

**APPENDIX F**  
**PRELIMINARY DRAINAGE CALCULATIONS**



**CALCULATION SUMMARY &  
CONTROL SHEET**

CALCULATION SET NO.

**371583-CE-01**

PRELIM.	FINAL	VOID	REVISION
X			B

Sheet 1 of 15

CLIENT: DOMINION

Discipline: CIVIL

PROJECT TITLE: MIRANT - WILLOW PASS COMBINED CYCLE POWER PLANT

Project No. 371583

SUBJECT: STORM DRAINAGE CALCULATIONS

COMPLETED BY: DAWN HATHAWAY *DH*

DATE: 5/5/2008

CHECKED BY: JOHN PURDY, P.E. *J Purdy*

DATE: 5/7/08

APPROVED BY: MARIO SCACCO, P.E. *M Scacco*

DATE: 5/7/08

REVISION SUMMARY:  
REVISED FOR NEW LAYOUT - SIEMENS FLEX 10 D

TOTAL NUMBER OF SHEETS  
IN THIS ISSUE:

SHEETS REVISED, ADDED,  
or DELETED:

PROBLEM STATEMENT: PRELIMINARY DRAINAGE STUDY OF PEAK FLOWS TO STRUCTURES FOR 25-YEAR AND 100-YEAR STORMS PER DESIGN BASIS CRITERIA.

RESULTS & CONCLUSIONS: SEE ATTACHMENTS FOR RESULTS.

DESIGN BASIS & ASSUMPTIONS: DRAINAGE DESIGN BASED ON 25-YEAR AND 100-YEAR STORM EVENTS

UNVERIFIED ASSUMPTIONS/OPEN ITEMS:

REFERENCES: NOAA ATLAS-2 VOLUME-XI ISOPLUVIALS OF 24 HOUR PRECIPITATION, FEMA FIRM #060025012B, USDA NRCS SOIL SURVEY

ATTACHMENTS (Including number of pages):

**COMPUTER PROGRAM DISCLOSURE INFORMATION:**

Program Used SCS (NRCS) TR-55 Rev No.: 1.00.08 CH2M Verified  
Issue Date: 12/2/2004  
 Yes  
 No

## Willow Pass Drainage Calculation

6/19/08

The Willow Pass Generating Station Drainage Calculation considers a tributary drainage area of 42.3 acres. Of which 26 acres will be disturbed during project construction.

Existing site conditions consist of an industrial facility made up of approximately 95% impermeable surfacing.

The proposed power generating station finished site condition will approximately be 50% impervious.

Clean storm water shall be conveyed by a system of ditches, swales, catch basins and pipes to existing Outfalls E001 and E009. Areas of potential oil/chemical contamination will be contained within concrete curbs. Storm water contained within the containment will be conveyed to an on-site oil water separator.

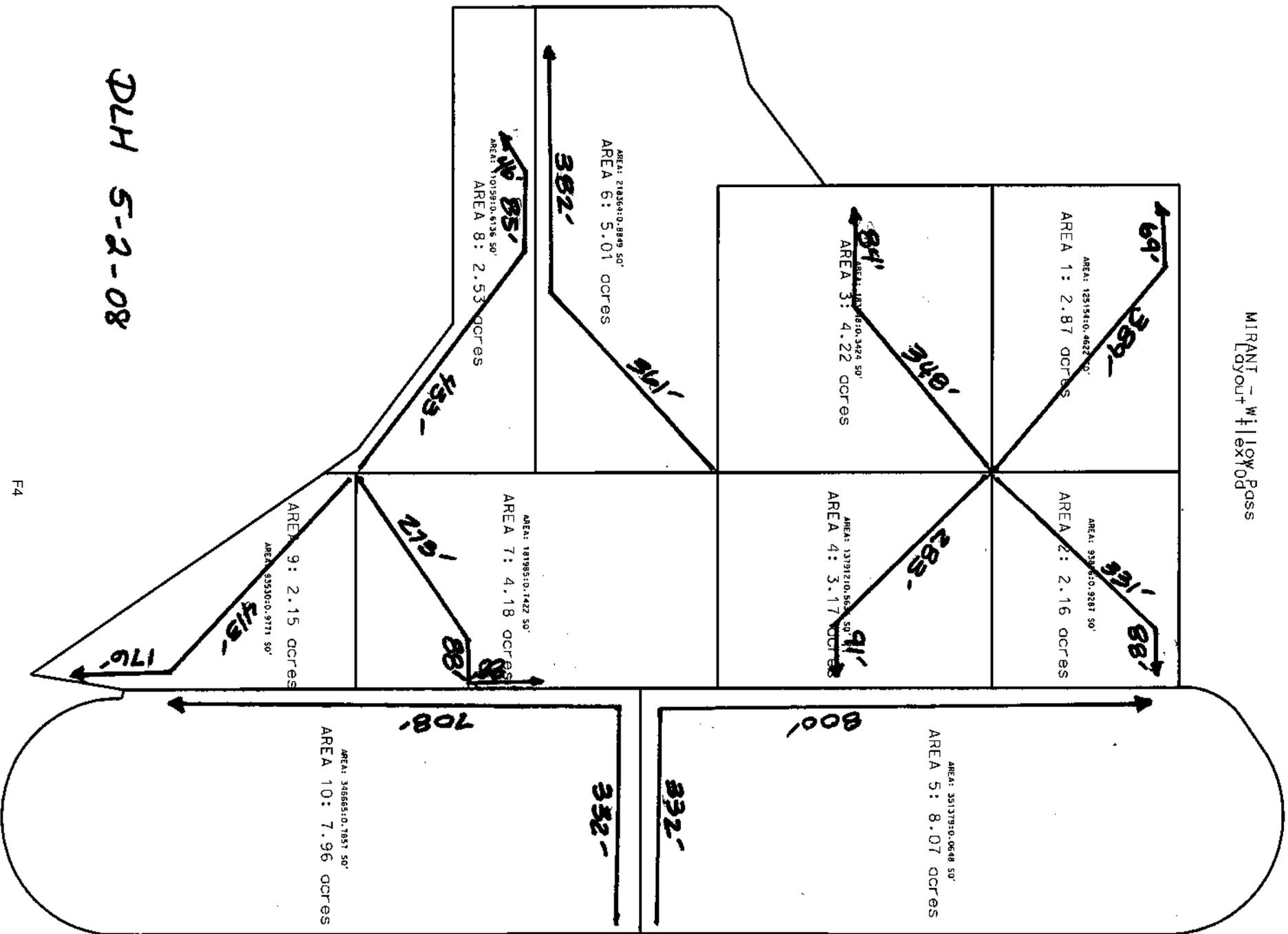
Calculation Assumptions as follows:

- Calculation Method - SCS TR-55
- Total Tributary Area - 42.3 Acres
- Rainfall Distribution Type - Type 1A
- Hydrologic Soil Group - D (see NRCS Soil Map attached)
- Curve Number - 93 (Urban Industrial)

**MIRANT**  
**Willow Pass Generating Station Site (Pittsburg) Rev C**  
**25yr-24hr Storm**

<u>SUB-AREA</u>	<u>FLOW (cfs)</u>
BASIN 1	1.86
BASIN 2	1.40
BASIN 3	2.74
BASIN 4	2.06
BASIN 5	4.99
BASIN 6	3.20
BASIN 7	2.70
BASIN 8	1.63
BASIN 9	1.39
BASIN 10	4.97
<u>TOTAL AREA</u>	<u>TOTAL FLOW</u>
42.3 acres	26.71 cfs

MIRANT Willow Pass  
Layout 11ex10d



DLH 5-2-08

WinTR-55 Current Data Description

--- Identification Data ---

User: CH2MHILL Date: 5/2/2008  
 Project: MIRANT - 371583 Units: English  
 SubTitle: Willow Pass Flex10d Areal Units: Acres  
 State: California  
 County: Contra Costa  
 Filename: N:\Mirant\Structural\Civil\Pittsburg\Calcs\Willow Pass Flex10d.w55

--- Sub-Area Data ---

Name	Description	Reach	Area (ac)	RCN	Tc
P1	north-north-east	Outlet	2.87	93	.156
P2	norht-north	Outlet	2.16	93	.152
P3	north-east	Outlet	4.22	93	.153
P4	north	Outlet	3.17	93	.146
P5	north-west	Outlet	8.07	93	.326
P6	south-east	Outlet	5.01	93	.228
P7	south	Outlet	4.18	93	.166
P8	south-south-east	Outlet	2.53	93	.176
P9	south-south	Outlet	2.15	93	.185
P10	south-west	Outlet	7.96	93	.303

Total area: 42.32 (ac)

--- Storm Data ---

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
1.7	2.25	2.6	3.25	3.5	3.7	.0

Storm Data Source: User-provided custom storm data  
 Rainfall Distribution Type: Type IA  
 Dimensionless Unit Hydrograph: <standard>

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MIRANT - 371583  
Willow Pass Flex10d  
Contra Costa County, California

Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period					
	2-Yr (cfs)	5-Yr (cfs)	10-Yr (cfs)	25-Yr (cfs)	50-Yr (cfs)	100-Yr (cfs)
-----						
SUBAREAS						
P1	0.75	1.14	1.39	1.86	2.04	2.19
P2	0.56	0.86	1.05	1.40	1.54	1.65
P3	1.10	1.67	2.04	2.74	3.00	3.22
P4	0.83	1.26	1.54	2.06	2.26	2.42
P5	1.99	3.04	3.72	4.99	5.48	5.87
P6	1.29	1.95	2.39	3.20	3.51	3.76
P7	1.09	1.65	2.02	2.70	2.97	3.18
P8	0.66	1.00	1.22	1.63	1.79	1.92
P9	0.56	0.85	1.03	1.39	1.52	1.63
P10	1.99	3.03	3.70	4.97	5.45	5.84
REACHES						
OUTLET	10.73	16.32	19.94	26.71	29.32	31.40

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Willow Pass Flex10d  
Contra Costa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
-----							
P1							
SHEET	100	0.0166	0.050				0.100
SHALLOW	289	0.0166	1.7				0.039
SHALLOW	69	0.0050	1.7				0.017
					Time of Concentration		.156
							=====
P2							
SHEET	100	0.0166	0.050				0.100
SHALLOW	231	0.0166	1.7				0.031
SHALLOW	88	0.0050	1.7				0.021
					Time of Concentration		.152
							=====
P3							
SHEET	100	0.0166	0.050				0.100
SHALLOW	248	0.0166	1.7				0.033
SHALLOW	84	0.0050	1.7				0.020
					Time of Concentration		.153
							=====
P4							
SHEET	100	0.0166	0.050				0.100
SHALLOW	183	0.0166	1.7				0.024
SHALLOW	91	0.0050	1.7				0.022
					Time of Concentration		.146
							=====
P5							
SHEET	100	0.0166	0.050				0.100
SHALLOW	232	0.0166	1.7				0.031

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Willow Pass Flex10d  
Contra Costa County, California

Sub-Area Time of Concentration Details (continued)

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
SHALLOW	800	0.0050	1.7				0.195
						Time of Concentration	.326
P6							
SHEET	100	0.0166	0.050				0.100
SHALLOW	261	0.0166	1.7				0.035
SHALLOW	382	0.0050	1.7				0.093
						Time of Concentration	.228
P7							
SHEET	100	0.0166	0.050				0.100
SHALLOW	173	0.0166	1.7				0.023
SHALLOW	176	0.0050	1.7				0.043
						Time of Concentration	.166
P8							
SHEET	100	0.0166	0.050				0.100
SHALLOW	333	0.0166	1.7				0.044
SHALLOW	131	0.0050	1.7				0.032
						Time of Concentration	.176
P9							
SHEET	100	0.0166	0.050				0.100
SHALLOW	313	0.0166	1.7				0.042
SHALLOW	176	0.0050	1.7				0.043
						Time of Concentration	.185

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Willow Pass Flex10d  
Contra Costa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
P1	Industrial	D	2.87	93
	Total Area / Weighted Curve Number		2.87	93
			====	==
P2	Industrial	D	2.16	93
	Total Area / Weighted Curve Number		2.16	93
			====	==
P3	Industrial	D	4.22	93
	Total Area / Weighted Curve Number		4.22	93
			====	==
P4	Industrial	D	3.17	93
	Total Area / Weighted Curve Number		3.17	93
			====	==
P5	Industrial	D	8.07	93
	Total Area / Weighted Curve Number		8.07	93
			====	==
P6	Industrial	D	5.01	93
	Total Area / Weighted Curve Number		5.01	93
			====	==
P7	Industrial	D	4.18	93
	Total Area / Weighted Curve Number		4.18	93
			====	==
P8	Industrial	D	2.53	93

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MIRANT - 371583  
Willow Pass Flex10d  
Contra Costa County, California

Sub-Area Land Use and Curve Number Details (continued)

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
-----				
	Total Area / Weighted Curve Number		2.53 =====	93 ==
P9	Industrial	D	2.15	93
	Total Area / Weighted Curve Number		2.15 =====	93 ==
P10	Industrial	D	7.96	93
	Total Area / Weighted Curve Number		7.96 =====	93 ==

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MIRANT - 371583  
Willow Pass Flex10d  
Contra Costa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period					
	2-Yr (cfs) (hr)	5-Yr (cfs) (hr)	10-Yr (cfs) (hr)	25-Yr (cfs) (hr)	50-Yr (cfs) (hr)	100-Yr (cfs) (hr)
<b>SUBAREAS</b>						
P1	0.75 7.97	1.14 7.95	1.39 7.94	1.86 7.94	2.04 7.94	2.19 7.94
P2	0.56 7.96	0.86 7.95	1.05 7.94	1.40 7.94	1.54 7.93	1.65 7.93
P3	1.10 7.96	1.67 7.95	2.04 7.94	2.74 7.94	3.00 7.93	3.22 7.93
P4	0.83 7.96	1.26 7.94	1.54 7.94	2.06 7.94	2.26 7.93	2.42 7.93
P5	1.99 8.07	3.04 8.05	3.72 8.06	4.99 8.04	5.48 8.05	5.87 8.03
P6	1.29 8.02	1.95 8.00	2.39 7.99	3.20 8.00	3.51 7.99	3.76 7.98
P7	1.09 7.97	1.65 7.96	2.02 7.95	2.70 7.95	2.97 7.94	3.18 7.94
P8	0.66 7.99	1.00 7.96	1.22 7.96	1.63 7.95	1.79 7.95	1.92 7.95
P9	0.56 8.00	0.85 7.97	1.03 7.96	1.39 7.95	1.52 7.96	1.63 7.95
P10	1.99 8.05	3.03 8.04	3.70 8.03	4.97 8.04	5.45 8.03	5.84 8.03
<b>REACHES</b>						
OUTLET	10.73	16.32	19.94	26.71	29.32	31.40

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## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

 Soil Map Units

### Special Point Features

-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot
-  Spoil Area
-  Stony Spot

-  Very Stony Spot
-  Wet Spot
-  Other

### Special Line Features

-  Gully
-  Short Steep Slope
-  Other

### Political Features

#### Municipalities

-  Cities
-  Urban Areas

### Water Features

-  Oceans
-  Streams and Canals

### Transportation

-  Rails

### Roads

-  Interstate Highways
-  US Routes
-  State Highways
-  Local Roads
-  Other Roads

## MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: UTM Zone 10N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Contra Costa County, California  
Survey Area Data: Version 7, Dec 6, 2007

Soil Survey Area: Solano County, California  
Survey Area Data: Version 5, Dec 12, 2007

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 6/16/1993; 7/11/1993

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Contra Costa County, California (CA013)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AdA	ANTIOCH LOAM, 0 TO 2 PERCENT SLOPES	90.5	3.5%
AdC	ANTIOCH LOAM, 2 TO 9 PERCENT SLOPES	36.3	1.4%
CaA	CAPAY CLAY, 0 TO 2 PERCENT SLOPES	417.6	16.3%
CaC	CAPAY CLAY, 2 TO 9 PERCENT SLOPES	71.1	2.8%
Cc	CLEAR LAKE CLAY	174.9	6.8%
Ja	JOICE MUCK	640.8	25.0%
Ob	OMNI SILTY CLAY	174.4	6.8%
RbC	RINCON CLAY LOAM, 2 TO 9 PERCENT SLOPES	162.7	6.3%
So	SYCAMORE SILTY CLAY LOAM	75.8	3.0%
W	WATER	549.5	21.4%
Solano County, California (CA095)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
W	Water	169.7	6.6%
Totals for Area of Interest (AOI)		2,563.4	100.0%

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

**Group A.** Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

**Group B.** Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

**Group C.** Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

**Group D.** Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

if a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Lower

