0.5}$	ft/s	3.6078	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.04	= 0.04

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	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	0.0000	
Flow length, L	ft	0	
T = L / (3600*V)	hrs	0.00	= 0.00

TOTAL TIME (hrs) 0.06

Quick TR-55 Ver.5.46 S/N:
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Dairyland Power Coop.
Plan of Operation
Operational Conditions

Tc COMPUTATIONS FOR: Area E

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		grass	
Manning's roughness coeff., n		0.1500	
Flow length, L (total < or = 300)	ft	230.0	
Two-yr 24-hr rainfall, P2	in	2.800	
Land slope, s	ft/ft	0.1800	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.14	= 0.14

SHALLOW CONCENTRATED FLOW

Segment ID		2	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	150.0	
Watercourse slope, s	ft/ft	0.0500	
$Avg.V = Csf * (s)^{0.5}$	ft/s	3.6078	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.01	= 0.01

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	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	0.0000	
Flow length, L	ft	0	
T = L / (3600*V)	hrs	0.00	= 0.00

TOTAL TIME (hrs) 0.15

Quick TR-55 Ver.5.46 S/N:
Executed: 19:42:40 10-12-2000 p:\data\projects\3081\40\sw\op\OPERAT.TCT

Dairyland Power Coop.
Plan of Operation
Operational Conditions

Tc COMPUTATIONS FOR: Area F

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		grass	
Manning's roughness coeff., n		0.1500	
Flow length, L (total < or = 300)	ft	185.0	
Two-yr 24-hr rainfall, P2	in	2.800	
Land slope, s	ft/ft	0.2500	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.10	= 0.10

SHALLOW CONCENTRATED FLOW

Segment ID		2	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	1370.0	
Watercourse slope, s	ft/ft	0.0300	
$Avg.V = Csf * (s)^{0.5}$	ft/s	2.7946	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.14	= 0.14

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	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	0.0000	
Flow length, L	ft	0	
T = L / (3600*V)	hrs	0.00	= 0.00

::

TOTAL TIME (hrs) 0.24

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Dairyland Power Coop.
Plan of Operation
Operational Conditions

Tc COMPUTATIONS FOR: Area G

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		grass	
Manning's roughness coeff., n		0.1500	
Flow length, L (total < or = 300)	ft	45.0	
Two-yr 24-hr rainfall, P2	in	2.800	
Land slope, s	ft/ft	0.3300	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.03	= 0.03

SHALLOW CONCENTRATED FLOW

Segment ID		2	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	320.0	
Watercourse slope, s	ft/ft	0.1200	
$Avg.V = Csf * (s)^{0.5}$	ft/s	5.5892	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.02	= 0.02

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	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	0.0000	
Flow length, L	ft	0	
T = L / (3600*V)	hrs	0.00	= 0.00

::

TOTAL TIME (hrs) 0.05

Quick TR-55 Ver.5.46 S/N:
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Dairyland Power Coop.
Plan of Operation
Operational Conditions

Tc COMPUTATIONS FOR: Area H

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		grass	
Manning's roughness coeff., n		0.1500	
Flow length, L (total < or = 300)	ft	50.0	
Two-yr 24-hr rainfall, P2	in	2.800	
Land slope, s	ft/ft	0.2000	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.04	= 0.04

SHALLOW CONCENTRATED FLOW

Segment ID		2	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	650.0	
Watercourse slope, s	ft/ft	0.0350	
$Avg.V = Csf * (s)^{0.5}$	ft/s	3.0185	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.06	= 0.06

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	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	0.0000	
Flow length, L	ft	0	
T = L / (3600*V)	hrs	0.00	= 0.00

::

TOTAL TIME (hrs) 0.10

Quick TR-55 Ver.5.46 S/N:
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Dairyland Power Coop.
Plan of Operation
Operational Conditions

Tc COMPUTATIONS FOR: Area I

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		grass	
Manning's roughness coeff., n		0.1500	
Flow length, L (total < or = 300)	ft	70.0	
Two-yr 24-hr rainfall, P2	in	2.800	
Land slope, s	ft/ft	0.0350	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.10	= 0.10

SHALLOW CONCENTRATED FLOW

Segment ID		2	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	570.0	
Watercourse slope, s	ft/ft	0.0500	
$Avg.V = Csf * (s)^{0.5}$	ft/s	3.6078	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.04	= 0.04

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	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	0.0000	
Flow length, L	ft	0	
T = L / (3600*V)	hrs	0.00	= 0.00

::

TOTAL TIME (hrs) 0.15

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 10-12-2000 20:11:42
Watershed file: --> p:\data\projects\3081\40\sw\op\CELL1 .WSD
Hydrograph file: --> p:\data\projects\3081\40\sw\op\CELL1 .HYD

Dairyland Power Coop.
Plan of Operation
Operational Conditions
Cell 1

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input	Ia/p used
Area A	1.10	69.0	0.10	0.00	6.10	2.79	.15	.10
Area B	2.70	69.0	0.20	0.00	6.10	2.79	.15	.10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 3.80 acres or 0.00594 sq.mi
Peak discharge = 14 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Area A	0.10	0.00	**	**	No	--
Area B	0.21	0.00	0.20	0.00	No	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 10-12-2000 20:11:42
Watershed file: --> p:\data\projects\3081\40\sw\op\CELL1 .WSD
Hydrograph file: --> p:\data\projects\3081\40\sw\op\CELL1 .HYD

Dairyland Power Coop.
Plan of Operation
Operational Conditions
Cell 1

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Area A	5	12.1
Area B	9	12.1
Composite Watershed	14	12.1

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 10-12-2000 20:11:49
Watershed file: --> p:\data\projects\3081\40\sw\op\CELL2A .WSD
Hydrograph file: --> p:\data\projects\3081\40\sw\op\CELL2A .HYD

Dairyland Power Coop.
Plan of Opertaion
Operational Conditions
Cell 2A

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
Area D	1.30	69.0	0.10	0.00	6.10	2.79	.15 .10
Area E	1.60	69.0	0.20	0.00	6.10	2.79	.15 .10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 2.90 acres or 0.00453 sq.mi
Peak discharge = 11 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Area D	0.10	0.00	**	**	No	--
Area E	0.15	0.00	0.20	0.00	No	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 10-12-2000 20:11:49
Watershed file: --> p:\data\projects\3081\40\sw\op\CELL2A .WSD
Hydrograph file: --> p:\data\projects\3081\40\sw\op\CELL2A .HYD

Dairyland Power Coop.
Plan of Opertaion
Operational Conditions
Cell 2A

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Area D	6	12.1
Area E	6	12.2
Composite Watershed	11	12.1

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 10-12-2000 20:11:57
Watershed file: --> p:\data\projects\3081\40\sw\op\TEMPBAS .WSD
Hydrograph file: --> p:\data\projects\3081\40\sw\op\TEMPBAS .HYD

Dairyland Power Coop.
Plan of Opertaion
Operational Conditions
Cell 2A Temporary Basin

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input	Ia/p used
Area F	7.60	69.0	0.20	0.00	6.10	2.79	.15	.10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 7.60 acres or 0.01187 sq.mi
Peak discharge = 27 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Area F	0.24	0.00	0.20	0.00	No	--

* Travel time from subarea outfall to composite watershed outfall point.

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 10-12-2000 20:11:57
Watershed file: --> p:\data\projects\3081\40\sw\op\TEMPBAS .WSD
Hydrograph file: --> p:\data\projects\3081\40\sw\op\TEMPBAS .HYD

Dairyland Power Coop.
Plan of Opertaion
Operational Conditions
Cell 2A Temporary Basin

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Area F	27	12.2
Composite Watershed	27	12.2

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 10-12-2000 20:12:03
Watershed file: --> p:\data\projects\3081\40\sw\op\CELL2B .WSD
Hydrograph file: --> p:\data\projects\3081\40\sw\op\CELL2B .HYD

Dairyland Power Coop.
Plan of Opertaion
Operational Conditions
Cell 2B

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
Area G	0.60	69.0	0.10	0.00	6.10	2.79	.15 .10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 0.60 acres or 0.00094 sq.mi
Peak discharge = 3 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Area G	0.10	0.00	**	**	No	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 10-12-2000 20:12:03
Watershed file: --> p:\data\projects\3081\40\sw\op\CELL2B .WSD
Hydrograph file: --> p:\data\projects\3081\40\sw\op\CELL2B .HYD

Dairyland Power Coop.
Plan of Opertaion
Operational Conditions
Cell 2B

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Area G	3	12.1
Composite Watershed	3	12.1

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 10-12-2000 20:12:08
Watershed file: --> p:\data\projects\3081\40\sw\op\CELL3 .WSD
Hydrograph file: --> p:\data\projects\3081\40\sw\op\CELL3 .HYD

Dairyland Power Coop.
Plan of Operation
Operational Conditions
Cell 3

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input	Ia/p used
Area H	1.70	69.0	0.10	0.00	6.10	2.79	.15	.10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 1.70 acres or 0.00266 sq.mi
Peak discharge = 7 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Area H	0.10	0.00	**	**	No	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 10-12-2000 20:12:08
Watershed file: --> p:\data\projects\3081\40\sw\op\CELL3 .WSD
Hydrograph file: --> p:\data\projects\3081\40\sw\op\CELL3 .HYD

Dairyland Power Coop.
Plan of Operation
Operational Conditions
Cell 3

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Area H	7	12.1
Composite Watershed	7	12.1

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 10-12-2000 20:21:09
Watershed file: --> p:\data\projects\3081\40\sw\op\CELL4A .WSD
Hydrograph file: --> p:\data\projects\3081\40\sw\op\CELL4A .HYD

Dairyland Power Coop.
Plan of Operation
Operational Conditions
Cell 4A

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input	Ia/p used
Area I	3.60	69.0	0.20	0.00	6.10	2.79	.15	.10

* Travel time from subarea outfall to composite watershed outfall point.
Total area = 3.60 acres or 0.00562 sq.mi
Peak discharge = 13 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Area I	0.15	0.00	0.20	0.00	No	--

* Travel time from subarea outfall to composite watershed outfall point.

TR-55 TABULAR HYDROGRAPH METHOD
Type II Distribution
(24 hr. Duration Storm)

Executed: 10-12-2000 20:21:09
Watershed file: --> p:\data\projects\3081\40\sw\op\CELL4A .WSD
Hydrograph file: --> p:\data\projects\3081\40\sw\op\CELL4A .HYD

Dairyland Power Coop.
Plan of Operation
Operational Conditions
Cell 4A

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Area I	13	12.2
Composite Watershed	13	12.2

Reference Information

Table 2-2a.—Runoff curve numbers for urban areas[1]

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area[2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.)[3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)[5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

[1]Average runoff condition, and $I_a = 0.2S$.

[2]The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

[3]CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

[4]Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

[5]Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4, based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2b.—Runoff curve numbers for cultivated agricultural lands[1]

Cover description			Curve numbers for hydrologic soil group—			
Cover type	Treatment[2]	Hydrologic condition[3]	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR) ⊥ to slope	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75 Ave = 77	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T + CR	Poor	65	73	79	81
		Good	61	70	77	80
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T + CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

[1]Average runoff condition, and $I_a = 0.2S$.

[2]*Crop residue cover* applies only if residue is on at least 5% of the surface throughout the year.

[3]Hydrologic condition is based on combination of factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes in rotations, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

Table 2-2c.—Runoff curve numbers for other agricultural lands[1]

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition	A	B	C	D
Pasture (grassland) or range—continuous forage for grazing.[2]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element.[3]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	430	48	65	73
Woods—grass combination (orchard or tree farm).[5]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods.[6]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	430	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

[1]Average runoff condition, and $I_a = 0.2S$.

[2]*Poor:* <50% ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: >75% ground cover and lightly or only occasionally grazed.

[3]*Poor:* <50% ground cover.
Fair: 50 to 75% ground cover.
Good: >75% ground cover.

[4]Actual curve number is less than 30; use CN = 30 for runoff computations.

[5]CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.

[6]*Poor:* Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

Sheet flow

Sheet flow is flow over plane surfaces. It usually occurs in the headwater of streams. With sheet flow, the friction value (Manning's n) is an effective roughness coefficient that includes the effect of raindrop impact; drag over the plane surface; obstacles such as litter, crop ridges, and rocks; and erosion and transportation of sediment. These n values are for very shallow flow depths of about 0.1 foot or so. Table 3-1 gives Manning's n values for sheet flow for various surface conditions.

For sheet flow of less than 300 feet, use Manning's kinematic solution (Overton and Meadows 1976) to compute T_t:

$$T_t = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,s^{0.4}} \qquad \text{[Eq. 3-3]}$$

Table 3-1.—Roughness coefficients (Manning's n) for sheet flow

Surface description	n[1]
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤20%	0.06
Residue cover >20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses[2]	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods:[3]	
Light underbrush	0.40
Dense underbrush	0.80

[1]The n values are a composite of information compiled by Engman (1986).
[2]Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.
[3]When selecting n, consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

where

T_t = travel time (hr),
n = Manning's roughness coefficient (table 3-1),
L = flow length (ft),
P_2 = 2-year, 24-hour rainfall (in), and
s = slope of hydraulic grade line (land slope, ft/ft).

This simplified form of the Manning's kinematic solution is based on the following: (1) shallow steady uniform flow, (2) constant intensity of rainfall excess (that part of a rain available for runoff), (3) rainfall duration of 24 hours, and (4) minor effect of infiltration on travel time. Rainfall depth can be obtained from appendix B.

Shallow concentrated flow

After a maximum of 300 feet, sheet flow usually becomes shallow concentrated flow. The average velocity for this flow can be determined from figure 3-1, in which average velocity is a function of watercourse slope and type of channel. For slopes less than 0.005 ft/ft, use equations given in appendix F for figure 3-1. Tillage can affect the direction of shallow concentrated flow. Flow may not always be directly down the watershed slope if tillage runs across the slope.

After determining average velocity in figure 3-1, use equation 3-1 to estimate travel time for the shallow concentrated flow segment.

Open channels

Open channels are assumed to begin where surveyed cross section information has been obtained, where channels are visible on aerial photographs, or where blue lines (indicating streams) appear on United States Geological Survey (USGS) quadrangle sheets. Manning's equation or water surface profile information can be used to estimate average flow velocity. Average flow velocity is usually determined for bank-full elevation.

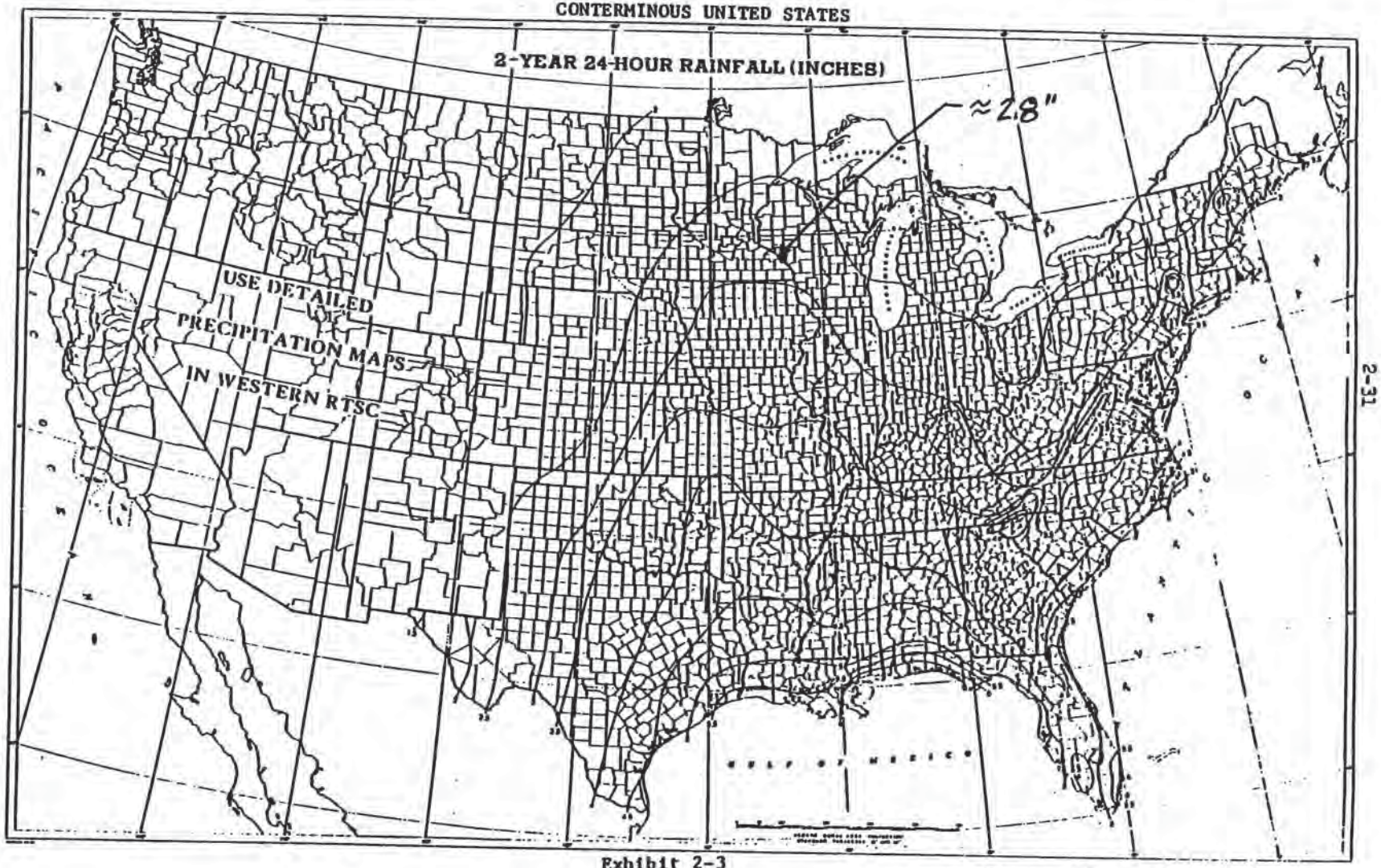
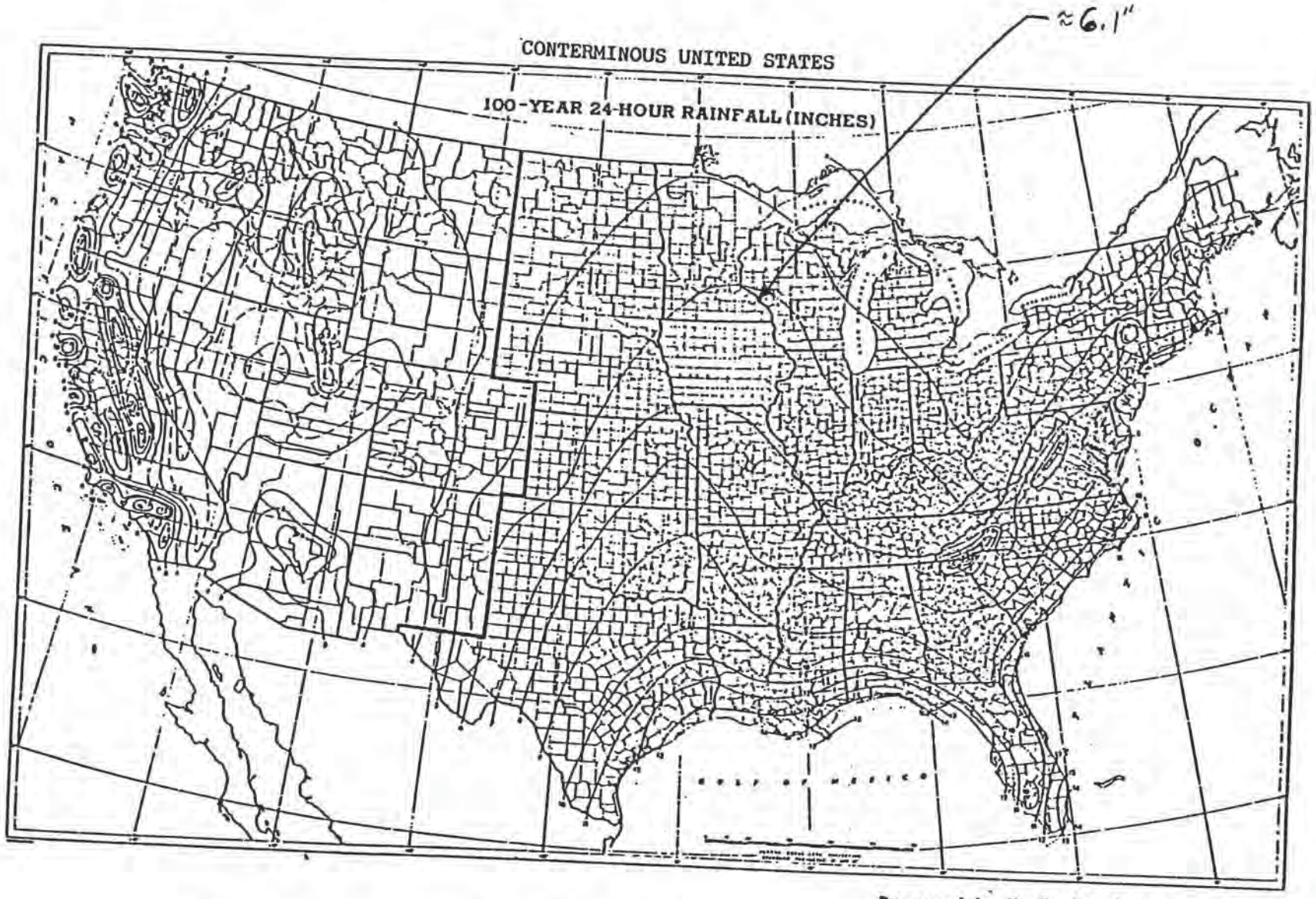


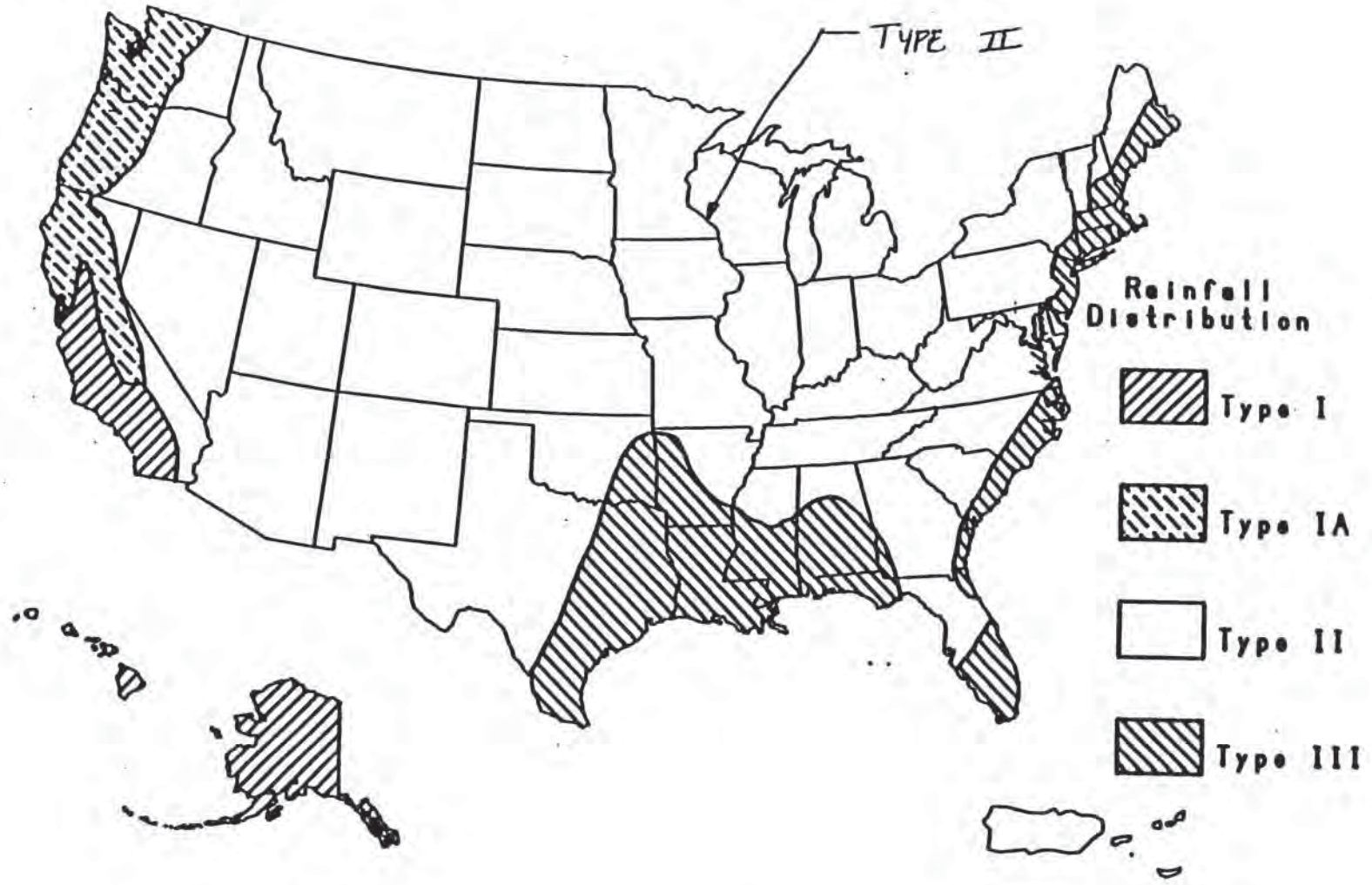
Exhibit 2-3
Sheet 1 of 5

Prepared by U. S. Weather Bureau



Prepared by U. S. Weather Bureau

FROM: Urban Hydrology for Small Watersheds. [n.p.]: U.S. Department of Agriculture. Soil Conservation Service Engineering Division, (Technical Release No. 55). 1975, as revised 1981.



—Approximate geographic boundaries for SCS rainfall distributions.

Diversion Berm, Perimeter Ditch, and Spillway Design Calculations

Purpose/Methodology/Assumptions/Results/References

744 Heartland Trail (53717-8923) P. O. Box 8923 (53708-8923) Madison, WI (608) 831-4444 FAX: (608) 831-3334 VOICE: (608) 831-1989

PROJECT/PROPOSAL NAME	PREPARED		CHECKED		PROJECT/PROPOSAL NO.
	By:	Date:	By:	Date:	
Dairyland Power Cooperative	BJK	9/00			3081.40

DIVERSION BERM, PERIMETER DITCH, AND SPILLWAY DESIGN CALCULATIONS

Purpose

To size the diversion berms, perimeter ditches and spillway at the proposed Dairyland Power Cooperative Landfill to adequately handle the surface water runoff from a 100-year, 24-hour storm.

Methodologies

Ditches, diversion berms and spillways were designed to channel the surface water runoff from the landfill drainage areas to the sedimentation basins, receiving ditches, or spillways. The direction of surface water runoff from the drainage areas surrounding the proposed landfill is towards the proposed landfill. Perimeter drainage ditches were therefore incorporated into the design to route the surface water runoff from outside the proposed landfill limits along the perimeter of the landfill area to the existing main channel at the south end of the landfill. These ditches are labeled as the NW, NE, West, SE, and SW ditches. The perimeter ditches sized in this subsection of the appendix, then, include ditches to collect runoff from the landfill drainage areas as well as ditches to collect surface water run-on from the drainage areas surrounding the landfill.

The adequacy of the diversion berms and ditches in handling the surface water runoff and run-on and in limiting the amount of erosion is based on the depth of flow and velocity, respectively, in the ditch. An in-house RMT spreadsheet incorporating Manning's equation was used to assist in the design of the diversion berms and ditches. This program allows the user to input the ditch geometry, the peak flow (as determined by the surface water runoff calculation), and the vegetative retardance factor (Chow, 1959). The program then begins an iterative process which adjusts the flow depth and Manning's coefficient until the trial velocity and the resultant velocity are within 0.002 feet per second (fps) of each other. The end result is the peak flow depth and peak velocity for the geometry and peak flow entered. Design software provided by Synthetic Industries was also used to select erosion control matting for ditches and grouted riprap for spillways.

Permanent ditches, diversion berms, and spillways will be constructed as early in the site development as practicable. Where temporary ditching is required, these temporary ditches have been designed to the same standards as the permanent ditches. Calculations for the sizing of the temporary ditches are also attached.

744 Heartland Trail (53717-8923) P. O. Box 8923 (53708-8923) Madison, WI (608) 831-4444 FAX: (608) 831-3334 VOICE: (608) 831-1989

PROJECT/PROPOSAL NAME	PREPARED		CHECKED		PROJECT/PROPOSAL NO.
	By:	Date:	By:	Date:	
Dairyland Power Cooperative	BJK	9/00			3081.40

It is noted that the storm water control structures have been designed using a 100-year, 24-hour storm event and a TR-55 Type II storm distribution. As noted in the surface water runoff calculations, the peak flows calculated using this method meet or exceed the peak flows calculated using a 25-year, time of concentration storm event (required by NR 504.09).

Assumptions

The following assumptions were used to design the diversion berms and perimeter ditches:

- Diversion berms, perimeter ditches and the spillway were designed to handle the runoff from the 100-year, 24-hour storm event.
- Diversion berm ditches were designed as V-notch ditches with a minimum 0.5 foot of freeboard for the 25-year, 24-hour storm. Diversion berm ditches were designed to convey the 100-year, 24-hour storm without overtopping.
- Perimeter ditches were designed as both V-notch and flat bottom (10-foot and 20-foot-wide) ditches with a minimum 0.5 foot of freeboard for the 25-year, 24-hour storm. Perimeter ditches were designed to convey the 100-year, 24-hour storm without overtopping.
- Grass-lined diversion berm and perimeter ditches were designed for a maximum velocity of 4 fps. Ditches with velocities exceeding 4 fps were designed to be lined with erosion mat or riprap, as appropriate.
- The spillway was designed as 20-foot-wide, flat-bottom spillway with a minimum 0.5 foot of freeboard.
- The peak flows in the diversion berms, perimeter ditches and the spillway were obtained from the hydrographs generated in the "Surface Water Runoff Calculations" subsection of this appendix.
- Manning's numbers were selected for both "low" retardance (Type "D") and "moderate" retardance (Type "C") as given by the U.S. Soil and Conservation Service. Type "D" is typical of spring conditions while Type "C" is typical of summer conditions. For ditches lined with erosion matting, default Manning numbers from the Synthetic Industries design software were utilized.

Results

The diversion berms and perimeter ditches were adequately sized to handle the surface water runoff from a 100-year, 24-hour storm event. The diversion berms at a 2 percent slope will be grass-lined. To limit erosion, permanent erosion matting will be placed in the diversion berms at a 6 percent slope, as well as in most of the perimeter ditching. Grouted riprap will be constructed in the spillways. The attached figure highlights the ditch sizing results.

744 Heartland Trail (53717-8923) P. O. Box 8923 (53708-8923) Madison, WI (608) 831-4444 FAX: (608) 831-3334 VOICE: (608) 831-1989

PROJECT/PROPOSAL NAME	PREPARED		CHECKED		PROJECT/PROPOSAL NO.
	By:	Date:	By:	Date:	
Dairyland Power Cooperative	BJK	9/00			3081.40

References

Chow, V.T. 1959. Open Channel Hydraulics, McGraw Hill, New York.

Wisconsin Department of Transportation. 1994. Facilities Development Manual. February 1994.

U.S. Department of Agriculture, Soil Conservation Service. 1986. Engineering Field Manual for Conservation Practices. November 1986.

Goldman, S.J., et al. Erosion and Sediment Control Handbook. New York: McGraw-Hill. 1986.

Synthetic Industries. EC-Design 2000. Stormwater Management and Erosion Control Design Software. V.1.2.

Wisconsin DNR, Bureau of Water Resources Management. 1989. Wisconsin Construction Site Best Management Practice Handbook, Publication WR-222-89.

TRANSFER PIPE FROM STORAGE TANK CONNECTS TO EXISTING PIPE OUTSIDE PROCESSING FACILITY. SEE DETAIL (5/21)

APPROXIMATE LIMITS OF EXISTING ASH

LEACHATE STORAGE TANK SEE DETAIL (1/18)

EXISTING BOX CULVERT

ACCESS ROAD TO EXISTING PHASE II LANDFILL

10' WIDE FLAT BOTTOM DITCH @ 8%

CULVERT INLET I.E. 812.0 OUTLET I.E. 809.0

V-NOTCH DITCH @ 8%

CULVERT I.E. 784.0N I.E. 750.0S

ACCESS ROAD @ 5%

10' WIDE FLAT BOTTOM DITCH @ 5%

10' WIDE FLAT BOTTOM DITCH @ 7%

CULVERT

8' WIDE BERM ELEV. 784.0

10' WIDE FLAT BOTTOM DITCH @ 2%

V-NOTCH DRAINAGE DITCH @ 8%

CULVERTS

FINAL COVER SEE DETAIL (1/18)

FINAL COVER DRAINAGE LAYER TRANSFER AND DISCHARGE PIPE SEE DETAIL (4/18)

V-NOTCH DRAINAGE DITCH @ 1% SEE DETAIL (8/23)

LANDFILL PERIMETER BERM AND DRAINAGE DITCH SEE DETAILS (3/17) (5/18)

FINAL COVER DOWNSLOPE FLUME NO. 3 SEE DETAILS (3/20) (1/21) (4/21) (4/21)

SEDIMENTATION BASIN NO. 1 SEE DETAIL (1/22)

20' WIDE FLAT BOTTOM DITCH @ 20% AND DIVERSION BERM

EMERGENCY OVERFLOW PIPE

MAINTENANCE ROAD 10% SLOPE

RISER AND DISCHARGE PIPE SEE DETAIL (3/23)

E 1477500

20' WIDE FLAT BOTTOM DITCH @ 6% SEE DETAIL (6/23)

DITCH @ 2%

FINAL COVER DOWNSLOPE FLUME NO. 1 AND NO. 2 SEE DETAILS (1/20) (2/20) (4/20) (1/21) (2/21) (3/21) (4/21)

MANHOLE SEE DETAIL (2/16)

BM104

SEDIMENTATION BASIN NO. 2 SEE DETAIL (1/22)

MAINTENANCE ROAD 10% SLOPE

RISER/CULVERT I.E. 873.0W I.E. 872.0E

EMERGENCY SPILLWAY

FINAL COVER DIVERSION BERM SEE DETAIL (2/19)

BM101

10' WIDE FLAT BOTTOM DITCH @ 2%

LEACHATE TRANSFER LINE SEE DETAIL (3/23)

RIPRAP SPILLWAY

20' WIDE FLAT BOTTOM DITCH @ 1%

FILL AREA

E 1478000

E 1478500

19 18
20 17

CONSTRUCTION ACTIVITIES

PHASE 4B CLOSURE

1. INSTALL EROSION CONTROL DEVICES.
2. INSTALL GRADING LAYER.
3. INSTALL CCL.
4. INSTALL GEOMEMBRANE.
5. INSTALL DOWNSLOPE FLUME.
6. INSTALL SELECT GRANULAR FILL, DRAINAGE PIPING, GEOTEXTILE, ROOTING ZONE LAYER, AND TOPSOIL.
7. INSTALL DIVERSION BERMS.
8. SEED, FERTILIZE, AND MULCH.

CONSTRUCTION QUANTITIES

PHASE 4B CLOSURE	VOLUME / AREA
TOPSOIL PLACED	9,800 CY
GRADING LAYER SOIL	9,800 CY
GENERAL FILL	19,600 CY
SELECT GRANULAR FILL	19,600 CY
GEOTEXTILE	66,700 SY
CCL	58,600 SY
GEOMEMBRANE	58,600 SY
SEED, FERTILIZER, MULCH	12.1 ACRES
DOWNSLOPE FLUME	1 EACH
4-INCH DIA. HDPE CORRUGATED PIPE W/ SMOOTH INTERIOR	3,150 LF
SELECT AGGREGATE FILL	470 CY

LEGEND

EROSION MATTING

GROUTED RIPRAP

Channel Lining Results

0 100 200 300 400
SCALE: 1" = 100'

NOTE: THESE PLANS ARE ACCOMPANIED BY A REPORT OF THE SAME TITLE. THESE DOCUMENTS ARE INTERRELATED AND ARE INTENDED TO BE USED AND REVIEWED TOGETHER. THESE DOCUMENTS ARE INTENDED TO BE USED FOR REGULATORY PURPOSES ONLY. (NOT FOR CONSTRUCTION)

NO.	BY	DATE	REVISION	APP'D.
3.				
2.				
1.				

PROJECT: DAIRYLAND POWER COOPERATIVE
PLAN OF OPERATION
BUFFALO COUNTY, WISCONSIN

SHEET TITLE: PROPOSED FINAL GRADES

DRAWN BY: STORMER	SCALE: 1"=100'	PROJ. NO. 3081.40
CHECKED BY: DM		FILE NO. FGRADES.PLT
APPROVED BY: BJK	DATE PRINTED:	SHEET 12 OF 23
DATE: OCTOBER 2000		

RMT

744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608-831-4444

RMT COMPUTER AIDED DESIGN & DRAFTING

FIGURE K-10

Calculations – Post-closure Landfill Conditions

RMT, Inc.
Grass Channel Sizing Calculations

Site:	Dairyland Power Cooperative	Date:	10/1/98
Project #:	3081.33	User:	BLP
Channel:	Diversion Berm (2%) - worst case flow		
	Area 1F		

VBLP 10/19/98

==========

I. Input Parameters.

A. Side slope, Z1 (hor/vert) =	4.000	ft/ft
B. Side slope, Z2 (hor/vert) =	2.000	ft/ft
C. Bottom width, B =	0.000	ft
D. Design channel slope, S =	0.020	ft/ft
E. Channel Peak Flow, Q =	25.000	cfs
F. Enter - 1 - for Type "C" Veg. Retardence - 2 - for Type "D" Veg. Retardence	1	← Summer Conditions

II. Peak Flow Calculations.

A. Trial flow depth, D = (Bisection method until Va=Vb)	1.570	ft 0.4' freeboard
B. Channel flow area, Ac = (.5*Z1*D^2) + (B*D) + (.5*Z2*D^2)	7.390	sq ft
C. Wetted Perimeter, Pw = (D*(Z1^2+1)^.5) + B + (D*(Z2^2+1)^.5)	9.981	ft
D. Hydraulic radius, Rh = (Ac/Pw)	0.740	ft
E. Velocity and hydraulic radius, VR = (Va * Rh)	2.505	sfps
F. Channel flow Manning's coeff, nc = 0	0.051	
G. Trial velocity, Va = (Q/Ac)	3.383	fps
H. Resultant velocity, Vb = (1.49/nc) * (Rh^.667) * (S^.5)	3.383	fps < 4 fps

Invoke Solution Macro by typing - 'ctrl' D

RMT, Inc.

Grass Channel Sizing Calculations

Site:	Dairyland Power Cooperative	Date:	10/1/98
Project #:	3081.33	User:	BLP
Channel:	Diversion Berm (2%) - worst case flow Area 1F		

VBJL 10/98

==========

I. Input Parameters.

A. Side slope, Z1 (hor/vert) =	4.000	ft/ft
B. Side slope, Z2 (hor/vert) =	2.000	ft/ft
C. Bottom width, B =	0.000	ft
D. Design channel slope, S =	0.020	ft/ft
E. Channel Peak Flow, Q =	25.000	cfs
F. Enter - 1 - for Type "C" Veg. Retardence - 2 - for Type "D" Veg. Retardence	2	← Spring Conditions

II. Peak Flow Calculations.

A. Trial flow depth, D = (Bisection method until Va=Vb)	**1.456**	**ft** 0.5' freeboard
B. Channel flow area, Ac = (.5*Z1*D^2) + (B*D) + (.5*Z2*D^2)	6.357	sq ft
C. Wetted Perimeter, Pw = (D*(Z1^2+1)^.5) + B + (D*(Z2^2+1)^.5)	9.257	ft
D. Hydraulic radius, Rh = (Ac/Pw)	0.687	ft
E. Velocity and hydraulic radius, VR = (Va * Rh)	2.701	sfps
F. Channel flow Manning's coeff, nc = 0	0.042	
G. Trial velocity, Va = (Q/Ac)	3.933	fps
H. Resultant velocity, Vb = (1.49/nc) * (Rh^.667) * (S^.5)	**3.933**	**fps** < 4 fps

Invoke Solution Macro by typing - 'ctrl' D

h:\data\common\template\sc-51\grasscha.xls

RMT, Inc.

Grass Channel Sizing Calculations

Site:	Dairyland Power Corp.	Date:	31-July-98
Project #:	3081.33	User:	SRC
Channel:	Ditch (8%)		
	Area 1G - Flow From Landfill Portion - 15 cfs		

VBK 10/1/98

I. Input Parameters.

A. Side slope, Z1 (hor/vert) =	3.000	ft/ft
B. Side slope, Z2 (hor/vert) =	2.000	ft/ft
C. Bottom width, B =	0.000	ft
D. Design channel slope, S =	0.080	ft/ft
E. Channel Peak Flow, Q =	15.000	cfs
F. Enter - 1 - for Type "C" Veg. Retardence - 2 - for Type "D" Veg. Retardence	1	← summer conditions

II. Peak Flow Calculations.

A. Trial flow depth, D = (Bisection method until Va=Vb)	1.071	ft 0.9' freeboard
B. Channel flow area, Ac = (.5*Z1*D^2) + (B*D) + (.5*Z2*D^2)	2.870	sq ft
C. Wetted Perimeter, Pw = (D*(Z1^2+1)^.5) + B + (D*(Z2^2+1)^.5)	5.784	ft
D. Hydraulic radius, Rh = (Ac/Pw)	0.496	ft
E. Velocity and hydraulic radius, VR = (Va * Rh)	2.593	sfps
F. Channel flow Manning's coeff, nc = 0	0.051	
G. Trial velocity, Va = (Q/Ac)	5.226	fps
H. Resultant velocity, Vb = (1.49/nc) * (Rh^.667) * (S^.5)	5.226	fps > 4fps

use permanent erosion

RMT, Inc.
Grass Channel Sizing Calculations

Site:	Dairyland Power Corp.	Date:	31-July-98
Project #:	3081.33	User:	SRC
Channel:	Ditch (8%)		
	Area 1G - Flow From Landfill Portion - 15 cfs		

VBJJR 10/99

I. Input Parameters.

A. Side slope, Z1 (hor/vert) =	3.000	ft/ft
B. Side slope, Z2 (hor/vert) =	2.000	ft/ft
C. Bottom width, B =	0.000	ft
D. Design channel slope, S =	0.080	ft/ft
E. Channel Peak Flow, Q =	15.000	cfs
F. Enter - 1 - for Type "C" Veg. Retardence - 2 - for Type "D" Veg. Retardence	2	← Spring conditions

II. Peak Flow Calculations.

A. Trial flow depth, D = (Bisection method until Va=Vb)	0.992	ft 1' freeboard
B. Channel flow area, Ac = (.5*Z1*D^2) + (B*D) + (.5*Z2*D^2)	2.459	sq ft
C. Wetted Perimeter, Pw = (D*(Z1^2+1)^.5) + B + (D*(Z2^2+1)^.5)	5.353	ft
D. Hydraulic radius, Rh = (Ac/Pw)	0.459	ft
E. Velocity and hydraulic radius, VR = (Va * Rh)	2.802	sfps
F. Channel flow Manning's coeff, nc = 0	0.041	
G. Trial velocity, Va = (Q/Ac)	6.101	fps
H. Resultant velocity, Vb = (1.49/nc) * (Rh^.667) * (S^.5)	6.101	fps > 4 fps use permanent erosion matting

BJK 10/6/98

****

NORTH AMERICAN GREEN - ECMDS VER.IV - CHANNEL PROTECTION - ENGLISH

USER SPECIFIED CHANNEL LINING ANALYSIS

****

PROJECT NAME: Dairyland Power
PROJECT NO.: 3081.33
COMPUTED BY: BJK
DATE: 10-06-1998
FROM STATION/REACH: Area 1G - Fl
TO STATION/REACH:
DRAINAGE AREA:
DESIGN FREQUENCY: 100

Channel Bottom Width (ft)	Side Slope Lt. (Horz. to 1)	Side Slope Rt. (Horz. to 1)	Channel Slope (ft/ft)
0.00	3.0	2.0	0.080

✓

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (ft/sec)	Area (ft^2)	Hydraulic Radius (ft)	Normal Depth (ft)
15.0	2.0	5.34	2.81	0.49	1.06

OK

Lining Type	Growth Habit	Veg. Den	Manning Coefficient	Permissible Shear (lb/sf)	Calculated Shear (lb/sf)	Safety Factor	Remark
P300 Staple E Phase 3 (Mature Vegetation)			0.049	8.00	5.29	1.51	STABLE

✓

RMT, Inc.

Grass Channel Sizing Calculations

Site:	Dairyland Power Corp.	Date:	31-July-98
Project #:	3081.33	User:	SRC
Channel:	Ditch (1%)		
	Area 2B		

VBWL 10 Yr

I. Input Parameters.

A. Side slope, Z1 (hor/vert) =	3.000	ft/ft
B. Side slope, Z2 (hor/vert) =	2.000	ft/ft
C. Bottom width, B =	0.000	ft
D. Design channel slope, S =	0.010	ft/ft
E. Channel Peak Flow, Q =	73.000	cfs
F. Enter - 1 - for Type "C" Veg. Retardence - 2 - for Type "D" Veg. Retardence	1	← Summer conditions

II. Peak Flow Calculations.

A. Trial flow depth, D = (Bisection method until Va=Vb)	2.593	ft 0.4' freeboard
B. Channel flow area, Ac = (.5*Z1*D^2) + (B*D) + (.5*Z2*D^2)	16.814	sq ft
C. Wetted Perimeter, Pw = (D*(Z1^2+1)^.5) + B + (D*(Z2^2+1)^.5)	14.000	ft
D. Hydraulic radius, Rh = (Ac/Pw)	1.201	ft
E. Velocity and hydraulic radius, VR = (Va * Rh)	5.214	sfps
F. Channel flow Manning's coeff, nc = 0	0.039	
G. Trial velocity, Va = (Q/Ac)	4.342	fps
H. Resultant velocity, Vb = (1.49/nc) * (Rh^.667) * (S^.5)	4.341	fps > 4 fps

use permanent erosion matting

RMT, Inc.

Grass Channel Sizing Calculations

Site:	Dairyland Power Corp.	Date:	31-July-98
Project #:	3081.33	User:	SRC
Channel:	Ditch (1%)		
	Area 2B		

VBK 10/98

I. Input Parameters.

A. Side slope, Z1 (hor/vert) =	3.000	ft/ft
B. Side slope, Z2 (hor/vert) =	2.000	ft/ft
C. Bottom width, B =	0.000	ft
D. Design channel slope, S =	0.010	ft/ft
E. Channel Peak Flow, Q =	73.000	cfs
F. Enter - 1 - for Type "C" Veg. Retardence - 2 - for Type "D" Veg. Retardence	2	← Spring conditions

II. Peak Flow Calculations.

A. Trial flow depth, D = (Bisection method until Va=Vb)	2.512	ft 0.5' freeboard
B. Channel flow area, Ac = (.5*Z1*D^2) + (B*D) + (.5*Z2*D^2)	15.774	sq ft
C. Wetted Perimeter, Pw = (D*(Z1^2+1)^.5) + B + (D*(Z2^2+1)^.5)	13.560	ft
D. Hydraulic radius, Rh = (Ac/Pw)	1.163	ft
E. Velocity and hydraulic radius, VR = (Va * Rh)	5.383	sfps
F. Channel flow Manning's coeff, nc = 0	0.036	
G. Trial velocity, Va = (Q/Ac)	4.628	fps
H. Resultant velocity, Vb = (1.49/nc) * (Rh^.667) * (S^.5)	4.627	fps > 4 fps

use permanent erosion matting

BJK 10/6/98

****

NORTH AMERICAN GREEN - ECMDS VER.IV - CHANNEL PROTECTION - ENGLISH
USER SPECIFIED CHANNEL LINING ANALYSIS

****

PROJECT NAME: Dairyland Paower Coop.
PROJECT NO.: 3081.33
COMPUTED BY: BJK
DATE: 10-06-1998
FROM STATION/REACH: Area 2B
TO STATION/REACH:
DRAINAGE AREA:
DESIGN FREQUENCY: 100

Channel Bottom Width (ft)	Side Slope Lt. (Horz. to 1)	Side Slope Rt. (Horz. to 1)	Channel Slope (ft/ft)
0.00	3.0	2.0	0.010

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (ft/sec)	Area (ft^2)	Hydraulic Radius (ft)	Normal Depth (ft)
73.0	2.0	3.64	20.08	1.31	2.83

Lining Type	Growth Habit	Veg. Den	Manning Coefficient	Permissible Shear (lb/sf)	Calculated Shear (lb/sf)	Safety Factor	Remark
P300 Staple E Phase 3 (Mature Vegetation)		0.049	8.00	1.77	4.52	STABLE	

COMPUTATION SHEET

RMT, Inc.
744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334 VOICE: (608) 831-1989

SHEET 1 OF 3.3

PROJECT / PROPOSAL NAME	PREPARED	CHECKED	PROJECT / PROPOSAL NO.
DAIRYLAND POWER COOP.	By: BJK Date: 5/9/97	By: [illegible] Date: 6/17/97	3081.24

Rev BLP/BJK 10/96
Rev BJK 9/00

DITCH DESIGN CALCULATIONS - DESIGN INFORMATION (25 YR-24 HR STORM)

SOUTH SPILLWAY

WIDTH = 20'
SLOPE = 20%
MIN DEPTH = 4'

PEAK FLOW - CONTRIBUTING DRAINAGE AREAS
3C + 4C + EAST + NORTHEAST + NORTH + BASIN 2 OUTFLOW ✓

18 + 11 + 445 + 68 + 194 + 10 = 746 CFS (25-YEAR)
↳ Round to 750 For calc's

28 + 18 + 857 + 110 + 360 + 21 = 1,374 CFS (100-year) ✓

Note: All Flows @ 12.6 HRS (25 year)
and @ 12.6 HRS (100-YR Fallow)

SE DITCH (2%) & (5%)

WIDTH = 20'
SLOPE = 2%
MIN DEPTH = 5'

PEAK FLOW - CONTRIBUTING DRAINAGE AREAS
3C + 4C + EAST + NORTHEAST + NORTH + BASIN 2 OUTFLOW ✓

See above = 750 CFS (25-YEAR)
= 1,374 (100-yr Fallow)

SE DITCH (1%)

SAME FLOWS AS ABOVE

WIDTH - 20'
SLOPE - 1%
MIN DEPTH - 6'

NE DITCH

WIDTH = 10'
SLOPE = 2%
MIN DEPTH = 10+'

PEAK FLOW - CONTRIBUTING DRAINAGE AREAS
4C + NORTH + BASIN 2 OUT ✓

11 + 194 + 10 = 215 CFS (25-YEAR) ✓

18 + 360 + 21 = 399 CFS (100-YEAR FALLOW)
- NE FLOWS AT 12.6 HRS (25 yr) and AT 12.5 HRS (100-YR FALLOW)

E Ditch

Width = 10'
Slope = 2%
Min Depth = 10'+

Peak Flow - Contributing Drainage Areas
4C + Northeast + North + Basin 2 out
= 18 + 110 + 360 + 21 = 509 cfs (100 yr)

COMPUTATION SHEET

744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334 VOICE: (608) 831-1989

PROJECT / PROPOSAL NAME	PREPARED By: BJK Date:	CHECKED By: CJS Date: 6/17/97	PROJECT / PROPOSAL NO.
DAIRYLAND POWER COOP.			3081.24

NW DITCH

WIDTH - 0' (V-NOTCH)
SLOPE - 19%
MIN DEPTH - 4 FT

PEAK FLOW - CONTRIBUTING DRAINAGE AREAS

28 - 48 CFS (25 YR) ✓

73 CFS (100 YR FALLOW)

WEST DITCH

WIDTH = 10'
SLOPE = 6%
MIN DEPTH = 6'

PEAK FLOW - CONTRIBUTING DRAINAGE AREAS

2C + WEST AREA ✓

10 + 111. = 121 CFS (25-YEAR) ✓

18 + 223 = 241 CFS (100 YEAR - FALLOW) ✓

- FLOWS @ 12.5 HRS (25-YEAR) AND AT 12.5 HRS (100-YEAR FALLOW)

SW DITCH

WIDTH = 10'
SLOPE = 2%, 5%, 7%
MIN DEPTH = 4' +

PEAK FLOW - CONTRIBUTING DRAINAGE AREAS

1C + 2C + WEST AREA ✓

46 + 10 + 111 = 167 CFS (25-YEAR) ✓

94 + 20 + 209 = 323 cfs (100-YEAR FALLOW) ✓

FLOWS @ 12.5 HRS (25-YEAR) AND @ 12.4 HRS (100-YEAR FALLOW)

MAIN CHANNEL

WIDTH ~ 20' MIN
SLOPE ~ 0.3%
MIN DEPTH ~ 6'

PEAK FLOW - CONTRIBUTING DRAINAGE AREAS

1C + 2C + 3C + 4C + EAST + NE + NORTH + WEST + BASIN1 + BASIN2 ✓

887 CFS + 8 + 10 = 905 CFS (25 YR)

1618 CFS + 21 + 21 = 1660 CFS (100-YR FALLOW) ✓

FLOWS @ 12.6 HRS (25-YEAR) AND @ 12.6 HRS (100-YEAR FALLOW)

RMT
744 Heartland Trail
Madison, WI 53717-1934
Tel. (608) 831-4444 • Fax (608) 831-3334

PROJECT / PROPOSAL NAME / LOCATION:		PROJECT / PROPOSAL NO.
SUBJECT: Dairyland Power Coop		3081.40
PREPARED BY: [illegible]	DATE: 9/00	FINAL ☒
CHECKED BY:	DATE:	REVISION ☐

AREA 1G DITCH

Width - V-NOTCH
SLOPE - 8%
MIN DEPTH = 4'

PEAK FLOW - CONTRIBUTING DRAINAGE AREA

= 15 CFS FLOW FROM LF.

PHASE 2 DITCH

WIDTH: V-NOTCH
SLOPE : 6%
MIN DEPTH: 2'

PEAK FLOW - CONTRIBUTING DRAINAGE AREA

~ 1.5 ACRES OF PHASE 2 COVER
DRAINAGE AREA -1C = 42 ACRES

$\frac{1.5}{42}$ (96 CFS) = 3.4 CFS

USE 4 CFS

EC-Design 2000 Channel Analysis Report

Analysis By:

User Information:	Generated by EC-Design:
Bernie Krantz **RMT, Inc.** **744 Heartland Trail** **Madison, WI 53717**	SYNTHETIC INDUSTRIES *Geosynthetic Products Division* 4019 Industry Drive • Chattanooga, TN 37416 • USA (423) 899-0444 • (800) FIX-SOIL www.fixsoil.com

General Information:

Project Details:		Project Notes:
Project Name:	**DPC Plan of Operation**	
Description:	**Channel Lining**	
State\Country:	**WI**	
City:	**La Crosse**	
Units:	**English**	
Created:	**01/19/99 @ 10:43**	

Disclaimer:

The information presented herein is for general information only. While every effort has been made to ensure its accuracy, this information should not be used for a specific application without independent professional examination and verification of its suitability, applicability and accuracy.

EC-Design 2000 Channel Analysis Report

Channel Analysis Information:

Name:

Channel Analysis Name: **South Spillway**

Channel Geometry & Hydraulics:

Design By:	Flow\Velocity:	Channel Geometry:
Designed By: **FLOW**	Discharge (cfs): **1374.00** Flow Duration (hrs): **1.00** Average Velocity (ft/s): **0.00**	Bed Slope (ft/ft): **0.20000** Req. Freeboard (ft): **0.00** Channel Length (ft): **270.00** Bottom Width (ft): **20.00** Channel Depth (ft): **4.00**
Channel Side Slopes:		
Left Slope (xH:1V): **2.00** Right Slope (xH:1V): **2.00**		
Channel Bend:	**Vegetation:**	**Soil Filled:**
Channel Bend: **No** Bend Radius (ft): **1.00** Outside Bend:	Vegetated: **Yes** Vegetation Class: **C**	Soil Filled: **No**

Factor of Safety: 1.10 **Functional Longevity:** 999

Analysis Results:

	Side	Lining Type	Manning's "n"	Velocity (ft/s) Actual	Max. Allowed	Safety Factor	Shear Stress (lbs/sqft) Actual	Max. Allowed	Safety Factor	Flow Depth (ft)	Discharge (cfs)	OK?
Analysis #1	Left:	PYRAMAT	0.0280	24.0	23.3	1.0	20.2	9.4	0.5	2.0857	1374.0	No
	Bottom:	PYRAMAT	0.0280	27.3	23.3	0.9	26.0	9.4	0.4			
	Right:	PYRAMAT	0.0280	24.0	23.3	1.0	20.2	9.4	0.5			
Analysis #2	Left:	GABIONS	0.0270	28.6	17.0	0.6	17.3	35.0	2.0	1.7968	1374.0	No
	Bottom:	GABIONS	0.0270	32.6	17.0	0.5	22.4	35.0	1.6			
	Right:	GABIONS	0.0270	28.6	17.0	0.6	17.3	35.0	2.0			
Analysis #3	Left:	ROCK RIPRAP	0.0300	26.6	50.0	1.9	18.3	45.0	2.5	1.9093	1374.0	Yes
	Bottom:	ROCK RIPRAP	0.0300	30.4	50.0	1.6	23.8	45.0	1.9			
	Right:	ROCK RIPRAP	0.0300	26.6	50.0	1.9	18.3	45.0	2.5			

Channel Calculation Results:

	Flow Area (sq ft)	Hydraulic Radius (ft)	Composite 'n'	Left Wetted Perimeter(ft)	Right Wetted Perimeter(ft)	Total Wetted Perimeter(ft)	Average Veleocity (ft/s)	Average Discharge (cfs)	Froude
Analysis #1	50.4146	1.7190	0.0351	4.6638	4.6638	29.3276	27.2540	1374.0	3.06
Analysis #2	42.3935	1.5121	0.0270	4.0178	4.0178	28.0356	32.4106	1374.0	3.94
Analysis #3	45.4772	1.5935	0.0300	4.2694	4.2694	28.5387	30.2130	1374.0	3.55

EC-Design 2000 Channel Analysis Report

Channel Analysis Information:

Name:

Channel Analysis Name: **SE Ditch (2%)**

Channel Geometry & Hydraulics:

Design By:	Flow\Velocity:	Channel Geometry:
Designed By: **FLOW**	Discharge (cfs): **1374.00** Flow Duration (hrs): **1.00** Average Velocity (ft/s): **0.00**	Bed Slope (ft/ft): **0.02000** Req. Freeboard (ft): **0.00** Channel Length (ft): **200.00** Bottom Width (ft): **20.00** Channel Depth (ft): **5.00**
Channel Side Slopes:		
Left Slope (xH:1V): **2.00** Right Slope (xH:1V): **2.00**		
Channel Bend:	**Vegetation:**	**Soil Filled:**
Channel Bend: **No** Bend Radius (ft): **0.00** Outside Bend:	Vegetated: **Yes** Vegetation Class: **C**	Soil Filled: **No**

Factor of Safety: 1.10 **Functional Longevity:** 999

Analysis Results:

	Side	Lining Type	Manning's "n"	Velocity (ft/s) Actual	Max. Allowed	Safety Factor	Shear Stress (lbs/sqft) Actual	Max. Allowed	Safety Factor	Flow Depth (ft)	Discharge (cfs)	OK?
Analysis #1	Left:	LANDLOK TRM	0.0250	10.0	16.5	1.6	4.2	4.7	1.1	4.2678	1374.0	No
	Bottom:	LANDLOK TRM	0.0250	11.3	16.5	1.5	5.3	4.7	0.9			
	Right:	LANDLOK TRM 435	0.0250	10.0	16.5	1.6	4.2	4.7	1.1			
Analysis #2	Left:	LANDLOK TRM	0.0250	10.0	16.8	1.7	4.2	6.5	1.6	4.2678	1374.0	Yes
	Bottom:	LANDLOK TRM	0.0250	11.3	16.8	1.5	5.3	6.5	1.2			
	Right:	LANDLOK TRM 450	0.0250	10.0	16.8	1.7	4.2	6.5	1.6			
Analysis #3	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			

Channel Calculation Results:

	Flow Area (sq ft)	Hydraulic Radius (ft)	Composite 'n'	Left Wetted Perimeter(ft)	Right Wetted Perimeter(ft)	Total Wetted Perimeter(ft)	Average Veleocity (ft/s)	Average Discharge (cfs)	Froude
Analysis #1	121.7841	3.1158	0.0397	9.5431	9.5431	39.0862	11.2823	1374.0	.890
Analysis #2	121.7841	3.1158	0.0397	9.5431	9.5431	39.0862	11.2823	1374.0	.890
Analysis #3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000

EC-Design 2000 Channel Analysis Report

Channel Analysis Information:

Name:

Channel Analysis Name: **SE Ditch (5%)**

Channel Geometry & Hydraulics:

Design By:

Designed By: **FLOW**

Channel Side Slopes:

Left Slope (xH:1V): **2.00**
Right Slope (xH:1V): **2.00**

Flow\Velocity:

Discharge (cfs): **1374.00**
Flow Duration (hrs): **1.00**
Average Velocity (ft/s): **0.00**

Channel Geometry:

Bed Slope (ft/ft): **0.05000**
Req. Freeboard (ft): **0.00**
Channel Length (ft): **750.00**
Bottom Width (ft): **20.00**
Channel Depth (ft): **5.00**

Channel Bend:

Channel Bend: **No**
Bend Radius (ft): **0.00**
Outside Bend:

Vegetation:

Vegetated: **Yes**
Vegetation Class: **C**

Soil Filled:

Soil Filled: **No**

Factor of Safety: **1.10**

Functional Longevity: **999**

Analysis Results:

	Side	Lining Type	Manning's "n"	Velocity (ft/s) Actual	Max. Allowed	Safety Factor	Shear Stress (lbs/sqft) Actual	Max. Allowed	Safety Factor	Flow Depth (ft)	Discharge (cfs)	OK?
Analysis #1	Left:	LANDLOK TRM	0.0260	14.3	19.1	1.3	7.8	7.5	1.0	3.2178	1374.0	No
	Bottom:	LANDLOK TRM	0.0260	16.2	19.1	1.2	10.0	7.5	0.8			
	Right:	LANDLOK TRM	0.0260	14.3	19.1	1.3	7.8	7.5	1.0			
Analysis #2	Left:	PYRAMAT	0.0280	14.3	23.3	1.6	7.8	9.4	1.2	3.2184	1374.0	No
	Bottom:	PYRAMAT	0.0280	16.2	23.3	1.4	10.0	9.4	0.9			
	Right:	PYRAMAT	0.0280	14.3	23.3	1.6	7.8	9.4	1.2			
Analysis #3	Left:	ROCK RIPRAP	0.0300	17.6	50.0	2.8	6.6	45.0	6.8	2.7285	1374.0	Yes
	Bottom:	ROCK RIPRAP	0.0300	19.9	50.0	2.5	8.5	45.0	5.3			
	Right:	ROCK RIPRAP	0.0300	17.6	50.0	2.8	6.6	45.0	6.8			

Channel Calculation Results:

	Flow Area (sq ft)	Hydraulic Radius (ft)	Composite 'n'	Left Wetted Perimeter(ft)	Right Wetted Perimeter(ft)	Total Wetted Perimeter(ft)	Average Veleocity (ft/s)	Average Discharge (cfs)	Froude
Analysis #1	85.0635	2.4735	0.0378	7.1952	7.1952	34.3903	16.1526	1374.0	1.47
Analysis #2	85.0856	2.4739	0.0378	7.1967	7.1967	34.3933	16.1484	1374.0	1.47
Analysis #3	69.4578	2.1569	0.0280	6.1010	6.1010	32.2020	19.7818	1374.0	1.96

EC-Design 2000 Channel Analysis Report

Channel Analysis Information:

Name:

Channel Analysis Name: **SE Ditch (1%)**

Channel Geometry & Hydraulics:

Design By:

Designed By: **FLOW**

Channel Side Slopes:

Left Slope (xH:1V): **2.00**
Right Slope (xH:1V): **2.00**

Flow\Velocity:

Discharge (cfs): **1374.00**
Flow Duration (hrs): **1.00**
Average Velocity (ft/s): **0.00**

Channel Geometry:

Bed Slope (ft/ft): **0.01000**
Req. Freeboard (ft): **0.00**
Channel Length (ft): **1000.0**
Bottom Width (ft): **20.00**
Channel Depth (ft): **6.00**

Channel Bend:

Channel Bend: **No**
Bend Radius (ft): **0.00**
Outside Bend:

Vegetation:

Vegetated: **Yes**
Vegetation Class: **C**

Soil Filled:

Soil Filled: **No**

Factor of Safety: **1.10**

Functional Longevity: **999**

Analysis Results:

	Side	Lining Type	Manning's "n"	Velocity (ft/s) Actual	Max. Allowed	Safety Factor	Shear Stress (lbs/sqft) Actual	Max. Allowed	Safety Factor	Flow Depth (ft)	Discharge (cfs)	OK?
Analysis #1	Left:	LANDLOK TRM 435	0.0250	7.7	16.5	2.2	2.6	4.7	1.8	5.2542	1374.0	Yes
	Bottom:	LANDLOK TRM	0.0250	8.6	16.5	1.9	3.3	4.7	1.4			
	Right:	LANDLOK TRM	0.0250	7.7	16.5	2.2	2.6	4.7	1.8			
Analysis #2	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
Analysis #3	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			

Channel Calculation Results:

	Flow Area (sq ft)	Hydraulic Radius (ft)	Composite 'n'	Left Wetted Perimeter(ft)	Right Wetted Perimeter(ft)	Total Wetted Perimeter(ft)	Average Veleocity (ft/s)	Average Discharge (cfs)	Froude
Analysis #1	160.2976	3.6852	0.0413	11.7488	11.7488	43.4975	8.5716	1374.0	.615
Analysis #2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000
Analysis #3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000

EC-Design 2000 Channel Analysis Report

Channel Analysis Information:

Name:

Channel Analysis Name: **NE Ditch**

Channel Geometry & Hydraulics:

Design By:

Designed By: **FLOW**

Channel Side Slopes:

Left Slope (xH:1V): **2.00**
Right Slope (xH:1V): **2.00**

Flow\Velocity:

Discharge (cfs): **399.00**
Flow Duration (hrs): **1.00**
Average Velocity (ft/s): **0.00**

Channel Geometry:

Bed Slope (ft/ft): **0.02000**
Req. Freeboard (ft): **0.00**
Channel Length (ft): **1800.0**
Bottom Width (ft): **10.00**
Channel Depth (ft): **5.00**

Channel Bend:

Channel Bend: **No**
Bend Radius (ft): **0.00**
Outside Bend:

Vegetation:

Vegetated: **Yes**
Vegetation Class: **C**

Soil Filled:

Soil Filled: **No**

Factor of Safety: **1.10**

Functional Longevity: **999**

Analysis Results:

	Side	Lining Type	Manning's "n"	Velocity (ft/s) Actual	Velocity (ft/s) Max. Allowed	Velocity (ft/s) Safety Factor	Shear Stress (lbs/sqft) Actual	Shear Stress (lbs/sqft) Max. Allowed	Shear Stress (lbs/sqft) Safety Factor	Flow Depth (ft)	Discharge (cfs)	OK?
Analysis #1	Left:	LANDLOK TRM	0.0250	7.1	16.5	2.3	3.1	4.7	1.5			
	Bottom:	LANDLOK TRM	0.0250	7.9	16.5	2.1	3.9	4.7	1.2	3.1235	399.0	Yes
	Right:	LANDLOK TRM 435	0.0250	7.1	16.5	2.3	3.1	4.7	1.5			
Analysis #2	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
Analysis #3	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			

Channel Calculation Results:

	Flow Area (sq ft)	Hydraulic Radius (ft)	Composite 'n'	Left Wetted Perimeter(ft)	Right Wetted Perimeter(ft)	Total Wetted Perimeter(ft)	Average Veleocity (ft/s)	Average Discharge (cfs)	Froude
Analysis #1	50.7483	2.1173	0.0440	6.9844	6.9844	23.9689	7.8623	399.0	.735
Analysis #2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000
Analysis #3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000

EC-Design 2000 Channel Analysis Report

Channel Analysis Information:

Name:

Channel Analysis Name: **East Ditch**

Channel Geometry & Hydraulics:

Design By:	Flow\Velocity:	Channel Geometry:
Designed By: **FLOW**	Discharge (cfs): **509.00** Flow Duration (hrs): **1.00** Average Velocity (ft/s): **0.00**	Bed Slope (ft/ft): **0.02000** Req. Freeboard (ft): **0.00** Channel Length (ft): **350.00** Bottom Width (ft): **10.00** Channel Depth (ft): **5.00**
Channel Side Slopes:		
Left Slope (xH:1V): **2.00** Right Slope (xH:1V): **2.00**		
Channel Bend:	**Vegetation:**	**Soil Filled:**
Channel Bend: **Yes** Bend Radius (ft): **200.00** Outside Bend: **L**	Vegetated: **Yes** Vegetation Class: **C**	Soil Filled: **No**

Factor of Safety: 1.10 **Functional Longevity:** 999

Analysis Results:

	Side	Lining Type	Manning's "n"	Velocity (ft/s) Actual	Max. Allowed	Safety Factor	Shear Stress (lbs/sqft) Actual	Max. Allowed	Safety Factor	Flow Depth (ft)	Discharge (cfs)	OK?
Analysis #1	Left:	LANDLOK TRM	0.0250	7.8	16.5	2.1	3.6	4.7	1.3			
	Bottom:	LANDLOK TRM	0.0250	8.6	16.5	1.9	4.4	4.7	1.1	3.4942	509.0	No
	Right:	LANDLOK TRM	0.0250	7.8	16.5	2.1	3.6	4.7	1.3			
Analysis #2	Left:	LANDLOK TRM	0.0250	7.8	16.8	2.2	3.6	6.5	1.8			
	Bottom:	LANDLOK TRM	0.0250	8.6	16.8	1.9	4.4	6.5	1.5	3.4942	509.0	Yes
	Right:	LANDLOK TRM 450	0.0250	7.8	16.8	2.2	3.6	6.5	1.8			
Analysis #3	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			

Channel Calculation Results:

	Flow Area (sq ft)	Hydraulic Radius (ft)	Composite 'n'	Left Wetted Perimeter(ft)	Right Wetted Perimeter(ft)	Total Wetted Perimeter(ft)	Average Veleocity (ft/s)	Average Discharge (cfs)	Froude
Analysis #1	59.3615	2.3164	0.0429	7.8133	7.8133	25.6267	8.5746	509.0	.760
Analysis #2	59.3615	2.3164	0.0429	7.8133	7.8133	25.6267	8.5746	509.0	.760
Analysis #3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000

EC-Design 2000 Channel Analysis Report

Channel Analysis Information:

Name:

Channel Analysis Name: **NW Ditch**

Channel Geometry & Hydraulics:

Design By:	Flow\Velocity:	Channel Geometry:
Designed By: **FLOW**	Discharge (cfs): **73.00** Flow Duration (hrs): **1.00** Average Velocity (ft/s): **0.00**	Bed Slope (ft/ft): **0.01000** Req. Freeboard (ft): **0.00** Channel Length (ft): **1000.0** Bottom Width (ft): **0.01** Channel Depth (ft): **4.00**
Channel Side Slopes: Left Slope (xH:1V): **2.00** Right Slope (xH:1V): **2.00**		
Channel Bend:	**Vegetation:**	**Soil Filled:**
Channel Bend: **No** Bend Radius (ft): **0.00** Outside Bend:	Vegetated: **Yes** Vegetation Class: **C**	Soil Filled: **No**
Factor of Safety: **1.10**		**Functional Longevity:** **999**

Analysis Results:

	Side	Lining Type	Manning's "n"	Velocity (ft/s) Actual	Velocity (ft/s) Max. Allowed	Velocity (ft/s) Safety Factor	Shear Stress (lbs/sqft) Actual	Shear Stress (lbs/sqft) Max. Allowed	Shear Stress (lbs/sqft) Safety Factor	Flow Depth (ft)	Discharge (cfs)	OK?
Analysis #1	Left:	LANDLOK TRM	0.0250	3.4	16.5	4.8	2.1	4.7	2.3	3.2826	73.0	Yes
	Bottom:	LANDLOK TRM	0.0250	3.4	16.5	4.8	2.0	4.7	2.3			
	Right:	LANDLOK TRM	0.0250	3.4	16.5	4.8	2.1	4.7	2.3			
Analysis #2	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
Analysis #3	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			

Channel Calculation Results:

	Flow Area (sq ft)	Hydraulic Radius (ft)	Composite 'n'	Left Wetted Perimeter(ft)	Right Wetted Perimeter(ft)	Total Wetted Perimeter(ft)	Average Veleocity (ft/s)	Average Discharge (cfs)	Froude
Analysis #1	21.5836	1.4693	0.0564	7.3401	7.3401	14.6902	3.3822	73.0	.331
Analysis #2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000
Analysis #3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000

EC-Design 2000 Channel Analysis Report

Channel Analysis Information:

Name:

Channel Analysis Name: **West Ditch**

Channel Geometry & Hydraulics:

Design By:	Flow\Velocity:	Channel Geometry:
Designed By: FLOW	Discharge (cfs): 241.00 Flow Duration (hrs): 1.00 Average Velocity (ft/s): 0.00	Bed Slope (ft/ft): 0.06000 Req. Freeboard (ft): 0.00 Channel Length (ft): 1020.0 Bottom Width (ft): 10.00 Channel Depth (ft): 6.00
Channel Side Slopes:		
Left Slope (xH:1V): 2.00 Right Slope (xH:1V): 2.00		
Channel Bend:	**Vegetation:**	**Soil Filled:**
Channel Bend: No Bend Radius (ft): 0.00 Outside Bend:	Vegetated: Yes Vegetation Class: C	Soil Filled: No

Factor of Safety: 1.10 **Functional Longevity:** 999

Analysis Results:

	Side	Lining Type	Manning's "n"	Velocity (ft/s) Actual	Max. Allowed	Safety Factor	Shear Stress (lbs/sqft) Actual	Max. Allowed	Safety Factor	Flow Depth (ft)	Discharge (cfs)	OK?
Analysis #1	Left:	PYRAMAT	0.0280	8.9	23.3	2.6	5.1	9.4	1.8	1.7595	241.0	Yes
	Bottom:	PYRAMAT	0.0280	10.1	23.3	2.3	6.6	9.4	1.4			
	Right:	PYRAMAT	0.0280	8.9	23.3	2.6	5.1	9.4	1.8			
Analysis #2	Left:	LANDLOK TRM	0.0260	8.9	19.1	2.1	5.1	7.5	1.5	1.7684	241.0	No
	Bottom:	LANDLOK TRM	0.0260	10.1	19.1	1.9	6.6	7.5	1.1			
	Right:	LANDLOK TRM	0.0260	8.9	19.1	2.1	5.1	7.5	1.5			
Analysis #3	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			

Channel Calculation Results:

	Flow Area (sq ft)	Hydraulic Radius (ft)	Composite 'n'	Left Wetted Perimeter(ft)	Right Wetted Perimeter(ft)	Total Wetted Perimeter(ft)	Average Veleocity (ft/s)	Average Discharge (cfs)	Froude
Analysis #1	23.7860	1.3312	0.0439	3.9343	3.9343	17.8685	10.1320	241.0	1.24
Analysis #2	23.9376	1.3367	0.0438	3.9541	3.9541	17.9083	10.0679	241.0	1.23
Analysis #3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000

EC-Design 2000 Channel Analysis Report

Channel Analysis Information:

Name:

Channel Analysis Name: **SW Ditch (7%)**

Channel Geometry & Hydraulics:

Design By:

Designed By: **FLOW**

Channel Side Slopes:

Left Slope (xH:1V): **2.00**
Right Slope (xH:1V): **2.00**

Flow\Velocity:

Discharge (cfs): **323.00**
Flow Duration (hrs): **1.00**
Average Velocity (ft/s): **0.00**

Channel Geometry:

Bed Slope (ft/ft): **0.07000**
Req. Freeboard (ft): **0.00**
Channel Length (ft): **225.00**
Bottom Width (ft): **10.00**
Channel Depth (ft): **4.00**

Channel Bend:

Channel Bend: **No**
Bend Radius (ft): **0.00**
Outside Bend:

Vegetation:

Vegetated: **Yes**
Vegetation Class: **C**

Soil Filled:

Soil Filled: **No**

Factor of Safety: **1.10**

Functional Longevity: **999**

Analysis Results:

	Side	Lining Type	Manning's "n"	Velocity (ft/s) Actual	Velocity (ft/s) Max. Allowed	Velocity (ft/s) Safety Factor	Shear Stress (lbs/sqft) Actual	Shear Stress (lbs/sqft) Max. Allowed	Shear Stress (lbs/sqft) Safety Factor	Flow Depth (ft)	Discharge (cfs)	OK?
Analysis #1	Left:	PYRAMAT	0.0280	10.6	23.3	2.2	6.6	9.4	1.4	1.9335	323.0	No
	Bottom:	PYRAMAT	0.0280	12.0	23.3	1.9	8.4	9.4	1.1			
	Right:	PYRAMAT	0.0280	10.6	23.3	2.2	6.6	9.4	1.4			
Analysis #2	Left:	ROCK RIPRAP	0.0300	13.4	50.0	3.7	5.5	45.0	8.2	1.6178	323.0	Yes
	Bottom:	ROCK RIPRAP	0.0300	15.2	50.0	3.3	7.1	45.0	6.4			
	Right:	ROCK RIPRAP	0.0300	13.4	50.0	3.7	5.5	45.0	8.2			
Analysis #3	Left:		0.0280	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			

Channel Calculation Results:

	Flow Area (sq ft)	Hydraulic Radius (ft)	Composite 'n'	Left Wetted Perimeter(ft)	Right Wetted Perimeter(ft)	Total Wetted Perimeter(ft)	Average Veleocity (ft/s)	Average Discharge (cfs)	Froude
Analysis #1	26.8125	1.4379	0.0419	4.3235	4.3235	18.6470	12.0466	323.0	1.40
Analysis #2	21.4118	1.2424	0.0300	3.6174	3.6174	17.2348	15.0851	323.0	1.94
Analysis #3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000

Channel Analysis Information:

Name:

Channel Analysis Name: **SW Ditch (2%)**

Channel Geometry & Hydraulics:

Design By:	Flow\Velocity:	Channel Geometry:
Designed By: FLOW	Discharge (cfs): 323.00 Flow Duration (hrs): 1.00 Average Velocity (ft/s): 0.00	Bed Slope (ft/ft): 0.02000 Req. Freeboard (ft): 0.00 Channel Length (ft): 300.00 Bottom Width (ft): 10.00 Channel Depth (ft): 4.00
Channel Side Slopes:		
Left Slope (xH:1V): 2.00 Right Slope (xH:1V): 2.00		
Channel Bend:	**Vegetation:**	**Soil Filled:**
Channel Bend: No Bend Radius (ft): 0.00 Outside Bend:	Vegetated: Yes Vegetation Class: C	Soil Filled: No

Factor of Safety: 1.10 **Functional Longevity:** 999

Analysis Results:

	Side	Lining Type	Manning's "n"	Velocity (ft/s) Actual	Max. Allowed	Safety Factor	Shear Stress (lbs/sqft) Actual	Max. Allowed	Safety Factor	Flow Depth (ft)	Discharge (cfs)	OK?
Analysis #1	Left:	PYRAMAT	0.0280	6.5	23.3	3.6	2.8	9.4	3.3	2.8325	323.0	Yes
	Bottom:	PYRAMAT	0.0280	7.3	23.3	3.2	3.5	9.4	2.7			
	Right:	PYRAMAT	0.0280	6.5	23.3	3.6	2.8	9.4	3.3			
Analysis #2	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
Analysis #3	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			

Channel Calculation Results:

	Flow Area (sq ft)	Hydraulic Radius (ft)	Composite 'n'	Left Wetted Perimeter(ft)	Right Wetted Perimeter(ft)	Total Wetted Perimeter(ft)	Average Veleocity (ft/s)	Average Discharge (cfs)	Froude
Analysis #1	44.3719	1.9575	0.0451	6.3337	6.3337	22.6675	7.2794	323.0	.709
Analysis #2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000
Analysis #3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000

EC-Design 2000 Channel Analysis Report

Channel Analysis Information:

Name:

Channel Analysis Name: **SW Ditch (5%)**

Channel Geometry & Hydraulics:

Design By:

Designed By: **FLOW**

Channel Side Slopes:

Left Slope (xH:1V): **2.00**
Right Slope (xH:1V): **2.00**

Flow\Velocity:

Discharge (cfs): **323.00**
Flow Duration (hrs): **1.00**
Average Velocity (ft/s): **0.00**

Channel Geometry:

Bed Slope (ft/ft): **0.05000**
Req. Freeboard (ft): **0.00**
Channel Length (ft): **240.00**
Bottom Width (ft): **10.00**
Channel Depth (ft): **4.00**

Channel Bend:

Channel Bend: **No**
Bend Radius (ft): **0.00**
Outside Bend:

Vegetation:

Vegetated: **Yes**
Vegetation Class: **C**

Soil Filled:

Soil Filled: **No**

Factor of Safety: **1.10**

Functional Longevity: **999**

Analysis Results:

	Side	Lining Type	Manning's "n"	Velocity (ft/s) Actual	Velocity (ft/s) Max. Allowed	Velocity (ft/s) Safety Factor	Shear Stress (lbs/sqft) Actual	Shear Stress (lbs/sqft) Max. Allowed	Shear Stress (lbs/sqft) Safety Factor	Flow Depth (ft)	Discharge (cfs)	OK?
Analysis #1	Left:	PYRAMAT	0.0280	9.3	23.3	2.5	5.2	9.4	1.8	2.1429	323.0	Yes
	Bottom:	PYRAMAT	0.0280	10.5	23.3	2.2	6.7	9.4	1.4			
	Right:	PYRAMAT	0.0280	9.3	23.3	2.5	5.2	9.4	1.8			
Analysis #2	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
Analysis #3	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			

Channel Calculation Results:

	Flow Area (sq ft)	Hydraulic Radius (ft)	Composite 'n'	Left Wetted Perimeter(ft)	Right Wetted Perimeter(ft)	Total Wetted Perimeter(ft)	Average Veleocity (ft/s)	Average Discharge (cfs)	Froude
Analysis #1	30.6135	1.5632	0.0427	4.7917	4.7917	19.5835	10.5509	323.0	1.17
Analysis #2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000
Analysis #3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000

EC-Design 2000 Channel Analysis Report

Channel Analysis Information:

Name:

Channel Analysis Name: **Main Channel**

Channel Geometry & Hydraulics:

Design By:	Flow\Velocity:	Channel Geometry:
Designed By: **FLOW**	Discharge (cfs): **1660.00** Flow Duration (hrs): **1.00** Average Velocity (ft/s): **0.00**	Bed Slope (ft/ft): **0.01300** Req. Freeboard (ft): **0.00** Channel Length (ft): **3500.0** Bottom Width (ft): **20.00** Channel Depth (ft): **6.00**
Channel Side Slopes:		
Left Slope (xH:1V): **2.00** Right Slope (xH:1V): **2.00**		
Channel Bend:	**Vegetation:**	**Soil Filled:**
Channel Bend: **No** Bend Radius (ft): **0.00** Outside Bend:	Vegetated: **Yes** Vegetation Class: **C**	Soil Filled: **No**

Factor of Safety: 1.10 **Functional Longevity:** 999

Analysis Results:

	Side	Lining Type	Manning's "n"	Velocity (ft/s) Actual	Velocity (ft/s) Max. Allowed	Velocity (ft/s) Safety Factor	Shear Stress (lbs/sqft) Actual	Shear Stress (lbs/sqft) Max. Allowed	Shear Stress (lbs/sqft) Safety Factor	Flow Depth (ft)	Discharge (cfs)	OK?
Analysis #1	Left:	LANDLOK TRM	0.0250	9.1	16.5	1.8	3.4	4.7	1.4	5.3260	1660.0	No
	Bottom:	LANDLOK TRM	0.0250	10.2	16.5	1.6	4.3	4.7	1.1			
	Right:	LANDLOK TRM	0.0250	9.1	16.5	1.8	3.4	4.7	1.4			
Analysis #2	Left:	LANDLOK TRM	0.0250	9.1	16.8	1.8	3.4	6.5	1.9	5.3260	1660.0	Yes
	Bottom:	LANDLOK TRM	0.0250	10.2	16.8	1.6	4.3	6.5	1.5			
	Right:	LANDLOK TRM	0.0250	9.1	16.8	1.8	3.4	6.5	1.9			
Analysis #3	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			

Channel Calculation Results:

	Flow Area (sq ft)	Hydraulic Radius (ft)	Composite 'n'	Left Wetted Perimeter(ft)	Right Wetted Perimeter(ft)	Total Wetted Perimeter(ft)	Average Veleocity (ft/s)	Average Discharge (cfs)	Froude
Analysis #1	163.2521	3.7256	0.0400	11.9093	11.9093	43.8185	10.1683	1660.0	.723
Analysis #2	163.2521	3.7256	0.0400	11.9093	11.9093	43.8185	10.1683	1660.0	.723
Analysis #3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000

EC-Design 2000 Channel Analysis Report

Channel Analysis Information:

Name:

Channel Analysis Name: **Area 1G Ditch**

Channel Geometry & Hydraulics:

Design By:	Flow\Velocity:	Channel Geometry:
Designed By: **FLOW**	Discharge (cfs): **15.00** Flow Duration (hrs): **1.00** Average Velocity (ft/s): **0.00**	Bed Slope (ft/ft): **0.08000** Req. Freeboard (ft): **0.00** Channel Length (ft): **140.00** Bottom Width (ft): **0.10** Channel Depth (ft): **4.00**
Channel Side Slopes: Left Slope (xH:1V): **2.00** Right Slope (xH:1V): **2.00**		
Channel Bend:	**Vegetation:**	**Soil Filled:**
Channel Bend: **No** Bend Radius (ft): **0.00** Outside Bend:	Vegetated: **Yes** Vegetation Class: **C**	Soil Filled: **No**

Factor of Safety: 1.10 **Functional Longevity:** 999

Analysis Results:

	Side	Lining Type	Manning's "n"	Velocity (ft/s) Actual	Velocity (ft/s) Max. Allowed	Velocity (ft/s) Safety Factor	Shear Stress (lbs/sqft) Actual	Shear Stress (lbs/sqft) Max. Allowed	Shear Stress (lbs/sqft) Safety Factor	Flow Depth (ft)	Discharge (cfs)	OK?
Analysis #1	Left:	LANDLOK TRM	0.0250	4.7	16.5	3.5	6.3	4.7	0.8	1.2450	15.0	No
	Bottom:	LANDLOK TRM	0.0250	4.6	16.5	3.5	6.2	4.7	0.8			
	Right:	LANDLOK TRM	0.0250	4.7	16.5	3.5	6.3	4.7	0.8			
Analysis #2	Left:	LANDLOK TRM	0.0250	4.7	16.8	3.6	6.3	6.5	1.0	1.2450	15.0	No
	Bottom:	LANDLOK TRM	0.0250	4.6	16.8	3.6	6.2	6.5	1.1			
	Right:	LANDLOK TRM	0.0250	4.7	16.8	3.6	6.3	6.5	1.0			
Analysis #3	Left:	PYRAMAT	0.0280	4.7	23.3	5.0	6.3	9.4	1.5	1.2502	15.0	Yes
	Bottom:	PYRAMAT	0.0280	4.7	23.3	5.0	6.2	9.4	1.5			
	Right:	PYRAMAT	0.0280	4.7	23.3	5.0	6.3	9.4	1.5			

Channel Calculation Results:

	Flow Area (sq ft)	Hydraulic Radius (ft)	Composite 'n'	Left Wetted Perimeter(ft)	Right Wetted Perimeter(ft)	Total Wetted Perimeter(ft)	Average Veleocity (ft/s)	Average Discharge (cfs)	Froude
Analysis #1	3.2247	0.5689	0.0624	2.7840	2.7840	5.6680	4.6516	15.0	.737
Analysis #2	3.2247	0.5689	0.0624	2.7840	2.7840	5.6680	4.6516	15.0	.737
Analysis #3	3.2511	0.5713	0.0622	2.7956	2.7956	5.6912	4.6138	15.0	.741

EC-Design 2000 Channel Analysis Report

Channel Analysis Information:

Name:

Channel Analysis Name: **Phase 2 Ditch**

Channel Geometry & Hydraulics:

Design By:

Designed By: **FLOW**

Channel Side Slopes:

Left Slope (xH:1V): **4.00**
Right Slope (xH:1V): **2.00**

Flow\Velocity:

Discharge (cfs): **4.00**
Flow Duration (hrs): **1.00**
Average Velocity (ft/s): **0.00**

Channel Geometry:

Bed Slope (ft/ft): **0.06000**
Req. Freeboard (ft): **0.00**
Channel Length (ft): **560.00**
Bottom Width (ft): **0.01**
Channel Depth (ft): **2.00**

Channel Bend:

Channel Bend: **No**
Bend Radius (ft): **0.00**
Outside Bend:

Vegetation:

Vegetated: **Yes**
Vegetation Class: **C**

Soil Filled:

Soil Filled: **No**

Factor of Safety: **1.10**

Functional Longevity: **999**

Analysis Results:

	Side	Lining Type	Manning's "n"	Velocity (ft/s) Actual	Max. Allowed	Safety Factor	Shear Stress (lbs/sqft) Actual	Max. Allowed	Safety Factor	Flow Depth (ft)	Discharge (cfs)	OK?
Analysis #1	Left:	LANDLOK TRM	0.0250	2.3	16.5	7.1	4.0	4.7	1.2			
	Bottom:	LANDLOK TRM	0.0250	2.0	16.5	8.1	3.1	4.7	1.5	0.8207	4.0	Yes
	Right:	LANDLOK TRM	0.0250	2.1	16.5	8.0	3.1	4.7	1.5			
Analysis #2	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
Analysis #3	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			

Channel Calculation Results:

	Flow Area (sq ft)	Hydraulic Radius (ft)	Composite 'n'	Left Wetted Perimeter(ft)	Right Wetted Perimeter(ft)	Total Wetted Perimeter(ft)	Average Veleocity (ft/s)	Average Discharge (cfs)	Froude
Analysis #1	2.0287	0.3880	0.0955	3.3837	1.8351	5.2288	1.9717	4.0	.415
Analysis #2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000
Analysis #3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000

Suggested Vegetation for: La Crosse,WI

All Season Grasses					
Species	Scentific Name	Retardance Class	Seed Rate (lbs/ac)	Height at Maturity (in)	Recommended Planting Dates
Alsike Clover	Trifolium hybridum	A - E	15		4/1 - 5/31 or8/16 - 10/15
Reed Canarygrass	Phalaris arundinacea	A- E	20		4/1 - 5/31 or 8/16 - 10/15
Colonial Bentgrass	Agrostis tenius	A - E	50		4/1 - 5/31 or 8/16 - 10/15
Creeping Bentgrass	Agrostis palustris	A - E	50		4/1 - 5/31 or 8/16 - 10/15
Poa Trivialis	Poa trivialis	A - E	50		4/1 - 5/31 or 8/16 - 10/15
Creeping Foxtrail	Alopecurus arundinaceus	A - E	50		4/1 - 5/31 or 8/16 - 10/15
Meadow Foxtail	Alopecurus pratensis	A - E	50		4/1 - 5/31 or 8/16 - 10/15
Perennial Ryegrass	Lolium perenne	A - E	240		4/1 - 5/31 or 8/16 - 10/15
RedTop	Agrostis alba	A - E	80		4/1 - 5/31 or 8/16 - 10/15
Meadow Fescue	Festuca elatior	A - E	160		4/1 - 5/31 or 8/16 - 10/15
Cold Season Grasses					
Species	Scentific Name	Retardance Class	Seed Rate (lbs/ac)	Height at Maturity (in)	Recommended Planting Dates
Crested Wheatgrass	Agropyron desertorum	A		2 - 3	
Green Needlegrass	Stipa viridula	A		3 - 4	
Russian WildRye	Psathyrostachys gunceus	A		3 - 4	
Smooth Bromegrass	Bromus inermis	A		3 - 4	
Tall Fescue	Festuca arundinacea	A		3 - 4	
Tall Wheatgrass	Elytriga pontica	A		4 - 5	
Western Wheatgrass	Agropyron smithii	A		2 - 3	
Warm Season Grasses					
Species	Scentific Name	Retardance Class	Seed Rate (lbs/ac)	Height at Maturity (in)	Recommended Planting Dates
Bermuda Grass	Cynodon dactylon	C		3/4 - 2	
Big Bluestem	Andropogon gerardii	B		4 - 6	
Blue grama	Boutelova gracillis	B		1 - 2	
Buffalo grass	Buchloe dactyloides	D		1/3 - 1	
Green Sprangletop	Leptochloa dubia	A		3 - 4	
Indian grass	Sorghastrum nutans	A		5 - 6	
Kleingrass	Panicum coloratum	A		3 - 4	
Little bluestem	Schizachyrium scoparium	A		3 - 4	
Plains bristlegrass	Setaria macrostachya	B		1 - 2	
Sand bluestem	Andropogon hallii	A		5 - 6	
Sideoats grama	Bouteloua curtipendula	A		2 - 3	
Switch grass	Panicum Virgatum	A		4 - 5	
Vine mesquitegrass	Panicum Obtusum	B		1 - 2	
Weeping lovegrass	Eragrostis Curvula	A		3 - 4	

Calculations – Operational Landfill Conditions

RMT
744 Heartland Trail
Madison, WI 53717-1934
Tel. (608) 831-4444 • Fax (608) 831-3334

PROJECT / PROPOSAL NAME / LOCATION: OPC-POO		PROJECT / PROPOSAL NO. 3078.40
SUBJECT: OPERATIONAL DITCH SIZING		
PREPARED BY: BJF	DATE: 10/00	FINAL ☒
CHECKED BY:	DATE:	REVISION ☐

OPERATIONAL DITCHES (SEE FIGURES K-4 to K-9, OPERATIONAL RUNOFF CALCULATIONS)

DITCH	LOCATION	100-YR FLOW	SLOPE	SHAPE
V-NOTCH DITCH A	CELL 1 ACTIVE	5 CFS	6%	V-NOTCH
DITCH B	CELL 1 ACTIVE	~~583~~ 561 CFS[1]	2%	10' FLAT
DITCH C	CELL 2A ACTIVE	6 CFS	6.3%	V-NOTCH
DITCH D	CELL 2B ACTIVE	3 CFS	12%	V-NOTCH
DITCH E	CELL 3 ACTIVE	~~583~~ 561 CFS[1] ✓	1%	10' FLAT
DITCH F	CELL 4A ACTIVE	~~433~~ 373 CFS[2]	1%	10' FLAT
DITCH G	CELL 2A ACTIVE	360 CFS[4]		

NOTES
1. FLOWS FROM PREDEVELOPMENT AREAS NORTH + WEST (See p. 96) @ 12.6 hrs
2. FLOWS FROM PREDEVELOPMENT AREAS NORTH + 2B @ 12.6 HRS (See p. 66/96)
3. PERMANANT DITCHES SIZED UNDER POST-DEVELOPMENT CALCULATIONS.
4. FLOW FROM PREDEVELOPMENT ~~AREA~~ AREA NORTH (See p. 95)

SW DITCH	CELL 2A ACTIVE	561 CFS[1]	5%	10' FLAT

RMT, Inc.
Grass Channel Sizing Calculations

Site:	Dairyland Power Cooperative	Date:	10/00
Project #:	3081.40	User:	BJK
Channel:	Ditch A		

==========

I. Input Parameters.

A. Side slope, Z1 (hor/vert) =	3.000	ft/ft
B. Side slope, Z2 (hor/vert) =	16.000	ft/ft
C. Bottom width, B =	0.000	ft
D. Design channel slope, S =	0.060	ft/ft
E. Channel Peak Flow, Q =	5.000	cfs
F. Enter - 1 - for Type "C" Veg. Retardence - 2 - for Type "D" Veg. Retardence	2	

II. Peak Flow Calculations.

A. Trial flow depth, D = (Bisection method until Va=Vb)	**0.533**	**ft**
B. Channel flow area, Ac = (.5*Z1*D^2) + (B*D) + (.5*Z2*D^2)	2.703	sq ft
C. Wetted Perimeter, Pw = (D*(Z1^2+1)^.5) + B + (D*(Z2^2+1)^.5)	10.239	ft
D. Hydraulic radius, Rh = (Ac/Pw)	0.264	ft
E. Velocity and hydraulic radius, VR = (Va * Rh)	0.488	sfps
F. Channel flow Manning's coeff, nc = 0	0.081	
G. Trial velocity, Va = (Q/Ac)	1.850	fps
H. Resultant velocity, Vb = (1.49/nc) * (Rh^.667) * (S^.5)	**1.850**	**fps** ✓OK

Invoke Solution Macro by typing - 'ctrl' D

Channel Analysis Information:

Name:

Channel Analysis Name: **Ditch B**

Channel Geometry & Hydraulics:

Design By:	Flow\Velocity:	Channel Geometry:
Designed By: **FLOW**	Discharge (cfs): **583.00** Flow Duration (hrs): **1.00** Average Velocity (ft/s): **0.00**	Bed Slope (ft/ft): **0.02000** Req. Freeboard (ft): **0.00** Channel Length (ft): **530.00** Bottom Width (ft): **10.00** Channel Depth (ft): **4.00**
Channel Side Slopes: Left Slope (xH:1V): **3.00** Right Slope (xH:1V): **3.00**		
Channel Bend:	**Vegetation:**	**Soil Filled:**
Channel Bend: **No** Bend Radius (ft): **0.00** Outside Bend:	Vegetated: **No** Vegetation Class:	Soil Filled: **Yes**
Factor of Safety: **1.00**		**Functional Longevity:** **48**

Analysis Results:

	Side	Lining Type	Manning's "n"	Velocity (ft/s) Actual	Max. Allowed	Safety Factor	Shear Stress (lbs/sqft) Actual	Max. Allowed	Safety Factor	Flow Depth (ft)	Discharge (cfs)	OK?
Analysis #1	Left:	LANDLOK TRM 450	0.0250	13.4	16.5	1.2	2.5	6.2	2.5	2.3594	583.0	Yes
	Bottom:	LANDLOK TRM	0.0250	14.5	16.5	1.1	2.9	6.2	2.1			
	Right:	LANDLOK TRM	0.0250	13.4	16.5	1.2	2.5	6.2	2.5			
Analysis #2	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
Analysis #3	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			

Channel Calculation Results:

	Flow Area (sq ft)	Hydraulic Radius (ft)	Composite 'n'	Left Wetted Perimeter(ft)	Right Wetted Perimeter(ft)	Total Wetted Perimeter(ft)	Average Veleocity (ft/s)	Average Discharge (cfs)	Froude
Analysis #1	40.2945	1.6168	0.0200	7.4611	7.4611	24.9222	14.4685	583.0	1.58
Analysis #2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000
Analysis #3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000

RMT, Inc.
Grass Channel Sizing Calculations

Site:	Dairyland Power Cooperative	Date:	10/00
Project #:	3081.40	User:	BJK
Channel:	Ditch C		

==========

I. Input Parameters.

A. Side slope, Z1 (hor/vert) =	3.000	ft/ft
B. Side slope, Z2 (hor/vert) =	16.000	ft/ft
C. Bottom width, B =	0.000	ft
D. Design channel slope, S =	0.063	ft/ft
E. Channel Peak Flow, Q =	6.000	cfs
F. Enter - 1 - for Type "C" Veg. Retardence - 2 - for Type "D" Veg. Retardence	2	

II. Peak Flow Calculations.

A. Trial flow depth, D = (Bisection method until Va=Vb)	**0.550**	**ft**
B. Channel flow area, Ac = (.5*Z1*D^2) + (B*D) + (.5*Z2*D^2)	2.870	sq ft
C. Wetted Perimeter, Pw = (D*(Z1^2+1)^.5) + B + (D*(Z2^2+1)^.5)	10.549	ft
D. Hydraulic radius, Rh = (Ac/Pw)	0.272	ft
E. Velocity and hydraulic radius, VR = (Va * Rh)	0.569	sfps
F. Channel flow Manning's coeff, nc = 0	0.075	
G. Trial velocity, Va = (Q/Ac)	2.091	fps
H. Resultant velocity, Vb = (1.49/nc) * (Rh^.667) * (S^.5)	**2.091**	**fps** ✓OK

Invoke Solution Macro by typing - 'ctrl' D

RMT, Inc.
Grass Channel Sizing Calculations

Site:	Dairyland Power Cooperative	Date:	10/00
Project #:	3081.40	User:	BJK
Channel:	Ditch D		

==========

I. Input Parameters.

A. Side slope, Z1 (hor/vert) =	3.000	ft/ft
B. Side slope, Z2 (hor/vert) =	3.000	ft/ft
C. Bottom width, B =	0.000	ft
D. Design channel slope, S =	0.120	ft/ft
E. Channel Peak Flow, Q =	3.000	cfs
F. Enter - 1 - for Type "C" Veg. Retardence - 2 - for Type "D" Veg. Retardence	2	

II. Peak Flow Calculations.

A. Trial flow depth, D = (Bisection method until Va=Vb)	**0.547**	**ft**
B. Channel flow area, Ac = (.5*Z1*D^2) + (B*D) + (.5*Z2*D^2)	0.897	sq ft
C. Wetted Perimeter, Pw = (D*(Z1^2+1)^.5) + B + (D*(Z2^2+1)^.5)	3.459	ft
D. Hydraulic radius, Rh = (Ac/Pw)	0.259	ft
E. Velocity and hydraulic radius, VR = (Va * Rh)	0.867	sfps
F. Channel flow Manning's coeff, nc = 0	0.063	
G. Trial velocity, Va = (Q/Ac)	3.344	fps
H. Resultant velocity, Vb = (1.49/nc) * (Rh^.667) * (S^.5)	**3.344**	**fps** ✓ OK

Invoke Solution Macro by typing - 'ctrl' D

Channel Analysis Information:

Name:

Channel Analysis Name: **Ditch E**

Channel Geometry & Hydraulics:

Design By:	Flow\Velocity:	Channel Geometry:
Designed By: **FLOW**	Discharge (cfs): **583.00** Flow Duration (hrs): **1.00** Average Velocity (ft/s): **0.00**	Bed Slope (ft/ft): **0.01000** Req. Freeboard (ft): **0.00** Channel Length (ft): **1000.0** Bottom Width (ft): **10.00** Channel Depth (ft): **3.00**
Channel Side Slopes: Left Slope (xH:1V): **3.00** Right Slope (xH:1V): **10.00**		
Channel Bend:	**Vegetation:**	**Soil Filled:**
Channel Bend: **No** Bend Radius (ft): **0.00** Outside Bend:	Vegetated: **No** Vegetation Class:	Soil Filled: **Yes**

Factor of Safety: 1.00 **Functional Longevity:** 60

Analysis Results:

	Side	Lining Type	Manning's "n"	Velocity (ft/s) Actual	Velocity (ft/s) Max. Allowed	Velocity (ft/s) Safety Factor	Shear Stress (lbs/sqft) Actual	Shear Stress (lbs/sqft) Max. Allowed	Shear Stress (lbs/sqft) Safety Factor	Flow Depth (ft)	Discharge (cfs)	OK?
Analysis #1	Left:	LANDLOK TRM	0.0250	8.9	16.5	1.9	1.3	6.2	4.9	2.3865	583.0	Yes
	Bottom:	LANDLOK TRM	0.0250	9.6	16.5	1.7	1.5	6.2	4.2			
	Right:	LANDLOK TRM	0.0250	9.3	16.5	1.8	1.4	6.2	4.5			
Analysis #2	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
Analysis #3	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			

Channel Calculation Results:

	Flow Area (sq ft)	Hydraulic Radius (ft)	Composite 'n'	Left Wetted Perimeter(ft)	Right Wetted Perimeter(ft)	Total Wetted Perimeter(ft)	Average Veleocity (ft/s)	Average Discharge (cfs)	Froude
Analysis #1	60.8850	1.4660	0.0200	7.5468	23.9840	41.5308	9.5754	583.0	1.06
Analysis #2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000
Analysis #3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000

Channel Analysis Information:

Name:

Channel Analysis Name: **Ditch F**

Channel Geometry & Hydraulics:

Design By:

Designed By: **FLOW**

Channel Side Slopes:

Left Slope (xH:1V): **3.00**
Right Slope (xH:1V): **5.00**

Flow\Velocity:

Discharge (cfs): **433.00**
Flow Duration (hrs): **1.00**
Average Velocity (ft/s): **0.00**

Channel Geometry:

Bed Slope (ft/ft): **0.01000**
Req. Freeboard (ft): **0.00**
Channel Length (ft): **750.00**
Bottom Width (ft): **10.00**
Channel Depth (ft): **3.00**

Channel Bend:

Channel Bend: **No**
Bend Radius (ft): **0.00**
Outside Bend:

Vegetation:

Vegetated: **No**
Vegetation Class:

Soil Filled:

Soil Filled: **Yes**

Factor of Safety: **1.00**

Functional Longevity: **0**

Analysis Results:

	Side	Lining Type	Manning's "n"	Velocity (ft/s) Actual	Max. Allowed	Safety Factor	Shear Stress (lbs/sqft) Actual	Max. Allowed	Safety Factor	Flow Depth (ft)	Discharge (cfs)	OK?
Analysis #1	Left:	LANDLOK TRM	0.0250	9.1	16.5	1.8	1.2	6.2	5.1	2.2978	433.0	Yes
	Bottom:	LANDLOK TRM	0.0250	9.9	16.5	1.7	1.4	6.2	4.4			
	Right:	LANDLOK TRM	0.0250	9.5	16.5	1.7	1.3	6.2	4.7			
Analysis #2	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
Analysis #3	Left:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0000	0.0	No
	Bottom:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			
	Right:		0.0000	0.0	0.0	0.0	0.0	0.0	0.0			

Channel Calculation Results:

	Flow Area (sq ft)	Hydraulic Radius (ft)	Composite 'n'	Left Wetted Perimeter(ft)	Right Wetted Perimeter(ft)	Total Wetted Perimeter(ft)	Average Veleocity (ft/s)	Average Discharge (cfs)	Froude
Analysis #1	44.0967	1.5215	0.0200	7.2662	11.7164	28.9826	9.8193	433.0	1.10
Analysis #2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000
Analysis #3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0	.000

EC-DESIGN(R) 2000 Channel Analysis Report

Project Information

Project Name: DPC
Description: Cell 2A operational Calcs
Last Update: 8/25/2003 10:58:10 A
Units: English
Nearest City:

Notes: Calculated for 1% slope section
Backwater from culvert 1 will
Protect 5% slope section

Channel Design

Channel Name: SW Ditch - Operational 100 yr
Units: English
Design life: 1,200 months

Design Criteria	
Flow Rate (Q)	

Vegetation and Soil	
Vegetated	Yes
Vegetation Class	B
Soil Filled	No

Channel Side Slopes	
Left (H:1 V)	2.000
Right (H:1 V)	2.000

Channel Bend	No
Bend Radius (ft)	0.000
Outside Bend	

Channel Geometry	
Bed Slope (ft/ft)	0.010
Req. Freeboard (ft)	0.000
Channel Length (ft)	475.000
Bottom Width (ft)	10.000
Channel Depth (ft)	6.000

Flow/Velocity	
Discharge (cf/s)	561.000
Flow Duration (hrs)	1.000
Avg. Velocity (ft/s)	5.490

Required Factor of Safety 1.00

Results

Lining Materials		Velocity (ft/s)			Shear Stress (lbs/sqft)			Avg. Flow Depth (ft)
		Computed	Max Allowed	Safety Factor	Computed	Max Allowed	Safety Factor	5.070
Left	PYRAMAT	5.100	23.340	4.580	2.720	9.400	3.460	
Bottom	PYRAMAT	5.510	23.340	4.240	3.170	9.400	2.970	
Right	PYRAMAT	5.100	23.340	4.580	2.720	9.400	3.460	

Calculation Results:

Flow Depth (ft)	5.070	**Left Wetted Perimeter (ft)**	11.350
Flow Area (ft)	102.230	**Bottom Wetted Perimeter (ft)**	9.990
		Right Wetted Perimeter (ft)	11.350
		Total Wetted Perimeter (ft)	32.690
Hydraulic Radius (ft)	3.130	**Avg. Velocity (ft/s)**	5.490
Composite 'n'	0.0580	**Avg. Discharge (cf/s)**	561.000

EC-DESIGN(R) 2000 Channel Analysis Report

Project Information

Project Name: DPC
Description: Cell 2A operational Calcs
Notes: FOR 5% SLOPE SECTION 25-YR STORM

Last Update: 8/25/2003 10:53:12 A
Units: English
Nearest City:

Channel Design

Channel Name: SW Ditch - Operational 25 yr
Units: English
Design life: 48 months

Design Criteria
Flow Rate (Q)

Vegetation and Soil	
Vegetated	Yes
Vegetation Class	B
Soil Filled	No

Channel Side Slopes	
Left (H:1 V)	2.000
Right (H:1 V)	2.000

Channel Bend	No
Bend Radius (ft)	0.000
Outside Bend	

Channel Geometry	
Bed Slope (ft/ft)	0.050
Req. Freeboard (ft)	0.000
Channel Length (ft)	450.000
Bottom Width (ft)	10.000
Channel Depth (ft)	4.000

Flow/Velocity	
Discharge (cf/s)	355.000
Flow Duration (hrs)	1.000
Avg. Velocity (ft/s)	8.940

Required Factor of Safety 1.00

Results

Lining Materials		Velocity (ft/s)			Shear Stress (lbs/sqft)			Avg. Flow Depth (ft)
		Computed	Max Allowed	Safety Factor	Computed	Max Allowed	Safety Factor	2.610
Left	PYRAMAT	8.030	23.340	2.910	6.450	9.400	1.460	
Bottom	PYRAMAT	9.020	23.340	2.590	8.140	9.400	1.150	
Right	PYRAMAT	8.030	23.340	2.910	6.450	9.400	1.460	

Calculation Results:

Flow Depth (ft)	2.610	**Left Wetted Perimeter (ft)**	5.830
Flow Area (ft)	39.690	**Bottom Wetted Perimeter (ft)**	10.000
		Right Wetted Perimeter (ft)	5.830
		Total Wetted Perimeter (ft)	21.660
Hydraulic Radius (ft)	1.830	**Avg. Velocity (ft/s)**	8.940
Composite 'n'	0.0554	**Avg. Discharge (cf/s)**	355.000

EC-DESIGN(R) 2000 Channel Analysis Report

Project Information

Project Name:	**DPC**	**Last Update:**	8/25/2003 11:00:48 A
Description:	Cell 2A operational Calcs	**Units:**	English
		Nearest City:	

Notes:

Channel Design

Channel Name: Phase III South Slope Ditch **Units:** English **Design life:** 24 months

Design Criteria	
Flow Rate (Q)	

Vegetation and Soil	
Vegetated	No
Vegetation Class	
Soil Filled	Yes

Channel Side Slopes	
Left (H:1 V)	2.000
Right (H:1 V)	3.000

Channel Bend	No
Bend Radius (ft)	0.000
Outside Bend	

Channel Geometry	
Bed Slope (ft/ft)	0.060
Req. Freeboard (ft)	0.000
Channel Length (ft)	500.000
Bottom Width (ft)	1.000
Channel Depth (ft)	1.500

Flow/Velocity	
Discharge (cf/s)	4.000
Flow Duration (hrs)	1.000
Avg. Velocity (ft/s)	6.280

Required Factor of Safety 1.00

Results

Lining Materials		Velocity (ft/s)			Shear Stress (lbs/sqft)			Avg. Flow Depth (ft)
		Computed	Max Allowed	Safety Factor	Computed	Max Allowed	Safety Factor	0.340
Left	LANDLOK TRM 450	6.080	16.490	2.710	1.050	6.250	5.950	
Bottom	LANDLOK TRM 450	6.730	16.490	2.450	1.280	6.250	4.880	
Right	LANDLOK TRM 450	6.350	16.490	2.600	1.140	6.250	5.480	

Calculation Results:

Flow Depth (ft)	0.340	**Left Wetted Perimeter (ft)**	0.770
Flow Area (ft)	0.640	**Bottom Wetted Perimeter (ft)**	1.000
		Right Wetted Perimeter (ft)	1.080
		Total Wetted Perimeter (ft)	2.850
Hydraulic Radius (ft)	0.220	**Avg. Velocity (ft/s)**	6.280
Composite 'n'	0.0200	**Avg. Discharge (cf/s)**	4.000

EC-DESIGN(R) 2000 Channel Analysis Report

Project Information

Project Name: DPC
Description: Cell 2A operational Calcs
Notes:

Last Update: 8/25/2003 11:00:48 A
Units: English
Nearest City:

Channel Design

Channel Name: Ditch G
Units: English
Design life: 48 months

Design Criteria
Flow Rate (Q)

Vegetation and Soil	
Vegetated	No
Vegetation Class	
Soil Filled	No

Channel Geometry	
Bed Slope (ft/ft)	0.015
Req. Freeboard (ft)	0.000
Channel Length (ft)	1.000
Bottom Width (ft)	10.000
Channel Depth (ft)	4.000

Flow/Velocity	
Discharge (cf/s)	360.000
Flow Duration (hrs)	1.000
Avg. Velocity (ft/s)	10.930

Channel Side Slopes	
Left (H:1 V)	3.000
Right (H:1 V)	3.000

Channel Bend	No
Bend Radius (ft)	0.000
Outside Bend	

Required Factor of Safety 1.00

Results

Lining Materials		Velocity (ft/s)			Shear Stress (lbs/sqft)			Avg. Flow Depth (ft)
		Computed	Max Allowed	Safety Factor	Computed	Max Allowed	Safety Factor	2.040
Left	LANDLOK TRM 450	10.170	16.490	1.620	1.610	6.250	3.880	
Bottom	LANDLOK TRM 450	11.090	16.490	1.490	1.910	6.250	3.270	
Right	LANDLOK TRM 450	10.170	16.490	1.620	1.610	6.250	3.880	

Calculation Results:

Flow Depth (ft)	2.040	Left Wetted Perimeter (ft)	6.460
Flow Area (ft)	32.920	Bottom Wetted Perimeter (ft)	9.990
		Right Wetted Perimeter (ft)	6.460
		Total Wetted Perimeter (ft)	22.910
Hydraulic Radius (ft)	1.440	Avg. Velocity (ft/s)	10.930
Composite 'n'	0.0210	Avg. Discharge (cf/s)	360.000

Reference Information

roughness) varies with VR. The term VR is the product of velocity and the hydraulic radius. This relationship will be referred to as the "n-VR relationship", which is the recommended basis for vegetated channel design.

The five general retardance curves, designated as A, B, C, D, and E in Exhibit 7-1, have been developed for various cover conditions. The vegetal conditions under which the various retardance values apply are shown in Exhibit 7-2. These cover classifications are based on tests in experimental channels when the covers were green and generally uniform.

Most of the vegetation used in waterways does not exceed 18 inches in height and may be much shorter at times during the year. Therefore, it is recommended that when designing the channel for safe velocity, a retardance not greater than "D" be used. After designing the channel for safe velocity, it must be checked for capacity to accommodate the peak flow under conditions where vegetation gives the highest retardance. The retardance used in this instance is the curve corresponding to the expected vegetal cover and, in most cases, it will be retardance "C", though curve "B" may be used where considered appropriate.

All pertinent design data and computations should be recorded.

DESIGN DATA

The following information is required for designing a waterway:

1. Watershed area in acres, together with the soil characteristics, cover and topography. This information is used to estimate runoff by the procedures set forth in Chapter 2 of this manual.

2. Grade of the proposed waterway in percent slope (this is the fall in feet per 100 feet of length).

3. Vegetal cover adapted to site conditions.

4. Erodibility of the soil in the waterway.

5. Expected height at which vegetative cover will be maintained.

6. The permissible velocity for the conditions encountered.

7. Allowance for space that will be occupied by the vegetative lining.

8. Allowance for freeboard, if required by State Standards and Specifications.

NON-EROSIVE VELOCITY OF FLOW

In designing grassed waterways, care must be taken to insure that the design velocity is well within the limits of permissible velocities given in Exhibit 7-3. These values apply to average, uniform stands of each type of cover.

Source: U.S. Department of Agriculture, Soil Conservation Service. Engineering Field Manual. November 1986.

Cover	Slope range 2/ (percent)	Permissible velocity 1/	
		Erosion resistant soils (ft.per sec.)	Easily eroded soils (ft.per sec.)
Bermudagrass	0-5 5-10 over 10	8 7 6	6 5 4
Bahia Buffalograss Kentucky bluegrass Smooth brome Blue grama Tall fescue	0-5 5-10 over 10	7 6 5	5 4 3
Grass mixtures Reed canarygrass	2/ 0-5 5-10	5 4	4 3
Lespedeza sericea Weeping lovegrass Yellow bluestem Redtop Alfalfa Red fescue	3/ 0-5	3.5	2.5
Common lespedeza 4/ Sudangrass 4/	5/ 0-5	3.5	2.5

1/ Use velocities exceeding 5 feet per second only where good covers and proper maintenance can be obtained.

2/ Do not use on slopes steeper than 10 percent except for vegetated side slopes in combination with a stone, concrete, or highly resistant vegetative center section.

3/ Do not use on slopes steeper than 5 percent except for vegetated side slopes in combination with a stone, concrete, or highly resistant vegetative center section.

4/ Annuals--use on mild slopes or as temporary protection until permanent covers are established.

5/ Use on slopes steeper than 5 percent is not recommended.

Exhibit 7-3. Permissible velocities for channels lined with vegetation

Source: U.S. Department of Agriculture, Soil Conservation Service. Engineering Field Manual. November 1986.

Culvert/Downslope Flume Design Calculations

Purpose/Methodology/Assumptions/Results/References

744 Heartland Trail (53717-8923) P. O. Box 8923 (53708-8923) Madison, WI (608) 831-4444 FAX: (608) 831-3334 VOICE: (608) 831-1989

PROJECT/PROPOSAL NAME	PREPARED		CHECKED		PROJECT/PROPOSAL NO.
	By:	Date:	By:	Date:	
Dairyland Power Cooperative	BJK	9/00	RAA	10/00	3081.40

CULVERT DESIGN CALCULATIONS

Purpose

To determine the appropriate culvert and downslope flume sizes for the anticipated peak flows resulting from the 100-year, 24-hour storm at the proposed Dairyland Power Cooperative Landfill.

Methodologies

Culvert design involves the process of selecting an appropriate culvert size capable of allowing the estimated peak storm water runoff to pass through it without creating surface water breaching (i.e., berm overflow) or excessive backwater levels. Culvert sizing was performed using design charts developed by the U.S. Department of Transportation Federal Highway Administration.

Downslope flumes will convey flow from the final cover diversion berms to the sedimentation basin. Downslope flumes were also sized using design charts developed by the U.S. Department of Transportation Federal Highway Administration. The energy dissipater for the downslope flume was sized using design guidance from the US Department of the Interior, Bureau of Reclamation.

Assumptions

The following assumptions were used in the culvert and downslope flume sizing analysis:

1. Culvert and downslope flume layout and allowable headwater levels are shown on the accompanying plan set.
2. Tailwater depths were assumed based on anticipated flows within the ditching. For culverts discharging into sedimentation basins, the tailwater elevation in the basin from the routing calculations.
3. Culverts are assumed to be corrugated metal culvert pipes or concrete box culverts.
4. Culverts were designed to maintain a minimum 1 to 2 feet of freeboard, depending on the location.

744 Heartland Trail (53717-8923) P. O. Box 8923 (53708-8923) Madison, WI (608) 831-4444 FAX: (608) 831-3334 VOICE: (608) 831-1989

PROJECT/PROPOSAL NAME	PREPARED		CHECKED		PROJECT/PROPOSAL NO.
	By:	Date:	By:	Date:	
Dairyland Power Cooperative	BJK	9/00	RAA	10/00	3081.40

Results

The table below summarizes the results of the culvert pipe sizing analyses:

CULVERT	SLOPE (%)	LENGTH (ft)	100-YR. FLOW (cfs)	SIZE
Culvert #1	7.0	96	323	4'x 7' Box
Culvert #2	7.7	126	323	4'x 7' Box
Culvert #3	11.2	125	15	30" CMP
Culvert #4	9.3	75	15	30" CMP
Culvert #5	5	85	323	4' x 7' Box

Note:
Culvert lengths to be adjusted based on available culvert section lengths.

Downslope pipe and energy dissipater sizing are shown on the engineering details included in the Plan Set.

References

U.S. Department of Transportation. Hydraulics charts for the selection of highway culverts. Hydraulic engineering circular no. 5. December 1965.

U.S. Department of the Interior, Bureau of Reclamation. Hydraulic Design of Stilling Basins and Energy Dissipaters. Engineering Nomograph No. 25. May 1984.

N 170500

N 171000

N 171500

EXISTING PROCESSING FACILITY

SILO

SILO

TRANSFER PIPE FROM STORAGE TANK CONNECTS TO EXISTING PIPE OUTSIDE PROCCESSING FACILITY. SEE DETAIL (5/21)

APPROXIMATE LIMITS OF EXISTING ASH

LEACHATE STORAGE TANK SEE DETAIL (1/18)

EXISTING BOX CULVERT

ACCESS ROAD TO EXISTING PHASE II LANDFILL

10' WIDE FLAT BOTTOM DITCH @ 6%

CULVERT 5
INLET I.E. 812.0
OUTLET I.E. 808.0

V-NOTCH DITCH @ 6%

CULVERT 1
I.E. 762.0N
I.E. 755.5S

ACCESS ROAD @ 8%

10' WIDE FLAT BOTTOM DITCH @ 5%

10' WIDE FLAT BOTTOM DITCH @ 7%

CULVERT 4

8' WIDE BERM ELEV. 784.0

10' WIDE FLAT BOTTOM DITCH @ 2%

V-NOTCH DRAINAGE DITCH @ 8%

CULVERT 2

CULVERT 3

SEDIMENTATION BASIN NO. 1 SEE DETAIL (1/22)

20' WIDE FLAT BOTTOM DITCH @ 20% AND DIVERSION BERM

MAINTENANCE ROAD 10% SLOPE

EMERGENCY OVERFLOW PIPE

RISER AND DISCHARGE PIPE SEE DETAIL (3/22)

E 1477500

DITCH @ 2%

4:1

FIGURE K-11
CULVERT SIZING

N

Calculations – Post-closure Landfill Conditions

COMPUTATION SHEET

RMT INC.

SHEET _____ OF _____

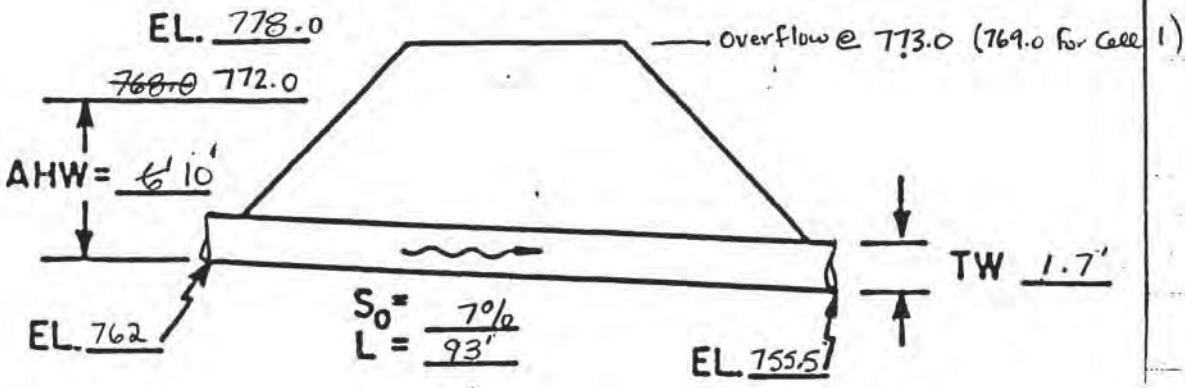
744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED		CHECKED		PROJECT/PROPOSAL NO.
DPC - PLAN OF OPERATION	By: BJK	Date: 9/00	By:	Date:	3081.40

Rev. 7/03
BJK

SKETCH

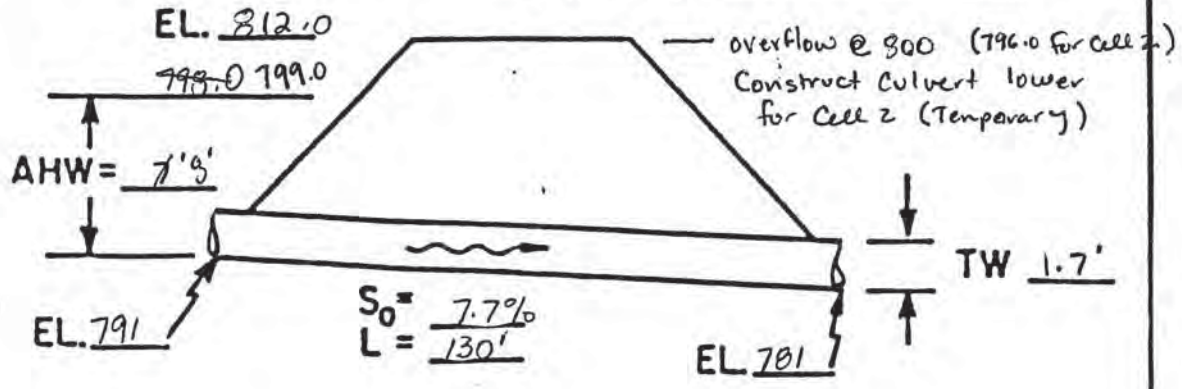
STATION: CULVERT #1



MAX. STREAM FLOW= 323 cfs

SKETCH

STATION: CULVERT #2



MAX. STREAM FLOW= 323 cfs

COMPUTATION SHEET

RMT INC.

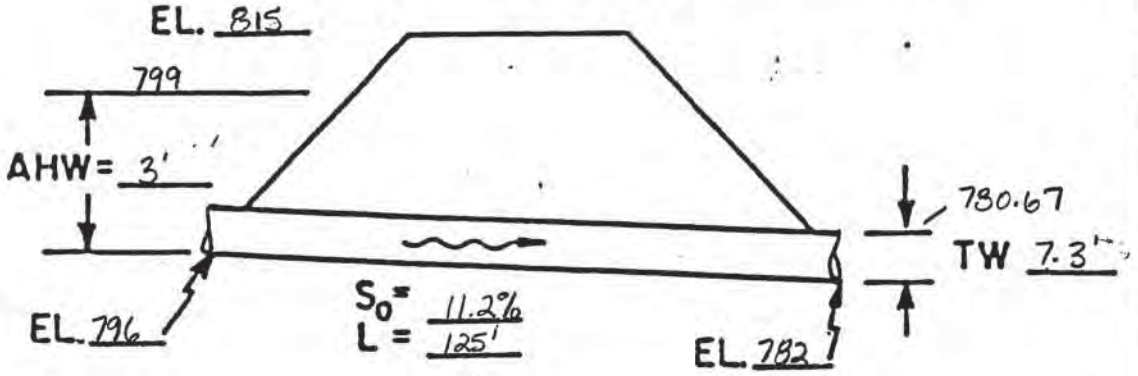
SHEET _____ OF _____

744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED By:	Date	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
DPC - PLAN OF OPERATION	BJN	9/00			3081.40

SKETCH

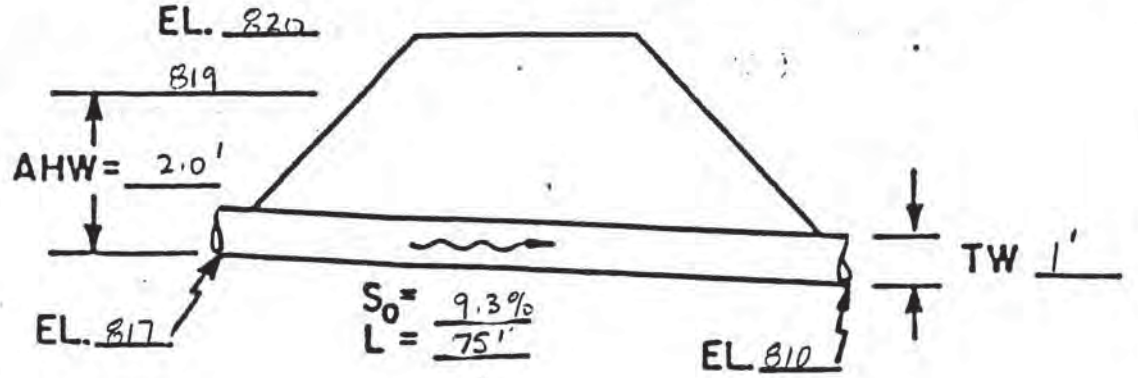
STATION : CULVERT #3



MAX. STREAM FLOW= 15 cfs

SKETCH

STATION : CULVERT #4



MAX. STREAM FLOW= 15 cfs

COMPUTATION SHEET

RMT INC.

SHEET _____ OF _____

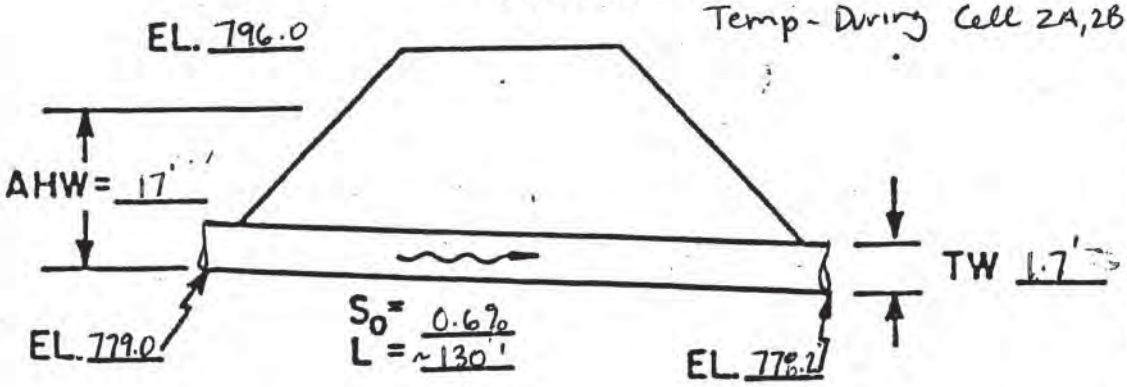
744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Dairyland Power – Phase IV	BJT	7/03			3061.56

SKETCH

STATION: Culvert #2

Temp - During Cell 2A, 2B

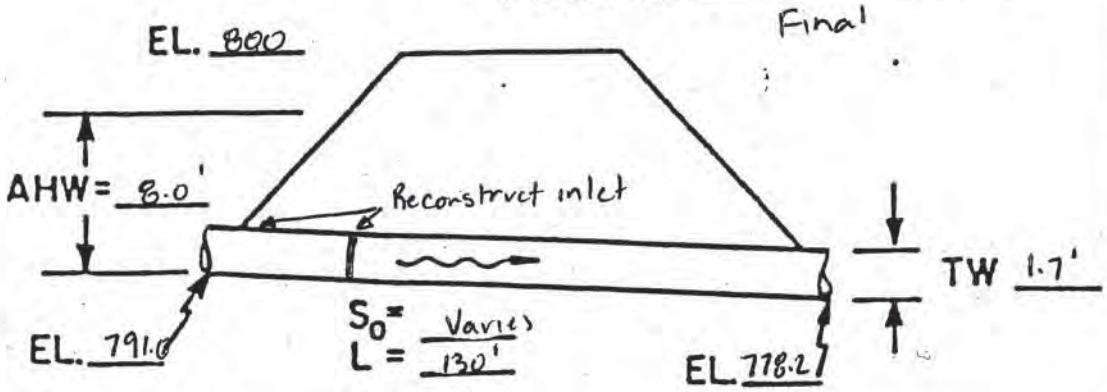


MAX. STREAM FLOW= 561 ~~323~~ cfs

SKETCH

STATION: Culvert #2

Final



MAX. STREAM FLOW= 323 cfs

Culvert Calculator Report
Culvert 2 - Operational

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	796.00 ft	Headwater Depth/ Height	3.86
Computed Headwater Elevation	794.45 ft	Discharge	561.00 cfs
Inlet Control HW Elev	792.30 ft	Tailwater Elevation	779.90 ft
Outlet Control HW Elev	794.45 ft	Control Type	Outlet Control

Grades			
Upstream Invert	779.00 ft	Downstream Invert	778.20 ft
Length	130.00 ft	Constructed Slope	0.006154 ft/ft

Hydraulic Profile			
Profile	Pressure	Depth, Downstream	4.00 ft
Slope Type	N/A	Normal Depth	N/A ft
Flow Regime	N/A	Critical Depth	4.00 ft
Velocity Downstream	20.04 ft/s	Critical Slope	0.022277 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	7.00 ft
Section Size	7 x 4 ft	Rise	4.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	794.45 ft	Upstream Velocity Head	6.24 ft
Ke	0.50	Entrance Loss	3.12 ft

Inlet Control Properties			
Inlet Control HW Elev	792.30 ft	Flow Control	Submerged
Inlet Type	18 to 33.7 ° wingwall flare, d=0.0830	Area Full	28.0 ft²
K	0.48600	HDS 5 Chart	9
M	0.66700	HDS 5 Scale	2
C	0.02490	Equation Form	2
Y	0.83000		

RMT, Inc.
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Culvert Calculator Report
Culvert 2 - Final

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	799.00 ft	Headwater Depth/ Height	1.78
Computed Headwater Elevation	798.10 ft	Discharge	323.00 cfs
Inlet Control HW Elev	797.44 ft	Tailwater Elevation	779.90 ft
Outlet Control HW Elev	798.10 ft	Control Type	Entrance Control

Grades			
Upstream Invert	791.00 ft	Downstream Invert	778.20 ft
Length	130.00 ft	Constructed Slope	0.098462 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	1.60 ft
Slope Type	Steep	Normal Depth	1.32 ft
Flow Regime	Supercritical	Critical Depth	4.00 ft
Velocity Downstream	28.87 ft/s	Critical Slope	0.007385 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	7.00 ft
Section Size	7 x 4 ft	Rise	4.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	798.10 ft	Upstream Velocity Head	2.07 ft
Ke	0.50	Entrance Loss	1.03 ft

Inlet Control Properties			
Inlet Control HW Elev	797.44 ft	Flow Control	Submerged
Inlet Type	18 to 33.7 ° wingwall flare, d=0.0830	Area Full	28.0 ft²
K	0.48600	HDS 5 Chart	9
M	0.66700	HDS 5 Scale	2
C	0.02490	Equation Form	2
Y	0.83000		

RMT, Inc. 37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

COMPUTATION SHEET

RMT INC.

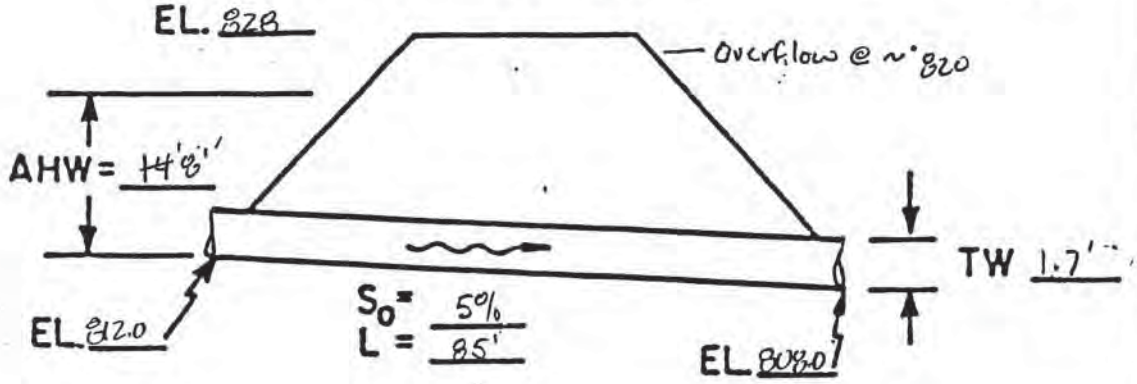
SHEET _____ OF _____

744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
OPC POO	BJP	9/00			3091.40

SKETCH

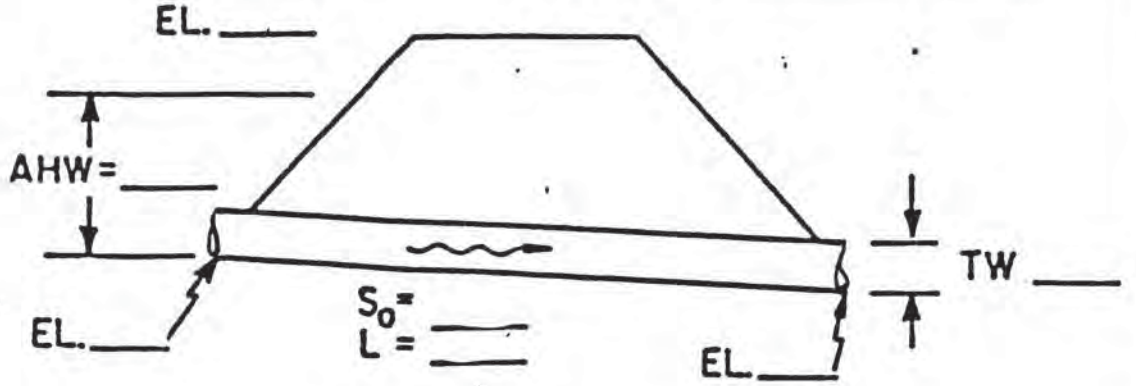
STATION : CULVERT # 5



MAX. STREAM FLOW= 323

SKETCH

STATION : _____



MAX. STREAM FLOW= _____

PROJECT: DPC POO

DESIGNER: BJK

DATE: 9/2000

HYDROLOGIC AND CHANNEL INFORMATION

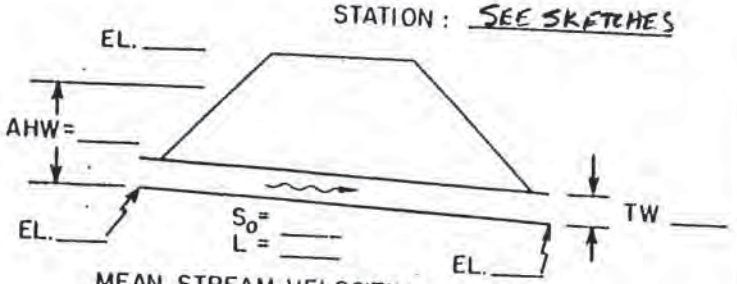
Q_1 = SEE SKETCHES TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: SEE SKETCHES



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. $\frac{HW}{D}$	INLET CONT. HW	OUTLET CONTROL K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
CULVERT #1 CMP	162 EA	2-60"	1.2	6'												
CULVERT #1 BOX CULVERT	323 46/ft	7'x 4'	~~1.45~~ 1.95	~~5.8~~ 7.8	0.4	3.8'	4.0'	4.0'	1.7'	4.0	6.5'	1.3	~~5.8~~ 7.8			Not Rec.
																Recommended
CULVERT #2 BOX CULVERT	323 46/ft	7'x 4'	~~1.45~~ 1.95	~~5.8'~~ 7.8	0.4	3.8	4.0'	4.0'	1.7	4.0	10'	—	~~5.8'~~ 7.8			
																Recommended
CULVERT #3 CMP	15	24"	1.15	2.3'	0.5	2.8'	1.4	1.7	7.3'	7.3'	6'	4.1				Not Rec.
CULVERT #3 CMP	15	30"	0.77	1.9	0.5	0.8	1.3	1.9	7.3'	7.3'	6'	2.1				Recommended

SUMMARY & RECOMMENDATIONS:

ACTUAL LENGTHS OF CULVERTS #1 & 2 = 96' and 126' RESPECTIVELY
BASED ON 6' CULVERT SECTION LENGTHS

Figure 7

PROJECT: DPC - P00

DESIGNER: BJK

DATE: 9/2000

HYDROLOGIC AND CHANNEL INFORMATION

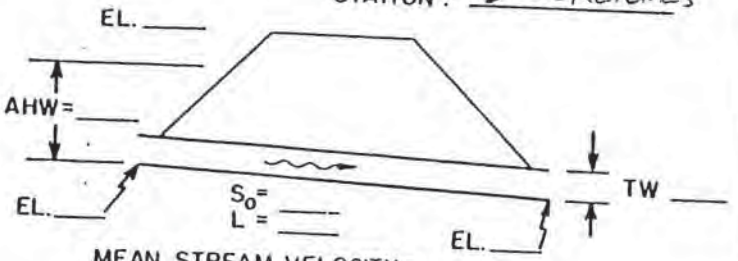
Q_1 = SEE SKETCHES TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION : SEE SKETCHES



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION										CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
			INLET CONT.		OUTLET CONTROL $HW = H + h_o - LS_o$											
			$\frac{HW}{D}$	HW	K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW				
CULVERT #4 CMP	15	30"	0.77	1.9'	0.5	0.7	1.3	1.9	1.0	1.9	7'	—	1.9'			Recommended
CULVERT #5 BOX CULVERT	323 46/F1	7'x 4'	~~1.45~~ 1.95	~~5.6~~ ~~7.8~~	0.4	3.8	4.0	4.0	1.7	4.0	4'	3.8	~~5.8~~ 7.8			Recommended

SUMMARY & RECOMMENDATIONS:

Figure 7

TABLE 1 - ENTRANCE LOSS COEFFICIENTS

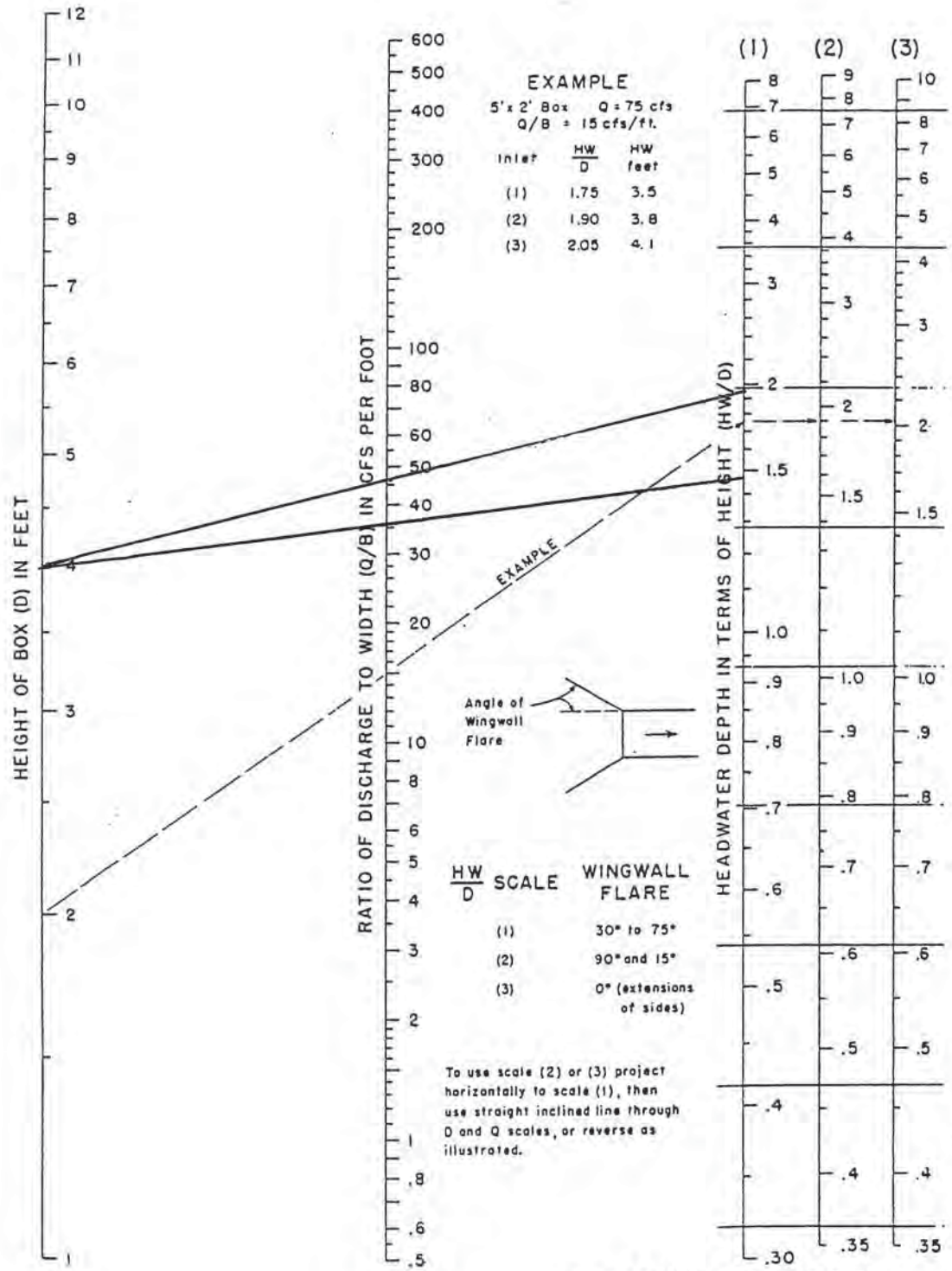
Outlet Control, Full or Partly Full

Entrance head loss $H_e = k_e \frac{V^2}{2g}$

Type of Structure and Design of Entrance	Coefficient k_e	
Pipe, Concrete		
Projecting from fill, socket end (groove-end)	0.2	
Projecting from fill, sq. cut end	0.5	
Headwall or headwall and wingwalls		
Socket end of pipe (groove-end)	0.2	
Square-edge	0.5	
Rounded (radius = 1/12D)	0.2	
Mitered to conform to fill slope	0.7	
*End-Section conforming to fill slope	0.5	
Beveled edges, 33.7° or 45° bevels	0.2	
Side-or slope-tapered inlet	0.2	
Pipe, or Pipe-Arch, Corrugated Metal		
Projecting from fill (no headwall)	0.9	
Headwall or headwall and wingwalls square-edge	0.5	
Mitered to conform to fill slope, paved or unpaved slope	0.7	
*End-Section conforming to fill slope	0.5	← CULVERTS 3, 4
Beveled edges, 33.7° or 45° bevels	0.2	
Side-or slope-tapered inlet	0.2	
Box, Reinforced Concrete		
Headwall parallel to embankment (no wingwalls)		
Square-edged on 3 edges	0.5	
Rounded on 3 edges to radius of 1/12 barrel dimension, or beveled edges on 3 sides	0.2	
Wingwalls at 30° to 75° to barrel		
Square-edged at crown	0.4	← CULVERTS 1, 2
Crown edge rounded to radius of 1/12 barrel dimension, or beveled top edge	0.2	
Wingwall at 10° to 25° to barrel		
Square-edged at crown	0.5	
Wingwalls parallel (extension of sides)		
Square-edged at crown	0.7	
Side-or slope-tapered inlet	0.2	

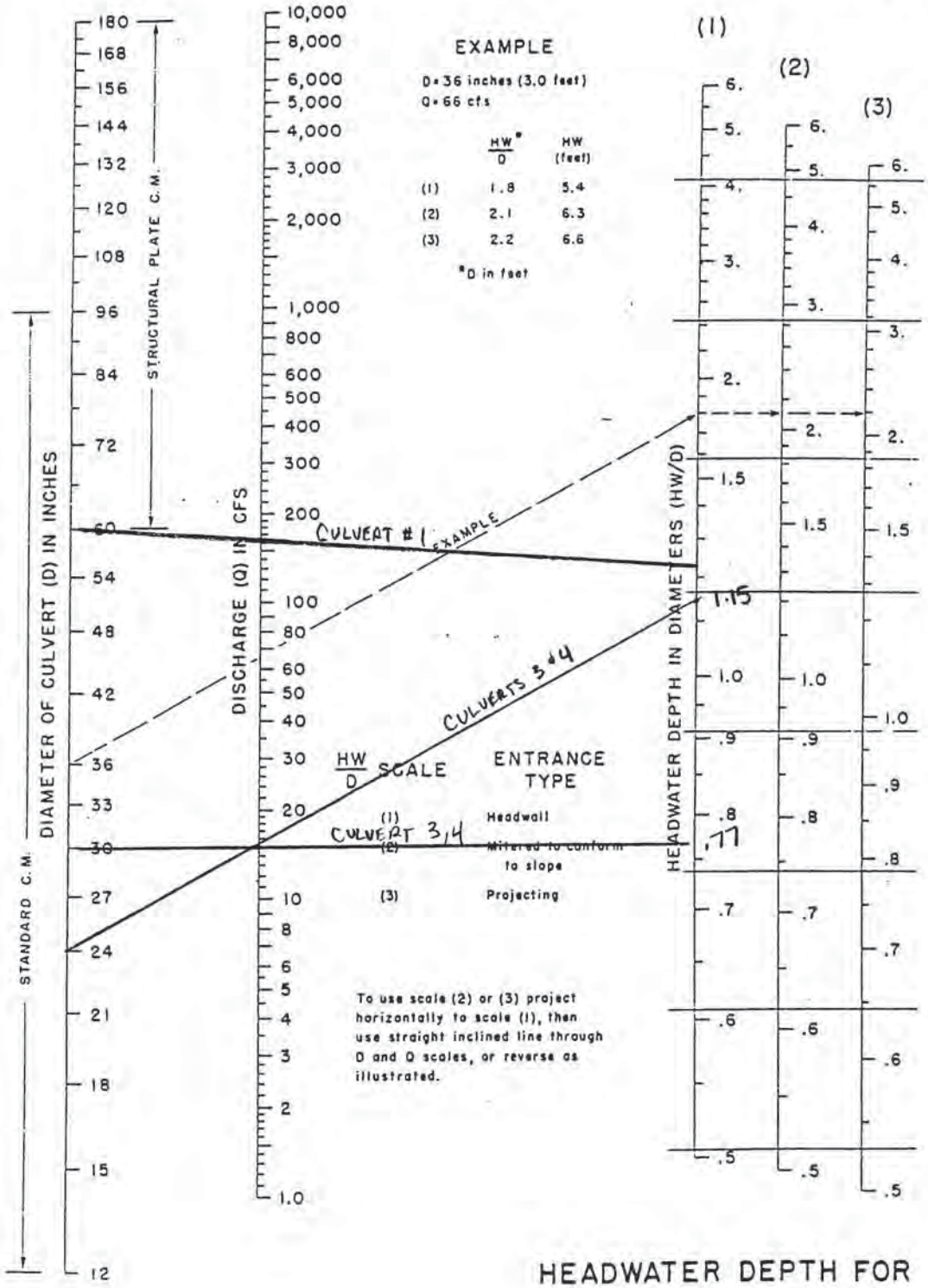
*Note: "End Section conforming to fill slope," made of either metal or concrete, are the sections commonly available from manufacturers. From limited hydraulic tests they are equivalent in operation to a headwall in both inlet and outlet control. Some end sections, incorporating a closed taper in their design have a superior hydraulic performance. These latter sections can be designed using the information given for the beveled inlet, p. 5-13.

CHART I



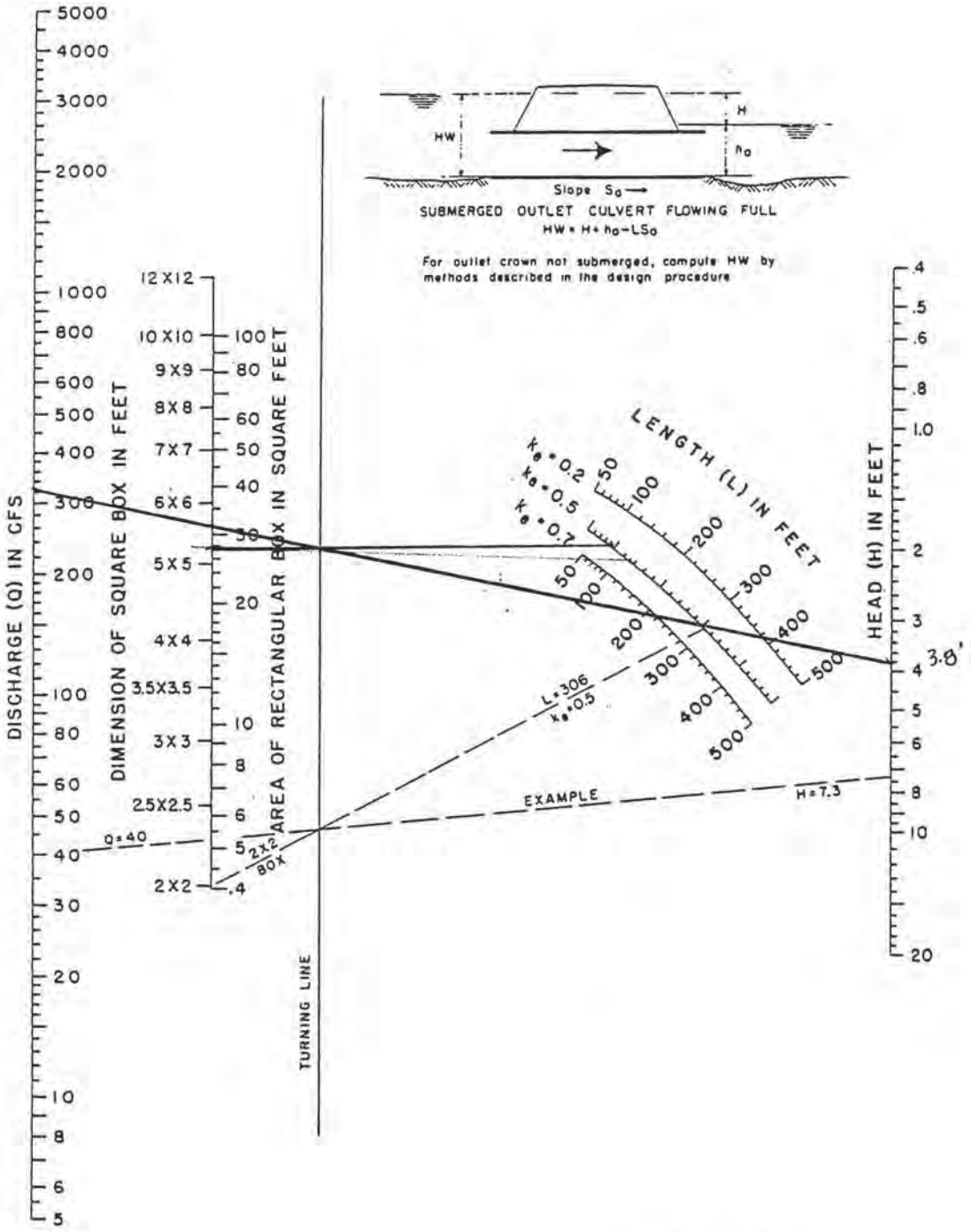
HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

CHART 5



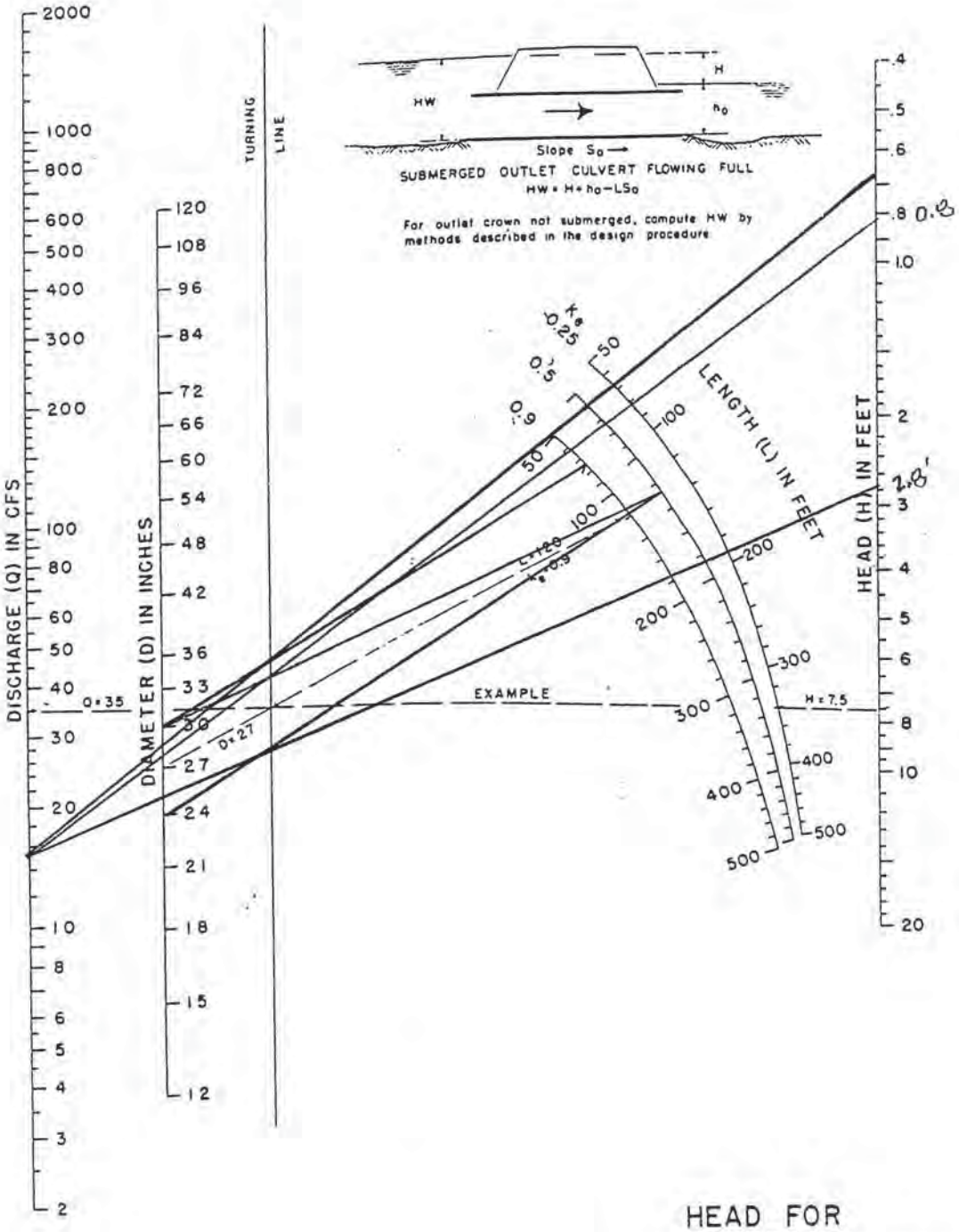
HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL

CHART 8



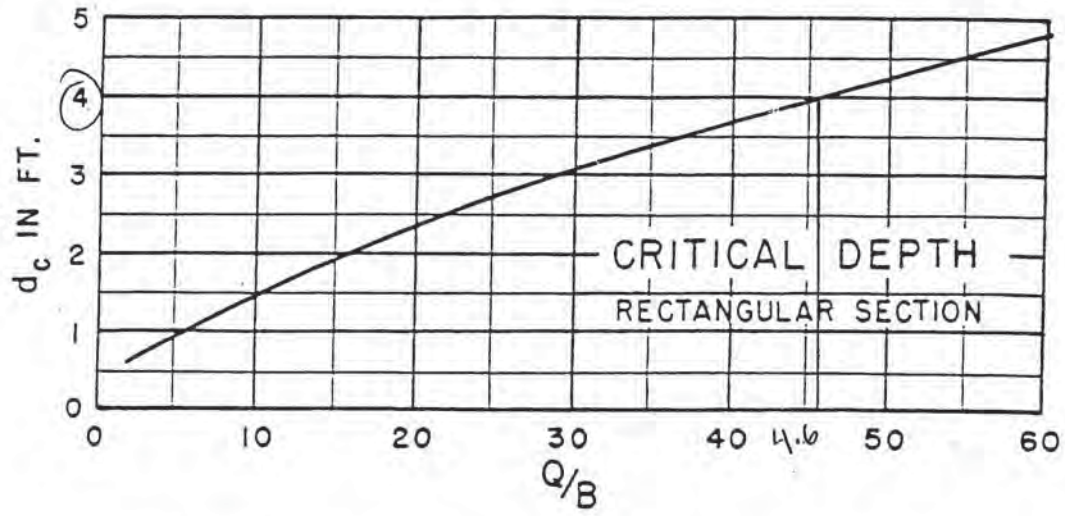
HEAD FOR
CONCRETE BOX CULVERTS
FLOWING FULL
n = 0.012

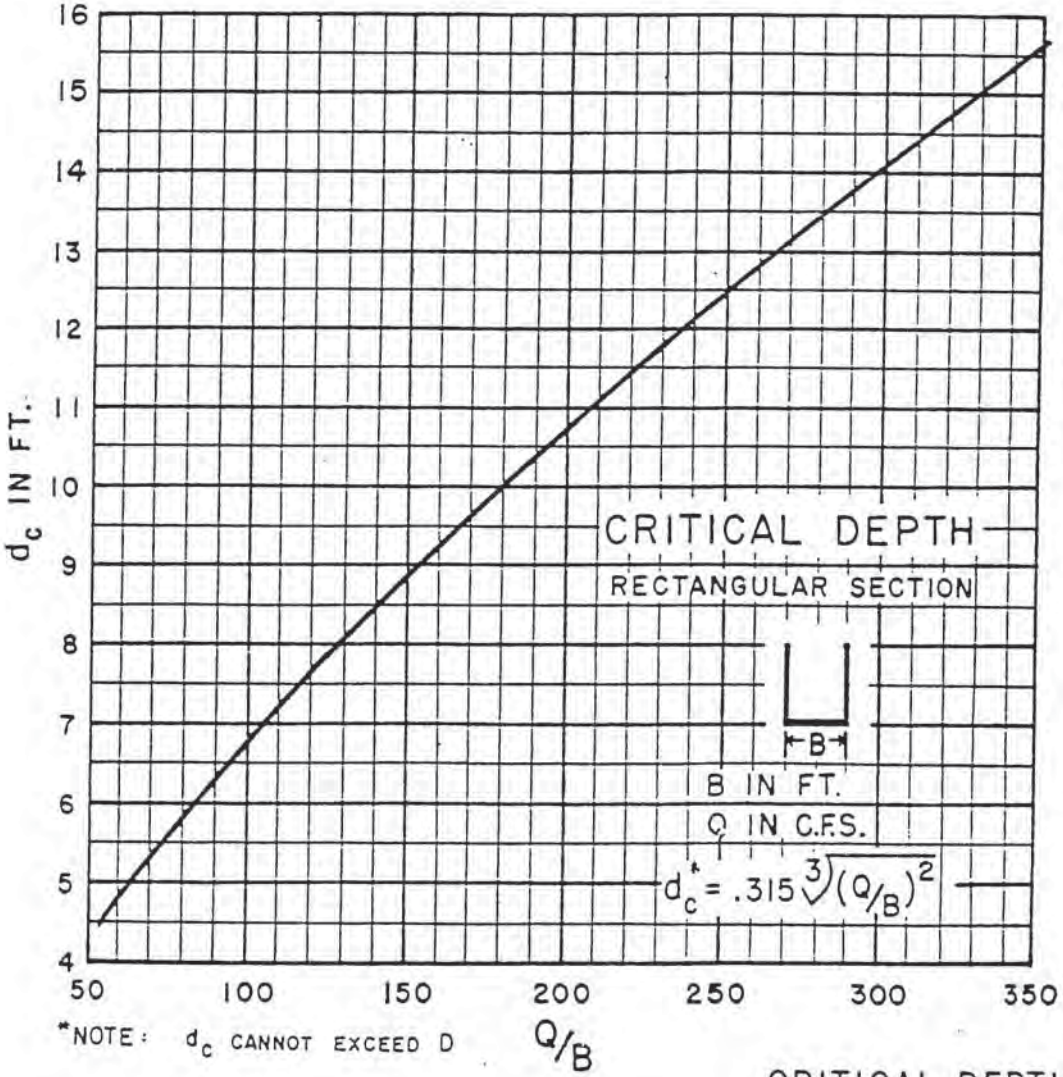
CHART 11



HEAD FOR
STANDARD
C. M. PIPE CULVERTS
FLOWING FULL
n = 0.024

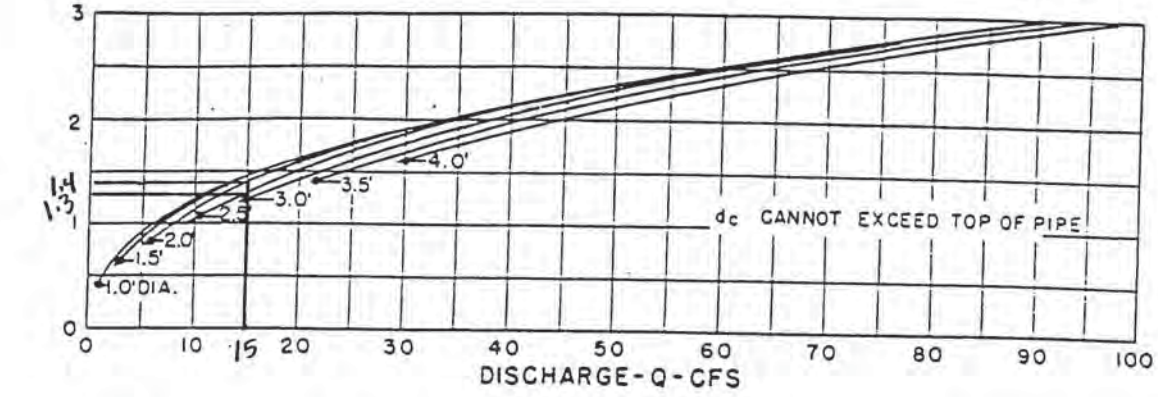
Chart 15

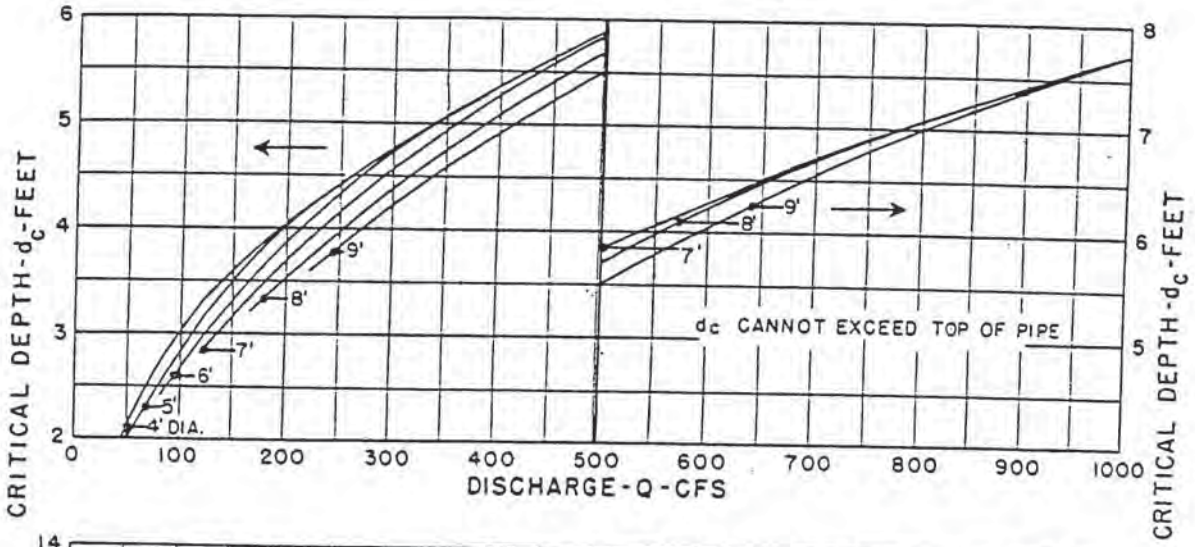


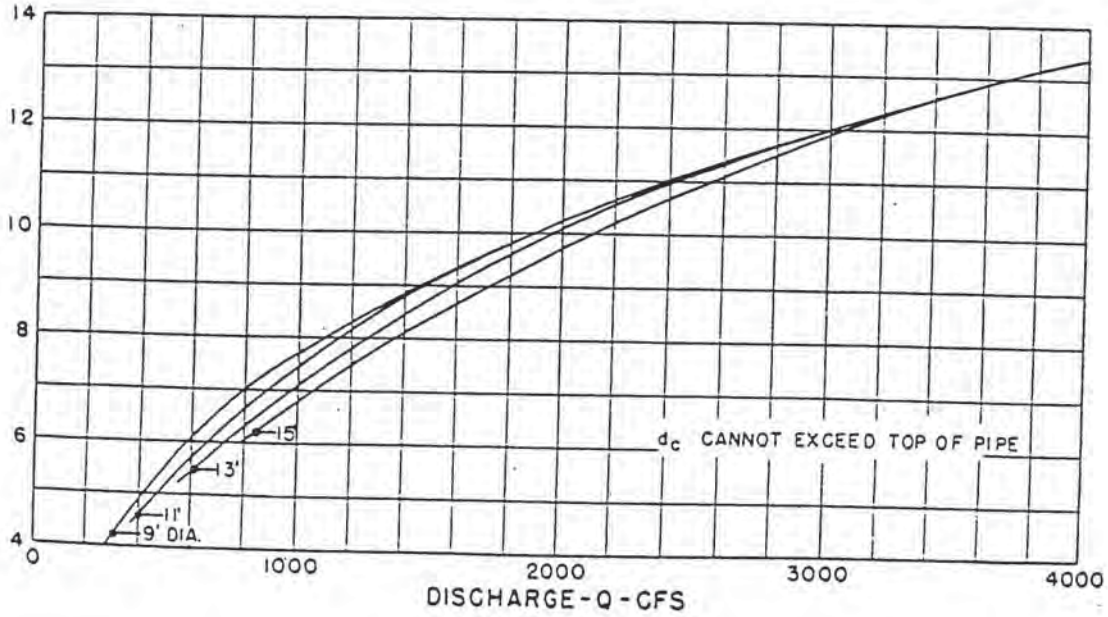


CRITICAL DEPTH
RECTANGULAR SECTION

CHART 16







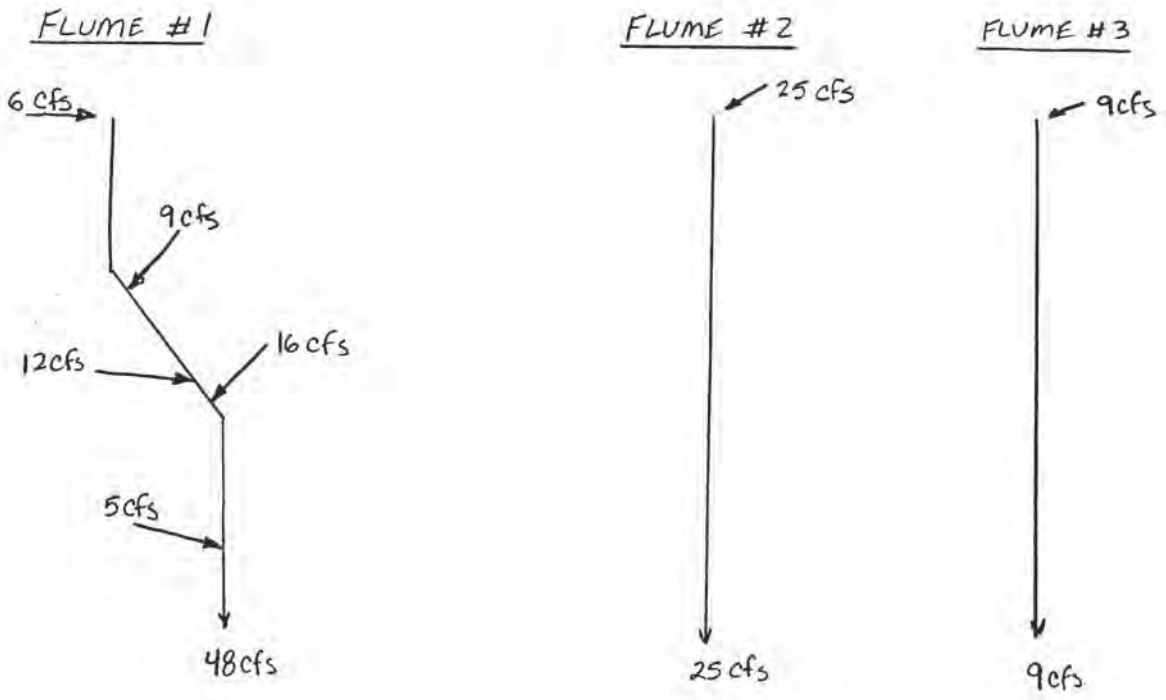
CRITICAL DEPTH
CIRCULAR PIPE

744 Heartland Trail
Madison, WI 53717-1934
Tel. (608) 831-4444 • Fax (608) 831-3334

PROJECT / PROPOSAL NAME / LOCATION: DAIRYLAND POWER - POO		PROJECT / PROPOSAL NO. 3081.40
SUBJECT: FLUME SIZING		
PREPARED BY: B.J.K	DATE: 9/00	FINAL ☐
CHECKED BY:	DATE:	REVISION ☐

DOWNSLOPE FLUME SIZING

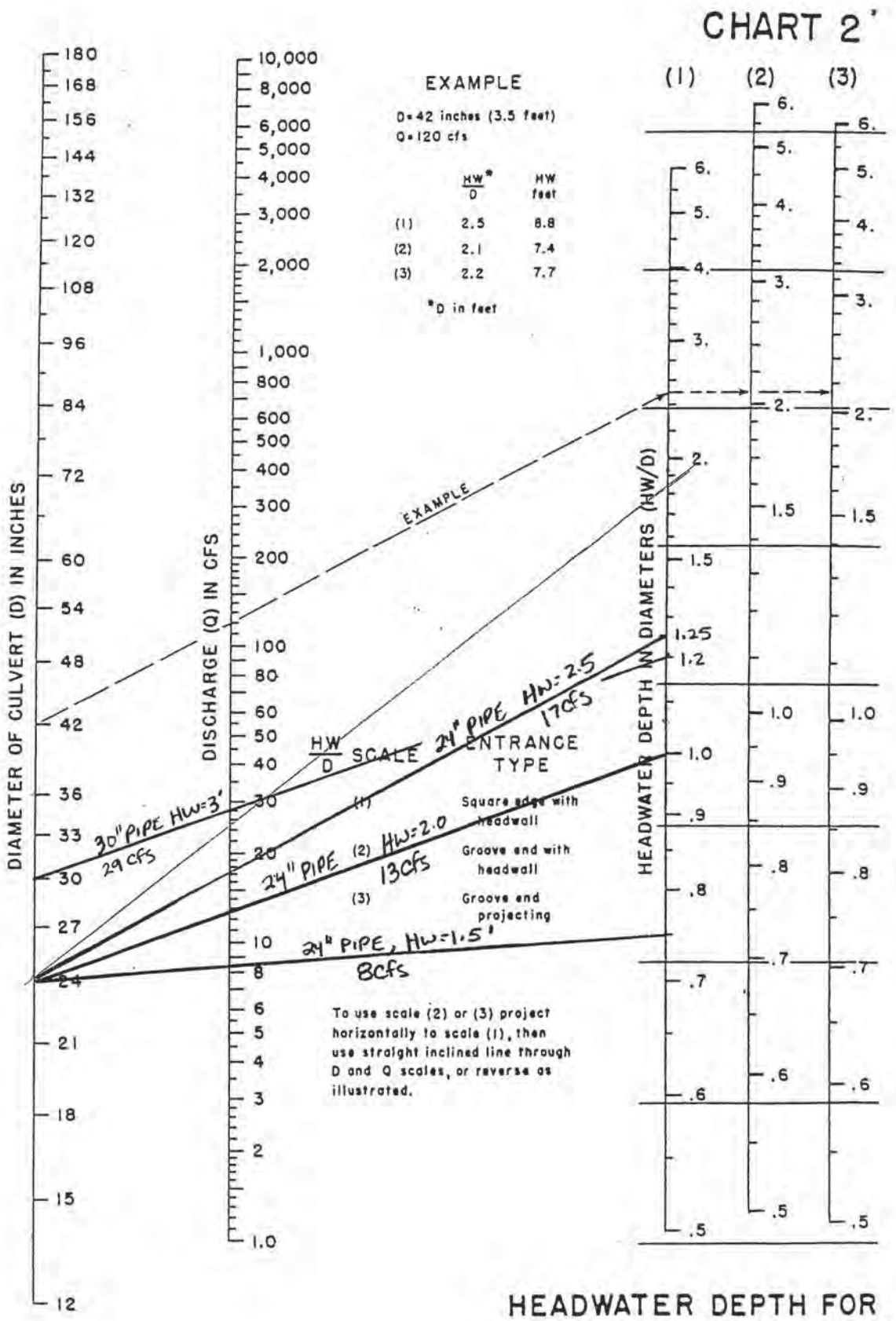
1. SIZE INLET PIPES



NOTE: PEAK FLOWS OBTAINED FROM RUNOFF CALCULATIONS
PEAK FLOWS ADDED TO OBTAIN TOTALS (CONSERVATIVE)

ESTABLISH INLET PIPE SIZES AND BERM HEIGHTS USING INLET CONTROL NOMOGRAPHS!

FLOW RANGE	INLET PIPE SIZE	HW	REQ'D BERM HEIGHT
0-8 cfs	24"	1.5'	2.5'
9-13 cfs	24"	2.0'	2.5'
14-17 cfs	24"	2.5'	3.0'
18-29 cfs	30"	3.0'	3.5'



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

RMT
744 Heartland Trail
Madison, WI 53717-1934
Tel. (608) 831-4444 • Fax (608) 831-3334

PROJECT / PROPOSAL NAME / LOCATION: DAIRYLAND POWER - POO		PROJECT / PROPOSAL NO. 30B140
SUBJECT: FLUME SIZING		
PREPARED BY: BJK	DATE: 9/00	FINAL ☐
CHECKED BY:	DATE:	REVISION ☐

CHECK STRAIGHT PIPE FLUME SIZING

WORST-CASE FLOW - FLUME #1

SLOPE = 20% (AT RIDGE)
PIPE DIA = 1.5'
MAX FLOW = 48 cfs

FULL PIPE FLOW:

$$Q = \frac{1.49}{n} R^{2/3} S^{1/2} A$$

$n = 0.010$ for HDPE PIPE
$R = D/4 = 1.5/4 = 0.375$
$S = 0.20$ ft/ft
$A = \pi D^2/4 = \pi (1.5)^2/4 = 1.77$ ft^2

$$Q_{FULL} = \frac{1.49}{0.01} (0.375)^{2/3} (0.20)^{1/2} (1.77)$$

$= 61$ cfs > 48 cfs ok ✓

A WATER RESOURCES TECHNICAL PUBLICATION

Engineering Monograph No. 25

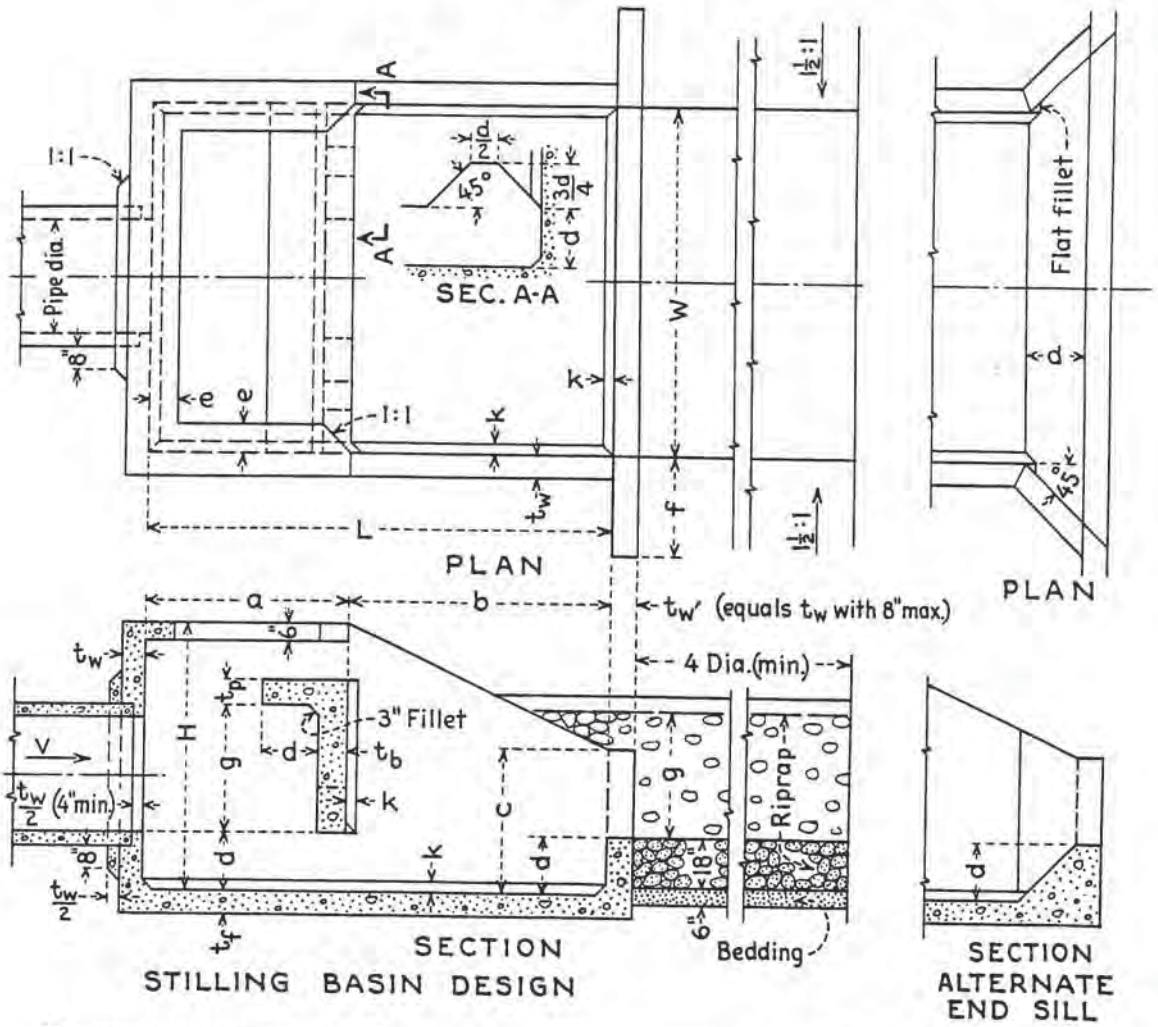
Hydraulic Design of Stilling Basins and Energy Dissipators

By A. J. PETERKA

Denver, Colorado

United States Department of the Interior

BUREAU OF RECLAMATION



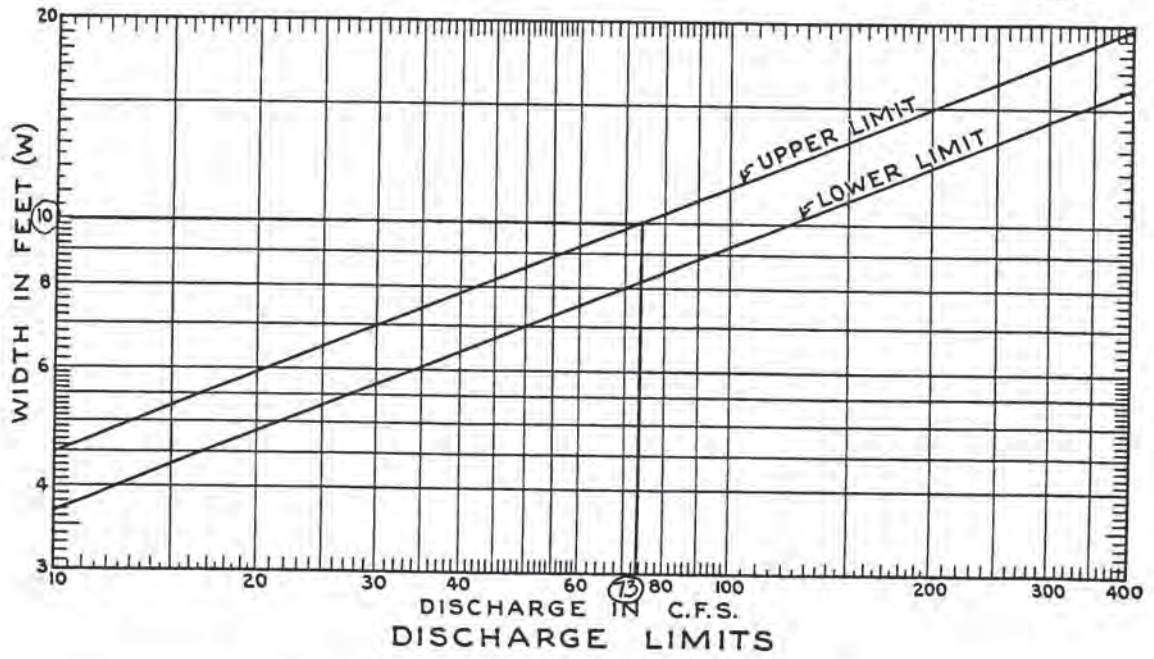


FIGURE 42.—*Impact-type energy dissipator (Basin VI).*

TABLE 11.—*Stilling basin dimensions (Basin VI). Impact-type energy dissipator.*

Suggested pipe size [1]		Max discharge Q	Feet and inches										Inches					
Dia in.	Area (sq ft)		W	H	L	a	b	c	d	e	f	g	t_w	t_f	t_b	t_p	K	Suggested riprap size [3]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19) [3]
18	1. 77	[2] 21	5–6	4–3	7–4	3–3	4–1	2–4	0–11	0–6	1–6	2–1	6	6½	6	6	3	4. 0
24	3. 14	38	6–9	5–3	9–0	3–11	5–1	2–10	1–2	0–6	2–0	2–6	6	6½	6	6	3	7. 0
30	4. 91	59	8–0	6–3	10–8	4–7	6–1	3–4	1–4	0–8	2–6	3–0	6	6½	7	7	3	8. 5
36	7. 07	85	9–3	7–3	12–4	5–3	7–1	3–10	1–7	0–8	3–0	3–6	7	7½	8	8	3	9. 0
42	9. 62	115	10–6	8–0	14–0	6–0	8–0	4–5	1–9	0–10	3–0	3–11	8	8½	9	8	4	9. 5
48	12. 57	151	11–9	9–0	15–8	6–9	8–11	4–11	2–0	0–10	3–0	4–5	9	9½	10	8	4	10. 5
54	15. 90	191	13–0	9–9	17–4	7–4	10–0	5–5	2–2	1–0	3–0	4–11	10	10½	10	8	4	12. 0
60	19. 63	236	14–3	10–9	19–0	8–0	11–0	5–11	2–5	1–0	3–0	5–4	11	11½	11	8	6	13. 0
72	28. 27	339	16–6	12–3	22–0	9–3	12–9	6–11	2–9	1–3	3–0	6–2	12	12½	12	8	6	14. 0

73cfs →

[1] Suggested pipe will run full when velocity is 12 feet per second or half full when velocity is 24 feet per second. Size may be modified for other velocities by $Q=AV$, but relation between Q and basin dimensions shown must be maintained.

[2] For discharges less than 21 second-feet, obtain basin width from curve of Fig. 42. Other dimensions proportional to W; $H=\frac{3W}{4}$, $L=\frac{4W}{3}$, $d=\frac{W}{6}$, etc.

[3] Determination of riprap size explained in Sec. 10.

Calculations – Temporary Culverts, Operational Conditions

COMPUTATION SHEET

RMT INC.

SHEET _____ OF _____

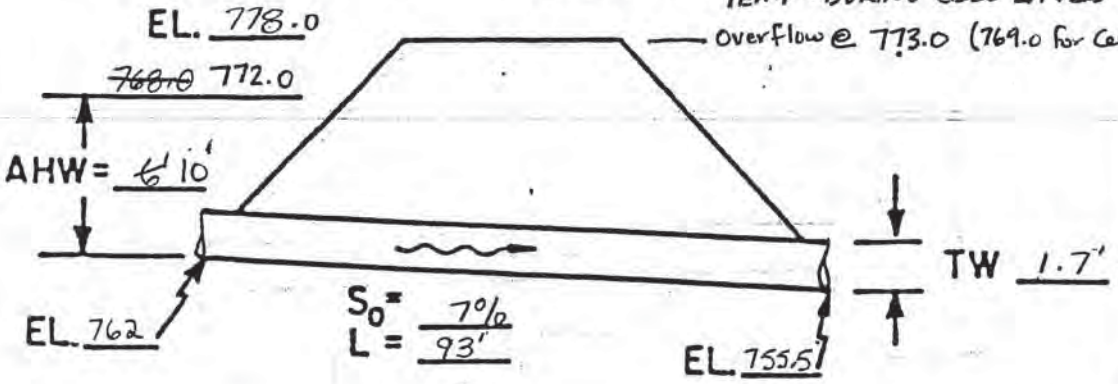
744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED By: BJK Date: 9/00	CHECKED By: Date:	PROJECT/PROPOSAL NO.
DPC - PLAN OF OPERATION			3081.40

REV BJK 7/03

SKETCH

STATION: CULVERT #1
TEMP - DURING CELL 2A & 2B



MAX. STREAM FLOW= ~~323 CFS~~ 355 cfs (25 yr)
561 cfs (100 yr)

Flows for Areas North + West - See Pages 92 & 96 From PCO Apx K

2.)

Culvert Calculator Report
Culvert 1 - Operational (25-Year)

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	773.00 ft	Headwater Depth/ Height	1.94
Computed Headwater Elevation	769.75 ft	Discharge	355.00 cfs
Inlet Control HW Elev	769.18 ft	Tailwater Elevation	757.20 ft
Outlet Control HW Elev	769.75 ft	Control Type	Entrance Control

Grades			
Upstream Invert	762.00 ft	Downstream Invert	755.50 ft
Length	93.00 ft	Constructed Slope	0.069892 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	2.10 ft
Slope Type	Steep	Normal Depth	1.58 ft
Flow Regime	Supercritical	Critical Depth	4.00 ft
Velocity Downstream	24.17 ft/s	Critical Slope	0.008921 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	7.00 ft
Section Size	7 x 4 ft	Rise	4.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	769.75 ft	Upstream Velocity Head	2.50 ft
Ke	0.50	Entrance Loss	1.25 ft

Inlet Control Properties			
Inlet Control HW Elev	769.18 ft	Flow Control	Submerged
Inlet Type	18 to 33.7 ° wingwall flare, d=0.0830	Area Full	28.0 ft²
K	0.48600	HDS 5 Chart	9
M	0.66700	HDS 5 Scale	2
C	0.02490	Equation Form	2
Y	0.83000		

RMT, Inc.
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Culvert Calculator Report
Culvert 1 - Operational (100-Year)

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	773.00 ft	Headwater Depth/ Height	3.34
Computed Headwater Elevation	775.36 ft	Discharge	561.00 cfs
Inlet Control HW Elev	775.18 ft	Tailwater Elevation	757.20 ft
Outlet Control HW Elev	775.36 ft	Control Type	Entrance Control

Grades			
Upstream Invert	762.00 ft	Downstream Invert	755.50 ft
Length	93.00 ft	Constructed Slope	0.069892 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	2.93 ft
Slope Type	Steep	Normal Depth	2.18 ft
Flow Regime	Supercritical	Critical Depth	4.00 ft
Velocity Downstream	27.37 ft/s	Critical Slope	0.022277 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	7.00 ft
Section Size	7 x 4 ft	Rise	4.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	775.36 ft	Upstream Velocity Head	6.24 ft
Ke	0.50	Entrance Loss	3.12 ft

Inlet Control Properties			
Inlet Control HW Elev	775.18 ft	Flow Control	Submerged
Inlet Type	18 to 33.7 ° wingwall flare, d=0.0830	Area Full	28.0 ft²
K	0.48600	HDS 5 Chart	9
M	0.66700	HDS 5 Scale	2
C	0.02490	Equation Form	2
Y	0.83000		

COMPUTATION SHEET

RMT INC.

SHEET _____ OF _____

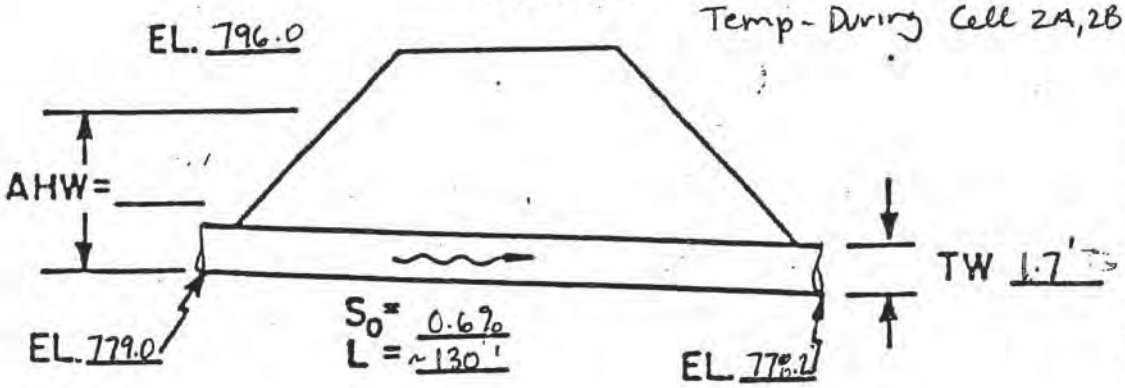
744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Dairyland Power – Phase IV	BJH	7/03			3061.56

SKETCH

STATION: Culvert #2

Temp - During Cell 2A, 2B

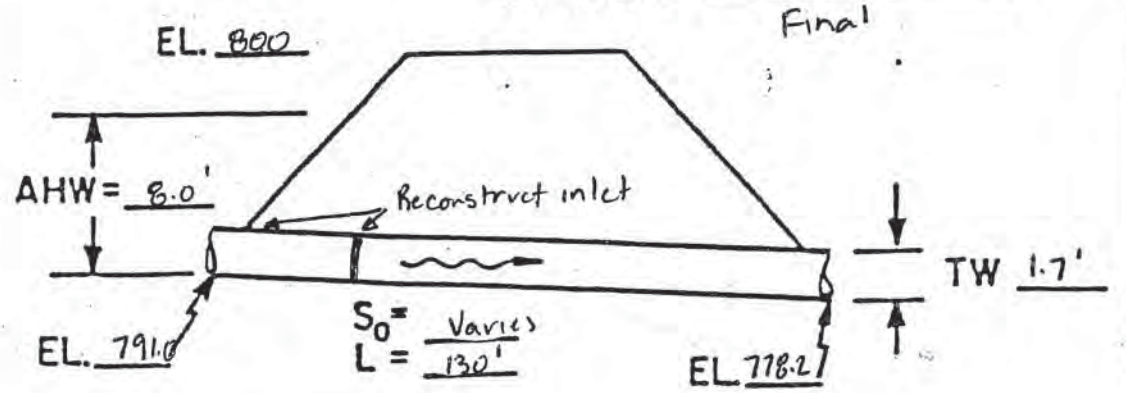


MAX. STREAM FLOW= 561 ~~323~~ cfs

SKETCH

STATION: Culvert #2

Final



MAX. STREAM FLOW= 323 cfs

Culvert Calculator Report
Culvert 2 - Operational

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	796.00 ft	Headwater Depth/ Height	3.86
Computed Headwater Elevation	794.45 ft	Discharge	561.00 cfs
Inlet Control HW Elev	792.30 ft	Tailwater Elevation	779.90 ft
Outlet Control HW Elev	794.45 ft	Control Type	Outlet Control

Grades			
Upstream Invert	779.00 ft	Downstream Invert	778.20 ft
Length	130.00 ft	Constructed Slope	0.006154 ft/ft

Hydraulic Profile			
Profile	Pressure	Depth, Downstream	4.00 ft
Slope Type	N/A	Normal Depth	N/A ft
Flow Regime	N/A	Critical Depth	4.00 ft
Velocity Downstream	20.04 ft/s	Critical Slope	0.022277 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	7.00 ft
Section Size	7 x 4 ft	Rise	4.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	794.45 ft	Upstream Velocity Head	6.24 ft
Ke	0.50	Entrance Loss	3.12 ft

Inlet Control Properties			
Inlet Control HW Elev	792.30 ft	Flow Control	Submerged
Inlet Type	18 to 33.7 ° wingwall flare, d=0.0830	Area Full	28.0 ft²
K	0.48600	HDS 5 Chart	9
M	0.66700	HDS 5 Scale	2
C	0.02490	Equation Form	2
Y	0.83000		

Culvert Calculator Report
Culvert 2 - Final

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	799.00 ft	Headwater Depth/ Height	1.78
Computed Headwater Elevation	798.10 ft	Discharge	323.00 cfs
Inlet Control HW Elev	797.44 ft	Tailwater Elevation	779.90 ft
Outlet Control HW Elev	798.10 ft	Control Type	Entrance Control

Grades			
Upstream Invert	791.00 ft	Downstream Invert	778.20 ft
Length	130.00 ft	Constructed Slope	0.098462 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	1.60 ft
Slope Type	Steep	Normal Depth	1.32 ft
Flow Regime	Supercritical	Critical Depth	4.00 ft
Velocity Downstream	28.87 ft/s	Critical Slope	0.007385 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	7.00 ft
Section Size	7 x 4 ft	Rise	4.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	798.10 ft	Upstream Velocity Head	2.07 ft
Ke	0.50	Entrance Loss	1.03 ft

Inlet Control Properties			
Inlet Control HW Elev	797.44 ft	Flow Control	Submerged
Inlet Type	18 to 33.7 ° wingwall flare, d=0.0830	Area Full	28.0 ft²
K	0.48600	HDS 5 Chart	9
M	0.66700	HDS 5 Scale	2
C	0.02490	Equation Form	2
Y	0.83000		

COMPUTATION SHEET

RMT INC.

SHEET _____ OF _____

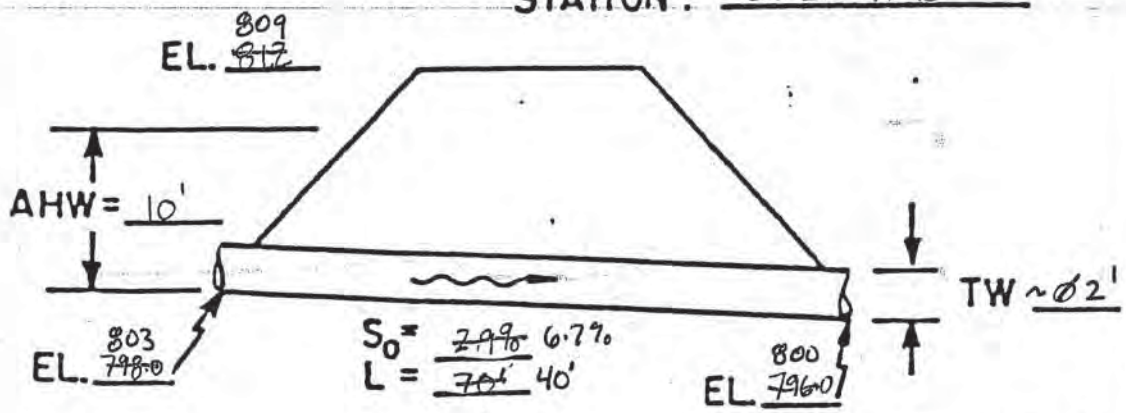
744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED		CHECKED		PROJECT/PROPOSAL NO.
DPC - PLAN OF OPERATION	By: KAA	Date: 9/[illegible]/04	By:	Date:	3081.4C

Rev BSK 8/03

SKETCH

STATION: CULVERT D



MAX. STREAM FLOW= ~~583 cfs~~ 228 CFS (25-YR) 360 CFS (100-YR)

Culvert Calculator Report
Culvert D - 25 Year

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	809.00 ft	Headwater Depth/ Height	1.40
Computed Headwater Elevation	808.61 ft	Discharge	228.00 cfs
Inlet Control HW Elev	807.84 ft	Tailwater Elevation	802.00 ft
Outlet Control HW Elev	808.61 ft	Control Type	Entrance Control

Grades			
Upstream Invert	803.00 ft	Downstream Invert	800.00 ft
Length	45.00 ft	Constructed Slope	0.066667 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	1.74 ft
Slope Type	Steep	Normal Depth	1.19 ft
Flow Regime	Supercritical	Critical Depth	3.21 ft
Velocity Downstream	18.70 ft/s	Critical Slope	0.003975 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	7.00 ft
Section Size	7 x 4 ft	Rise	4.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	808.61 ft	Upstream Velocity Head	1.60 ft
Ke	0.50	Entrance Loss	0.80 ft

Inlet Control Properties			
Inlet Control HW Elev	807.84 ft	Flow Control	Submerged
Inlet Type	18 to 33.7 ° wingwall flare, d=0.0830	Area Full	28.0 ft²
K	0.48600	HDS 5 Chart	9
M	0.66700	HDS 5 Scale	2
C	0.02490	Equation Form	2
Y	0.83000		

RMT, Inc.
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Culvert Calculator Report
Culvert D - 100 Year

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	809.00 ft	Headwater Depth/ Height	1.96
Computed Headwater Elevation	810.85 ft	Discharge	360.00 cfs
Inlet Control HW Elev	810.30 ft	Tailwater Elevation	802.00 ft
Outlet Control HW Elev	810.85 ft	Control Type	Entrance Control

Grades			
Upstream Invert	803.00 ft	Downstream Invert	800.00 ft
Length	45.00 ft	Constructed Slope	0.066667 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	2.52 ft
Slope Type	Steep	Normal Depth	1.63 ft
Flow Regime	Supercritical	Critical Depth	4.00 ft
Velocity Downstream	20.38 ft/s	Critical Slope	0.009174 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	7.00 ft
Section Size	7 x 4 ft	Rise	4.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	810.85 ft	Upstream Velocity Head	2.57 ft
Ke	0.50	Entrance Loss	1.28 ft

Inlet Control Properties			
Inlet Control HW Elev	810.30 ft	Flow Control	Submerged
Inlet Type	18 to 33.7 ° wingwall flare, d=0.0830	Area Full	28.0 ft²
K	0.48600	HDS 5 Chart	9
M	0.66700	HDS 5 Scale	2
C	0.02490	Equation Form	2
Y	0.83000		

RMT, Inc.
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Culvert Calculator Report
Flume MH

Solve For: Headwater Elevation

Culvert Summary					
		→ 827.5, adjacent pipe inlet			
Allowable HW Elevation	8.00	ft	Headwater Depth/ Height	1.98	
Computed Headwater Elevation	825.18	ft	Discharge	73.00	cfs
Inlet Control HW Elev	825.18	ft	Tailwater Elevation	780.67	ft
Outlet Control HW Elev	824.72	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	819.25	ft	Downstream Invert	779.00	ft
Length	185.00	ft	Constructed Slope	0.217568	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.91	ft
Slope Type	Steep		Normal Depth	0.86	ft
Flow Regime	Supercritical		Critical Depth	2.70	ft
Velocity Downstream	40.57	ft/s	Critical Slope	0.006248	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.010	
Section Material	PVC		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev	824.72	ft	Upstream Velocity Head	1.85	ft
Ke	0.50		Entrance Loss	0.92	ft

Inlet Control Properties					
Inlet Control HW Elev	825.18	ft	Flow Control	Submerged	
Inlet Type	Square edge w/headwall		Area Full	7.1	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

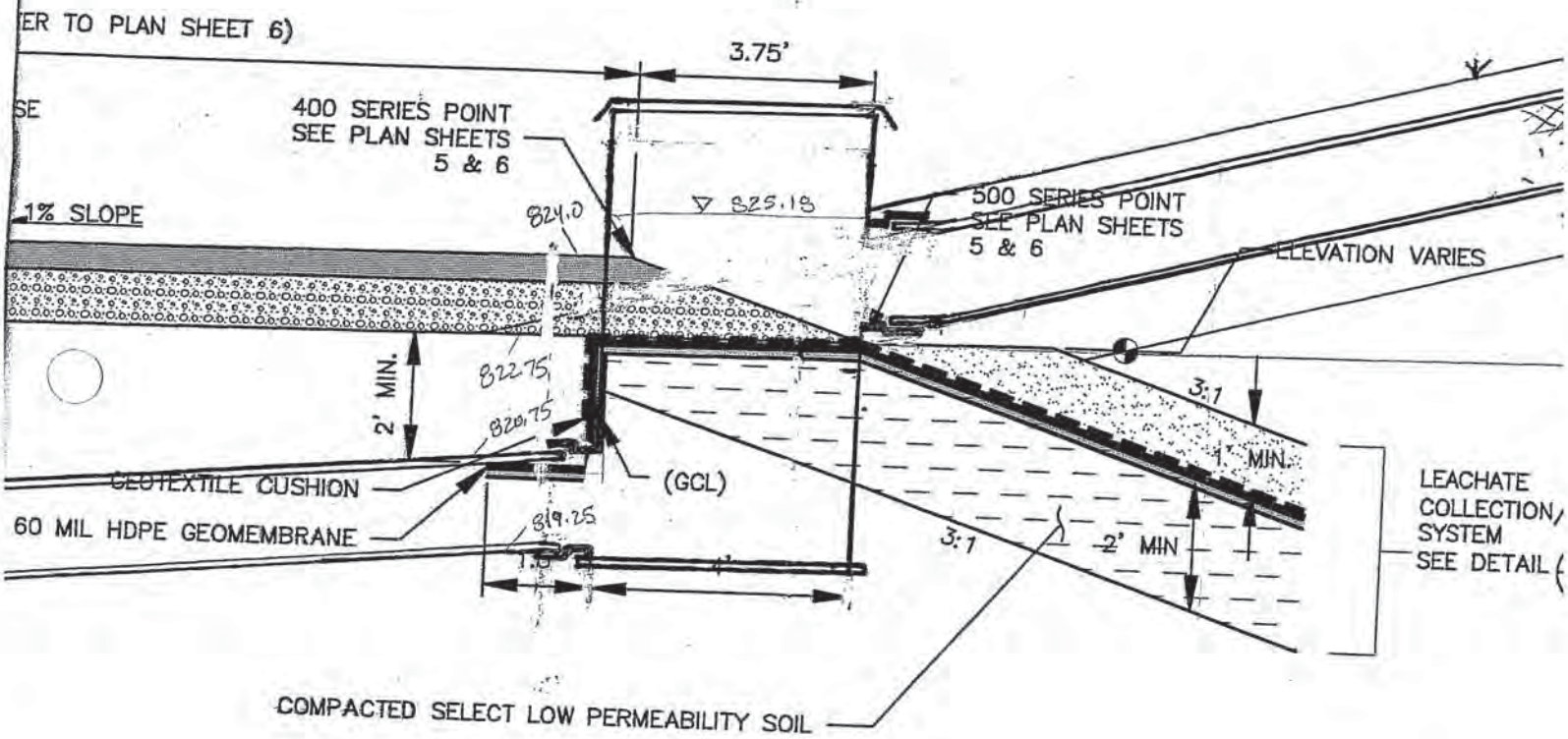
RMT, Inc. 37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

POWER SUPPLY
LARRY WOOD
262-255-3030
5/27/03

$65/VF × 7 VF BARREL
PLATE 1"

2,200 - 2,500 (incl. $500 for lid)

d flange
lid add $500



COMPUTATION SHEET

RMT INC.

SHEET _____ OF _____

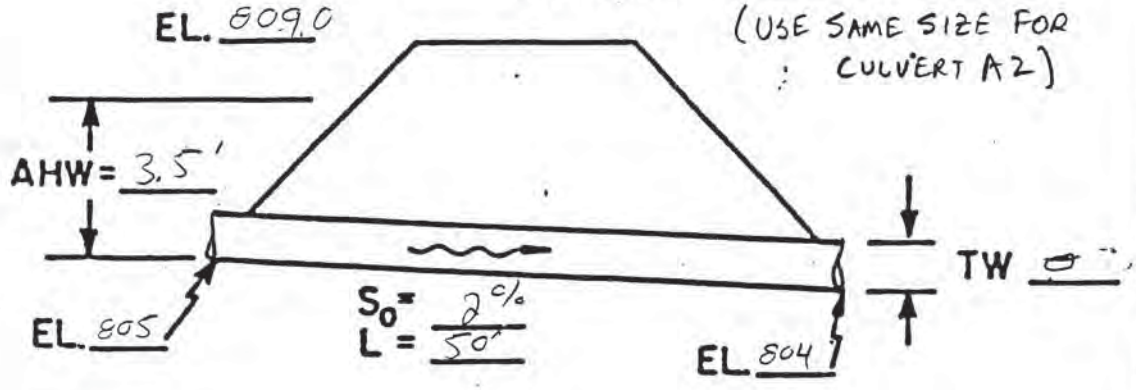
744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED	CHECKED	PROJECT/PROPOSAL NO.
DPC - PLAN OF OPERATION	By: SAA ; Date: 9/8-9/00	By: BJK Date:	3CE1.40

SKETCH

STATION : CULVERT A1/A2

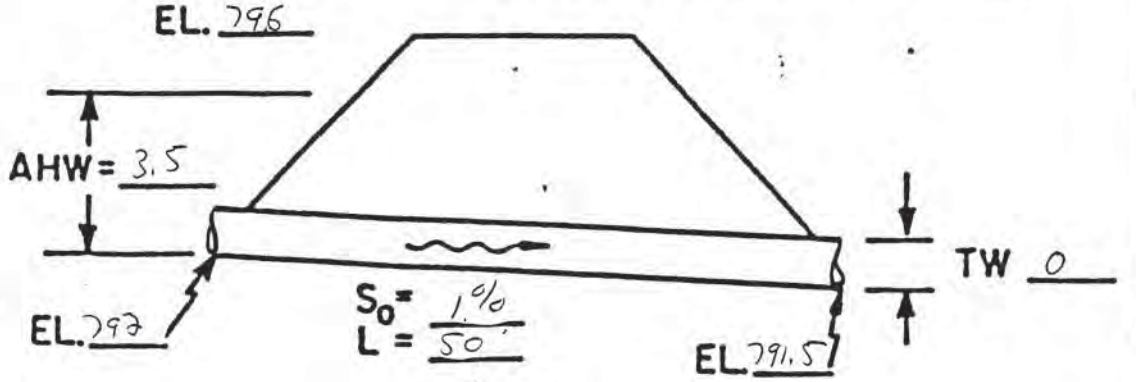
(USE SAME SIZE FOR : CULVERT A2)



MAX. STREAM FLOW= 14 cfs

SKETCH

STATION : CULVERT B



MAX. STREAM FLOW= 11 cfs

COMPUTATION SHEET

RMT INC.

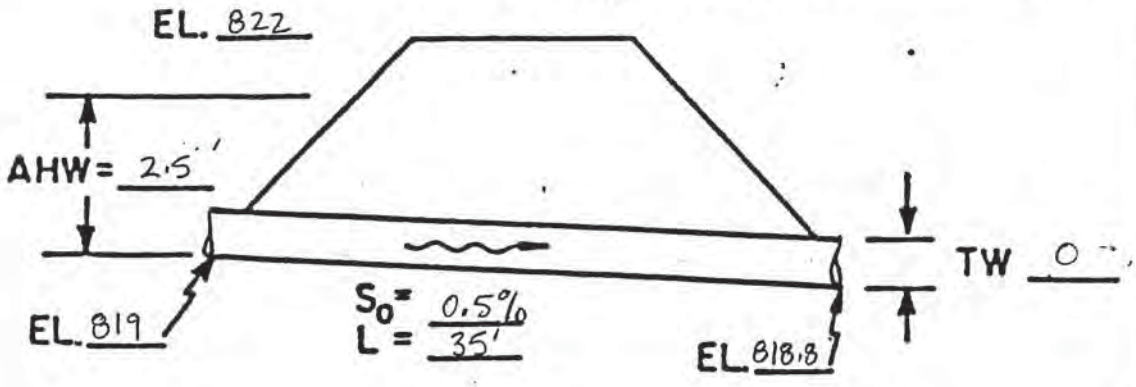
SHEET _____ OF _____

744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
DPC - PLAN OF OPERATION	AA	9/27/06			3081.41C

SKETCH

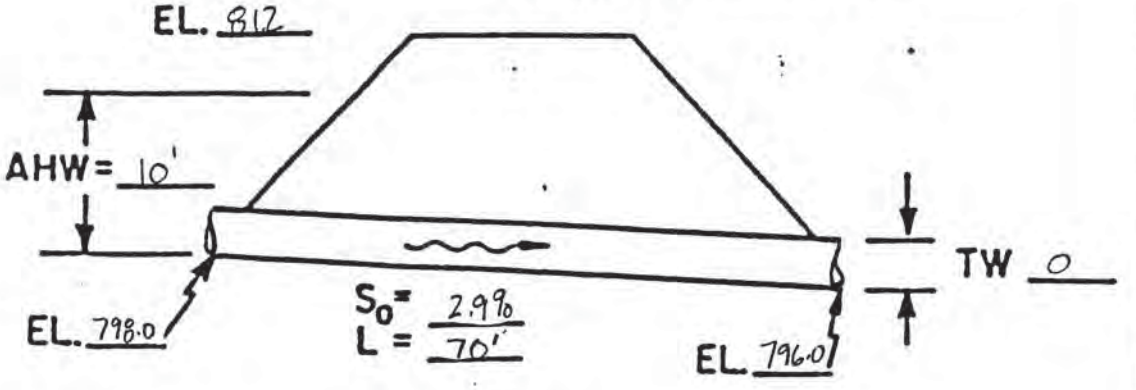
STATION : CULVERT C



MAX. STREAM FLOW= 6 cfs

SKETCH

STATION : CULVERT D



MAX. STREAM FLOW= 583 cfs

COMPUTATION SHEET

RMT INC.

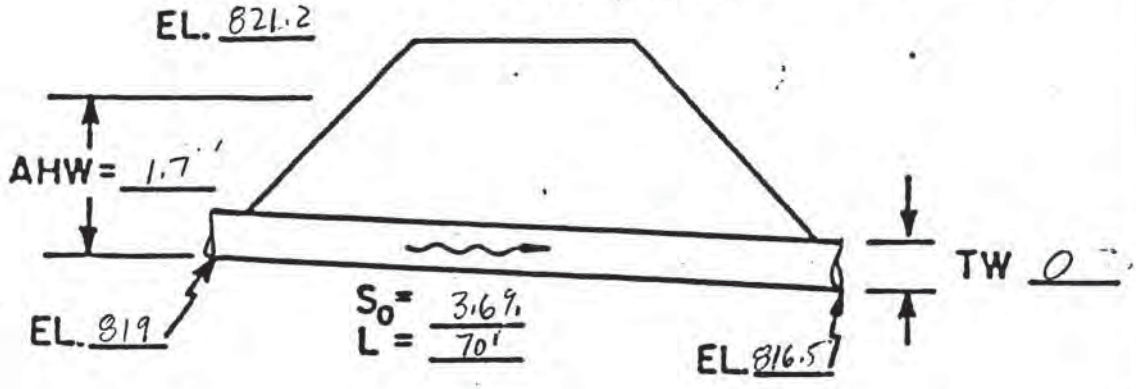
SHEET _____ OF _____

744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
DPC - PLAN OF OPERATION	BAA	9/29/06			3C81.4C

SKETCH

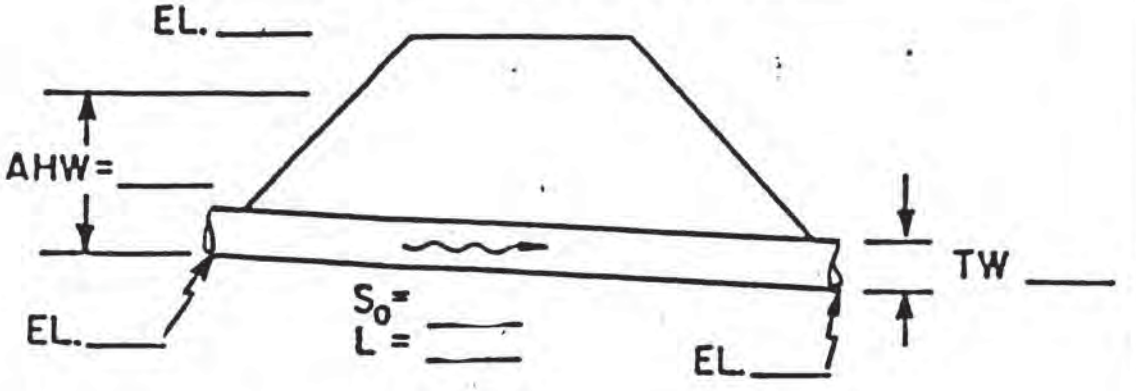
STATION : CULVERT E



MAX. STREAM FLOW= 7 cfs

SKETCH

STATION : _____



MAX. STREAM FLOW= _____

PROJECT: DPC PCO

DESIGNER: BAA

DATE: 9/29/00

HYDROLOGIC AND CHANNEL INFORMATION

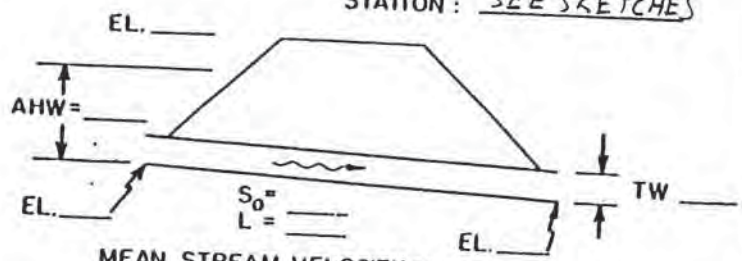
Q_1 = SEE SKETCHES TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: SEE SKETCHES



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION											CONTROLLING H W	OUTLET VELOCITY	COST	COMMENTS
			INLET CONT.		OUTLET CONTROL HW=H + h_o - LS_o												
			$\frac{HW}{D}$	HW	K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW					
CULVERT A CMP-PROJECTING	14	24"	1.15	2.3	0.9	1.3	1.4	1.7		1.7	1	2	2.3			OK	
CULVERT A CONCRETE	14	18"	2	3	0.2	2.1	1.4	1.45		1.45	1	2.55				OK	
CULVERT B CMP	11	24"	1.0	2.0	0.9	0.8	1.2	1.6	0	1.6	1.0	1.4				RECOMMENDED	
CULVERT C	6	24"	.65	1.3	0.9	0.4	0.8	1.4	0	1.4	0.2	1.6				OK	

SUMMARY & RECOMMENDATIONS:

Figure 7

PROJECT: DRC P00

DESIGNER: BAA

DATE: 9/29/00

HYDROLOGIC AND CHANNEL INFORMATION

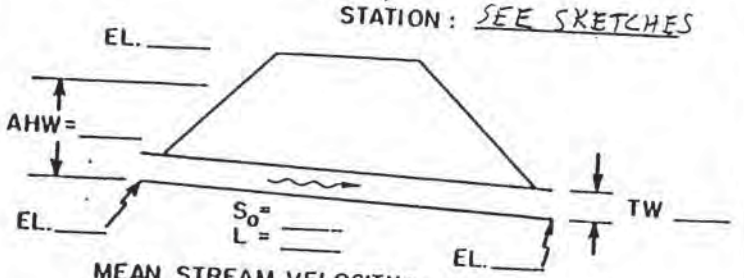
Q_1 = SEE SKETCHES TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: SEE SKETCHES



MEAN STREAM VELOCITY = _____

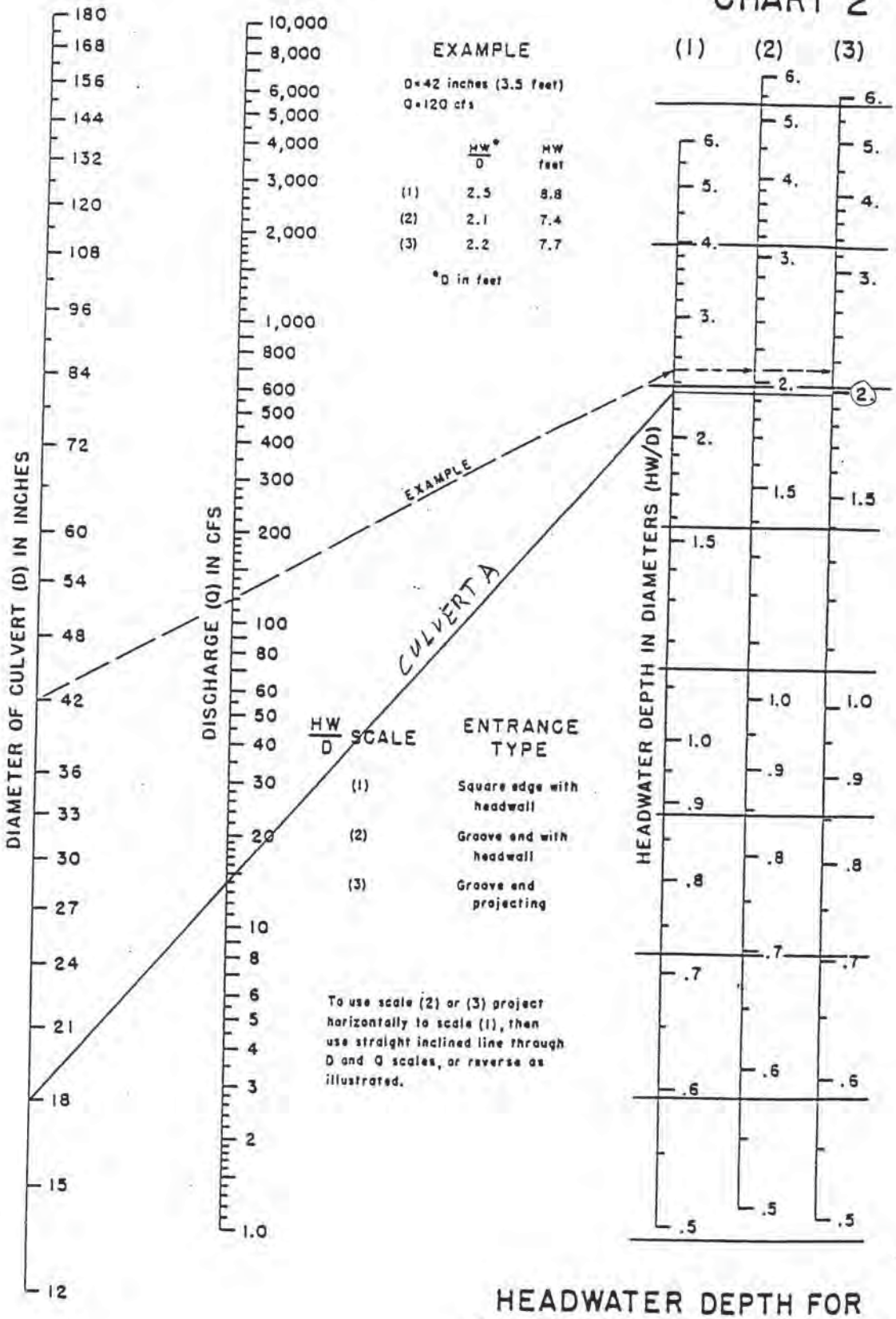
MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION										CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
			INLET CONT.		OUTLET CONTROL $HW = H + h_o - LS_o$											
			$\frac{HW}{D}$	HW	K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW				
CULVERT E CMP-PROJECTING	7	24"	0.7	1.4	0.9	0.4	0.8	1:4	0	1.4	2.5	—	1.4			OK
CULVERT D 7'X4' BOX	583	SAME FLOW AS PERMANENT CULVERTS 1, 2, and 5.														

SUMMARY & RECOMMENDATIONS:

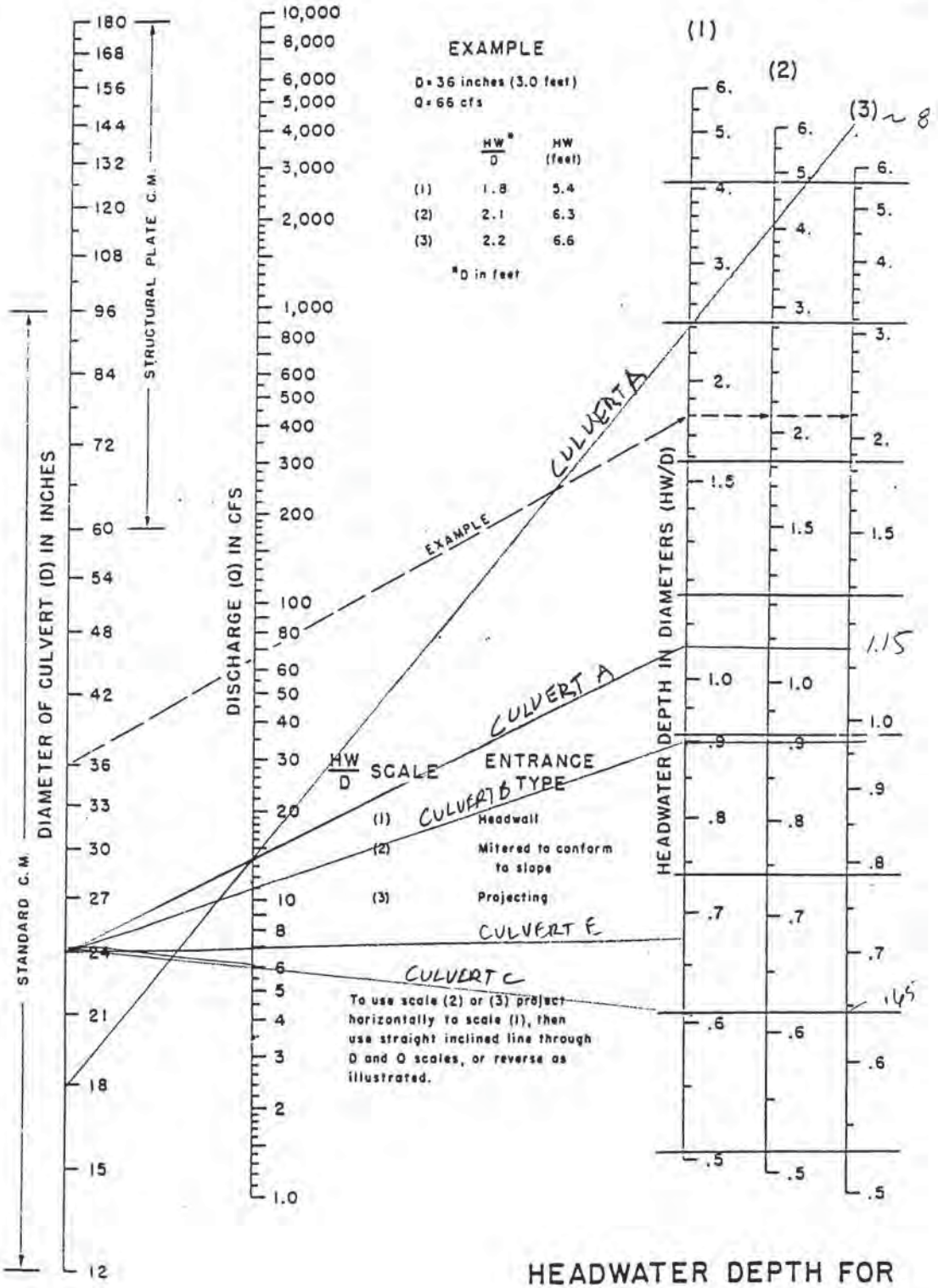
Figure 7

CHART 2



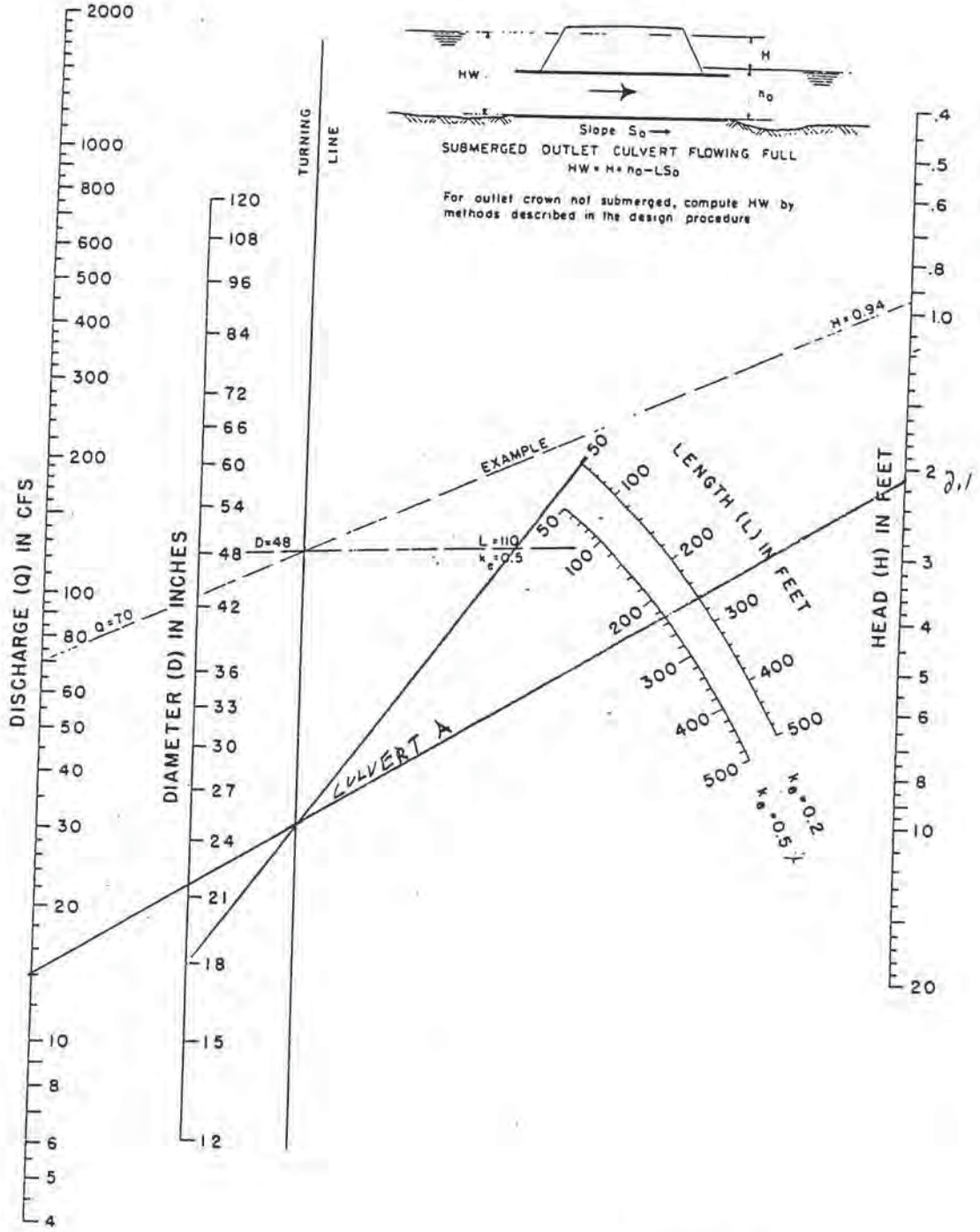
HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

CHART 5



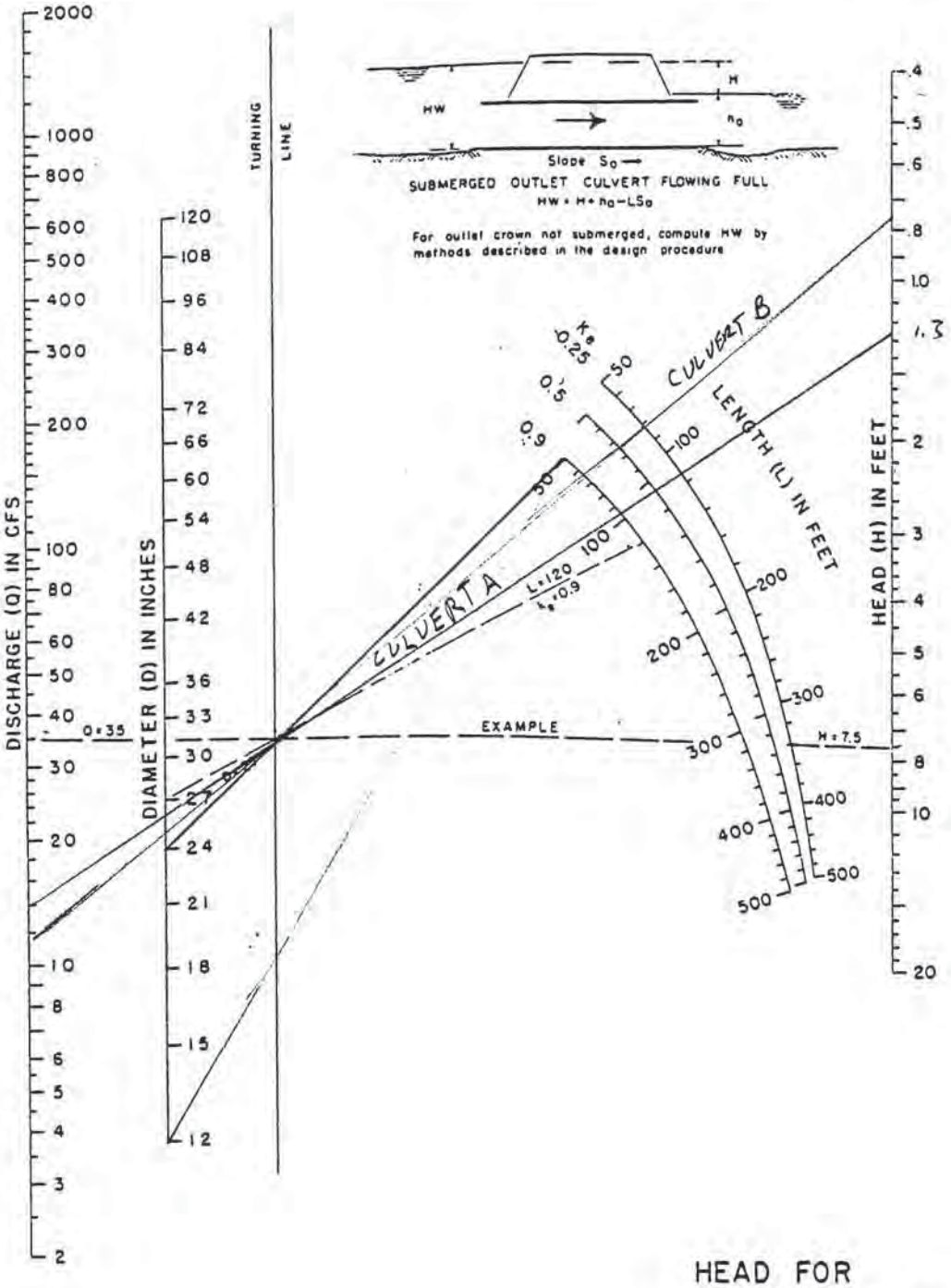
HEADWATER DEPTH FOR
C. M. PIPE CULVERTS
WITH INLET CONTROL

CHART 9



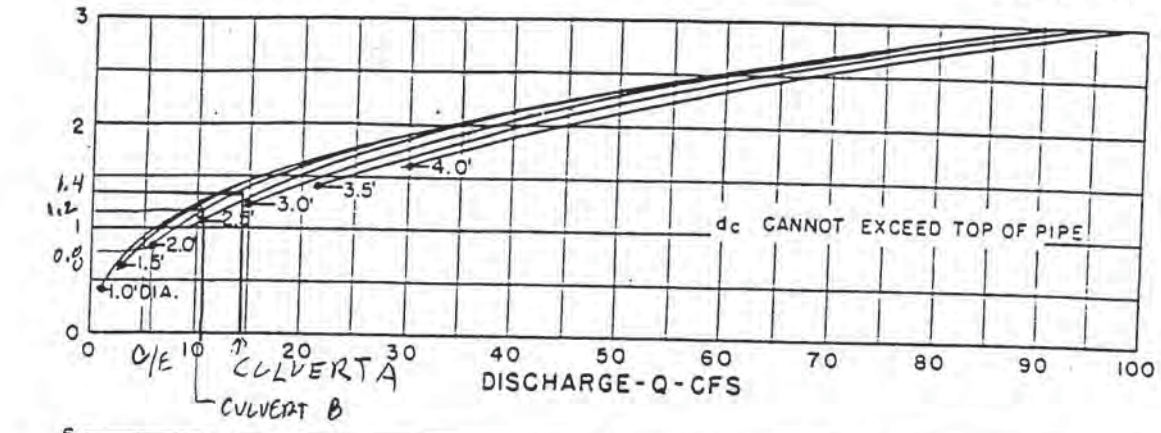
HEAD FOR
CONCRETE PIPE CULVERTS
FLOWING FULL
n = 0.012

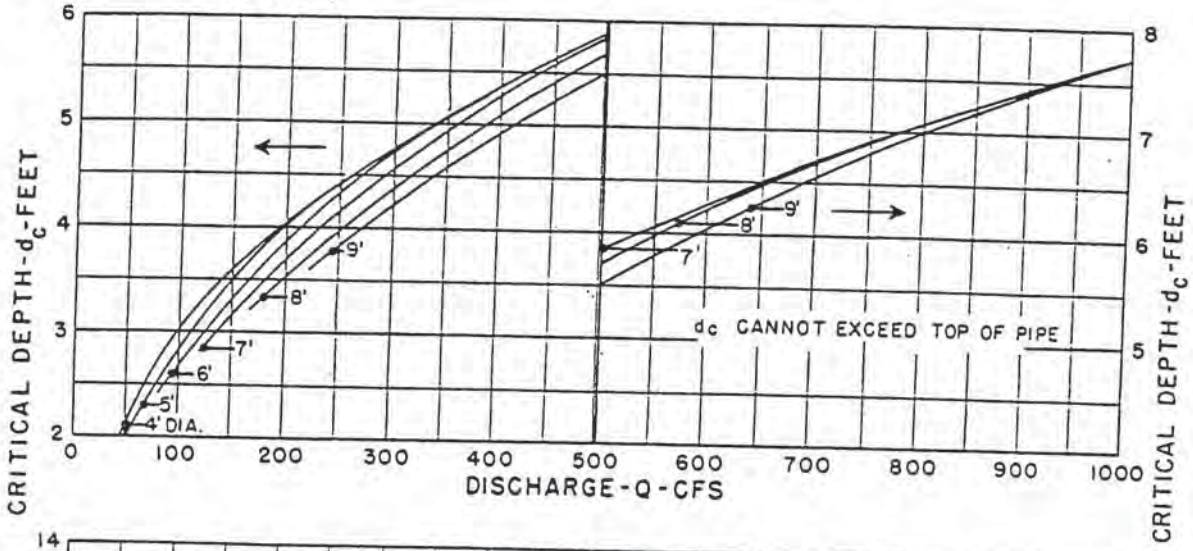
CHART 11

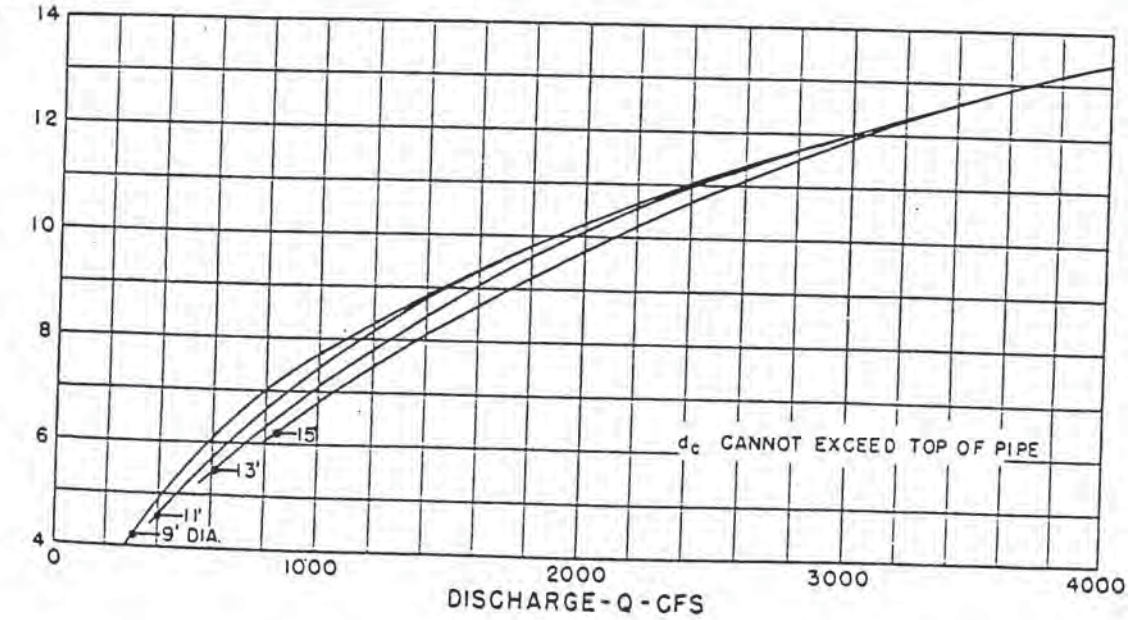


HEAD FOR
STANDARD
C. M. PIPE CULVERTS
FLOWING FULL
n = 0.024

CHART 16







CRITICAL DEPTH
CIRCULAR PIPE

TABLE 1 - ENTRANCE LOSS COEFFICIENTS

Outlet Control, Full or Partly Full

Entrance head loss $H_e = k_e \frac{V^2}{2g}$

Type of Structure and Design of Entrance	Coefficient k_e
Pipe, Concrete	
Projecting from fill, socket end (groove-end)	0.2
Projecting from fill, sq. cut end	0.5
Headwall or headwall and wingwalls	
Socket end of pipe (groove-end)	0.2
Square-edge	0.5
Rounded (radius = 1/12D)	0.2
Mitered to conform to fill slope	0.7
*End-Section conforming to fill slope	0.5
Beveled edges, 33.7° or 45° bevels	0.2
Side-or slope-tapered inlet	0.2
Pipe, or Pipe-Arch, Corrugated Metal	
Projecting from fill (no headwall)	0.9
Headwall or headwall and wingwalls square-edge	0.5
Mitered to conform to fill slope, paved or unpaved slope	0.7
*End-Section conforming to fill slope	0.5
Beveled edges, 33.7° or 45° bevels	0.2
Side-or slope-tapered inlet	0.2
Box, Reinforced Concrete	
Headwall parallel to embankment (no wingwalls)	
Square-edged on 3 edges	0.5
Rounded on 3 edges to radius of 1/12 barrel dimension, or beveled edges on 3 sides	0.2
Wingwalls at 30° to 75° to barrel	
Square-edged at crown	0.4
Crown edge rounded to radius of 1/12 barrel dimension, or beveled top edge	0.2
Wingwall at 10° to 25° to barrel	
Square-edged at crown	0.5
Wingwalls parallel (extension of sides)	
Square-edged at crown	0.7
Side-or slope-tapered inlet	0.2

*Note: "End Section conforming to fill slope," made of either metal or concrete, are the sections commonly available from manufacturers. From limited hydraulic tests they are equivalent in operation to a headwall in both inlet and outlet control. Some end sections, incorporating a closed taper in their design have a superior hydraulic performance. These latter sections can be designed using the information given for the beveled inlet, p. 5-13.

Vegetation Information

✓ BJK 10/6/98

****

NORTH AMERICAN GREEN - ECMDS VER.IV - SLOPE PROTECTION - ENGLISH

USER SPECIFIED - PERMANENT PROTECTION RESULTS

****

PROJECT NAME: Dairyland Power Coop. PROJECT NO.: 3081.33

COMPUTED BY: BJK DATE: 10-06-1998

SLOPE DESCRIPTION: 2:1 Slopes

Slope Gradient: 2.00:1 ✓ Slope Length: 50 feet ✓

Soil Type: Clay Loam (K= 0.21) ✓ Annual R Factor: 125.0 ✓

Slope Reach feet		Material	Type	Density	LS	C
0 -	30	Est. Veg.	Mix	75-95%	4.10	.020
30 -	50	P300	Mix	75-95%	7.35	.002

Slope Reach feet		Material	Type	Density	ASLbare inch	ASLmat inch	SLT inch	Sf	Recommend
0 -	30	Est. Veg.	Mix	75-95%	0.641	0.013	0.03	2.3	STABLE
30 -	50	P300	Mix	75-95%	1.149	0.002	0.03	13.1	STABLE
0 -	50	Composite			0.844	0.009			

Vegetation Density=Percentage of soil coverage provided by vegetation
C=Cover material performance factor (Fraction of soil loss of unprotected)
ASLbare=Average Soil Loss potential of unprotected soil (uniform inches)
ASLmat=Average Soil Loss potential w/material (uniform inches)
SLT=Soil Loss Tolerance for slope segment (uniform inches)
Sf=Safety Factor
Composite=Average soil loss from total slope length (uniform inches)

← For Slope's 0'-30' use Mix No. 20 Vegetation

For slopes >30', use permanant erosion matting on bottom portion of slope (below 30') And No. 20 Vegetation on upper portion

- See Attached For Vegetation Types

Species Common Name	Species Botanical Name	Acceptable Varieties
Kentucky Bluegrass	Poa pratensis	
Red Fescue	Festuca rubra	Creeping
Hard Fescue	Festuca ovina var. duriuscula	Improved
Tall Fescue	Festuca arundinacea	Improved turf type
Salt Grass	Puccinella distans	Fult's
Redtop	Agrostis alba	
Timothy	Phleum pratense	
Little Bluestem*	Andropogon scoparius	
Sideoats Grama*	Bouteloua curtipendula	
Canada Wild Rye*	Elymus canadensis	
Perennial Ryegrass	Lolium perenne	
Perennial Ryegrass	Lolium perenne	Improved Fine
Annual Ryegrass	Lolium multiflorum	
Alsike Clover	Trifolium hybridum	
Red Clover	Trifolium pratense	
White Clover	Trifolium repens	
Birdsfoot Trefoil	Lotus corniculatus	Empire
Japanese Millet	Echinochola crusgalli var. frumentacea	
Annual Oats	Avena sativa	
Alfalfa	Medicago sativa	
Bromegrass	Bromus inermis	
Orchardgrass	Dactylis glomerata	
Ladino Clover	Trifolium repens var. latum	Ladino
Agricultural Rye	Secale cereale	
Winter Wheat	Triticum aestivum	

*Pure Live Seed

Ditches

Slopes

Species	*Purity Min. %*	*Germination min.%*	*Mixture Proportions, Percent* No. 10	No. 20	No. 30	No. 40	No. 50	No. 60	No. 70
Kentucky Bluegrass	85	80	40	6	10	35			
Red Fescue	97	85	25		30	20			
Hard Fescue	97	85		24	25	20			10
Tall Fescue	98	85		40					25
Salt Grass	98	85			10				
Redtop	92	85	5						
Timothy	98	90						12	
Little Bluestem		PLS*							15
Sideoats Grama		PLS*							15
Canada Wild Rye		PLS*						12	5
Perennial Ryegrass	97	90	20	30					30
Improved Fine Perennial Ryegrass	96	85			15	25			
Annual Ryegrass	97	90						35	
Alsike Clover	97	90						4	
Red Clover	98	90						4	
White Clover	95	90	10						
Birdsfoot Trefoil	95	80			10		100		
Japenese Millet	97	85						8	
Annual Oats*	98	90						25	

* Substitute winter wheat for annual oats in fall plantings started after September 1.

630.2.1.5.1.1.2 Mixture to be Used. The selection of the seed mixture or mixtures for use on the project shall meet with the approval of the engineer, and unless otherwise provided in the contract, shall be in accordance with the following:

Seed Mixture No. 10 is intended for use on projects where average loam, heavy clay or moist soils predominate.

Seed Mixture No. 20 is intended for use on projects where light, dry, well-drained, sandy or gravelly soils predominate and shall be used for all high cut and fill slopes (generally exceeding 1.8 to 2.4 m), except where No. 70 is used.

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

STANDARD SPECIFICATIONS

FOR

HIGHWAY AND STRUCTURE CONSTRUCTION

1996 EDITION

****
***** VEGETATION SELECTION *****
***** North American Green *****
****

Region Number: 1

Predominant Soil Type: Clay - Clay Loam

Moisture Regime Conditions: Normal Moisture

Planned Maintenance: Medium - High Maintenance

	Longevity	Growth Habit	Seed Rate lb/ac	kg/ha	
Grasses					
Tall Fescue (Festuca arundinacea)	P	B	200	224	(No. 20)
Chewings Fescue (Festuca rubra, commutata)	P	B	120	134	(No. 10)
Kentucky Bluegrass (Poa pratensis)	P	S	80	90	(No 10, No. 20)
Perennial Ryegrass (Lolium perenne)	P	B	160	179	(No. 10, No 20)
Annual Ryegrass (Lolium multiflorum)	A	B	160	179	
Orchardgrass (Dactylis glomerata)	P	B	40	45	
Timothy (Phleum pratense)	P	B	80	90	
Creeping Red Fescue (Festuca rubra)	P	S	120	134	
Legumes					
Alsike Clover (Trifolium hybridum)	P		15	17	
White Dutch Clover (Trifolium repens)	P		5	6	
White Sweet Clover (Melilotus alba)	P		15	17	

Appendix B: Surface Water Run-Off Control System Calculations

- Leachate Storage Capacity for the 25-Year 24-Hour Storm Event
- References

Leachate Storage Capacity for the 25-Year 24-Hour Storm Event

PROJECT / LOCATION: DPC: Alma Offsite Disposal Facility, Phase IV Landfill		PROJECT / PROPOSAL NO.
SUBJECT: Active Area Leachate Disposal Capacity		421717.0000
PREPARED BY: B. Kahnk	DATE: 4/27/2021	FINAL X
CHECKED BY: J. Hotstream	DATE: 4/29/2021	REVISION X

Purpose: Determine the leachate storage capacity from a 25 year, 24-hour storm event during the critical leachate generation scenario.

Assumptions:

1. Critical leachate generation scenario occurs during the current condition with approximately 12.7 acres are operational (Portions of Cell 2 and the entirety of Cell 3) and approximately 7.6 acres have final cover. (See Figure 1 for this scenario).

2. The 25 year, 24-hour storm event is 5.40 inches (refer to attached sheet).

3. No portion of the leachate drainage layer within the open area is saturated.

4. The leachate drainage sand has a porosity of 30 percent. The bottom ash has a porosity of 25 percent.

5. The minimum thickness of the drainage layer is 1.0 foot.

6. A minimum of 1 foot of bottom ash was installed above the drainage layer in Cell 2A over an area of approximately 2.3 acres.

7.A minimum of 4 feet of bottom ash was installed above the drainage layer during the Cell 3A construction. Using a maximum elevation of 820 feet, this bottom ash covers an area of approximately 2.75 acres.

Method:

1. Determine the volume of rain collected in the open areas during the critical condition from a 25 year, 24-hour storm event.

2. Calculate the available storage volume for leachate in the drainage layer. Due to the slope of the landfill perimeter berm, the capacity of the drainage layer is based on the area of the drainage layer at or below an elevation of 820 feet. Elevation 820 represents the lowest top of berm base grade elevation documented during construction of Cell 3A (refer to attached base grades sheet).

3. The available storage volume within the pipe trenches, transfer piping, and leachate collection tank is ignored.

4. Calculate the available storage volume for leachate in the 4 feet of bottom ash placed above the drainage layer during Cell 3A construction and 1 foot of bottom ash placed above the drainage layer during Cell 2A construction.

5. Calculate the volume of storage required for the 25 year, 24-hour storm event.

PROJECT / LOCATION: DPC: Alma Offsite Disposal Facility, Phase IV Landfill		PROJECT / PROPOSAL NO.
SUBJECT: Active Area Leachate Disposal Capacity		421717.0000
PREPARED BY: B. Kahnk	DATE: 4/27/2021	FINAL X
CHECKED BY: J. Hotstream	DATE: 4/29/2021	REVISION ☐

Step 1. Determine volume of run-off collected during the 25 year, 24-hour storm event

Area: 12.7 acres - Area open (portions of Cell 2 and the entirety of Cell 3)

Rain Event: 5.43 inches

$$Runoff\ Volume(ft^3): Rain\ Event\ (inches) \times \frac{1ft}{12\ inches} \times Area\ (acres) \times \frac{43{,}560\ ft^2}{1\ acre}$$

Runoff Volume: 250,328 cubic feet

Step 2. Calculate the available storage volume for leachate in the drainage layer.

Area: 9.2 acres - see attached base grades plan
Thickness: 1 foot
Porosity: 0.3

$$Storage\ Capacity(ft^3): Area\ (acres) \times \frac{43{,}560\ ft^2}{1\ acre} \times Thickness\ (foot) \times Porosity$$

Storage Capacity: 120,226 cubic feet

Step 3. Ignore storage in pipe trenches, transfer piping and leachate collection tank

Step 4. Calculate the available storage volume in the bottom ash placed above the drainage layer

Cell 2A:		Cell 3A:	
Area:	2.3 acre(s)	Area:	2.75 acre(s)
Thickness:	1 feet	Thickness:	4 feet
Porosity:	0.25	Porosity:	0.25

$$Storage\ Capacity(ft^3): Area\ (acres) \times \frac{43{,}560\ ft^2}{1\ acre} \times Thickness\ (foot) \times Porosity$$

Cell 2A:		Cell 3A:	
Storage Capacity:	25,047 cubic feet	Storage Capacity:	119,790 cubic feet

Total Storage Capacity (Cell 2A + Cell 3A): 144,837 cubic feet

PROJECT / LOCATION: DPC: Alma Offsite Disposal Facility, Phase IV Landfill		PROJECT / PROPOSAL NO.
SUBJECT: Active Area Leachate Disposal Capacity		421717.0000
PREPARED BY: B. Kahnk	DATE: 4/27/2021	FINAL X
CHECKED BY: J. Hotstream	DATE: 4/29/2021	REVISION

Step 5. Calculate the storage required for the 25 year, 24-hour storm event.

Required Storage:

$$Required\ Storage = Run\ Off\ Volume - Drainage\ Layer\ Capacity\ - Bottom\ Ash\ Capacity$$

Run-Off Volume:	250,328	cubic feet from Step 1
Drainage Layer:	120,226	cubic feet, from Step 2
Bottom Ash:	144,837	cubic feet from Step 4
Required Storage:	-14,734	cubic feet

The negative required storage calculated above indicates that there is sufficient storage capacity in the leachate collection drainage layer and the bottom ash that was placed in the cells above the drainage layer to contain the runoff from a 25 year, 24-hour storm event.

References

NOAA Atlas 14, Volume 8, Version 2
Location name: Alma, Wisconsin, US*
Latitude: 44.3657°, Longitude: -91.9171°
Elevation: 1074 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.366 (0.300-0.455)	0.436 (0.357-0.543)	0.555 (0.453-0.692)	0.657 (0.532-0.822)	0.801 (0.626-1.03)	0.915 (0.697-1.20)	1.03 (0.757-1.38)	1.16 (0.809-1.58)	1.32 (0.887-1.85)	1.45 (0.946-2.06)
10-min	0.536 (0.439-0.666)	0.639 (0.523-0.795)	0.813 (0.663-1.01)	0.962 (0.779-1.20)	1.17 (0.917-1.52)	1.34 (1.02-1.75)	1.51 (1.11-2.02)	1.69 (1.19-2.31)	1.94 (1.30-2.71)	2.13 (1.39-3.02)
15-min	0.653 (0.535-0.812)	0.779 (0.638-0.969)	0.991 (0.809-1.24)	1.17 (0.950-1.47)	1.43 (1.12-1.85)	1.64 (1.25-2.14)	1.84 (1.35-2.46)	2.06 (1.45-2.82)	2.36 (1.58-3.31)	2.59 (1.69-3.68)
30-min	0.908 (0.744-1.13)	1.09 (0.894-1.36)	1.40 (1.14-1.74)	1.66 (1.34-2.08)	2.03 (1.58-2.62)	2.32 (1.76-3.03)	2.62 (1.92-3.49)	2.92 (2.05-4.00)	3.34 (2.24-4.68)	3.66 (2.39-5.19)
60-min	1.19 (0.978-1.48)	1.42 (1.16-1.77)	1.82 (1.48-2.27)	2.17 (1.76-2.72)	2.69 (2.12-3.51)	3.13 (2.39-4.11)	3.58 (2.63-4.81)	4.07 (2.86-5.60)	4.76 (3.20-6.70)	5.31 (3.46-7.53)
2-hr	1.48 (1.22-1.82)	1.75 (1.44-2.15)	2.23 (1.84-2.76)	2.68 (2.19-3.33)	3.36 (2.67-4.37)	3.94 (3.04-5.15)	4.55 (3.38-6.09)	5.22 (3.70-7.15)	6.18 (4.20-8.66)	6.96 (4.57-9.80)
3-hr	1.67 (1.38-2.04)	1.95 (1.62-2.39)	2.48 (2.05-3.05)	2.99 (2.46-3.69)	3.79 (3.04-4.93)	4.48 (3.48-5.86)	5.24 (3.92-7.00)	6.07 (4.33-8.31)	7.28 (4.97-10.2)	8.28 (5.46-11.6)
6-hr	1.96 (1.64-2.38)	2.28 (1.91-2.77)	2.90 (2.41-3.53)	3.50 (2.90-4.28)	4.47 (3.63-5.79)	5.32 (4.18-6.93)	6.27 (4.73-8.33)	7.32 (5.27-9.96)	8.86 (6.11-12.3)	10.1 (6.74-14.1)
12-hr	2.23 (1.88-2.68)	2.59 (2.18-3.12)	3.29 (2.76-3.96)	3.96 (3.30-4.79)	5.02 (4.10-6.43)	5.96 (4.71-7.68)	6.99 (5.31-9.21)	8.13 (5.90-11.0)	9.80 (6.81-13.5)	11.2 (7.49-15.5)
24-hr	2.53 (2.15-3.01)	2.91 (2.47-3.46)	3.63 (3.07-4.33)	4.33 (3.64-5.19)	5.43 (4.47-6.89)	6.40 (5.10-8.17)	7.46 (5.72-9.75)	8.65 (6.33-11.6)	10.4 (7.26-14.2)	11.8 (7.97-16.2)
2-day	2.94 (2.52-3.46)	3.29 (2.81-3.87)	3.97 (3.39-4.69)	4.65 (3.94-5.53)	5.76 (4.79-7.25)	6.75 (5.44-8.56)	7.86 (6.08-10.2)	9.10 (6.72-12.1)	10.9 (7.72-14.9)	12.5 (8.48-17.0)
3-day	3.23 (2.79-3.79)	3.58 (3.08-4.19)	4.26 (3.65-5.01)	4.95 (4.21-5.84)	6.07 (5.07-7.59)	7.07 (5.72-8.91)	8.19 (6.37-10.6)	9.45 (7.01-12.5)	11.3 (8.02-15.3)	12.8 (8.79-17.5)
4-day	3.48 (3.00-4.05)	3.85 (3.32-4.49)	4.57 (3.93-5.35)	5.28 (4.51-6.21)	6.42 (5.37-7.98)	7.43 (6.03-9.31)	8.55 (6.67-11.0)	9.81 (7.30-12.9)	11.6 (8.29-15.7)	13.2 (9.04-17.9)
7-day	4.09 (3.56-4.73)	4.59 (3.99-5.31)	5.48 (4.75-6.37)	6.30 (5.42-7.35)	7.54 (6.31-9.20)	8.58 (6.97-10.6)	9.70 (7.58-12.3)	10.9 (8.15-14.2)	12.6 (9.03-16.9)	14.0 (9.70-19.0)
10-day	4.64 (4.05-5.34)	5.24 (4.57-6.03)	6.27 (5.45-7.24)	7.17 (6.20-8.32)	8.50 (7.11-10.3)	9.58 (7.80-11.7)	10.7 (8.39-13.4)	11.9 (8.91-15.4)	13.6 (9.73-18.1)	14.9 (10.4-20.1)
20-day	6.27 (5.53-7.14)	7.04 (6.19-8.02)	8.32 (7.29-9.51)	9.40 (8.19-10.8)	10.9 (9.19-13.0)	12.1 (9.95-14.7)	13.4 (10.6-16.6)	14.7 (11.0-18.7)	16.4 (11.8-21.6)	17.7 (12.4-23.7)
30-day	7.70 (6.82-8.72)	8.60 (7.61-9.75)	10.1 (8.89-11.5)	11.3 (9.91-12.9)	13.0 (11.0-15.3)	14.3 (11.8-17.2)	15.7 (12.4-19.3)	17.0 (12.9-21.6)	18.8 (13.6-24.6)	20.2 (14.2-26.9)
45-day	9.58 (8.53-10.8)	10.7 (9.51-12.1)	12.5 (11.1-14.1)	13.9 (12.3-15.8)	15.9 (13.4-18.5)	17.3 (14.3-20.6)	18.8 (14.9-22.9)	20.2 (15.3-25.3)	21.9 (15.9-28.5)	23.3 (16.4-30.8)
60-day	11.2 (10.0-12.6)	12.6 (11.2-14.1)	14.7 (13.0-16.5)	16.3 (14.4-18.5)	18.5 (15.7-21.4)	20.1 (16.6-23.7)	21.5 (17.1-26.1)	22.9 (17.4-28.7)	24.7 (18.0-31.8)	25.9 (18.4-34.2)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PROJECT / LOCATION: DPC: Alma Offsite Disposal Facility, Phase IV Landfill		PROJECT / PROPOSAL NO.
SUBJECT: Active Area Leachate Disposal Capacity		243332.0002
PREPARED BY: J. Hotstream	DATE: 8/31/2016	FINAL ☐
CHECKED BY:	DATE:	REVISION ☐

Volume Relationships of Sand

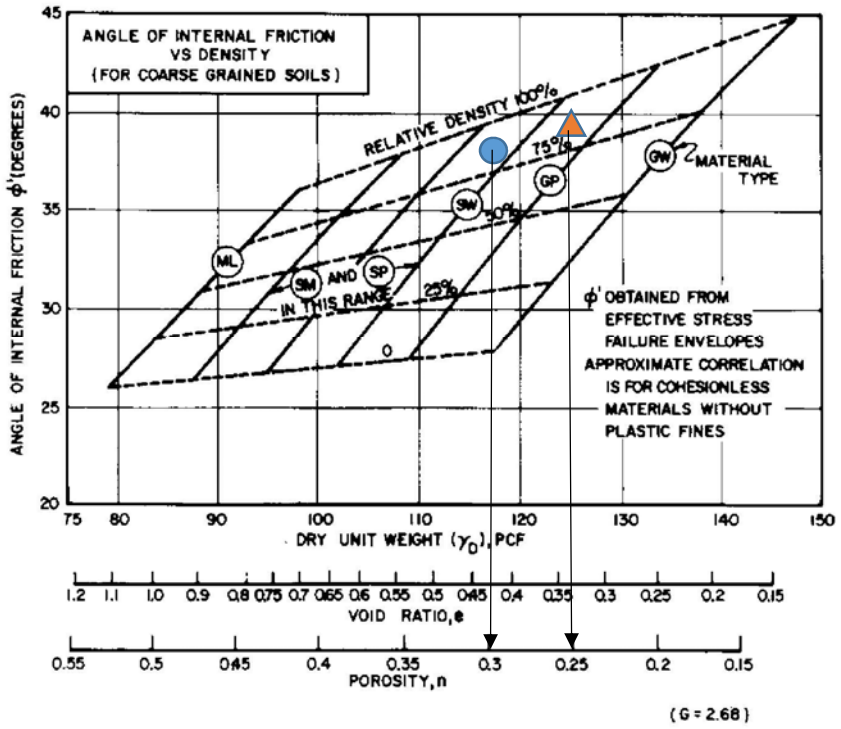
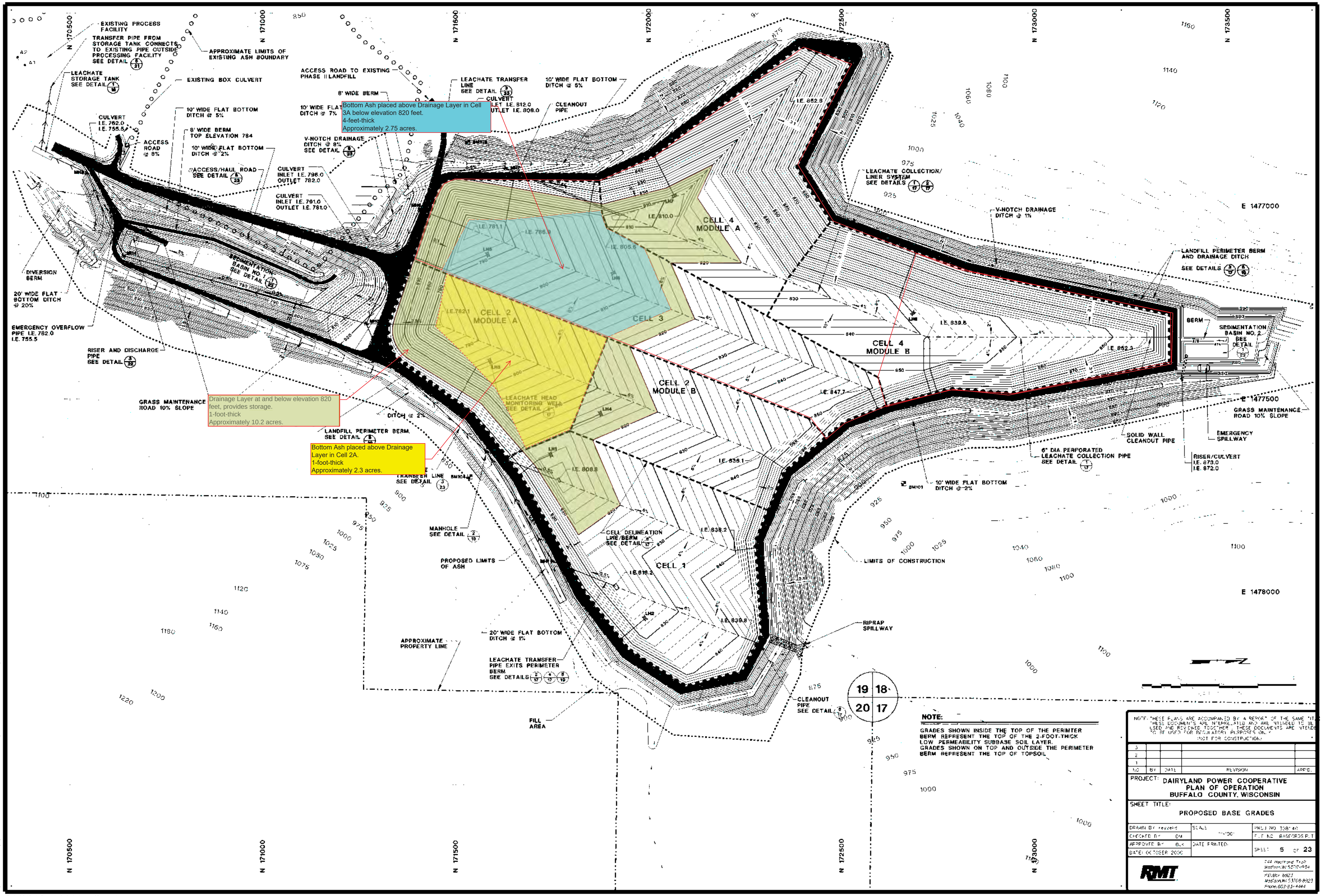


Figure from NavFac DM 7.1 (1986)

Drainage Layer Sand - Poorly Graded Sand (SP)

Bottom Ash - Poorly Graded Sand (SP) to Poorly Graded Gravel (GP)


Bottom Ash placed above Drainage Layer in Cell 3A below elevation 820 feet.
4-feet-thick
Approximately 2.75 acres.
Drainage Layer at and below elevation 820 feet, provides storage.
1-foot-thick
Approximately 10.2 acres.
Bottom Ash placed above Drainage Layer in Cell 2A.
1-foot-thick
Approximately 2.3 acres.
EXISTING PROCESS FACILITY
TRANSFER PIPE FROM STORAGE TANK CONNECTS TO EXISTING PIPE OUTSIDE PROCESSING FACILITY SEE DETAIL
APPROXIMATE LIMITS OF EXISTING ASH BOUNDARY
ACCESS ROAD TO EXISTING PHASE II LANDFILL
LEACHATE STORAGE TANK SEE DETAIL
EXISTING BOX CULVERT
8' WIDE BERM
LEACHATE TRANSFER LINE SEE DETAIL
10' WIDE FLAT BOTTOM DITCH @ 5%
CLEANOUT PIPE
CULVERT I.E. 762.0 I.E. 755.5
10' WIDE FLAT BOTTOM DITCH @ 5%
8' WIDE BERM TOP ELEVATION 784
ACCESS ROAD @ 8%
10' WIDE FLAT BOTTOM DITCH @ 2%
ACCESS/HAUL ROAD SEE DETAIL
V-NOTCH DRAINAGE DITCH @ 8% SEE DETAIL
CULVERT INLET I.E. 798.0 OUTLET 782.0
CULVERT INLET I.E. 791.0 OUTLET I.E. 781.0
LEACHATE COLLECTION/ LINER SYSTEM SEE DETAILS
V-NOTCH DRAINAGE DITCH @ 1%
LANDFILL PERIMETER BERM AND DRAINAGE DITCH SEE DETAILS
SEDIMENTATION BASIN NO. 1 SEE DETAIL
SEDIMENTATION BASIN NO. 2 SEE DETAIL
BERM
DIVERSION BERM
20' WIDE FLAT BOTTOM DITCH @ 20%
EMERGENCY OVERFLOW PIPE I.E. 782.0 I.E. 755.5
RISER AND DISCHARGE PIPE SEE DETAIL
GRASS MAINTENANCE ROAD 10% SLOPE
CELL 4 MODULE A
CELL 3
CELL 2 MODULE A
CELL 4 MODULE B
CELL 2 MODULE B
CELL 1
LEACHATE HEAD MONITORING WELL SEE DETAIL
LANDFILL PERIMETER BERM SEE DETAIL
DITCH @ 2%
GRASS MAINTENANCE ROAD 10% SLOPE
EMERGENCY SPILLWAY
SOLID WALL CLEANOUT PIPE
6" DIA PERFORATED LEACHATE COLLECTION PIPE SEE DETAIL
RISER/CULVERT I.E. 873.0 I.E. 872.0
10' WIDE FLAT BOTTOM DITCH @ 2%
MANHOLE SEE DETAIL
CELL DELINEATION LINE/BERM SEE DETAIL
PROPOSED LIMITS OF ASH
LIMITS OF CONSTRUCTION
RIPRAP SPILLWAY
APPROXIMATE PROPERTY LINE
20' WIDE FLAT BOTTOM DITCH @ 1%
LEACHATE TRANSFER PIPE EXITS PERIMETER BERM SEE DETAILS
FILL AREA
CLEANOUT PIPE SEE DETAIL
E 1477000
E 1477500
E 1478000
N 170500
N 171000
N 171500
N 172000
N 172500
N 173000
N 173500
NOTE:
GRADES SHOWN INSIDE THE TOP OF THE PERIMETER BERM REPRESENT THE TOP OF THE 2-FOOT-THICK LOW PERMEABILITY SUBBASE SOIL LAYER.
GRADES SHOWN ON TOP AND OUTSIDE THE PERIMETER BERM REPRESENT THE TOP OF TOPSOIL.
PROJECT: DAIRYLAND POWER COOPERATIVE PLAN OF OPERATION BUFFALO COUNTY, WISCONSIN
SHEET TITLE: PROPOSED BASE GRADES
DATE: OCTOBER 2000
SHEET 5 OF 23
RMT

EXISTING PHASE II LANDFILL (CLOSED)

W106

P42B

W42

P42A

CELL 4A (FUTURE)

OPEN AREA OF LANDFILL: 12.69 ACRES

EXISTING PHASE IV, CELL 3A AND 3B (ACTIVE)

W100R

W100AR

W107

CELL 4B (FUTURE)

SG-2

EXISTING PHASE IV, CELL 2A

W105

EXISTING PHASE IV, CELL 2B

W104A

W104

W101A

W101

EXISTING PHASE IV, CELL 1

AREA OF PHASE IV LANDFILL THAT HAS RECEIVED FINAL COVER

W102AR

W102R

SG-3

LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- GRID LOCATION
- 890 — EXISTING 10' CONTOUR
- x 895.7 — EXISTING SPOT ELEVATION
- LIMITS OF PERMITTED LANDFILL
- LIMITS OF CCR DISPOSAL (ACTIVE LANDFILL)
- PHASE LINE
- W42 — MONITORING WELL (NOT INCLUDED IN FEDERAL GWMP)
- W42B — PIEZOMETER (NOT INCLUDED IN FEDERAL GWMP)
- W101 — MONITORING WELL LOCATION
- W101A — PIEZOMETER LOCATION

NOTES

1. THE BASE MAP WAS COMPILED FROM THE CELL 3B LINER CONSTRUCTION DOCUMENTATION REPORT (OCTOBER, 2016) AND THE NOVEMBER 12, 2020 ANNUAL AIR SPACE SURVEY BY EXETER DESIGN, INC.
2. THE HORIZONTAL DATUM IS REFERENCED TO THE WISCONSIN STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, NORTH AMERICAN DATUM 1983, US SURVEY FEET.
3. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM 1988. CONTOUR INTERVAL IS 10 FEET.

N

0 200 400

SCALE IN FEET

PROJECT: DAIRYLAND POWER COOPERATIVE
RUN-ON AND RUN-OFF CONTROL SYSTEMS PLAN
ALMA OFF-SITE PHASE IV LANDFILL
BUFFALO COUNTY, WISCONSIN

TITLE: EXISTING CONDITIONS

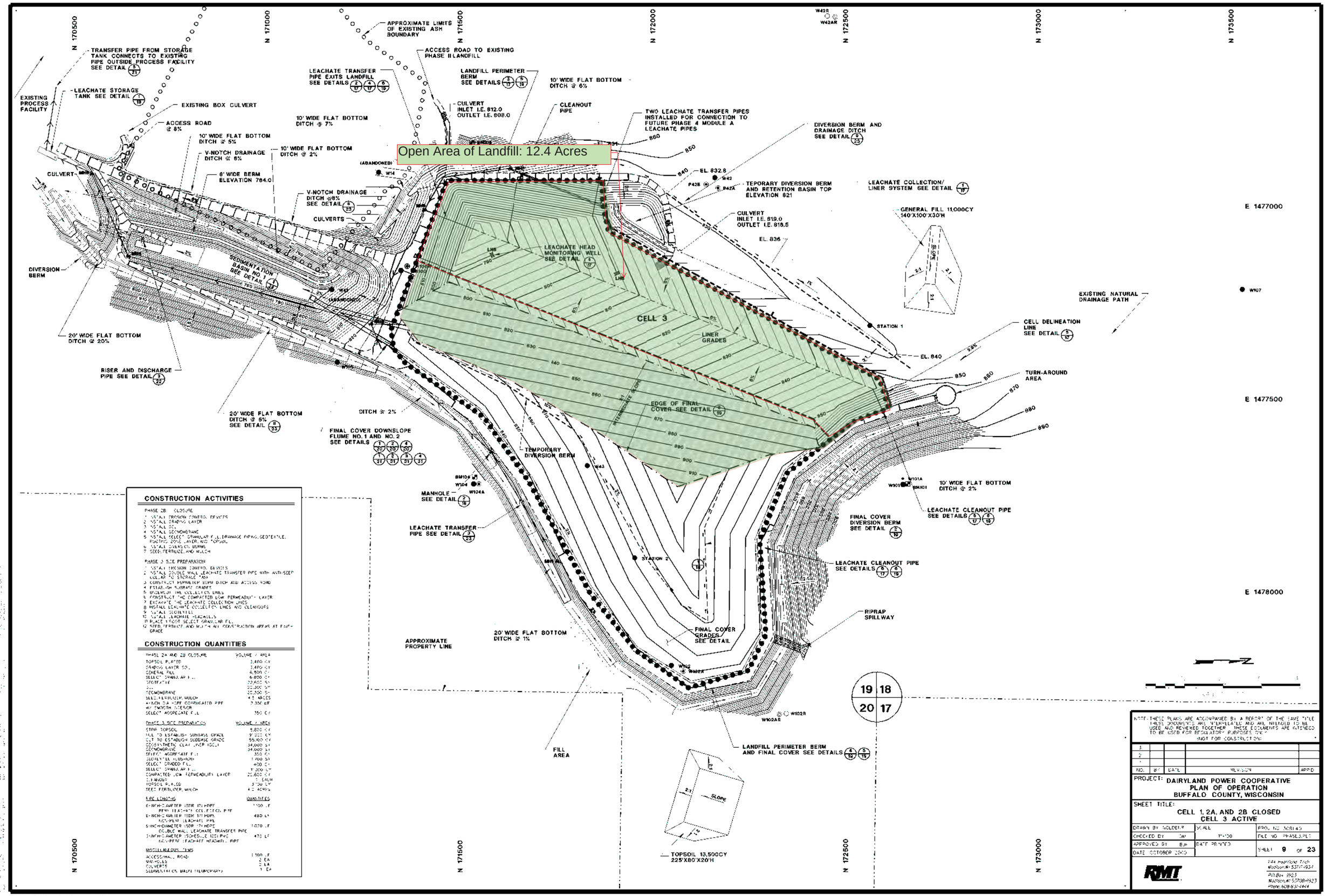
WORKING COPY

DRAWN BY:	S. HAMWAY	PROJ NO.:	421717
CHECKED BY:	B. KAHNK		
APPROVED BY:			FIGURE 1
DATE:	OCTOBER 2021		

TRC
708 Heartland Trail
Suite 3000
Madison, WI 53717
Phone: 608.826.3600

FILE NO.: 421717.01.dwg

11x17 -- ATTACHED XREFS: WELLS 200, GWD 200, PROPOSED_50 2020-11-12 -- ATTACHED IMAGES:
DRAWING NAME: I:\dairyland power\Alma\421717 - 2020 annual groundwater\0000\ 421717.01.dwg -- PLOT DATE: April 28, 2021 - 3:59PM -- LAYOUT: FIGURE 2 GROUNDWATER ELEVATION MAP
Version: 2017-03-03



CONSTRUCTION ACTIVITIES

PHASE 2B - CLOSURE
1. INSTALL EROSION CONTROL DEVICES
2. INSTALL GRADING LAYER
3. INSTALL GCL
4. INSTALL GEOMEMBRANE
5. INSTALL SELECT GRANULAR F.L. DRAINAGE PIPING, GEOTEXTILE, PROTECTIVE COVER LAYER, AND TOPSOIL
6. INSTALL DIVERSION BERMS
7. SEED, FERTILIZE, AND MULCH

PHASE 3 SITE PREPARATION
1. INSTALL EROSION CONTROL DEVICES
2. INSTALL DOUBLE WALL LEACHATE TRANSFER PIPE WITH ANTI-SEEP COLLAR TO STORAGE TANK
3. CONSTRUCT PERIMETER BERM DITCH AND ACCESS ROAD
4. ESTABLISH SUBBASE GRADES
5. UNDERCUT THE COLLECTION LINES
6. CONSTRUCT THE COMPACTED LOW PERMEABILITY LAYER
7. EXCAVATE THE LEACHATE COLLECTION LINES
8. INSTALL LEACHATE COLLECTION LINES AND CLEANOUTS
9. INSTALL GEOTEXTILE
10. INSTALL LEACHATE HEADWALLS
11. PLACE 1 FOOT SELECT GRANULAR F.L.
12. SEED, FERTILIZE, AND MULCH ALL CONSTRUCTION AREAS AT FINAL GRADE

CONSTRUCTION QUANTITIES

PHASE 2A AND 2B CLOSURE	VOLUME / AREA
TOPSOIL PLACED	3,400 CY
GRADING LAYER SOIL	3,400 CY
GENERAL FILL	6,800 CY
SELECT GRANULAR F.L.	6,800 CY
GEOTEXTILE	22,600 SY
GCL	22,300 SY
GEOMEMBRANE	22,300 SY
SEED, FERTILIZER, MULCH	4.5 ACRES
4-INCH DIA. HDPE CORRUGATED PIPE W/ SMOOTH INTERIOR	2,350 LF
SELECT AGGREGATE F.L.	350 CY

PHASE 3 SITE PREPARATION	VOLUME / AREA
STRIP TOPSOIL	6,800 CY
FILL TO ESTABLISH SUBBASE GRADE	9,300 CY
CUT TO ESTABLISH SUBBASE GRADE	55,100 CY
GEOSYNTHETIC CLAY LINER (GCL)	34,000 SY
GEOMEMBRANE	34,000 SY
SELECT AGGREGATE F.L.	350 CY
SLOPE MESS-NOH	1,700 SY
SELECT GRADED F.L.	400 CY
SELECT GRANULAR F.L.	7,200 CY
COMPACTED LOW PERMEABILITY LAYER	20,600 CY
MANHOLE	1 EACH
TOPSOIL PLACED	3,700 CY
SEED, FERTILIZER, MULCH	4.0 ACRES

PIPE LENGTHS	QUANTITIES
6-INCH-DIAMETER (SDR 17) HDPE PERF. LEACHATE COLLECTION PIPE	1,100 LF
6-INCH-DIAMETER (SDR 17) HDPE NON-PERF. LEACHATE PIPE	480 LF
6-INCH-DIAMETER (SDR 17) HDPE DOUBLE WALL LEACHATE TRANSFER PIPE	1070 LF
3-INCH-DIAMETER (SCHEDULE 80) PVC NON-PERF. LEACHATE HEADWALL PIPE	470 LF

MISCELLANEOUS ITEMS	
ACCESS/HAUL ROAD	1,500 LF
MANHOLES	2 EA
CULVERTS	2 EA
SEDIMENTATION BASIN (TEMPORARY)	1 EA

NOTE: THESE PLANS ARE ACCOMPANIED BY A REPORT OF THE SAME TITLE. THESE DOCUMENTS ARE INTERRELATED AND ARE INTENDED TO BE USED AND REVIEWED TOGETHER. THESE DOCUMENTS ARE INTENDED TO BE USED FOR REGULATORY PURPOSES ONLY.
NOT FOR CONSTRUCTION

NO.	BY	DATE	REVISION	APPD
3				
2				
1				

PROJECT: DAIRYLAND POWER COOPERATIVE
PLAN OF OPERATION
BUFFALO COUNTY, WISCONSIN

SHEET TITLE:
CELL 1, 2A, AND 2B CLOSED
CELL 3 ACTIVE

DRAWN BY: WOLDER	SCALE:	PROJ. NO: 3081A0
CHECKED BY: DM	1"=100'	FILE NO: PHASE3.PLT
APPROVED BY: BJA	DATE PRINTED:	SHEET 9 OF 23
DATE: OCTOBER 2010		

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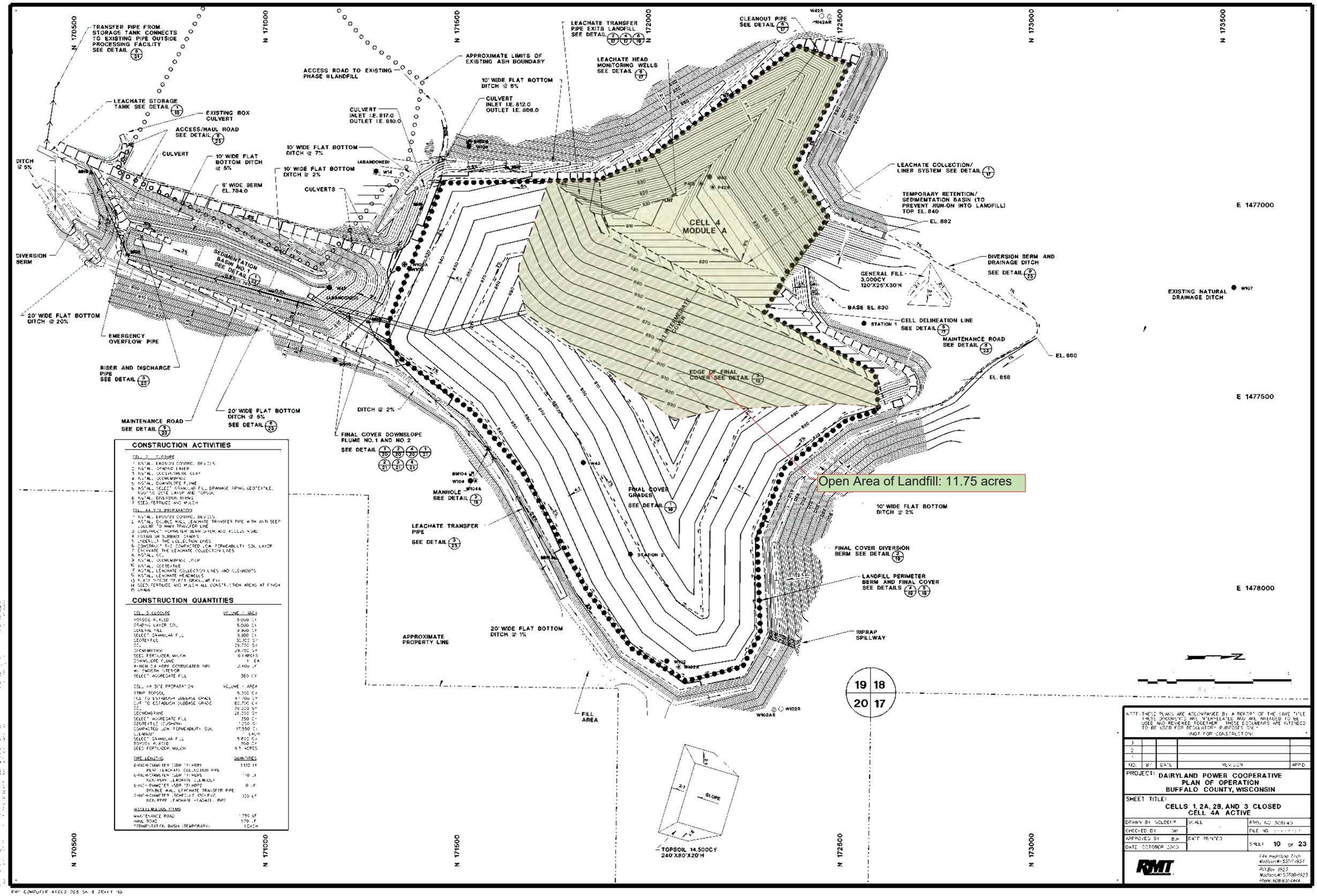
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608-831-4444

RMT COMPUTER AIDED DESIGN & DRAFTING



CONSTRUCTION ACTIVITIES

CELL 3 CLOSURE
1. INSTAL. EROSION CONTRL. DEVICES
2. INSTAL. GRADING LAYER
3. INSTAL. GEOSYNTHETIC CLAY
4. INSTAL. GEOMEMBRANE
5. INSTAL. DOWNSLOPE FLUME
6. INSTAL. SELECT GRANULAR FILL, DRAINAGE PIPING, GEOTEXTILE, AGGR'G ZONE LAYER AND TOPSOIL
6. INSTAL. DIVERSION BERMS
7. SEED, FERTILIZE AND MULCH

CELL 4A SITE PREPARATION
1. INSTAL. EROSION CONTRL. DEVICES
2. INSTAL. DOUBLE WALL LEACHATE TRANSFER PIPE WITH ANTI SEEP COLLAR TO MAIN TRANSFER LINE
3. CONSTRUCT TEMPORARY BERM DITCH, AND ACCESS ROAD
4. ESTABLISH SUBBASE GRADES
5. UNDERCUT THE COLLECTION LINES
6. CONSTRUCT THE COMPACTED LOW PERMEABILITY SOIL LAYER
7. EXCAVATE THE LEACHATE COLLECTION LINES
8. INSTAL. GCL
9. INSTAL. GEOMEMBRANE LINER
10. INSTAL. GEOTEXTILE
11. INSTAL. LEACHATE COLLECTION LINES AND CLEANOUTS
12. INSTAL. LEACHATE HEADCELLS
13. PLACE 24"COOT SELECT GRANULAR FILL
14. SEED, FERTILIZE AND MULCH ALL CONSTRUCTION AREAS AT FINISH GRADE

CONSTRUCTION QUANTITIES

CELL 3 CLOSURE	VOLUME / AREA
TOPSOIL PLACED	5,000 CY
GRADING LAYER SOIL	5,000 CY
LATERAL FILL	9,900 CY
SELECT GRANULAR FILL	3,300 CY
GEOTEXTILE	32,100 SY
GCL	29,700 SY
GEOMEMBRANE	29,700 SY
SEED FERTILIZER, MULCH	6.1 ACRES
DOWNSLOPE FLUME	1 EA
4-INCH DIA HDPE CORRUGATED PIPE W/ SMOOTH INTERIOR	2,400 LF
SELECT AGGREGATE FILL	360 CY

CELL 4A SITE PREPARATION	VOLUME / AREA
STRIP TOPSOIL	5,300 CY
FILL TO ESTABLISH LATERAL GRADE	47,700 CY
CUT TO ESTABLISH SUBBASE GRADE	65,700 CY
GCL	26,300 SY
GEOMEMBRANE	26,300 SY
SELECT AGGREGATE FILL	350 CY
GEOTEXTILE CUSHION	1,350 SY
COMPACTED LOW PERMEABILITY SOIL	17,550 CY
CLEANOUT	1 EACH
SELECT GRANULAR FILL	9,800 CY
TOPSOIL PLACED	350 CY
SEED FERTILIZER, MULCH	6.5 ACRES

PIPE LENGTHS	QUANTITIES
8-INCH-DIAMETER SDR 17 HDPE PERF LEACHATE COLLECTION PIPE	1,130 LF
6-INCH-DIAMETER SDR 17 HDPE NON-PERF LEACHATE CLEANOUT	170 LF
6-INCH-DIAMETER SDR 17 HDPE DOUBLE WALL LEACHATE TRANSFER PIPE	0 LF
3-INCH-DIAMETER SCHEDULE 80 PVC NON-PERF LEACHATE HEADER PIPE	120 LF

MISCELLANEOUS ITEMS	
MAINTENANCE ROAD	1,350 LF
HAUL ROAD	570 LF
SEDIMENTATION BASIN (TEMPORARY)	1 EACH

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NO.	BY	DATE	REVISION	APPD
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PROJECT: DAIRYLAND POWER COOPERATIVE
PLAN OF OPERATION
BUFFALO COUNTY, WISCONSIN

SHEET TITLE:
CELLS 1, 2A, 2B, AND 3 CLOSED
CELL 4A ACTIVE

DRAWN BY	WOLDER	SCALE	PROJ. NO. 3081.45
CHECKED BY	SM		FILE NO. [illegible]
APPROVED BY	BJH	DATE PRINTED	SHEET 10 OF 23
DATE	OCTOBER 2010		

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Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608-831-4444

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N 170500 N 171000 N 171500 N 172000 N 172500 N 173000 N 173500

TRANSFER PIPE FROM STORAGE TANK CONNECTS TO EXISTING PIPE OUTSIDE PROCESSING FACILITY SEE DETAIL 5/21

EXISTING PROCESSING FACILITY

LEACHATE STORAGE TANK TO SEE DETAIL 1/19

ALL-WEATHER ACCESS/ HAUL ROAD SEE DETAIL 6/23

10' WIDE FLAT BOTTOM DITCH @ 5%

10' WIDE FLAT BOTTOM DITCH @ 7%

CULVERT INLET I.E. 817.0 OUTLET I.E. 810.0

APPROXIMATE LIMITS OF EXISTING ASH BOUNDARY

ACCESS ROAD TO EXISTING PHASE II LANDFILL

10' WIDE FLAT BOTTOM DITCH @ 6%

CULVERT INLET I.E. 812.0 OUTLET I.E. 808.0

LEACHATE COLLECTION/ LINER SYSTEM SEE DETAIL 1/17

CULVERTS

V-NOTCH DITCH @ 5%

8' WIDE BERM ELEV. 784.0

V-NOTCH DITCH @ 8% (ABANDONED)

10' WIDE FLAT BOTTOM DITCH @ 2%

CULVERTS

LEACHATE HEAD MONITORING WELL SEE DETAIL 6/17

V-NOTCH DRAINAGE DITCH @ 1% SEE DETAIL 6/23

LANDFILL PERIMETER BERM SEE DETAILS 3/17 6/18

DIVERSION BERM

EMERGENCY OVERFLOW PIPE

SEDIMENTATION BASIN NO.1 SEE DETAIL 1/22

EDGE OF FINAL COVER SEE DETAIL 3/20

1:1 INTERMEDIATE COVER

CELL 4 MODULE B

STATION 1

TOP OF BERM ELEV. 884

SEDIMENTATION BASIN NO. 2 SEE DETAIL 1/22

20' WIDE FLAT BOTTOM DITCH @ 20%

RISER AND DISCHARGE PIPE SEE DETAIL 3/22

20' WIDE FLAT BOTTOM DITCH @ 6% SEE DETAIL 9/25

DITCH @ 2%

FINAL COVER GRADES SEE DETAIL 1/19

EMERGENCY SPILLWAY

FINAL COVER DOWNSLOPE FLUME NO. 1 AND NO. 2 SEE DETAILS 1/20 2/20 4/20 1/21 2/21 3/21 4/21

LEACHATE COLLECTION/ LINER SYSTEM SEE DETAIL 1/17 2/17

CLEANOUT PIPE SEE DETAIL 6/17

ACCESS ROAD INTO CELL CONSTRUCTED WITH ASH

10' WIDE FLAT BOTTOM DITCH @ 2%

Open Area of Landfill: 12 acres

CELL DELINEATION BERM SEE DETAIL 5/17

MANHOLE SEE DETAIL 2/18

FINAL COVER DIVERSION BERM SEE DETAIL 2/19

RIPRAP SPILLWAY

APPROXIMATE PROPERTY LINE

20' WIDE FLAT BOTTOM DITCH @ 1%

STATION 2

FILL AREA

LANDFILL PERIMETER BERM AND FINAL COVER SEE DETAILS 4/19 5/19

TOPSOIL 14,900CY
245'X80'X20'H

SLOPE

19 18
20 17

0 100 200 300 400
SCALE: 1" = 100

CONSTRUCTION ACTIVITIES

CELL 4A - CLOSURE
1 INSTALL EROSION CONTROL DEVICES
2 INSTALL GRADING LAYER
3 INSTALL GEOSYNTHETIC CLAY
4 INSTALL GEOMEMBRANE
5 INSTALL DRAINAGE FLUME
6 INSTALL SELECT GRANULAR FILL, DRAINAGE PANEL, GEOTEXTILE ROOTING ZONE LAYER, AND TOPSOIL
7 INSTALL DIVERSION BERMS
8 SEED, FERTILIZE, AND MULCH

CELL 4B SITE PREPARATION
1 INSTALL EROSION CONTROL DEVICES
2 INSTALL DOUBLE WALL LEACHATE TRANSFER PIPE WITH ANTI-SEEP COLLAR TO MAIN TRANSFER LINE
3 CONSTRUCT PERIMETER BERM, DITCH, AND ACCESS ROAD
4 ESTABLISH SUBBASE GRADES
5 UNDERCUT THE COLLECTION LINES
6 CONSTRUCT THE COMPACTED LOW PERMEABILITY SOIL LAYER
7 EXCAVATE THE LEACHATE COLLECTION LINES
8 INSTALL GCL
9 INSTALL GEOMEMBRANE LINER
10 INSTALL GEOTEXTILE
11 INSTALL LEACHATE COLLECTION LINES AND CLEANOUTS
12 INSTALL LEACHATE HEADWALLS
13 PLACE 1 FOOT SELECT GRANULAR FILL
14 SEED, FERTILIZE, AND MULCH ALL CONSTRUCTION AREAS AT FINAL GRADE

CONSTRUCTION QUANTITIES

CELL 4A CLOSURE	VOLUME / AREA
TOPSOIL PLACED	5,000 CY
GRADING LAYER SOIL	5,000 CY
GENERAL FILL	9,900 CY
SELECT GRANULAR FILL	9,900 CY
GEOTEXTILE	31,900 SY
GCL	31,900 SY
GEOMEMBRANE	31,900 SY
WASTE REMOVAL, MULCH	6.1 ACRES
4 INCH DIA HDPE CORRUGATED PIPE W/ SMOOTH INTERIOR	2,100 LF
SELECT AGGREGATE FILL	320 CY
CELL 4B SITE PREPARATION	VOLUME / AREA
STRIP TOPSOIL	6,800 CY
FILL TO ESTABLISH SUBBASE GRADE	50,200 CY
CUT TO ESTABLISH SUBBASE GRADE	56,800 CY
GCL	31,100 SY
GEOMEMBRANE	31,100 SY
SELECT AGGREGATE FILL	280 CY
GEOTEXTILE 500/500N	1,050 SY
COMPACTED LOW PERMEABILITY SOIL	20,700 CY
CLEANOUT	1 EACH
SELECT GRANULAR FILL	10,400 CY
TOPSOIL PLACED	4,650 CY
SEED FERTILIZE, MULCH	2.0 ACRES

PIPE LENGTHS	QUANTITIES
6 INCH DIAMETER (SDR 17) HDPE PERF LEACHATE COLLECTION PIPE	460 LF
6 INCH DIAMETER (SDR 17) HDPE NON-PERF LEACHATE CLEANOUT	370 LF
6 INCH DIAMETER (SDR 17) HDPE DOUBLE WALL LEACHATE TRANSFER PIPE	0 LF
3 INCH DIAMETER (SCHEDULE 120) PVC NON PERF LEACHATE HEADWALL PIPE	160 LF

MISCELLANEOUS ITEMS	
MAINTENANCE ROAD	1,450 LF
SEDIMENTATION BASIN (PERMANENT)	1 EACH

NOTE: THESE PLANS ARE ACCOMPANIED BY A REPORT OF THE SAME TITLE. THESE DOCUMENTS ARE INTERRELATED AND ARE INTENDED TO BE USED AND REVIEWED TOGETHER. THESE STATEMENTS ARE INTENDED TO BE USED FOR REGULATORY PURPOSES ONLY.
NOT FOR CONSTRUCTION

NO.	BY	DATE	REVISION	APPD
3				
2				
1				

PROJECT: DAIRYLAND POWER COOPERATIVE
PLAN OF OPERATION
BUFFALO COUNTY, WISCONSIN

SHEET TITLE: CELLS 1, 2A, 2B, 3, AND 4A CLOSED CELL 4B ACTIVE

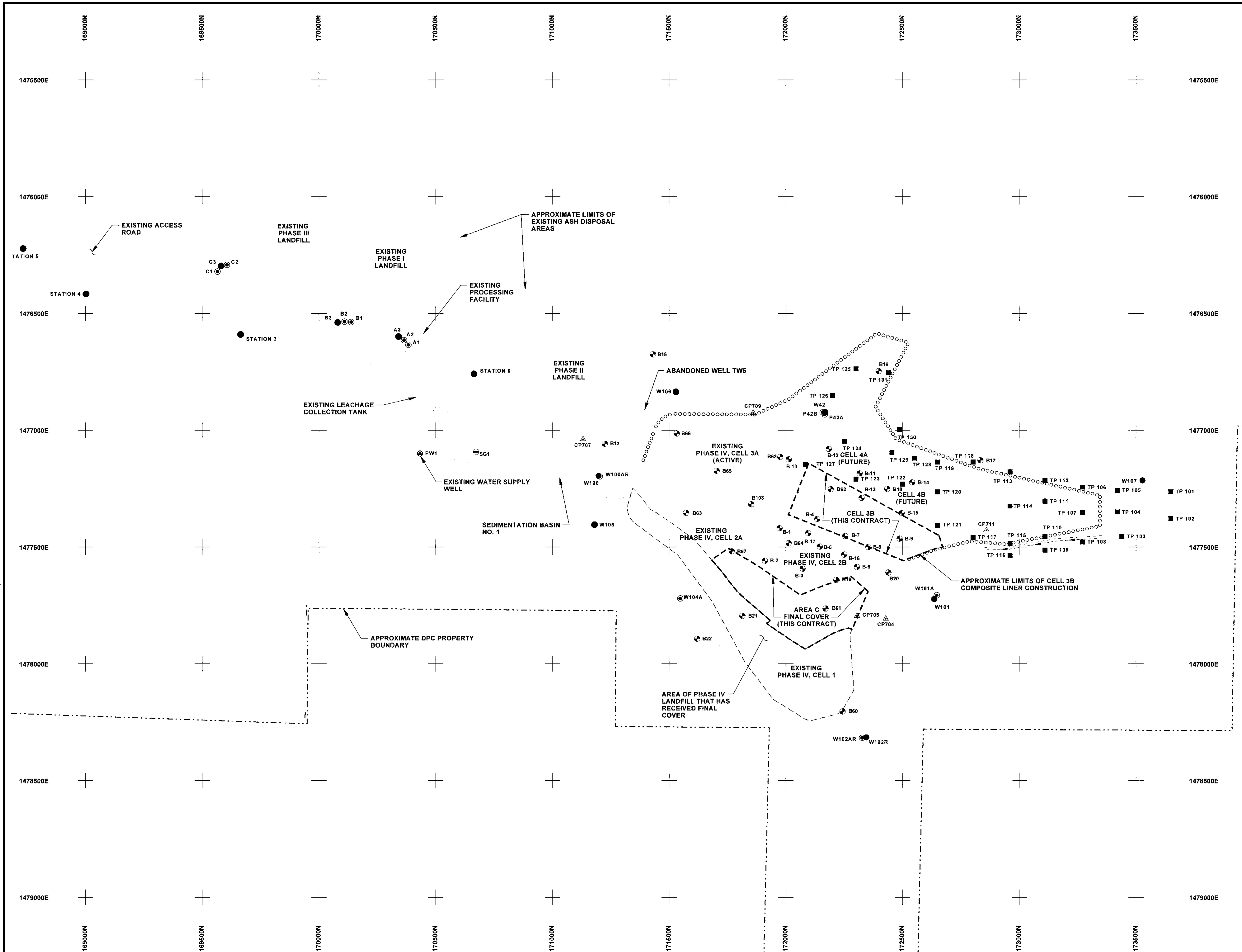
DRAWN BY: WOLDER	SCALE: 1" = 100'	PROJ. NO. 0081.40
CHECKED BY: DM		FILE NO. PHASE4B.PLT
APPROVED BY: BJH	DATE PRINTED	SHEET 11 OF 23
DATE: OCTOBER 2010		

RMT
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608-831-4444

RMT COMPUTER: ACAD 2005 SR. 6 DRAFT: DG

Appendix C: Relevant October 2000 POO Plan Sheets

- Sheet 3 Existing Conditions Map – Phase IV, Cell 3B Liner & Area C (Over Cells 1 & 2) Final Cover Construction
- Sheet 5 Proposed Base Grades
- Sheet 9 Phasing Plan – Cell 1, 2A, and 2B Closed; Cell 3 Active
- Sheet 11 Phasing Plan – Cell 1, 2A, 2B, 3, and 4A Closed; Cell 4B Active
- Sheet 12 Proposed Final Grades
- Sheet 17 Details – Liner and Collection Pipes
- Sheet 19 Details – Final Cover
- Sheet 22 Details – Sedimentation Basins
- Sheet 23 Details – Miscellaneous



169000N
169500N
170000N
170500N
171000N
171500N
172000N
172500N
173000N
173500N
1475500E
1476000E
1476500E
1477000E
1477500E
1478000E
1478500E
1479000E
EXISTING ACCESS ROAD
EXISTING PHASE III LANDFILL
EXISTING PHASE I LANDFILL
APPROXIMATE LIMITS OF EXISTING ASH DISPOSAL AREAS
EXISTING PROCESSING FACILITY
EXISTING PHASE II LANDFILL
EXISTING LEACHAGE COLLECTION TANK
ABANDONED WELL TW5
EXISTING WATER SUPPLY WELL
SEDIMENTATION BASIN NO. 1
EXISTING PHASE IV, CELL 3A (ACTIVE)
CELL 4A (FUTURE)
CELL 4B (FUTURE)
CELL 3B (THIS CONTRACT)
EXISTING PHASE IV, CELL 2A
EXISTING PHASE IV, CELL 2B
AREA C FINAL COVER (THIS CONTRACT)
EXISTING PHASE IV, CELL 1
AREA OF PHASE IV LANDFILL THAT HAS RECEIVED FINAL COVER
APPROXIMATE LIMITS OF CELL 3B COMPOSITE LINER CONSTRUCTION
APPROXIMATE DPC PROPERTY BOUNDARY
STATION 3
STATION 4
STATION 6
PW1
SG1
W100AR
W100
W105
W106
W42
P42B
P42A
W107
W101A
W101
W104A
W102AR
W102R
CP704
CP705
CP707
CP709
CP711
0
200
400
600
800
SCALE IN FEET

NOTES

1. REFER TO PLAN SHEET 2 FOR STANDARD LEGEND, NOTES, AND BENCHMARK LOCATIONS.

NOTE: THE CONTRACTOR SHALL NOTIFY ALL AREA UTILITY COMPANIES PRIOR TO COMMENCING WORK ON THIS CONTRACT, IN ACCORDANCE WITH STATE AND LOCAL REQUIREMENTS.

NOTE: THESE PLANS ARE ACCOMPANIED BY A PROJECT MANUAL OF THE SAME TITLE. THESE DOCUMENTS ARE INTERRELATED AND ARE INTENDED TO BE USED TOGETHER.

NO.	BY	DATE	REVISION	APP'D.

PROJECT: DAIRYLAND POWER COOPERATIVE
PHASE IV, CELL 3B LINER & AREA C (OVER CELLS 1 & 2)
FINAL COVER CONSTRUCTION
BUFFALO COUNTY, WISCONSIN

SHEET TITLE:

EXISTING CONDITIONS MAP

DRAWN BY:	lstormer	SCALE:		PROJ. NO.	216851.0004
CHECKED BY:	DM	AS SHOWN		FILE NO.	215851.0004.SHT03-EC.PLT
APPROVED BY:	TWM	DATE PRINTED:		SHEET 3 OF 13	
DATE:	MARCH 2015				

TRC
708 Heartland Trail
Suite 3000
Madison, WI 53717
Phone: 608.826.3600

NOTE:
GRADES SHOWN INSIDE THE TOP OF THE PERIMETER BERM REPRESENT THE TOP OF THE 2-FOOT-THICK LOW PERMEABILITY SUBBASE SOIL LAYER.
GRADES SHOWN ON TOP AND OUTSIDE THE PERIMETER BERM REPRESENT THE TOP OF TOPSOIL

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NO.	BY	DATE	REVISION	APP'D.
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PROJECT: DAIRYLAND POWER COOPERATIVE
PLAN OF OPERATION
BUFFALO COUNTY, WISCONSIN

SHEET TITLE: PROPOSED BASE GRADES

DRAWN BY: reyzekd	SCALE: 1"=100'	PROJ. NO. 3081.40
CHECKED BY: DM		FILE NO. BASEGRDS.PLT
APPROVED BY: BJK	DATE PRINTED:	SHEET 5 OF 23
DATE: OCTOBER 2000		

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Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
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CONSTRUCTION ACTIVITIES

PHASE 2B CLOSURE

1. INSTALL EROSION CONTROL DEVICES.
2. INSTALL GRADING LAYER.
3. INSTALL GCL.
4. INSTALL GEOMEMBRANE.
5. INSTALL SELECT GRANULAR FILL, DRAINAGE PIPING, GEOTEXTILE, ROOTING ZONE LAYER, AND TOPSOIL.
6. INSTALL DIVERSION BERMS.
7. SEED, FERTILIZE, AND MULCH.

PHASE 3 SITE PREPARATION

1. INSTALL EROSION CONTROL DEVICES.
2. INSTALL DOUBLE WALL LEACHATE TRANSFER PIPE WITH ANTI-SEEP COLLAR TO STORAGE TANK.
3. CONSTRUCT PERIMETER BERM, DITCH, AND ACCESS ROAD.
4. ESTABLISH SUBBASE GRADES.
5. UNDERCUT THE COLLECTION LINES.
6. CONSTRUCT THE COMPACTED LOW PERMEABILITY LAYER.
7. EXCAVATE THE LEACHATE COLLECTION LINES.
8. INSTALL LEACHATE COLLECTION LINES AND CLEANOUTS.
9. INSTALL GEOTEXTILE.
10. INSTALL LEACHATE HEADWELLS.
11. PLACE 1-FOOT SELECT GRANULAR FILL.
12. SEED, FERTILIZE, AND MULCH ALL CONSTRUCTION AREAS AT FINISH GRADE.

CONSTRUCTION QUANTITIES

PHASE 2A AND 2B CLOSURE	VOLUME / AREA
TOPSOIL PLACED	3,400 CY
GRADING LAYER SOIL	3,400 CY
GENERAL FILL	6,800 CY
SELECT GRANULAR FILL	6,800 CY
GEOTEXTILE	22,600 SY
GCL	20,300 SY
GEOMEMBRANE	20,300 SY
SEED, FERTILIZER, MULCH	4.5 ARCES
4-INCH DIA. HDPE CORRUGATED PIPE W/ SMOOTH INTERIOR	2,350 LF
SELECT AGGREGATE FILL	350 CY

PHASE 3 SITE PREPARATION	VOLUME / AREA
STRIP TOPSOIL	8,800 CY
FILL TO ESTABLISH SUBBASE GRADE	91,200 CY
CUT TO ESTABLISH SUBBASE GRADE	55,100 CY
GEOSYNTHETIC CLAY LINER (GCL)	34,000 SY
GEOMEMBRANE	34,000 SY
SELECT AGGREGATE FILL	350 CY
GEOTEXTILE (CUSHION)	1,700 SY
SELECT GRADED FILL	400 CY
SELECT GRANULAR FILL	11,300 CY
COMPACTED LOW PERMEABILITY LAYER	22,600 CY
CLEANOUT	1 EACH
TOPSOIL PLACED	3,100 CY
SEED FERTILIZER, MULCH	4.0 ACRES

PIPE LENGTHS	QUANTITIES
6-INCH-DIAMETER (SDR 17) HDPE PERF. LEACHATE COLLECTION PIPE	1,100 LF
6-INCH-DIAMETER (SDR 17) HDPE NON-PERF. LEACHATE PIPE	480 LF
6-INCH-DIAMETER (SDR 17) HDPE DOUBLE WALL LEACHATE TRANSFER PIPE	1,070 LF
3-INCH-DIAMETER (SCHEDULE 120) PVC NON-PERF. LEACHATE HEADWELL PIPE	470 LF

MISCELLANEOUS ITEMS	
ACCESS/HAUL ROAD	1,300 LF
MANHOLES	2 EA
CULVERTS	2 EA
SEDIMENTATION BASIN (TEMPORARY)	1 EA

SCALE: 1" = 100'

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NO.	BY	DATE	REVISION	APP'D.
3.				
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1.				

PROJECT: **DAIRYLAND POWER COOPERATIVE PLAN OF OPERATION BUFFALO COUNTY, WISCONSIN**

SHEET TITLE: **CELL 1, 2A, AND 2B CLOSED CELL 3 ACTIVE**

DRAWN BY: NOLDENR	SCALE: 1"=100'	PROJ. NO. 3081.40
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APPROVED BY: BJK	DATE PRINTED:	SHEET 9 OF 23
DATE: OCTOBER 2000		

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P.O. Box 8923
Madison, WI 53708-8923
Phone: 608-831-4444

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N 170500
N 171000
N 171500
N 172000
N 172500
N 173000
N 173500
TRANSFER PIPE FROM STORAGE TANK CONNECTS TO EXISTING PIPE OUTSIDE PROCESSING FACILITY SEE DETAIL 5/21
EXISTING PROCESSING FACILITY
LEACHATE STORAGE TANK TO SEE DETAIL 1/18
ALL-WEATHER ACCESS/ HAUL ROAD SEE DETAIL 6/23
10' WIDE FLAT BOTTOM DITCH @ 5%
CULVERTS
V-NOTCH DITCH @ 6%
DIVERSION BERM
EMERGENCY OVERFLOW PIPE
SEDIMENTATION BASIN NO. 1 SEE DETAIL 1/22
20' WIDE FLAT BOTTOM DITCH @ 20%
RISER AND DISCHARGE PIPE SEE DETAIL 3/22
20' WIDE FLAT BOTTOM DITCH @ 5% SEE DETAIL 8/23
ACCESS ROAD TO EXISTING PHASE II LANDFILL
CULVERT INLET I.E. 817.0 OUTLET I.E. 810.0
10' WIDE FLAT BOTTOM DITCH @ 7%
8' WIDE BERM ELEV. 784.0
V-NOTCH DITCH @ 8%
10' WIDE FLAT BOTTOM DITCH @ 2%
APPROXIMATE LIMITS OF EXISTING ASH BOUNDARY
CULVERT INLET I.E. 812.0 OUTLET I.E. 808.0
10' WIDE FLAT BOTTOM DITCH @ 6%
LEACHATE COLLECTION/ LINER SYSTEM SEE DETAIL 1/17
LEACHATE HEAD MONITORING WELL SEE DETAIL 6/17
LANDFILL PERIMETER BERM SEE DETAILS 3/17 5/18
V-NOTCH DRAINAGE DITCH @ 1% SEE DETAIL 8/23
EDGE OF FINAL COVER SEE DETAIL 3/19
CELL 4 MODULE B
TOP OF BERM ELEV. 894
SEDIMENTATION BASIN NO. 2 SEE DETAIL 1/22
EMERGENCY SPILLWAY
LEACHATE COLLECTION/ LINER SYSTEM SEE DETAIL 1/17 2/17
CLEANOUT PIPE SEE DETAIL 6/17
ACCESS ROAD INTO CELL CONSTRUCTED WITH ASH
10' WIDE FLAT BOTTOM DITCH @ 2%
DITCH @ 2%
FINAL COVER DOWNSLOPE FLUME NO. 1 AND NO. 2 SEE DETAILS
FINAL COVER GRADES SEE DETAIL 1/19
MANHOLE SEE DETAIL 2/18
CELL DELINEATION BERM SEE DETAIL 5/17
FINAL COVER DIVERSION BERM SEE DETAIL 2/19
RIPRAP SPILLWAY
APPROXIMATE PROPERTY LINE
20' WIDE FLAT BOTTOM DITCH @ 1%
FILL AREA
LANDFILL PERIMETER BERM AND FINAL COVER SEE DETAILS 4/19 5/19
TOPSOIL 14,900CY 245'X80'X20'H
STATION 1
STATION 2
0 100 200 300 400
SCALE: 1" = 100'

CONSTRUCTION ACTIVITIES

CELL 4A CLOSURE

1. INSTALL EROSION CONTROL DEVICES.
2. INSTALL GRADING LAYER
3. INSTALL GEOSYNTHETIC CLAY
4. INSTALL GEOMEMBRANE
5. INSTALL DOWNSLOPE FLUME.
6. INSTALL SELECT GRANULAR FILL, DRAINAGE PIPING, GEOTEXTILE, ROOTING ZONE LAYER, AND TOPSOIL.
7. INSTALL DIVERSION BERMS.
8. SEED, FERTILIZE, AND MULCH.

CELL 4B SITE PREPARATION

1. INSTALL EROSION CONTROL DEVICES.
2. INSTALL DOUBLE WALL LEACHATE TRANSFER PIPE WITH ANTI-SEEP COLLAR TO MAIN TRANSFER LINE.
3. CONSTRUCT PERIMETER BERM, DITCH, AND ACCESS ROAD.
4. ESTABLISH SUBBASE GRADES.
5. UNDERCUT THE COLLECTION LINES.
6. CONSTRUCT THE COMPACTED LOW PERMEABLILTY SOIL LAYER.
7. EXCAVATE THE LEACHATE COLLECTION LINES.
8. INSTALL GCL
9. INSTALL GEOMEMBRANE LINER
10. INSTALL GEOTEXTILE.
11. INSTALL LEACHATE COLLECTION LINES AND CLEANOUTS.
12. INSTALL LEACHATE HEADWELLS.
13. PLACE 1-FOOT SELECT GRANULAR FILL.
14. SEED, FERTILIZE, AND MULCH ALL CONSTRUCTION AREAS AT FINISH
15. GRADE.

CONSTRUCTION QUANTITIES

CELL 4A CLOSURE	VOLUME / AREA
TOPSOIL PLACED	5,000 CY
GRADING LAYER SOIL	5,000 CY
GENERAL FILL	9,900 CY
SELECT GRANULAR FILL	9,900 CY
GEOTEXTILE	31,800 SY
GCL	29,700 SY
GEOMEMBRANE	29,700 SY
SEED, FERTILIZER, MULCH	6.1 ARCES
4-INCH DIA. HDPE CORRUGATED PIPE W/ SMOOTH INTERIOR	2,100 LF
SELECT AGGREGATE FILL	320 CY
CELL 4B SITE PREPARATION	**VOLUME / AREA**
STRIP TOPSOIL	6,800 CY
FILL TO ESTABLISH SUBBASE GRADE	55,200 CY
CUT TO ESTABLISH SUBBASE GRADE	58,800 CY
GCL	31,100 SY
GEOMEMBRANE	31,100 SY
SELECT AGGREGATE FILL	280 CY
GEOTEXTILE (CUSHION)	1,050 SY
COMPACTED LOW PERMEABILITY SOIL	20,700 CY
CLEANOUT	3 EACH
SELECT GRANULAR FILL	10,400 CY
TOPSOIL PLACED	1,600 CY
SEED FERTILIZER, MULCH	2.0 ACRES
PIPE LENGTHS	**QUANTITIES**
6-INCH-DIAMETER (SDR 17) HDPE PERF. LEACHATE COLLECTION PIPE	450 LF
6-INCH-DIAMETER (SDR 17) HDPE NON-PERF. LEACHATE CLEANOUT	370 LF
6-INCH-DIAMETER (SDR 17) HDPE DOUBLE WALL LEACHATE TRANSFER PIPE	0 LF
3-INCH-DIAMETER (SCHEDULE 120) PVC NON-PERF. LEACHATE HEADWELL PIPE	180 LF
MISCELLANEOUS ITEMS	
MAINTENANCE ROAD	1,450 LF
SEDIMENTATION BASIN (PRIMARY)	1 EACH

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NO.	BY	DATE	REVISION	APP'D.
3.				
2.				
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PROJECT: **DAIRYLAND POWER COOPERATIVE**
PLAN OF OPERATION
BUFFALO COUNTY, WISCONSIN

SHEET TITLE: **CELLS 1, 2A, 2B, 3, AND 4A CLOSED**
CELL 4B ACTIVE

DRAWN BY: NOLDENR	SCALE: 1" = 100'	PROJ. NO. 3081.40
CHECKED BY: DM		FILE NO. PHASE4B.PLT
APPROVED BY: BJK	DATE PRINTED:	SHEET 11 OF 23
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RMT COMPUTER AIDED DESIGN & DRAFTING

CONSTRUCTION ACTIVITIES

PHASE 4B CLOSURE

1. INSTALL EROSION CONTROL DEVICES.
2. INSTALL GRADING LAYER.
3. INSTALL GCL.
4. INSTALL GEOMEMBRANE.
5. INSTALL DOWNSLOPE FLUME.
6. INSTALL SELECT GRANULAR FILL, DRAINAGE PIPING, GEOTEXTILE, ROOTING ZONE LAYER, AND TOPSOIL.
7. INSTALL DIVERSION BERMS.
8. SEED, FERTILIZE, AND MULCH.

CONSTRUCTION QUANTITIES

PHASE 4B CLOSURE	VOLUME / AREA
TOPSOIL PLACED	
GRADING LAYER SOIL	9,800 CY
GENERAL FILL	9,800 CY
SELECT GRANULAR FILL	19,600 CY
GEOTEXTILE	19,600 CY
GCL	61,700 SY
GEOMEMBRANE	58,600 SY
SEED, FERTILZER, MULCH	58.600 SY
DOWNSLOPE FLUME	12.1 ACRES
4-INCH DIA. HDPE CORRUGATED PIPT	1 EACH
W/ SMOOTH INTERIOR	3,150 LF
SELECT AGGREGATE FILL	470 CY

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PROJECT: **DAIRYLAND POWER COOPERATIVE**
PLAN OF OPERATION
BUFFALO COUNTY, WISCONSIN

SHEET TITLE:
PROPOSED FINAL GRADES

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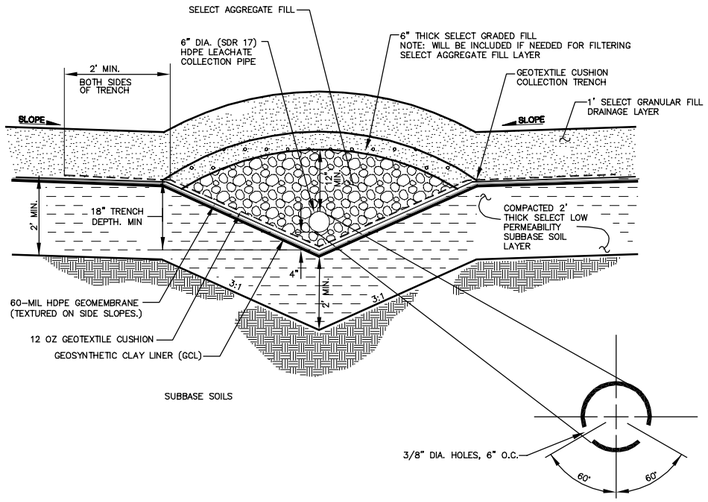
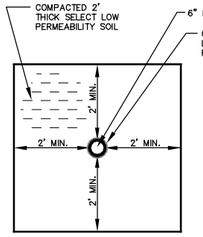
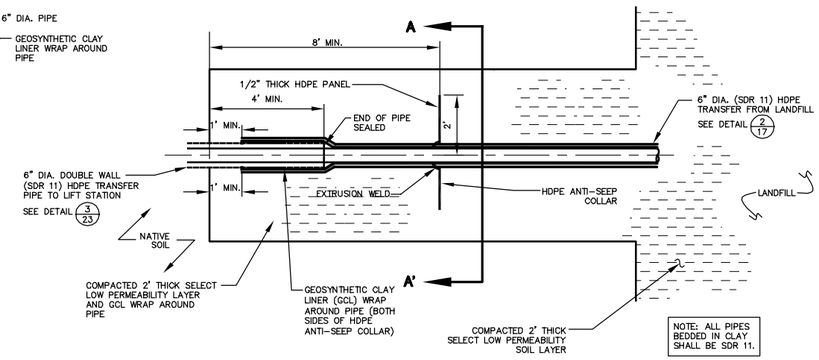


1/17 LEACHATE COLLECTION/LINER SYSTEM

(NOT TO SCALE)

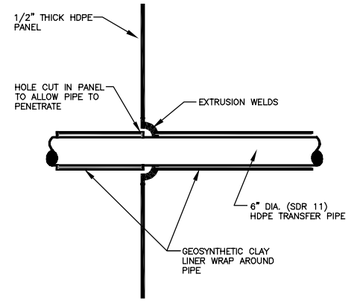


SECTION A-A'

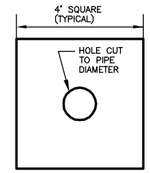


4/17 LEACHATE TRANSFER PIPE CLAY TRENCH CUT-OFF THROUGH PERIMETER BERM (TYPICAL)

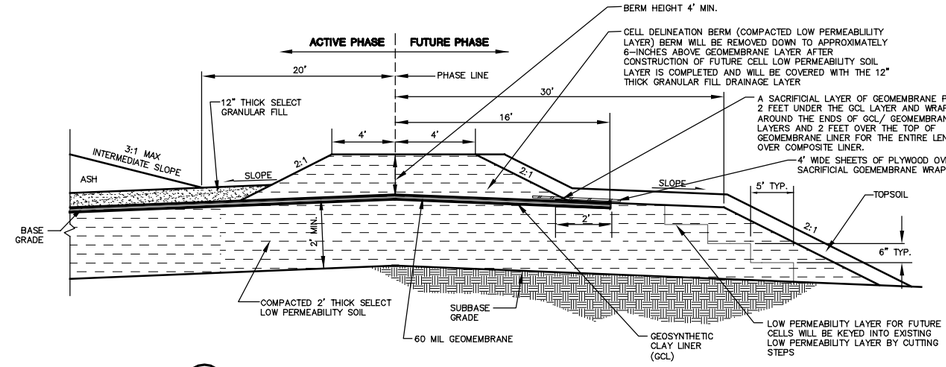
(NOT TO SCALE)



HDPE ANTI-SEEP COLLAR DETAIL (TYPICAL)

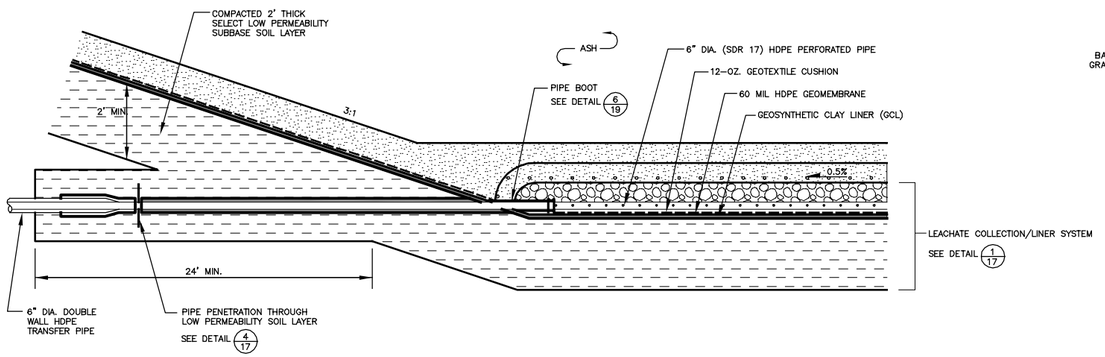


1/2" THICK HDPE PANEL



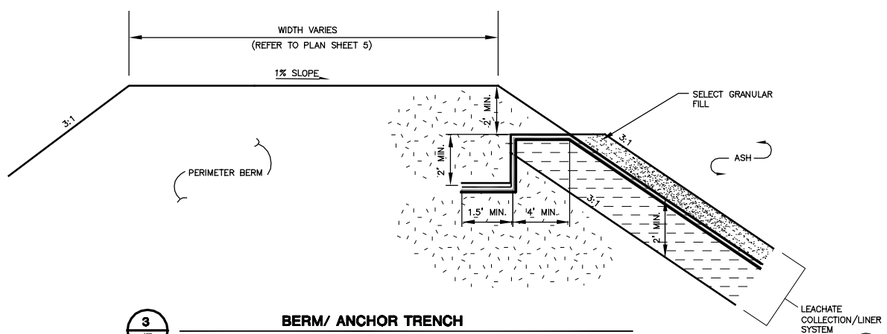
5/17 CELL DELINEATION BERM

(NOT TO SCALE)



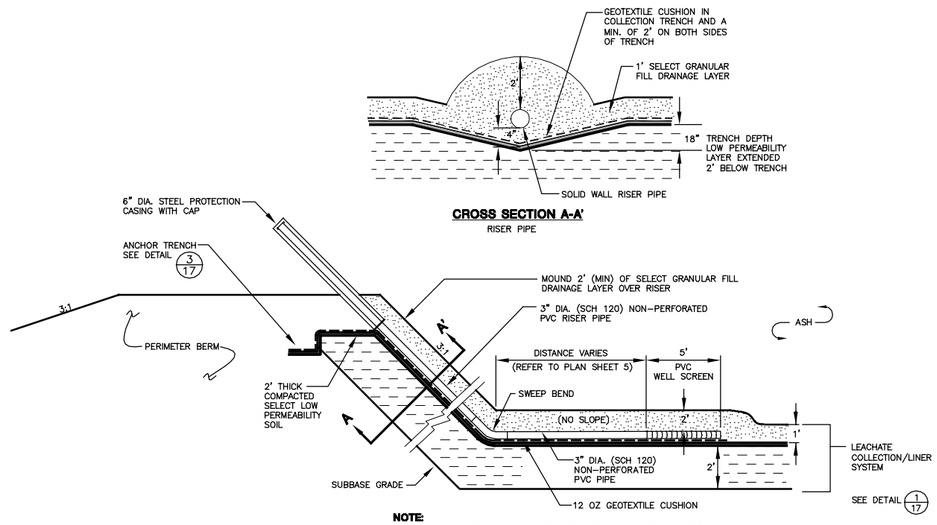
2/17 PIPE PENETRATION THROUGH LANDFILL PERIMETER BERM (TYPICAL)

(NOT TO SCALE)
LOOKING EAST



3/17 BERM/ ANCHOR TRENCH

(NOT TO SCALE)



CROSS SECTION A-A'

RISER PIPE

NOTE:
LEACHATE HEADWELL WILL LIE HORIZONTALLY ON TOP OF LINER AND WITHIN 12" SELECT GRANULAR FILL DRAINAGE LAYER.

PIPE CONSTRUCTION ON BERM SIDE SLOPE IS ALSO TYPICAL FOR LEACHATE CLEANOUT PIPES.

6/17 LEACHATE HEADWELL

(NOT TO SCALE)

LINE AND SHADING LEGEND

GEOTEXTILE	GEOMEMBRANE
GEOCOMPOSITE	GEOSYNTHETIC CLAY LINER (GCL)
TOPSOIL	NATIVE SOIL
SELECT GRANULAR FILL DRAINAGE LAYER	CONCRETE
PIPE BEDDING MATERIAL	RIPRAP
SELECT AGGREGATE FILL	GRAVEL
COMPACTED SELECT LOW PERMEABILITY SOIL	GENERAL FILL

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PROJECT: **DAIRYLAND POWER COOPERATIVE PLAN OF OPERATION BUFFALO COUNTY, WISCONSIN**

SHEET TITLE: **DETAILS- LINER AND COLLECTION PIPES**

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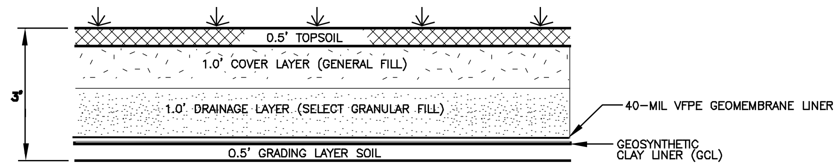
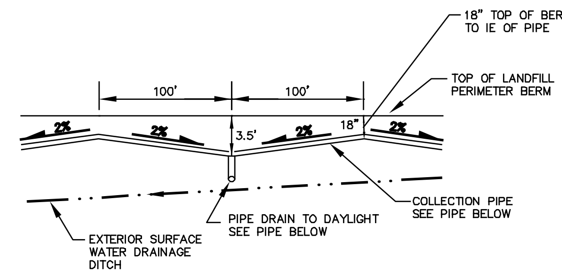


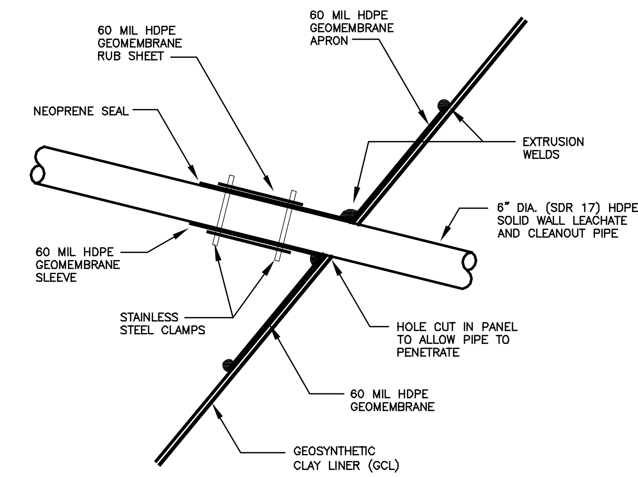
1/19 **FINAL COVER**

(NOT TO SCALE)



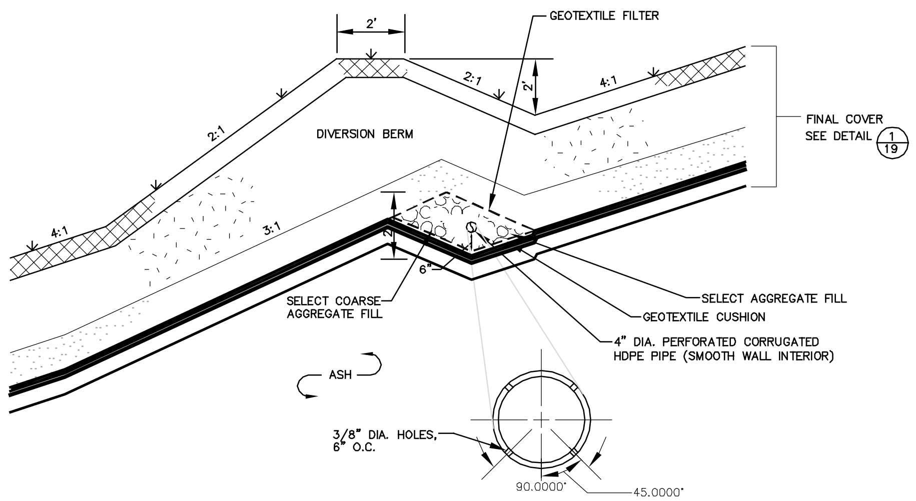
NOTE: IN AREAS WHERE THE TOP OF BERM SLOPES, THE COLLECTION PIPE WILL FOLLOW THE SAME SLOPE AS THE TOP OF BERM AND WILL OUTLET THROUGH DISCHARGE PIPES LOCATED AT SPECIFIED INTERVALS. REFER TO PLAN SHEET 12.

SECTION A-A' OF FINAL COVER DRAINAGE LAYER



6/19 **PIPE BOOT- PIPES PENETRATING THROUGH FINAL COVER AND LOW PERMEABILITY LAYER (TYPICAL)**

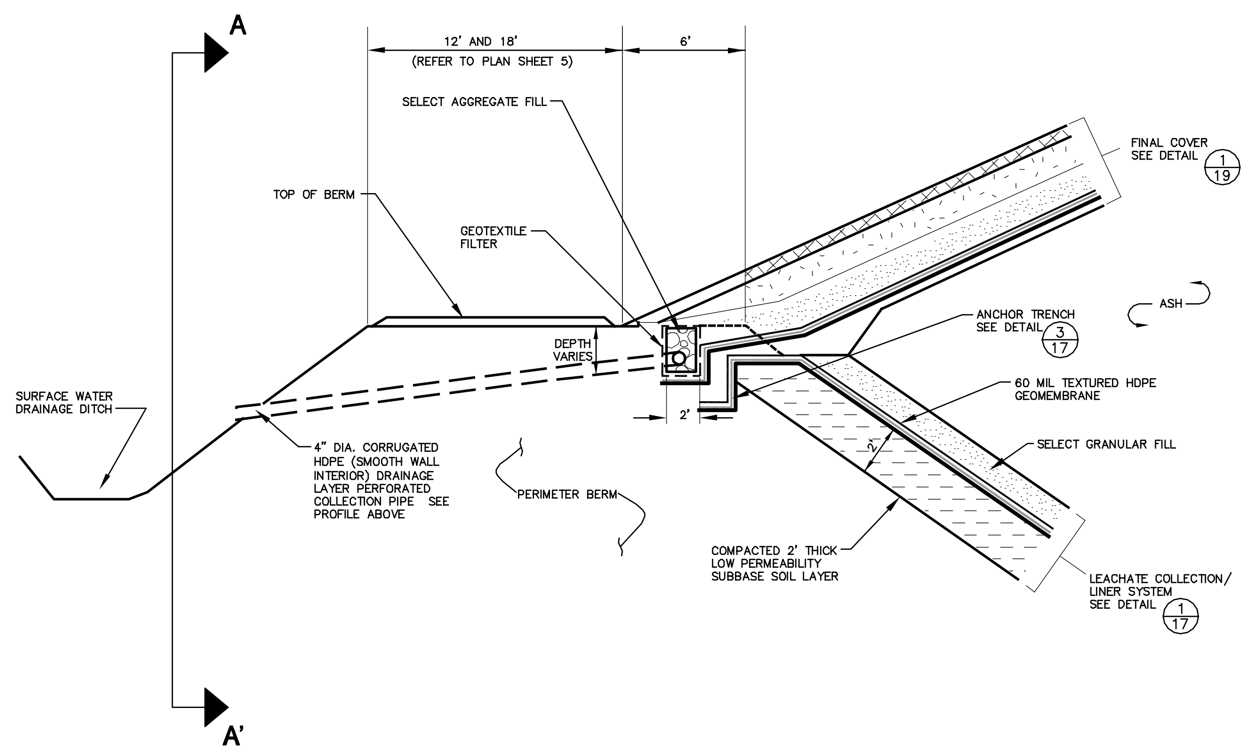
(NOT TO SCALE)



NOTE:
A 4" DIA. PERFORATED CORRUGATED HDPE PIPE WILL BE LOCATED BELOW EVERY DIVERSION BERM ABOVE THE FINAL COVER EXCEPT THE LOWEST BERM LOCATED NEXT TO THE LANDFILL PERIMETER BERM. TO COLLECT WATER IN THE DRAINAGE LAYER ALONG THE PERIMETER BERM PIPES WILL BE CONSTRUCTED IN THE BERM AS SHOWN ON DETAIL 4 OF 19.

2/19 **SURFACE WATER DIVERSION BERM ON FINAL COVER (TYPICAL)**

(NOT TO SCALE)



4/19 **PERIMETER BERM FINAL COVER DRAINAGE LAYER DISCHARGE PIPE (TYPICAL)**

(NOT TO SCALE)

LINE AND SHADING LEGEND	
GEOTEXTILE	GEOMEMBRANE
GEOCOMPOSITE	GEOSYNTHETIC CLAY LINER (GCL)
TOPSOIL	NATIVE SOIL
SELECT GRANULAR FILL DRAINAGE LAYER	CONCRETE
PIPE BEDDING MATERIAL	RIPRAP
SELECT AGGREGATE FILL	GRAVEL
COMPACTED SELECT LOW PERMEABILITY SOIL	GENERAL FILL

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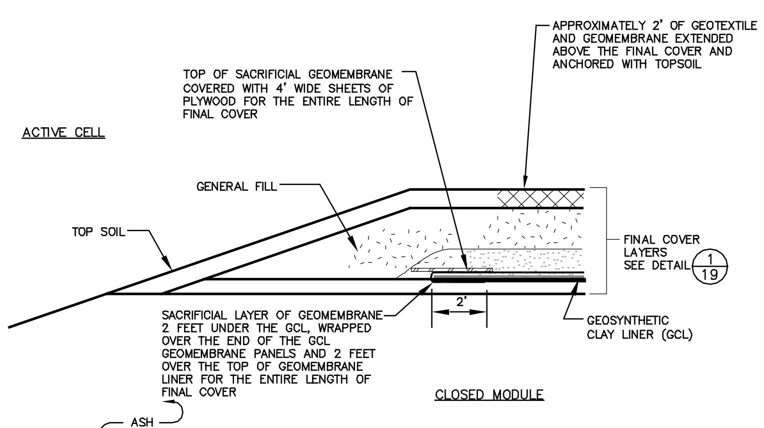
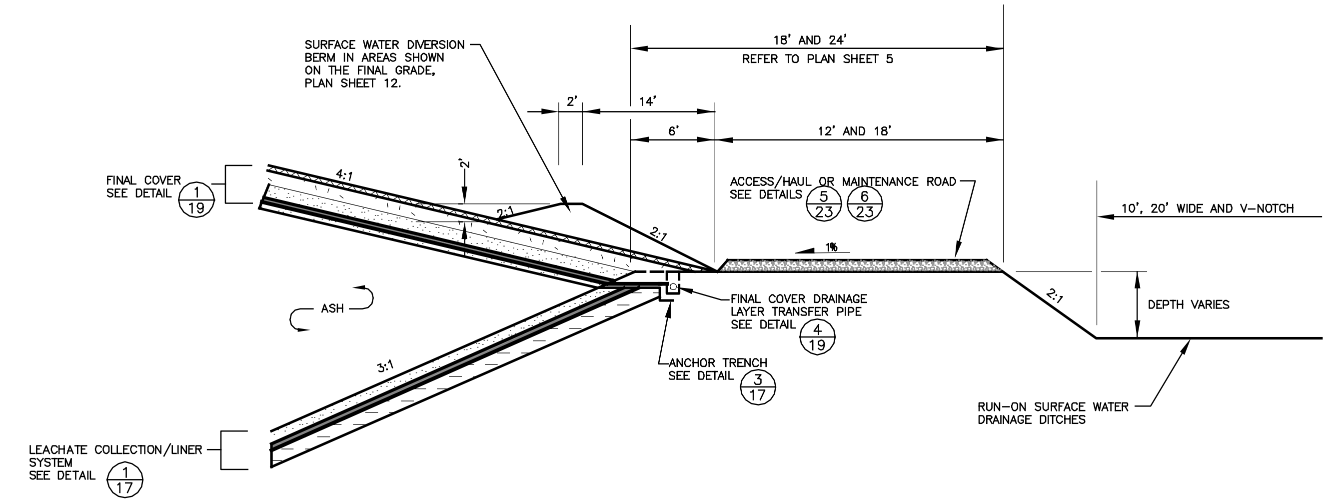


3/19 **CONSTRUCTION OF FINAL COVER FOR SPLICING FUTURE FINAL COVER**

(NOT TO SCALE)



5/19 **LANDFILL PERIMETER BERM AND SURFACE WATER DRAINAGE DITCHES (TYPICAL)**

(NOT TO SCALE)

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PROJECT: DAIRYLAND POWER COOPERATIVE PLAN OF OPERATION BUFFALO COUNTY, WISCONSIN

SHEET TITLE: DETAILS- FINAL COVER

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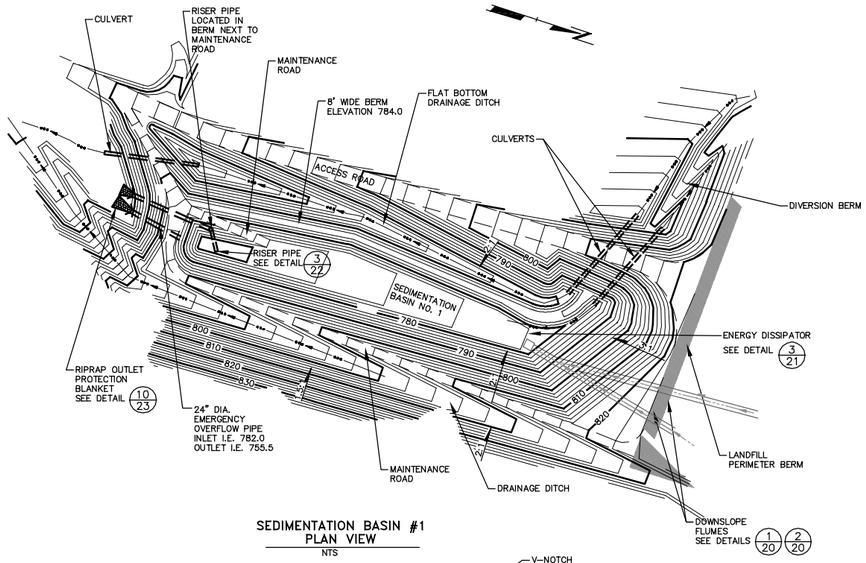
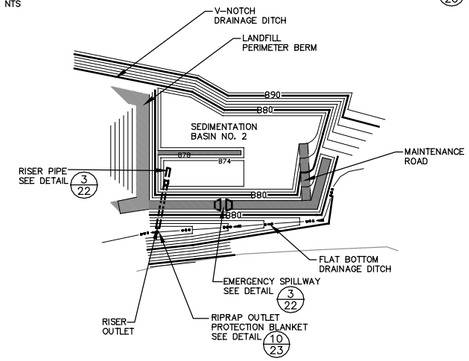


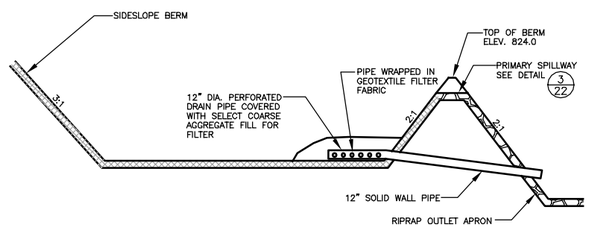
SEDIMENTATION BASIN #1
PLAN VIEW
NTS



SEDIMENTATION BASIN #2
PLAN VIEW
NTS

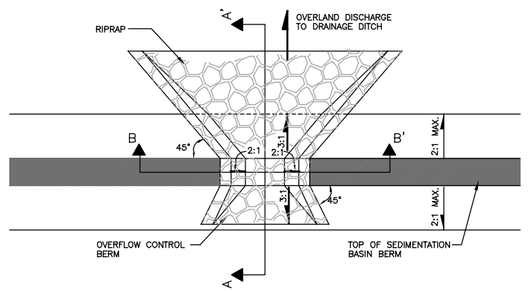
1/22 SEDIMENTATION BASINS NO. 1 AND NO. 2

(NOT TO SCALE)



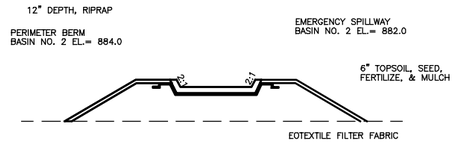
2/22 TEMPORARY SEDIMENTATION BASIN (TYPICAL)

(NOT TO SCALE)

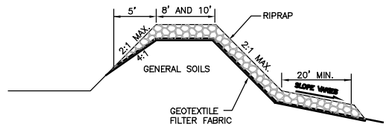


SURFACE WATER PRIMARY OR EMERGENCY SPILLWAY
PLAN VIEW

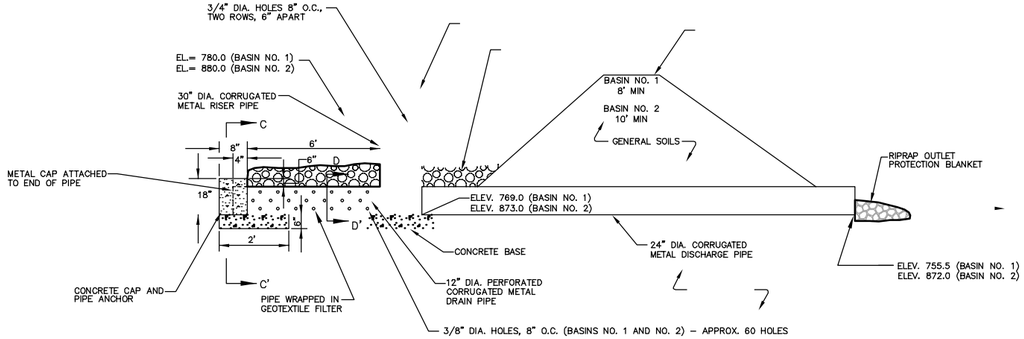
NOTE:
SEDIMENTATION BASIN NO. 1 WILL HAVE A CULVERT PIPE INSTALLED FOR THE EMERGENCY OVERFLOW. SEE DETAIL 1 OF 22.



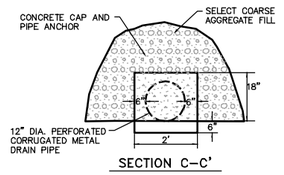
CROSSECTION B–B'



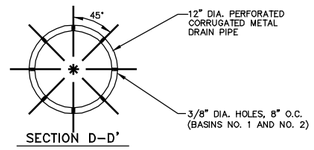
SECTION A–A'



RISER/DISCHARGE PIPE CROSS SECTION (TYPICAL)



SECTION C–C'



SECTION D–D'

3/22 RISER/DISCHARGE PIPE/EMERGENCY SPILLWAY

(NOT TO SCALE)

LINE AND SHADING LEGEND

GEOTEXTILE	GEOMEMBRANE
GEOCOMPOSITE	GEOSYNTHETIC CLAY LINER (GCL)
TOPSOIL	NATIVE SOIL
SELECT GRANULAR FILL DRAINAGE LAYER	CONCRETE
PIPE BEDDING MATERIAL	RIPRAP
SELECT AGGREGATE FILL	GRAVEL
COMPACTED SELECT LOW PERMEABILITY SOIL	GENERAL FILL

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PROJECT: **DAIRYLAND POWER COOPERATIVE PLAN OF OPERATION BUFFALO COUNTY, WISCONSIN**

SHEET TITLE: **DETAILS- SEDIMENTATION BASINS**

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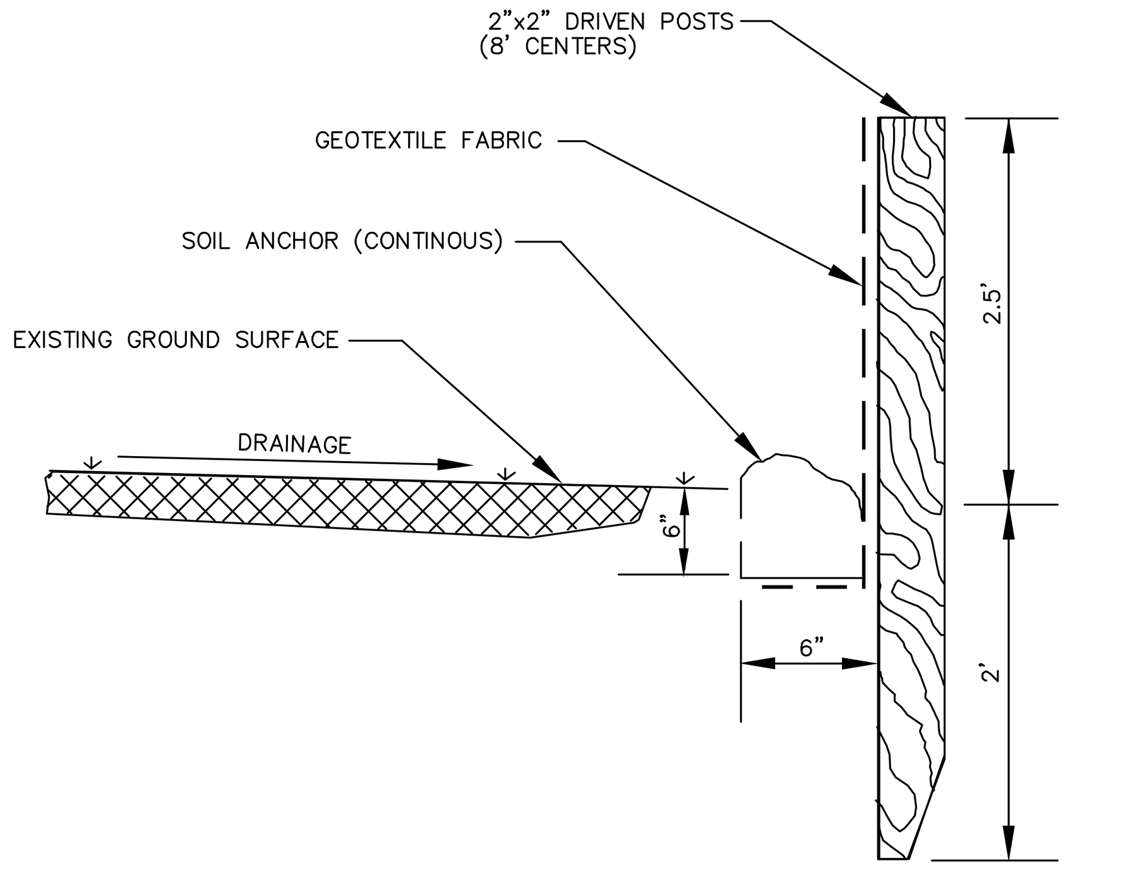
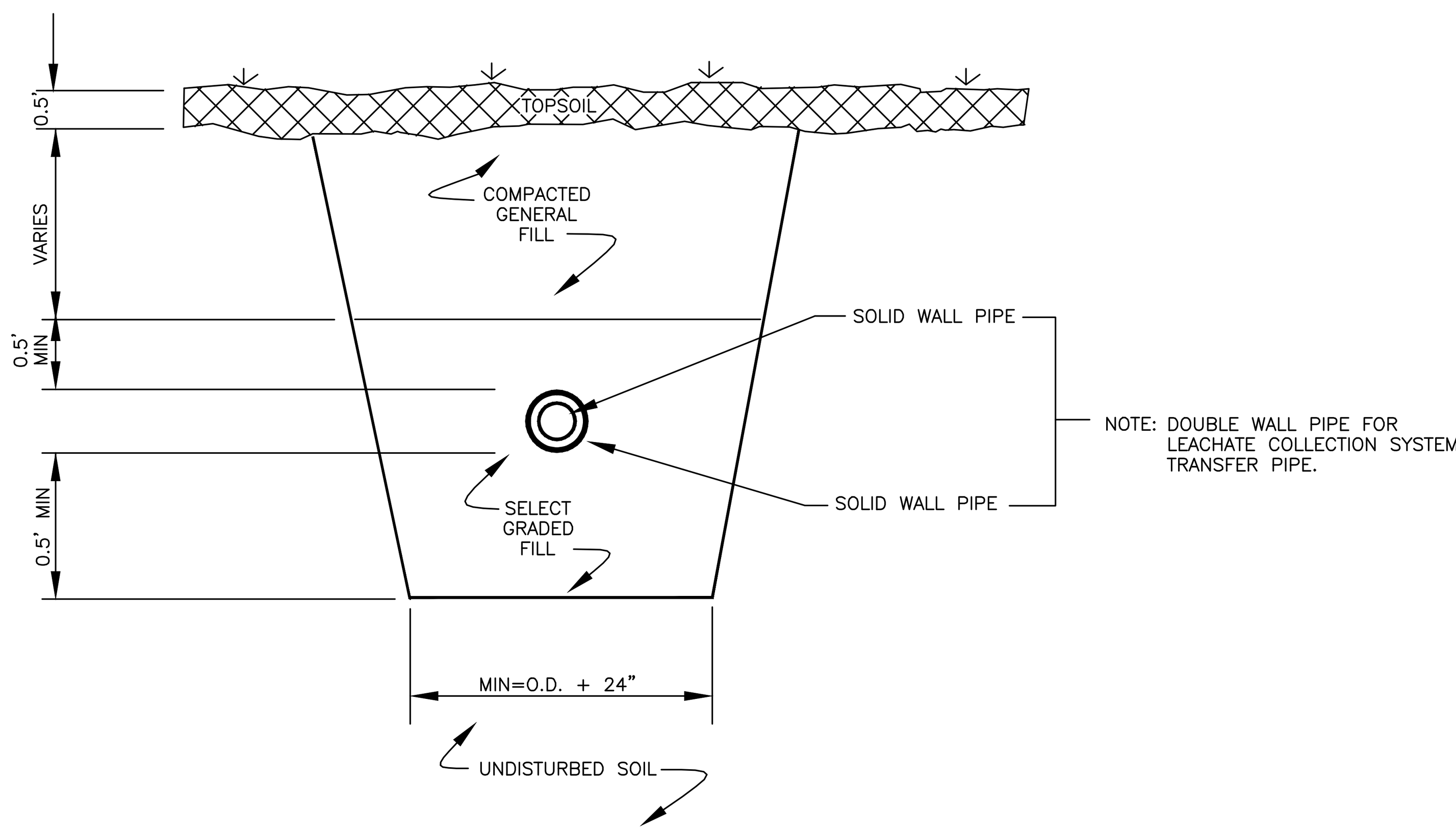
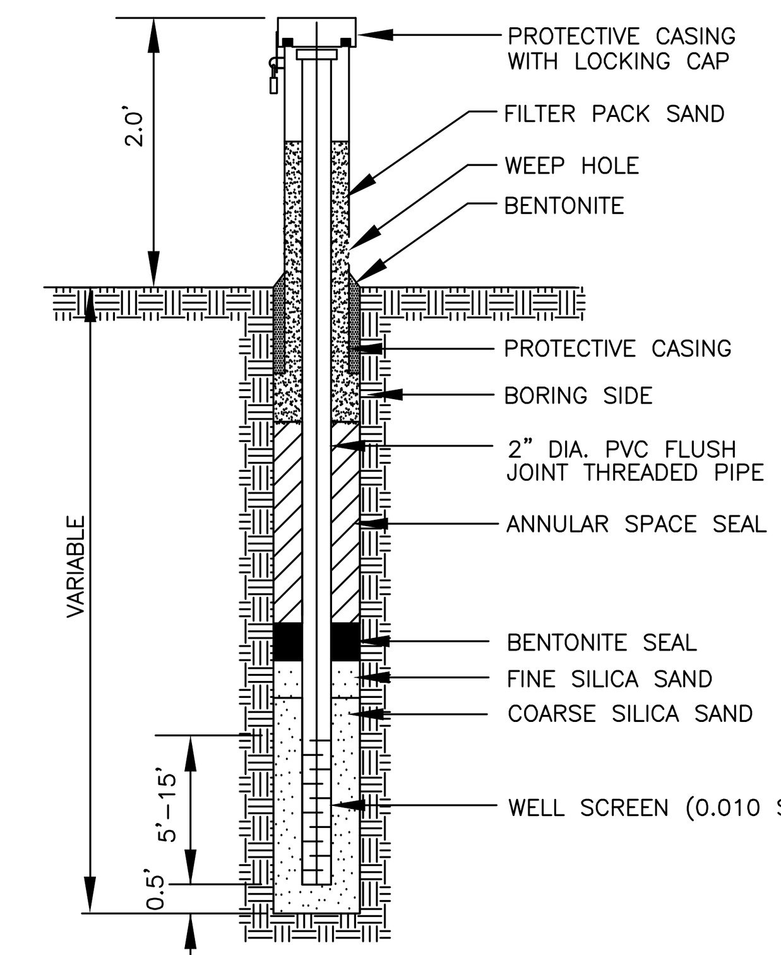


NOTE:
DETAIL SHOWN FOR PURPOSES OF IDENTIFYING INSTALLATION METHOD. LOCATION OF FENCE WILL BE DETERMINED AT DEVELOPMENT OF ENGINEERING PLANS FOR EACH PHASE OF CONSTRUCTION AND IN THE FIELD DURING ACTUAL CONSTRUCTION OF EACH PHASE.

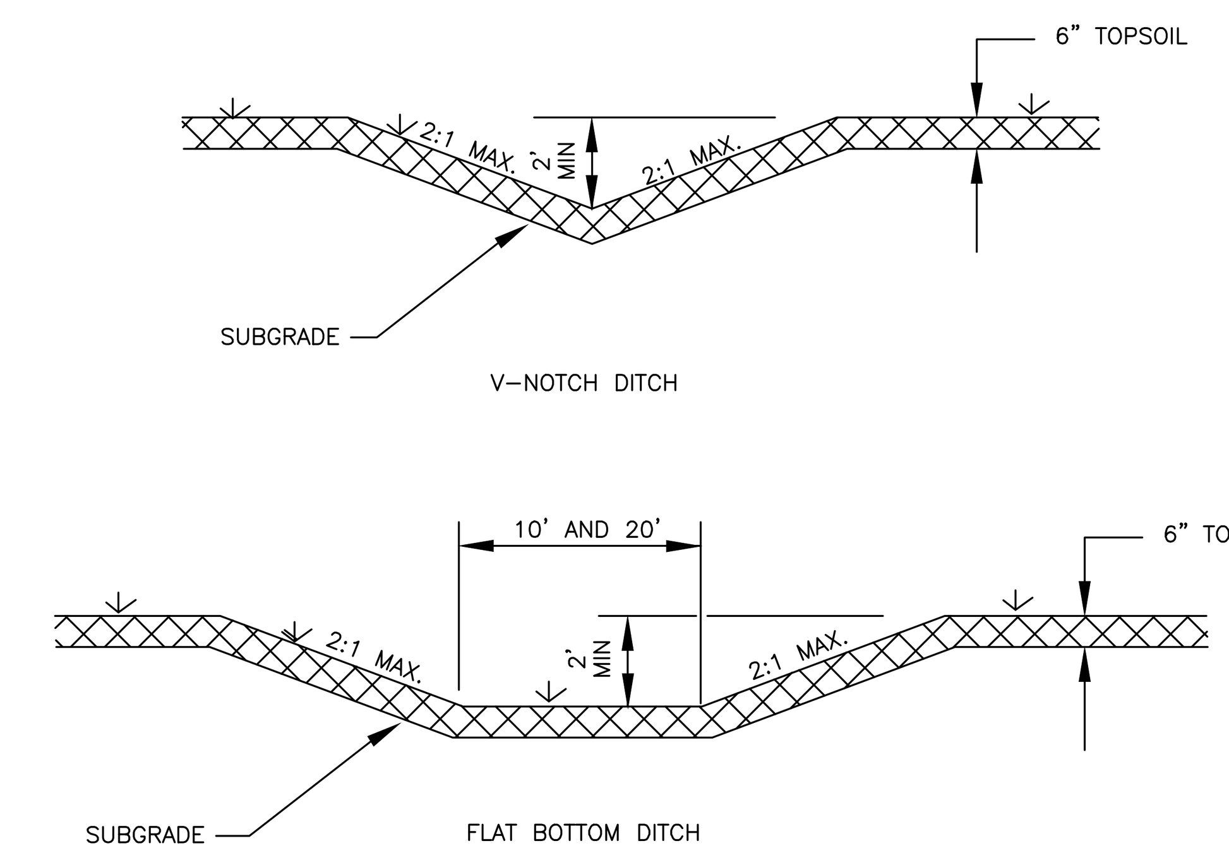
1/23 **SEDIMENT CONTROL FENCE**
(NOT TO SCALE)



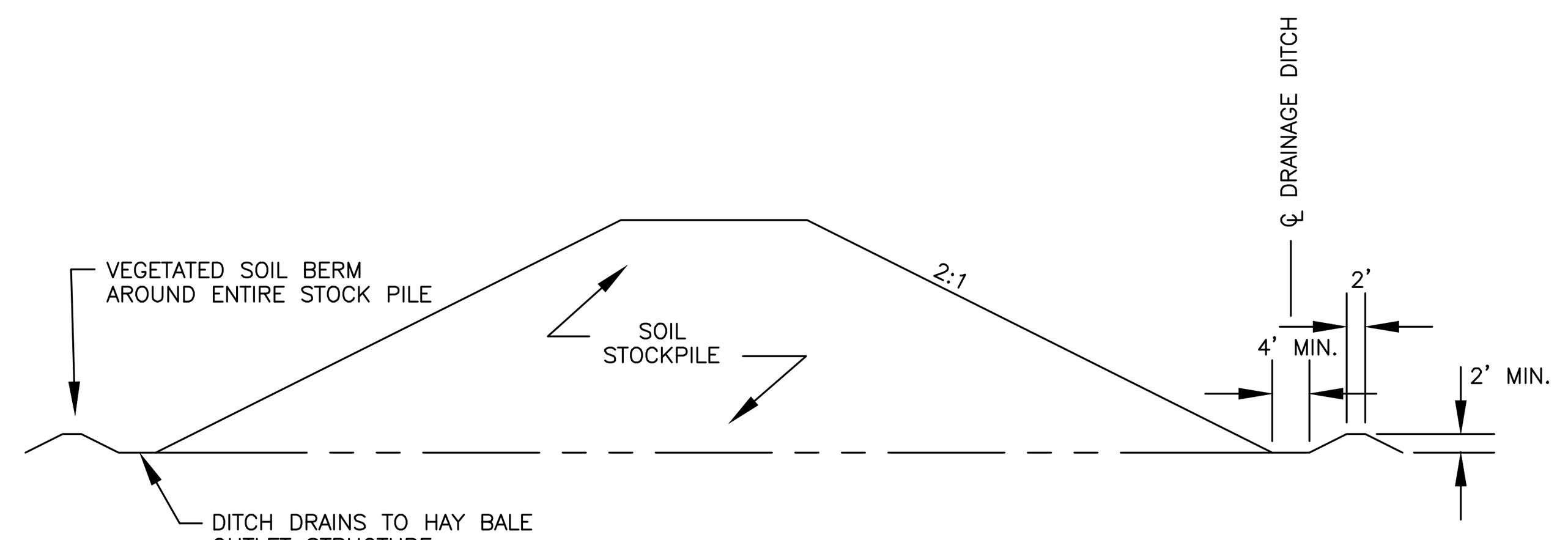
3/23 **DOUBLE WALL TRANSFER PIPE**
(NOT TO SCALE)



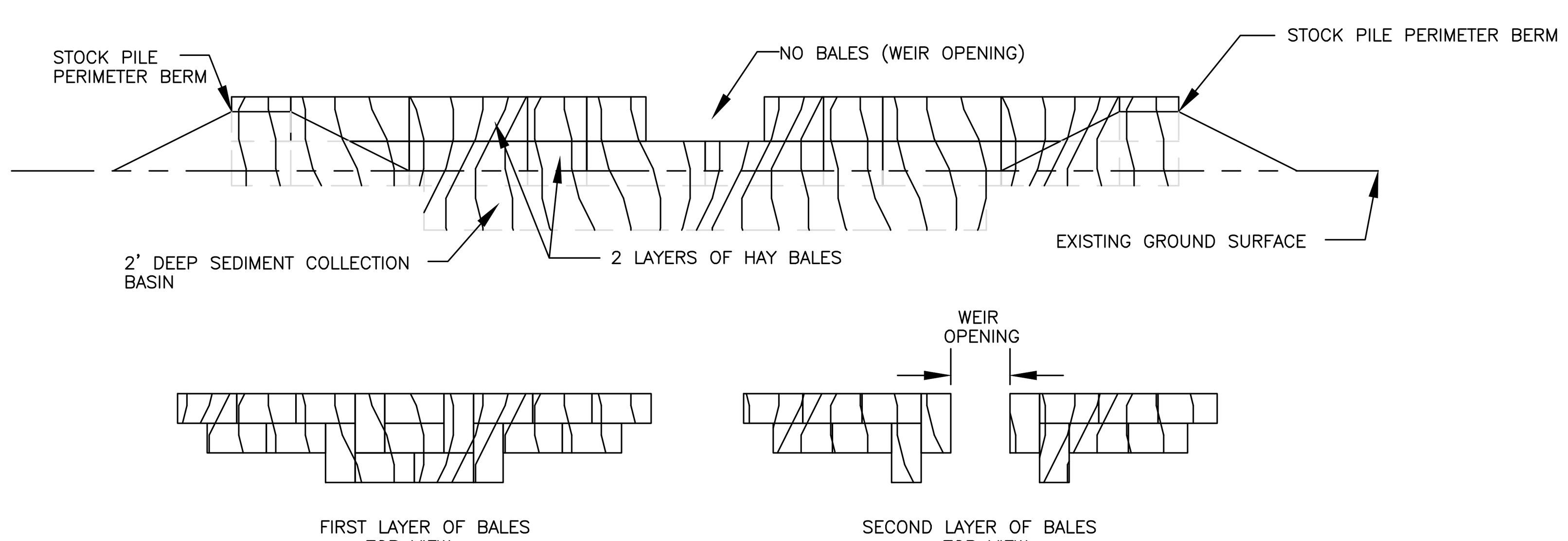
4/23 **WATER TABLE MONITORING WELL**
NOT TO SCALE



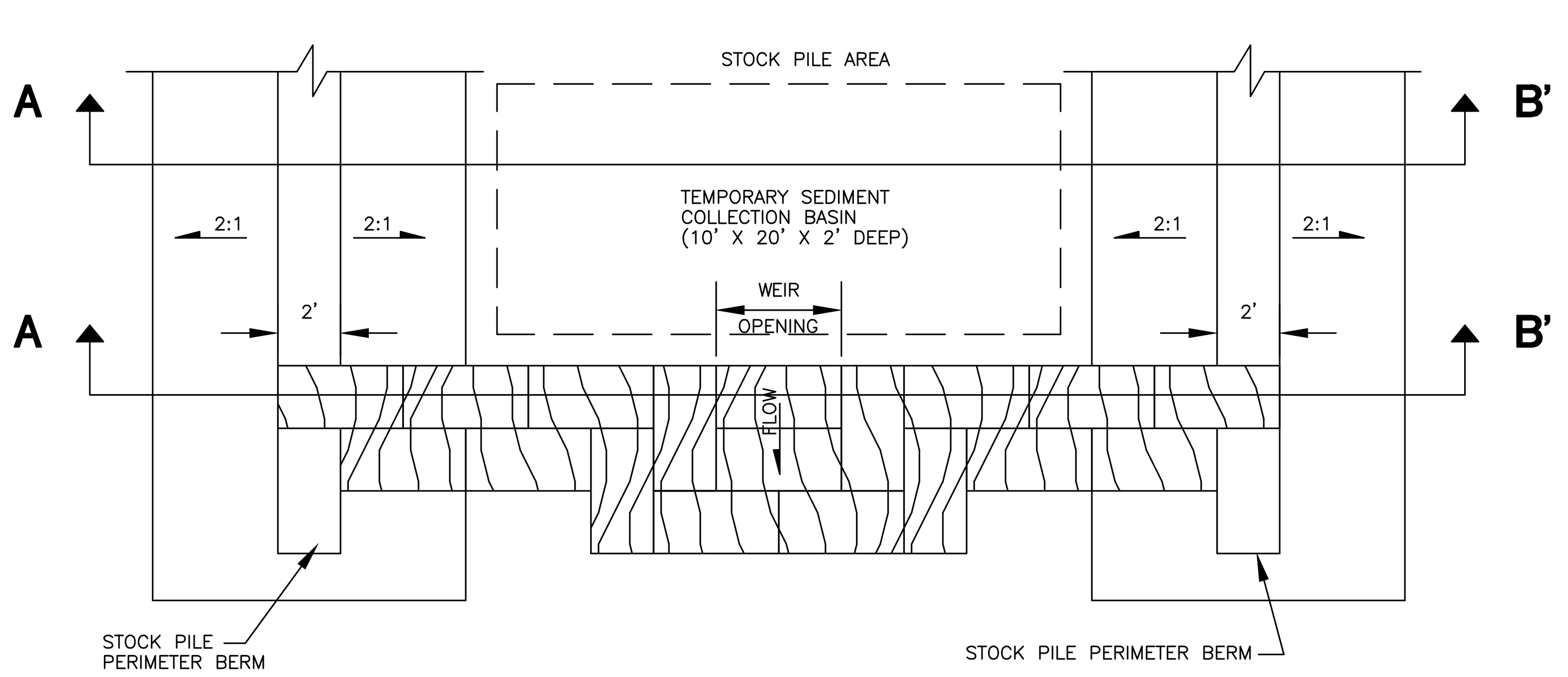
8/23 **DRAINAGE DITCH DETAILS OUTSIDE LANDFILL COVER**
(NOT TO SCALE)



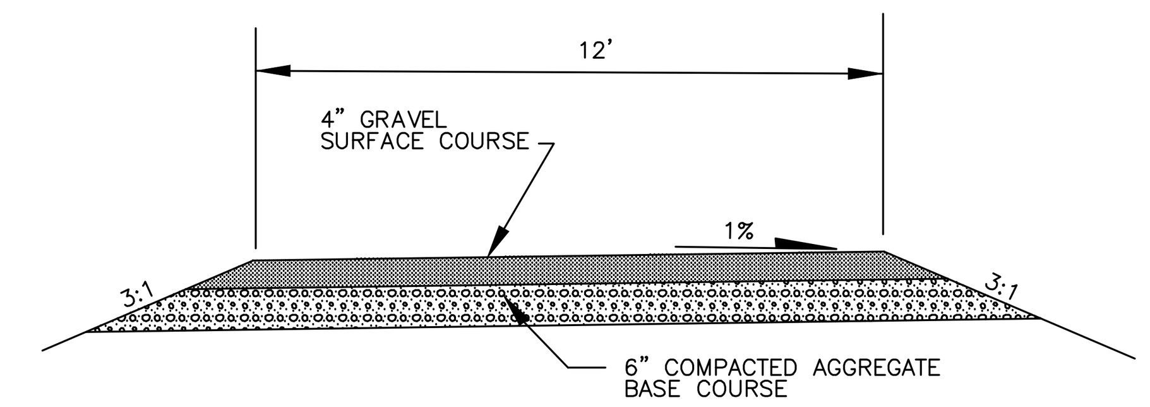
SECTION B-B'



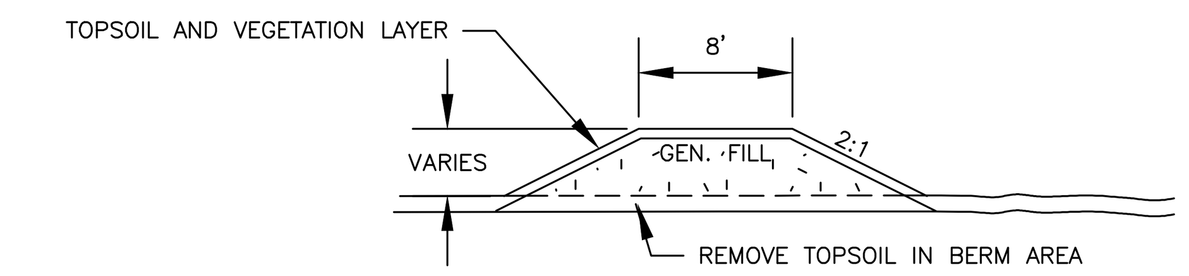
SECTION A-A'



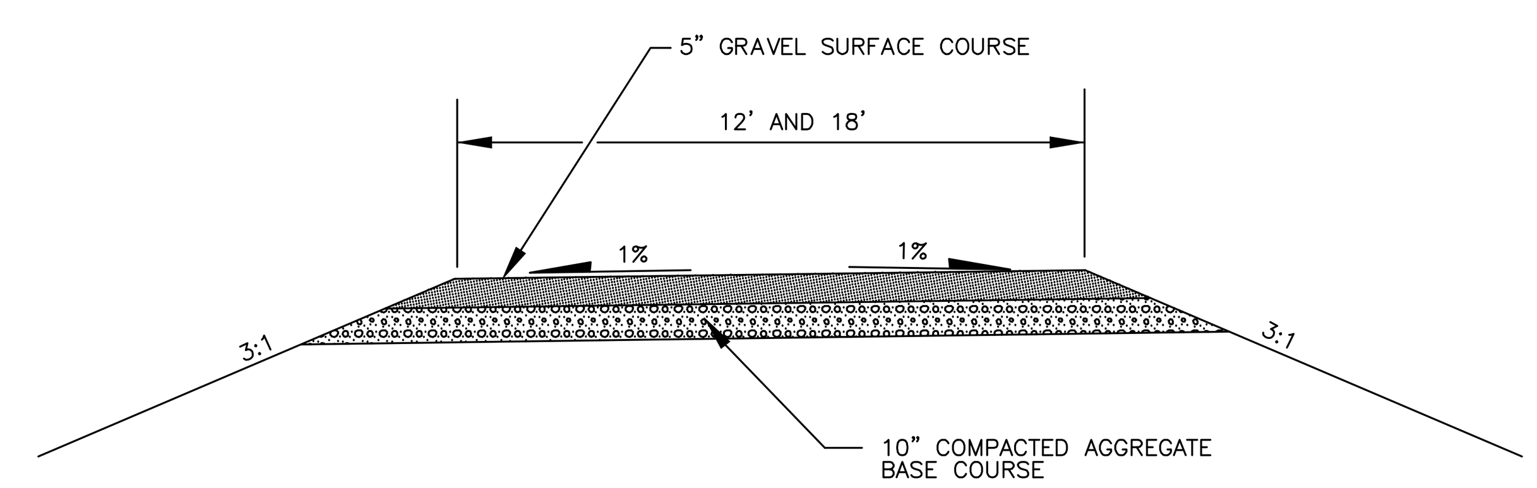
2/23 **SURFACE WATER OUTLET FOR STOCKPILES**
(NOT TO SCALE)



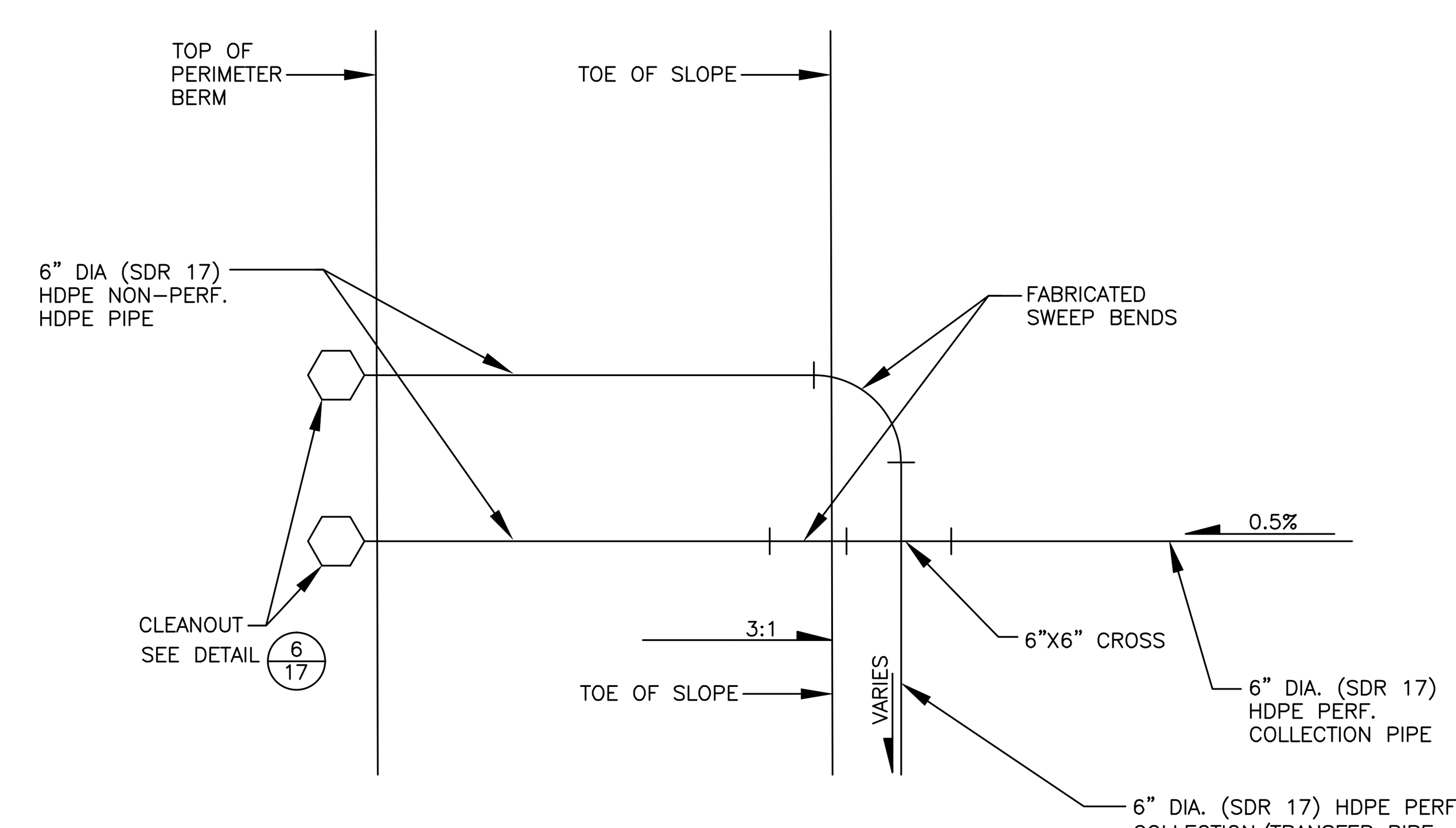
5/23 **MAINTENACE ROAD**
(NOT TO SCALE)



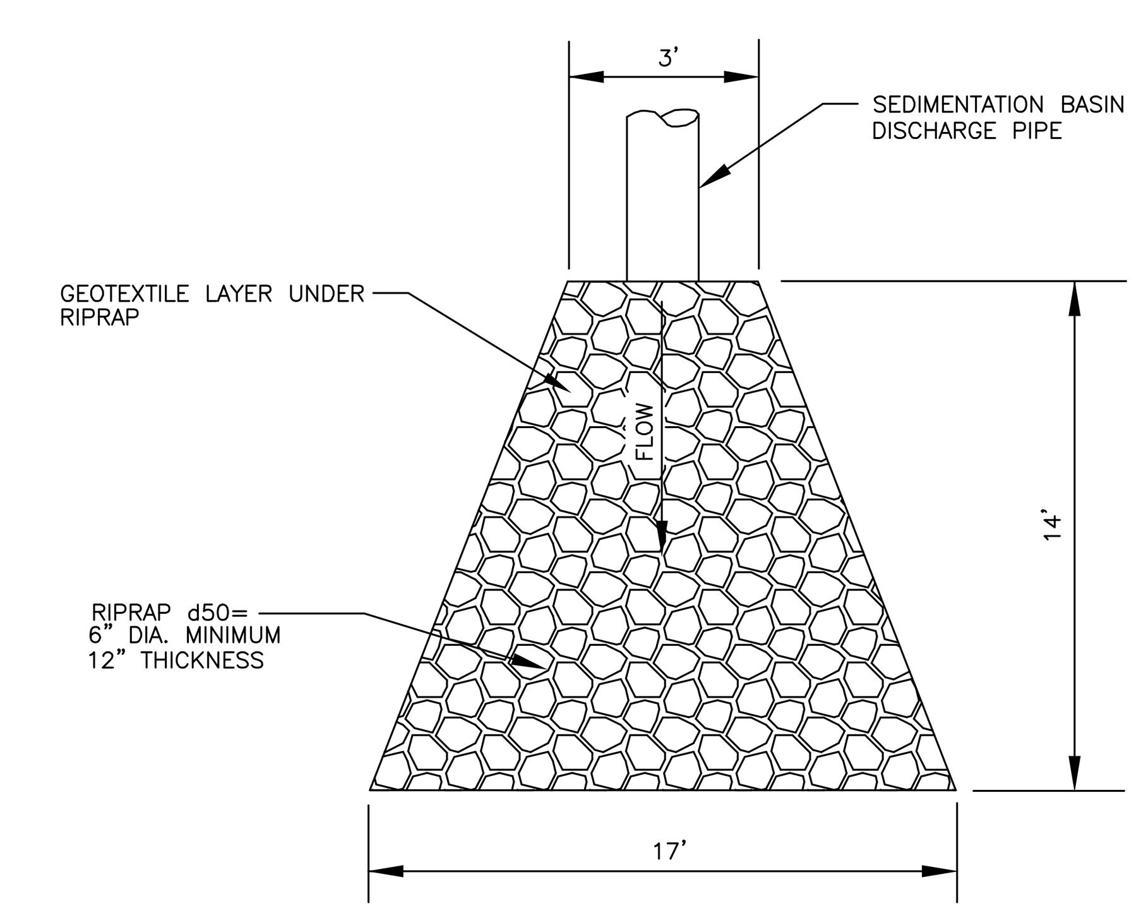
9/23 **TEMPORARY BERM FOR CONTROLLING WATER**
(NOT TO SCALE)



6/23 **ALL WEATHER ACCESS/ HAUL ROAD**
(NOT TO SCALE)



7/23 **PIPE CONNECTIONS (TYPICAL)**
(NOT TO SCALE)



10/23 **DISCHARGE PIPE RIPRAP OUTLET PROTECTION BLANKET**
(NOT TO SCALE)

LINE AND SHADING LEGEND

GEOTEXTILE	GEOMEMBRANE
GEOCOMPOSITE	GEOSYNTHETIC CLAY LINER (GCL)
TOPSOIL	NATIVE SOIL
SELECT GRANULAR FILL DRAINAGE LAYER	CONCRETE
PIPE BEDDING MATERIAL	RIPRAP
SELECT AGGREGATE FILL	GRAVEL
COMPACTED SELECT LOW PERMEABILITY SOIL	GENERAL FILL

NOTE: THESE PLANS ARE ACCOMPANIED BY A REPORT OF THE TITLE. THESE DOCUMENTS ARE INTERRELATED AND ARE INTENDED TO BE USED AND REVIEWED TOGETHER. THESE DOCUMENTS ARE INTENDED TO BE USED FOR REGULATORY PURPOSES ONLY.
NOT FOR CONSTRUCTION

NO.	BY	DATE	REVISION	APP'D.
3.				
2.				
1.				

PROJECT: DAIRYLAND POWER COOPERATIVE PLAN OF OPERATION BUFFALO COUNTY, WISCONSIN

SHEET TITLE: DETAILS- MISCELLANEOUS

DRAWN BY: DEFOEJ	SCALE:	PROJ. NO. 3081.40
CHECKED BY: DM	NOT TO SCALE	FILE NO. 30814003.dwg
APPROVED BY: BJK	DATE PRINTED:	SHEET 23 OF 23
DATE: OCTOBER 2000		

RMT
744 Heartland Trail
Madison, WI 53717-1934
P.O. Box 8923
Madison, WI 53708-8923
Phone: 608/831-4444

Attachment 13

Revised Post Closure Care Plan

Post-Closure Plan

Alma Offsite Disposal Facility, Phase IV Landfill Alma, Wisconsin

January 2024

Prepared For:

Dairyland Power Cooperative
3200 East Avenue South
La Crosse, Wisconsin 54601

Prepared By:

TRC
999 Fourier Drive, Suite 101
Madison, Wisconsin 53717

BreAnne Kahnk, P.E.
Project Engineer

Todd W. Martin
Principal Project Manager

TABLE OF CONTENTS

REVISION HISTORY

Revision Number	Revision Date	Section Revised	Summary of Revisions
01	01/12/2023	1-3	Updated text per WDNR regulations.
02	10/11/2023	2	Revised 2.3.5 to reference ch. NR 507

1.0 Introduction

This Post-Closure Care Plan (Plan) was prepared by TRC Environmental Corporation (TRC) on behalf of Dairyland Power Cooperative (DPC) for the Alma Offsite Disposal Facility, Phase IV Landfill (Landfill) where coal combustion residuals (CCR) are disposed. The approximately 32.1 acre Landfill is located in Sections 18 and 19, T21N, R12W, Town of Belvidere, Buffalo County, Wisconsin. DPC owns and operates the landfill in compliance with the Plan of Operation as permitted by the Wisconsin Department of Natural Resources (WDNR).

This Plan meets the post-closure (long-term) care requirements of the United States Environmental Protection Agency's (USEPA) CCR Rule, Title 40 Code of Federal Regulations (40 CFR) Parts 257 and 261 Subpart D - "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments" and s. NR 506.084. Post-closure care requirements apply to the owners or operators of CCR landfills subject to closure criteria under 40 CFR 257.102. Because DPC plans to conduct closure of the Landfill through leaving the CCR material in-place, post-closure/long-term care requirements are necessary. Following closure of the CCR landfill (placement of final cover), the owner or operator shall begin to conduct long-term care for the Landfill in accordance with this Plan.

2.0 Post-Closure Care

2.1 Post-Closure Period

Following closure of the CCR landfill, the site owner is required to maintain and monitor the closed site for a minimum of 40 years. The post-closure period begins on the date identified in the notification of closure of the CCR unit as required by 40 CFR 257.102(h) and s. NR 506.084(1). Post-closure care will be provided to maintain integrity and effectiveness of the final cover system, the leachate collection system in accordance with 40 CFR 257.70(d), and groundwater monitoring system in accordance with 40 CFR 257.90 through 40 CFR 257.98. These goals are consistent with those detailed in s. NR 514.07(10)(d)(1)(b),(c), and (d).

2.2 Post-Closure Contact

The post-closure contact for this facility will be:

Manager, Water and Waste Programs
Dairyland Power Cooperative
3200 East Avenue South
La Crosse, WI 54601
Phone: 608-787-1311
ccrinfodesk@dairylandpower.com

2.3 Inspection, Monitoring and Maintenance

The site will be inspected annually during the post-closure care period. The Landfill post-closure/long-term monitoring program was initially outlined in the 2000 Plan of Operation. A written record of the inspection(s) will be made and retained in the operating record. The inspector will assess the condition and need for repair of the final cover, vegetation, monitoring points, and storm water control features.

Minor repairs may be required to maintain the integrity and functionality of the drainage structures, roads, monitoring points, etc. Repairs will be made as warranted.

2.3.1 Final Cover Maintenance

Because the CCR is handled dry, moisture conditioned, and compacted in the Landfill, settlement of the final cover system is not anticipated. However, erosion may require minor final cover repairs. Areas of the final cover where ponding or erosion are observed will be repaired to maintain the integrity of the final cover system. Minor repairs may be required to maintain the integrity and functionality of the drainage structures, storm water controls, roads, monitoring points, etc.

2.3.2 Vegetation Maintenance

During inspections, areas lacking vegetation where it is required will be noted. Reworked surfaces, areas of failed or eroded vegetation, and repaired surfaces will be revegetated appropriately. Vegetation maintenance includes mowing. Mowing will be conducted as needed or on a semi-annual basis, whichever is more frequent. Mowing is not required where native prairie grass vegetative cover has been installed as previously approved by the WDNR.

2.3.3 Storm Water Runoff Management System Maintenance

Erosion controls and avoiding ponding of water are addressed by the design, grading, construction, and establishing vegetation on the landfill final cover to ensure proper run-on and run-off of storm water. During site inspections, diversion berms, perimeter dikes, roads, slopes, and storm water sedimentation basins will be inspected for erosion, seeps, depressions, obstructions to flow, vegetation cover, and other maintenance concerns. Maintenance associated with sediment accumulations and erosion will be performed as needed.

2.3.4 Leachate Collection System Maintenance and Monitoring

The leachate collection system will be maintained as needed during the post-closure care period. Features of the system that will be inspected annually include manholes, surface features, transfer piping, controls, the storage tank, and leachate collection volumes. Leachate lines will be cleaned and televised on an annual basis at a minimum. Miscellaneous repairs will be performed on an as-needed basis. The leachate storage tank will be replaced as necessary.

The leachate monitoring program will continue to be conducted during the post-closure period. At a minimum, leachate sampling from the storage tank will occur on a bi-annual basis and leachate head wells will be recorded annually, as presented in the 2000 Plan of Operation and the Environmental Sampling Plan.

Leachate collected in the leachate collection tanks will be utilized on-site for approved activities or hauled to the DPC wastewater treatment plant (WWTP), located in Alma, Wisconsin or the La Crosse Waste Water Utility WWTP location in La Crosse, Wisconsin for treatment and disposal. Miscellaneous repairs will be performed on an as-needed basis to maintain the integrity and effectiveness of the system.

2.3.5 Groundwater Monitoring Well Maintenance and Monitoring

The groundwater monitoring system will be maintained and monitored per ch. NR 507 throughout the post-closure care period. Groundwater monitoring wells will be sampled as outlined in the Environmental Sampling Plan during the post-closure care period. Results associated with CCR wells will be presented in the annual Groundwater Monitoring and Corrective Action Report submitted to the WDNR and posted to the publicly accessible website. The remainder of the results will be submitted to the WDNR as required. Groundwater monitoring records will be maintained in the operating record.

Sampling procedures and the groundwater monitoring program, as described in the Environmental Sampling Plan, will be followed throughout the post-closure care period. The parameters, frequency, and monitoring locations are summarized within the Environmental Sampling Plan.

If adverse trends develop, then the WDNR will be notified and further evaluation will be performed. If corrective action becomes necessary, then a plan will be developed and submitted to the WDNR for approval.

2.4 Post-Closure Uses

After the Landfill is closed, the site will be secured and maintained by the owner as open green space and recreation. These uses do not conflict with long-term care plans for the area. The final use is intended to prohibit agricultural uses, building construction, and excavation of the final cover or CCR. These uses are protective of the final cover system and do not increase the potential threat to human health or the environment.

2.5 Post-Closure Care Termination

Post-closure care termination may be considered after a period of 40 years from the notification of closure. In the event that the Landfill is operating under assessment groundwater monitoring in accordance with 40 CFR 257.95, the Owner will continue to perform post-closure care and groundwater monitoring in accordance with 40 CFR 257.95 until the Landfill returns to detection monitoring.

No later than 60 days following completion of the post-closure care period, the owner or operator of the CCR landfill shall post the notification of completion of post-closure care period to the operating record in accordance with 40 CFR 257.104(e) and s. NR 506.084(2)(b). Section 3 provides details on notification requirements.

2.6 Revision of the Post-Closure Plan

This Post-Closure Plan should be amended and submitted to the WDNR at least 60 days prior to a planned change that will substantially affect this plan or within 60 days of an unanticipated event after post-closure activities have commenced. If the Post-Closure Care Plan is revised after long-term care activities have commenced, the owner or operator shall submit the modification request to the WDNR no later than 30 days following the triggering event. Modifications to the Post-Closure Care Plan shall be completed in accordance with s. NR 514.04(6).

3.0 Notifications

3.1 Operating Record

The following items will be maintained in the operating record for a minimum of five years:

- 40 CFR 257.105(h): applicable requirements for groundwater monitoring
- 40 CFR 257.105(i)(12): the current post-closure plan and any amendment of the plan; the current version of the post-closure plan will be maintained in the facility's operating record irrespective of time,
- 40 CFR 257.105(i)(13): the notification of completing post-closure care
- Inspection reports

3.2 Notification Requirements

The following required notifications will be provided before the close of business on the day the notification is required to be completed:

- 40 CFR 257.106(h): *applicable* requirements for groundwater monitoring
- 40 CFR 257.106(i)(12): the availability of the written post-closure plan and any amendment of the plan
- 40 CFR 257.106(i)(13): the availability of completion of post-closure care

3.3 Publicly Accessible Internet Site

The following required items will be posted on the publicly accessible internet site:

- 40 CFR 257.107(h): *applicable* requirements for groundwater monitoring
- 40 CFR 257.107(i)(12): the written post-closure plan and any amendment of the plan
- 40 CFR 257.107(i)(13): the notification of completion of post-closure care

Information should be posted within 30 days of placing the pertinent information in the operating record. Records will be made available to the public for at least five years following the date on which the information was posted on the internet site.

4.0 Engineer's Certification

Pursuant to 40 CFR 257.104 and by means of this certification I attest that:

(i) I am familiar with the requirements of the federal CCR rule (40 CFR 257);

(ii) this Post-Closure Plan has been prepared in accordance with good engineering practice; and

(iii) this Post-Closure Plan meets the requirements of 40 CFR 257.104(d).

For the purpose of this document, "certify" and "certification" shall be interpreted and construed to be a "statement of professional opinion." The certification is understood and intended to be an expression of my professional opinion as a Wisconsin licensed professional engineer, based upon knowledge, information, and belief. The statement(s) of professional opinion are not and shall not be interpreted or construed to be a guarantee or a warranty of the analysis herein.

Signature of Registered Professional Engineer

Registration No. E-46825 State: Wisconsin

Attachment 14

Revised Closure and Post-Closure Costs

Table 1: Engineering Opinion of Probable Cost
Site Closure - Phase IV Landfill
Dairyland Power Cooperative, Alma Off-Site Disposal Facility
Plan Modification - August 2023

Item No.	Major Cost Item	Unit	Unit Cost[1]	Quantity	Cost[2]
1	Mobilization[3]	LS	$110,000.00	1	$ 110,000
	Final Cover System:[4][5][6]				
2	Barrier Layer (24" Fine Grained Soil)	CY	$10.20	40,100	$ 410,000
3	GCL	SF	$0.75	540,200	$ 406,000
4	40-mil LLDPE Geomembrane	SF	$0.61	540,200	$ 330,000
5	Granular Drainage Layer (12")	SY	$9.45	60,100	$ 568,000
6	Vegetative Layer (18")	SY	$3.21	90,100	$ 290,000
7	Topsoil (6")	CY	$6.89	10,100	$ 70,000
8	Seed, Fertilize, and Mulch	Acre	$2,290.00	12.4	$ 29,000
9	Surface Water Control System[7]	LS	$150,000.00	1	$ 150,000
10	Silt Fence	LF	$3.50	1,000	$ 4,000
	Engineering Fees:				
11	Construction Plans	LS	$34,000.00	1	$ 34,000
12	Construction Observation	Week	$10,000.00	25	$ 250,000
13	Documentation Report	LS	$34,000.00	1	$ 34,000
				Subtotal:	$ 2,685,000
				Contingency (10 percent):	$ 268,500
				Total cost (2023 dollars):	**$ 2,953,500**

Assumptions:

(1) Unit cost were inflated to 2023 dollars from 2019 dollars through the Owner Financial Responsibility Inflation Factor Table. An inflation factor of 1.1477 was generally used on the previous 2019 unit costs.

(2) Some totals may not agree due to rounding.

(3) Mobilization is assumed to be approximately 5 percent of construction cost.

(4) The total final cover area is approximately 12.4 acres.

(5) Proper drainage grades are established upon closure, and no additional grading costs are assumed.

(6) Barrier layer, granular drainage layer, vegetative layer, and topsoil will be obtained from on-site stockpiles/borrow areas.

(7) Includes diversion berms, downslope flumes, energy dissipaters, final cover drainage piping. Second stormwater basin assumed to be constructed during liner event.

Updated By: B. Kahnk 08/03/2023
Checked By: T. Martin 10/11/2023

Table 2: Opinion of Probable Cost
Long-term Care, Phase IV Landfill
Dairyland Power Cooperative, Alma Off-Site Disposal Facility
Plan Modification - August 2023

Major Cost Item	Unit	Unit Cost [1]	Quantity	Average Cost Per Year
Land Surface Care and Site Maintenance				
Reseed/Erosion Damage	Acre	$ 830.00	32	$ 27,000.00
Lawn Mowing	LS	$ 5,310.00	1	$ 6,000.00
Snow Plowing	LS	$ 3,000.00	1	$ 3,000.00
Road Maintenance	LS	$ 2,000.00	1	$ 2,000.00
Storm Water Control Structures Maintenance	LS	$ 8,300.00	1	$ 9,000.00
Repair Cover from Settlement	Acre	$ 340.00	32	$ 11,000.00
Sedimentation Basin Cleaning	LS	$ 830.00	1	$ 1,000.00
Groundwater Monitoring Maintenance				
Inspections and Maintenance/Purge/Resurvey, Pumps [2]	LS	$ 4,000.00	0.025	$ 1,000.00
Well Replacement/Abandonment [3]	LS	$ 10,000.00	0.375	$ 4,000.00
Leachate Collection System				
Leachate Collection Line Cleaning	LS	$ 3,320.00	1	$ 4,000.00
Operation and Maintenance	LS	$ 4,980.00	1	$ 5,000.00
Leachate Disposal	Gallon	$ 0.0415	876,000	$ 37,000.00
Environmental Monitoring [4]				
Groundwater Monitoring (15 wells)	LS	$ 9,000.00	1	$ 9,000.00
Leachate Monitoring (1 tank)	LS	$ 1,000.00	1	$ 1,000.00
Surface Water Monitoring (2 locations)	LS	$ 1,000.00	1	$ 1,000.00
Data Preparation/Submittal	LS	$ 3,000.00	1	$ 3,000.00
Inspection and Reporting				
Annual Inspections	LS	$ 3,400.00	1	$ 4,000.00
Annual Report	LS	$ 5,000.00	1	$ 5,000.00
			Long-term Care Subtotal:	$ 133,000.00
			Contingency (10%):	$ 13,300.00
			Yearly Grand Total:	$ 146,300.00
			40-year Long-term Care Cost:	**$ 5,852,000.00**

Note:

[1] Costs are in 2023 dollars according to Wisconsin DNR Owner Financial Responsibility Inflation Factor Table. Some totals may not agree due to rounding.

[2] Resurvey/rehabilitation - Assumed to occur once per 40 years.

[3] Replace 15 wells over 40 years.

[4] Assumes semiannual monitoring.

Update By: B. Kahnk 8/10/2023
Checked By: T. Martin 10/11/2023

Attachment 15

PAL and ACL Calculations

Attachment 15.1: Summary Table of PAL Calculations
Plan of Operation Modification for Initial Permitting of CCR Landfill - Addendum 1
Dairyland Power Cooperative, Alma Off-Site Disposal Facility Phase IV Landfill
Town of Belvidere, Buffalo County, Wisconsin

Parameter (units)	Well	# Samples	# Samples for Calcs Count	Avg.	StDev for Calc[1]	Min. Increase[2]	Avg. + 3StDev	Avg. + Min. Increase	PAL, Calculated	PAL, Rounded[3]
Alkalinity (mg/L)	W-100R	8	8	299.375	2.875	100	308.00	399.38	399.38	400
Alkalinity (mg/L)	W-100AR	8	8	309.125	3.357	100	319.20	409.13	409.13	410
Alkalinity (mg/L)	W-101	8	8	291.125	3.182	100	300.67	391.13	391.13	400
Alkalinity (mg/L)	W-102R	8	8	277	2.000	100	283.00	377.00	377.00	380
Alkalinity (mg/L)	W-105	8	8	284	2.204	100	290.61	384.00	384.00	390
Alkalinity (mg/L)	W-106	8	8	292.5	1.195	100	296.09	392.50	392.50	400
Alkalinity (mg/L)	W-107	8	8	308.375	2.387	100	315.54	408.38	408.38	410
Calcium, total (µg/L)	W-100R	8	8	75518.75	5231.477	25	91213.18	75543.75	91213.18	92000
Calcium, total (µg/L)	W-100AR	8	8	76671.25	3905.825	25	88388.73	76696.25	88388.73	89000
Calcium, total (µg/L)	W-101	8	8	67706.25	3229.847	25	77395.79	67731.25	77395.79	78000
Calcium, total (µg/L)	W-102R	8	8	61010	2511.465	25	68544.40	61035.00	68544.40	69000
Calcium, total (µg/L)	W-105	8	8	64871.25	2930.039	25	73661.37	64896.25	73661.37	74000
Calcium, total (µg/L)	W-106	8	8	68117.5	2483.838	25	75569.01	68142.50	75569.01	76000
Calcium, total (µg/L)	W-107	8	8	71852.5	4584.507	25	85606.02	71877.50	85606.02	86000
Conductance (µmhos/cm)	W-100R	8	8	574.25	5.625	200	591.13	774.25	774.25	780
Conductance (µmhos/cm)	W-100AR	8	8	590.25	8.876	200	616.88	790.25	790.25	800
Conductance (µmhos/cm)	W-101	8	8	579.5	11.464	200	613.89	779.50	779.50	780
Conductance (µmhos/cm)	W-102R	8	8	528.625	7.726	200	551.80	728.63	728.63	730
Conductance (µmhos/cm)	W-105	8	8	547.75	7.402	200	569.96	747.75	747.75	750
Conductance (µmhos/cm)	W-106	8	8	597.375	8.070	200	621.59	797.38	797.38	800
Conductance (µmhos/cm)	W-107	8	8	661.375	11.686	200	696.43	861.38	861.38	870
Hardness, total (mg/L as CaCO3)	W-100R	8	8	322.25	17.027	100	373.33	422.25	422.25	430
Hardness, total (mg/L as CaCO3)	W-100AR	8	8	335.875	21.404	100	400.09	435.88	435.88	440
Hardness, total (mg/L as CaCO3)	W-101	8	8	327.125	21.788	100	392.49	427.13	427.13	430
Hardness, total (mg/L as CaCO3)	W-102R	8	8	300	16.178	100	348.53	400.00	400.00	400
Hardness, total (mg/L as CaCO3)	W-105	8	8	311.625	16.818	100	362.08	411.63	411.63	420
Hardness, total (mg/L as CaCO3)	W-106	8	8	337.75	21.171	100	401.26	437.75	437.75	440
Hardness, total (mg/L as CaCO3)	W-107	8	8	373	16.630	100	422.89	473.00	473.00	480

Attachment 15.1: Summary Table of PAL Calculations
Plan of Operation Modification for Initial Permitting of CCR Landfill - Addendum 1
Dairyland Power Cooperative, Alma Off-Site Disposal Facility Phase IV Landfill
Town of Belvidere, Buffalo County, Wisconsin

Parameter (units)	Well	# Samples	# Samples for Calcs Count	Avg.	StDev for Calc[(1)]	Min. Increase[(2)]	Avg. + 3StDev	Avg. + Min. Increase	PAL, Calculated	PAL, Rounded[(3)]
Lithium, total (µg/L)	W-100R	8	8	1.625	0.128	-	2.01	-	2.01	2.1
Lithium, total (µg/L)	W-100AR	8	8	1.9125	0.136	-	2.32	-	2.32	2.4
Lithium, total (µg/L)	W-101	8	8	1.6	0.233	-	2.30	-	2.30	2.3
Lithium, total (µg/L)	W-102R	8	8	1.18125	0.113	-	1.52	-	1.52	1.6
Lithium, total (µg/L)	W-105	8	8	1.4375	0.119	-	1.79	-	1.79	1.8
Lithium, total (µg/L)	W-106	8	8	1.45	0.093	-	1.73	-	1.73	1.8
Lithium, total (µg/L)	W-107	8	8	1.675	0.089	-	1.94	-	1.94	2.0
Total Dissolved Solids (TDS) (mg/L)	W-100R	8	8	377.75	34.648	200	481.69	577.75	577.75	580
Total Dissolved Solids (TDS) (mg/L)	W-100AR	8	8	379.25	53.893	200	540.93	579.25	579.25	580
Total Dissolved Solids (TDS) (mg/L)	W-101	8	8	352	31.924	200	447.77	552.00	552.00	560
Total Dissolved Solids (TDS) (mg/L)	W-102R	8	8	301.25	30.174	200	391.77	501.25	501.25	510
Total Dissolved Solids (TDS) (mg/L)	W-105	8	8	331.125	31.643	200	426.05	531.13	531.13	540
Total Dissolved Solids (TDS) (mg/L)	W-106	8	8	348	30.426	200	439.28	548.00	548.00	550
Total Dissolved Solids (TDS) (mg/L)	W-107	8	8	368.25	48.553	200	513.91	568.25	568.25	570

Notes:

Prepared by: L. Auner, 11/22/2023

PAL = preventive action limit

Checked by: S. Sellwood, 11/27/2023

PALs are calculated following NR 140.20(2), except lithium, which follows NR 507.18(5)(d).

Per NR 507.27, PALs are not required for pH or temperature; however, they have been included.

- = Not applicable

Footnotes:

(1) Determined per NR 140.20(2)

(2) Minimum increase as specified in NR 140.20 Table 3, except for pH and temperature, for which values are based on NR 140.20(2)(a) and (b), respectively.

(3) PALs are rounded up two significant figures following WDNR guidance document WA 1105.

Attachment 15.2: Summary Table of ACL Calculations
Plan of Operation Modification for Initial Permitting of CCR Landfill - Addendum 1
Dairyland Power Cooperative, Alma Off-Site Disposal Facility Phase IV Landfill
Town of Belvidere, Buffalo County, Wisconsin

Parameter (units)	Well	# Samples	# Samples for Calcs Count	Detects Count	ES Exc Count[1]	PAL Exc Count[1]	Average	StDev for Calc[2]	PAL	ES	≥1 ES Exc	≥2 PAL Exc	Avg. > PAL and at Least 1 Detect	ACL Calculated	ACL Rounded[3]
Nitrate + Nitrite (mg/L as N)	W-100R	8	8	8	0	8	2.2000	0.0926	2	10		Y	Y	2.385	2.4
Nitrate + Nitrite (mg/L as N)	W-100AR	8	8	8	0	5	2.0125	0.1246	2	10		Y	Y	2.262	2.3
Nitrate + Nitrite (mg/L as N)	W-101	8	8	8	0	8	3.0625	0.2387	2	10		Y	Y	3.540	3.6
Nitrate + Nitrite (mg/L as N)	W-102R	8	8	8	0	0	1.7375	0.1061	2	10					
Nitrate + Nitrite (mg/L as N)	W-105	8	8	8	0	8	2.1500	0.1195	2	10		Y	Y	2.389	2.4
Nitrate + Nitrite (mg/L as N)	W-106	8	8	8	0	8	3.8750	0.3495	2	10		Y	Y	4.574	4.6
Nitrate + Nitrite (mg/L as N)	W-107	8	8	8	0	8	6.0375	0.2560	2	10		Y	Y	6.549	6.6

Notes:

Prepared by: L. Auner, 11/22/2023

Checked by: S. Sellwood, 11/27/2023

ACL = alternative concentration limit

ACLs are proposed following WDNR guidance document WA 1105.

ES = NR 140 enforcement standard

PAL = NR 140 preventive action limit

Footnotes:

[1] Per WDNR guidance, concentrations below the limit of quantitation (i.e., J flagged results) are not counted as exceedances of NR 140 standards for the purpose of determining the need for ACLs.

[2] Determined per NR 140.20(2)

[3] ACLs were rounded up two significant figures.

Attachment 16

Additional Waste Stream Request

Additional Waste Stream Request

Alma Offsite Disposal Facility, Phase IV Landfill
Alma, Wisconsin

January 2024

Prepared For:

Dairyland Power Cooperative
3200 East Avenue South
La Crosse, Wisconsin 54601

Prepared By:

TRC
999 Fourier Drive, Suite 101
Madison, Wisconsin 53717

TABLE OF CONTENTS

ATTACHMENTS

1.0 Introduction

On behalf of Dairyland Power Cooperative (DPC) TRC Environmental Corporation (TRC) is including a request to accept a new waste stream in this s. NR 514.075 Plan Modification for Initial Permitting response to Incompleteness Comments. The waste will originate from the temporarily closed EJ Stoneman Landfill (license #3122) in Cassville, Grant County, Wisconsin and be disposed of in the Alma Off-Site Ash Disposal Facility, Phase IV Landfill in Alma, WI (AOS Phase IV Landfill), License #4126. We request that the Wisconsin Department of Natural Resources (WDNR) review and approve this request.

2.0 Request of New Waste Stream Acceptance

2.1 Background and Waste Characterization

The proposed new waste stream will be generated from the removal of waste currently interred at the EJ Stoneman Landfill in Cassville, Wisconsin. This waste stream includes the coal combustion residual (CCR) waste material interred in the landfill (combination of fly ash and bottom ash) along with CCR contaminated soils encountered during the removal of the landfill. The CCR waste material was generated at the former EJ Stoneman Generating Station located adjacent to the landfill.

The EJ Stoneman Landfill was approved in November 1987 and was constructed and operated until 1998. Approximately 23,000 cubic yards (approximately 20,000 tons) of the permitted disposal capacity of 83,400 cubic yards was consumed prior to halting waste placement in 1998. A temporary cover consisting of 6-inches of vegetated cover soil was constructed over the 2.6-acre landfill in 1998 and the temporary cover currently remains in-place. It is DPC's intention to remove the CCR waste from the EJ Stoneman Landfill along with CCR contaminated soils to fully decommission this landfill. DPC's plan for removal, further management of potentially impacted soils, and decommissioning the landfill will be presented in a Plan Modification for license number 3122 (EJ Stoneman Landfill).

Testing of the existing waste in the EJ Stoneman was completed in 2009. This testing is included in **Attachment 16.1**. The waste material was categorized as a dark to black sand/silt mixed waste mixture. During sampling the waste material at the surface was not observed to be saturated; however, sampling at depth was not completed. DPC would complete paint filter testing and GCL compatibility testing for the material and supply that information to the WDNR prior to removal of the waste. If material is encountered that would not meet the paint filter test, the material would be dried out prior to its removal and transportation to the Alma Phase IV Landfill.

2.2 Schedule

Disposal of this material is anticipated to occur during a limited time period, within a span of a couple months during the course of one calendar year. The exact timing is yet to be determined. Prior to removal and disposal of the material, a plan modification for the EJ Stoneman Landfill will need to be submitted and approved. In addition, the next module of the Phase IV Disposal Area in Alma, Wisconsin will have been constructed. The overall timeline of this material's disposal is generally dependent on these two factors.

2.3 Handling

The waste material removed from the EJ Stoneman Landfill will increase the tonnage of ash waste residual material to be landfilled at the Alma Phase IV Landfill by approximately 20,000 tons to 21,000 tons during the year that it is landfilled. The potentially impacted soil is not anticipated to cause a significant increase in the tonnage. It is anticipated that all material will be moved to the Alma Phase IV Landfill within a one-year period, so in the years following this removal disposal rates are anticipated to return to normal.

Since the material is currently interred within the EJ Stoneman Landfill, the material will be excavated from the EJ Stoneman Landfill and placed within dump trucks and/or barges. The dump trucks and/or barges will be covered so that the release of dust particles is minimized during the haul between Cassville and Alma, Wisconsin. If additional moisture conditioning is required for the material, it will be moisture conditioned to approximately 10 to 15 percent (for dust control) before being placed in the landfill (followed by grading and compaction). These activities will be discussed in further detail in a Plan Modification for license number 3122 (EJ Stoneman Landfill).

Attachment 16.1: Laboratory Results

DAIRYLAND POWER
COOPERATIVE

2008 Ash Products

Data Package

August 13, 2008

A Touchstone Energy® Cooperative

3200 East Ave. S. • PO Box 817 • La Crosse, WI 54602-0817 • 608-788-4000 • 608-787-1420 fax • www.dairynet.com

DAIRYLAND POWER
COOPERATIVE

2008 Ash Products
Sample Sources and Classifications

Product	Sample Date	Wisconsin NR 538 Classification
Cassville Landfill Ash Old Landfill	7/23/08	Category 2
Cassville Leachate Pad Ash	7/23/08	Category 3

2008 ASTM Leachate Analyses

Cassville Landfill Products

Leachate Date: 7/31/08

Parameter	Req. Det. Limit (mg/L)	Reported Detection Limit (mg/L)	Wi DNR Cat. 2 & 3 Limits (from Table 2A) (mg/L)	Wi DNR Category 4 Limits (from Table 3) (mg/L)	ASTM Cassville Landfill Ash	ASTM Cassville Leachate Pad Ash	Analysis Date	Analysis Method
Aluminum	0.10	0.020			<0.020	<0.020	8/6/08	6010B
Antimony	0.005	0.002	0.012		0.0021	<0.002	8/5/08	7010
Arsenic	0.005	0.0010	0.050		0.016	0.012	8/5/08	7010
Barium	0.04	0.010	4.0		0.029	0.021	8/5/08	6010B
Beryllium	0.001	0.0005	0.004		<0.0005	<0.0005	8/5/08	6010B
Boron	0.004	0.020	1.9	4.8	0.25	0.16	8/5/08	6010B
Cadmium	0.0002	0.002	0.005	0.025	0.0022	0.0023	8/5/08	6010B
Calcium	1.0	0.50			11	7.7	8/6/08	6010B
Chromium	0.003	0.003	0.10	0.50	<0.0030	<0.0030	8/5/08	6010B
Copper	0.003	0.005			0.0053	<0.005	8/5/08	6010B
Iron	0.05	0.010			<0.010	<0.010	8/6/08	6010B
Lead	0.003	0.0020	0.015		<0.0020	<0.0020	8/5/08	7010
Magnesium	1.0	0.50			1.8	1.6	8/6/08	6010B
Manganese	0.01	0.005	0.25		0.022	<0.005	8/5/08	6010B
Nickel	0.01	0.015			<0.015	<0.015	8/5/08	6010B
Selenium	0.001	0.002	0.10	0.25	<0.0020	<0.0020	8/5/08	7010
Silver	0.0005	0.025	0.10	0.25	<0.025	<0.025	8/5/08	6010B
Thallium	0.003	0.0020	0.004		<0.0020	<0.0020	8/6/08	7010
Zinc	0.02	0.010			0.019	<0.010	8/5/08	6010B
Sulfate (mg/L)	1.0	1.1	1250	2500	<1.1	11	8/8/08	9038
pH	0.1 units	NA			9.35	9.62	7/31/08	Hydrolab
Conductivity	10 umhos/cm	10			85	125	7/31/08	Hydrolab
Mercury			0.002		<0.0024	<0.0048		Calc.

DAIRYLAND POWER COOPERATIVE

Chemical Services Laboratory
3251 East Ave. South
La Crosse, WI 54601
(608)788-4000

Chemical Analysis Report Form

Sample ID: **EJS Landfill Ash**

Report Date: 8/13/08

Sampling Location: Cassville, WI
Collected By: Dave Lesky
Delivered By: Dave Lesky

Sample Type: ASTM D3987-85 Leachate
Leach Date 7/31/08
Date Collected: 7/23/08
Date Received: 7/23/08

Parameter	Method	LOD	LOQ	Result	Category 2 Limit	Units	Notes
Aluminum	6010B	0.020	0.067	<0.020	NA	mg/L	
Antimony	7010	0.0020	0.0067	0.0021	0.012	mg/L	A
Arsenic	7010	0.0010	0.0033	0.016	0.050	mg/L	
Barium	6010B	0.010	0.033	0.029	4.0	mg/L	#
Beryllium	6010B	0.0005	0.0017	<0.0005	0.004	mg/L	
Boron	6010B	0.020	0.067	0.25	1.9	mg/L	
Cadmium	6010B	0.0020	0.0067	0.0022	0.005	mg/L	#
Calcium	6010B	0.50	1.7	11	NA	mg/L	
Chromium	6010B	0.0030	0.010	<0.0030	0.10	mg/L	
Copper	6010B	0.0050	0.017	0.0053	1.3	mg/L	#
Iron	6010B	0.010	0.033	<0.010	1.5	mg/L	
Lead	7010	0.0020	0.0067	<0.0020	0.015	mg/L	
Magnesium	6010B	0.50	1.7	1.8	NA	mg/L	
Manganese	6010B	0.005	0.017	0.022	0.25	mg/L	
Nickel	6010B	0.015	0.050	<0.015	0.20	mg/L	
Selenium	7010	0.0020	0.0067	<0.0020	0.10	mg/L	
Silver	6010B	0.025	0.083	<0.025	0.10	mg/L	
Thallium	7010	0.0020	0.0067	<0.0020	0.004	mg/L	
Zinc	6010B	0.010	0.033	0.019	NA	mg/L	#
Sulfate	9038	1.1	3.7	<1.1	1250	mg/L	

LOD = Limit of Detection
LOQ = Limit of Quantitation
NA = Not Applicable

# = Results between LOD and LOQ
A = Matrix Spike Recovery was outside of control limits
B = Matrix Duplicate recovery was outside of control limits

The laboratory analyses reported above were determined in accordance with approved EPA Methodology and the latest edition of STANDARD METHODS.

Dairyland Power Cooperative Chemical Services Laboratory is a Wisconsin Registered Testing Laboratory. Our Wisconsin Registration ID Number is 632023810.

Submitted by:

Dairyland Power Cooperative Chemical Services Laboratory

Tad Schwartzhoff, Analytical Chemist II.

DAIRYLAND POWER COOPERATIVE

Chemical Services Laboratory
3251 East Ave. South
La Crosse, WI 54601
(608)788-4000

Chemical Analysis Report Form

Sample ID: **EJS Leachate Pad Ash**

Report Date: 8/13/08

Sampling Location: Cassville, WI
Collected By: Dave Lesky
Delivered By: Dave Lesky

Sample Type: ASTM D3987-85 Leachate
Leach Date 7/31/08
Date Collected: 7/23/08
Date Received: 7/23/08

Parameter	Method	LOD	LOQ	Result	Category 2 Limit	Units	Notes
Aluminum	6010B	0.020	0.067	<0.020	NA	mg/L	
Antimony	7010	0.0020	0.0067	<0.002	0.012	mg/L	A
Arsenic	7010	0.0010	0.0033	0.012	0.050	mg/L	
Barium	6010B	0.010	0.033	0.021	4.0	mg/L	#
Beryllium	6010B	0.0005	0.0017	<0.0005	0.004	mg/L	
Boron	6010B	0.020	0.067	0.16	1.9	mg/L	
Cadmium	6010B	0.0020	0.0067	0.0023	0.005	mg/L	#
Calcium	6010B	0.50	1.7	7.7	NA	mg/L	
Chromium	6010B	0.0030	0.010	<0.0030	0.10	mg/L	
Copper	6010B	0.0050	0.017	<0.005	1.3	mg/L	
Iron	6010B	0.010	0.033	<0.010	1.5	mg/L	
Lead	7010	0.0020	0.0067	<0.0020	0.015	mg/L	
Magnesium	6010B	0.50	1.7	1.6	NA	mg/L	#
Manganese	6010B	0.005	0.017	<0.005	0.25	mg/L	
Nickel	6010B	0.015	0.050	<0.015	0.20	mg/L	
Selenium	7010	0.0020	0.0067	<0.0020	0.10	mg/L	
Silver	6010B	0.025	0.083	<0.025	0.10	mg/L	
Thallium	7010	0.0020	0.0067	<0.0020	0.004	mg/L	
Zinc	6010B	0.010	0.033	<0.010	NA	mg/L	
Sulfate	9038	1.1	3.7	11	1250	mg/L	

LOD = Limit of Detection
LOQ = Limit of Quantitation
NA = Not Applicable

# = Results between LOD and LOQ
A = Matrix Spike Recovery was outside of control limits
B = Matrix Duplicate recovery was outside of control limits

The laboratory analyses reported above were determined in accordance with approved EPA Methodology and the latest edition of STANDARD METHODS.

Dairyland Power Cooperative Chemical Services Laboratory is a Wisconsin Registered Testing Laboratory. Our Wisconsin Registration ID Number is 632023810.

Submitted by:

Dairyland Power Cooperative Chemical Services Laboratory

Tad Schwartzhoff, Analytical Chemist II.

2008 Total Elemental Analysis

Cassville Landfill Ash

Parameter	Reported Detection Limit (mg/kg)	WI DNR Category 2 Limits (From Table 2B) (mg/kg)	Cassville Landfill Ash (mg/kg)	Cassville Leachate Pad Ash (mg/kg)	Analysis Date	Analysis Method
Aluminum	50		7,726	8,708	8/6/08	6010B
Antimony	0.10		0.96	1.5	8/6/08	7010
Arsenic	0.10	21	8.5	40	7/30/08	7010
Barium	1.0		92	127	8/5/08	6010B
Beryllium	0.10	7	1.6	2.6	8/5/08	6010B
Boron	1.0		17	26	8/5/08	6010B
Cadmium	0.25		1.6	1.9	8/5/08	6010B
Calcium	50		9,186	5,822	8/6/08	6010B
Chromium	0.50		18	23	8/5/08	6010B
Cobalt	2.0		5.7	9.6	8/5/08	6010B
Copper	0.50		16	23	8/5/08	6010B
Iron	50		15,593	16,505	8/6/08	6010B
Lead	2.5		13	26	7/30/08	7010
Magnesium	50		2,544	2,481	8/6/08	6010B
Manganese	0.50		273	197	8/5/08	6010B
Molybdenum	2.0		<2.0	5.2	8/7/08	6010B
Nickel	1.0		17	26	8/5/08	6010B
Selenium	0.10		1.7	1.9	8/5/08	7010
Silver	1.3		<1.3	<1.3	8/5/08	6010B
Strontium	13		39	51	8/7/08	6010B
Thallium	0.10		0.53	0.68	7/30/08	7010
Vanadium	1.3		35	47	8/7/08	6010B
Zinc	0.50		73	66	8/5/08	6010B
% Solids			85%	79%	7/29/08	
Mercury			0.047	0.096	8/7/08	7471A

* **Notes** Values are reported on a dry weight basis

Merury was analyzed by TestAmerica in University Park, IL

DAIRYLAND POWER COOPERATIVE

Chemical Services Laboratory
3251 East Ave. South
La Crosse, WI 54601
(608)788-4000

Chemical Analysis Report Form

Sample ID: **EJS Landfill Ash**

Report Date: 8/7/08

Sampling Location: Cassville, WI
Collected By: Dave Lesky
Delivered By: Dave Lesky

Sample Type: Ash Mixture
Date Collected: 7/23/08
Date Received: 7/23/08

Parameter	Method	LOD	LOQ	Result	Notes
Aluminum, Total (mg/kg, dry wt.)	6010B	50	167	7,726	
Antimony, Total	7010	0.10	0.33	0.96	A
Arsenic, Total	7010	0.10	0.33	8.5	
Barium, Total	6010B	1.0	3.3	92	
Beryllium, Total	6010B	0.10	0.33	1.6	
Boron, Total	6010B	1.0	3.3	17	B
Cadmium, Total	6010B	0.25	0.83	1.6	A
Calcium, Total	6010B	50	167	9,186	
Chromium, Total	6010B	0.50	1.7	18	
Cobalt, Total	6010B	2.0	6.7	5.7	A, #
Copper, Total	6010B	0.50	1.7	16	
Iron, Total	6010B	50	167	15,593	B
Lead, Total	7010	2.5	8.3	13	B
Magnesium, Total	6010B	50	167	2,544	
Manganese, Total	6010B	0.50	1.7	273	
Molybdenum, Total	6010B	2.0	6.7	<2.0	
Nickel, Total	6010B	1.0	3.3	17	
Selenium, Total	7010	0.10	0.33	1.7	B
Silver, Total	6010B	1.3	4.3	<1.3	
Strontium, Total	6010B	13	42	39	
Thallium, Total	7010	0.10	0.33	0.53	
Vanadium, Total	6010B	1.3	4.3	35	
Zinc, Total	6010B	0.50	1.7	73	
% Solids		N/A	N/A	85%	

LOD = Limit of Detection

LOQ = Limit of Quantitation

# = Results between LOD and LOQ
A = Matrix Spike Recovery was outside of control limits
B = Matrix Duplicate recovery was outside of control limits

The laboratory analyses reported above were determined in accordance with approved EPA Methodology and the latest edition of STANDARD METHODS.

Dairyland Power Cooperative Chemical Services Laboratory is a Wisconsin Registered Testing Laboratory. Our Wisconsin Registration ID Number is 632056590.

Submitted by:

Dairyland Power Cooperative Chemical Services Laboratory

Tad Schwartzhoff, Analytical Chemist II.

DAIRYLAND POWER COOPERATIVE

Chemical Services Laboratory
3251 East Ave. South
La Crosse, WI 54601
(608)788-4000

Chemical Analysis Report Form

Sample ID: **EJS Leachate Pad Ash** Report Date: 8/7/08

Sampling Location: Cassville, WI
Collected By: Dave Lesky
Delivered By: Dave Lesky

Sample Type: Ash Mixture
Date Collected: 7/23/08
Date Received: 7/23/08

Parameter	Method	LOD	LOQ	Result	Notes
Aluminum, Total (mg/kg, dry wt.)	6010B	50	167	8,708	
Antimony, Total	7010	0.10	0.33	1.5	A
Arsenic, Total	7010	0.10	0.33	40	
Barium, Total	6010B	1.0	3.3	127	
Beryllium, Total	6010B	0.10	0.33	2.6	
Boron, Total	6010B	1.0	3.3	26	B
Cadmium, Total	6010B	0.25	0.83	1.9	A
Calcium, Total	6010B	50	167	5,822	
Chromium, Total	6010B	0.50	1.7	23	
Cobalt, Total	6010B	2.0	6.7	10	A
Copper, Total	6010B	0.50	1.7	23	
Iron, Total	6010B	50	167	16,505	B
Lead, Total	7010	2.5	8.3	26	B
Magnesium, Total	6010B	50	167	2,481	
Manganese, Total	6010B	0.50	1.7	197	
Molybdenum, Total	6010B	2.0	6.7	5.2	#
Nickel, Total	6010B	1.0	3.3	26	
Selenium, Total	7010	0.10	0.33	1.9	B
Silver, Total	6010B	1.3	4.3	<1.3	
Strontium, Total	6010B	13	42	51	
Thallium, Total	7010	0.10	0.33	0.68	
Vanadium, Total	6010B	1.3	4.3	47	
Zinc, Total	6010B	0.50	1.7	66	
% Solids		N/A	N/A	100%	

= Results between LOD and LOQ

LOD = Limit of Detection LOQ = Limit of Quantitation

A = Matrix Spike Recovery was outside of control limits

B = Matrix Duplicate recovery was outside of control limits

The laboratory analyses reported above were determined in accordance with approved EPA Methodology and the latest edition of STANDARD METHODS.

Dairyland Power Cooperative Chemical Services Laboratory is a Wisconsin Registered Testing Laboratory. Our Wisconsin Registration ID Number is 632056590.

Submitted by:

Dairyland Power Cooperative Chemical Services Laboratory

Tad Schwartzhoff, Analytical Chemist II.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

Job Number: 500-13006-1

Job Description: Cassville Landfill

For:
Dairyland Power Co-op
PO BOX 817
3200 East Avenue South
La Crosse, WI 54602

Attention: Tad Schwartzhoff

Margaret Kniest

Margaret Kniest
Project Manager II
margaret.kniest@testamericainc.com
08/11/2008

These test results meet all the requirements of NELAC for accredited parameters.

The Lab Certification ID# is 100201.

All questions regarding this test report should be directed to the TestAmerica Project Manager whose signature appears on this report. All pages of this report are integral parts of the analytical data. Therefore, this report should be reproduced only in its entirety.

Reporting limits are adjusted for sample size used, dilutions and moisture content if applicable.

TestAmerica Laboratories, Inc.
TestAmerica Chicago 2417 Bond Street, University Park, IL 60466
Tel (708) 534-5200 Fax (708) 534-5211 www.testamericainc.com

ACCREDITED IN ACCORDANCE WITH nelac

Comments
No additional comments.

Receipt
The samples were received at 16.8,17.2 degrees.

All other samples were received in good condition within temperature requirements.

Metals
No analytical or quality issues were noted.

EXECUTIVE SUMMARY - Detections

Client: Dairyland Power Co-op

Job Number: 500-13006-1

Lab Sample ID Analyte	Client Sample ID Result / Qualifier	Reporting Limit	Units	Method
500-13006-1	**CASSVILLE LANDFILL ASH**			
Mercury	47	21	ug/Kg	7471A
Percent Moisture	21	0.10	%	PercentMoisture
Percent Solids	79	0.10	%	PercentMoisture
500-13006-2	**CASSVILLE LEACHATE PAD ASH**			
Mercury	96	21	ug/Kg	7471A
Percent Moisture	19	0.10	%	PercentMoisture
Percent Solids	81	0.10	%	PercentMoisture

METHOD SUMMARY

Client: Dairyland Power Co-op

Job Number: 500-13006-1

Description	Lab Location	Method	Preparation Method
Matrix: Solid			
Mercury in Solid or Semisolid Waste (Manual Cold Vapor Technique)	TAL CHI	SW846 7471A	
Mercury in Solid or Semi-Solid Waste (Manual Cold	TAL CHI		SW846 7471A

Lab References:

TAL CHI = TestAmerica Chicago

Method References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

METHOD / ANALYST SUMMARY

Client: Dairyland Power Co-op

Job Number: 500-13006-1

Method	Analyst	Analyst ID
SW846 7471A	Klee, George O	GOK
EPA PercentMoisture	Boyd, Cheryl L	CLB

SAMPLE SUMMARY

Client: Dairyland Power Co-op

Job Number: 500-13006-1

Lab Sample ID	Client Sample ID	Client Matrix	Date/Time Sampled	Date/Time Received
500-13006-1	CASSVILLE LANDFILL ASH	Solid	07/23/2008 1200	08/05/2008 0945
500-13006-2	CASSVILLE LEACHATE PAD ASH	Solid	07/23/2008 1200	08/05/2008 0945

SAMPLE RESULTS

Client: Dairyland Power Co-op

Job Number: 500-13006-1

Client Sample ID: CASSVILLE LANDFILL ASH

Lab Sample ID: 500-13006-1
Client Matrix: Solid

% Moisture: 20.6

Date Sampled: 07/23/2008 1200
Date Received: 08/05/2008 0945

7471A Mercury in Solid or Semisolid Waste (Manual Cold Vapor Technique)

Method: 7471A
Preparation: 7471A
Dilution: 1.0
Date Analyzed: 08/07/2008 1237
Date Prepared: 08/07/2008 0900

Analysis Batch: 500-43989
Prep Batch: 500-43984

Instrument ID: Leeman Labs PS200
Lab File ID: N/A
Initial Weight/Volume: 0.60 g
Final Weight/Volume: 50 mL

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	RL
Mercury		47		21

Client: Dairyland Power Co-op

Job Number: 500-13006-1

Client Sample ID: CASSVILLE LEACHATE PAD ASH

Lab Sample ID: 500-13006-2
Client Matrix: Solid

% Moisture: 18.6

Date Sampled: 07/23/2008 1200
Date Received: 08/05/2008 0945

7471A Mercury in Solid or Semisolid Waste (Manual Cold Vapor Technique)

Method: 7471A
Preparation: 7471A
Dilution: 1.0
Date Analyzed: 08/07/2008 1239
Date Prepared: 08/07/2008 0900

Analysis Batch: 500-43989
Prep Batch: 500-43984

Instrument ID: Leeman Labs PS200
Lab File ID: N/A
Initial Weight/Volume: 0.60 g
Final Weight/Volume: 50 mL

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	RL
Mercury		96		21

General Chemistry

Client Sample ID: CASSVILLE LANDFILL ASH

Lab Sample ID: 500-13006-1
Client Matrix: Solid

Date Sampled: 07/23/2008 1200
Date Received: 08/05/2008 0945

Analyte	Result	Qual	Units	RL	Dil	Method
Percent Moisture	21		%	0.10	1.0	PercentMoisture
	Anly Batch: 500-43817		Date Analyzed 08/06/2008 0138			
Percent Solids	79		%	0.10	1.0	PercentMoisture
	Anly Batch: 500-43817		Date Analyzed 08/06/2008 0138			

Client Sample ID: CASSVILLE LEACHATE PAD ASH

Lab Sample ID: 500-13006-2
Client Matrix: Solid

Date Sampled: 07/23/2008 1200
Date Received: 08/05/2008 0945

Analyte	Result	Qual	Units	RL	Dil	Method
Percent Moisture	19		%	0.10	1.0	PercentMoisture
	Anly Batch: 500-43817		Date Analyzed 08/06/2008 0138			
Percent Solids	81		%	0.10	1.0	PercentMoisture
	Anly Batch: 500-43817		Date Analyzed 08/06/2008 0138			

QUALITY CONTROL RESULTS

Client: Dairyland Power Co-op

Job Number: 500-13006-1

QC Association Summary

Lab Sample ID	Client Sample ID	Report Basis	Client Matrix	Method	Prep Batch
Metals					
Prep Batch: 500-43984					
LCS 500-43984/2-A	Lab Control Spike	T	Solid	7471A	
MB 500-43984/1-A	Method Blank	T	Solid	7471A	
500-13006-1	CASSVILLE LANDFILL ASH	T	Solid	7471A	
500-13006-2	CASSVILLE LEACHATE PAD ASH	T	Solid	7471A	
Analysis Batch:500-43989					
LCS 500-43984/2-A	Lab Control Spike	T	Solid	7471A	500-43984
MB 500-43984/1-A	Method Blank	T	Solid	7471A	500-43984
500-13006-1	CASSVILLE LANDFILL ASH	T	Solid	7471A	500-43984
500-13006-2	CASSVILLE LEACHATE PAD ASH	T	Solid	7471A	500-43984

Report Basis
T = Total

General Chemistry					
Analysis Batch:500-43817					
500-13006-1	CASSVILLE LANDFILL ASH	T	Solid	PercentMoisture	
500-13006-2	CASSVILLE LEACHATE PAD ASH	T	Solid	PercentMoisture	

Report Basis
T = Total

Client: Dairyland Power Co-op

Job Number: 500-13006-1

Method Blank - Batch: 500-43984

Method: 7471A
Preparation: 7471A

Lab Sample ID: MB 500-43984/1-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 08/07/2008 1227
Date Prepared: 08/07/2008 0900

Analysis Batch: 500-43989
Prep Batch: 500-43984
Units: ug/Kg

Instrument ID: Leeman Labs PS200 Merci
Lab File ID: N/A
Initial Weight/Volume: 0.60 g
Final Weight/Volume: 50 mL

Analyte	Result	Qual	RL
Mercury	ND		17

Lab Control Spike - Batch: 500-43984

Method: 7471A
Preparation: 7471A

Lab Sample ID: LCS 500-43984/2-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 08/07/2008 1229
Date Prepared: 08/07/2008 0900

Analysis Batch: 500-43989
Prep Batch: 500-43984
Units: ug/Kg

Instrument ID: Leeman Labs PS200 Merci
Lab File ID: N/A
Initial Weight/Volume: 0.60 g
Final Weight/Volume: 50 mL

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Mercury	167	167	100	80 - 120	

Calculations are performed before rounding to avoid round-off errors in calculated results.

TestAmerica
ANALYTICAL TESTING CORPORATION

CHAIN OF CUSTODY REPORT

1380 Busch Parkway
Buffalo Grove, Illinois 60089-4505
(847) 808-7766
FAX (847) 808-7772

500-13006

Client: Dairyland Power Cooperative	Project Name: Cassville Landfill	TAT (in days): Std (5-7) 4 3 2 1	
Address: 3251 East Ave. South	Project Number:	For RUSH requests:	DATE RESULTS NEEDED:
La Crosse, WI 54601	PO#:	Quote ID:	Received at laboratory: ☐ ambient ☐ ice / Lab temp.
Phone #: (608) 787-1441 Fax #: ( )	State & Program:	Invoice will be sent to the Client Address unless other arrangements have been made.	Deliverable Package: ☒ STD ☐ Other / Delivery Method: TA☐ Client☐ Shipped
PM/Report to: Tod Schwartzhoff			
Email: TCS@dairynet.com			
Sampler: Dave Lesky			

	FIELD ID, LOCATION	PID Readings	DATE COLLECTED	TIME COLLECTED	SAMPLE MATRIX	# of Bottles Preservative Used: MeOH	NaHSO4	HCl	HNO3	H2SO4	NaOH	NONE	TOTAL # OF BOTTLES	Measure Total	THIS SECTION FOR LAB USE ONLY: LABORATORY ID NUMBER
1	1 Cassville Landfill Ash		7/23/08		Ash							1	1	X	
2	2 Cassville Leachate Pad Ash		7/23/08		Ash							1	1	X	
3															
4															
5															
6															
7															
8															
9															
10															

RELINQUISHED	DATE	RECEIVED	DATE	RELINQUISHED	DATE	RECEIVED	DATE
	8/4/08 1400		8/5/08 0945				
RELINQUISHED	DATE	RECEIVED	DATE	RELINQUISHED	DATE	RECEIVED	DATE

COMMENTS:

PAGE | OF

Login Sample Receipt Check List

Client: Dairyland Power Co-op

Job Number: 500-13006-1

Login Number: 13006
Creator: Lunt, Jeff T
List Number: 1

List Source: TestAmerica Chicago

Question	T / F/ NA	Comment
Radioactivity either was not measured or, if measured, is at or below background	True	
The cooler's custody seal, if present, is intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	False	
Cooler Temperature is recorded.	True	16.8,17.2
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the sample IDs on the containers and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
VOA sample vials do not have headspace or bubble is <6mm (1/4") in diameter.	True	
If necessary, staff have been informed of any short hold time or quick TAT needs	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	

DAIRYLAND POWER COOPERATIVE
AS RECEIVED COAL ANALYSIS
Special Tests From ID Number 532 To ID Number540

29-May-09

Sample Date	ID Number	Air Dry Moisture	Inherent Moisture	Total Moisture	BTU	Ash	Sulfur	Volatiles	Fixed Carbon	MAF BTU	SO2 lb/MBTU	Special Test	Comments
5/20/2009	532	25.60	1.74	26.89	3247	0.00	0.000	0.00	0.00	4441	0.00		-1# AD LOI=18.78
5/20/2009	533	20.99	1.40	22.10	2742	0.00	0.000	0.00	0.00	3519	0.00		-1# AE LOI=12.79
5/20/2009	534	22.60	1.96	24.11	3330	0.00	0.000	0.00	0.00	4388	0.00		-1# AF LOI=16.42
5/20/2009	535	13.75	1.30	14.88	3099	0.00	0.000	0.00	0.00	3640	0.00		-1# BD LOI =11.29
5/20/2009	536	14.12	1.82	15.68	3646	0.00	0.000	0.00	0.00	4325	0.00		-1# BE LOI=20.14
5/20/2009	537	17.04	1.73	18.48	3109	0.00	0.000	0.00	0.00	3814	0.00		-1# BF LOI=15.88
5/20/2009	538	22.80	1.73	24.13	2718	0.00	0.000	0.00	0.00	3583	0.00		-1# CD LOI=15.88
5/20/2009	539	15.59	1.85	17.15	3280	0.00	0.000	0.00	0.00	3959	0.00		-1# CE LOI=18.55
5/20/2009	540	22.31	1.60	23.55	3040	0.00	0.000	0.00	0.00	3977	0.00		-1# CF LOI=18.17

Cassville Sample ID