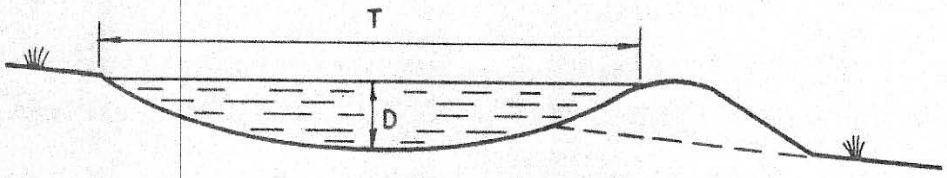
PARABOLIC DIVERSION DESIGN, WITHOUT FREEBOARD

RETARDANCE - D & B
GRADE, % - 0.25

V_1 Based on Permissible Velocity of the Soil With Retardance "D"
Top Width, Depth & V_2 Based on Retardance "B"

Q	V_1 = 2.0			V_1 = 2.5			V_1 = 3.0			V_1 = 3.5			V_1 = 4.0			V_1 = 4.5			V_1 = 5.0			V_1 = 5.5			V_1 = 6.0		
cfs	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2
15																											
20																											
25	11	3.3	1.0																								
30	13	3.1	1.1																								
35	15	3.0	1.1																								
40	17	3.0	1.2	12	3.6	1.4																					
45	19	2.9	1.2	13	3.5	1.4																					
50	21	2.9	1.2	15	3.4	1.5																					
55	24	2.9	1.2	16	3.4	1.5																					
60	26	2.9	1.2	18	3.4	1.5																					
65	28	2.9	1.2	19	3.3	1.6																					
70	30	2.9	1.2	20	3.3	1.6	14	4.0	1.8																		
75	32	2.9	1.2	22	3.3	1.6	15	3.9	1.9																		
80	34	2.9	1.2	23	3.3	1.6	16	3.9	1.9																		
90	38	2.9	1.2	26	3.3	1.6	18	3.9	1.9																		
100	42	2.9	1.2	29	3.2	1.6	20	3.8	2.0																		
110	46	2.9	1.2	31	3.2	1.6	22	3.8	2.0																		
120	50	2.8	1.3	34	3.2	1.6	24	3.8	2.0	17	4.5	2.3															
130	55	2.9	1.2	37	3.2	1.6	26	3.8	2.0	18	4.4	2.4															
140	59	2.9	1.3	40	3.2	1.7	28	3.7	2.0	20	4.4	2.3															
150	63	2.9	1.3	43	3.2	1.7	30	3.7	2.1	21	4.3	2.5															
160	67	2.8	1.3	45	3.2	1.7	32	3.7	2.1	22	4.3	2.5															
170	71	2.8	1.3	48	3.2	1.7	34	3.7	2.1	24	4.3	2.5	19	5.0	2.8												
180	75	2.8	1.3	51	3.2	1.7	35	3.7	2.1	25	4.2	2.6	20	4.9	2.8												
190	79	2.8	1.3	54	3.2	1.7	37	3.7	2.1	26	4.2	2.6	21	4.9	2.8												
200	84	2.8	1.3	57	3.2	1.7	39	3.7	2.1	28	4.2	2.6	22	4.8	2.9												
220	92	2.8	1.3	62	3.2	1.7	43	3.7	2.1	30	4.2	2.6	24	4.8	2.9												
240				68	3.2	1.7	47	3.6	2.1	33	4.2	2.6	26	4.8	3.0												
260				73	3.2	1.7	51	3.6	2.1	35	4.2	2.6	28	4.7	3.0	21	5.5	3.3									
280				79	3.2	1.7	55	3.6	2.1	38	4.1	2.6	30	4.6	3.1	23	5.4	3.4									
300				84	3.2	1.7	59	3.6	2.1	41	4.1	2.6	32	4.6	3.1	25	5.4	3.4									



T = Top width, Retardance "B"
D = Flow depth, Retardance "B"
V_1 = Permissible velocity, Retardance "D"
V_2 = Velocity, Retardance "B"

T and D are the dimensions required to carry the design flow. Add freeboard and allowance for settlement as necessary.

9-14.11

Exhibit 9-1.1

REFERENCE	U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ENGINEERING & WATERSHED PLANNING UNIT UPPER DARBY, PENNSYLVANIA	RTSC - NE - ENG. 910 SHEET 1 OF 6
SCS - TP - 61		

PARABOLIC DIVERSION DESIGN, WITHOUT FREEBOARD

RETARDANCE - D & B
GRADE, % - 0.50

V_1 Based on Permissible Velocity of the Soil With Retardance "D"
Top Width, Depth & V_2 Based on Retardance "B"

Q	V_1 = 2.0			V_1 = 2.5			V_1 = 3.0			V_1 = 3.5			V_1 = 4.0			V_1 = 4.5			V_1 = 5.0			V_1 = 5.5			V_1 = 6.0		
cfs	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2
15	10	2.3	1.0																							
20	13	2.2	1.0																							
25	17	2.2	1.1	11	2.6	1.4																				
30	20	2.1	1.1	12	2.5	1.4	10	2.9	1.6																	
35	23	2.1	1.1	14	2.5	1.5	11	2.8	1.7																	
40	26	2.1	1.1	16	2.4	1.5	12	2.7	1.8																	
45	29	2.1	1.1	18	2.4	1.5	14	2.7	1.8																	
50	32	2.1	1.1	20	2.4	1.5	15	2.6	1.9	11	3.2	2.1														
55	36	2.1	1.1	22	2.4	1.6	17	2.6	1.9	12	3.1	2.2														
60	39	2.1	1.1	24	2.4	1.6	18	2.6	1.9	13	3.1	2.2														
65	42	2.1	1.1	26	2.4	1.6	20	2.6	1.9	14	3.0	2.3														
70	45	2.1	1.1	28	2.4	1.6	21	2.6	1.9	15	3.0	2.3														
75	48	2.1	1.1	30	2.4	1.6	22	2.6	1.9	16	3.0	2.3	13	3.5	2.5											
80	52	2.1	1.1	32	2.4	1.6	24	2.6	1.9	17	3.0	2.4	13	3.4	2.6											
90	58	2.1	1.1	36	2.4	1.6	27	2.6	2.0	19	3.0	2.4	15	3.4	2.6											
100	64	2.1	1.1	40	2.3	1.6	30	2.6	2.0	21	2.9	2.4	17	3.3	2.7	13	3.8	3.0								
110	71	2.1	1.1	44	2.3	1.6	33	2.6	2.0	23	2.9	2.4	18	3.3	2.8	15	3.7	3.1								
120	77	2.1	1.1	48	2.3	1.6	36	2.6	2.0	25	2.9	2.5	20	3.2	2.9	16	3.6	3.1								
130	83	2.1	1.1	52	2.3	1.6	38	2.6	2.0	27	2.9	2.5	21	3.2	2.8	17	3.6	3.2								
140	90	2.1	1.1	55	2.3	1.6	41	2.6	2.0	29	2.9	2.5	23	3.2	2.8	18	3.6	3.2								
150	96	2.1	1.1	59	2.3	1.6	44	2.6	2.0	31	2.9	2.5	24	3.2	2.9	19	3.6	3.2	16	4.1	3.5					
160				63	2.3	1.6	47	2.5	2.0	34	2.9	2.5	26	3.2	2.9	21	3.5	3.3	16	4.0	3.6					
170				67	2.3	1.6	50	2.5	2.0	36	2.9	2.5	28	3.2	2.9	22	3.5	3.3	17	4.0	3.6					
180				71	2.3	1.6	53	2.5	2.0	38	2.9	2.5	29	3.2	2.9	23	3.5	3.3	18	4.0	3.7					
190				75	2.3	1.6	56	2.5	2.0	40	2.9	2.5	31	3.2	2.9	24	3.5	3.3	19	4.0	3.7					
200				79	2.3	1.6	59	2.5	2.0	42	2.9	2.5	32	3.2	2.9	26	3.5	3.3	20	3.9	3.8	17	4.5	4.0			
220				87	2.3	1.62	65	2.5	2.0	46	2.9	2.5	35	3.2	2.9	28	3.5	3.4	22	3.9	3.8	18	4.4	4.1			
240				94	2.3	1.6	70	2.5	2.0	50	2.9	2.5	39	3.2	2.9	31	3.5	3.4	24	3.9	3.8	20	4.4	4.1			
260							76	2.5	2.0	54	2.9	2.5	42	3.2	3.0	33	3.5	3.4	26	3.8	3.9	22	4.3	4.2			
280							82	2.5	2.0	58	2.9	2.5	45	3.2	3.0	36	3.5	3.4	28	3.8	3.9	23	4.3	4.2	19	4.9	4.5
300							88	2.5	2.0	62	2.9	2.5	48	3.1	3.0	38	3.5	3.4	30	3.8	3.9	25	4.3	4.3	20	4.8	4.6

Exhibit 9-1.1

REFERENCE	U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ENGINEERING & WATERSHED PLANNING UNIT UPPER DARBY, PENNSYLVANIA	RTSC - NE - ENG. 910 SHEET 2 OF 6
SCS - TP - 61		

9-14.12

PARABOLIC DIVERSION DESIGN, WITHOUT FREEBOARD

RETARDANCE - D & B
GRADE, % - 0.75

V_1 Based on Permissible Velocity of the Soil With Retardance "D"
Top Width, Depth & V_2 Based on Retardance "B"

Q	V_1 = 2.0			V_1 = 2.5			V_1 = 3.0			V_1 = 3.5			V_1 = 4.0			V_1 = 4.5			V_1 = 5.0			V_1 = 5.5			V_1 = 6.0		
cfs	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2
15	14	1.8	0.9	8	2.2	1.2																				
20	18	1.8	0.9	10	2.1	1.4																				
25	23	1.7	1.0	13	2.0	1.4	10	2.3	1.7																	
30	27	1.7	1.0	15	2.0	1.4	11	2.3	1.8	9	2.6	1.9														
35	32	1.7	1.0	18	2.0	1.5	13	2.2	1.8	10	2.5	2.1														
40	36	1.7	1.0	20	2.0	1.5	15	2.2	1.8	12	2.4	2.1														
45	40	1.7	1.0	23	2.0	1.5	17	2.2	1.9	13	2.4	2.2														
50	45	1.7	1.0	25	2.0	1.5	18	2.2	1.9	14	2.4	2.2	11	2.8	2.5											
55	49	1.7	1.0	28	2.0	1.5	20	2.2	1.9	16	2.4	2.2	12	2.8	2.5											
60	54	1.7	1.0	30	2.0	1.5	22	2.2	1.9	17	2.4	2.2	13	2.7	2.6											
65	58	1.7	1.0	33	2.0	1.5	24	2.1	1.9	18	2.3	2.3	14	2.7	2.6	11	3.0	2.8								
70	63	1.7	1.0	35	2.0	1.5	25	2.1	1.9	20	2.3	2.3	14	2.7	2.7	12	3.0	2.9								
75	67	1.7	1.0	37	2.0	1.5	27	2.1	1.9	21	2.3	2.3	15	2.6	2.7	13	3.0	2.9								
80	71	1.7	1.0	40	2.0	1.5	29	2.1	1.9	23	2.3	2.3	16	2.6	2.7	14	2.9	3.0								
90	80	1.7	1.0	45	2.0	1.5	33	2.1	1.9	25	2.3	2.3	18	2.6	2.8	15	2.9	3.1	12	3.3	3.3					
100	89	1.7	1.0	50	2.0	1.5	36	2.1	1.9	28	2.3	2.3	20	2.6	2.8	17	2.9	3.1	14	3.2	3.4					
110	98	1.7	1.0	55	2.0	1.5	40	2.1	1.9	31	2.3	2.3	22	2.6	2.8	18	2.8	3.2	15	3.2	3.5					
120				60	2.0	1.5	43	2.1	2.0	34	2.3	2.3	24	2.6	2.8	20	2.8	3.2	16	3.1	3.5	13	3.5	3.8			
130				65	2.0	1.5	47	2.1	2.0	36	2.3	2.3	26	2.6	2.9	22	2.8	3.2	18	3.1	3.6	15	3.5	3.8			
140				69	2.0	1.5	50	2.1	2.0	39	2.3	2.3	28	2.6	2.9	23	2.8	3.2	19	3.1	3.6	16	3.4	3.9			
150				74	2.0	1.6	54	2.1	2.0	42	2.3	2.3	30	2.6	2.9	25	2.8	3.2	20	3.1	3.7	17	3.4	4.0			
160				79	2.0	1.6	57	2.1	2.0	45	2.3	2.3	32	2.6	2.9	26	2.8	3.3	21	3.1	3.7	18	3.4	4.0	14	3.8	4.4
170				84	2.0	1.6	61	2.1	2.0	47	2.3	2.3	34	2.6	2.9	28	2.8	3.2	23	3.0	3.7	19	3.4	4.1	15	3.8	4.4
180				89	2.0	1.6	65	2.1	2.0	50	2.3	2.3	36	2.6	2.9	30	2.8	3.3	24	3.0	3.7	20	3.3	4.1	16	3.7	4.5
190				94	2.0	1.6	68	2.1	2.0	53	2.3	2.3	38	2.6	2.9	31	2.8	3.3	25	3.0	3.7	21	3.3	4.1	17	3.7	4.5
200				99	2.0	1.6	72	2.1	2.0	56	2.3	2.3	40	2.6	2.9	33	2.8	3.3	27	3.0	3.7	22	3.3	4.2	18	3.7	4.5
220							79	2.1	2.0	61	2.3	2.3	44	2.6	2.9	36	2.8	3.3	29	3.0	3.7	24	3.3	4.2	20	3.7	4.6
240							86	2.1	2.0	67	2.3	2.4	48	2.6	2.9	39	2.8	3.3	32	3.0	3.8	26	3.3	4.2	21	3.6	4.6
260							93	2.1	2.0	72	2.3	2.4	52	2.6	2.9	43	2.8	3.3	34	3.0	3.8	28	3.3	4.2	23	3.6	4.7
280							100	2.1	2.0	78	2.3	2.4	56	2.6	2.9	46	2.8	3.3	37	3.0	3.8	30	3.3	4.3	25	3.6	4.7
300										83	2.3	2.4	60	2.6	2.9	49	2.8	3.3	40	3.0	3.8	32	3.3	4.3	26	3.6	4.7

Exhibit 9-1.1

REFERENCE
SCS - TP - 61

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ENGINEERING & WATERSHED PLANNING UNIT
UPPER DARBY, PENNSYLVANIA

RTSC - NE - ENG. 910
SHEET 3 OF 6

9-14.13

PARABOLIC DIVERSION DESIGN, WITHOUT FREEBOARD

RETARDANCE - D & B
GRADE, % - 1.0

V_1 Based on Permissible Velocity of the Soil With Retardance "D"
Top Width, Depth & V_2 Based on Retardance "B"

Q	V_1 = 2.0			V_1 = 2.5			V_1 = 3.0			V_1 = 3.5			V_1 = 4.0			V_1 = 4.5			V_1 = 5.0			V_1 = 5.5			V_1 = 6.0		
cfs	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2
15	16	1.6	0.9	10	1.8	1.2																				
20	21	1.5	0.9	13	1.7	1.3	9	2.0	1.7																	
25	26	1.5	0.9	16	1.7	1.3	11	2.0	1.7	9	2.2	1.9														
30	31	1.5	0.9	19	1.7	1.4	13	1.9	1.8	11	2.1	2.0														
35	36	1.5	0.9	23	1.7	1.4	15	1.9	1.8	12	2.1	2.1	9	2.4	2.4											
40	41	1.5	1.0	26	1.7	1.4	17	1.9	1.8	14	2.0	2.1	10	2.3	2.5											
45	46	1.5	1.0	29	1.7	1.4	19	1.9	1.8	15	2.0	2.1	12	2.3	2.5											
50	52	1.5	1.0	32	1.7	1.4	22	1.9	1.9	17	2.0	2.2	13	2.3	2.5	10	2.6	2.9								
55	57	1.5	1.0	35	1.7	1.4	23	1.9	1.9	19	2.0	2.2	14	2.3	2.6	11	2.6	2.9								
60	62	1.5	1.0	38	1.7	1.4	25	1.9	1.9	20	2.0	2.2	15	2.2	2.6	12	2.5	3.0								
65	67	1.5	1.0	41	1.7	1.4	28	1.9	1.9	22	2.0	2.2	17	2.2	2.6	13	2.6	3.0	11	2.9	3.2					
70	72	1.5	1.0	45	1.7	1.4	30	1.9	1.9	24	2.0	2.2	18	2.2	2.6	14	2.5	3.0	11	2.8	3.3					
75	77	1.5	1.0	48	1.7	1.4	32	1.9	1.9	25	2.0	2.2	19	2.2	2.7	15	2.5	3.1	12	2.8	3.4					
80	82	1.5	1.0	51	1.7	1.4	34	1.9	1.9	27	2.0	2.2	20	2.2	2.6	15	2.5	3.1	13	2.7	3.4					
90	92	1.5	1.0	57	1.7	1.4	38	1.9	1.9	30	2.0	2.2	23	2.2	2.7	17	2.5	3.1	14	2.7	3.5	12	3.0	3.8		
100				63	1.7	1.4	42	1.9	1.9	34	2.0	2.2	25	2.2	2.7	19	2.5	3.1	16	2.7	3.6	13	2.9	3.9		
110				70	1.7	1.4	46	1.9	1.9	37	2.0	2.3	28	2.2	2.7	21	2.4	3.2	17	2.7	3.5	14	2.9	3.9	12	3.2	4.1
120				76	1.7	1.4	50	1.9	1.9	40	2.0	2.3	30	2.2	2.7	23	2.4	3.2	19	2.7	3.6	16	2.9	4.0	13	3.2	4.2
130				82	1.7	1.4	54	1.9	1.9	43	2.0	2.3	33	2.2	2.7	25	2.4	3.2	20	2.6	3.6	17	2.9	4.0	14	3.1	4.3
140				88	1.7	1.4	59	1.9	1.9	47	2.0	2.3	35	2.2	2.7	27	2.4	3.2	22	2.6	3.6	18	2.9	4.1	16	3.1	4.3
150				95	1.7	1.4	63	1.9	1.9	50	2.0	2.3	38	2.2	2.7	29	2.4	3.2	23	2.6	3.7	19	2.9	4.1	17	3.1	4.4
160							67	1.9	1.9	53	2.0	2.3	40	2.2	2.7	30	2.4	3.2	25	2.6	3.7	20	2.8	4.1	18	3.1	4.4
170							71	1.9	1.9	57	2.0	2.3	43	2.2	2.7	32	2.4	3.3	26	2.6	3.7	22	2.9	4.1	19	3.1	4.5
180							75	1.9	1.9	60	2.0	2.3	45	2.2	2.7	34	2.4	3.3	28	2.6	3.7	23	2.8	4.1	20	3.0	4.5
190							79	1.9	1.9	63	2.0	2.3	48	2.2	2.7	36	2.4	3.3	29	2.6	3.7	24	2.8	4.2	21	3.0	4.5
200							83	1.9	1.9	66	2.0	2.3	50	2.2	2.7	38	2.4	3.3	31	2.6	3.7	25	2.8	4.2	22	3.0	4.6
220							91	1.9	1.9	73	2.0	2.3	55	2.2	2.7	42	2.4	3.3	34	2.6	3.7	28	2.8	4.2	24	3.0	4.6
240							99	1.9	1.9	80	2.0	2.3	60	2.2	2.8	45	2.4	3.3	37	2.6	3.7	30	2.8	4.2	26	3.0	4.6
260										86	2.0	2.3	65	2.2	2.7	49	2.4	3.3	40	2.6	3.8	33	2.8	4.2	28	3.0	4.7
280										93	2.0	2.3	70	2.2	2.8	53	2.4	3.3	43	2.6	3.8	35	2.8	4.2	30	3.0	4.7
300										99	2.0	2.3	75	2.2	2.8	56	2.4	3.3	46	2.6	3.8	38	2.8	4.2	32	3.0	4.7

Exhibit 9-1.1

REFERENCE
SCS - TP - 61

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ENGINEERING & WATERSHED PLANNING UNIT
UPPER DARBY, PENNSYLVANIA

RTSC - NE - ENG. 910
SHEET 4 OF 6

9-14.14

PARABOLIC DIVERSION DESIGN, WITHOUT FREEBOARD

RETARDANCE - D & B
GRADE, % - 1.5

V_1 Based on Permissible Velocity of the Soil With Retardance "D"
Top Width, Depth & V_2 Based on Retardance "B"

Q	V_1 = 2.0			V_1 = 2.5			V_1 = 3.0			V_1 = 3.5			V_1 = 4.0			V_1 = 4.5			V_1 = 5.0			V_1 = 5.5			V_1 = 6.0		
cfs	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2
15	20	1.3	0.9	13	1.4	1.2	9	1.7	1.5																	
20	27	1.3	0.9	18	1.4	1.2	12	1.6	1.6	8	1.9	2.0	7	2.1	2.1											
25	33	1.3	0.9	22	1.4	1.2	15	1.6	1.6	10	1.8	2.1	8	2.0	2.3											
30	40	1.3	0.9	26	1.4	1.2	17	1.6	1.6	12	1.8	2.2	10	1.9	2.4	8	2.1	2.6								
35	47	1.3	0.9	31	1.4	1.2	20	1.6	1.7	14	1.7	2.2	11	1.9	2.5	9	2.1	2.7								
40	53	1.3	0.9	35	1.4	1.2	23	1.6	1.7	16	1.7	2.2	13	1.8	2.6	10	2.0	2.8	8	2.4	3.0					
45	60	1.3	0.9	39	1.4	1.2	26	1.6	1.7	18	1.7	2.2	14	1.9	2.6	12	2.0	2.8	9	2.3	3.2					
50	66	1.3	0.9	43	1.4	1.2	29	1.6	1.7	19	1.7	2.2	16	1.8	2.6	13	2.0	2.9	10	2.3	3.3					
55	73	1.3	0.9	48	1.4	1.2	32	1.6	1.7	21	1.7	2.3	17	1.9	2.6	14	2.0	2.9	11	2.2	3.4	9	2.5	3.5		
60	79	1.3	0.9	52	1.4	1.2	34	1.5	1.7	23	1.7	2.3	19	1.8	2.6	15	2.0	2.9	12	2.2	3.4	10	2.5	3.6		
65	86	1.3	0.9	56	1.4	1.2	37	1.5	1.7	25	1.7	2.3	20	1.8	2.6	17	2.0	3.0	13	2.2	3.4	11	2.4	3.7		
70	92	1.3	0.9	60	1.4	1.2	40	1.5	1.7	27	1.7	2.3	22	1.8	2.6	18	2.0	3.0	14	2.2	3.4	12	2.4	3.8	10	2.6	4.0
75	98	1.3	0.9	65	1.4	1.2	43	1.5	1.7	29	1.7	2.3	23	1.8	2.7	19	2.0	3.0	15	2.2	3.5	12	2.4	3.8	11	2.6	4.0
80				68	1.4	1.2	46	1.5	1.7	31	1.7	2.3	25	1.8	2.6	20	2.0	3.0	16	2.2	3.5	13	2.4	3.8	11	2.6	4.2
90				77	1.4	1.2	51	1.5	1.7	35	1.7	2.3	28	1.8	2.7	23	2.0	3.0	18	2.2	3.5	15	2.3	3.9	12	2.5	4.2
100				86	1.4	1.2	57	1.5	1.7	38	1.7	2.3	31	1.8	2.7	25	1.9	3.0	20	2.2	3.5	16	2.3	4.0	14	2.5	4.3
110				94	1.4	1.2	62	1.5	1.7	42	1.7	2.3	34	1.8	2.7	28	1.9	3.0	21	2.2	3.6	18	2.3	4.0	15	2.5	4.4
120							68	1.5	1.7	46	1.7	2.3	37	1.8	2.7	30	1.9	3.0	23	2.1	3.6	20	2.3	4.0	16	2.5	4.4
130							73	1.5	1.7	50	1.7	2.3	40	1.8	2.7	33	1.9	3.0	25	2.1	3.6	21	2.3	4.0	18	2.5	4.5
140							79	1.5	1.7	53	1.7	2.3	43	1.8	2.7	35	1.9	3.1	27	2.1	3.6	23	2.3	4.0	19	2.4	4.5
150							85	1.5	1.7	57	1.7	2.3	46	1.8	2.7	38	1.9	3.1	29	2.1	3.6	24	2.3	4.1	20	2.4	4.5
160							90	1.5	1.7	61	1.7	2.3	49	1.8	2.7	40	1.9	3.1	31	2.1	3.6	26	2.3	4.1	22	2.5	4.5
170							96	1.5	1.7	65	1.7	2.3	52	1.8	2.7	43	1.9	3.1	33	2.1	3.6	27	2.3	4.1	23	2.4	4.5
180										68	1.7	2.3	55	1.8	2.7	45	1.9	3.1	35	2.1	3.6	29	2.3	4.1	24	2.4	4.6
190										72	1.7	2.3	58	1.8	2.7	48	1.9	3.1	37	2.1	3.7	31	2.3	4.1	26	2.4	4.6
200										76	1.7	2.3	61	1.8	2.7	50	1.9	3.1	38	2.1	3.7	32	2.3	4.1	27	2.4	4.6
220										83	1.7	2.3	67	1.8	2.7	55	1.9	3.1	42	2.1	3.7	35	2.3	4.1	30	2.4	4.6
240										91	1.7	2.3	74	1.8	2.7	60	1.9	3.1	46	2.1	3.7	39	2.3	4.1	32	2.4	4.6
260										98	1.7	2.3	80	1.8	2.7	65	1.9	3.1	50	2.1	3.7	42	2.3	4.1	35	2.4	4.6
280													86	1.8	2.7	70	1.9	3.1	54	2.1	3.7	45	2.3	4.1	37	2.4	4.6
300													92	1.8	2.7	75	1.9	3.1	57	2.1	3.7	48	2.3	4.1	40	2.4	4.7

Exhibit 9-1.1

REFERENCE
SCS - TP - 61

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ENGINEERING & WATERSHED PLANNING UNIT
UPPER DARBY, PENNSYLVANIA

RTSC - NE - ENG. 910
SHEET 5 OF 6

9-14.15

PARABOLIC DIVERSION DESIGN, WITHOUT FREEBOARD

RETARDANCE - D & B
GRADE, % - 2.0

V_1 Based on Permissible Velocity of the Soil With Retardance "D"
Top Width, Depth & V_2 Based on Retardance "B"

Q	V_1 = 2.0			V_1 = 2.5			V_1 = 3.0			V_1 = 3.5			V_1 = 4.0			V_1 = 4.5			V_1 = 5.0			V_1 = 5.5			V_1 = 6.0		
cfs	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2
15	25	1.1	0.8	15	1.3	1.2	11	1.4	1.4	8	1.6	1.8															
20	33	1.1	0.8	20	1.3	1.2	15	1.4	1.5	10	1.5	1.9	8	1.7	2.3	6	1.9	2.4									
25	41	1.1	0.8	25	1.2	1.2	18	1.4	1.5	13	1.5	2.0	9	1.7	2.4	8	1.8	2.6									
30	49	1.1	0.8	30	1.2	1.2	22	1.4	1.5	15	1.5	2.0	11	1.6	2.5	9	1.8	2.8	8	2.0	3.0						
35	57	1.1	0.8	35	1.2	1.2	25	1.4	1.5	18	1.5	2.0	13	1.6	2.5	11	1.7	2.9	9	2.0	3.0						
40	65	1.1	0.8	40	1.2	1.2	29	1.4	1.5	20	1.5	2.0	15	1.6	2.5	12	1.7	2.9	10	1.9	3.2	8	2.1	3.4			
45	73	1.1	0.8	45	1.2	1.2	32	1.4	1.5	23	1.5	2.0	16	1.6	2.5	14	1.7	2.9	11	1.9	3.2	9	2.1	3.5			
50	81	1.1	0.8	49	1.2	1.2	36	1.4	1.6	25	1.5	2.0	18	1.6	2.6	15	1.7	2.9	12	1.9	3.2	10	2.0	3.6	8	2.3	3.8
55	89	1.1	0.8	54	1.2	1.2	39	1.3	1.6	28	1.5	2.0	20	1.6	2.6	16	1.7	2.9	14	1.9	3.3	11	2.0	3.7	9	2.2	4.0
60	97	1.1	0.8	59	1.2	1.2	43	1.3	1.6	30	1.5	2.1	22	1.6	2.6	18	1.7	3.0	15	1.9	3.3	12	2.0	3.7	10	2.2	4.0
65				64	1.2	1.2	46	1.4	1.6	33	1.5	2.0	23	1.6	2.6	19	1.7	2.9	16	1.8	3.4	13	2.0	3.7	11	2.2	4.1
70				69	1.2	1.2	50	1.4	1.6	35	1.5	2.1	25	1.6	2.6	21	1.7	3.0	17	1.8	3.4	14	2.0	3.8	12	2.2	4.1
75				73	1.2	1.2	53	1.3	1.6	37	1.5	2.1	27	1.6	2.6	22	1.7	3.0	18	1.8	3.4	15	2.0	3.8	13	2.2	4.1
80				78	1.2	1.2	57	1.4	1.6	40	1.5	2.1	29	1.6	2.6	24	1.7	3.0	19	1.8	3.4	16	2.0	3.8	13	2.1	4.2
90				88	1.2	1.2	64	1.3	1.6	45	1.5	2.1	32	1.6	2.6	27	1.7	3.0	22	1.8	3.4	18	2.0	3.8	15	2.1	4.2
100				97	1.2	1.2	71	1.3	1.6	50	1.5	2.1	36	1.6	2.6	29	1.7	3.0	24	1.8	3.4	20	2.0	3.9	17	2.1	4.3
110							77	1.3	1.6	55	1.5	2.1	39	1.6	2.6	32	1.7	3.0	27	1.8	3.4	22	2.0	3.9	18	2.1	4.3
120							84	1.3	1.6	59	1.5	2.1	43	1.6	2.6	35	1.7	3.0	29	1.8	3.4	23	1.9	3.9	20	2.1	4.3
130							91	1.3	1.6	64	1.5	2.1	46	1.6	2.6	38	1.7	3.0	31	1.8	3.4	25	2.0	3.9	21	2.1	4.4
140							98	1.3	1.6	69	1.5	2.1	50	1.6	2.6	41	1.7	3.0	34	1.8	3.5	27	2.0	3.9	23	2.1	4.4
150										74	1.5	2.1	53	1.6	2.7	44	1.7	3.0	36	1.8	3.5	29	2.0	3.9	25	2.1	4.4
160										79	1.5	2.1	57	1.6	2.7	47	1.7	3.1	38	1.8	3.5	31	1.9	3.9	26	2.1	4.4
170										84	1.5	2.1	60	1.6	2.7	50	1.7	3.1	41	1.8	3.5	33	1.9	4.0	28	2.1	4.4
180										88	1.5	2.1	64	1.6	2.7	53	1.7	3.0	43	1.8	3.5	35	1.9	4.0	29	2.1	4.4
190										93	1.5	2.1	67	1.6	2.7	55	1.7	3.1	45	1.8	3.5	37	1.9	4.0	31	2.1	4.5
200										98	1.5	2.1	71	1.6	2.7	58	1.7	3.1	48	1.8	3.5	39	1.9	4.0	32	2.1	4.5
220													78	1.6	2.7	64	1.7	3.1	53	1.8	3.5	43	1.9	4.0	36	2.1	4.5
240													85	1.6	2.7	70	1.7	3.1	57	1.8	3.5	46	1.9	4.0	39	2.1	4.5
260													92	1.6	2.7	75	1.7	3.1	62	1.8	3.5	50	1.9	4.0	42	2.1	4.5
280													99	1.6	2.7	81	1.7	3.1	67	1.8	3.5	54	1.9	4.0	45	2.1	4.5
300																87	1.7	3.1	71	1.8	3.5	58	1.9	4.0	48	2.1	4.5

Exhibit 9-1.1

9-14.16

REFERENCE
SCS - TP - 61

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ENGINEERING & WATERSHED PLANNING UNIT
UPPER DARBY, PENNSYLVANIA

RTSC - NE - ENG. 910
SHEET 6 OF 6