STORMWATER MANAGEMENT DESIGN REPORT

FOR

WEST CHESTER CHURCH OF THE NAZARENE AND VARIOUS SUROUNDING PROPERTIES

(W00521)

WEST CHESTER TOWNSHIP
BUTLER COUNTY, OHIO

Revised: February 4, 2016
Revised: February 26, 2016

Evans
CivilPro
Engineers, LLC
Consulting Engineers & Surveyors

4700 Duke Drive, Suite 100
Mason, Ohio 45040
(513) 398-1728

RECEIVED
FEB 26 2016
BY:

PROJECT DESCRIPTION

The attached report has been prepared for West Chester Church of the Nazarene and various surrounding properties in West Chester Township, Butler County, Ohio.

The West Chester Church of the Nazarene (WCCN) site is located south of Tylersville Road and east of Cox Road. The parcel was the subject of an original 1986 stormwater management plan with the design of an approximate 2 acre pond. The drainage area tributary to this pond as identified in that 1986 report is 77 acres south of and including Tylersville Road and 163 acres north of Tylersville Road, the Voice of America (VOA) site.

Over the past 30 years several projects and subsequent stormwater management plans were developed and approved by Butler County Engineers Office (BCEO). The following notable stormwater management plans include the following as provided to Evans CivilPro Engineers, LLC by Butler County Engineers Office:

1986-07-04 Vision 2000 Church PUD project (now WCCN)
2002-01-03 Storm Water Drainage Analysis for Kohl's Expansion
2002-03-06 VOA Storm Water Management Report - Southeast Retention Basin
2003-05-26 VOA Storm Water Management Report - Southeast Retention Basin
(Updated to reflect as-built conditions)
2005-07-14 Retention Basin Analysis at Chesterwood Village

Currently the above noted 77 acres including Tylersville Road, a shopping center, Chesterwood Village (a retirement community) and West Chester Church of the Nazarene is 83% developed. North of Tylersville Road is the VOA site (West Chester Township Park) including the Voice of America Centre (a developed shopping center). Stormwater management is provided for this area north of Tylersville Road in a stormwater management basin in the southwest corner of the VOA site immediately east of the entrance to the VOA Centre as evidenced in the 2003 VOA report. This basin was designed for the tributary north of Tylersville Road and associated direct runoff. The release flow from this system drains through a large storm pipe and outlets to the 2 acre WCCN stormwater management pond.

Our understanding based upon the information provided in discussions with the Butler County Engineers Office the VOA stormwater management basin handles detention requirements upstream of the WCCN storm system and can be considered as a pass-through condition.

South of Tylersville Road the original 1986 report took into consideration the project site, being 68.9 acres with 26 acres determined to be paved area. The remaining area of the total 240 acre drainage shed was considered as a pass-through condition. The 2002 Kohl's expansion report addressed its approximately 20,000 ft.^{2} expansion and noted insignificant effect on the existing on-site detention as previously provided.

South and east of WCCN, Chesterwood Village was developed in 2005 and provided on-site stormwater management within its development area to work in conjunction with the WCCN pond.

HYDROLOGY AND HYDRAULICS

The stormwater management calculations for this current submission were prepared using ICPR, Version 3.02 (2002), hydraulic modeling software. The method for the computation of peak runoff rates and volumes was the Natural Resource Conservation Service Technical Release 55 (NRCS TR-55) and in conjunction with prior reports.

DESIGN SUMMARY

General

This project site is unique from various perspectives. The West Chester Church of the Nazarene (WCCN) project site south of Tylersville Road is currently almost completely developed, 83% developed. The project was previously designed and approved under prior Butler County storm water regulations. The storm water management basin was designed and constructed in its entirety at the time of initial project construction in 1986. The project was designed and constructed as an in-line basin with an upstream flow-through element. The upstream element, north of Tylersville Road, has since introduced storm water management components and will continue to be governed by Butler County and OEPA regulations separate from the WCCN project. A base flow, generally due to this upstream pass-through condition, is being maintained.

A feature introduced with the redesign of the basin outlet is the water quality orifice which has been designed with an adjustable orifice plate. The intent of this adjustable orifice plate is to establish and generally maintain a normal water surface of 872.00 in the pond. The adjustable orifice plate provides for the flexibility to adjust the Weir in order to obtain a best fit for the average base flow, while maintaining the required water quality volume.

The goal of this project and stormwater analysis is to provide a design to provide for water quality volume as required by OEPA and reduce overall pond release rates to less than pre-developed conditions. The original study did not account for post construction water quality volume nor did it address flow increases in the most frequent storm events. The original study provided controls for larger storm events. The goal of this project is to reduce some larger post-developed storm events to or less than the pre-developed 1-year storm event in order to reduce the flashy nature of increased flow rate experienced with increased impervious surface. The project design has achieved these goals.

This project analysis calculations have ignored the benefit of several factors that if taken into account would and will enhance the results. First, the upstream condition flow rates have been assumed at pre-developed rates. The upstream area North of Tylersville Road now has a storm water management basin controlling and actually reduces rates to the subject pond system. It is conceivable that the upstream system may require future analysis to determine conformance to current County and State regulations if further development occurs in this upstream area, additionally benefitting this system.

On the subject site itself, there are two additional stormwater management basins currently functioning in the Eastern portion of the site prior to outletting into the subject pond. These basins, not part of the original stormwater analysis, reduce flow rates to below pre-developed conditions for their particular subareas. The current analysis assumes these areas as developed for inflow purposes

however ignores the benefit of the existing storm water management capacity and reduction in flow rates.

The project analysis assumes the 17% of the undeveloped project site area to be fully developed.

The above analysis criteria has been utilized to best compare current flow enhancements with the prior original 1986 pond design. With the upstream improvements in place, flow rate reductions for the pond will be further enhanced. The intent of this project is to allow for the completion of development of the 12 acres on the project site without further modifications to the pond or individual future detention for these areas. The Water Quality volume design are as per current OEPA regulations and the modified pond outlet release structure system is intended to be hereby approved without further County individual site stormwater management requirements.

Evans CivilPro Engineers, LLC
2/4/2016

Base Basin Release Rates - 1986 Design Calcs

Date	Project Calc Name	Ex Shed	Notes	Tc	CN	Q1	Q2	Q5	Q10	Q25	Q50	Q100
		Ac										
7/4/1986	Original Church Site	68.9	project site only	43.0	80	39.4	52.1	76.0	94.1	116.6	135.9	151.5
7/4/1986	Original Church Site & VOA	240.0	77 ac south of Tylersville & 163 from VOA site = 240 ac to Basin	81.0	80	86.7	114.6	167.3	207.1	256.7	299.1	333.7
		Developed		Tc	CN	Q1	Q2	Q5	Q10	Q25	Q50	Q100
		Ac										
7/4/1986	Original Church Site	68.9	project site only	42.0	86	54.8	69.5	96.4	116.2	140.5	161.0	177.6
			Only 26 ac paved									
		240.0	77 ac south of Tylersville & 163 from VOA site = 240 ac to Basin (tc based on 5000')	81.0	81	91.9	120.6	174.5	215.1	265.4	308.4	343.3

Revised Basin Future Release Rates

					Avg CN	Q1	Q2	Q5	Q10	Q25	Q50	Q100
Future Development Included south of Tylersville		241.8	*1 (see note below)	60.0	78.3	28.0	51.0	82.0	111.0	169.0	231.0	307.0
Future Development Included south of Tylersville		241.8	Sloped Option west end of basin	60.0	78.3	29.0	53.0	84.0	113.0	173.0	237.0	311.0
Future Development Included south of Tylersville		243.2	Sloped Option & 1.4 ac Add'l area	60.0	78.3	29	53	85	114	175	239	313
7/4/1986	Original Church Site & VOA Release	240.0	77 ac south of Tylersville & 163 from VOA site = 240 ac to Basin			87	115	167	207	257	299	334
			Anticipated Reduction in flowrate (cfs) vs 1986 Release =			-58	-62	-82	-93	-82	-60	-21
			Anticipated % Reduction in flowrate vs 1986 Release =			-66.6%	-53.8%	-49.2%	-45.0%	-31.8%	-20.1%	-6.2%
						Q1	Q2	Q5	Q10	Q25	Q50	Q100

*1 - No add'l detention required at future Chesterwood and other future development sites south of Tylersville Rd;
Conservative comparison ignoring benefit of ex detention of 9.3+1.1 ac at ex Chesterwood; ignoring benefit of upstream VOA reduction in flowrate.

Evans CivilPro Engineers, LLC

2/4/2016

West Chester Church of the Nazarene

W00521

Existing less area of 879 & 880 outside Det Esmt

Contour Elevation	Contour Areas (SF)	Contour Areas (SF) Ex Pond	Contour Areas (SF) A	Contour Areas (SF) B	Contour Areas (SF) C	Contour Areas (Ac)	Average (sq ft)	Depth (ft)	Volume (cu ft)	Cumulative Volume (cu ft)
BASIN 2:	**Ex Pond Modified**									
	0									
873	**85,033**	85,033				**1.9521**				
							90,678	1.00	90,678	90,678
874	**96,322**	96,322				**2.2112**				
							103,111	1.00	103,111	193,788
875	**109,899**	109,899				**2.5229**				
							113,967	1.00	113,967	307,755
876	**118,035**	118,035				**2.7097**				
							120,771	0.72	86,955	394,710
876.72	**123,506**	123,506				**2.8353**				
							124,570	0.28	34,880	429,590
877	**125,634**	125,634				**2.8842**				
							131,121	1.00	131,121	560,711
878	**136,608**	136,608				**3.1361**				
							145,909	1.00	145,909	706,620
879	**155,210**	**155,210**				**3.5631**				
							156,942	0.36	56,499	763,119
879.36	**158,674**	**158,674**				**3.6427**				
							161,754	0.64	103,522	866,641
880	**164,833**	**164,833**				**3.7840**				
		Ex Mod	**A**	**B**	**C**			Total Volume (cf) =		**866,641**
								Ac-ft =		**19.90**

Modified Ex Pond with addition of Areas D, C4 & C4.1

Contour Elevation	Contour Areas (SF)	Contour Areas (SF)	Contour Areas (SF)	Contour Areas (SF)	Contour Areas (SF)	Contour Areas (Ac)	Average (sq ft)	Depth (ft)	Volume (cu ft)	Cumulative Volume (cu ft)
BASIN 3:	**Proposed**									
872	**81,400**	81,400				**1.8687**				
	assumed 2:1	rock edge from 873 to 872					82,853	0.80	66,283	66,283
872.8	**84,306**	84,306				**1.9354**				
							84,670	0.20	16,934	83,217
873	**85,033**	85,033				**1.9521**				
							107,115	1.00	107,115	190,331
874	**129,196**	129,196				**2.9659**				
							144,555	1.00	144,555	334,886
875	**159,914**	159,914				**3.6711**				
							166,791	1.00	166,791	501,677
876	**173,668**	173,668				**3.9869**				
							176,098	0.72	126,790	628,467
876.72	**178,527**	178,527				**4.0984**				
							179,472	0.28	50,252	678,720
877	**180,417**	180,417				**4.1418**				
							183,876	1.00	183,876	862,596
878	**187,335**	187,335				**4.3006**				
							190,536	1.00	190,536	1,053,132
879	**193,737**	193,737				**4.4476**				
							194,957	0.36	70,185	1,123,316
879.36	**196,178**	196,178				**4.5036**				
							198,347	0.64	126,942	1,250,259
880	**200,517**	200,517				**4.6032**				
		Ex Mod	**0**	**0**	**0**			Total Volume (cf) =		**1,250,259**
								Ac-ft =		**28.70**

W00521 _ Ex Mod & D+C4-C4.1 _ OUTPUT SUMMARY - 243.2 ac Inflow at CN 78.3 (inc 68.5 ac Future 1.4 ac and slope grading option 2016-02-04

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
A-011	BASE	001	0.00	872.00	872.00	0.0000	13	13.59	29	0.00	0
A-011	BASE	002	0.00	872.00	872.00	0.0000	13	13.41	53	0.00	0
A-011	BASE	005	0.00	872.00	872.00	0.0000	13	13.29	85	0.00	0
A-011	BASE	010	0.00	872.00	872.00	0.0000	13	13.22	114	0.00	0
A-011	BASE	025	0.00	872.00	872.00	0.0000	13	13.09	175	0.00	0
A-011	BASE	050	0.00	872.00	872.00	0.0000	13	13.00	239	0.00	0
A-011	BASE	100	0.00	872.00	872.00	0.0000	13	12.95	313	0.00	0
A-012	BASE	001	13.59	874.43	880.00	0.0050	132915	12.58	81	13.59	29
A-012	BASE	002	13.39	875.14	880.00	-0.0050	151945	12.58	128	13.41	53
A-012	BASE	005	13.29	876.00	880.00	0.0050	163590	12.50	189	13.29	85
A-012	BASE	010	13.22	876.68	880.00	-0.0050	168499	12.50	242	13.22	114
A-012	BASE	025	13.09	877.51	880.00	0.0050	174692	12.50	319	13.09	175
A-012	BASE	050	13.00	878.11	880.00	0.0050	179026	12.50	389	13.00	239
A-012	BASE	100	12.95	878.73	880.00	0.0050	183345	12.50	472	12.95	313

Basins

Name: A-012 Node: A-012 Status: Onsite
Group: BASE Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh484 Peaking Factor: 484.0
Rainfall File: Storm Duration(hrs): 0.00
Rainfall Amount(in): 0.000 Time of Conc(min): 60.00
Area(ac): 243.200 Time Shift(hrs): 0.00
Curve Number: 78.30 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Nodes

Name: A-011 Base Flow(cfs): 0.000 Init Stage(ft): 872.000
Group: BASE Warn Stage(ft): 872.000
Type: Time/Stage

Time(hrs)	Stage(ft)
0.00	872.000
999.00	872.000

Name: A-012 Base Flow(cfs): 0.000 Init Stage(ft): 872.000
Group: BASE Warn Stage(ft): 880.000
Type: Stage/Area

Stage(ft)	Area(ac)
872.000	1.6900
872.800	1.7700
873.000	1.7800
874.000	2.7500
875.000	3.4400
876.000	3.7500
876.720	3.8700
877.000	3.9200
878.000	4.0900
879.000	4.2500
879.360	4.3100
880.000	4.4100

Pipes

```
        Name: Culvert             From Node: A-012            Length(ft): 75.00
       Group: BASE                  To Node: A-011               Count: 1
                                                        Friction Equation: Automatic
             UPSTREAM       DOWNSTREAM                Solution Algorithm: Most Restrictive
    Geometry: Horz Ellipse  Horz Ellipse                        Flow: Both
    Span(in): 81.00         81.00                   Entrance Loss Coef: 0.00
    Rise(in): 60.00         60.00                       Exit Loss Coef: 1.00
  Invert(ft): 872.800       872.420                     Bend Loss Coef: 0.00
Manning's N: 0.013000       0.013000                 Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000         0.000                      Inlet Ctrl Spec: Use dc
Bot Clip(in): 0.000         0.000                   Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Horizontal Ellipse Concrete: Square edge with headwall

Downstream FHWA Inlet Edge Description:
Horizontal Ellipse Concrete: Square edge with headwall


==========================================================================================
==== Weirs ===============================================================================
==========================================================================================

        Name: A-011W1             From Node: A-012
       Group: BASE                  To Node: A-011
        Flow: Both                    Count: 1
        Type: Vertical: Mavis      Geometry: Trapezoidal

          Bottom Width(ft): 9.70
      Left Side Slope(h/v): 0.21
     Right Side Slope(h/v): 0.21
                Invert(ft): 876.730
    Control Elevation(ft): 876.730
  Struct Opening Dim(ft): 9999.00
                                       TABLE
           Bottom Clip(ft): 0.000
              Top Clip(ft): 0.000
       Weir Discharge Coef: 3.200
    Orifice Discharge Coef: 0.600


------------------------------------------------------------------------------------------
        Name: A-011W3             From Node: A-012
       Group: BASE                  To Node: A-011
        Flow: Both                    Count: 1
        Type: Vertical: Mavis      Geometry: Circular

                Span(in): 7.00
                Rise(in): 7.00
              Invert(ft): 872.000
    Control Elevation(ft): 872.000
                                       TABLE
         Bottom Clip(in): 0.000
```

```
               Top Clip(in): 0.000
          Weir Discharge Coef: 3.200
      Orifice Discharge Coef: 0.600


================================================================================
==== Hydrology Simulations =====================================================
================================================================================

         Name: 001
     Filename: P:\Car-2e\Calculations\SWM\ICPR\001.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Scsii-24
    Rainfall Amount(in): 2.33

Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          5.00

--------------------------------------------------------------------------------

         Name: 002
     Filename: P:\Car-2e\Calculations\SWM\ICPR\002.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Scsii-24
    Rainfall Amount(in): 2.86

Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          5.00

--------------------------------------------------------------------------------

         Name: 005
     Filename: P:\Car-2e\Calculations\SWM\ICPR\005.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Scsii-24
    Rainfall Amount(in): 3.49

Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          5.00

--------------------------------------------------------------------------------

         Name: 010
     Filename: P:\Car-2e\Calculations\SWM\ICPR\010.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: Scsii-24
    Rainfall Amount(in): 3.99

Time(hrs)       Print Inc(min)
```

24.000	5.00

Name: 025
Filename: P:\Car-2e\Calculations\SWM\ICPR\025.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Scsii-24
Rainfall Amount(in): 4.70

Time(hrs)	Print Inc(min)
24.000	5.00

Name: 050
Filename: P:\Car-2e\Calculations\SWM\ICPR\050.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Scsii-24
Rainfall Amount(in): 5.32

Time(hrs)	Print Inc(min)
24.000	5.00

Name: 100
Filename: P:\Car-2e\Calculations\SWM\ICPR\100.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: Scsii-24
Rainfall Amount(in): 6.04

Time(hrs)	Print Inc(min)
24.000	5.00

==========

==== Routing Simulations ==========

==========

Name: 001 Hydrology Sim: 001
Filename: P:\Car-2e\Calculations\SWM\ICPR\001.I32

Execute: Yes Restart: No Patch: No
Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000
Start Time(hrs): 0.000 End Time(hrs): 24.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
24.000	15.000

Group	Run
BASE	Yes

Name: 002 Hydrology Sim: 002
Filename: P:\Car-2e\Calculations\SWM\ICPR\002.I32

Execute: Yes Restart: No Patch: No
Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000
Start Time(hrs): 0.000 End Time(hrs): 24.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
24.000	15.000

Group	Run
BASE	Yes

Name: 005 Hydrology Sim: 005
Filename: P:\Car-2e\Calculations\SWM\ICPR\005.I32

Execute: Yes Restart: No Patch: No
Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000
Start Time(hrs): 0.000 End Time(hrs): 24.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
24.000	15.000

Group	Run
BASE	Yes

```
------------------------------------------------------------------------------------------------------------
         Name: 010                  Hydrology Sim: 010
     Filename: P:\Car-2e\Calculations\SWM\ICPR\010.I32

      Execute: Yes         Restart: No           Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                     End Time(hrs): 24.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
       Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          15.000

Group           Run
--------------- -----
BASE            Yes

------------------------------------------------------------------------------------------------------------
         Name: 025                  Hydrology Sim: 025
     Filename: P:\Car-2e\Calculations\SWM\ICPR\025.I32

      Execute: Yes         Restart: No           Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
       Start Time(hrs): 0.000                     End Time(hrs): 24.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
       Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          15.000

Group           Run
--------------- -----
BASE            Yes

------------------------------------------------------------------------------------------------------------
         Name: 050                  Hydrology Sim: 050
     Filename: P:\Car-2e\Calculations\SWM\ICPR\050.I32

      Execute: Yes         Restart: No           Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                    Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
```

```
        Start Time(hrs): 0.000                    End Time(hrs): 24.00
     Min Calc Time(sec): 0.5000                Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          15.000

Group           Run
--------------- -----
BASE            Yes
```

```
         Name: 100                 Hydrology Sim: 100
     Filename: P:\Car-2e\Calculations\SWM\ICPR\100.I32

      Execute: Yes         Restart: No           Patch: No
  Alternative: No

        Max Delta Z(ft): 1.00                   Delta Z Factor: 0.00500
    Time Step Optimizer: 10.000
        Start Time(hrs): 0.000                    End Time(hrs): 24.00
     Min Calc Time(sec): 0.5000                Max Calc Time(sec): 60.0000
        Boundary Stages:                          Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
24.000          15.000

Group           Run
--------------- -----
BASE            Yes
```

W00521 _ Ex Mod & D+C4-C4.1 _ OUTPUT SUMMARY - 243.2 ac Inflow at CN 78.3 (inc 68.5 ac Future 1.4 ac and slope grading option 2016-02-04

Simulation	Node	Group	Time hrs	Stage ft	Warning Stage ft	Surface Area ft2	Total Inflow cfs	Total Outflow cfs	Total Vol In af	Total Vol Out af
001	A-011	BASE	10.02	872.00	872.00	13	0	0	0.0	0.0
001	A-011	BASE	10.27	872.00	872.00	13	0	0	0.0	0.0
001	A-011	BASE	10.52	872.00	872.00	13	0	0	0.0	0.0
001	A-011	BASE	10.77	872.00	872.00	13	0	0	0.0	0.0
001	A-011	BASE	11.02	872.00	872.00	13	0	0	0.0	0.0
001	A-011	BASE	11.27	872.00	872.00	13	0	0	0.0	0.0
001	A-011	BASE	11.52	872.00	872.00	13	0	0	0.0	0.0
001	A-011	BASE	11.77	872.00	872.00	13	0	0	0.0	0.0
001	A-011	BASE	12.00	872.00	872.00	13	0	0	0.0	0.0
001	A-011	BASE	12.25	872.00	872.00	13	0	0	0.0	0.0
001	A-011	BASE	12.50	872.00	872.00	139	4	0	0.0	0.0
001	A-011	BASE	12.75	872.00	872.00	198	14	0	0.2	0.0
001	A-011	BASE	13.00	872.00	872.00	215	23	0	0.6	0.0
001	A-011	BASE	13.26	872.00	872.00	221	28	0	1.1	0.0
001	A-011	BASE	13.50	872.00	872.00	224	29	0	1.7	0.0
001	A-011	BASE	13.76	872.00	872.00	223	29	0	2.4	0.0
001	A-011	BASE	14.01	872.00	872.00	221	28	0	2.9	0.0
001	A-011	BASE	14.26	872.00	872.00	219	26	0	3.5	0.0
001	A-011	BASE	14.51	872.00	872.00	217	24	0	4.0	0.0
001	A-011	BASE	14.76	872.00	872.00	214	22	0	4.5	0.0
001	A-011	BASE	15.01	872.00	872.00	211	20	0	4.9	0.0
001	A-011	BASE	15.26	872.00	872.00	208	19	0	5.3	0.0
001	A-011	BASE	15.51	872.00	872.00	205	17	0	5.7	0.0
001	A-011	BASE	15.76	872.00	872.00	202	16	0	6.1	0.0
001	A-012	BASE	10.02	872.00	880.00	73629	0	0	0.0	0.0
001	A-012	BASE	10.27	872.00	880.00	73629	0	0	0.0	0.0
001	A-012	BASE	10.52	872.00	880.00	73629	0	0	0.0	0.0
001	A-012	BASE	10.77	872.00	880.00	73629	0	0	0.0	0.0
001	A-012	BASE	11.02	872.00	880.00	73629	0	0	0.0	0.0
001	A-012	BASE	11.27	872.00	880.00	73629	0	0	0.0	0.0
001	A-012	BASE	11.52	872.00	880.00	73635	0	0	0.0	0.0
001	A-012	BASE	11.77	872.01	880.00	73689	2	0	0.0	0.0
001	A-012	BASE	12.00	872.10	880.00	74064	16	0	0.2	0.0
001	A-012	BASE	12.25	872.48	880.00	75730	52	0	0.9	0.0
001	A-012	BASE	12.50	873.24	880.00	87993	79	4	2.2	0.0
001	A-012	BASE	12.75	873.87	880.00	114529	75	14	3.8	0.2
001	A-012	BASE	13.00	874.22	880.00	126600	55	23	5.2	0.6
001	A-012	BASE	13.26	874.37	880.00	131282	41	28	6.2	1.1
001	A-012	BASE	13.50	874.43	880.00	132833	32	29	7.0	1.7
001	A-012	BASE	13.76	874.42	880.00	132609	25	29	7.6	2.4
001	A-012	BASE	14.01	874.38	880.00	131405	21	28	8.0	2.9
001	A-012	BASE	14.26	874.32	880.00	129719	17	26	8.4	3.5
001	A-012	BASE	14.51	874.26	880.00	127805	15	24	8.8	4.0
001	A-012	BASE	14.76	874.19	880.00	125788	13	22	9.0	4.5
001	A-012	BASE	15.01	874.12	880.00	123745	11	20	9.3	4.9
001	A-012	BASE	15.26	874.06	880.00	121789	10	19	9.5	5.3
001	A-012	BASE	15.51	874.00	880.00	119991	10	17	9.7	5.7
001	A-012	BASE	15.76	873.95	880.00	117702	9	16	9.9	6.1
002	A-011	BASE	10.02	872.00	872.00	13	0	0	0.0	0.0
002	A-011	BASE	10.27	872.00	872.00	13	0	0	0.0	0.0
002	A-011	BASE	10.52	872.00	872.00	13	0	0	0.0	0.0
002	A-011	BASE	10.77	872.00	872.00	13	0	0	0.0	0.0
002	A-011	BASE	11.02	872.00	872.00	13	0	0	0.0	0.0

Simulation	Node	Group	Time hrs	Stage ft	Warning Stage ft	Surface Area ft2	Total Inflow cfs	Total Outflow cfs	Total Vol In af	Total Vol Out af
002	A-011	BASE	11.27	872.00	872.00	13	0	0	0.0	0.0
002	A-011	BASE	11.52	872.00	872.00	13	0	0	0.0	0.0
002	A-011	BASE	11.76	872.00	872.00	13	0	0	0.0	0.0
002	A-011	BASE	12.00	872.00	872.00	13	0	0	0.0	0.0
002	A-011	BASE	12.25	872.00	872.00	87	1	0	0.0	0.0
002	A-011	BASE	12.50	872.00	872.00	202	16	0	0.2	0.0
002	A-011	BASE	12.75	872.00	872.00	228	36	0	0.7	0.0
002	A-011	BASE	13.00	872.00	872.00	242	47	0	1.6	0.0
002	A-011	BASE	13.25	872.00	872.00	251	53	0	2.6	0.0
002	A-011	BASE	13.51	872.00	872.00	251	53	0	3.7	0.0
002	A-011	BASE	13.75	872.00	872.00	244	50	0	4.8	0.0
002	A-011	BASE	14.01	872.00	872.00	242	47	0	5.8	0.0
002	A-011	BASE	14.25	872.00	872.00	240	43	0	6.7	0.0
002	A-011	BASE	14.50	872.00	872.00	238	40	0	7.6	0.0
002	A-011	BASE	14.75	872.00	872.00	229	36	0	8.4	0.0
002	A-011	BASE	15.01	872.00	872.00	225	32	0	9.1	0.0
002	A-011	BASE	15.26	872.00	872.00	223	29	0	9.7	0.0
002	A-011	BASE	15.50	872.00	872.00	219	26	0	10.3	0.0
002	A-011	BASE	15.75	872.00	872.00	216	24	0	10.8	0.0
002	A-012	BASE	10.02	872.00	880.00	73629	0	0	0.0	0.0
002	A-012	BASE	10.27	872.00	880.00	73629	0	0	0.0	0.0
002	A-012	BASE	10.52	872.00	880.00	73629	0	0	0.0	0.0
002	A-012	BASE	10.77	872.00	880.00	73631	0	0	0.0	0.0
002	A-012	BASE	11.02	872.00	880.00	73645	0	0	0.0	0.0
002	A-012	BASE	11.27	872.01	880.00	73693	1	0	0.0	0.0
002	A-012	BASE	11.52	872.04	880.00	73805	3	0	0.1	0.0
002	A-012	BASE	11.76	872.10	880.00	74047	7	0	0.2	0.0
002	A-012	BASE	12.00	872.29	880.00	74895	31	0	0.6	0.0
002	A-012	BASE	12.25	872.96	880.00	77535	88	1	1.8	0.0
002	A-012	BASE	12.50	873.93	880.00	117021	127	16	4.0	0.2
002	A-012	BASE	12.75	874.62	880.00	138755	117	36	6.5	0.7
002	A-012	BASE	13.00	874.99	880.00	149770	85	47	8.6	1.6
002	A-012	BASE	13.25	875.12	880.00	151741	62	53	10.1	2.6
002	A-012	BASE	13.51	875.13	880.00	151825	47	53	11.3	3.7
002	A-012	BASE	13.75	875.07	880.00	151030	37	50	12.1	4.8
002	A-012	BASE	14.01	874.97	880.00	149271	30	47	12.8	5.8
002	A-012	BASE	14.25	874.86	880.00	146032	25	43	13.4	6.7
002	A-012	BASE	14.50	874.75	880.00	142614	21	40	13.8	7.6
002	A-012	BASE	14.75	874.63	880.00	139078	18	36	14.3	8.4
002	A-012	BASE	15.01	874.52	880.00	135616	16	32	14.6	9.1
002	A-012	BASE	15.26	874.42	880.00	132533	15	29	14.9	9.7
002	A-012	BASE	15.50	874.32	880.00	129775	14	26	15.2	10.3
002	A-012	BASE	15.75	874.24	880.00	127334	13	24	15.5	10.8
005	A-011	BASE	10.02	872.00	872.00	13	0	0	0.0	0.0
005	A-011	BASE	10.27	872.00	872.00	13	0	0	0.0	0.0
005	A-011	BASE	10.52	872.00	872.00	13	0	0	0.0	0.0
005	A-011	BASE	10.77	872.00	872.00	13	0	0	0.0	0.0
005	A-011	BASE	11.02	872.00	872.00	13	0	0	0.0	0.0
005	A-011	BASE	11.27	872.00	872.00	13	0	0	0.0	0.0
005	A-011	BASE	11.50	872.00	872.00	13	0	0	0.0	0.0
005	A-011	BASE	11.75	872.00	872.00	13	0	0	0.0	0.0
005	A-011	BASE	12.00	872.00	872.00	13	1	0	0.0	0.0
005	A-011	BASE	12.25	872.00	872.00	180	9	0	0.1	0.0

W00521 _ Ex Mod & D+C4-C4.1 _ OUTPUT SUMMARY - 243.2 ac Inflow at CN 78.3 (inc 68.5 ac Future 1.4 ac and slope grading option 2016-02-04

Simulation	Node	Group	Time hrs	Stage ft	Warning Stage ft	Surface Area ft2	Total Inflow cfs	Total Outflow cfs	Total Vol In af	Total Vol Out af
005	A-011	BASE	12.50	872.00	872.00	230	37	0	0.6	0.0
005	A-011	BASE	12.75	872.00	872.00	248	64	0	1.6	0.0
005	A-011	BASE	13.00	872.00	872.00	250	80	0	3.1	0.0
005	A-011	BASE	13.25	872.00	872.00	250	85	0	4.8	0.0
005	A-011	BASE	13.51	872.00	872.00	250	83	0	6.6	0.0
005	A-011	BASE	13.76	872.00	872.00	250	78	0	8.3	0.0
005	A-011	BASE	14.00	872.00	872.00	249	72	0	9.8	0.0
005	A-011	BASE	14.25	872.00	872.00	248	65	0	11.2	0.0
005	A-011	BASE	14.50	872.00	872.00	247	59	0	12.5	0.0
005	A-011	BASE	14.75	872.00	872.00	250	53	0	13.6	0.0
005	A-011	BASE	15.01	872.00	872.00	242	47	0	14.7	0.0
005	A-011	BASE	15.25	872.00	872.00	239	43	0	15.6	0.0
005	A-011	BASE	15.50	872.00	872.00	237	38	0	16.4	0.0
005	A-011	BASE	15.76	872.00	872.00	227	34	0	17.2	0.0
005	A-012	BASE	10.02	872.00	880.00	73636	0	0	0.0	0.0
005	A-012	BASE	10.27	872.01	880.00	73656	1	0	0.0	0.0
005	A-012	BASE	10.52	872.02	880.00	73700	1	0	0.0	0.0
005	A-012	BASE	10.77	872.04	880.00	73782	2	0	0.1	0.0
005	A-012	BASE	11.02	872.07	880.00	73921	3	0	0.1	0.0
005	A-012	BASE	11.27	872.12	880.00	74151	5	0	0.2	0.0
005	A-012	BASE	11.50	872.20	880.00	74486	8	0	0.3	0.0
005	A-012	BASE	11.75	872.33	880.00	75055	16	0	0.6	0.0
005	A-012	BASE	12.00	872.68	880.00	76583	52	1	1.3	0.0
005	A-012	BASE	12.25	873.60	880.00	103091	135	9	3.2	0.1
005	A-012	BASE	12.50	874.67	880.00	140213	189	37	6.6	0.6
005	A-012	BASE	12.75	875.47	880.00	156398	171	64	10.3	1.6
005	A-012	BASE	13.00	875.88	880.00	162030	122	80	13.3	3.1
005	A-012	BASE	13.25	876.00	880.00	163573	88	85	15.5	4.8
005	A-012	BASE	13.51	875.95	880.00	162985	66	83	17.1	6.6
005	A-012	BASE	13.76	875.83	880.00	161292	51	78	18.3	8.3
005	A-012	BASE	14.00	875.67	880.00	159128	41	72	19.3	9.8
005	A-012	BASE	14.25	875.49	880.00	156736	34	65	20.0	11.2
005	A-012	BASE	14.50	875.32	880.00	154414	29	59	20.7	12.5
005	A-012	BASE	14.75	875.15	880.00	152096	25	53	21.3	13.6
005	A-012	BASE	15.01	874.98	880.00	149628	22	47	21.7	14.7
005	A-012	BASE	15.25	874.84	880.00	145238	20	43	22.2	15.6
005	A-012	BASE	15.50	874.70	880.00	141153	18	38	22.6	16.4
005	A-012	BASE	15.76	874.58	880.00	137533	17	34	22.9	17.2
010	A-011	BASE	10.02	872.00	872.00	13	0	0	0.0	0.0
010	A-011	BASE	10.27	872.00	872.00	13	0	0	0.0	0.0
010	A-011	BASE	10.52	872.00	872.00	13	0	0	0.0	0.0
010	A-011	BASE	10.77	872.00	872.00	13	0	0	0.0	0.0
010	A-011	BASE	11.01	872.00	872.00	13	0	0	0.0	0.0
010	A-011	BASE	11.25	872.00	872.00	13	0	0	0.0	0.0
010	A-011	BASE	11.50	872.00	872.00	13	0	0	0.0	0.0
010	A-011	BASE	11.75	872.00	872.00	13	1	0	0.0	0.0
010	A-011	BASE	12.00	872.00	872.00	113	2	0	0.0	0.0
010	A-011	BASE	12.25	872.00	872.00	209	19	0	0.3	0.0
010	A-011	BASE	12.50	872.00	872.00	246	56	0	1.0	0.0
010	A-011	BASE	12.75	872.00	872.00	249	90	0	2.5	0.0
010	A-011	BASE	13.00	872.00	872.00	246	110	0	4.6	0.0
010	A-011	BASE	13.25	872.00	872.00	245	114	0	6.9	0.0
010	A-011	BASE	13.50	872.00	872.00	246	110	0	9.2	0.0

W00521 Basin WSE 872.00 7" Dia equiv Orifice
2016-02-04

W00521 _ Ex Mod & D+C4-C4.1 _ OUTPUT SUMMARY - 243.2 ac Inflow at CN 78.3 (inc 68.5 ac Future 1.4 ac and slope grading option 2016-02-04

Simulation	Node	Group	Time hrs	Stage ft	Warning Stage ft	Surface Area ft2	Total Inflow cfs	Total Outflow cfs	Total Vol In af	Total Vol Out af
010	A-011	BASE	13.75	872.00	872.00	248	102	0	11.4	0.0
010	A-011	BASE	14.00	872.00	872.00	249	92	0	13.4	0.0
010	A-011	BASE	14.25	872.00	872.00	250	83	0	15.2	0.0
010	A-011	BASE	14.50	872.00	872.00	249	74	0	16.9	0.0
010	A-011	BASE	14.75	872.00	872.00	249	66	0	18.3	0.0
010	A-011	BASE	15.00	872.00	872.00	247	59	0	19.6	0.0
010	A-011	BASE	15.25	872.00	872.00	250	53	0	20.8	0.0
010	A-011	BASE	15.50	872.00	872.00	242	47	0	21.8	0.0
010	A-011	BASE	15.75	872.00	872.00	239	43	0	22.7	0.0
010	A-012	BASE	10.02	872.03	880.00	73739	1	0	0.0	0.0
010	A-012	BASE	10.27	872.05	880.00	73837	2	0	0.1	0.0
010	A-012	BASE	10.52	872.08	880.00	73977	3	0	0.1	0.0
010	A-012	BASE	10.77	872.13	880.00	74175	4	0	0.2	0.0
010	A-012	BASE	11.01	872.19	880.00	74451	6	0	0.3	0.0
010	A-012	BASE	11.25	872.28	880.00	74837	9	0	0.5	0.0
010	A-012	BASE	11.50	872.41	880.00	75402	13	0	0.7	0.0
010	A-012	BASE	11.75	872.61	880.00	76276	24	1	1.1	0.0
010	A-012	BASE	12.00	873.08	880.00	81000	70	2	2.1	0.0
010	A-012	BASE	12.25	874.07	880.00	122055	176	19	4.6	0.3
010	A-012	BASE	12.50	875.23	880.00	153210	242	56	8.9	1.0
010	A-012	BASE	12.75	876.13	880.00	164566	215	90	13.6	2.5
010	A-012	BASE	13.00	876.59	880.00	167838	153	110	17.5	4.6
010	A-012	BASE	13.25	876.68	880.00	168491	110	114	20.2	6.9
010	A-012	BASE	13.50	876.59	880.00	167831	82	110	22.2	9.2
010	A-012	BASE	13.75	876.40	880.00	166523	63	102	23.6	11.4
010	A-012	BASE	14.00	876.18	880.00	164920	51	92	24.8	13.4
010	A-012	BASE	14.25	875.95	880.00	162972	42	83	25.8	15.2
010	A-012	BASE	14.50	875.73	880.00	159961	36	74	26.6	16.9
010	A-012	BASE	14.75	875.52	880.00	157091	30	66	27.3	18.3
010	A-012	BASE	15.00	875.32	880.00	154455	26	59	27.8	19.6
010	A-012	BASE	15.25	875.14	880.00	151998	24	53	28.4	20.8
010	A-012	BASE	15.50	874.98	880.00	149479	22	47	28.8	21.8
010	A-012	BASE	15.75	874.84	880.00	145214	21	43	29.3	22.7
025	A-011	BASE	10.02	872.00	872.00	13	0	0	0.0	0.0
025	A-011	BASE	10.27	872.00	872.00	13	0	0	0.0	0.0
025	A-011	BASE	10.51	872.00	872.00	13	0	0	0.0	0.0
025	A-011	BASE	10.76	872.00	872.00	13	0	0	0.0	0.0
025	A-011	BASE	11.00	872.00	872.00	13	0	0	0.0	0.0
025	A-011	BASE	11.26	872.00	872.00	13	1	0	0.0	0.0
025	A-011	BASE	11.50	872.00	872.00	3	1	0	0.0	0.0
025	A-011	BASE	11.75	872.00	872.00	117	2	0	0.1	0.0
025	A-011	BASE	12.00	872.00	872.00	183	9	0	0.2	0.0
025	A-011	BASE	12.25	872.00	872.00	230	38	0	0.7	0.0
025	A-011	BASE	12.50	872.00	872.00	250	85	0	1.9	0.0
025	A-011	BASE	12.75	872.00	872.00	238	138	0	4.3	0.0
025	A-011	BASE	13.00	872.00	872.00	220	173	0	7.5	0.0
025	A-011	BASE	13.26	872.00	872.00	222	170	0	11.1	0.0
025	A-011	BASE	13.50	872.00	872.00	232	152	0	14.4	0.0
025	A-011	BASE	13.75	872.00	872.00	239	132	0	17.3	0.0
025	A-011	BASE	14.00	872.00	872.00	245	115	0	19.9	0.0
025	A-011	BASE	14.25	872.00	872.00	248	103	0	22.1	0.0
025	A-011	BASE	14.50	872.00	872.00	249	92	0	24.1	0.0
025	A-011	BASE	14.75	872.00	872.00	250	82	0	25.9	0.0

W00521 Basin WSE 872.00 7" Dia equiv Orifice
2016-02-04

Simulation	Node	Group	Time hrs	Stage ft	Warning Stage ft	Surface Area ft2	Total Inflow cfs	Total Outflow cfs	Total Vol In af	Total Vol Out af
025	A-011	BASE	15.00	872.00	872.00	249	73	0	27.5	0.0
025	A-011	BASE	15.25	872.00	872.00	248	64	0	28.9	0.0
025	A-011	BASE	15.50	872.00	872.00	246	58	0	30.2	0.0
025	A-011	BASE	15.75	872.00	872.00	251	53	0	31.3	0.0
025	A-012	BASE	10.02	872.13	880.00	74198	4	0	0.2	0.0
025	A-012	BASE	10.27	872.19	880.00	74444	5	0	0.3	0.0
025	A-012	BASE	10.51	872.25	880.00	74737	7	0	0.4	0.0
025	A-012	BASE	10.76	872.34	880.00	75122	8	0	0.6	0.0
025	A-012	BASE	11.00	872.45	880.00	75606	11	0	0.8	0.0
025	A-012	BASE	11.26	872.61	880.00	76275	16	1	1.1	0.0
025	A-012	BASE	11.50	872.81	880.00	77126	21	1	1.5	0.0
025	A-012	BASE	11.75	873.10	880.00	82052	35	2	2.0	0.1
025	A-012	BASE	12.00	873.64	880.00	104841	99	9	3.4	0.2
025	A-012	BASE	12.25	874.68	880.00	140466	236	38	6.9	0.7
025	A-012	BASE	12.50	876.01	880.00	163662	319	85	12.6	1.9
025	A-012	BASE	12.75	877.06	880.00	171437	282	138	18.8	4.3
025	A-012	BASE	13.00	877.49	880.00	174526	199	173	23.8	7.5
025	A-012	BASE	13.26	877.46	880.00	174291	141	170	27.4	11.1
025	A-012	BASE	13.50	877.25	880.00	172808	105	152	29.9	14.4
025	A-012	BASE	13.75	876.99	880.00	170882	80	132	31.8	17.3
025	A-012	BASE	14.00	876.71	880.00	168743	64	115	33.3	19.9
025	A-012	BASE	14.25	876.44	880.00	166768	53	103	34.5	22.1
025	A-012	BASE	14.50	876.17	880.00	164854	45	92	35.5	24.1
025	A-012	BASE	14.75	875.92	880.00	162572	38	82	36.3	25.9
025	A-012	BASE	15.00	875.69	880.00	159423	33	73	37.1	27.5
025	A-012	BASE	15.25	875.48	880.00	156523	30	64	37.7	28.9
025	A-012	BASE	15.50	875.29	880.00	154014	28	58	38.3	30.2
025	A-012	BASE	15.75	875.13	880.00	151803	26	53	38.9	31.3
050	A-011	BASE	10.01	872.00	872.00	13	0	0	0.0	0.0
050	A-011	BASE	10.25	872.00	872.00	13	0	0	0.0	0.0
050	A-011	BASE	10.51	872.00	872.00	13	0	0	0.0	0.0
050	A-011	BASE	10.75	872.00	872.00	13	1	0	0.0	0.0
050	A-011	BASE	11.00	872.00	872.00	13	1	0	0.0	0.0
050	A-011	BASE	11.25	872.00	872.00	90	1	0	0.1	0.0
050	A-011	BASE	11.50	872.00	872.00	136	3	0	0.1	0.0
050	A-011	BASE	11.75	872.00	872.00	172	7	0	0.2	0.0
050	A-011	BASE	12.00	872.00	872.00	208	19	0	0.5	0.0
050	A-011	BASE	12.25	872.00	872.00	249	54	0	1.2	0.0
050	A-011	BASE	12.50	872.00	872.00	245	114	0	3.0	0.0
050	A-011	BASE	12.75	872.00	872.00	188	202	0	6.2	0.0
050	A-011	BASE	13.00	872.00	872.00	186	239	0	10.9	0.0
050	A-011	BASE	13.25	872.00	872.00	187	220	0	15.6	0.0
050	A-011	BASE	13.50	872.00	872.00	209	189	0	19.8	0.0
050	A-011	BASE	13.75	872.00	872.00	228	159	0	23.4	0.0
050	A-011	BASE	14.00	872.00	872.00	239	134	0	26.4	0.0
050	A-011	BASE	14.25	872.00	872.00	244	116	0	29.0	0.0
050	A-011	BASE	14.50	872.00	872.00	248	103	0	31.2	0.0
050	A-011	BASE	14.75	872.00	872.00	249	92	0	33.3	0.0
050	A-011	BASE	15.00	872.00	872.00	250	82	0	35.1	0.0
050	A-011	BASE	15.25	872.00	872.00	249	73	0	36.7	0.0
050	A-011	BASE	15.50	872.00	872.00	248	65	0	38.1	0.0
050	A-011	BASE	15.75	872.00	872.00	247	59	0	39.4	0.0

Simulation	Node	Group	Time hrs	Stage ft	Warning Stage ft	Surface Area ft2	Total Inflow cfs	Total Outflow cfs	Total Vol In af	Total Vol Out af
050	A-012	BASE	10.01	872.28	880.00	74870	7	0	0.5	0.0
050	A-012	BASE	10.25	872.37	880.00	75249	8	0	0.6	0.0
050	A-012	BASE	10.51	872.48	880.00	75716	10	0	0.8	0.0
050	A-012	BASE	10.75	872.60	880.00	76253	12	1	1.1	0.0
050	A-012	BASE	11.00	872.76	880.00	76939	16	1	1.4	0.0
050	A-012	BASE	11.25	872.97	880.00	77562	22	1	1.8	0.1
050	A-012	BASE	11.50	873.22	880.00	86992	29	3	2.3	0.1
050	A-012	BASE	11.75	873.52	880.00	99778	47	7	3.1	0.2
050	A-012	BASE	12.00	874.06	880.00	121684	125	19	4.8	0.5
050	A-012	BASE	12.25	875.17	880.00	152367	292	54	9.1	1.2
050	A-012	BASE	12.50	876.68	880.00	168487	389	114	16.2	3.0
050	A-012	BASE	12.75	877.79	880.00	176684	341	202	23.7	6.2
050	A-012	BASE	13.00	878.11	880.00	179026	238	239	29.8	10.9
050	A-012	BASE	13.25	877.96	880.00	177923	169	220	34.0	15.6
050	A-012	BASE	13.50	877.66	880.00	175779	125	189	37.0	19.8
050	A-012	BASE	13.75	877.33	880.00	173366	96	159	39.3	23.4
050	A-012	BASE	14.00	877.01	880.00	171058	76	134	41.0	26.4
050	A-012	BASE	14.25	876.72	880.00	168790	63	116	42.5	29.0
050	A-012	BASE	14.50	876.44	880.00	166790	53	103	43.7	31.2
050	A-012	BASE	14.75	876.17	880.00	164849	45	92	44.7	33.3
050	A-012	BASE	15.00	875.93	880.00	162588	39	82	45.5	35.1
050	A-012	BASE	15.25	875.70	880.00	159515	35	73	46.3	36.7
050	A-012	BASE	15.50	875.50	880.00	156841	33	65	47.0	38.1
050	A-012	BASE	15.75	875.32	880.00	154474	31	59	47.6	39.4
100	A-011	BASE	10.01	872.00	872.00	13	1	0	0.0	0.0
100	A-011	BASE	10.25	872.00	872.00	13	1	0	0.0	0.0
100	A-011	BASE	10.50	872.00	872.00	1	1	0	0.1	0.0
100	A-011	BASE	10.75	872.00	872.00	92	1	0	0.1	0.0
100	A-011	BASE	11.00	872.00	872.00	128	3	0	0.1	0.0
100	A-011	BASE	11.25	872.00	872.00	158	5	0	0.2	0.0
100	A-011	BASE	11.50	872.00	872.00	182	9	0	0.4	0.0
100	A-011	BASE	11.75	872.00	872.00	201	15	0	0.6	0.0
100	A-011	BASE	12.00	872.00	872.00	225	31	0	1.1	0.0
100	A-011	BASE	12.25	872.00	872.00	249	73	0	2.2	0.0
100	A-011	BASE	12.50	872.00	872.00	225	166	0	4.6	0.0
100	A-011	BASE	12.75	872.00	872.00	189	288	0	9.3	0.0
100	A-011	BASE	13.00	872.00	872.00	188	312	0	15.5	0.0
100	A-011	BASE	13.25	872.00	872.00	181	279	0	21.6	0.0
100	A-011	BASE	13.50	872.00	872.00	187	230	0	26.9	0.0
100	A-011	BASE	13.75	872.00	872.00	210	188	0	31.2	0.0
100	A-011	BASE	14.00	872.00	872.00	230	155	0	34.8	0.0
100	A-011	BASE	14.25	872.00	872.00	240	131	0	37.7	0.0
100	A-011	BASE	14.50	872.00	872.00	245	114	0	40.2	0.0
100	A-011	BASE	14.75	872.00	872.00	248	102	0	42.5	0.0
100	A-011	BASE	15.00	872.00	872.00	249	91	0	44.4	0.0
100	A-011	BASE	15.25	872.00	872.00	250	81	0	46.2	0.0
100	A-011	BASE	15.50	872.00	872.00	249	73	0	47.8	0.0
100	A-011	BASE	15.75	872.00	872.00	249	66	0	49.3	0.0
100	A-012	BASE	10.01	872.53	880.00	75936	11	1	0.9	0.0
100	A-012	BASE	10.25	872.66	880.00	76487	12	1	1.2	0.0
100	A-012	BASE	10.50	872.80	880.00	77111	14	1	1.4	0.1
100	A-012	BASE	10.75	872.98	880.00	77582	18	1	1.8	0.1
100	A-012	BASE	11.00	873.17	880.00	84902	22	3	2.2	0.1

W00521 _ Ex Mod & D+C4-C4.1 _ OUTPUT SUMMARY - 243.2 ac Inflow at CN 78.3 (inc 68.5 ac Future 1.4 ac and slope grading option 2016-02-04

Simulation	Node	Group	Time hrs	Stage ft	Warning Stage ft	Surface Area ft2	Total Inflow cfs	Total Outflow cfs	Total Vol In af	Total Vol Out af
100	A-012	BASE	11.25	873.39	880.00	94222	29	5	2.7	0.2
100	A-012	BASE	11.50	873.64	880.00	104578	39	9	3.4	0.4
100	A-012	BASE	11.75	873.92	880.00	116815	61	15	4.5	0.6
100	A-012	BASE	12.00	874.47	880.00	134305	156	31	6.7	1.1
100	A-012	BASE	12.25	875.70	880.00	159567	357	73	12.0	2.2
100	A-012	BASE	12.50	877.41	880.00	173956	472	166	20.6	4.6
100	A-012	BASE	12.75	878.51	880.00	181800	411	288	29.7	9.3
100	A-012	BASE	13.00	878.72	880.00	183251	287	312	36.9	15.5
100	A-012	BASE	13.25	878.44	880.00	181299	203	279	41.9	21.6
100	A-012	BASE	13.50	878.04	880.00	178493	149	230	45.6	26.9
100	A-012	BASE	13.75	877.65	880.00	175671	113	188	48.3	31.2
100	A-012	BASE	14.00	877.28	880.00	173038	90	155	50.4	34.8
100	A-012	BASE	14.25	876.97	880.00	170704	74	131	52.1	37.7
100	A-012	BASE	14.50	876.68	880.00	168526	62	114	53.5	40.2
100	A-012	BASE	14.75	876.41	880.00	166540	52	102	54.7	42.5
100	A-012	BASE	15.00	876.15	880.00	164670	45	91	55.7	44.4
100	A-012	BASE	15.25	875.91	880.00	162396	41	81	56.6	46.2
100	A-012	BASE	15.50	875.70	880.00	159576	39	73	57.4	47.8
100	A-012	BASE	15.75	875.52	880.00	157103	36	66	58.2	49.3

Water Quality Volume and Flow Rate for 24-hour Drain Time (Wet Basin)

West Chester Church of the Nazarene
RETENTION POND

W00521
February 4, 2016

WQv (ac-ft)=C*0.75*A/12

C=	0.8	
A=	69.9	
WQv (ac-ft)=	3.50	ac-ft
	152,242	cf

(12.0 ac x 100%) + (57.9 ac x 20%) = **Weighted WQv = 1.18 ac-ft**
See Calc next sheet

Wet Extended Detention Vol. Required=0.75*WQv= **1.18 ac-ft**
51,401 cf

Basin Size 1.910 ac
83,200 sf

Depth for Extended Detention Volume Required **0.62 ft**

Diameter of Equivilent WQ Orifice Req'd 7.0 inches
(Modified orifice to accommodate and maintain a base flow. See construciton plans for adjustable Orifice Plate Detail)

Initital Flow Rate **0.61 cfs**
Ending Flow Rate **0.01 cfs**

High Water Elevation	872.62	ft
Invert Elevation (Pond Base Surface Elev	872.00	ft
Depth	0.62	ft

WQv Volume Requirement

West Chester Church of the Nazarene

2/4/2016

Area	WQv	Weighted WQv Req'd
69.9 Ac (Total Site) assuming undeveloped	3.50 ac-ft	
12.0 Future Dvmt (currently undeveloped)	0.60 ac-ft	100%= 0.60 ac-ft
57.9 Future Re-development (Total area less undev)	2.90 ac-ft	20%= 0.58 ac-ft
69.9 Ac (Total Site)		Weighted WQv **1.18** **ac-ft**

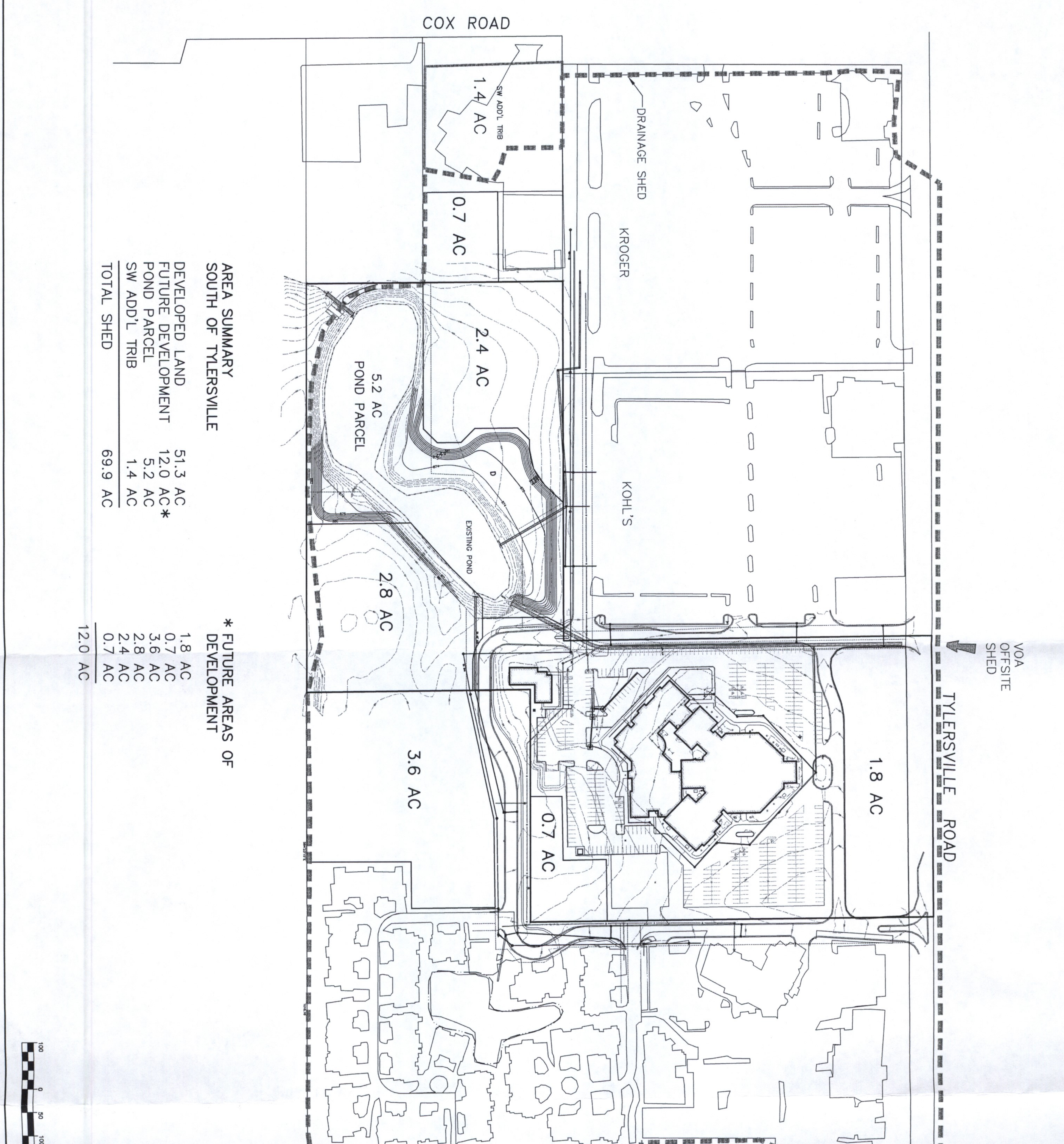
Redeveloped area is required to provide for 20% of WQv of traditional developed site or ensure a 20% net reduction of the site impervious area or a combination of the two per OHC000004

\\Brutus\P\W00521\dwgfiles\Improvement Plan_W00521_IP.dwg, Model, 6/15/2015 8:15:57 AM



EXISTING
IMPERVIOUS

P:\W00521\dwgfiles\Improvement Plan_W00521_STWM REPORT.dwg, Future Areas for Development in Watershed, 1/29/2016 12:37:03 PM, sthompson, 1:1



\\Brutus\p\W00521\dwgfiles\Improvement Plan_W00521_STWM REPORT.dwg 1/29/2016 12:36 PM EST

SHEET 1 OF 1

Evans CivilPro Engineers, LLC
Consulting Engineers & Surveyors
4700 Duke Drive, Suite 100
Mason, Ohio 45040
(513) 398-1728

WEST CHESTER CHURCH OF THE NAZARENE

7951 TYLERSVILLE ROAD
WEST CHESTER TOWNSHIP
BUTLER COUNTY, OHIO 45069

FUTURE AREAS FOR DEVELOPMENT IN WATERSHED

DATE:	JOB NO.:	DRAWN BY:	SCALE:
1/25/16	W00521	SRT	AS SHOWN

REVISIONS

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION

COPYRIGHT © 2016 BY Evans CivilPro Engineers, LLC

NOTES

ESTABLISH VEGETATION ON ALL BARE AREAS AS PER OEPA N.P.D.E.S. REGULATIONS.

THE CONTRACTOR WILL BE RESPONSIBLE FOR THE EROSION AND SEDIMENT CONTROL AND N.P.D.E.S. INSPECTIONS DURING CONSTRUCTION PERIOD.

APPROVED INLET PROTECTION DEVICES TO BE PLACED AT POND OUTLET STRUCTURE.

EROSION CONTROL PRACTICES ARE TO BE INSTALLED PRIOR TO ANY MAJOR SOIL DISTURBANCE.

PONDING OR LOW UNDRAINABLE AREAS CREATED BY CONSTRUCTION ARE TO BE ELIMINATED BY FILLING AND REGRADING.

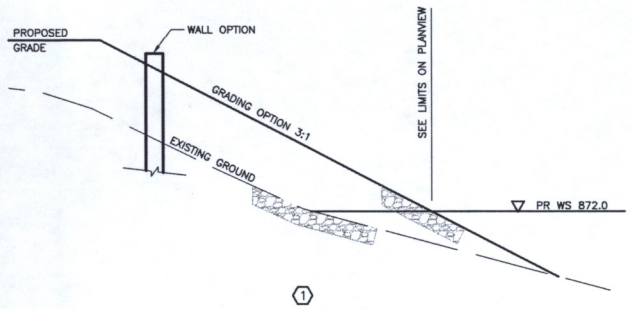
CONTRACTOR TO VERIFY LOCATION AND DEPTH OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION OF ANY UTILITIES.

KEY NOTES

(1) POSSIBLE FUTURE WALL BY OTHERS – FUTURE BUYER OF THE 2.4 ACRE PARCEL MAY DESIRE TO CONSTRUCT A WALL OR CHOOSE TO GRADE GENERALLY AS SHOWN IN THE "GRADING OPTION" EXHIBIT. PROPER DESIGN, COMPACTION AND TESTING OF WALL OR FILL SLOPE IS REQUIRED PRIOR TO AND DURING CONSTRUCTION. THE MORE RESTRICTIVE GRADING OPTION HAS BEEN UTILIZED IN STORMWATER COMPUTATIONS.

(2) GRADING BEYOND THE LIMITS OF THE DAYLIGHT OF THE CUT SLOPE MAY BE COORDINATED WITH OWNER TO PLACE EXCAVATED MATERIAL. THE LIMITS OF THE STORMWATER MANAGEMENT STUDY HAS ASSUMED THE CONTOURS ABOVE THE DAYLIGHT AS SHOWN. THEREFORE GRADING MAY OR MAY NOT OCCUR ABOVE AND BEYOND THE DAYLIGHT WITHOUT COMPROMISING THE STUDY COMPUTATION OUTFLOW RESULTS.

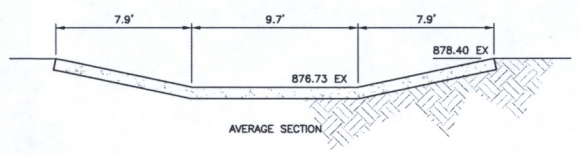
PROPER PREPARATION OF THE AREA TO RECEIVE FILL WILL BE REQUIRED FOR THE FUTURE INTENDED PURPOSE OF THE AREA. THEREFORE STRIPPING AND COMPACTION MAY BE REQUIRED. COORDINATE WITH OWNER PRIOR TO CONSTRUCTION.



(1)

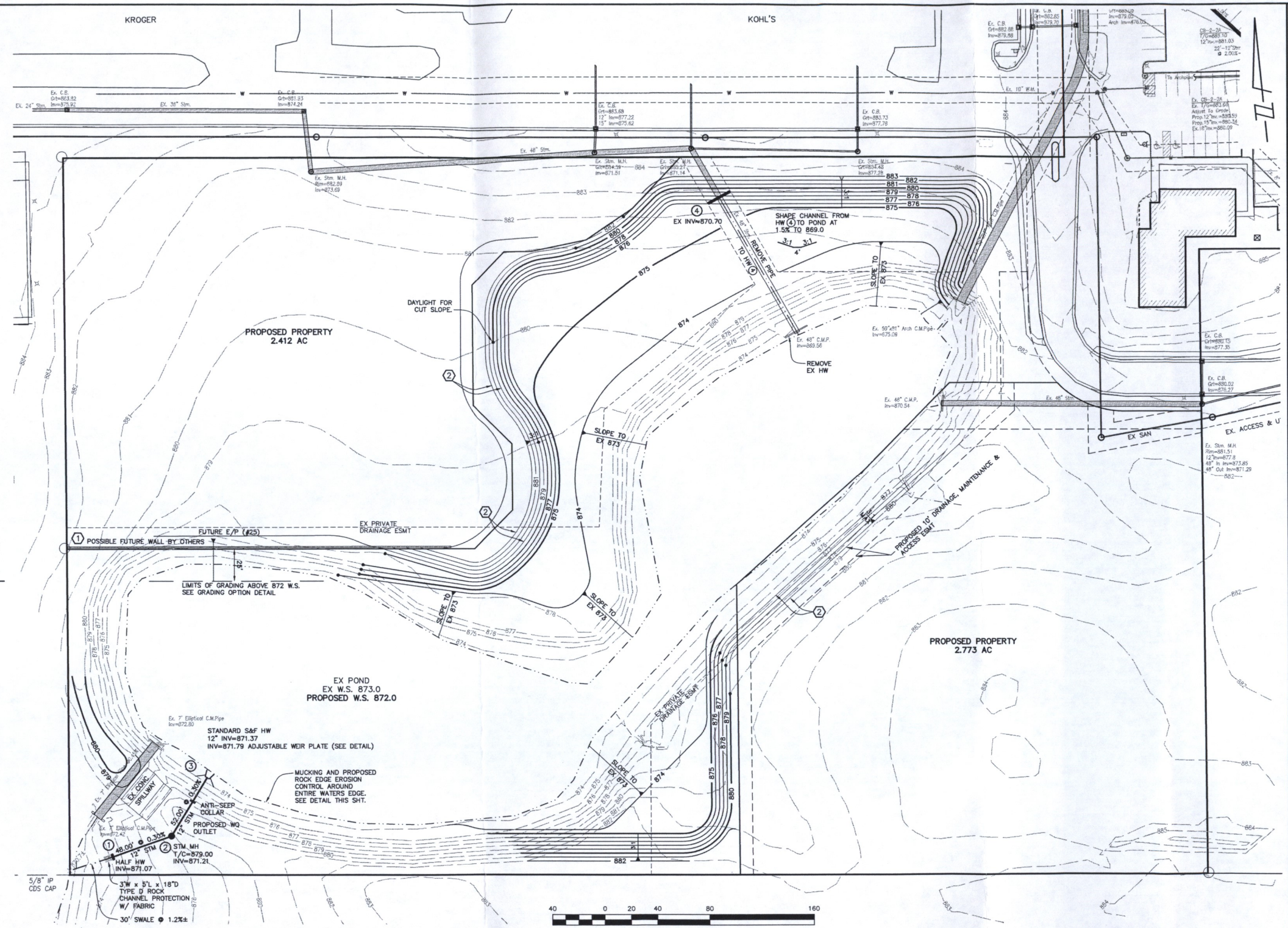
GRADING OPTION DETAIL

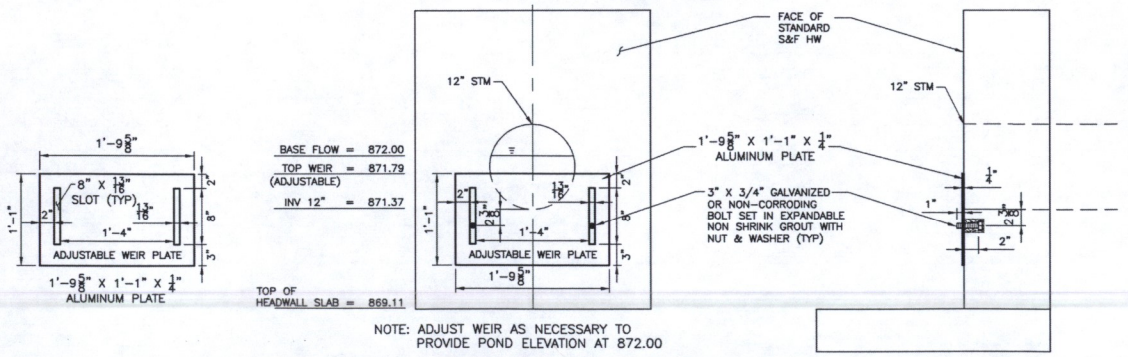
N.T.S.



EXISTING CONCRETE SPILLWAY DETAIL

N.T.S.

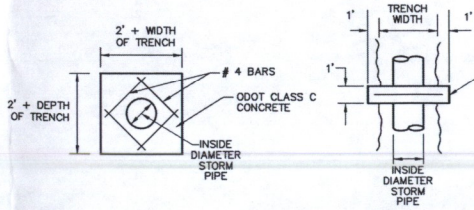




NOTE: ADJUST WEIR AS NECESSARY TO PROVIDE POND ELEVATION AT 872.00

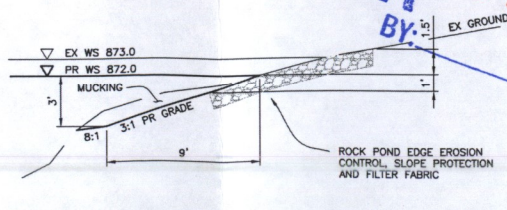
ORIFICE PLATE DETAIL

N.T.S.



ANTI-SEEP COLLAR DETAIL

N.T.S.



WATERS EDGE DETAIL

N.T.S.

RECEIVED FEB 26 2016 BY:

OHIO UTILITIES PROTECTION SERVICE
CALL 811 OR 1-800-362-2764 TWO WORKING DAYS BEFORE YOU DIG
NON-MEMBERS MUST BE CALLED DIRECTLY

NO.	DATE	DESCRIPTION
		REVISIONS

RETENTION POND PLAN

DATE: 2/26/16 | JOB No: W00521 | DRAWN BY: TDA | SCALE: AS SHOWN

WEST CHESTER CHURCH OF THE NAZARENE

7951 TYLERSVILLE ROAD
WEST CHESTER TOWNSHIP
BUTLER COUNTY, OHIO 45069

Evans CivilPro Engineers, LLC
Consulting Engineers & Surveyors
4700 Duke Drive, Suite 100
Mason, Ohio 45040
(513) 398-1728

SHEET 2 OF 4

P:\W00521\civil\eia\Improvement Plan_W00521_IP.dwg 2/4/2016 10:02:01 AM EST

COPYRIGHT © 2016 BY Evans CivilPro Engineers, LLC

GENERAL NOTES

1) ALL CONSTRUCTION SHALL CONFORM TO THE CURRENT SPECIFICATIONS AND REGULATIONS OF THE OHIO DEPARTMENT OF TRANSPORTATION (O.D.O.T.), AND BUTLER COUNTY, OHIO.

2) ALL STRUCTURES TO BE BUTLER COUNTY DESIGN STANDARDS UNLESS OTHERWISE NOTED.

3) EXISTING UTILITY LOCATIONS ARE APPROXIMATE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION AND ELEVATIONS BY FIELD INVESTIGATION PRIOR TO CONNECTION TO UTILITIES. IF DISCREPANCY EXISTS, CONTACT ENGINEER.

4) ALL STORM DRAINAGE PIPE SHALL HAVE A MAXIMUM MANNING "N" VALUE OF 0.011 AS PER MANUFACTURER SPECIFICATIONS. ALL STORM DRAINAGE PIPES SHOWN ON PLANS SHALL MEET ODOT 706.02 OR 707.33 SPECIFICATIONS.

5) NO DIMENSION MAY BE SCALED. REFER ANY UNCLEAR ITEMS TO THE ENGINEER FOR INTERPRETATION.

6) EXISTING FEATURES AND UTILITIES ARE SHOWN BASED ON VARIOUS METHODS AS AVAILABLE; VISIBLE ABOVE GROUND FIELD SURVEY OBSERVATIONS, AND VARIOUS CONSTRUCTION PLANS AND OTHER INFORMATION AS MAY HAVE BEEN PROVIDED. CONTRACTOR TO VERIFY FEATURES IN THE FIELD AT THE TIME OF CONSTRUCTION.

7) THE CONTRACTOR WILL BE RESPONSIBLE FOR THE EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION.

8) PONDING OR LOW UNDRAINABLE AREAS CREATED BY CONSTRUCTION ARE TO BE ELIMINATED BY FILLING AND REGRADING.

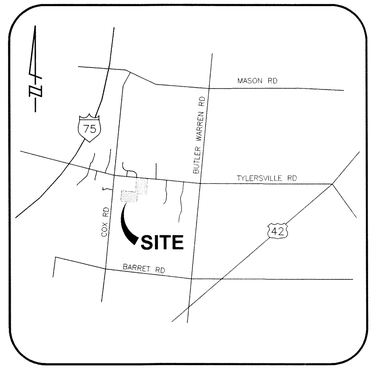
IMPROVEMENT PLANS
FOR
RETENTION POND MODIFICATIONS
AT
WEST CHESTER CHURCH OF THE NAZARENE

SITUATED IN
SECTION 11, TOWN 3, RANGE 2
WEST CHESTER TOWNSHIP
BUTLER COUNTY, OHIO

FEBRUARY, 2016

PREPARED BY

Evans
CivilPro
Engineers, LLC
Consulting Engineers & Surveyors
4700 Duke Drive, Suite 100
Mason, Ohio 45040
(513) 398-1728



VICINITY MAP
NOT TO SCALE

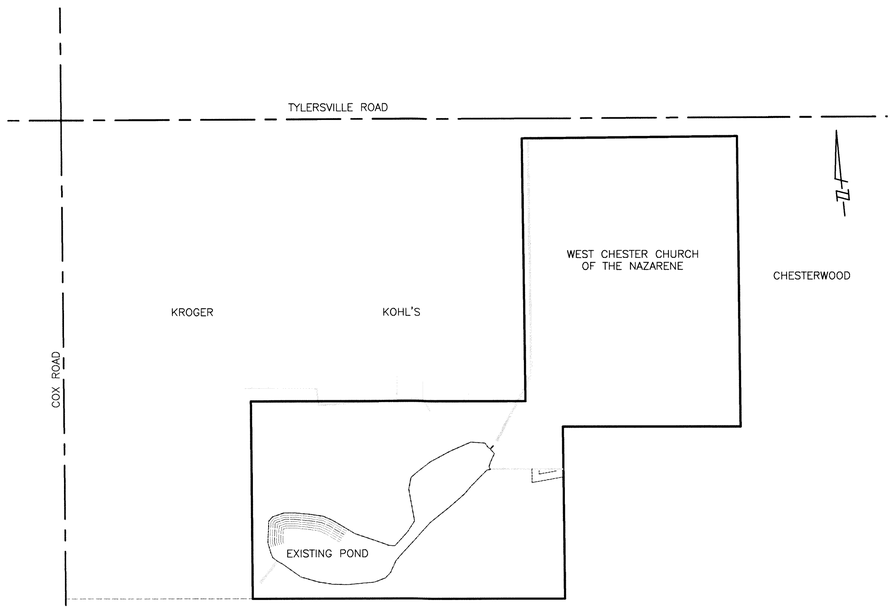
BENCH MARKS

BM 101 IRON PIN ON THE NORTHWEST PROPERTY CORNER BEHIND KROGERS 23' SOUTH OF THE BACK OF CURB
ELEV 884.24

BM 100 IRON PIN ON WEST PROPERTY LINE 300' SOUTH OF THE NORTHWEST PROPERTY CORNER
ELEV 882.49

SHEET INDEX

TITLE SHEET 1
RETENTION POND PLAN 2
EROSION & SEDIMENTATION CONTROL NOTES AND DETAILS 3
EROSION & SEDIMENTATION CONTROL DETAILS 4



PROPERTY EXHIBIT
200 0 100 200 400
SCALE: 1" = 200'

STATE OF OHIO
RICHARD K. EVANS
E-50143
REGISTERED PROFESSIONAL ENGINEER

2/26/2016

RICHARD K. EVANS, P.E. — DATE
Evans CivilPro Engineers, LLC

RECEIVED
FEB 26 2016
BY:

/ / BUTLER COUNTY ENGINEER'S OFFICE
DATE RECEIVED
APPROVAL

OHIO UTILITIES PROTECTION SERVICE
CALL 811 OR 1-800-362-2764
TWO WORKING DAYS BEFORE YOU DIG
NON-MEMBERS MUST BE CALLED DIRECTLY

REVISIONS

NO.	DATE	DESCRIPTION
1		

NO.	DATE	DESCRIPTION

TITLE SHEET

SCALE: AS SHOWN
DRAWN BY: TDA
JOB No: W00521
DATE: 2/26/16

WEST CHESTER CHURCH OF THE NAZARENE
7951 TYLERSVILLE ROAD
WEST CHESTER TOWNSHIP
BUTLER COUNTY, OHIO 45069

Evans CivilPro Engineers, LLC
Consulting Engineers & Surveyors
4700 Duke Drive, Suite 100
Mason, Ohio 45040
(513) 398-1728

P:\W00521\Graphics\Improvement Plan_W00521_IP.dwg 2/4/2016 10:02:01 AM EST

SHEET
1
OF 4

COPYRIGHT © 2016 BY Evans CivilPro Engineers, LLC

NOTES

ESTABLISH VEGETATION ON ALL BARE AREAS AS PER OEPA N.P.D.E.S. REGULATIONS.

THE CONTRACTOR WILL BE RESPONSIBLE FOR THE EROSION AND SEDIMENT CONTROL AND N.P.D.E.S. INSPECTIONS DURING CONSTRUCTION PERIOD.

APPROVED INLET PROTECTION DEVICES TO BE PLACED AT POND OUTLET STRUCTURE.

EROSION CONTROL PRACTICES ARE TO BE INSTALLED PRIOR TO ANY MAJOR SOIL DISTURBANCE.

PONDING OR LOW UNDRAINABLE AREAS CREATED BY CONSTRUCTION ARE TO BE ELIMINATED BY FILLING AND REGRADING.

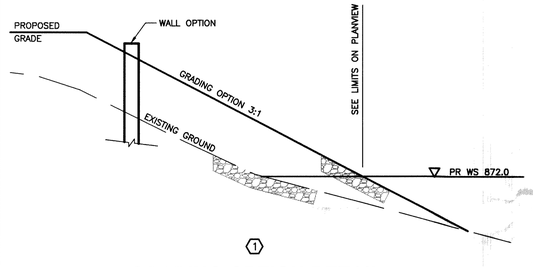
CONTRACTOR TO VERIFY LOCATION AND DEPTH OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION OF ANY UTILITIES.

KEY NOTES

(1) POSSIBLE FUTURE WALL BY OTHERS – FUTURE BUYER OF THE 2.4 ACRE PARCEL MAY DESIRE TO CONSTRUCT A WALL OR CHOOSE TO GRADE GENERALLY AS SHOWN IN THE "GRADING OPTION" EXHIBIT. PROPER DESIGN, COMPACTION AND TESTING OF WALL OR FILL SLOPE IS REQUIRED PRIOR TO AND DURING CONSTRUCTION. THE MORE RESTRICTIVE GRADING OPTION HAS BEEN UTILIZED IN STORMWATER COMPUTATIONS.

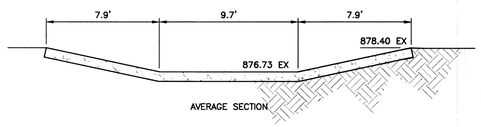
(2) GRADING BEYOND THE LIMITS OF THE DAYLIGHT OF THE CUT SLOPE MAY BE COORDINATED WITH OWNER TO PLACE EXCAVATED MATERIAL. THE LIMITS OF THE STORMWATER MANAGEMENT STUDY HAS ASSUMED THE CONTOURS ABOVE THE DAYLIGHT AS SHOWN. THEREFORE GRADING MAY OR MAY NOT OCCUR ABOVE AND BEYOND THE DAYLIGHT WITHOUT COMPROMISING THE STUDY COMPUTATION OUTFLOW RESULTS.

PROPER PREPARATION OF THE AREA TO RECEIVE FILL WILL BE REQUIRED FOR THE FUTURE INTENDED PURPOSE OF THE AREA. THEREFORE STRIPPING AND COMPACTION MAY BE REQUIRED. COORDINATE WITH OWNER PRIOR TO CONSTRUCTION.

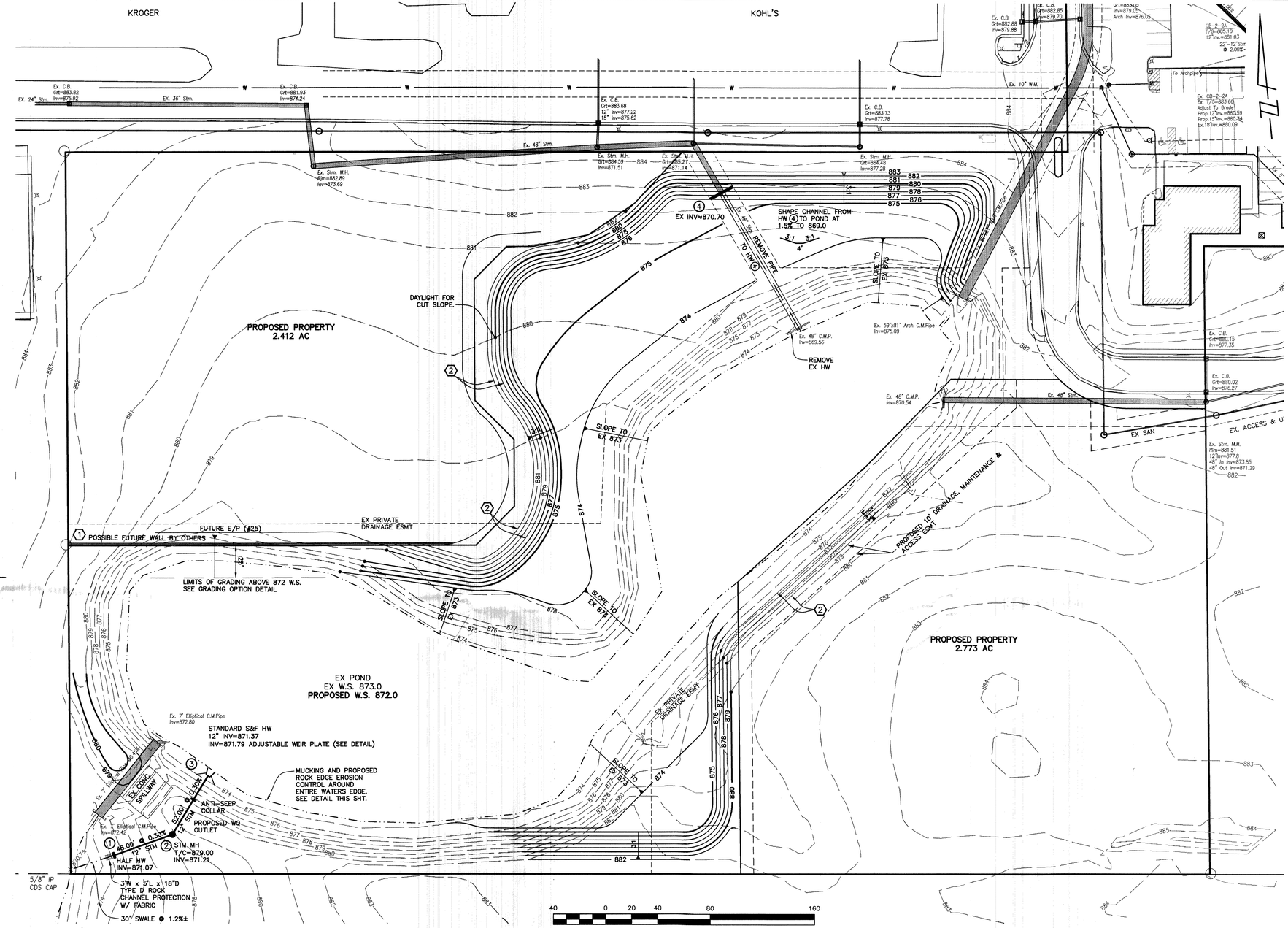


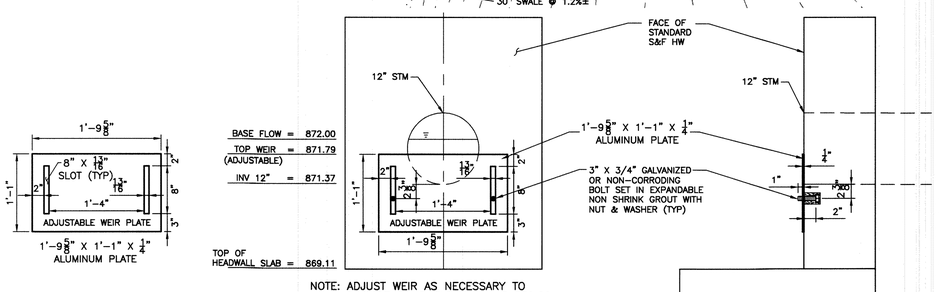
(1)

GRADING OPTION DETAIL
N.T.S.



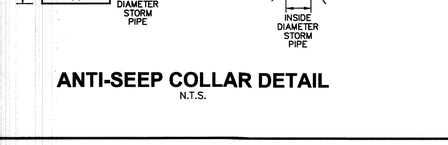
EXISTING CONCRETE SPILLWAY DETAIL
N.T.S.



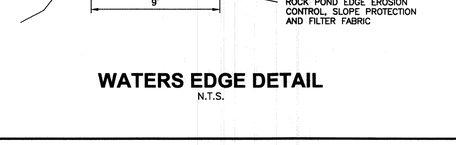


NOTE: ADJUST WEIR AS NECESSARY TO PROVIDE POND ELEVATION AT 872.00

ORIFICE PLATE DETAIL
N.T.S.



ANTI-SEEP COLLAR DETAIL
N.T.S.



WATERS EDGE DETAIL
N.T.S.

OHIO UTILITIES PROTECTION SERVICE
CALL 811 OR 1-800-362-2764 TWO WORKING DAYS BEFORE YOU DIG
NON-MEMBERS MUST BE CALLED DIRECTLY

NO.	DATE	DESCRIPTION
		REVISIONS
		DESCRIPTION
		DATE
		NO.

RETENTION POND PLAN

JOB No: W000521 | DRAWN BY: TDA | SCALE: AS SHOWN | DATE: 2/26/16

WEST CHESTER CHURCH OF THE NAZARENE
7951 TYLERSVILLE ROAD
WEST CHESTER TOWNSHIP
BUTLER COUNTY, OHIO 45069

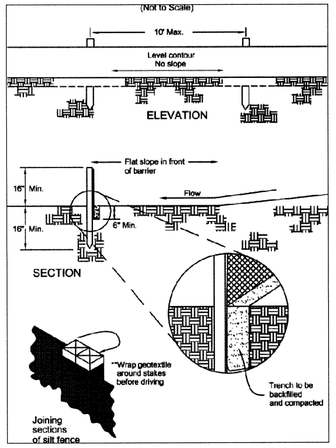
Evans CivilPro Engineers, LLC
Consulting Engineers & Surveyors
4700 Duke Drive, Suite 100
Mason, Ohio 45040
(513) 398-1728

P:\W000521\dwgfiles\Improvement Plan_W000521_IP.dwg 2/4/2016 10:02:01 AM EST

SHEET 2 OF 4

COPYRIGHT © 2016 BY Evans CivilPro Engineers, LLC

Specifications
for
Silt Fence



1. Silt fence shall be constructed before upslope land disturbance begins.
2. All silt fence shall be placed as close to the contour as possible so that water will not concentrate at low points in the fence and so that small swales or depressions that may carry small concentrated flows to the silt fence are dissipated along its length.
3. Ends of the silt fences shall be brought upslope slightly so that water ponded by the silt fence will be prevented from flowing around the ends.
4. Silt fence shall be placed on the flattest area available.
5. Where possible, vegetation shall be preserved for 5 feet (or as much as possible) upslope from the silt fence. If vegetation is removed, it shall be reestablished within 7 days from the installation of the silt fence.
6. The height of the silt fence shall be a minimum of 16 inches above the original ground surface.
7. The silt fence shall be placed in an excavated or sliced trench cut a minimum of 6 inches deep. The trench shall be made with a trencher, cable laying machine, slicing machine, or other suitable device that will ensure an adequately uniform trench depth.
8. The silt fence shall be placed with the stakes on the downslope side of the geotextile. A minimum of 8 inches of geotextile must be below the ground surface. Excess material shall lay on the bottom of the 6-inch deep trench. The trench shall be backfilled and compacted on both sides of the fabric.
9. Seams between sections of silt fence shall be spliced together only at a support post with a minimum 6-in. overlap prior to driving into the ground, (see details).
10. Maintenance—Silt fence shall allow runoff to pass only as diffuse flow through the geotextile. If runoff overtops the silt fence, flows under the fabric or around the fence ends, or in any other way allows a concentrated flow discharge, one of the following shall be performed, as appropriate: 1) the layout of the silt fence shall be changed, 2) accumulated sediment shall be removed, or 3) other practices shall be installed.

Sediment deposits shall be routinely removed when the deposit reaches approximately one–half of the height of the silt fence. Silt fences shall be inspected after each rainfall and at least daily during a prolonged rainfall. The location of existing silt fence shall be reviewed daily to ensure its proper location and effectiveness. If damaged, the silt fence shall be repaired immediately.

Criteria for silt fence materials

1. Fence post –The length shall be a minimum of 32 inches. Wood posts will be 2–by–2–in. nominal dimensioned hardwood of sound quality. They shall be free of knots, splits and other visible imperfections, that will weaken the posts. The maximum spacing between posts shall be 10 ft. Posts shall be driven a minimum 16 inches into the ground, where possible. If not possible, the posts shall be adequately secured to prevent overturning of the fence due to sediment/water loading.
2. Silt fence fabric –See chart below.

FABRIC PROPERTIES	VALUES	TEST METHOD
Minimum Tensile Strength	120 lbs. (535 N)	ASTM D 4635
Maximum Elongation @ 60 lbs	50%	ASTM D 4635
Minimum Puncture Strength	50 lbs (220 N)	ASTM D 4833
Minimum Tear Strength	40 lbs (180 N)	ASTM D 4533
Apparent Opening Size	≤ 0.84 mm	ASTM D 4751
Minimum Permitivity	1x10−2 sec. −1	ASTM D 4491
UV Exposure Strength Retention	70%	ASTM G 4355

NOTE: MULCH BERMS MAY BE SUBSTITUTED.

Specifications
for
Mulching

1. Mulch and other appropriate vegetative practices shall be applied to disturbed areas within 7 days of grading if the area is to remain dormant (undisturbed) for more than 21 days or on areas and portions of the site which can be brought to final grade.
2. Mulch shall consist of one of the following:
   - Straw – Straw shall be unrotted small grain straw applied at the rate of 2 tons/ac. or 90 lb./1,000 sq. ft. (two to three bales). The straw mulch shall be spread uniformly by hand or mechanically so the soil surface is covered. For uniform distribution of hand–spread mulch, divide area into approximately 1,000 sq.ft. sections and place two 45–lb. bales of straw in each section.
   - Hydroseeders – Wood cellulose fiber should be used at 2,000 lb./ac. or 46 lb./1,000 sq. ft.
   - Other – Acceptable mulches include mulch mattings and rolled erosion control products applied according to manufacturer's recommendations or wood mulch/chips applied at 10–20 tons/ac.
3. Mulch Anchoring – Mulch shall be anchored immediately to minimize loss by wind or runoff. The following are acceptable methods for anchoring mulch.
   - Mechanical – Use a disk, crimper, or similar type tool set straight to punch or anchor the mulch material into the soil. Straw mechanically anchored shall not be finely chopped but be left generally longer than 6 inches.
   - Mulch Nettings – Use according to the manufacturer's recommendations, following all placement and anchoring requirements. Use in areas of water concentration and steep slopes to hold mulch in place.
   - Synthetic Binders – For straw mulch, synthetic binders such as Acrylic DLR (Agri–Tac), DCA–70, Petroset, Terra Tack or equal may be used at rates recommended by the manufacturer. All applications of Sythetic Binders must be conducted in such a manner where there is no contact with waters of the state.
   - Wood Cellulose Fiber – Wood cellulose fiber may be used for anchoring straw. The fiber binder shall be applied at a net dry weight of 750 lb./acre. The wood cellulose fiber shall be mixed with water and the mixture shall contain a maximum of 50 lb./100 gal. of wood cellulose fiber.

Specifications
for
Temporary Seeding

Temporary Seeding Species Selection

Seeding Dates	Species	Lb./1000 ft2	Lb./Acre
March 1 to August 15	Oats	3	128 (4 bushel)
	Tall Fescue	1	40
	Annual Ryegrass	1	40
	Perennial Ryegrass	1	40
	Tall Fescue	1	40
	Annual Ryegrass	1	40
	Annual Ryegrass	1.25	55
	Perennial Ryegrass	3.25	142
	Creeping Red Fescue	0.4	17
	Kentucky Bluegrass	0.4	17
August 16 to November	Rye	Oats	
	Tall Fescue	Tall Fescue	
	Annual Ryegrass	Annual Ryegrass	
	wheat	Oats	
	Tall Fescue	Tall Fescue	
	Annual Ryegrass	Annual Ryegrass	
	perennial Ryegrass	Oats	
	Tall Fescue	Tall Fescue	
	Annual Ryegrass	Annual Ryegrass	
	Annual Ryegrass	1.25	40
	Perennial Ryegrass	3.25	40
	Creeping Red Fescue	0.4	40
	Kentucky Bluegrass	0.4	
November 1 to February 29	Use mulch only or dormant seeding		

1. Structural erosion and sediment control practices such as diversions and sediment traps shall be installed and stabilized with temporary seeding prior to grading the rest of the construction site.
2. Temporary seed shall be applied between construction operations on soil that will not be graded or reworked for 21 days or greater. These idle areas shall be seeded within 7 days after grading.
3. The seedbed should be pulverized and loose to ensure the success of establishing vegetation. Temporary seeding should not be postponed if ideal seedbed preparation is not possible.

Mulching Temporary Seeding

1. Applications of temporary seeding shall include mulch, which shall be applied during or immediatey after seeding. Seedings made during optimum seeding dates on favorable, very flat soil conditions may not need mulch to achieve adequate stabilization.
2. Materials:
   - Straw–if straw is used, it shall be unrotted small–grain straw applied at a rate of 2 tons per acre or 90 lbs./ 1,000 sq. ft. (2–3 bales)
   - Hydroseeders–if wood cellulose fiber is used, it shall be used at 2000 lbs./ ac. or 46 lb./ 1,000–sq.–ft.
   - Other–Other acceptable mulches include mulch mattings applied according to manufacturer's recommendations or wood chips applied at 6 ton/ ac.
3. Straw Mulch shall be anchored immediately to minimize loss by wind or water. Anchoring methods:
   - Mechanical—A disk, crimper, or similar type tool shall be set straight to punch or anchor the mulch material into the soil. Straw mechanically anchored shall not be finely chopped but left to a length of approximately 6 inches.
   - Mulch Netting—Netting shall be used according to the manufacturers recommendations. Netting may be necessary to hold mulch in place in areas of concentrated runoff and on critical slopes.
   - Synthetic Binders—Synthetic binders such as Acrylic DLR (Agri–Tac), DCA–70, Petroset, Terra Tack or equivalent may be used at rates recommended by the manufacturer.
   - Wood–Cellulose Fiber—Wood–cellulose fiber binder shall be applied at a net dry wt. of 750 lb./ac. The wood–cellulose fiber shall be mixed with water and the mixture shall contain a maximum of 50 lb. / 100 gal.
4. Soil Amendments—Temporary vegetation seeding rates shall establish adequate stands of vegetation, which may require the use of soil amendments. Base rates for lime and fertilizer shall be used.
5. Seeding Method—Seed shall be applied uniformly with a cyclone spreader, drill, cultipacker seeder, or hydroseeder. When feasible, seed that has been broadcast shall be covered by raking or dragging and then lightly tamped into place using a roller or cultipacker. If hydroseeding is used, the seed and fertilizer will be mixed on–site and the seeding shall be done immediately and without interruption.

Specifications
for
Sodding

Materials

1. Sod shall be harvested, delivered and installed within a period of 48 hours. Sod not transplanted within this period shall be inspected and approved prior to installation.
2. The sod shall be kept moist and covered during hauling and preparation for placement.
3. Sod shall be machine cut at a uniform soil thickness of 0.75 inches, plus or minus 0.25 inches, at the time of cutting. Measurements for thickness shall exclude top growth and thatch.

Site Preparation

1. A subsoiler, plow or other implement shall be used to reduce soil compaction and allow maximum infiltration. Maximizing infiltration will help control both runoff rate and water quality. Subsoiling shall not be conducted on slip–prone areas where soil preparation should be limited only to what is necessary for establishing vegetation.
2. The area shall be graded and topsoil spread where needed. (see Topsoiling)
3. Soil Amendments:

   Lime—Agricultural ground limestone shall be applied to acidic soils as recommended by a soil test. In lieu of a soil test, lime shall be applied at the rate of 100 lb./1,000 sq. ft. or 2 tons/ac.

   Fertilizer—Fertilizer shall be applied as recommended by a soil test. In lieu of a 2soil test fertilizer shall be applied at a rate of 12 lb./1,000 sq. ft. or 500 lb./ac. of 10:10:10 or 12:12:12 analysis.

   The lime and fertilizer shall be worked into the soil with a disk harrow, spring–tooth harrow, or other suitable field implement to a depth of 3 inches.
4. Before laying sod, the surface shall be uniformly graded and cleared of all debris, stones and clods larger than 3–in. diameter.Sod Installation

Maintenance

1. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary during the first week with sufficient quantities to maintain moist soil to a depth of 4–6 inches.
2. After the first week, sod shall be watered as necessary to maintain adequate moisture and ensure establishment.
3. The first mowing shall not be attempted until sod is firmly rooted.

Specifications
for
Permanent Seeding

Site Preparation

1. Subsoiler, plow, or other implement shall be used to reduce soil compaction and allow maximum infiltration. (Maximizing infiltration will help control both runoff rate and water quality.) Subsoiling should be done when the soil moisture is low enough to allow the soil to crack or fracture. Subsoiling shall not be done on slip–prone areas where soil preparation should be limited to what is necessary for establishing vegetation.
2. The site shall be graded as needed to permit the use of conventional equipment for seedbed preparation and seeding.
3. Topsoil shall be applied where needed to establish vegetation.

Seedbed Preparation

1. Lime—Agricultural ground limestone shall be applied to acidic soil as recommended by a soil test. In lieu of a soil test, lime shall be applied at the rate of 100 pounds per 1,000–sq. ft. or 2 tons per acre.
2. Fertilizer—Fertilizer shall be applied as recommended by a soil test. In place of a soil test, fertilizer shall be applied at a rate of 25 pounds per 1,000–sq. ft. or 1000 pounds per acre of a 10–10–10 or 12–12–12 analyses.
3. The lime and fertilizer shall be worked into the soil with a disk harrow, spring–tooth harrow, or other suitable field implement to a depth of 3 inches. On sloping land, the soil shall be worked on the contour.

Seeding Dates and Soil Conditions

Seeding should be done March 1 to May 31 or August 1 to September 30. If seeding occurs outside of the abovespecified dates, additional mulch and irrigation may be required to ensure a minimum of 80% germination. Tillage for seedbed preparation should be done when the soil is dry enough to crumble and not form ribbons when compressed by hand. For winter seeding, see the following section on dormant seeding.

Dormant Seedings

1. Seedings should not be made from October 1 through November 20. During this period, the seeds are likely to germinate but probably will not be able to survive the winter.
2. The following methods may be used for "Dormant Seeding":
   - From October 1 through November 20, prepare the seedbed, add the required amounts of lime and fertilizer, then mulch and anchor. After November 20, and before March 15, broadcast the selected seed mixture. Increase the seeding rates by 50% for this type of seeding.
   - From November 20 through March 15, when soil conditions permit, prepare the seedbed, lime and fertilize, apply the selected seed mixture, mulch and nchor. Increase the seeding rates by 50% for this type of seeding.
   - Apply seed uniformly with a cyclone seeder, drill, cuitpacker seeder, or hydro–seeder (slurry may include seed and fertilizer) on a firm, moist seedbed.
   - Where feasible, except when a cultipacker type seeder is used, the seedbed should be firmed following seeding operations with a cultipacker, roller, or light drag. On sloping land, seeding operations should be on the contour where feasible.Mulching
3. Straw Mulch and Anchoring Methods Straw mulch shall be anchored immediately to minimize loss by wind or water.
   - Mechanical—A disk, crimper, or similar type tool shall be set straight to punch or anchor the mulch material into the soil. Straw mechanically anchored shall not be finely chopped but, generally, be left longer than 6 inches.
   - Mulch Netting—Netting shall be used according to the manufacturer's recommendations. Netting may be necessary to hold mulch in place in areas of concentrated runoff and on critical slopes.
   - Asphalt Emulsion—Asphalt shall be applied as recommended by the manufacture or at the rate of 160 gallons per acre.
   - Synthetic Binders—Synthetic binders such as Acrylic DLR (Agri–Tac), DCA–70, Petroset, Terra Tack or equivalent may be used at rates specified by the manufacturer.
   - Wood Cellulose Fiber—Wood cellulose fiber shall be applied at a net dry weight of 750 pounds per acre. The wood cellulose fiber shall be mixed with water with the mixture containing a maximum of 50 pounds cellulose per 100 gallons of water.

Irrigation

Permanent seeding shall include irrigation to establish vegetation during dry weather or on adverse site conditions, which require adequate moisture for seed germination and plant growth.

Irrigation rates shall be monitored to prevent erosion and damage to seeded areas from excessive runoff.

PERMANENT SEEDING			
Seed Mix	Seeding Rate lb./ac.	Seeding Rate lb/1,000SF	Notes:
General Use			
Creeping Red Fescue Domestic Ryegrass Kentucky Bluegrass	20 – 40 10 – 20 20 – 40	½ – 1 ¼ – ½ ½ – 1	For close mowing & for waterways with <2.0 ft/sec velocity.
Tall Fescue	40 – 50	1 – 1½	
Turf–type (dwarf) Fescue	90	2½	
Steep Banks or Cut Slopes			
Tall Fescue	40 – 50	1 – 1½	
Crown Vetch Tall Fescue	10 – 20 20 – 30	¼ – ½ ½ – ¾	Do not seed later than Augtust.
Flat Pea Tall Fescue	20 – 25 20 – 30	¼ – ½ ½ – ¾	Do not seed later than August.
Road Ditches and Swales			
Tall Fescue	40 – 50	1 – 1½	
Turf–type (dwarf) Fescue Kentucky Bluegrass	90 5	2½ 0.1	
Lawns			
Kentucky Bluegrass Perennial Ryegrass	100 – 120	2 2	
Kentucky Bluegrass Creeping Red Fescue	100 – 120	2 1 – 1½	For Shaded areas
Note: Other approved seed species may be substituted.			

Specifications
for
Grass Filter Strip

Note: See Specifications for Permanent Seeding.

1. Filter strips shall be graded to prevent runoff from concentrating. Depressions, ridges and swales shall be graded out to achieve a uniform slope having a level grade across the slope.
2. To assure that runoff remains as sheet flow through the filter strip, a level spreader shall be used at the top of the slope. The rock or grass level spreader must be placed on a contour, and shall have a minimum width and depth of 1 foot.
3. Soil compaction shall be minimized in the filter strip area. Work shall be performed only when the soil moisture is low.
4. A subsoiler, plow or other implement shall be used to decrease soil compaction and allow maximum infiltration. Subsoiling shall be done when the soil moisture is low enough to allow the soil to crack or fracture.
5. Because a dense vegetation is critical for effective filter strips, only a dense stand of vegetation without rills or gullies shall be acceptable. If rills or gullies form or if vegetative cover is not dense, a new seedbed shall be prepared and replanted.
6. The filter strip shall be seeded no later than September 30th to assure that vegetation establishes prior to the onset of winter weather.

Specifications
for
Maintenance of Permanent Seeding

Maintenance

1. Expect emergence within 4 to 28 days after seeding, with legumes typically following grasses. Check permanent seedings within 4 to 6 weeks after planting. Look for:
   - Vigorous seedlings;
   - Uniform ground surface coverage with at least 30% growth density;
   - Uniformity with legumes and grasses well intermixed;
   - Green, not yellow, leaves. Perennials should remain green throughout the summer, at least at the plant bases.
2. Permanent seeding shall not be considered established for at least 1 full year from the time of planting. Inspect the seeding for soil erosion or plant loss during this first year. Repair bare and sparse areas. Fill gullies. Re–fertilize, re–seed, and re–mulch if required. Consider no–till planting. A minimum of 70% growth density, based on a visual inspection, must exist for an adequate permanent vegetative planting.
   - If stand is inadequate or plant cover is patchy, identify the cause of failure and take corrective action: choice of plant materials, lime and fertilizer quantities, poor seedbed preparation, or weather. If vegetation fails to grow, have the soil tested to determine whether pH is in the correct range or nutrient deficiency is a problem.
   - Depending on stand conditions, repair with complete seedbed preparation, then over–seed or re–seed.
   - If it is the wrong time of year to plant desired species, over–seed with small grain cover crop to thicken the stand until timing is right to plant perennials or use temporary seeding. See Temporary Seeding standard.
3. Satisfactory establishment may require re–fertilizing the stand in the second growing season.
   - Do not fertilize cool season grasses in late May through July (i.e. Kentucky Bluegrass, Orchardgrass, Perrenial Ryegrass, Smooth Brome, Fescues, Timothy, Reed Canarygrass and Garrison Grass)
   - Grass that looks yellow may be nitrogen deficient. In lieu of a soil test, an application of 50 lbs. of N–P–K per acre in early spring will help cool season grasses compete against weeds or grow more successfully.
   - Do not use nitrogen fertilizer if the stand contains more than 20 percent legumes.
4. Long–term maintenance fertilization rates shall be established by following soil test recommendations or by using the rates shown in Table 2.
5. Consider mowing after plants reach a height of 6 to 8 inches. Mow grasses tall, at least 3 inches in height and minimize compaction during the mowing process. Vegetation on structural practices such as embankments and grass–lined channels need to be mowed only to prevent woody plants from invading the stand.

Common Problems / Concerns

- Insufficient topsoil or inadequately tilled, limed, and/or fertilized seedbed:
  – results in poor establishment of vegetation.
- Unsuitable species or seeding mixture:
  – results in competition with the perennials.
- Nurse crop rate too high in the mixture:
  – results in competition with the perennials.
- Seeding done at the wrong time of year:
  – results in poor establishment of vegetation, also plant hardiness is significantly decreased.
- Mulch rate inadequate:
  – results in poor germination and failure.

MAINTENANCE FOR PERMANENT SEEDINGS: FERTILIZATION AND MOWING					
Mixture	Formula	lb./ac.	lb./1,00 SF	Time	Mowing
Creeping Red Fescue Rygrass Kentucky Bluegrass	10–10–10	500	12	Fall, yearly or as needed.	Not closer that 3"
Tall Fescue	10–10–10	500	12		Not closer than 4"
Turf–type (Dwarf) Fescue	10–10–10	500	12		Not closer than 2"
Crown Vetch Fescue	0–20–20	400	10	Spring, yearly following establishment and every 4–7 yr. thereafter	Do not mow
Flat Pea Fescue	0–20–20	400	10		Do not mow
Note: Following soil test recommendations is preferred to fertilizer rates shown above.					

STORMWATER WATTLE / COMPOST SOCK – USED FOR EROSION CONTROL: TUBES OF STRAW USED FOR EROSION CONTROL. EACH STRAW WATTLE IS 8–9 INCHES IN DIAMETER. STAKE THE STRAW WATTLES AT EACH END AND 4 FEET ON CENTER.

EROSION AND SEDIMENTATION CONTROL AND MAINTENANCE NOTES

1) ALL EROSION AND SEDIMENTATION CONTROL SHALL BE PERFORMED ACCORDING TO THE LATEST OHIO EPA AUTHORIZATION FOR CONSTRUCTION ACTIVITY UNDER THE "NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM" (NPDES); ANY AND ALL REQUIRED PERMITS, REPORTS, AND RELATED DOCUMENTS. SEE OHIO EPA PERMIT NO. OHC000004 FOR SWPPP RULES AND REGULATIONS FOR ALL REQUIREMENTS. THE ITEMS LISTED BELOW ARE HIGHLIGHTS BUT NOT NECESSARILY INCLUSIVE OF ALL REQUIRED MEASURES AND PROCEDURES.

2) A COPY OF THE FOLLOWING DOCUMENTS MUST BE KEPT ON SITE; STORM WATER POLLUTION PREVENTION PLAN (SWPPP); "NOTICE OF INTENT" (NOI) GENERAL PERMIT; SITE MAP AND PERMITS FOR ANY CONSTRUCTION ACTIVITY IMPACTING STATE WATERS OR REGULATED WETLANDS. REQUESTS BY THE PUBLIC AND WRITTEN REQUESTS BY OTHERS TO BE HANDLED ACCORDING TO OHIO EPA SWPPP REGULATIONS PART III.C.2.

3) AN AMENDMENT TO THE SWPPP IS REQUIRED WHENEVER A CHANGE IN DESIGN CONSTRUCTION, AND OPERATION OR MAINTENANCE HAS A SIGNIFICANT NEGATIVE EFFECT ON THE POTENTIAL DISCHARGE OF POLLUTANTS, OR IF THE SWPPP PROVES TO BE INEFFECTIVE IN ACHEIVING THE GENERAL OBJECTIVES OF THE SWPPP. SEE OHIO EPA REGULATIONS PART III.D.

4) THE RETENTION POND MODIFICATIONS AT WEST CHESTER CHURCH OF THE NAZARENE IS A MODIFICATION OF AN EXISTING RETENTION POND TO ADD STORAGE VOLUME AND WQv AND INVOLVES 3.0± AC OF GRADING.

6) THE TOPOGRAPHY OF THE SITE IS MODERATE SLOPES GENERALLY DRAINING TO THE SOUTH. THE SITE IS OPEN MEADOW.

7) THE SITE IS BORDERED TO THE NORTH BY KOHL'S/ ILLINOIS INC/ LANDS AND WEST CHESTER PLAZA SECTION ONE, THE WEST BY PROVIDENCE BIBLE FELLOWSHIP LANDS AND WEST CHESTER TOWNSHIP LANDS, THE SOUTH BY BETHANY STATION SUBDIVISION PHASE I, AND THE EAST BY CHESTERWOOD COTTAGES REAL ESTATE II LTD LANDS.

9) THERE ARE NO IMPERVIOUS AREAS PLANNED FOR POND CONSTRUCTION AREA.

10) EROSION AND SEDIMENT CONTROL MEASURES INCLUDE: SILT TRAPS AT ALL STORM WATER INLETS, SILT FENCES ALONG THE DOWNHILL EDGE OF ALL DISTURBED AREAS AROUND THE PERIMETER OF THE POND.

EROSION, SEDIMENT AND STORM WATER MANAGEMENT PRACTICES SHALL MEET THE STANDARDS AND SPECIFICATIONS IN THE CURRENT EDITION OF OHIO'S RAINWATER AND LAND DEVELOPMENT MANUAL OR OTHER STANDARDS ACCEPTABLE TO OHIO EPA.

11) THE STORMWATER MANAGEMENT PLAN AND DESIGN CALCULATIONS FOR THE SHED HAVE BEEN SUBMITTED TO THE BUTLER COUNTY ENGINEER FOR REVIEW AND APPROVAL.

12) ALL SEDIMENT AND EROSION CONTROL PRACTICES ARE TO BE IN ACCORDANCE WITH THE BUTLER COUNTY EROSION AND SEDIMENT CONTROL REGULATIONS AND INSTALLED PRIOR TO ANY MAJOR SOIL DISTURBANCE OR IN THEIR PROPER SEQUENCE AND MAINTAINED UNTIL PERMANENT PROTECTION IS ESTABLISHED.

SEDIMENT CONTROLS ARE TO BE INSTALLED/IMPLEMENTED WITHIN SEVEN (7) DAYS OF GRUBBING ACTIVITIES.

ANY AREAS THAT WILL BE LEFT EXPOSED MORE THAN TWENTY-ONE (21) DAYS AND NOT SUBJECT TO CONSTRUCTION TRAFFIC, WILL RECEIVE A TEMPORARY COVER WITHIN SEVEN (7) DAYS OF GRUBBING ACTIVITIES OR WITHIN TWO (2) DAYS AFTER FINAL GRADING FOR AREAS WITHIN 50 FEET OF A STREAM. THE DISTURBED AREAS WILL BE MULCHED WITH STRAW OR EQUIVALENT MATERIAL AT A RATE OF TWO (2) TONS PER ACRE, ACCORDING TO THE STATE STANDARDS.

PERMANENT VEGETATION IS TO BE SEEDED OR SODDED ON ALL EXPOSED AREAS WITHIN SEVEN (7) DAYS AFTER FINAL GRADING. MULCH IS TO BE USED AS NECESSARY FOR PROTECTION UNTIL SEEDING IS ESTABLISHED. MULCH SHALL BE KEPT IN PLACE WITH ASPHALT EMULSION APPLIED AT A MINIMUM RATE OF ONE-HUNDRED SIXTY (160) GALLONS PER TON OF MULCH OR BY OTHER ACCEPTABLE METHODS.

13) ALL EROSION AND SEDIMENT CONTROL STRUCTURES ON THE SITE SHALL BE INSPECTED AND REPAIRED BY THE CONTRACTOR ON A WEEKLY BASIS AND WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN ONE-HALF INCH OF RAIN PER 24 HOUR PERIOD.

14) THE FOLLOWING SEQUENSCE OF CONSTRUCTION AND PROJECTED COMPLETION DATES IS CURRENTLY ESTIMATED:

A.	CLEARING & GRUBBING FOR THOSE AREAS NECESSARY FOR INSTALLATION OR PERIMETER CONTROLS	WEEK 1
B.	CONSTRUCTION OF PERIMETER CONTROLS	WEEK 2
C.	REMAINING CLEARING AND GRUBBING	WEEK 3
D.	GRADING FOR THE REMAINDER OF THE SITE	WEEK 5
E.	FINAL GRADING & STABILIZATION	WEEK 7
F.	REMOVAL OF CONTROLS FOR SITE DEVELOPMENT	MONTH 5

15) PLANNER AND ENGINEER:
EVANS CIVILPRO ENGINEERS, LLC
7400 DUKE DRIVE, SUITE 100
MASON, OHIO 45040
TEL. (513) 388-1728

PERSON RESPONSIBLE:
MR. STEVE CADDELL
WEST CHESTER CHURCH OF THE NAZARENE
7951 TYLERSVILLE RD
WEST CHESTER, OHIO 45069

NO.	DATE	DESCRIPTION
		REVISIONS

EROSION & SEDIMENTATION CONTROL NOTES AND DETAILS

DATE: 2/26/16 | JOB No: W00521 | DRAWN BY: TDA | SCALE: AS SHOWN

WEST CHESTER CHURCH OF THE NAZARENE
7951 TYLERSVILLE ROAD
WEST CHESTER TOWNSHIP
BUTLER COUNTY, OHIO 45069

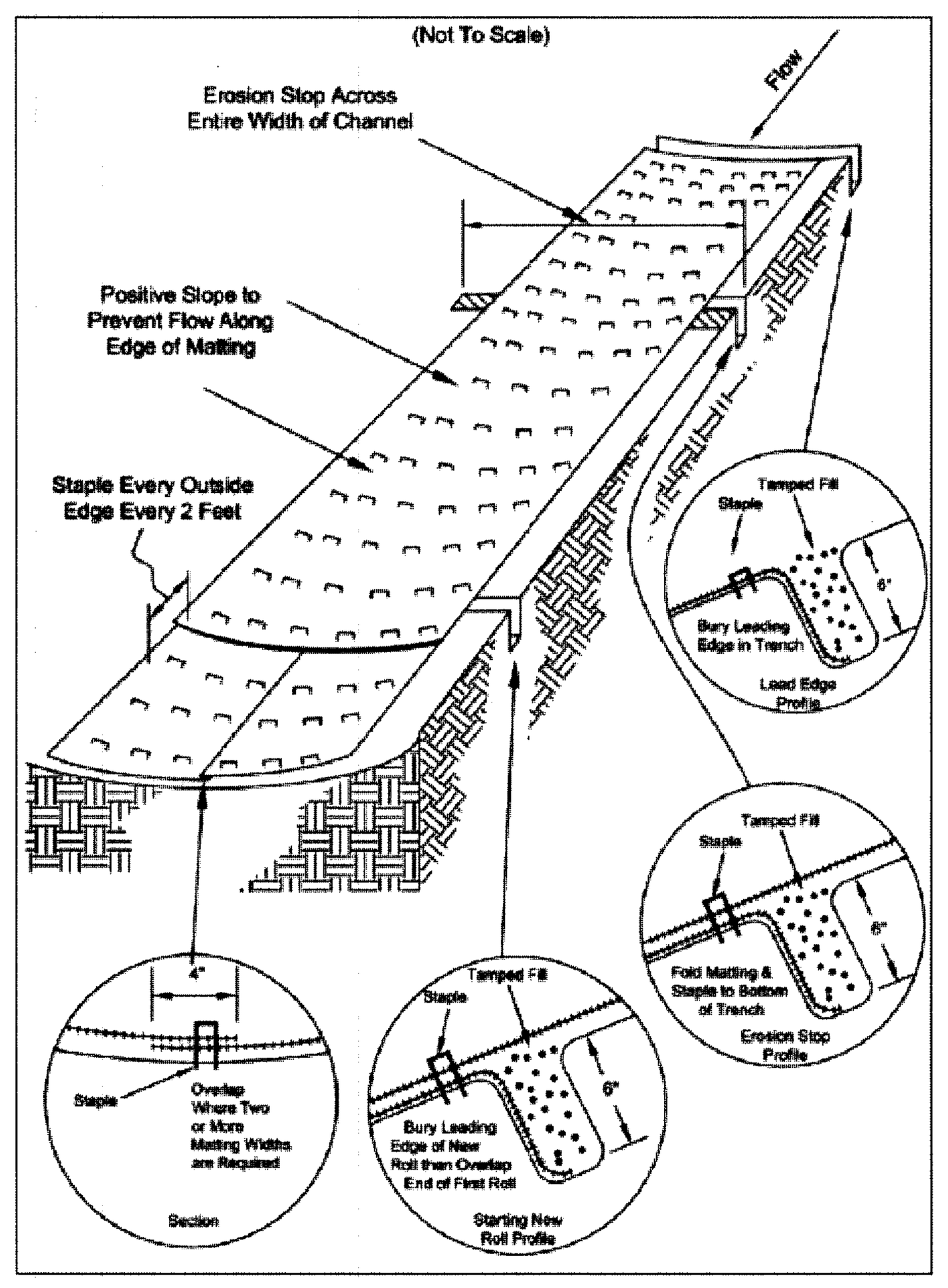
Evans CivilPro Engineers, LLC
Consulting Engineers & Surveyors
4700 Duke Drive, Suite 100
Mason, Ohio 45040
(513) 388-1728

SHEET 3 OF 4

P:\W00521\dwg\Plan\Improvement Plan_W00521_LP.dwg 2/4/2016 10:02:01 AM EST

COPYRIGHT © 2016 BY Evans CivilPro Engineers, LLC

Specifications for Turf Reinforcement Matting

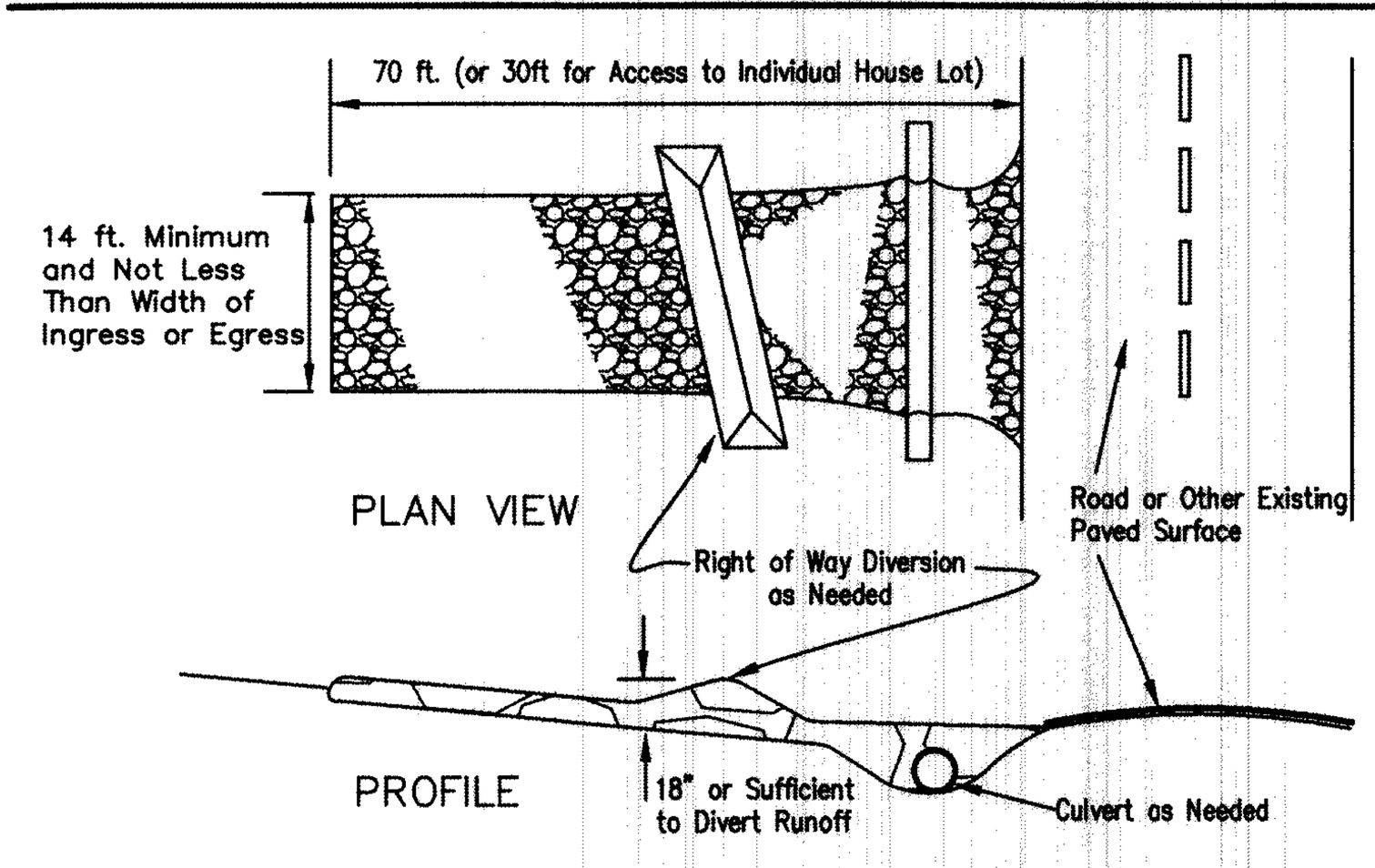


1. Channel/Slope Soil Preparation Grade and compact area of installation, preparing seedbed by loosening 2"–3" of topsoil above final grade. Incorporate amendments such as lime and fertilizer into soil. Remove all rocks, clods, vegetation or other debris so that installed TRM will have direct contact with the soil surface.
2. Channel/Slope Seeding Apply seed to soil surface prior to installation. All check slots, anchor trenches, and other disturbed areas must be reseeded. Refer to the Permanent Seeding specification for seeding recommendations.

Slope Installation

3. Excavate top and bottom trenches (12"x6"). Intermittent erosion check slots (6"x6") may be required based on slope length. Excavate top anchor trench 2'x 3' over crest of the slope.
4. If intermittent erosion check slots are required install TRM in 6"x6" slot at a maximum of 30' centers or the mid point of the slope. TRM should be stapled into trench on 12" centers.
5. Install TRM in top anchor trench, anchor on 12" spacings, backfill and compact soil.
6. Unroll TRM down slope with adjacent rolls overlapped a minimum of 3". Anchor the seam every 18". Lay the TRM loose to maintain direct soil contact, do not pull taught.
7. Overlap roll ends a minimum of 12" with upslope TRM on top for a shingle effect. Begin all new rolls in an erosion check slot if required, double anchor across roll every 12".
8. Install TRM in bottom anchor trench (12"x6"), anchor every 12". Place all other staples throughout slope at 1 to 2.5 per square yard dependant on slope. Refer to manufacturer's anchor guide.Channel Installation
9. Excavate initial anchor trench (12"x6") across the lower end of the project area.
10. Excavate intermittent check slots (6"x6") across the channel at 30' intervals along the channel.
11. Excavate longitudinal channel anchor slots (4"x4") along both sides of the channel to bury the edges. Whenever possible extend the TRM 2'–3' above the crest of channel side slopes.
12. Install TRM in initial anchor trench (downstream) anchor every 12", backfill and compact soil.
13. Roll out TRM beginning in the center of the channel toward the intermittent check slot. Do not pull taught. Unroll adjacent rolls upstream with a 3" minimum overlap (anchor every 18") and up each channel side slope.
14. At top of channel side slopes install TRM in the longitudinal anchor slots, anchor every 18".
15. Install TRM in intermittent check slots. Lay into trench and secure with anchors every 12", backfill with soil and compact.
16. Overlap roll ends a minimum of 12" with upstream TRM on top for a shingling effect. Begin all new rolls in an intermittent check slot, double anchored every 12".
17. Install upstream end in a terminal anchor trench (12"x6"); anchor every 12", backfill and compact.
18. Complete anchoring throughout channel at 2.5 per square yard using suitable ground anchoring devices (U shaped wire staples, metal geotextile pins, plastic stakes, and triangular wooden stakes). Anchors should be of sufficient length to resist pullout. Longer anchors may be required in loose sandy or gravelly soils.

Specifications for Construction Entrance

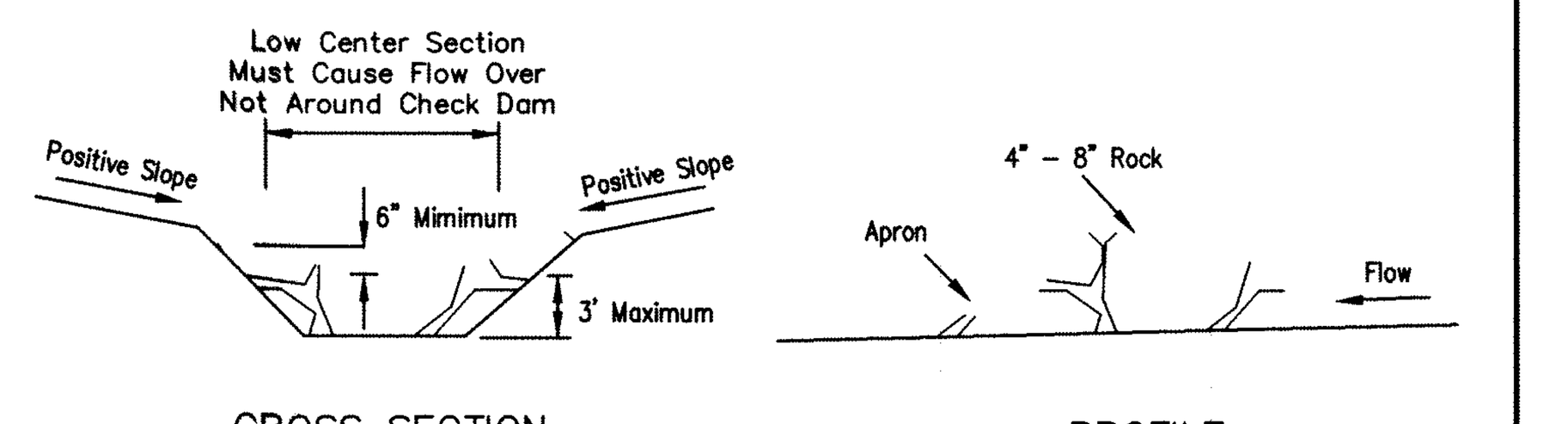


1. Stone Size—ODOT # 2 (1.5–2.5 inch) stone shall be used, or recycled concrete equivalent.
2. Length—The Construction entrance shall be as long as required to stabilize high traffic areas but not less than 70 ft. (exception: apply 30 ft. minimum to single residence lots).
3. Thickness —The stone layer shall be at least 6 inches thick for light duty entrances or at least 10 inches for heavy duty use.
4. Width —The entrance shall be at least 14 feet wide, but not less than the full width at points where ingress or egress occurs.
5. Geotextile —A geotextile shall be laid over the entire area prior to placing stone. It shall be composed of strong rot–proof polymeric fibers and meet the following specifications:

GEOTEXTILE SPECIFICATION FOR CONSTRUCTION ENTRANCE	
Minimum Tensile Strength	200 lbs.
Minimum Puncture Strength	80 psi.
Minimum Tear Strength	50 lbs.
Minimum Burst Strength	320 psi.
Minimum Elongation	20%
Equivalent Opening Size	EOS < 0.6 mm
Permitivity	1x10–3 cm/sec.

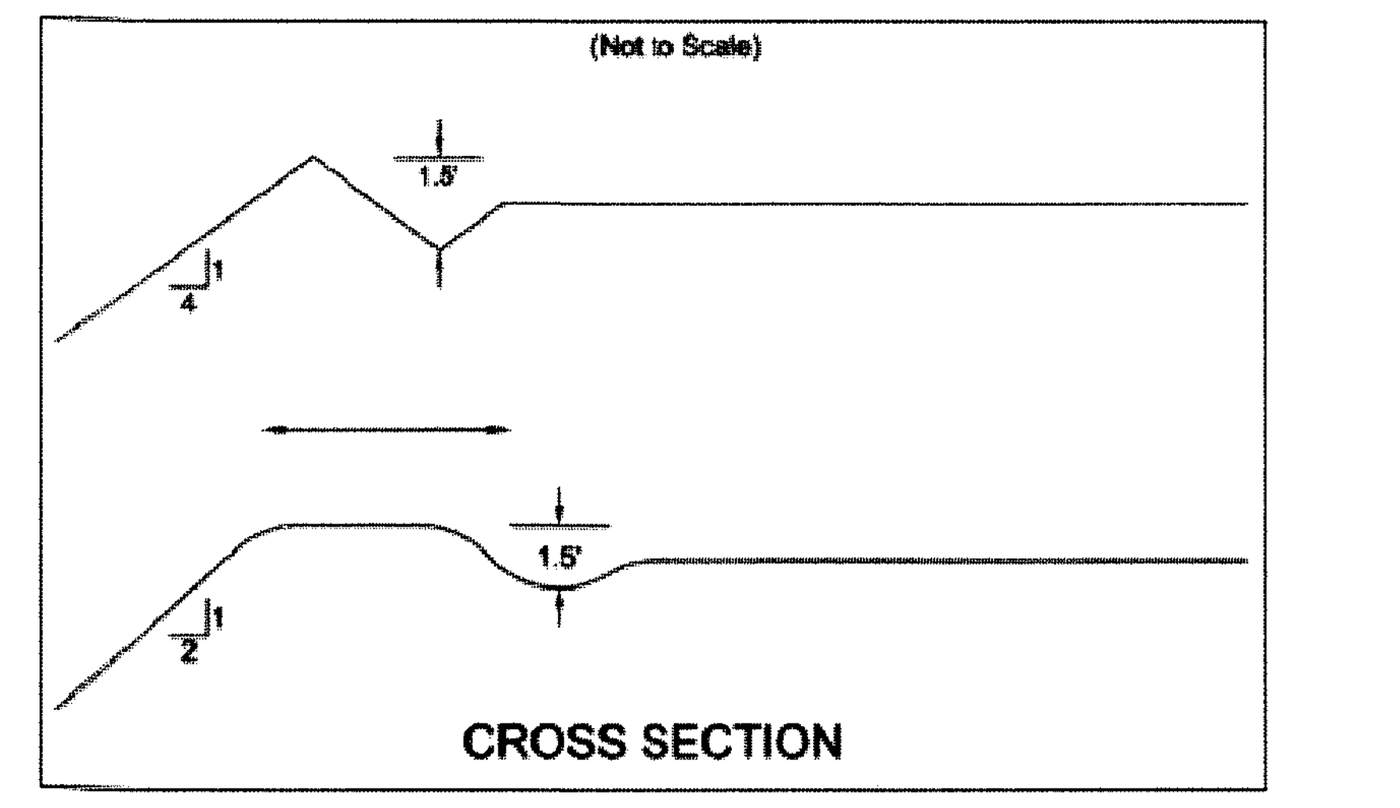
6. Timing—The construction entrance shall be installed as soon as is practicable before major grading activities.
7. Culvert —A pipe or culvert shall be constructed under the entrance if needed to prevent surface water from flowing across the entrance or to prevent runoff from being directed out onto paved surfaces.
8. Water Bar —A water bar shall be constructed as part of the construction entrance if needed to prevent surface runoff from flowing the length of the construction entrance and ut onto paved surfaces.
9. Maintenance —Top dressing of additional stone shall be applied as conditions demand. Mud spilled, dropped, ashed or tracked onto public roads, or any surface where runoff is not checked by sediment controls, shall be removed immediately. Removal shall be accomplished by scraping or sweeping.
10. Construction entrances shall not be relied upon to remove mud from vehicles and prevent off–site tracking. Vehicles that enter and leave the construction–site shall be restricted from muddy areas.
11. Removal—the entrance shall remain in place until the disturbed area is stabilized or replaced with a permanent roadway or entrance.

Specifications for Rock Check Dam



1. The check dam shall be constructed of 4–8 inch diameter stone, placed so that it completely covers the width of the channel. ODOT Type D stone is acceptable, but should be underlain with a gravel filter consisting of ODOT No. 3 or 4 or suitable filter fabric.
2. Maximum height of check dam shall not exceed 3.0 feet.
3. The midpoint of the rock check dam shall be a minimum of 6 inches lower than the sides in order to direct across the center and away from the channel sides.
4. The base of the check dam shall be entrenched approximately 6 inches.
5. Spacing of check dams shall be in a manner such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.
6. A Splash Apron shall be constructed where check dams are expected to be in use for an extended period of time, a stone apron shall be constructed immediately downstream of the check dam to prevent flows from undercutting the structure. The apron should be 6 in. thick and its length two times the height of the dam.
7. Stone placement shall be performed either by hand or mechanically as long as the center of check dam is lower than the sides and extends across entire channel.
8. Side slopes shall be a minimum of 2:1.

Specifications for Temporary Diversion



1. Drainage area should not exceed 10 acres. Larger areas require a more extensive design.
2. The channel cross section may be parabolic or trapezoidal. Disk the base of the dike before placing fill. Build the dike 10% higher than designed for settlement. The dike shall be compacted by traversing with tracked earth–moving equipment.
3. The minimum cross section of the levee or dike will be as follows: (Minimum design freeboard shall be 0.3 foot.) Where construction traffic will cross, the top width may be made wider and the side slopes flatter than specified above.

Dike Top Width(ft.)	Height(ft.)	Side Slopes	Shape
0	1.5	4:1	Trapezoidal
4	1.5	2:1	Parabolic

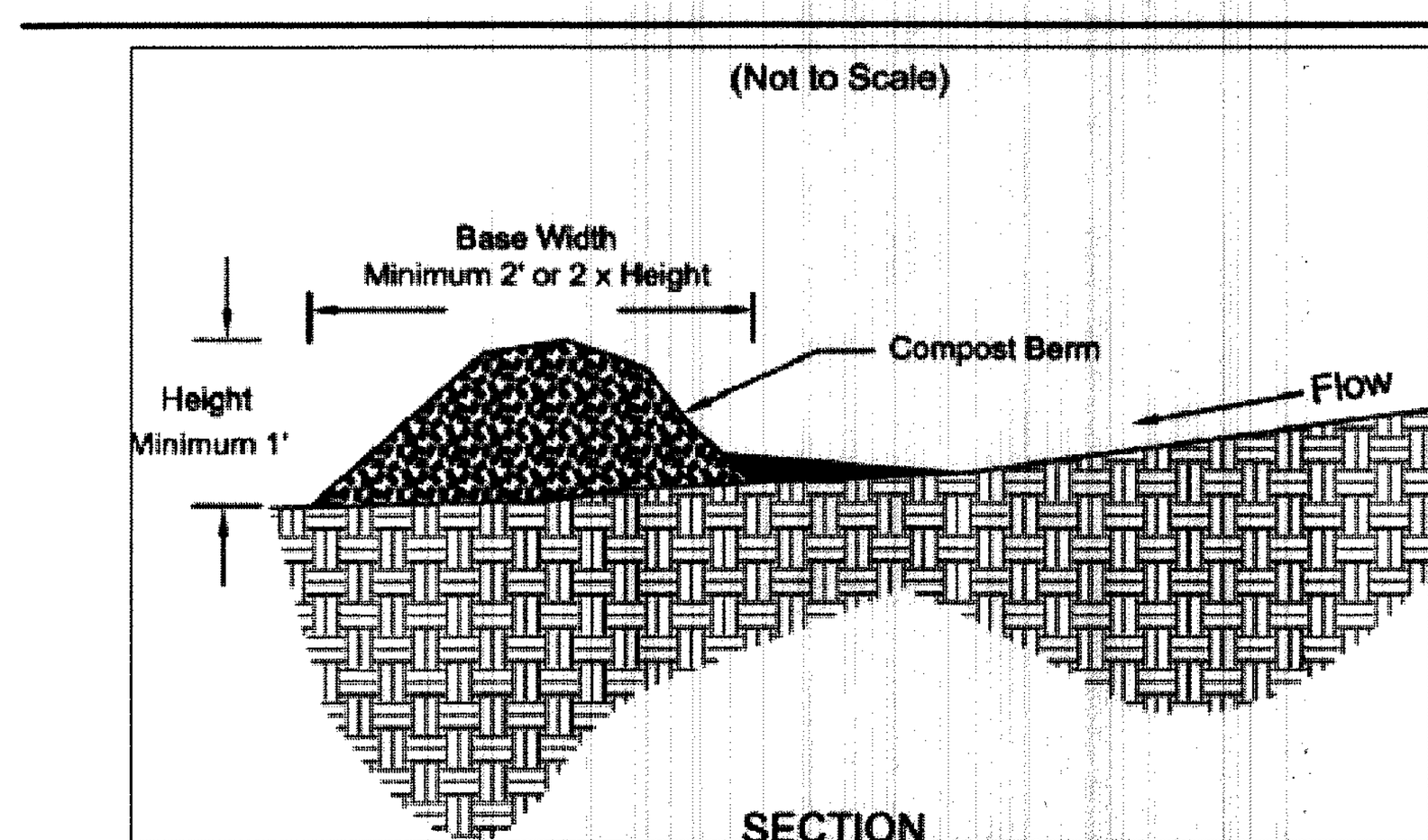
4. The grade may be variable depending upon the topography, but must have a positive drainage to the outlet and be stabilized to be non–erosive.

Temporary Diversion Stabilization Treatment			
Diversion Slope	<2 ac.	2 – 5 ac.	5 – 10 ac.
0 – 3%	Seed & Straw	Seed & Straw	Seed & Straw
3 – 5%	Seed & Straw	Seed & Straw	Matting
5 – 8%	Seed & Straw	Matting	Matting
8 – 20%	Seed & Straw	Matting	Engineered

Note: Diversions with steeper slopes or greater drainage areas are beyond the scope of this standard and must be designed for stability. Seed, straw and matting used shall meet the Specifications for Temporary Seeding, Mulching and Matting.

5. Outlet runoff onto a stabilized area, into a properly designed waterway, grade stabilization structure, or sediment trapping facility.
6. Diversions shall be seeded and mulched in accordance with the requirements in practice standards TEMPORARY SEEDING (or PERMANENT SEEDING) and MULCHING as soon as they are constructed or other suitable stabilization in order to preserve dike height and reduce maintenance.

Specifications for Filter Berm



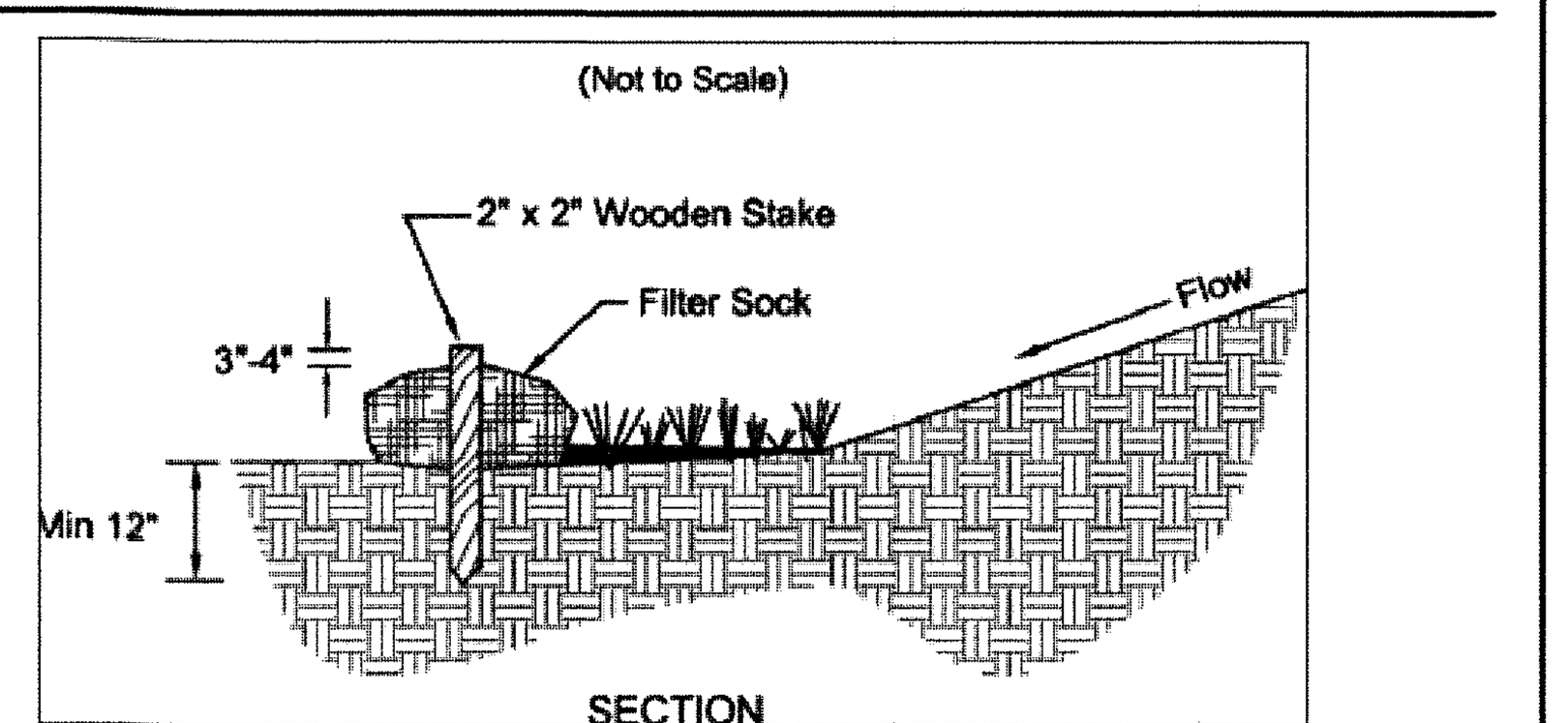
1. Materials –Compost used for filter berms shall be weed, pathogen and insect free and free of any refuse, contaminants or other materials toxic to plant growth. They shall be derived from a well–decomposed source of organic matter and consist of a particles ranging from 1/4" to 3".
2. Installation –Filter berms will be placed on a level line across slopes, generally parallel to the base of the slope or other affected area. On slopes approaching 2:1, additional berms shall be provided at the top and as needed mid–slope.

   Filter berms are not to be used in concentrated flow situations or in runoff channels.
3. Maintenance –Inspect filter berms after each significant rain, maintaining the berms in a functional condition at all times.

   Remove sediments collected at the base of the filter berms when they reach 1/3 of the exposed height of the practice.

   Where the filter berm deteriorates or fails it will be, repaired or replaced with a more effective alternative.
4. Removal –Filter berms no longer needed will be dispersed on site in a manner that will facilitate seeding.

Specifications for Filter Sock



1. Materials –Compost used for filter socks shall be weed, pathogen and insect free and free of any refuse, contaminants or other materials toxic to plant growth. They shall be derived from a well–decomposed source of organic matter and consist of a particles ranging from 3/8" to 2".
2. Filter Socks shall be 3 or 5 mil continuous, tubular, HDPE 3/8" knitted mesh netting material, filled with compost passing the above specifications for compost products.

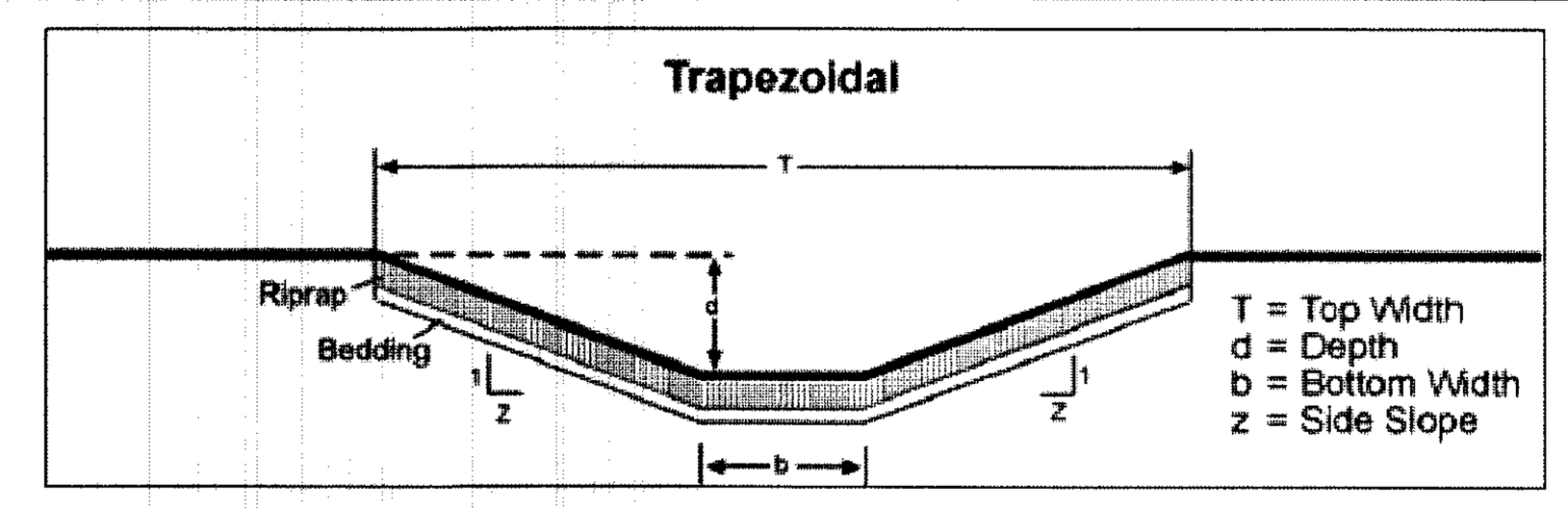
Installation:

3. Filter socks will be placed on a level line across slopes, generally parallel to the base of the slope or other affected area. On slopes approaching 2:1, additional socks shall be provided at the top and as needed midslope.
4. Filter socks intended to be left as a permanent filter or part of the natural landscape, shall be seeded at the time of installation for establishment of permanent vegetation.5. Filter Socks are not to be used in concentrated flow situations or in runoff channels.

Maintenance:

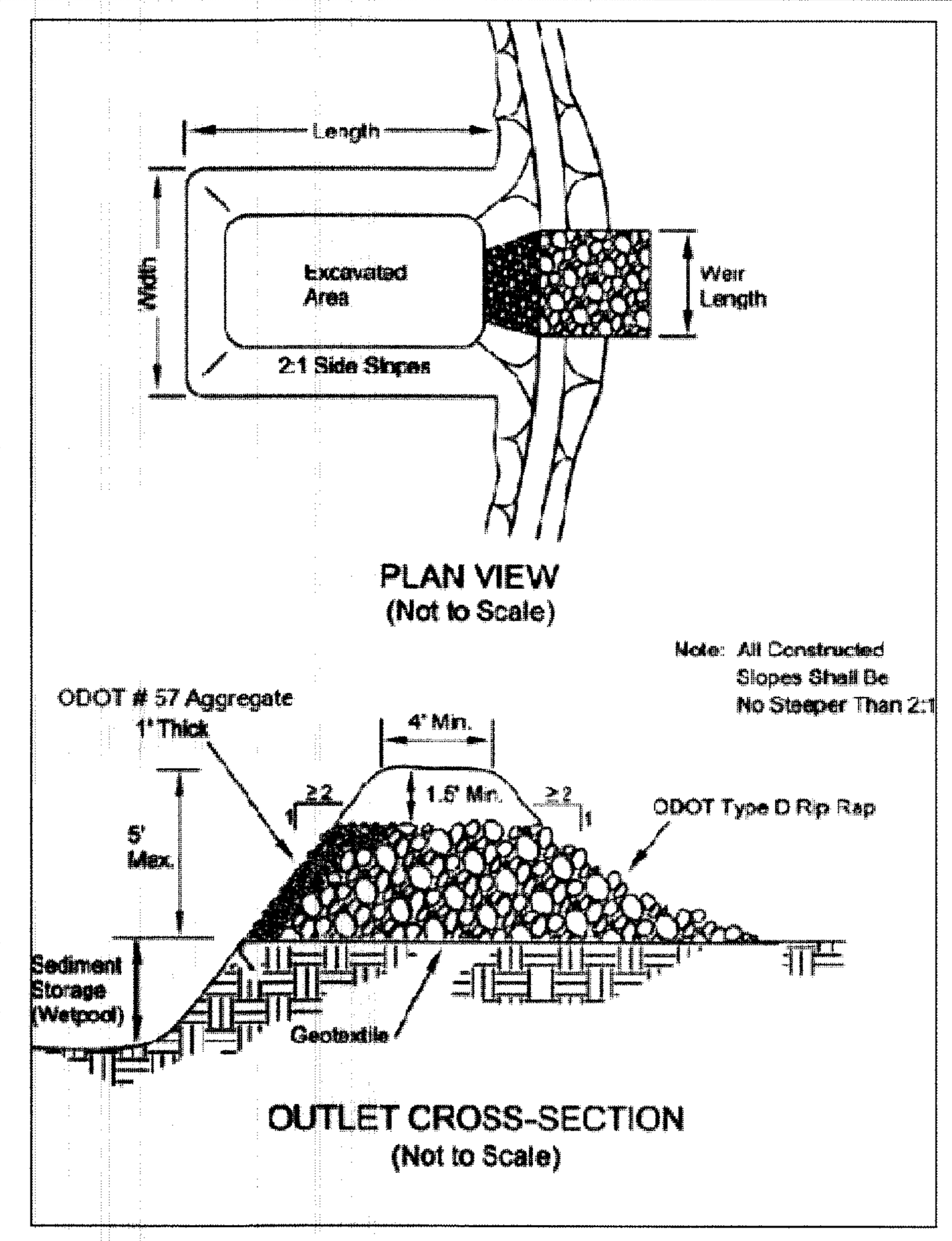
6. Routinely inspect filter socks after each significant rain, maintaining filter socks in a functional condition at all times.
7. Remove sediments collected at the base of the filter socks when they reach 1/3 of the exposed height of the practice.
8. Where the filter sock deteriorates or fails, it will be repaired or replaced with a more effective alternative.
9. Removal –Filter socks will be dispersed on site when no longer required in such as way as to facilitate and not obstruct seedings.

Specifications for Rock Lined Channel



1. Subgrade for the filter and riprap shall be prepared to the required lines and grades as shown on the plan. The subgrade shall be cleared of all trees, stumps, roots, sod, loose rock, or other material.
2. Riprap shall conform to the grading limits as shown on the plan.
3. No abrupt deviations from the design grade or horizontal alignment shall be permitted.
4. Geotextile shall be securely anchored according to manufacturers recommendations.
5. Geotextile shall be laid with the long dimension parallel to the direction of flow and shall be laid loosely but without wrinkles and creases. Where joints are necessary, strips shall be placed to provide a 12–in. minimum overlap, with the upstream strip overlapping the downstream strip.
6. Gravel bedding shall be ODOT No. 67's or 57's unless shown differently on the drawings.
7. Riprap may be placed by equipment but shall be placed in a manner to prevent slippage or damage to the geotextile.
8. Riprap shall be placed by a method that does not cause segregation of sizes. Extensive pushing with a dozer causes segregation and shall be avoided by delivering riprap near its final location within the channel.
9. Construction shall be sequenced so that riprap channel protection is placed and functional without delays when the channel becomes operational.
10. All disturbed areas will be vegetated as soon as practical.

Specifications for Sediment Trap



1. Work shall consist of the installation and removal of all sediment traps at the locations designated on the drawings.
2. Sediment traps shall be constructed to the dimensions specified on the drawings and operational prior to upslope land disturbance.
3. Fill used for the embankment shall be cleared, grubbed and stripped of vegetation to a minimum depth of six (6) inches. The pool shall be cleared as needed to facilitate sediment cleanout.
4. Fill used for the embankment shall be evaluated to assure its suitability and it must be free of roots or other woody vegetation, large rocks, organics or other objectionable materials. Fill material shall shall be placed in six (6) inch lifts and shall be compacted to by traversing with a sheepsfoot or other approved compaction equipment. Fill height shall be increased five (5) percent to allow for structure/foundation settlement. Construction shall not be permitted if the earthfill or compaction surface is frozen.
5. The maximum height of embankment shall be five (5) feet. All cut and fill slopes shall be 2:1 (h:v) or flatter.
6. A minimum storage volume below the crest of the outlet of 67 yd^3. for every acre of contributing drainage area shall be achieved at each location noted on the drawings with additional sediment storage volume provided below this elevation.
7. Temporary seeding shall be established and maintained over the useful life of the practice.
8. The outlet for the sediment trap structure shall be constructed to the dimension shown on the drawings.
9. The outlet shall be constructed using the materials specified on the drawings. Where geotextile is used, all overlaps shall be a minimum of two (2) feet or as specified by the manufacturer, whichever is greater. All overlaps shall be made with the upper most layer placed last. Geotextile shall be keyed in at least 6" on the upstream side of the outlet.
10. Warning signs and safety fence shall be placed around the traps and maintained over the life of the practice.
11. After all sediment–producing areas have been permanently stabilized, the structure and all associated sediment shall be removed. Stabile earth materials shall be placed in the sediment trap area and compacted. The area shall be graded to blend in with the adjoining land surfaces and have positive drainage. The area shall be immediately seeded.

NO.	DATE	DESCRIPTION
1		

REVISIONS

NO.	DATE	DESCRIPTION

EROSION & SEDIMENTATION CONTROL DETAILS

DATE: 2/26/16 | JOB No: W00521 | DRAWN BY: TDA | SCALE: AS SHOWN

WEST CHESTER CHURCH OF THE NAZARENE

7951 TYLERSVILLE ROAD
WEST CHESTER TOWNSHIP
BUTLER COUNTY, OHIO 45069

Evans CivilPro Engineers, LLC
Consulting Engineers & Surveyors
4700 Duke Drive, Suite 100
Mason, Ohio 45040
(513) 398-1728

SHEET 4 OF 4

P:\W00521\dwgfiles\Improvement Plan_W00521_IP.dwg 2/4/2016 10:02:01 AM EST

COPYRIGHT © 2016 BY Evans CivilPro Engineers, LLC