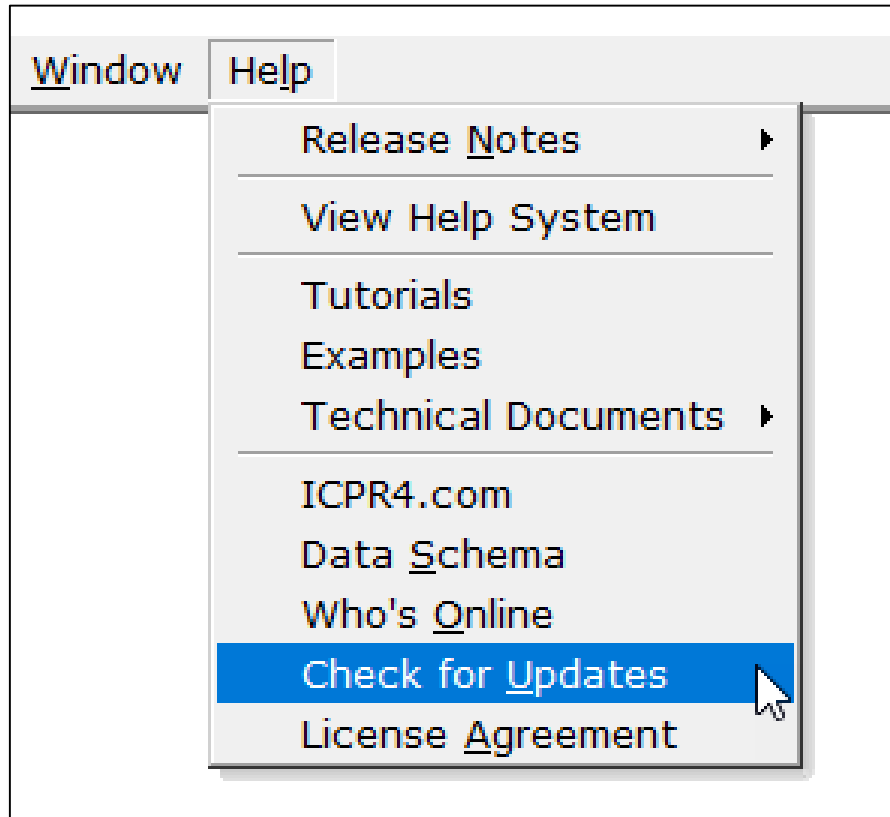# Regulatory Review Webinar Series

Lesson 5
Hydraulics, Pre/Post Examples

F. Warren McKinnie & Heather Brady
Streamline Technologies, Inc.

Tuesday – November 5, 2019

Final Webinar

Window	Help

Release Notes ▸

View Help System

Tutorials
Examples
Technical Documents ▸

ICPR4.com
Data Schema
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We will try to post a recording of this webinar and/or the presentation material as soon as we can.

To find them:
"Check for Updates"
sometime tomorrow.

support@icpr4.com

Lesson 5 Pre/Post Examples

- 854 Capital Circle Southwest
- St. Augustine VA Hospital
- Commercial Development – Wawa
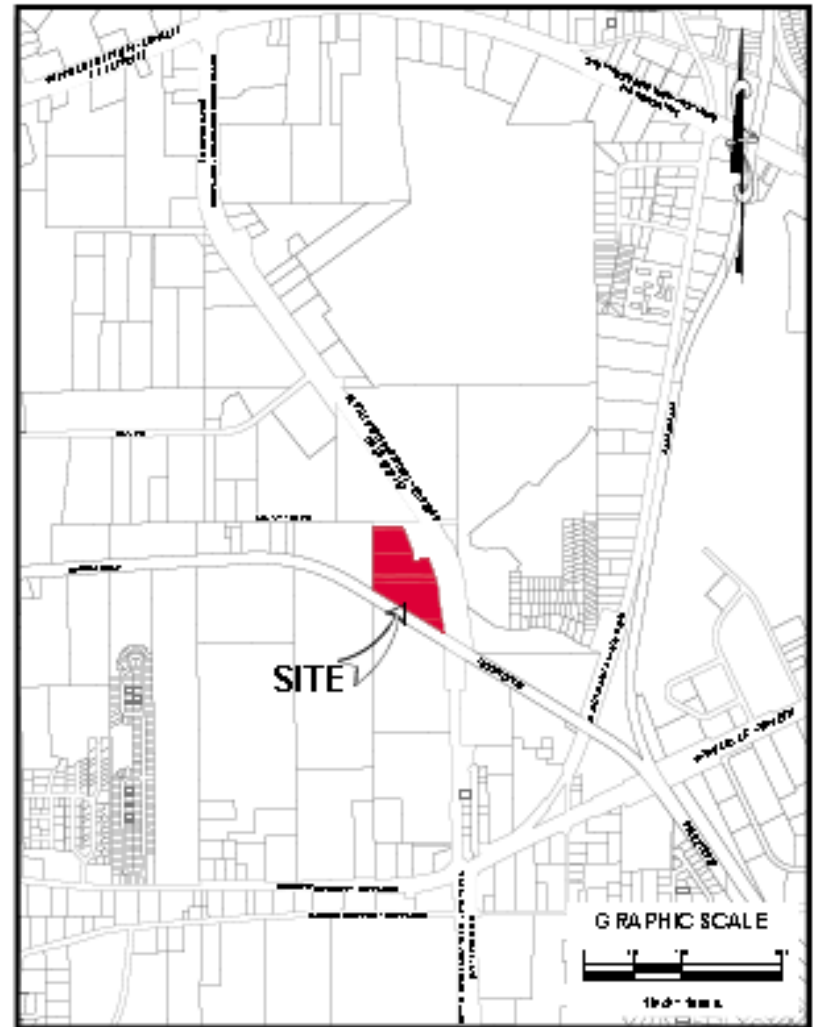- US 19 Drainage Improvements

Moore Bass Example

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Moore Bass Example
Overview

- **Project Name:**
  854 Capital Circle Southwest

- **Location:**
  Leon County, Florida

- **Firm:**
  Moore Bass Consulting

- **Engineer of Record (Plans and H&H Calcs):**
  Roger V. Wynn, PE

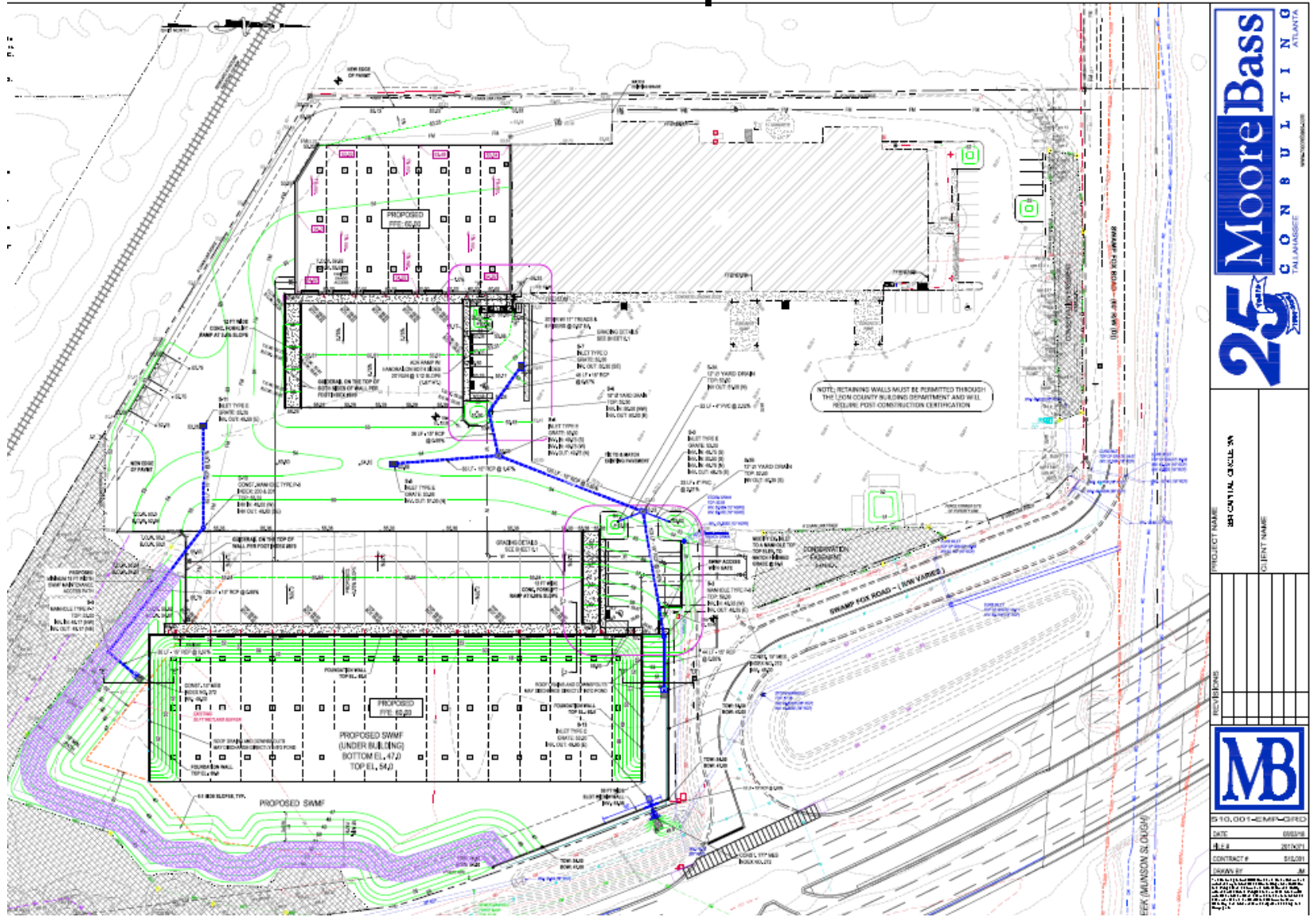- **Converted from ICPR3 to ICPR4 by SLT**

Moore Bass Example – Project Description

- **Existing Condition**
  Industrial Re-Development within the 100 yr FP

- **Proposed Conditions**
  Warehouse Expansion

- **Proposed Stormwater Facility**
  Wet Detention Pond (with compensating floodplain storage)

- **Outfall:** West Branch of the Gum Creek

VICINITY MAP

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Moore Bass Example – Site Plan

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Moore Bass Example – Design Criteria

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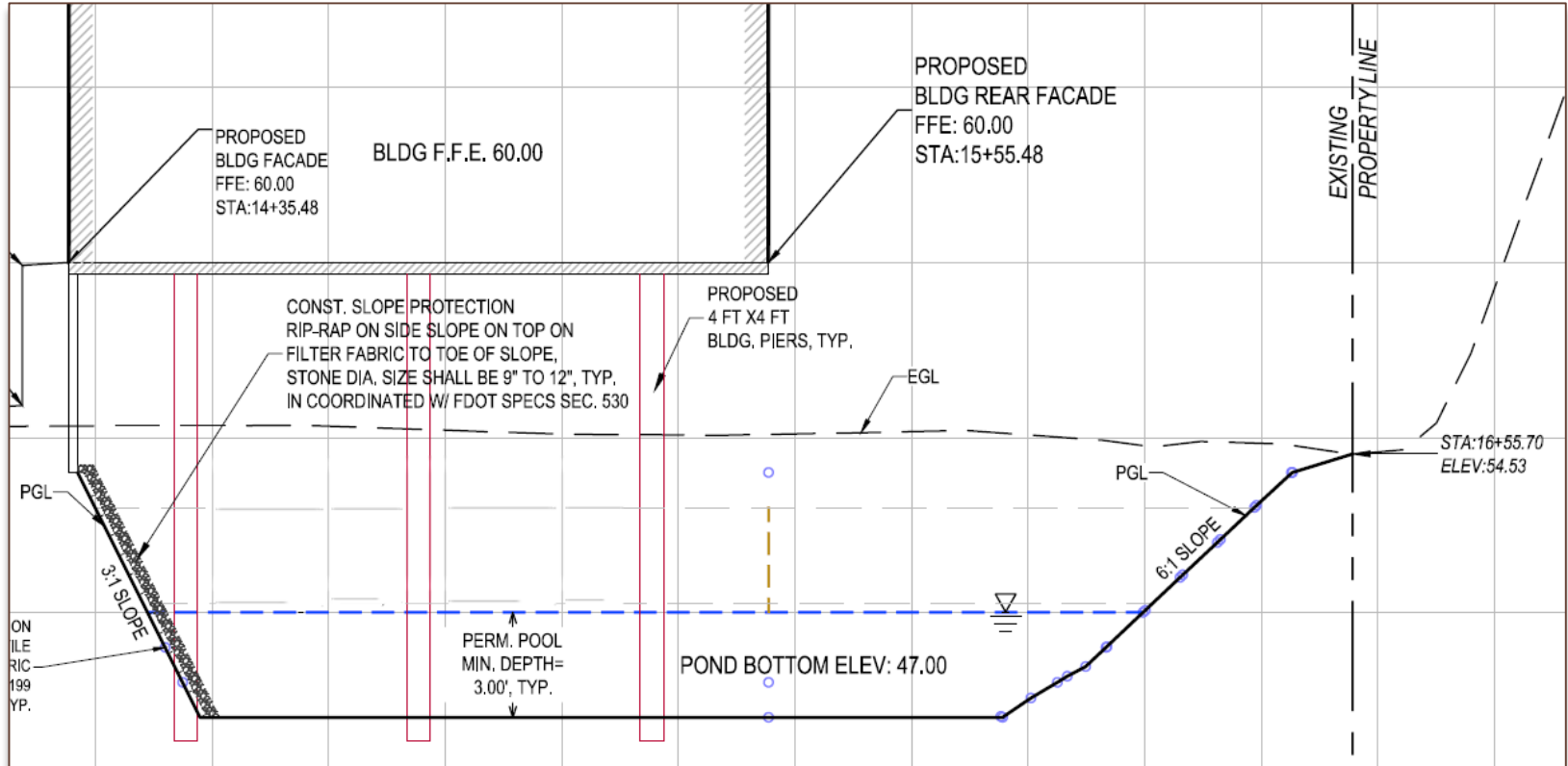
Moore Bass Example – Design Criteria

- Provided Treatment Volume 36,176 cf > Required Treatment Volume = 31,799 cf
- Provided Permanent Pool Volume 173,132 cf > Required Permanent Pool Volume = 95,150 cf

Provided Treatment Volume (External Only)

Stage (feet)	Area (sf)	Area (ac)	Inc. Vol. (cf)	Sum Vol. (cf)	Sum Vol. (af)
50.0	26,663	0.612	0.0	0.0	0.00
51.0	30,307	0.696	28,485	28,485	0.65
51.25	31,218	0.717	7,691	36,176	0.83

SWMF (External + Internal)

Stage (feet)	Area (sf)	Area (ac)	Inc. Vol. (cf)	Sum Vol. (cf)	Sum Vol. (af)
47.0	50,149	1.151	0.0	0.0	0.00
48.0	55,103	1.265	52,626.0	52,626.0	1.21
49.0	60,207	1.382	57,655.0	110,281.0	2.53
50.0	65,495	1.504	62,851.0	173,132.0	3.97
51.0	71,012	1.630	68,253.5	241,385.5	5.54
52.0	76,451	1.755	73,731.5	315,117.0	7.23
53.0	82,642	1.897	79,546.5	394,663.5	9.06
54.0	88,733	2.037	85,687.5	480,351.0	11.03
					0.00

*icpr*4

Moore Bass Example – Design Criteria

- Provided Treatment Volume **36,176 cf** > Required Treatment Volume = 31,799 cf
- Provided Permanent Pool Volume **173,132 cf** > Required Permanent Pool Volume = 95,150 cf

Verify in ICPR4 model input reports

Provided Treatment Volume (External Only)

Stage (feet)	Area (sf)	Area (ac)	Inc. Vol. (cf)	Sum Vol. (cf)	Sum Vol. (af)
50.0	26,663	0.612	0.0	0.0	0.00
51.0	30,307	0.696	28,485	28,485	0.65
51.25	31,218	0.717	7,691	36,176	0.83

SWMF (External + Internal)

Stage (feet)	Area (sf)	Area (ac)	Inc. Vol. (cf)	Sum Vol. (cf)	Sum Vol. (af)
47.0	50,149	1.151	0.0	0.0	0.00
48.0	55,103	1.265	52,626.0	52,626.0	1.21
49.0	60,207	1.382	57,655.0	110,281.0	2.53
50.0	65,495	1.504	62,851.0	173,132.0	3.97
51.0	71,012	1.630	68,253.5	241,385.5	5.54
52.0	76,451	1.755	73,731.5	315,117.0	7.23
53.0	82,642	1.897	79,546.5	394,663.5	9.06
54.0	88,733	2.037	85,687.5	480,351.0	11.03
					0.00

icpr4

Moore Bass Example – Design Criteria

- Pre/Post Discharge: All critical duration storms up to and including the 25-year frequency
- Treatment Recovery: ½ volume in 60 hrs ~ Designed orifice diameter = 1.79 in

Verify in ICPR4 model input & output reports

Moore Bass Example – Model Development

- Curve Numbers
  - Area Weighted Average – *Simple Basins*
  - No DCIA

- Time of Concentration
  Estimated to be 5 minutes for post development

Existing Conditions

Lesson 5 - Pre/Post Examples

Moore Bass Example – Pre Nodal Network

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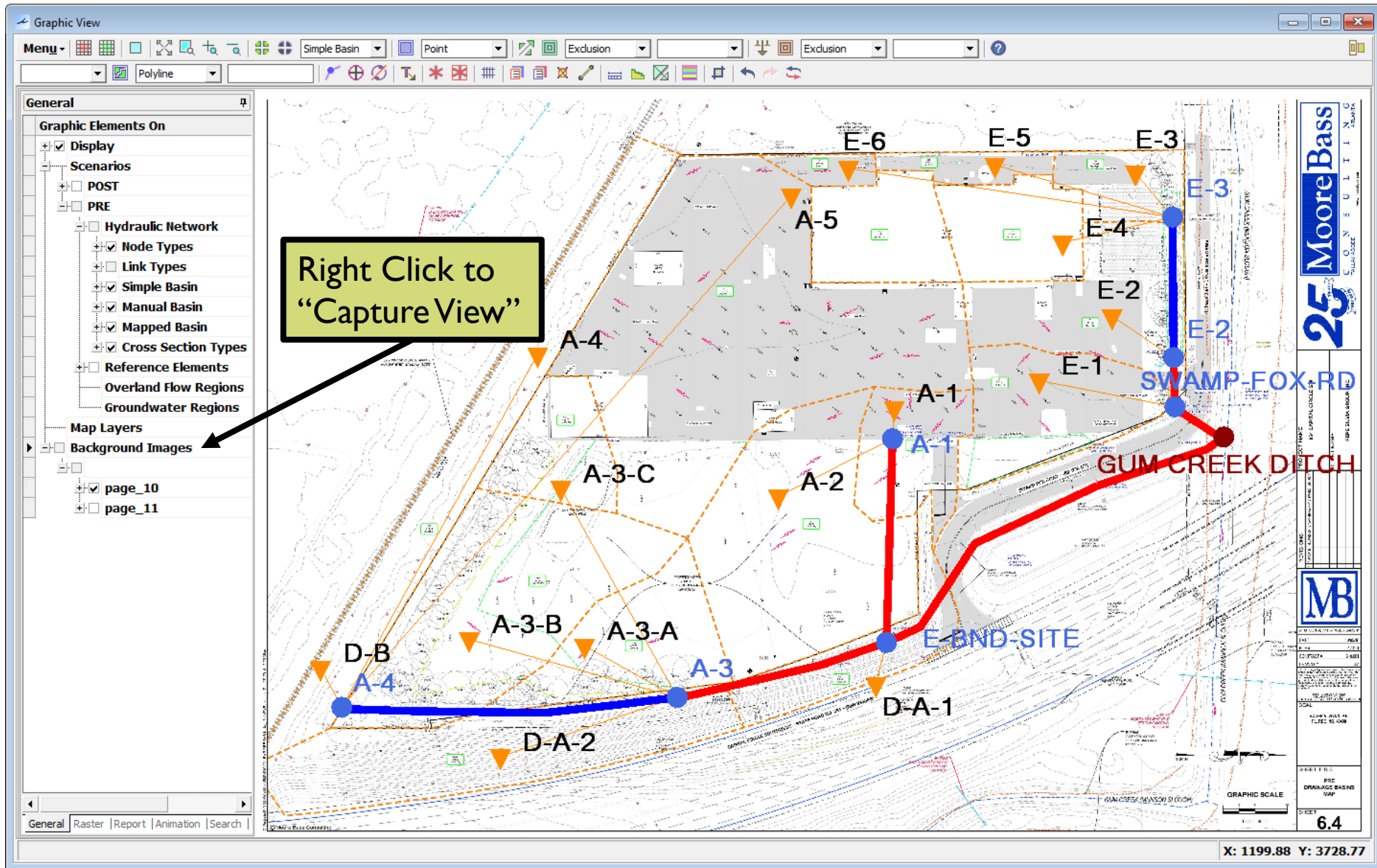
Moore Bass Example – Drainage Report: Nodal Network

ICPR3 Network Builder

ICPR4 Background Image

Moore Bass Example – Drainage Report: Input

ICPR3 Basin Input
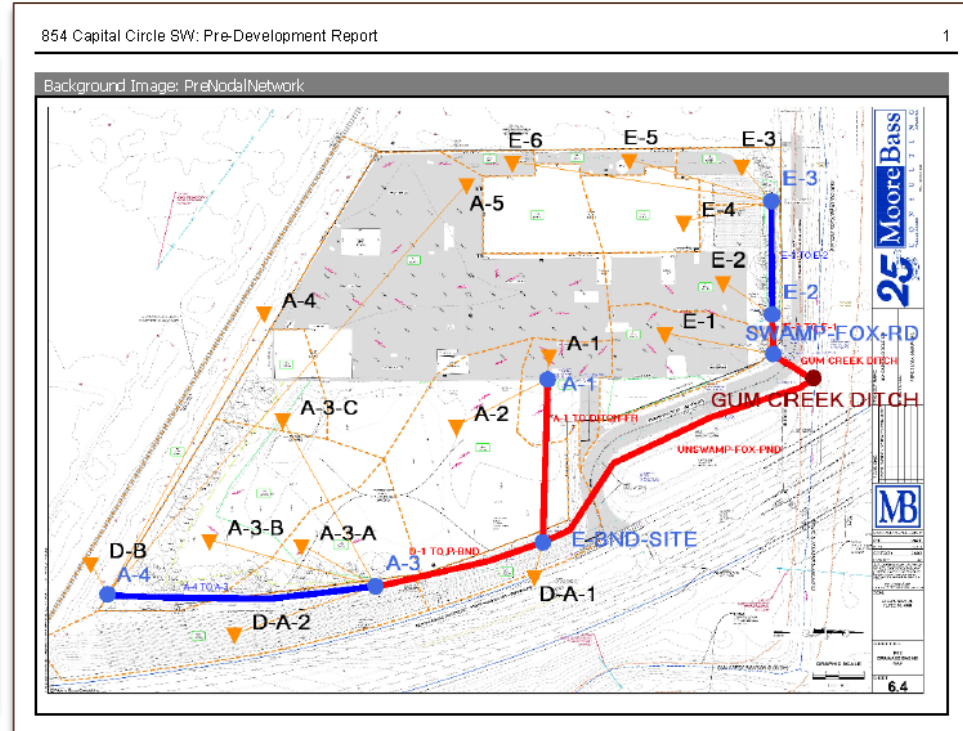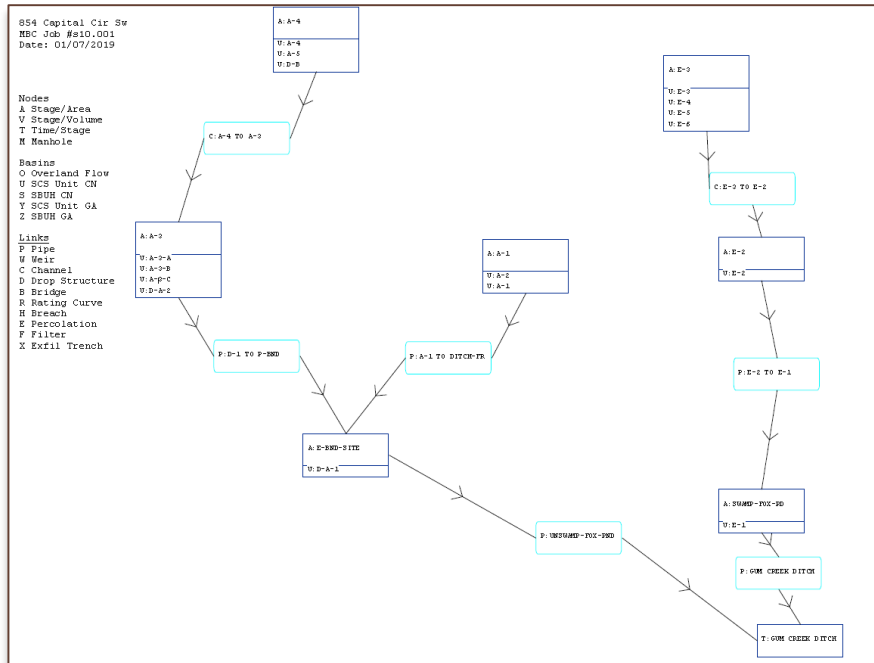
```
================================================================================
==== Basins ====================================================================
================================================================================

        Name: A-1                    Node: A-1                   Status: Onsite
       Group: BASE                   Type: SCS Unit Hydrograph CN

  Unit Hydrograph: Uh323                  Peaking Factor: 323.0
    Rainfall File:                   Storm Duration(hrs): 0.00
Rainfall Amount(in): 0.000           Time of Conc(min): 5.20
          Area(ac): 0.470            Time Shift(hrs): 0.00
     Curve Number: 90.30          Max Allowable Q(cfs): 999999.000
         DCIA(%): 0.00
```

ICPR4 Basin Input

Simple Basins = Lumped CN method. CN and Impervious areas will be included in the basin data form (just like ICPR3).

Simple Basin: A-1

Scenario:	PRE
Node:	A-1
Hydrograph Method:	NRCS Unit Hydrograph
Infiltration Method:	Curve Number
Time of Concentration:	5.2000 min
Max Allowable Q:	999999.00 cfs
Time Shift:	0.0000 hr
Unit Hydrograph:	Uh323
Peaking Factor:	323.0
Area:	0.4700 ac
Curve Number:	90.3
% Impervious:	0.00
% DCIA:	0.00
% Direct:	0.00
Rainfall Name:	

Lesson 5 - Pre/Post Examples   *icpr4*

Moore Bass Example – Drainage Report

ICPR3 Stage/Area Node Input

```
==========================================================================================
==== Nodes ===============================================================================
==========================================================================================

        Name: A-1              Base Flow(cfs): 0.000        Init Stage(ft): 50.980
       Group: BASE                                          Warn Stage(ft): 53.000
        Type: Stage/Area

No Storage: Dummy Node to accumulate flow and transfer downstream

       Stage(ft)           Area(ac)
     --------------     --------------
          50.980             0.0000
          50.990             0.0000
```

ICPR4 Stage/Area Node Input

Node: A-1		
Scenario:	PRE	
Type:	Stage/Area	
Base Flow:	0.00 cfs	
Initial Stage:	50.98 ft	
Warning Stage:	53.00 ft	

Stage [ft]	Area [ac]	Area [ft2]
50.98	0.0000	0
50.99	0.0000	0

Comment: No Storage: Dummy Node to accumulate flow and transfer downstream

   Lesson 5 - Pre/Post Examples

Moore Bass Example – Drainage Report

ICPR3 Time/Stage Node Input

```
-----------------------------------------------------------------------------
      Name: GUM CREEK DITCH      Base Flow(cfs): 0.000      Init Stage(ft): 48.000
     Group: BASE                                            Warn Stage(ft): 52.000
      Type: Time/Stage

FDOT Hydraulic 50 yr Design for Gum Creek Bridge Crossing
N.H.W.: 52.0
Design Flood Elev: 56.5
Design Discharge: 700 cfs
Design Velocity: 2.2 fps
2% exceedance

        Time(hrs)        Stage(ft)
     --------------- ---------------
              0.00          48.000
          99999.00          48.000
```

ICPR4 Time/Stage Node Input

If a Boundary Stage Table is assigned to the node, it must be provided for review. If none, then the data shown to the right is used for all simulations.

Node: GUM CREEK DITCH				
Scenario:	PRE			
Type:	Time/Stage			
Base Flow:	0.00 cfs			
Initial Stage:	48.00 ft			
Warning Stage:	52.00 ft			
Boundary Stage:				

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	48.00
0	0	0	99999.0000	48.00

Comment: FDOT Hydraulic 50 yr Design for Gum Creek Bridge Crossing
N.H.W.: 52.0
Design Flood Elev: 56.5
Design Discharge: 700 cfs
Design Velocity: 2.2 fps
2% exceedance

Moore Bass Example – Drainage Report: Input

ICPR3 Link Input: Pipe

```
===================================================================================
==== Pipes ========================================================================
===================================================================================

         Name: A-1 TO DITCH-FR      From Node: A-1           Length(ft): 225.00
        Group: BASE                   To Node: E-BND-SITE          Count: 1
                                                       Friction Equation: Automatic
             UPSTREAM         DOWNSTREAM            Solution Algorithm: Most Restrictive
   Geometry: Circular         Circular                            Flow: Both
   Span(in): 12.00            12.00               Entrance Loss Coef: 0.00
   Rise(in): 12.00            12.00                   Exit Loss Coef: 1.00
  Invert(ft): 50.970          50.180                   Bend Loss Coef: 0.00
 Manning's N: 0.015000        0.015000               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:
Circular: Smooth tapered inlet throat

Downstream FHWA Inlet Edge Description:
Circular: Smooth tapered inlet throat
```

ICPR4 Link Input: Pipe

Pipe Link: A-1 TO DITCH-FR		Upstream		Downstream	
Scenario:	PRE	Invert:	50.97 ft	Invert:	50.18 ft
From Node:	A-1	Manning's N:	0.0150	Manning's N:	0.0150
To Node:	E-BND-SITE	Geometry: Circular		Geometry: Circular	
Link Count:	1	Max Depth:	1.00 ft	Max Depth:	1.00 ft
Flow Direction:	Both	Bottom Clip			
Damping:	0.0000 ft	Default:	0.00 ft	Default:	0.00 ft
Length:	225.00 ft	Op Table:		Op Table:	
FHWA Code:	48	Ref Node:		Ref Node:	
Entr Loss Coef:	0.00	Manning's N:	0.0150	Manning's N:	0.0150
Exit Loss Coef:	1.00	Top Clip			
Bend Loss Coef:	0.00	Default:	0.00 ft	Default:	0.00 ft
Bend Location:	0.00 ft	Op Table:		Op Table:	
Energy Switch:	Energy	Ref Node:		Ref Node:	
		Manning's N:	0.0150	Manning's N:	0.0150

Lesson 5 - Pre/Post Examples

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Proposed Conditions

 Lesson 5 - Pre/Post Examples

Lessn 5 Moore Bass Example – Post Nodal Network

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Moore Bass Example – Drainage Report: Post-Development Input

ICPR4 Stage/Area Node: Pond Input Data

Node: P-SWMF

Scenario:	POST
Type:	Stage/Area
Base Flow:	0.00 cfs
Initial Stage:	50.00 ft
Warning Stage:	53.01 ft

Verify Treatment Volume Requirements

Stage [ft]	Area [ac]	Area [ft2]
47.00	1.1510	50138
48.00	1.2650	55103
49.00	1.3820	60200
50.00	1.5040	65514
51.00	1.6300	71003
52.00	1.7620	76753
53.00	1.8970	82633
54.00	2.0370	88732

Comment: Permanent Pool Elevation set at 50.00

icpr4

Moore Bass Example – Drainage Report: Input

ICPR3 Link Input: Channel

```
================================================================================
==== Channels ==================================================================
================================================================================

              Name: E-3 TO E-2           From Node: E-3            Length(ft): 204.70
             Group: BASE                    To Node: E-2               Count: 1

                    UPSTREAM       DOWNSTREAM          Friction Equation: Automatic
          Geometry: Irregular      Irregular          Solution Algorithm: Automatic
        Invert(ft): 51.000         51.000                          Flow: Both
      TClpInitZ(ft): 9999.000      9999.000          Contraction Coef: 0.100
        Manning's N:                                  Expansion Coef: 0.300
       Top Clip(ft):                               Entrance Loss Coef: 0.000
       Bot Clip(ft):                                   Exit Loss Coef: 0.000
          Main XSec: E-4 TO E-3     E-3 TO E-2          Outlet Ctrl Spec: Use dc or tw
       AuxElev1(ft): 0.000          0.000               Inlet Ctrl Spec: Use dc
          Aux XSec1:                                 Stabilizer Option: None
       AuxElev2(ft): 0.000          0.000
          Aux XSec2:
      Top Width(ft):
          Depth(ft):
      Bot Width(ft):
       LtSdSlp(h/v):
       RtSdSlp(h/v):
```
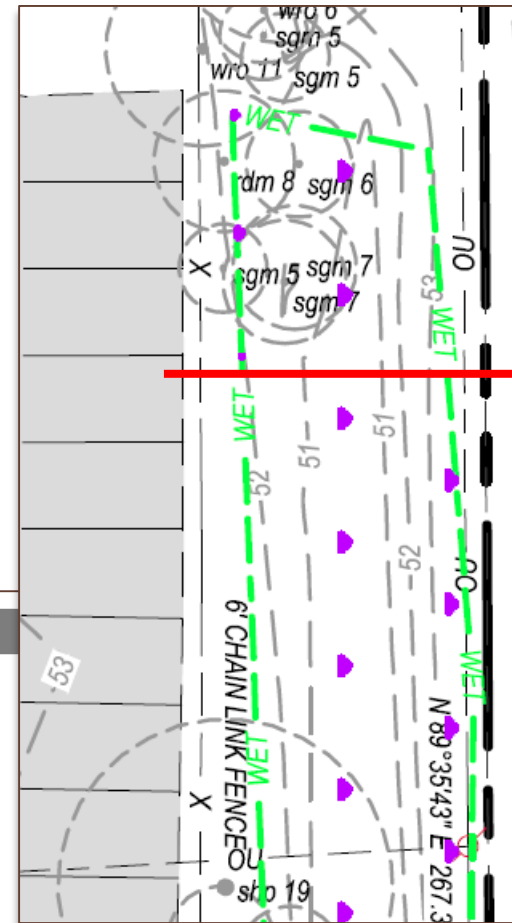
ICPR4 Link Input: Channel

Channel Link: E-3 TO E-2		Upstream		Downstream	
Scenario:	POST	Invert:	51.00 ft	Invert:	51.00 ft
From Node:	E-3	Manning's N:	0.0000	Manning's N:	0.0000
To Node:	E-2	Geometry: Irregular		Geometry: Irregular	
Link Count:	1	Cross Section:	E-4 TO E-3	Cross Section:	E-3 TO E-2
Flow Direction:	Both				
Damping:	0.0000 ft				
Length:	204.70 ft				
Contraction Coef:	0.10				
Expansion Coef:	0.30				
Entr Loss Coef:	0.00				
Exit Loss Coef:	0.00				
Bend Loss Coef:	0.00				
Bend Location:	0.00 ft				
Energy Switch:	Energy				

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Moore Bass Example – Drainage Report: Input

ICPR3 Cross Section Input

```
==================================================================
==== Cross Sections ==============================================
==================================================================

            Name: E-3 TO E-2                Group: BASE

     Encroachment: No

     Station(ft)     Elevation(ft)     Manning's N
    ---------------  ---------------  ---------------
          -8.480           52.000          0.070000
          -5.600           51.000          0.070000
           0.000           51.000          0.070000
           5.600           51.000          0.070000
           7.540           52.000          0.070000
           9.980           53.000          0.070000
```

ICPR4 Cross Section Input

Channel Cross Section: E-3 TO E-2			

Scenario:	PRE
Lid:	No
Conveyance Method:	ICPRv3

Bottom Point Table

Order	Station [ft]	Elevation [ft]	Manning's N
0	-8.48	52.00	0.0700
1	-5.60	51.00	0.0700
2	0.00	51.00	0.0700
3	5.60	51.00	0.0700
4	7.54	52.00	0.0700
5	9.98	53.00	0.0700

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Moore Bass Example – Drainage Report: Input

ICPR3 Link Input: Drop Structure

```
==============================================================================
==== Drop Structures =========================================================
==============================================================================

          Name: P-DROP TO OUT        From Node: P-SWMF           Length(ft): 16.00
         Group: BASE                   To Node: P-BND-SITE             Count: 1

                UPSTREAM        DOWNSTREAM              Friction Equation: Automatic
      Geometry: Circular        Circular               Solution Algorithm: Automatic
      Span(in): 18.00           18.00                                Flow: Both
      Rise(in): 18.00           18.00              Entrance Loss Coef: 0.000
     Invert(ft): 49.950         49.760                  Exit Loss Coef: 1.000
    Manning's N: 0.012000       0.012000            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                   Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular: Smooth tapered inlet throat

Downstream FHWA Inlet Edge Description:
Circular: Smooth tapered inlet throat
```

```
*** Weir 1 of 3 for Drop Structure P-DROP TO OUT ***
                                                                  TABLE
            Count: 1            Bottom Clip(in): 0.000
             Type: Horizontal      Top Clip(in): 0.000
             Flow: Both          Weir Disc Coef: 3.200
         Geometry: Rectangular   Orifice Disc Coef: 0.670

          Span(in): 24.00            Invert(ft): 53.300
          Rise(in): 36.00       Control Elev(ft): 53.300
```

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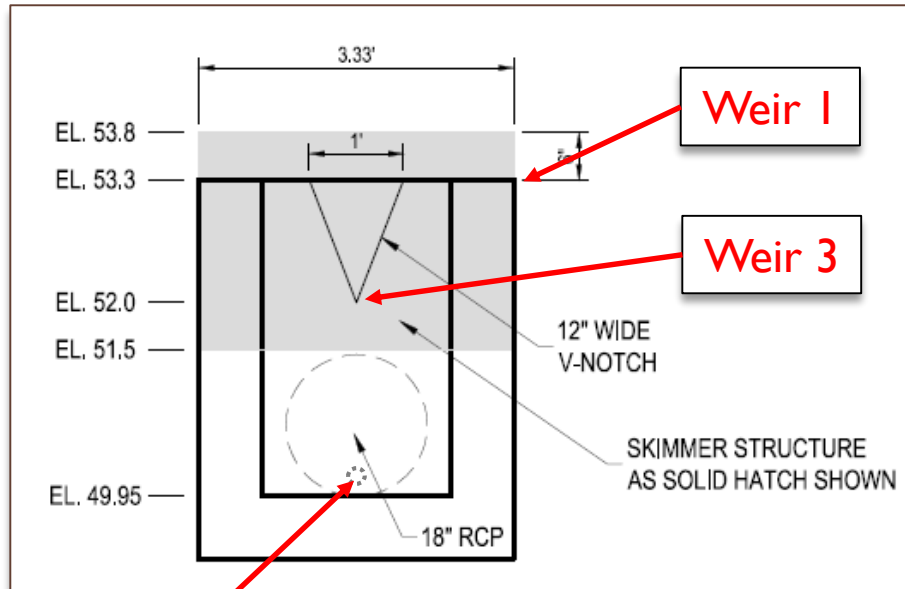
Moore Bass Example – Drainage Report: Input

ICPR4 Link Input: Drop Structure – Pipe Component

Drop Structure Link: P-DROP TO OUT		Upstream Pipe		Downstream Pipe	
Scenario:	POST	Invert:	49.95 ft	Invert:	49.76 ft
From Node:	P-SWMF	Manning's N:	0.0120	Manning's N:	0.0120
To Node:	P-BND-SITE	Geometry: Circular		Geometry: Circular	
Link Count:	1	Max Depth:	1.50 ft	Max Depth:	1.50 ft
Flow Direction:	Both	Bottom Clip			
Solution:	Combine	Default:	0.00 ft	Default:	0.00 ft
Increments:	10	Op Table:		Op Table:	
Pipe Count:	1	Ref Node:		Ref Node:	
Damping:	0.0000 ft	Manning's N:	0.0120	Manning's N:	0.0120
Length:	16.00 ft	Top Clip			
FHWA Code:	48	Default:	0.00 ft	Default:	0.00 ft
Entr Loss Coef:	0.00	Op Table:		Op Table:	
Exit Loss Coef:	1.00	Ref Node:		Ref Node:	
Bend Loss Coef:	0.00	Manning's N:	0.0120	Manning's N:	0.0120
Bend Location:	0.00 ft				
Energy Switch:	Energy				
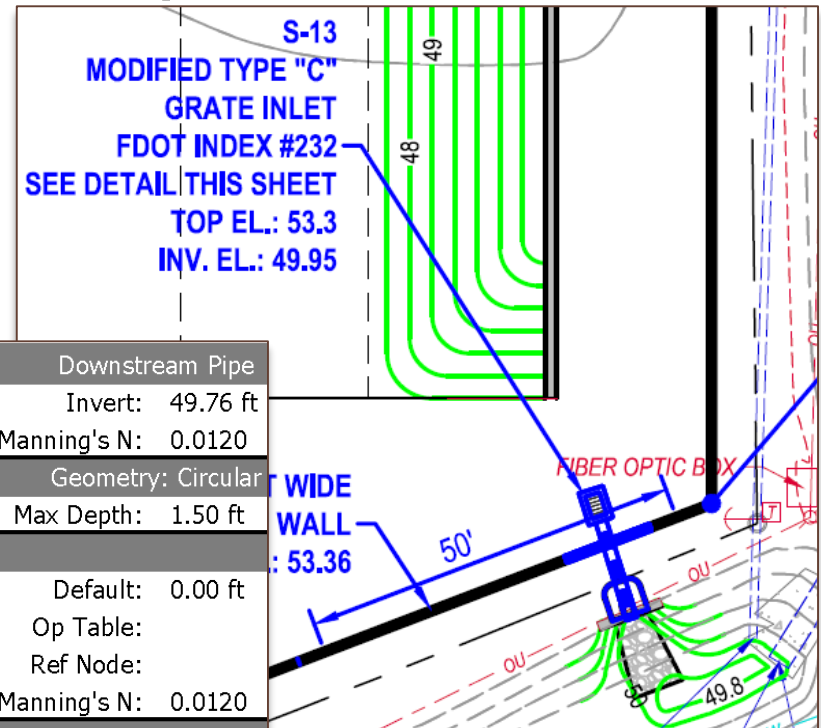
Moore Bass Example – Drainage Report: Input

ICPR4 Link Input: Drop Structure – Weir Components

Weir 1

Weir 3

Weir 2

Verify Weir Detail matches Model

Weir Component			
Weir:	1	Bottom Clip	
Weir Count:	1	Default:	0.00 ft
Weir Flow Direction:	Both	Op Table:	
Damping:	0.0000 ft	Ref Node:	
Weir Type:	Horizontal	Top Clip	
Geometry Type:	Rectangular	Default:	0.00 ft
Invert:	53.30 ft	Op Table:	
Control Elevation:	53.30 ft	Ref Node:	
Max Depth:	3.00 ft	Discharge Coefficients	
Max Width:	2.00 ft	Weir Default:	3.200
Fillet:	0.00 ft	Weir Table:	
		Orifice Default:	0.670
		Orifice Table:	

Moore Bass Example – Drainage Report: Post-Development Input

ICPR4 Link Input: Drop Structure (cont'd)

Weir Component	
Weir:	2
Weir Count:	1
Weir Flow Direction:	Both
Damping:	0.0000 ft
Weir Type:	Sharp Crested Vertical
Geometry Type:	Circular
Invert:	50.00 ft
Control Elevation:	50.00 ft
Max Depth:	0.15 ft

Orifice Design from Treatment Calcs, Diameter = 1.79 in

Weir Component	
Weir:	3
Weir Count:	1
Weir Flow Direction:	Both
Damping:	0.0000 ft
Weir Type:	Sharp Crested Vertical
Geometry Type:	Trapezoidal
Invert:	52.00 ft
Control Elevation:	52.00 ft
Max Depth:	1.22 ft
Extrapolation Method:	Normal Projection
Bottom Width:	0.00 ft
Left Slope:	0.385 (h:v)
Right Slope:	0.385 (h:v)

Lesson 5 - Pre/Post Examples

icpr4

Moore Bass Example – Drainage Report: Simulation Input

ICPR3 Simulation Input: Hydrology & Routing

```
================================================================================
==== Hydrology Simulations =====================================================
================================================================================


          Name: 002yr-001hr
      Filename: C:\Projects\S10.001\Workfiles\STORMWATER\PRE\002yr-001hr.R32

    Override Defaults: Yes
   Storm Duration(hrs): 1.00
          Rainfall File: Fdot-1
   Rainfall Amount(in): 2.34

Time(hrs)        Print Inc(min)
--------------   ---------------
2.000            2.00
================================================================================
==== Routing Simulations =======================================================
================================================================================


          Name: 002yr-001hr          Hydrology Sim: 002yr-001hr
      Filename: C
       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): 2.00
     Min Calc Time(sec): 0.5000          Max Calc Time(sec): 60.0000
        Boundary Stages:                     Boundary Flows:

Time(hrs)        Print Inc(min)
--------------   ---------------
2.000            2.000

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

Moore Bass Example – Drainage Report: Simulation Input

ICPR4 Simulation Input: General Tab

Simulation: 002yr-001hr	
Scenario:	POST
Run Date/Time:	10/17/2019 1:15:19 PM
Program Version:	ICPR4 4.05.02

General				
Run Mode: Normal				

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	2.0000

	Hydrology [sec]	Surface Hydraulics [sec]	Groundwater [sec]
Min Calculation Time:	60.0000	0.1000	900.0000
Max Calculation Time:		60.0000	

Moore Bass Example – Drainage Report: Simulation Input

ICPR4 Simulation Input: Output Time Increments Tab

Output Time Increments				

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	2.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	2.0000

Groundwater

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	360.0000

Restart File

Save Restart: False

Lesson 5 - Pre/Post Examples

icpr4

Moore Bass Example – Drainage Report: Simulation Input

ICPR4 Simulation Input: Resources & Lookup Tables Tab

Resources & Lookup Tables	
Resources	**Lookup Tables**
Rainfall Folder: ICPR3	Boundary Stage Set:
Reference ET Folder:	Extern Hydrograph Set:
Unit Hydrograph ICPR3	Curve Number Set:
Folder:	
	Green-Ampt Set:
	Vertical Layers Set:
	Impervious Set:
	Roughness Set:
	Crop Coef Set:
	Fillable Porosity Set:
	Conductivity Set:
	Leakage Set:

Lesson 5 - Pre/Post Examples

Moore Bass Example – Drainage Report: Simulation Input

ICPR4 Simulation Input: Tolerances & Options Tab

Tolerances & Options			
Time Marching:	SAOR	IA Recovery Time:	24.0000 hr
Max Iterations:	6	ET for Manual Basins:	False
Over-Relax Weight Fact:	0.5 dec		
dZ Tolerance:	0.0010 ft	Smp/Man Basin Rain Opt:	Global
Max dZ:	1.0000 ft	OF Region Rain Opt:	Global
Link Optimizer Tol:	0.0001 ft	Rainfall Name:	Fdot-1
		Rainfall Amount:	2.34 in
Edge Length Option:	Automatic	Storm Duration:	1.0000 hr
Dflt Damping (2D):	0.0050 ft	Dflt Damping (1D):	0.0050 ft
Min Node Srf Area (2D):	1 ft2	Min Node Srf Area (1D):	113 ft2
Energy Switch (2D):	Energy	Energy Switch (1D):	Energy

Comment:

NOAA Rainfall site: San Luis City Park - Station ID: 91-0623

Lesson 5 - Pre/Post Examples

Pre/Post Analysis

Moore Bass Example – Drainage Report: Output

ICPR3 Hydrology Results

Simulation	Basin	Group	Time Max hrs	Flow Max cfs	Volume in	Volume ft3
002yr-001hr	A-1	BASE	0.53	1.78	1.926	2865.818
002yr-002hr	A-1	BASE	0.80	1.44	2.554	3801.739
002yr-004hr	A-1	BASE	2.00	0.73	3.078	4581.117
002yr-008hr	A-1	BASE	4.00	0.69	3.583	5333.321
002yr-024hr	A-1	BASE	12.00	0.20	4.408	6560.528
002yr-072hr	A-1	BASE	59.99	0.12	5.583	8309.090

Lesson 5 - Pre/Post Examples

Moore Bass Example – Drainage Report: Output

ICPR4 Hydrology Results: Basin Summary Report

854 Capital Circle SW: Post-Development Report   2

Simple Basin Runoff Summary [POST]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
A-1	002yr-001 hr	1.77	0.5333	2.34	1.93	0.4100	96.2	0.00	0.00
A-1	002yr-002 hr	1.40	0.7667	2.98	2.53	0.4100	96.2	0.00	0.00
A-1	002yr-004 hr	0.73	2.0000	3.51	3.07	0.4100	96.2	0.00	0.00
A-1	002yr-008 hr	0.69	4.0000	4.02	3.58	0.4100	96.2	0.00	0.00
A-1	002yr-024 hr	0.20	12.0000	4.85	4.41	0.4100	96.2	0.00	0.00
A-1	002yr-072 hr	0.12	59.9167	6.03	5.58	0.4100	96.2	0.00	0.00
A-1	002yr-168 hr	0.09	160.0000	7.41	6.96	0.4100	96.2	0.00	0.00
A-1	002yr-240 hr	0.12	184.0000	8.36	7.91	0.4100	96.2	0.00	0.00

Lesson 5 - Pre/Post Examples

icpr4

Moore Bass Example – Drainage Report: Output

ICPR3 Node Max:

Name	Simulation	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Inflow cfs	Max Outflow cfs
A-1	002yr-001hr	55.26	53.00	0.0053	120	10.04	9.90
A-1	002yr-002hr	53.72	53.00	0.0042	120	8.18	8.07
A-1	002yr-004hr	51.46	53.00	-0.0050	120	4.44	4.39
A-1	002yr-008hr	51.56	53.00	0.0049	120	4.16	4.11
A-1	002yr-024hr	51.34	53.00	0.0043	134	1.17	1.17
A-1	002yr-072hr	51.53	53.00	0.0030	129	0.73	0.72

Lesson 5 - Pre/Post Examples

Moore Bass Example – Drainage Report: Output

ICPR4 Node Summary Report:

Node Max Conditions w/ Times [POST]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]	Time to Max Stage [hr]	Time to Min/Max Delta Stage [hr]	Time to Max Total Inflow [hr]	Time to Max Total Outflow [hr]
A-1	002yr-001hr	53.00	55.19	0.00	9.96	9.81	134	0.63	0.27	0.60	0.62
A-1	002yr-002hr	53.00	53.56	0.00	7.98	7.88	134	0.82	1.14	0.79	0.81
A-1	002yr-004hr	53.00	51.47	0.00	4.39	4.37	134	2.03	2.99	2.00	2.00
A-1	002yr-008hr	53.00	51.58	0.00	4.08	4.07	133	4.02	0.02	3.85	3.85
A-1	002yr-024hr	53.00	51.35	0.00	1.18	1.18	132	24.00	22.86	12.00	11.46
A-1	002yr-072hr	53.00	51.54	0.00	0.73	0.73	132	71.99	55.25	59.24	59.67
A-1	002yr-168hr	53.00	51.65	0.00	0.55	0.54	130	167.99	150.37	0.04	155.32
A-1	002yr-240hr	53.00	51.68	0.00	0.71	0.71	131	216.02	191.33	180.25	180.25

Lesson 5 - Pre/Post Examples

icpr4

Moore Bass Example – Drainage Report: Output

ICPR4 Node Summary Report: Freeboard provided @SWF?

Node Max Conditions w/ Times [POST]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]	Time to Max Stage [hr]	Time to Min/Max Delta Stage [hr]	Time to Max Total Inflow [hr]	Time to Max Total Outflow [hr]
P-SWMF	100yr-001hr	53.01	51.42	0.00	49.42	2.92	73420	1.28	0.64	0.60	0.01
P-SWMF	100yr-002hr	53.01	51.83	0.00	40.91	2.92	75763	2.00	1.58	0.78	0.01
P-SWMF	100yr-004hr	53.01	52.29	0.00	24.36	2.92	78431	4.00	2.99	2.00	0.01
P-SWMF	100yr-008hr	53.01	52.69	0.00	23.95	2.92	80791	8.00	4.82	4.00	0.01
P-SWMF	100yr-024hr	53.01	53.06	0.00	7.28	2.92	83028	22.05	12.01	12.00	0.01
P-SWMF	100yr-072hr	53.01	53.27	0.00	4.48	2.92	84267	64.07	57.01	56.66	0.01
P-SWMF	100yr-168hr	53.01	53.23	0.00	2.97	2.92	84046	160.08	152.81	159.39	0.01
P-SWMF	100yr-240hr	53.01	53.09	0.00	3.62	2.92	83212	184.16	180.17	181.36	0.01

Lesson 5 - Pre/Post Examples

*icpr*4

Moore Bass Example – Drainage Report: Output

ICPR4 Node Summary Report: Pre-Post Comparison @ Boundary Node

Node Max Conditions w/ Times [PRE]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]	Time to Max Stage [hr]	Time to Min/Max Delta Stage [hr]	Time to Max Total Inflow [hr]	Time to Max Total Outflow [hr]
GUM CREEK DITCH	025yr-024hr	52.00	48.00	0.0000	11.50	0.00	0	0.0000	0.0000	12.0229	0.0000

Node Max Conditions w/ Times [POST]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]	Time to Max Stage [hr]	Time to Min/Max Delta Stage [hr]	Time to Max Total Inflow [hr]	Time to Max Total Outflow [hr]
GUM CREEK DITCH	025yr-024hr	52.00	48.00	0.0000	7.32	0.00	0	0.0000	0.0000	12.0140	0.0000

Lesson 5 - Pre/Post Examples

*icpr*4

Moore Bass Example – Drainage Report: Output

ICPR3 Link Max Report:

Name	Simulation	Max Flow cfs	Max Delta Q cfs	Max US Stage ft	Max DS Stage ft
A-1 TO A-A	002yr-001hr	9.90	-1.097	55.262	52.231
A-1 TO A-A	002yr-002hr	8.07	-0.997	53.721	51.704
A-1 TO A-A	002yr-004hr	4.39	-0.537	51.463	51.013
A-1 TO A-A	002yr-008hr	4.11	-0.401	51.561	51.142
A-1 TO A-A	002yr-024hr	1.17	0.296	51.337	51.338
A-1 TO A-A	002yr-072hr	0.72	0.475	51.532	51.534

Moore Bass Example – Drainage Report: Output

ICPR4 Link Summary Report:

Link Min/Max Conditions with Times [POST]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Time to Max Flow [hrs]	Time to Min Flow [hrs]	Time to Min/Max Delta Flow [hrs]	Time to Max Us Velocity [hrs]	Time to Max Ds Velocity [hrs]
A-1 TO A-A	002yr-001hr	9.81	-0.55	-0.31	8.00	8.00	0.6222	0.0429	0.3128	0.6222	0.6222
A-1 TO A-A	002yr-002hr	7.88	-0.55	-0.29	6.42	6.42	0.8108	0.0430	0.3345	0.8108	0.8108
A-1 TO A-A	002yr-004hr	4.37	-0.55	0.28	3.56	3.56	2.0042	0.0429	3.9350	2.0042	2.0042
A-1 TO A-A	002yr-008hr	4.07	-0.55	0.32	3.31	3.31	3.8490	0.0429	7.2358	3.8490	3.8490
A-1 TO A-A	002yr-024hr	1.18	-0.55	0.37	0.97	-2.51	11.4605	0.0429	22.0776	11.4605	0.0389
A-1 TO A-A	002yr-072hr	0.73	-0.55	0.36	0.71	-2.51	59.6742	0.0429	53.6435	8.8106	0.0389

VA Example

 Lesson 5 - Pre/Post Examples

VA Example Overview

- **Project Name:**
  St. Augustine V.A.

- **Location:**
  St. Augustine, Florida

- **Firm:**
  Davis Dinkins Engineering, P.A.

- **Engineer of Record (Plans):**
  Davis Dinkins, PE
  Engineer of Record (H&H Calcs):
  Warren McKinnie, PE, CFM

VA Example – Project Description

- **Existing Condition**
  Pine Plantation and Wetlands

- **Proposed Conditions**
  Institutional/Hospital

- **Proposed Stormwater Facility**
  Wet Detention

- **Outfall:** Fox Creek
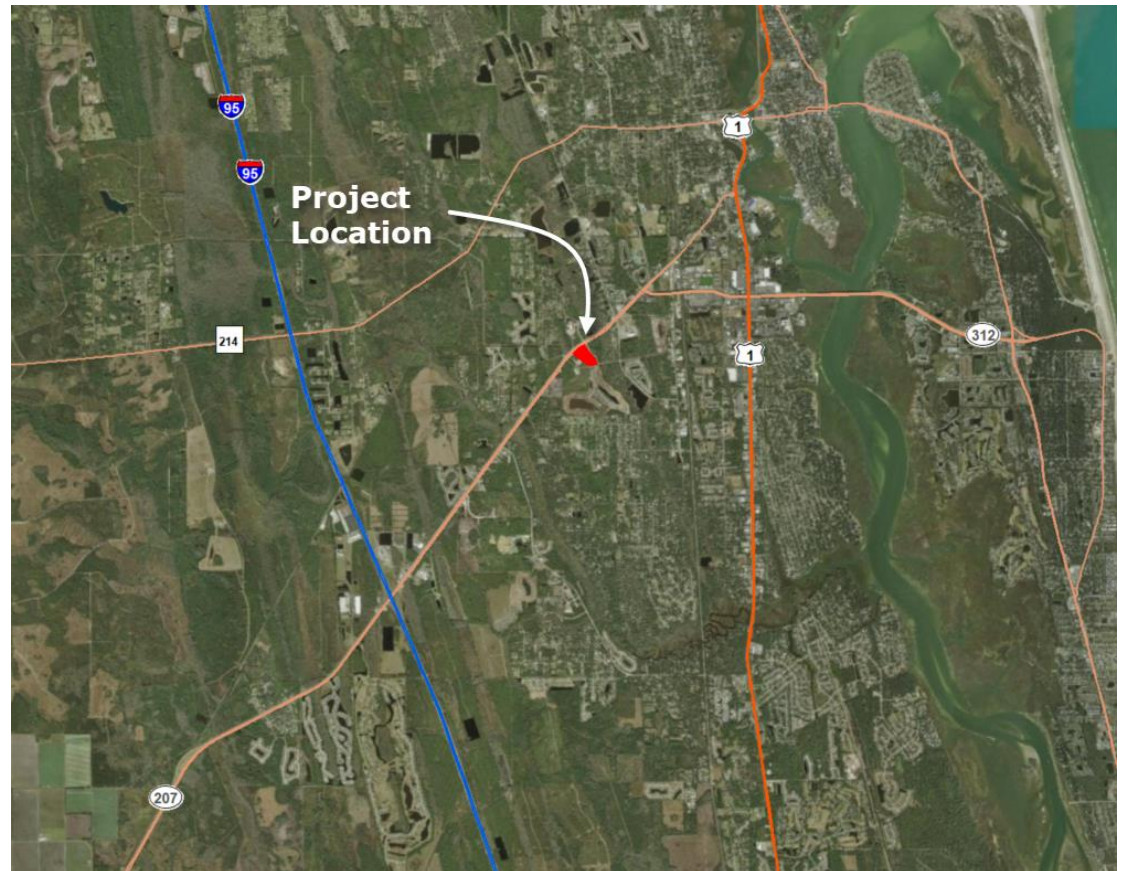
VA Example – Design Criteria

SJRWMD
- Wet detention treatment shall be provided for the greater of:

  - 1 inch of runoff over the drainage area or 2.5 inches across the impervious area

- ½ Treatment Recovery: 24 - 30 hrs

- Pre/Post Discharge: 25-year 24-hour and 2.33-year 24-hour

VA Example – Model Development

- **Curve Numbers**
  - Distributed Approach
  - TR-55 Table 2-2a

- **Time of Concentration**
  - Calculated with minimum of 10 minutes

- **Seasonal Higher Water Level (SHWL)**
  - 34.2-ft (NAVD88)

- **Tailwater**
  - Established from Moultrie Creek and Moses Creek Watershed model (Jones Edmunds)

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Existing Conditions

  Lesson 5 - Pre/Post Examples

VA Example - Model Network

Lesson 5 - Pre/Post Examples

VA Example – Existing Conditions

Property Limits

22006

21780

21308

Existing Conditions Basins

Boundary Nodes

VA Example – Existing Conditions

VA Example – Existing Conditions
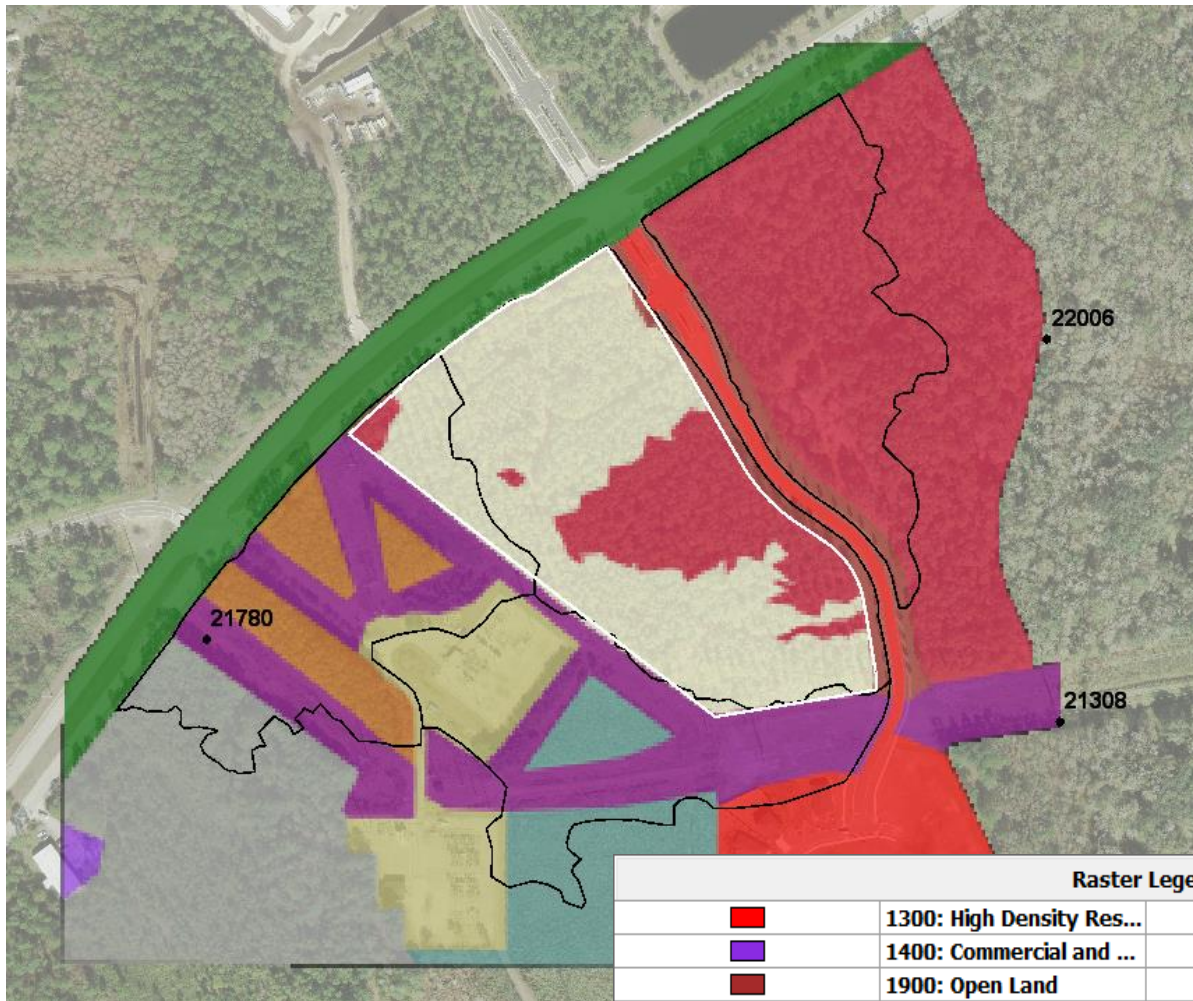
	Raster Legend		
🟥	1300: High Density Res...	⬜	4410: Pine Plantation
🟪	1400: Commercial and ...	🟥	6300: Wetland Forest ...
🟫	1900: Open Land	🟩	8140: Roads and High...
🟦	3200: Shrub and Brush...	🟨	8310: Electrical Power ...
🟧	4200: Upland Hardwoo...	🟪	8320: Electrical Power ...
⬜	4340: Upland Mixed Co...	⬜	

VA Example – Existing Conditions
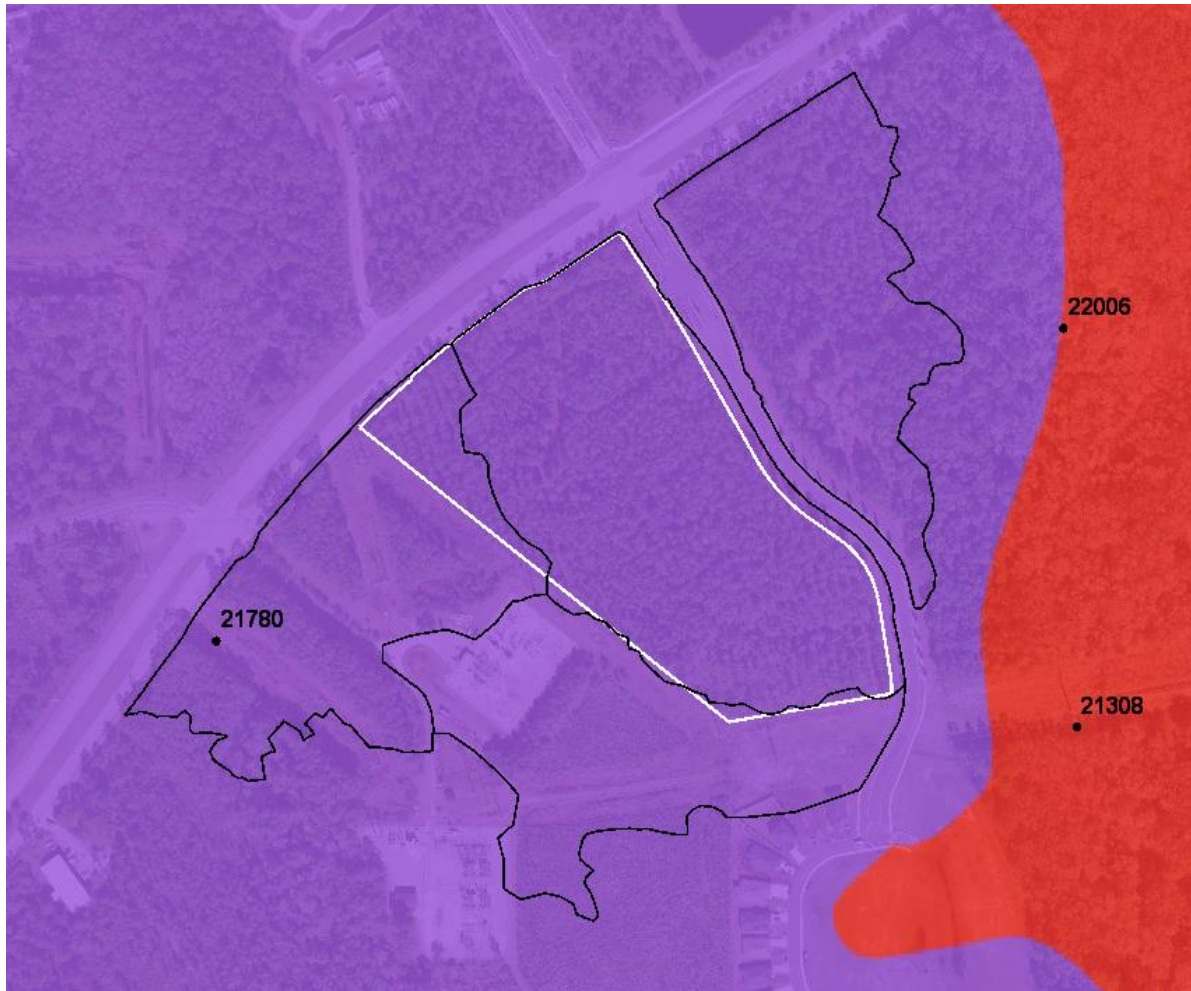
Raster Legend			
�▮	A/D	▮	C/D

VA Example – Existing Conditions

Basins
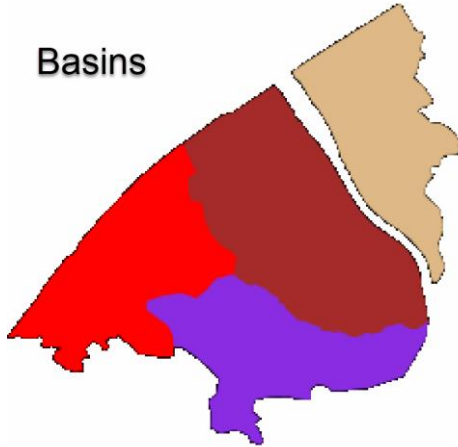
Land Cover
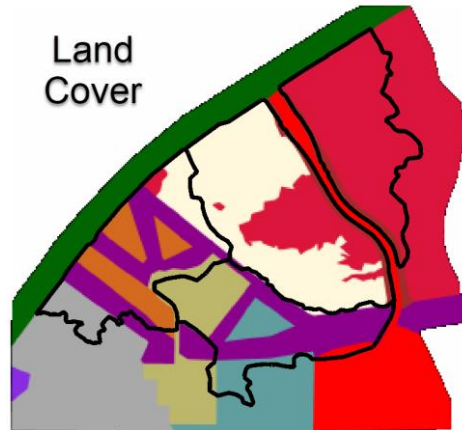
Soils
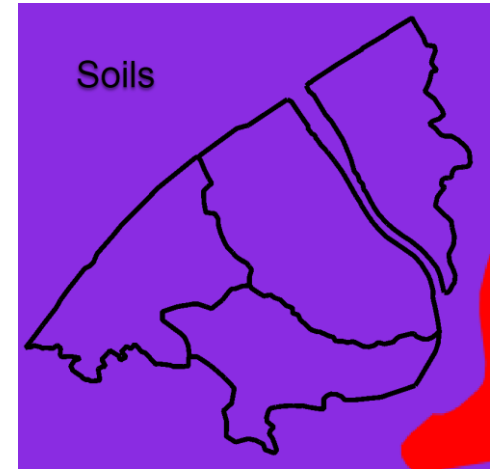
Name	B22006A
Scenario	PRE
Node	22006A
Hydrograph Method	NRCS Unit Hydrograph
Infiltration Method	Curve Number
Time of Concentration	37
Max Allowable Q	0
Time Shift	0
Unit Hydrograph	UH100
Peaking Factor	100
Comment	

Create   Delete

Manual Basin Sub-Basin Edit

Area	Land Cover Zone	Soil Zone	Rainfall Name	Crop Coefficient Zone	Reference ET Station
0.678604	1900: Open Land	A/D			
7.175849	6300: Wetland ...	A/D			
0.003926	1300: High Den...	A/D			
0.043182	8140: Roads an...	A/D			

VA Example Curve Number Set

Land Cover Zone	Soil Zone	Curve Number
1300: High Density Residential	A/D	80
1300: High Density Residential	C/D	80
1400: Commercail and Services	A/D	80
1400: Commercail and Services	C/D	80
1900: Open Land	A/D	84
1900: Open Land	C/D	84
3200: Shrub and Brushland	A/D	73
3200: Shrub and Brushland	C/D	73
4200: Upland Hardwood Forest	A/D	79
4200: Upland Hardwood Forest	C/D	79
4340: Upland Mixed Coniferous/Hardwood	A/D	79
4340: Upland Mixed Coniferous/Hardwood	C/D	79
4410: Pine Plantation	A/D	79
4410: Pine Plantation	C/D	79
6300: Wetland Forest Mixed	A/D	98
6300: Wetland Forest Mixed	C/D	98
8140: Roads and Highways (divided 4-lanes with medians)	A/D	100
8140: Roads and Highways (divided 4-lanes with medians)	C/D	100
8310: Electrical Power Facilities	A/D	84
8310: Electrical Power Facilities	C/D	84
8320: Electrical Power Transmission Lines	A/D	84
8320: Electrical Power Transmission Lines	C/D	84
Impervious	A/D	98
Impervious	C/D	98
Proposed Open Space	A/D	39
Proposed Open Space	C/D	74
Pond Open Space	C/D	80
Water	A/D	98
Water	C/D	98
Pond Open Space	A/D	80

Lesson 5 - Pre/Post Examples

VA Example Impervious Set

Land Cover Zone	% Impervious	% DCIA
▶ 1300: High Density Residential	55	20
1400: Commercail and Services	70	60
1900: Open Land	0	0
3200: Shrub and Brushland	0	0
4200: Upland Hardwood Forest	0	0
4340: Upland Mixed Coniferous/Hardwood	0	0
4410: Pine Plantation	0	0
6300: Wetland Forest Mixed	0	0
8140: Roads and Highways (divided 4-lanes with medians)	100	100
8310: Electrical Power Facilities	50	0
8320: Electrical Power Transmission Lines	0	0
Impervious	100	100
Proposed Open Space	0	0
Pond Open Space	0	0
Water	100	100

VA Example TC's

2yr 24hr rain event	5
Minimum TC	10

Sheet Flow Surface Codes
a Smooth Surface
b fallow (no residue)
c cultivated < 20% Res.
d cultivated > 20% Res.
e grass - range, short

f grass, dense
g grass, bermuda
h woods, light
i woods, dense
j range, natural

Shallow Concentrated Surface Codes
u unpaved surface
p paved surface

BASIN	FLOW TYPE	LENGTH (feet)	Elev 1 (feet)	Elev 2 (feet)	SLOPE (ft./ft.)	SURFACE CODE	MANNINGS "N"	AREA (sq.ft.)	WP (feet)	VELOCITY (ft./sec.)	TRAVEL TIME
B22006A	SHEET	200	37.09	33.16	0.01965	H	0.4	n/a	n/a	n/a	30.12 min
	SHALLOW CONCENTRATED	365	33.16	32.07	0.00299	U	n/a	n/a	n/a	0.88	6.90 min
									B22006A Time of Concentration		**37.0 min**

BASIN	FLOW TYPE	LENGTH (feet)	Elev 1 (feet)	Elev 2 (feet)	SLOPE (ft./ft.)	SURFACE CODE	MANNINGS "N"	AREA (sq.ft.)	WP (feet)	VELOCITY (ft./sec.)	TRAVEL TIME
B22006B	SHEET	197	37.88	34.87	0.01528	H	0.4	n/a	n/a	n/a	32.91 min
	SHALLOW CONCENTRATED	594	34.87	33.28	0.00268	U	n/a	n/a	n/a	0.83	11.86 min
									B22006B Time of Concentration		**44.8 min**

BASIN	FLOW TYPE	LENGTH (feet)	Elev 1 (feet)	Elev 2 (feet)	SLOPE (ft./ft.)	SURFACE CODE	MANNINGS "N"	AREA (sq.ft.)	WP (feet)	VELOCITY (ft./sec.)	TRAVEL TIME
B21308A	SHEET	208	39.24	36.68	0.01231	J	0.13	n/a	n/a	n/a	15.25 min
	SHALLOW CONCENTRATED	853	36.68	35.08	0.00188	U	n/a	n/a	n/a	0.70	20.34 min
									B21308A Time of Concentration		**35.6 min**

BASIN	FLOW TYPE	LENGTH (feet)	Elev 1 (feet)	Elev 2 (feet)	SLOPE (ft./ft.)	SURFACE CODE	MANNINGS "N"	AREA (sq.ft.)	WP (feet)	VELOCITY (ft./sec.)	TRAVEL TIME
B21780	SHEET	235	38.68	36.29	0.01017	H	0.4	n/a	n/a	n/a	44.60 min
	SHALLOW CONCENTRATED	557	36.29	35.06	0.00221	U	n/a	n/a	n/a	0.76	12.24 min
									B21780 Time of Concentration		**56.8 min**

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VA Example – Basin Max

Manual Basin Runoff Summary [PRE]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B21308A	025YR_24 HR	11.89	12.5833	9.50	7.45	7.7992	83.7	15.00	0.59
B21780	025YR_24 HR	9.24	12.9333	9.50	7.24	8.7902	82.1	3.21	0.57
B22006A	025YR_24 HR	13.45	12.5667	9.50	9.04	7.9016	96.8	0.57	0.56
B22006B	025YR_24 HR	16.08	12.7000	9.50	7.51	12.5214	84.2	0.01	0.01
B21308A	100YR_24 HR	16.70	12.5667	12.70	10.53	7.7992	83.6	15.00	0.59
B21780	100YR_24 HR	13.15	12.9000	12.70	10.32	8.7902	82.0	3.21	0.57
B22006A	100YR_24 HR	18.08	12.5667	12.70	12.20	7.9016	96.7	0.57	0.56
B22006B	100YR_24 HR	22.65	12.7000	12.70	10.59	12.5214	84.0	0.01	0.01
B21308A	233YR_24 HR	5.18	12.6167	5.00	3.25	7.7992	84.0	15.00	0.59
B21780	233YR_24 HR	3.86	13.0167	5.00	3.07	8.7902	82.2	3.21	0.57
B22006A	233YR_24 HR	6.94	12.5667	5.00	4.60	7.9016	96.9	0.57	0.56
B22006B	233YR_24 HR	7.02	12.7333	5.00	3.32	12.5214	84.7	0.01	0.01

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VA Example – Node Max

Node Max Conditions [PRE]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
21308	025YR_24HR	36.70	31.59	0.0055	11.89	0.00	0
21308	100YR_24HR	36.70	32.07	0.0067	16.70	0.00	0
21308	233YR_24HR	36.70	30.23	0.0069	5.18	0.00	0
21308A	025YR_24HR	39.15	34.72	0.0010	11.89	11.89	259
21308A	100YR_24HR	39.15	35.06	0.0010	16.70	16.70	1453
21308A	233YR_24HR	39.15	34.17	0.0010	5.18	5.18	237
21780	025YR_24HR	44.60	36.32	0.0029	9.24	0.00	0
21780	100YR_24HR	44.60	36.35	0.0034	13.15	0.00	0
21780	233YR_24HR	44.60	36.26	0.0024	3.86	0.00	0
22006	025YR_24HR	37.50	32.26	0.0056	25.82	0.00	0
22006	100YR_24HR	37.50	32.74	0.0064	33.21	0.00	0
22006	233YR_24HR	37.50	31.24	0.0041	12.93	0.00	0
22006A	025YR_24HR	38.48	34.17	0.0004	25.97	25.82	127636
22006A	100YR_24HR	38.48	34.20	0.0005	33.31	33.21	129820
22006A	233YR_24HR	38.48	34.10	0.0004	13.47	12.93	122169
22006B	025YR_24HR	38.48	35.25	0.0010	16.08	13.96	69937
22006B	100YR_24HR	38.48	35.52	0.0010	22.65	17.95	107719
22006B	233YR_24HR	38.48	34.71	0.0010	7.02	6.86	10310

Lesson 5 - Pre/Post Examples

icpr4

VA Example – Link Max

Link Min/Max Conditions [PRE]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P22006B	025YR_24HR	13.96	0.00	0.02	3.45	4.54	4.00
P22006B	100YR_24HR	17.95	0.00	0.02	3.72	4.95	4.34
P22006B	233YR_24HR	6.86	0.00	0.02	2.83	3.66	3.24
P31308A	025YR_24HR	11.89	0.00	0.02	3.29	4.54	3.92
P31308A	100YR_24HR	16.70	0.00	0.02	3.64	5.06	4.35
P31308A	233YR_24HR	5.18	0.00	0.01	2.62	3.59	3.11
W22006A	025YR_24HR	25.82	0.00	0.04	1.09	1.09	1.09
W22006A	100YR_24HR	33.21	0.00	0.05	1.13	1.13	1.13
W22006A	233YR_24HR	12.93	0.00	0.05	1.01	1.01	1.01

Lesson 5 - Pre/Post Examples

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Proposed Conditions

Lesson 5 - Pre/Post Examples

VA Example – Proposed Conditions

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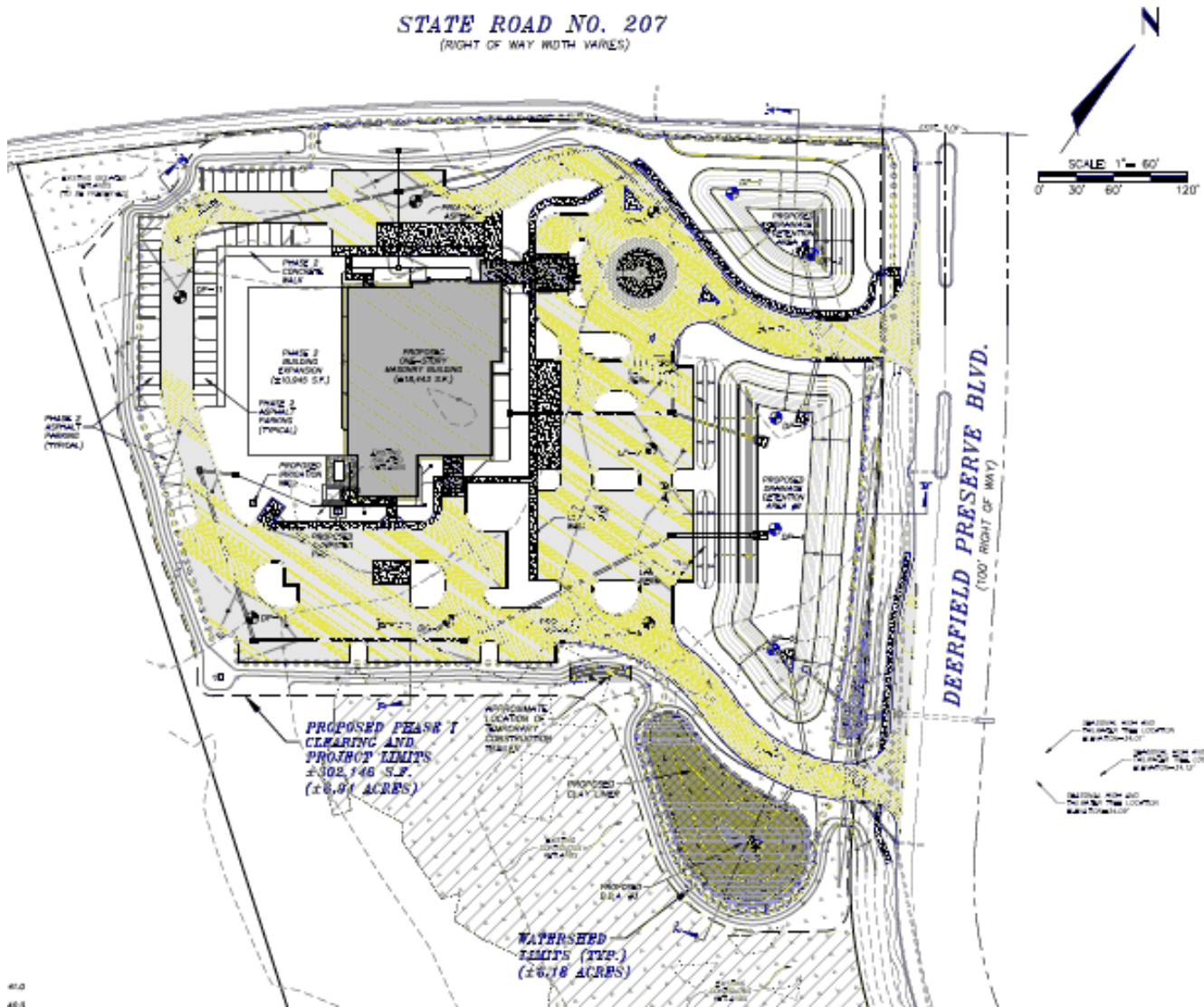
Lesson 5: VA Example – Proposed Conditions

Treatment Volume Calculations

Total Drainage Area =	6.19 acres
Impervious Area =	3.48 acres
Treatment Volume (1-inch) =	0.52 ac-ft
Treatment Volume (2.5-inches over impervious) =	0.72 ac-ft
Required Treatment Volume (ac-ft) =	**0.72 ac-ft**
Provided Treatment Volume (ac-ft) =	**0.72 ac-ft**

Control Elevation =	34.30 ft, NAVD88
Overflow Weir Elevation =	35.45 ft, NAVD88
Treatment Volume Depth =	1.15 ft

Permanent Pool Volumes

Drainage Area (DA)	6.19 acres
Runoff Coefficient (C)	0.85
Wet Season Rainfall (R)	30 inches
Residence Time (RT)	21 days
Length of Wet Season (WS)	153 days
Conversion Factor (CF)	12 in/ft
Permanent Pool Volumes (PPV) Required	**1.81 ac-ft**
Permanent Pool Volumes (PPV) Actual	**1.92 ac-ft**

Pond Storage 1

Stage (ft, NAVD88)	Area (ac)	Area (ft²)	Incremental Volume (ac-ft)	Cumultive Storage Volume (ac-ft)	Comments
28.3	0.035	1516.04	0.00	0.00	Pond Bottom
29.0	0.040	1761.81	0.03	0.03	
33.0	0.080	3495.14	0.24	0.27	
34.30	0.113	4912.81	0.13	0.39	Control Elevation
34.91	0.130	5668.79	0.07	0.47	1/2 TV (Interpolated)
35.45	0.146	6349.79	0.08	0.54	Top of TV (Interpolated). Incremental Treatment is based on total treatment volume.
36.00	0.162	7037.04	0.23	0.63	
37.00	0.193	8422.30	0.18	0.80	
38.30	0.238	10373.44	0.28	1.08	TOB

Pond Storage 2

Stage (ft, NAVD88)	Area (ac)	Area (ft²)	Incremental Volume (ac-ft)	Cumultive Storage Volume (ac-ft)	Comments
28.3	0.178	7752.6528	0.00	0.00	Pond Bottom
29.0	0.194	8443.1604	0.13	0.13	
33.0	0.292	12732.8446	0.97	1.10	
34.30	0.363	15805.713	0.43	1.53	Control Elevation
34.91	0.398	17327.84	0.23	1.76	1/2 TV (Interpolated)
35.45	0.429	18693.02	0.23	1.98	Top of TV (Interpolated). Incremental Treatment is based on total treatment volume.
36.00	0.461	20082.779	0.70	2.23	
37.00	0.522	22734.417	0.49	2.72	
38.30	0.604	26331.840	0.73	3.45	TOB

Pond Storage 3

Stage (ft, NAVD88)	Area (ac)	Area (ft²)	Incremental Volume (ac-ft)	Cumultive Storage Volume (ac-ft)	Comments
28.3	0.017	750.1786	0.00	0.00	Pond Bottom
29.0	0.022	937.3859	0.01	0.01	
33.0	0.055	2415.147	0.15	0.17	
34.30	0.087	3799.809	0.09	0.26	Control Elevation
34.91	0.106	4614.76	0.06	0.32	1/2 TV (Interpolated)
35.45	0.123	5348.90	0.06	0.38	Top of TV (Interpolated). Incremental Treatment is based on total treatment volume.
36.00	0.140	6085.764	0.13	0.45	
37.00	0.174	7575.633	0.16	0.61	
38.30	0.222	9657.555	0.26	0.87	TOB

Lesson 5 - Pre/Post Examples

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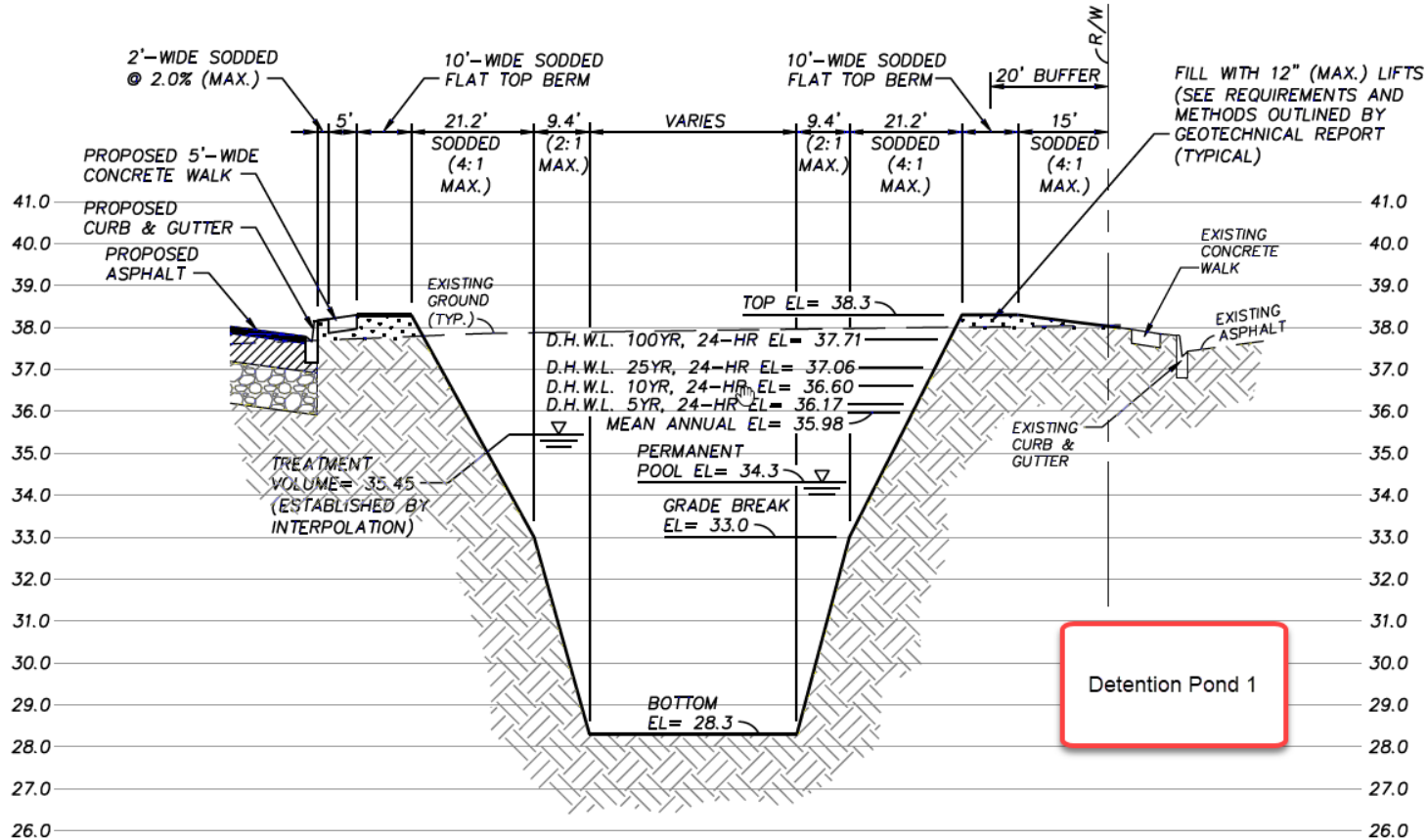
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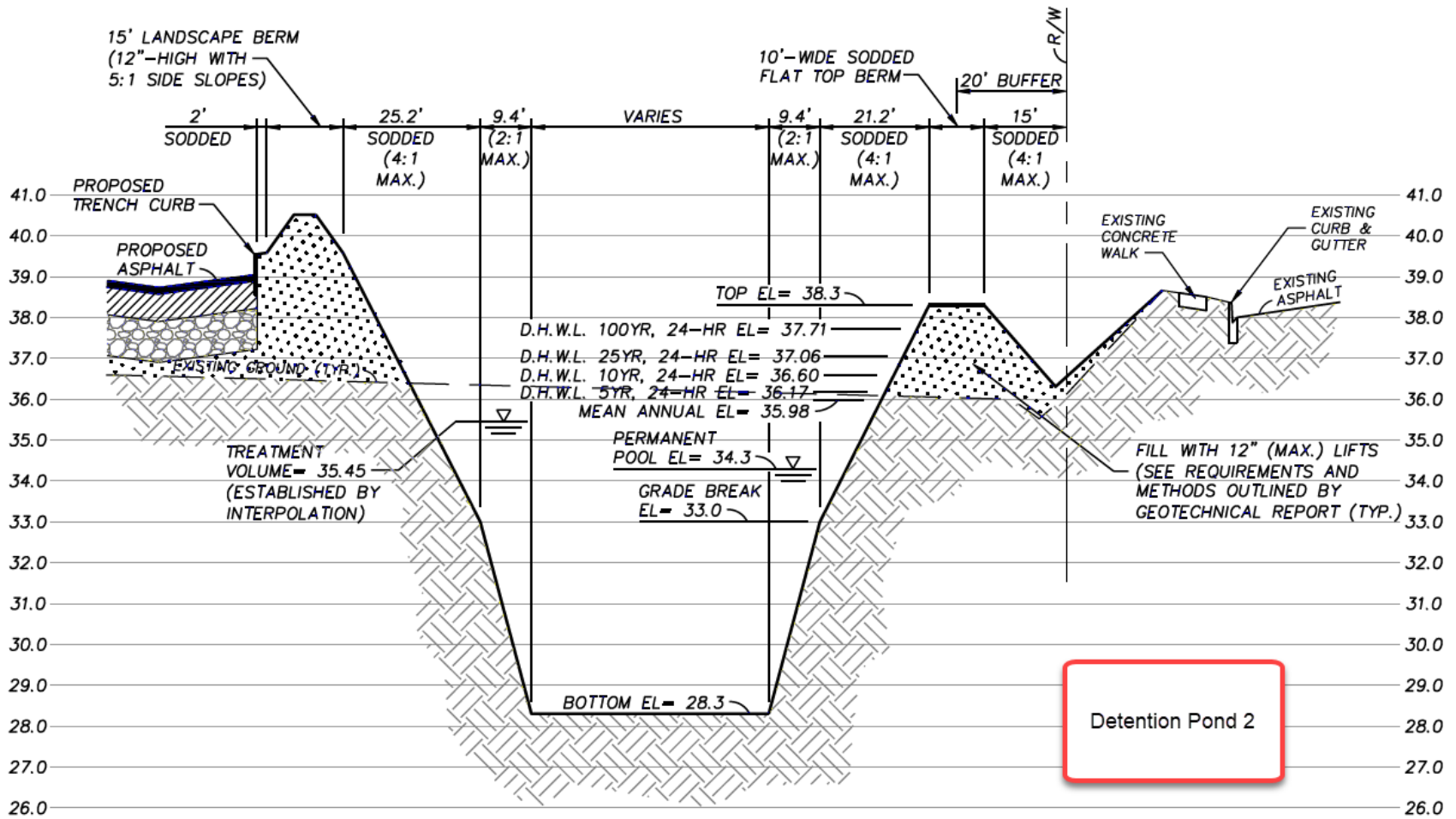
CROSS SECTION 'B'-'B'
NOT TO SCALE

Lesson 5: VA Example – Proposed Conditions

VARIES SODDED (4:1 MAX.)

EXISTING WETLANDS ±5'

10'-WIDE SODDED FLAT TOP BERM

10'-WIDE SODDED FLAT TOP BERM

8' SODDED (4:1 MAX.)

21.2' SODDED (4:1 MAX.)   9.4' (2:1 MAX.)   VARIES   9.4' (2:1 MAX.)   21.2' SODDED (4:1 MAX.)

FILL WITH 12" (MAX.) LIFTS (SEE REQUIREMENTS AND METHODS OUTLINED BY GEOTECHNICAL REPORT (TYPICAL)

FILL WITH 12" (MAX.) LIFTS (SEE REQUIREMENTS AND METHODS OUTLINED BY GEOTECHNICAL REPORT (TYPICAL)

PROPOSED CURB & GUTTER

PROPOSED ASPHALT

PROPOSED SILT FENCE

TOP EL= 38.3

D.H.W.L. 100YR, 24-HR EL= 37.71
D.H.W.L. 25YR, 24-HR EL= 37.06
D.H.W.L. 10YR, 24-HR EL= 36.60
D.H.W.L. 5YR, 24-HR EL= 36.17
MEAN ANNUAL EL= 35.98

EXISTING GROUND (TYP.)

PERMANENT POOL EL= 34.3

TOP OF CLAY LINER EXTENDS TO ELEVATION 35.50 (MIN.) OR NATURAL GROUND SURFACE (WHICHEVER IS GREATER)

TREATMENT VOLUME= 35.45 (ESTABLISHED BY INTERPOLATION)

GRADE BREAK EL= 33.0

CLAY LINER FOR D.D.A. #3 PER GEOTECHNICAL RECOMMENDATION OUTLINED IN LETTER FROM "UNIVERSAL ENGINEERING SCIENCES" DATED JULY 12, 2019.

LINER THICKNESS= 12" (MIN.)
HORIZONTAL PERMEABILITY RATE=1.0×10^{-6} cm/sec. (MAX.)
A MINIMUM OF 18" OF GRANULAR SOIL TO BE PLACED OVER LINER

BOTTOM EL= 28.3

GEOTECHNICAL ENGINEER TO PRE-QUALIFY MATERIAL AND PROVIDE TESTING REPORT PRIOR TO INSTALLATION. GEOTECHNICAL ENGINEER TO WITNESS CONSTRUCTION. AS AN ALTERNATE, A SYNTHETIC POND LINER WITH WELDED SEAMS MAY BE ALLOWED PENDING APPROVAL BY BOTH GEOTECHNICAL AND PROJECT ENGINEER.

Detention Pond 3

CROSS SECTION 'C'-'C'
NOT TO SCALE

Lesson 5: VA Example – Proposed Conditions

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Lesson 5: VA Example - Model Network

Lesson 5 - Pre/Post Examples
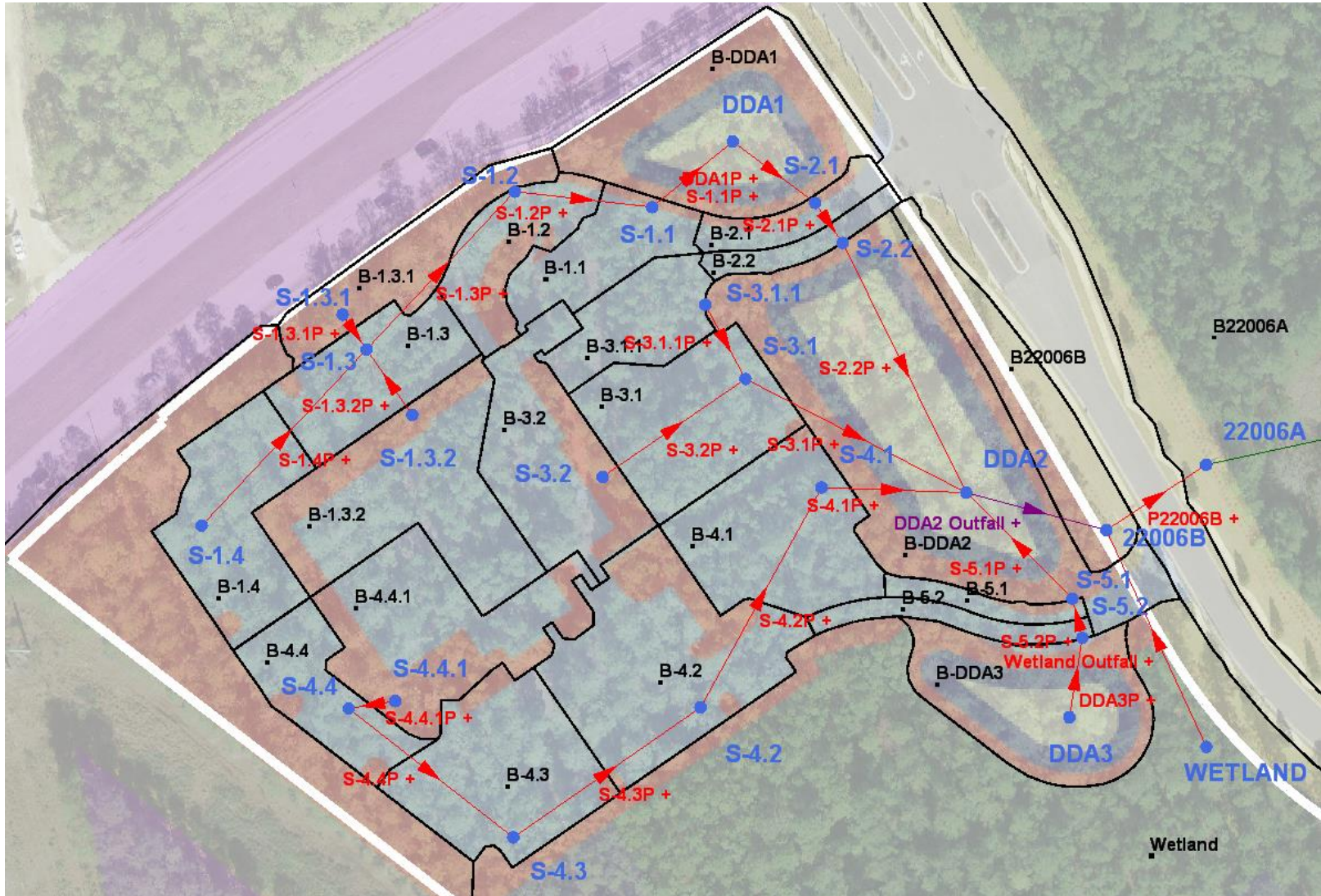
Pre/Post Analysis

Lesson 5 - Pre/Post Examples

Lesson 5: VA Example – Post Conditions

Node Max Conditions [POST]

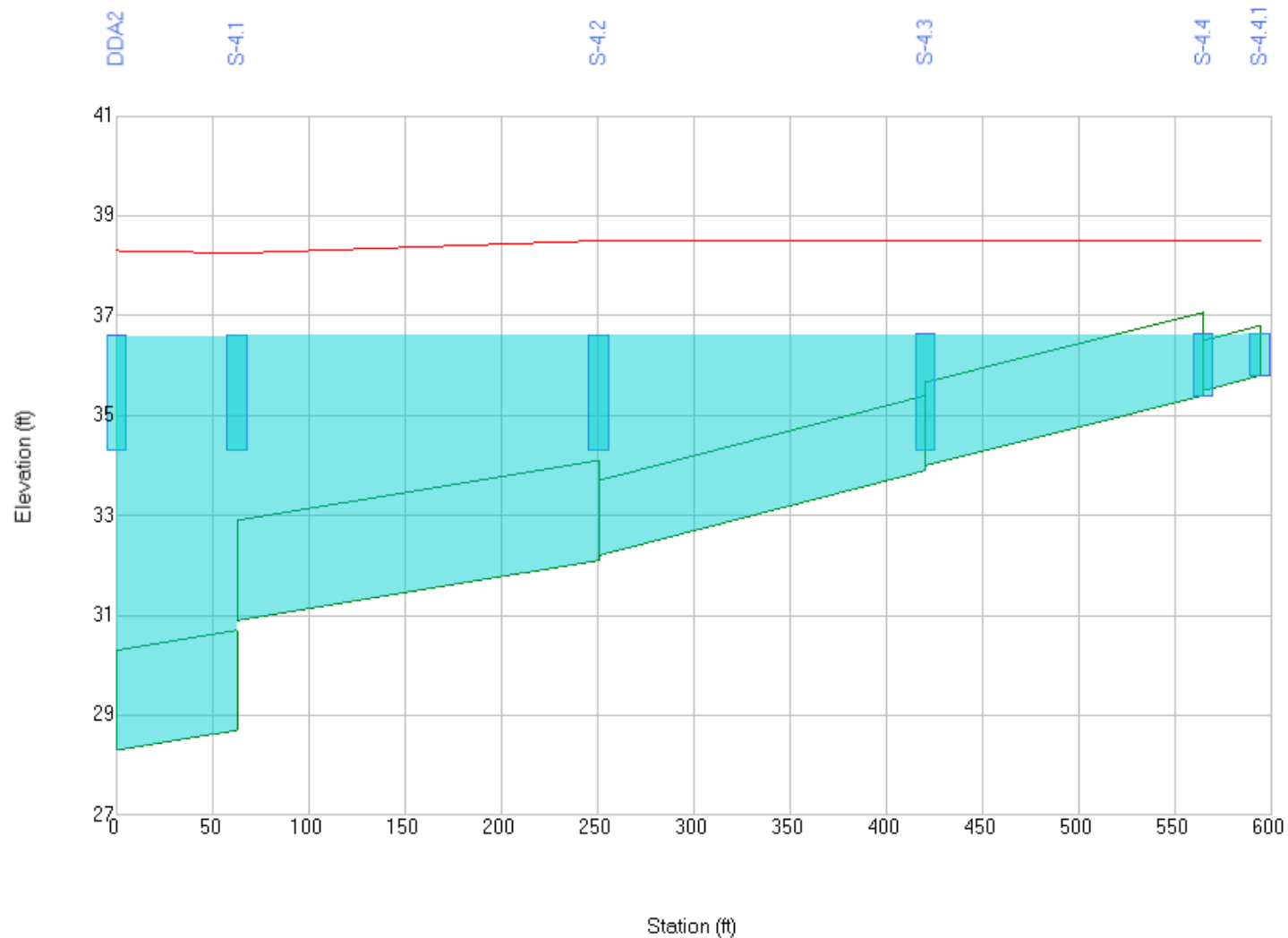| Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
22006A	025YR_24HR	38.48	34.17	0.0000	25.88	25.67	127588
22006A	100YR_24HR	38.48	34.20	0.0000	34.01	33.88	130004
22006A	233YR_24HR	38.48	34.08	0.0000	12.02	11.39	121296
22006B	025YR_24HR	38.48	35.22	0.0001	13.52	13.52	2951
22006B	100YR_24HR	38.48	35.52	0.0001	17.95	17.94	3892
22006B	233YR_24HR	38.48	34.57	0.0001	5.41	5.41	1275
DDA1	025YR_24HR	38.30	37.07	0.0001	8.46	3.18	8522
DDA1	100YR_24HR	38.30	37.74	0.0001	11.34	4.75	9524
DDA1	233YR_24HR	38.30	35.99	0.0001	4.05	1.18	7050
DDA2	025YR_24HR	38.30	37.06	0.0001	21.01	6.95	22899
DDA2	100YR_24HR	38.30	37.71	0.0001	28.94	11.18	24704
DDA2	233YR_24HR	38.30	35.98	0.0001	10.16	1.78	20044
DDA3	025YR_24HR	38.30	37.07	0.0001	4.72	0.73	7686
DDA3	100YR_24HR	38.30	37.72	0.0001	6.33	1.28	8745
DDA3	233YR_24HR	38.30	35.99	0.0001	2.41	0.13	6083

Node Max Conditions [PRE]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
22006A	025YR_24HR	38.48	34.17	0.0004	25.97	25.82	127636
22006A	100YR_24HR	38.48	34.20	0.0005	33.31	33.21	129820
22006A	233YR_24HR	38.48	34.10	0.0004	13.47	12.93	122169
22006B	025YR_24HR	38.48	35.25	0.0010	16.08	13.96	69937
22006B	100YR_24HR	38.48	35.52	0.0010	22.65	17.95	107719
22006B	233YR_24HR	38.48	34.71	0.0010	7.02	6.86	10310

   Lesson 5 - Pre/Post Examples

Lesson 5: VA Example – Post Conditions

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Lesson 5: Example 1 – Post Conditions

Treatment Recovery

*icpr*4

Lesson 5: Example 1 – Post Conditions

Treatment Recovery

Scenario & Sim Name	Pond Node Name	Relative Time [hrs]	Stage [ft]
Drawdown	DDA1	24.167	34.92
Drawdown	DDA1	24.2512	34.92
Drawdown	DDA1	24.3336	34.92
Drawdown	DDA1	24.4167	34.92
Drawdown	DDA1	24.5002	34.92
Drawdown	DDA1	24.5836	34.92
Drawdown	DDA1	24.667	34.91
Drawdown	DDA1	24.7512	34.91
Drawdown	DDA1	24.8334	34.91
Drawdown	DDA1	24.9175	34.91
Drawdown	DDA1	25.0002	34.91
Drawdown	DDA1	25.0839	34.91
Drawdown	DDA1	25.1667	34.9
Drawdown	DDA1	25.2508	34.9
Drawdown	DDA1	25.3336	34.9
Drawdown	DDA1	25.4173	34.9
Drawdown	DDA1	25.5009	34.9
Drawdown	DDA1	25.5834	34.9
Drawdown	DDA1	25.6675	34.89
Drawdown	DDA1	25.7507	34.89
Drawdown	DDA1	25.8334	34.89
Drawdown	DDA1	25.9171	34.89

Scenario & Sim Name	Pond Node Name	Relative Time [hrs]	Stage [ft]
Drawdown	DDA3	24.167	34.92
Drawdown	DDA3	24.2512	34.92
Drawdown	DDA3	24.3336	34.92
Drawdown	DDA3	24.4167	34.92
Drawdown	DDA3	24.5002	34.92
Drawdown	DDA3	24.5836	34.91
Drawdown	DDA3	24.667	34.91
Drawdown	DDA3	24.7512	34.91
Drawdown	DDA3	24.8334	34.91
Drawdown	DDA3	24.9175	34.91
Drawdown	DDA3	25.0002	34.91
Drawdown	DDA3	25.0839	34.91
Drawdown	DDA3	25.1667	34.9
Drawdown	DDA3	25.2508	34.9
Drawdown	DDA3	25.3336	34.9
Drawdown	DDA3	25.4173	34.9
Drawdown	DDA3	25.5009	34.9
Drawdown	DDA3	25.5834	34.9
Drawdown	DDA3	25.6675	34.89
Drawdown	DDA3	25.7507	34.89
Drawdown	DDA3	25.8334	34.89
Drawdown	DDA3	25.9171	34.89

Scenario & Sim Name	Pond Node Name	Relative Time [hrs]	Stage [ft]
Drawdown	DDA2	24.167	34.92
Drawdown	DDA2	24.2512	34.92
Drawdown	DDA2	24.3336	34.92
Drawdown	DDA2	24.4167	34.92
Drawdown	DDA2	24.5002	34.91
Drawdown	DDA2	24.5836	34.91
Drawdown	DDA2	24.667	34.91
Drawdown	DDA2	24.7512	34.91
Drawdown	DDA2	24.8334	34.91
Drawdown	DDA2	24.9175	34.91
Drawdown	DDA2	25.0002	34.9
Drawdown	DDA2	25.0839	34.9
Drawdown	DDA2	25.1667	34.9
Drawdown	DDA2	25.2508	34.9
Drawdown	DDA2	25.3336	34.9
Drawdown	DDA2	25.4173	34.9
Drawdown	DDA2	25.5009	34.89
Drawdown	DDA2	25.5834	34.89
Drawdown	DDA2	25.6675	34.89
Drawdown	DDA2	25.7507	34.89
Drawdown	DDA2	25.8334	34.89
Drawdown	DDA2	25.9171	34.89

Lesson 5 - Pre/Post Examples

Wawa Example

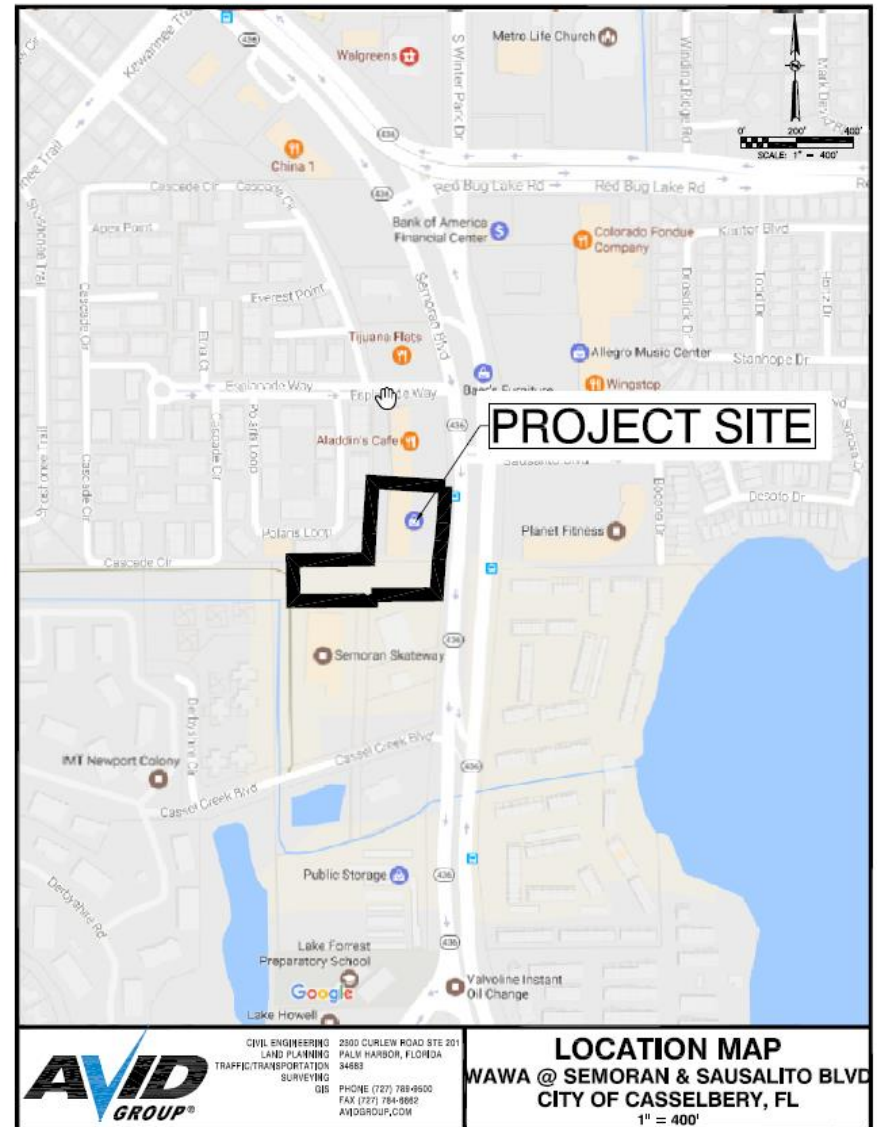© 2019, Streamline Technologies, Inc.   Lesson 5 - Pre/Post Examples

Wawa
Overview

- **Project Name:**
  Wawa at NWC Semoran Blvd. & Sausalita Blvd.

- **Location:**
  Casselberry, Florida

- **Firm:**
  AVID Group

- **Engineer of Record (Plans):**
  Ron Henson, PE
  Engineer of Record (H&H Calcs):
  Ron Morahan, PE, LEED ® AP

- Converted Original ICPR3 to ICPR4

Wawa Example – Project Description

- **Existing Condition**
  Commercial Development

- **Proposed Conditions**
  Redevelop as Wawa including parking

- **Proposed Stormwater Facility**
  Modify Existing Dry Retention Pond

- **Outfall:** SR436 conveyance/pipe to Cassel Creek, then into Lake Howell

PROJECT SITE

LOCATION MAP
WAWA @ SEMORAN & SAUSALITO BLVD
CITY OF CASSELBERY, FL
1" = 400'

Lesson 5 - Pre/Post Examples

Wawa Example – Design Criteria

- **SJRWMD**
    - Dry retention treatment shall be provided for the greater of:
        1) 0.5 inch of runoff over the drainage area or 1.25 inches across the impervious area
        2) a depth of treatment adequate to provide a net improvement in nutrient discharge from the site
    - Treatment Recovery: 72 hrs
    - Pre/Post Discharge: 25-year 24-hour and 2.33-year 24-hour
- **FDOT**
    - Pre/Post Critical Storm Analysis
    - 0.5-ft freeboard paved areas (highest design high stage)
    - 1.0-ft freeboard grassed areas (highest design high stage)
- **City of Casselberry**
    - Pre/Post Discharge: 25-year 24-hour
    - 1.0-ft of freeboard above the 25-year 24-hour design high water level

Wawa Example – Model Development

- **Curve Numbers**
  - Area Weighted Average
  - TR-55 Table 2-2a

Land Cover	Curve Number
Impervious	98
Open Space (Fair Condition)	84
Open Water/Pond	100

- **Time of Concentration**
  Estimated to be 10 minutes

- **Seasonal Higher Groundwater**
  - Data from ERP #22053-6 SR436 & Redbug Lake Rd.
  - Confining Layer = 55.75-ft (NAVD88)
  - SHGWL = 62-ft (NAVD88)
  - Ksat(vert) = 2.44 ft/day (Measured)
    - FOS = 2 & Ksat(hori) = 1.5 X Ksat(vert)
  - Porosity = 30%

     Lesson 5 - Pre/Post Examples   icpr4

Existing Conditions

Lesson 5 - Pre/Post Examples

Wawa Example – Existing Conditions

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Wawa Example - Model Network

Lesson 5 - Pre/Post Examples

Wawa Example – Existing Conditions

Site Outfall Location

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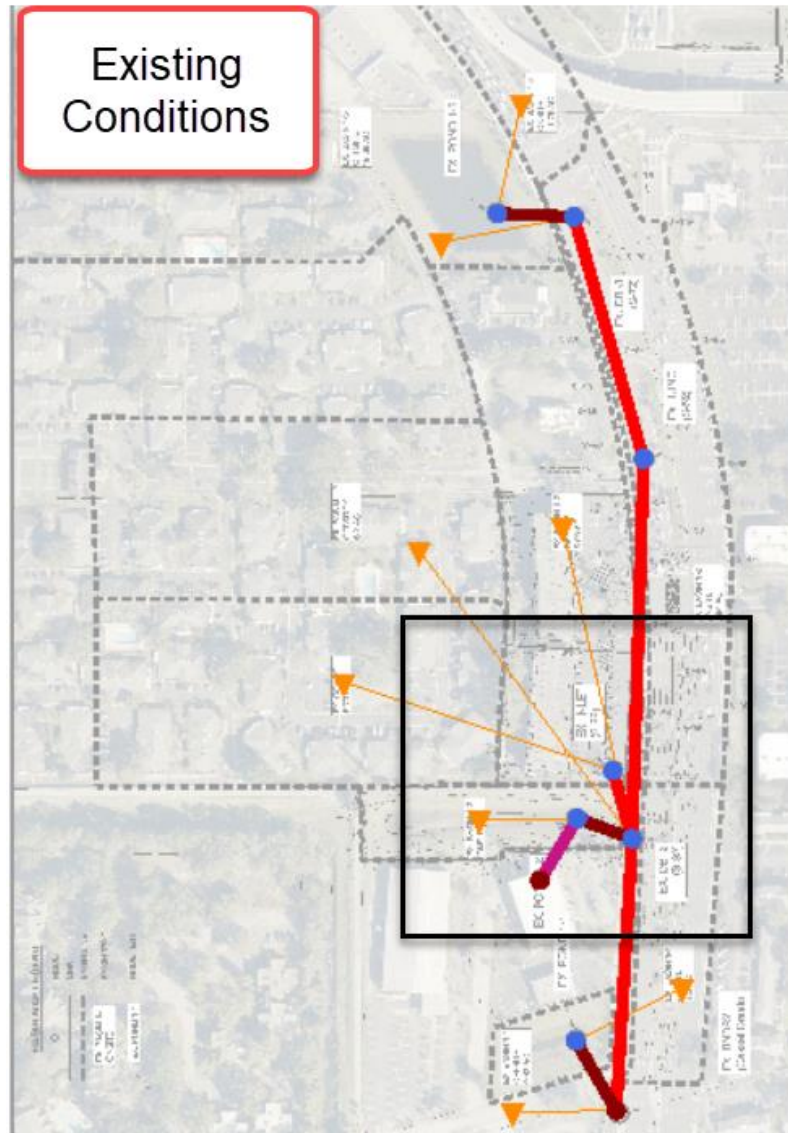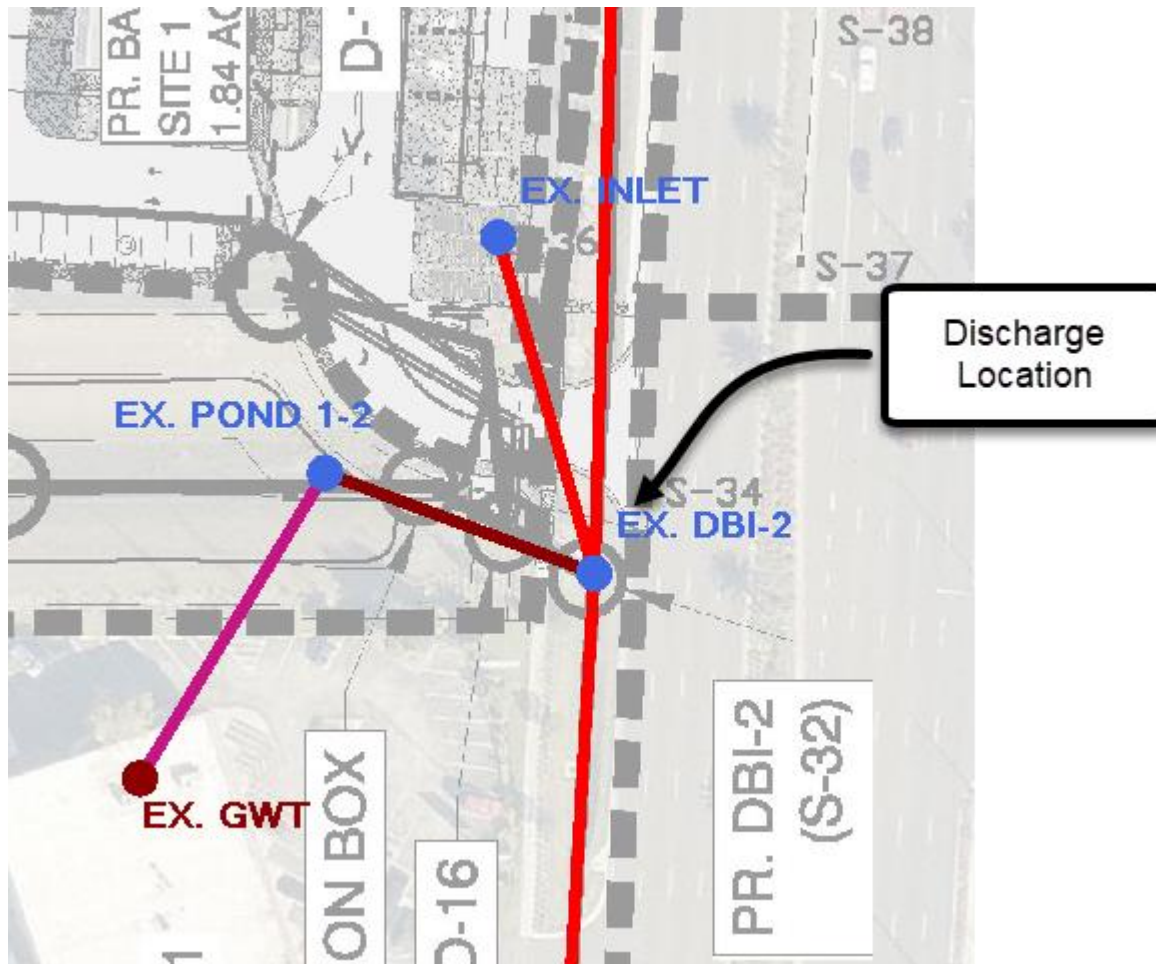
Wawa Example – FDOT Critical Storm

Node Max Conditions [Existing]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
EX. BNDRY	002YR001HR	69.37	63.08	0.0063	77.61	0.06	0
EX. BNDRY	002YR002HR	69.37	63.08	0.0063	64.50	0.03	0
EX. BNDRY	002YR004HR	69.37	63.08	0.0060	47.62	0.05	0
EX. BNDRY	002YR008HR	69.37	63.08	0.0048	52.06	0.03	0
EX. BNDRY	002YR024HR	69.37	63.08	0.0063	18.05	0.00	0
EX. BNDRY	002YR072HR	69.37	63.08	0.0063	14.87	0.00	0
EX. BNDRY	003YR024HR	69.37	63.08	0.0063	20.48	0.00	0
EX. BNDRY	005YR001HR	69.37	63.08	0.0063	101.81	0.04	0
EX. BNDRY	005YR002HR	69.37	63.08	0.0063	85.04	0.03	0
EX. BNDRY	005YR004HR	69.37	63.08	0.0046	63.02	0.03	0
EX. BNDRY	005YR008HR	69.37	63.08	0.0048	69.23	0.03	0
EX. BNDRY	005YR024HR	69.37	63.08	0.0060	26.34	0.00	0
EX. BNDRY	005YR072HR	69.37	63.08	0.0063	21.00	0.00	0
EX. BNDRY	010YR001HR	69.37	63.08	0.0063	116.74	0.05	0
EX. BNDRY	010YR002HR	69.37	63.08	0.0061	102.64	0.02	0
EX. BNDRY	010YR004HR	69.37	63.08	0.0037	74.94	0.03	0
EX. BNDRY	010YR008HR	69.37	63.08	0.0042	83.83	0.07	0
EX. BNDRY	010YR024HR	69.37	63.08	0.0054	34.42	0.00	0
EX. BNDRY	010YR072HR	69.37	63.08	0.0063	24.70	0.00	0
EX. BNDRY	025YR001HR	69.37	63.08	0.0063	142.25	0.04	0
EX. BNDRY	025YR002HR	69.37	63.08	0.0049	120.45	0.04	0
EX. BNDRY	025YR004HR	69.37	63.08	0.0031	91.08	0.02	0
EX. BNDRY	025YR008HR	69.37	63.08	0.0038	100.45	0.06	0
EX. BNDRY	025YR024HR	69.37	63.08	0.0048	40.74	0.00	0
EX. BNDRY	025YR072HR	69.37	63.08	0.0063	29.10	0.00	0
EX. BNDRY	050YR001HR	69.37	63.08	0.0063	162.80	0.03	0
EX. BNDRY	050YR002HR	69.37	63.08	0.0044	141.92	0.06	0
EX. BNDRY	050YR004HR	69.37	63.08	0.0027	103.77	0.05	0
EX. BNDRY	050YR008HR	69.37	63.08	0.0033	116.09	0.03	0
EX. BNDRY	050YR024HR	69.37	63.08	0.0048	46.86	0.00	0
EX. BNDRY	050YR072HR	69.37	63.08	0.0063	34.22	0.00	0
EX. BNDRY	100YR001HR	69.37	63.08	0.0056	183.18	0.03	0

 Lesson 5 - Pre/Post Examples

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Wawa Example – FDOT Critical Storm

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
EX. BNDRY	100YR002HR	69.37	63.08	0.0044	160.16	0.02	0
EX. BNDRY	100YR004HR	69.37	63.08	0.0025	116.74	0.02	0
EX. BNDRY	100YR008HR	69.37	63.08	0.0033	124.07	0.03	0
EX. BNDRY	100YR024HR	69.37	63.08	0.0042	52.30	0.00	0
EX. BNDRY	100YR072HR	69.37	63.08	0.0063	39.08	0.00	0
EX. DBI-2	002YR001HR	74.19	65.06	0.0010	77.12	76.54	4003
EX. DBI-2	002YR002HR	74.19	64.68	0.0010	64.12	63.59	4004
EX. DBI-2	002YR004HR	74.19	64.15	0.0010	47.03	46.90	3996
EX. DBI-2	002YR008HR	74.19	64.29	0.0010	51.53	51.29	4004
EX. DBI-2	002YR024HR	74.19	63.20	0.0010	17.66	17.65	3794
EX. DBI-2	002YR072HR	74.19	63.16	0.0010	14.36	14.37	3784
EX. DBI-2	003YR024HR	74.19	63.22	0.0010	19.91	19.90	3805
EX. DBI-2	005YR001HR	74.19	65.75	0.0010	101.00	100.42	4002
EX. DBI-2	005YR002HR	74.19	65.27	0.0010	84.49	83.87	4003
EX. DBI-2	005YR004HR	74.19	64.61	0.0010	61.60	61.51	4004
EX. DBI-2	005YR008HR	74.19	64.79	0.0010	67.74	67.49	4005
EX. DBI-2	005YR024HR	74.19	63.36	0.0010	25.03	24.97	3849
EX. DBI-2	005YR072HR	74.19	63.22	0.0010	19.75	19.75	3807
EX. DBI-2	010YR001HR	74.19	66.16	0.0010	115.69	115.16	4002
EX. DBI-2	010YR002HR	74.19	65.77	0.0010	101.86	101.24	4003
EX. DBI-2	010YR004HR	74.19	64.94	0.0010	72.43	72.35	4004
EX. DBI-2	010YR008HR	74.19	65.18	0.0010	81.02	80.77	4005
EX. DBI-2	010YR024HR	74.19	63.65	0.0010	32.41	32.35	3894
EX. DBI-2	010YR072HR	74.19	63.29	0.0010	23.22	23.21	3823
EX. DBI-2	025YR001HR	74.19	66.88	0.0010	140.63	140.35	4001
EX. DBI-2	025YR002HR	74.19	66.27	0.0010	119.41	118.81	4003
EX. DBI-2	025YR004HR	74.19	65.36	0.0010	86.99	86.90	4004
EX. DBI-2	025YR008HR	74.19	65.62	0.0010	96.14	95.84	4005
EX. DBI-2	025YR024HR	74.19	63.86	0.0010	38.32	38.25	3928
EX. DBI-2	025YR072HR	74.19	63.46	0.0010	27.36	27.34	3846
EX. DBI-2	050YR001HR	74.19	67.47	0.0010	160.78	160.63	4001
EX. DBI-2	050YR002HR	74.19	66.87	0.0010	140.31	139.98	4002
EX. DBI-2	050YR004HR	74.19	65.69	0.0010	98.53	98.41	4004

Lesson 5 - Pre/Post Examples

icpr4

Wawa Example – FDOT Critical Storm

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
EX. DBI-2	050YR008HR	74.19	66.02	0.0010	110.43	110.14	4005
EX. DBI-2	050YR024HR	74.19	64.06	0.0010	44.07	44.00	3953
EX. DBI-2	050YR072HR	74.19	63.64	0.0010	32.17	32.16	3861
EX. DBI-2	100YR001HR	74.19	68.18	0.0010	180.87	180.70	4000
EX. DBI-2	100YR002HR	74.19	67.39	0.0010	157.89	157.68	4001
EX. DBI-2	100YR004HR	74.19	66.03	0.0010	110.39	110.27	4004
EX. DBI-2	100YR008HR	74.19	66.23	0.0010	117.76	117.48	4005
EX. DBI-2	100YR024HR	74.19	64.22	0.0010	49.16	49.10	3970
EX. DBI-2	100YR072HR	74.19	63.81	0.0010	36.73	36.71	3865
EX. POND 1-2	002YR001HR	74.50	71.30	0.0010	16.38	6.10	23994
EX. POND 1-2	002YR002HR	74.50	71.34	0.0010	13.57	6.24	24153
EX. POND 1-2	002YR004HR	74.50	71.34	0.0010	9.12	6.26	24163
EX. POND 1-2	002YR008HR	74.50	71.30	0.0010	9.67	6.09	23985
EX. POND 1-2	002YR024HR	74.50	70.74	0.0009	3.13	2.66	21812
EX. POND 1-2	002YR072HR	74.50	70.62	0.0010	2.02	1.93	21362
EX. POND 1-2	003YR024HR	74.50	70.79	0.0009	3.48	2.98	22021
EX. POND 1-2	005YR001HR	74.50	71.60	0.0010	20.49	7.07	25137
EX. POND 1-2	005YR002HR	74.50	71.67	0.0010	17.01	7.27	25405
EX. POND 1-2	005YR004HR	74.50	71.71	0.0010	11.68	7.38	25586
EX. POND 1-2	005YR008HR	74.50	71.65	0.0010	12.34	7.22	25326
EX. POND 1-2	005YR024HR	74.50	70.89	0.0009	4.17	3.62	22415
EX. POND 1-2	005YR072HR	74.50	70.74	0.0010	2.67	2.58	21817
EX. POND 1-2	010YR001HR	74.50	71.78	0.0010	22.95	7.57	25846
EX. POND 1-2	010YR002HR	74.50	71.95	0.0010	19.88	8.00	26498
EX. POND 1-2	010YR004HR	74.50	72.01	0.0010	13.62	8.08	26724
EX. POND 1-2	010YR008HR	74.50	71.96	0.0010	14.55	8.01	26523
EX. POND 1-2	010YR024HR	74.50	71.01	0.0010	5.04	4.41	22873
EX. POND 1-2	010YR072HR	74.50	70.81	0.0010	3.11	3.01	22098
EX. POND 1-2	025YR001HR	74.50	72.09	0.0010	27.07	8.27	27042
EX. POND 1-2	025YR002HR	74.50	72.24	0.0010	22.76	8.68	27614
EX. POND 1-2	025YR004HR	74.50	72.41	0.0010	16.20	9.09	28259
EX. POND 1-2	025YR008HR	74.50	72.31	0.0010	16.97	8.86	27883
EX. POND 1-2	025YR024HR	74.50	71.10	0.0010	5.73	5.04	23218

Lesson 5 - Pre/Post Examples

icpr4

Wawa Example – FDOT Critical Storm

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
EX. POND 1-2	025YR072HR	74.50	70.89	0.0010	3.63	3.53	22418
EX. POND 1-2	050YR001HR	74.50	72.33	0.0010	30.37	8.92	27982
EX. POND 1-2	050YR002HR	74.50	72.58	0.0010	26.21	9.39	28940
EX. POND 1-2	050YR004HR	74.50	72.71	0.0010	18.13	9.55	29438
EX. POND 1-2	050YR008HR	74.50	72.64	0.0010	19.16	9.49	29147
EX. POND 1-2	050YR024HR	74.50	71.19	0.0010	6.41	5.63	23555
EX. POND 1-2	050YR072HR	74.50	70.98	0.0010	4.24	4.14	22770
EX. POND 1-2	100YR001HR	74.50	72.58	0.0010	33.66	9.38	28928
EX. POND 1-2	100YR002HR	74.50	72.88	0.0010	29.08	9.71	30096
EX. POND 1-2	100YR004HR	74.50	73.03	0.0010	20.05	10.01	30656
EX. POND 1-2	100YR008HR	74.50	72.81	0.0010	20.26	9.64	29826
EX. POND 1-2	100YR024HR	74.50	71.29	0.0010	7.10	6.05	23945
EX. POND 1-2	100YR072HR	74.50	71.07	0.0010	4.84	4.74	23105

- Critical Storm (Peak Flow): 1-hour
  - Q (100-year) = 180.87 cfs
- Peak Stage: 100-year 4-hour
  - Stage = 73.03-ft (NAVD88)

Lesson 5 - Pre/Post Examples

icpr4

Wawa Example – SJRWMD & Casselberry
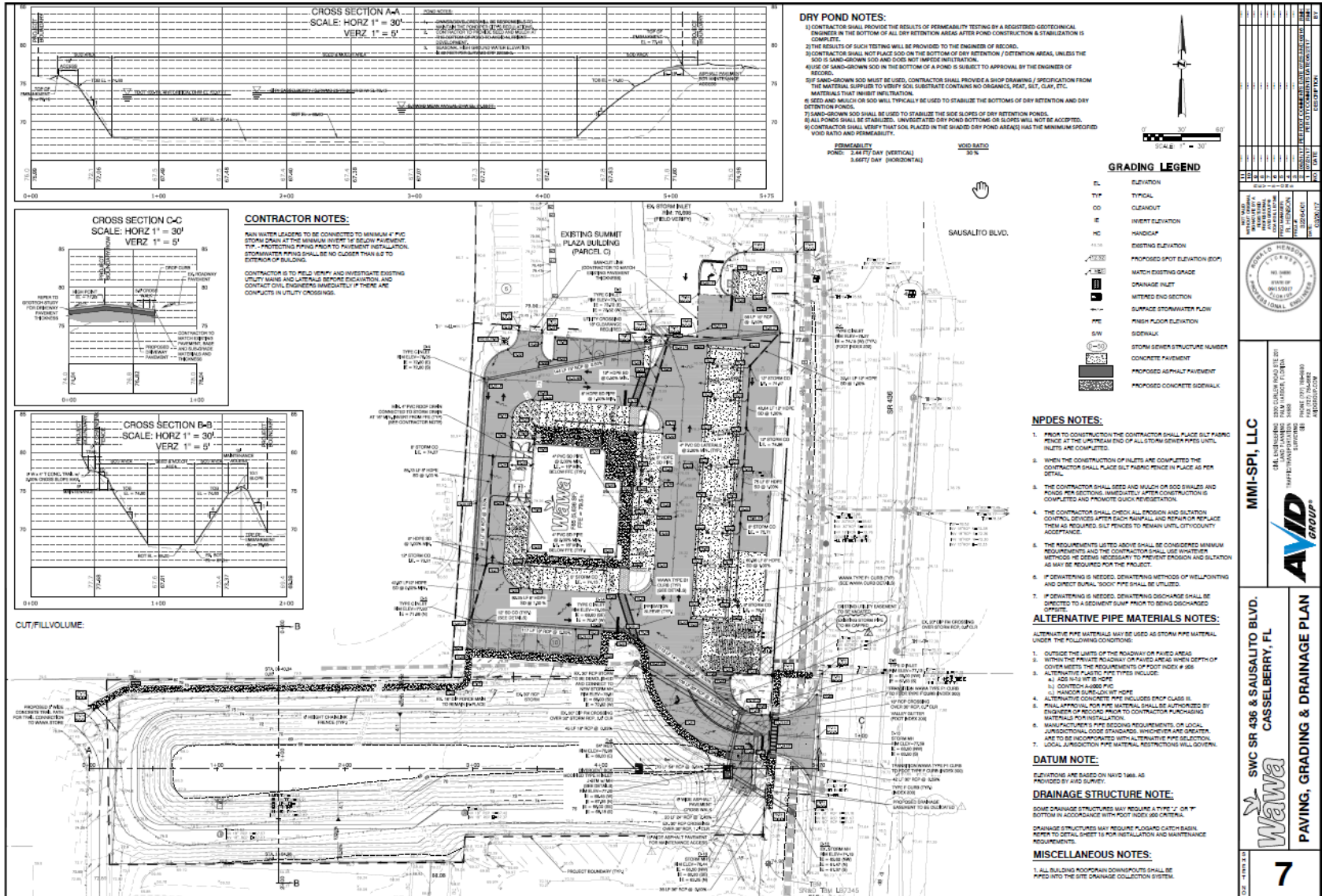
Node Max Conditions [Existing]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
EX. BNDRY	025YR024HR WMD	69.37	63.08	0.0031	166.07	0.00	0
EX. BNDRY	100YR024HR WMD	69.37	63.08	0.0031	220.94	0.00	0
EX. BNDRY	MEAN ANNUAL	69.37	63.08	0.0031	72.54	0.00	0
EX. DBI-2	025YR024HR WMD	74.19	67.46	0.0010	160.17	160.04	3894
EX. DBI-2	100YR024HR WMD	74.19	69.49	0.0010	211.37	211.45	3904
EX. DBI-2	MEAN ANNUAL	74.19	64.91	0.0010	72.06	71.49	3873

- Mean Annual Peak Flow
  - Boundary = 72.54 cfs
  - DBI-2 = 72.06 cfs
- 25-year 24-hour Peak Flow
  - Boundary = 166.07 cfs
  - DBI-2 = 160.17 cfs

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Proposed Conditions

Wawa Example – Proposed Conditions

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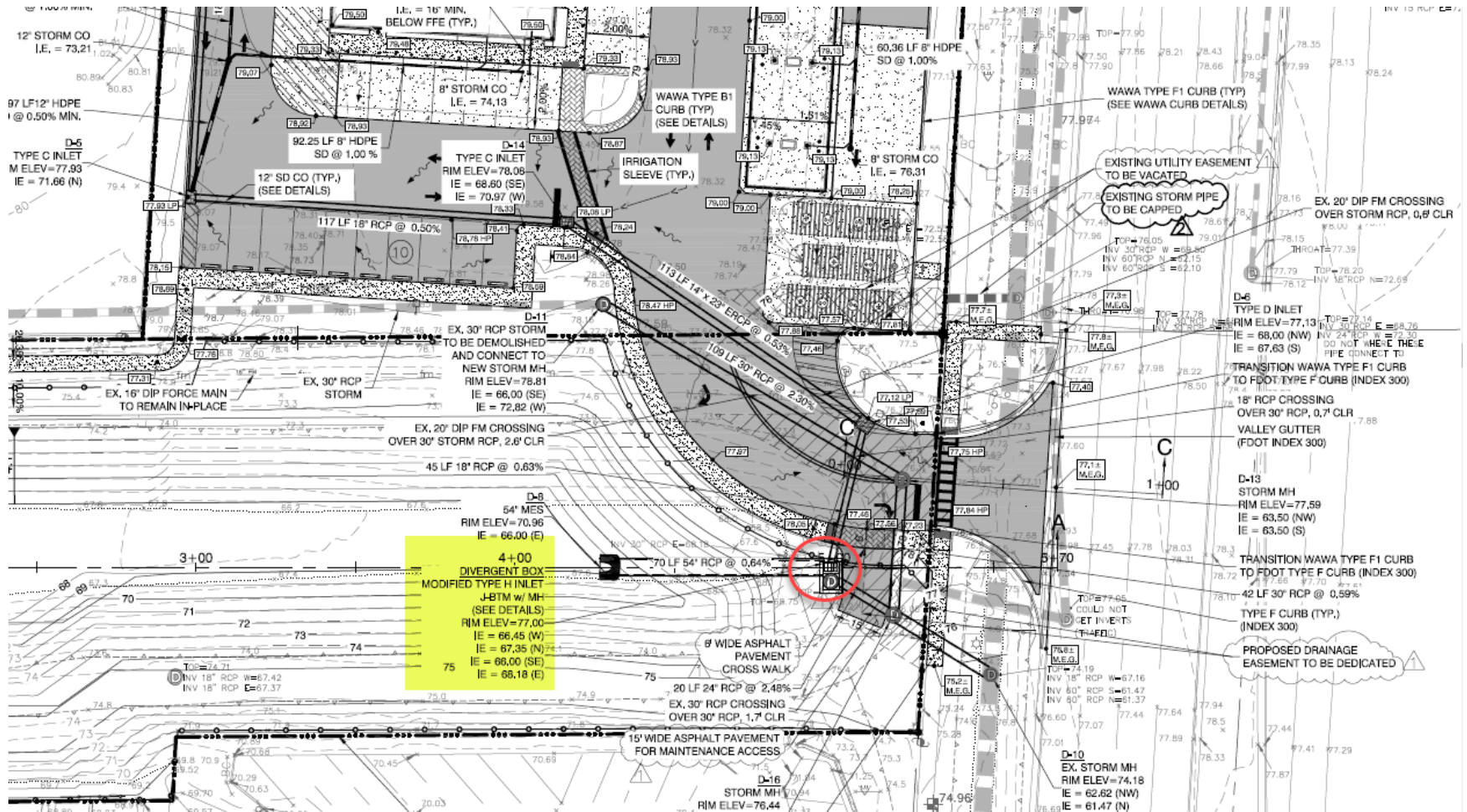# Wawa Example – Post Conditions

Treatment Calculations

Pr. Pond 1-2

Elevation (ft NAVD)	Area (sq ft)	Area (acres)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)
68.00	10355	0.238		0.000
69.00	13517	0.310	0.274	0.274
70.00	16864	0.387	0.349	0.623
71.00	20370	0.468	0.427	1.050
72.00	23370	0.537	0.502	1.552
73.00	27693	0.636	0.586	2.138
73.64	30133	0.692	0.425	2.563
74.00	31506	0.723	0.255	2.818
74.60	35817	0.822	0.464	3.281

		0.5" Over entire basin	1.25" Over Paved Area	Nutrient Loading
CONTRIBUTING AREA	(ac)	8.72	5.91	7.89
DEPTH OF TREATMENT	(in)	0.50	1.25	0.63
WATER QUALITY VOLUME	(ac-ft)	0.363	0.616	0.411
	(cu-ft)	15821	26814	17911
WATER QUALITY ELEVATION	(ft)	---	---	69.39

icpr4

Wawa Example – Proposed Conditions

     Lesson 5 - Pre/Post Examples

Wawa Example – Proposed Conditions

Lesson 5 - Pre/Post Examples

icpr4

Wawa Example - Model Network

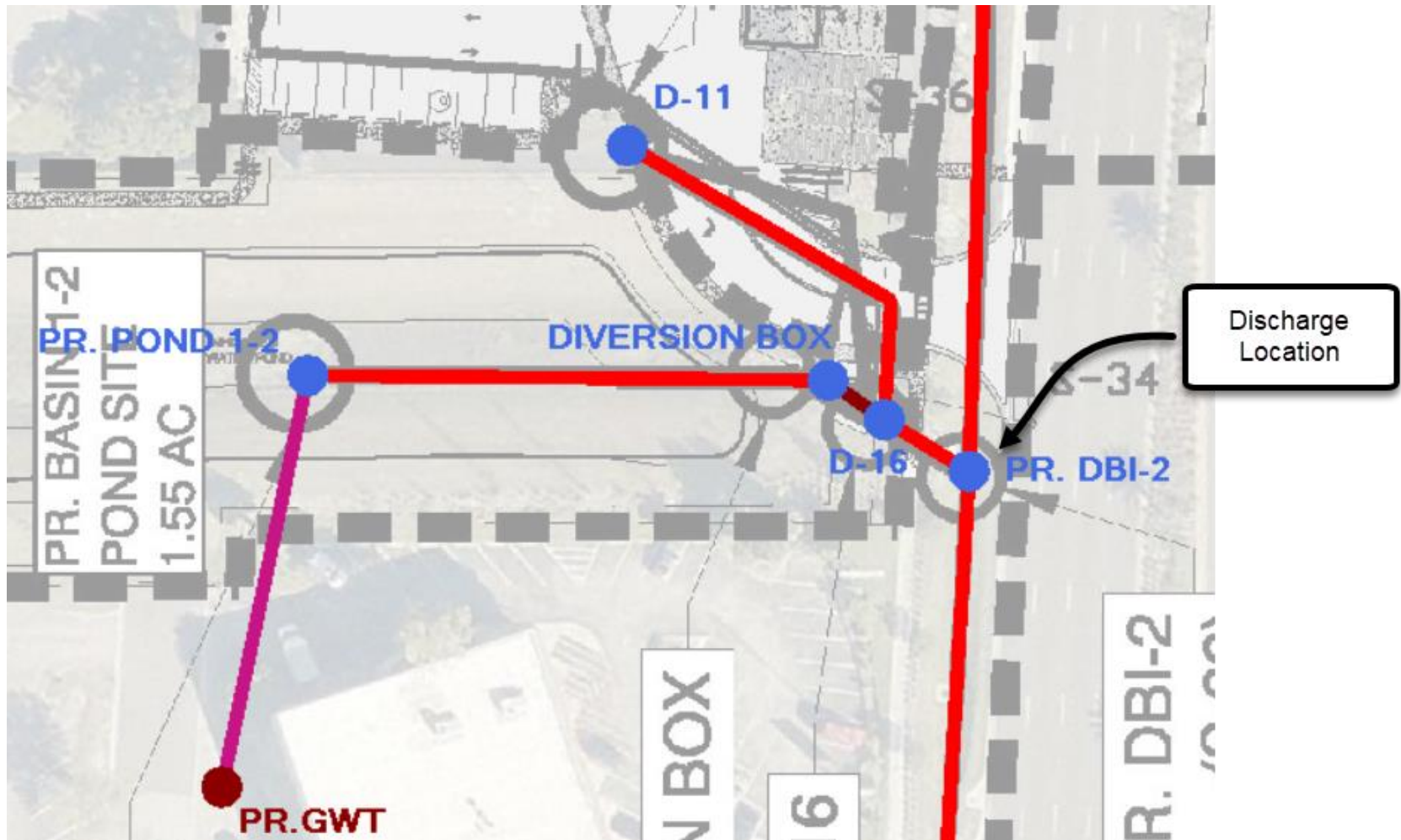Proposed Conditions

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Wawa Example – Existing Conditions

Site Outfall Location

Pre/Post Analysis

Wawa Example – Post Conditions

FDOT Critical Storm Analysis – Node DBI-2

- ➢ Peak flows less for post conditions

- ➢ Peak stages are lower for post conditions

Return Period	Max	Duration						Receiving Water
		1-Hour	2-Hour	4-hour	8-hour	24-hour	72-hour	
2-year	Q (Pre)	77.12	64.12	47.03	51.53	17.66	14.36	DBI-2
	Q (Post)	73.27	61.07	44.32	48.6	17.42	14.32	
	Stage (Pre)	65.06	64.68	64.15	64.29	63.2	63.16	
	Stage (Post)	64.95	64.58	64.06	64.2	63.19	63.16	
5-year	Q (Pre)	101	84.49	61.6	67.74	25.03	19.75	DBI-2
	Q (Post)	95.5	79.89	58.1	63.77	24.44	19.67	
	Stage (Pre)	65.75	65.27	64.61	64.79	63.36	63.22	
	Stage (Post)	65.59	65.14	64.51	64.67	63.34	63.22	
10-year	Q (Pre)	115.69	101.86	72.43	81.02	32.41	23.22	DBI-2
	Q (Post)	109.13	95.89	69.23	77.21	31.44	23.02	
	Stage (Pre)	66.16	65.77	64.94	65.18	63.65	63.29	
	Stage (Post)	65.98	65.6	64.84	65.07	63.61	63.28	
25-year	Q (Pre)	140.63	119.41	86.99	96.14	38.32	27.36	DBI-2
	Q (Post)	132.29	112.09	84.78	93.09	36.99	26.99	
	Stage (Pre)	66.88	66.27	65.36	65.62	63.86	63.46	
	Stage (Post)	66.64	66.06	65.3	65.53	63.81	63.44	
50-year	Q (Pre)	160.78	140.31	98.53	110.43	44.07	32.17	DBI-2
	Q (Post)	151.14	131.97	97.17	108.31	42.37	31.56	
	Stage (Pre)	67.47	66.87	65.69	66.02	64.06	63.64	
	Stage (Post)	67.19	66.63	65.65	65.96	64	63.62	
100-year	Q (Pre)	180.87	157.89	110.39	117.76	49.16	36.73	DBI-2
	Q (Post)	170.71	149.14	109.87	116.05	47.32	35.83	
	Stage (Pre)	68.18	67.39	66.03	66.23	64.22	63.81	
	Stage (Post)	67.81	67.13	66.01	66.18	64.16	63.77	

Lesson 5 - Pre/Post Examples

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Wawa Example – Post Conditions

FDOT Critical Storm Analysis – Boundary Node

➢ Peak flows less for post conditions

Return Period	Max	Duration						Receiving Water
		1-Hour	2-Hour	4-hour	8-hour	24-hour	72-hour	
2-year	Q (Pre)	77.61	64.5	47.62	52.06	18.05	14.87	BNDRY
	Q (Post)	73.73	61.46	44.94	49.16	17.81	14.83	
5-year	Q (Pre)	101.81	85.04	63.02	69.23	26.34	21	BNDRY
	Q (Post)	96.26	80.45	59.57	65.3	25.75	20.92	
10-year	Q (Pre)	116.74	102.64	74.94	83.83	34.42	24.7	BNDRY
	Q (Post)	110.13	96.66	71.81	80.07	33.45	24.49	
25-year	Q (Pre)	142.25	120.45	91.08	100.45	40.74	29.1	BNDRY
	Q (Post)	133.84	113.13	88.93	97.45	39.41	28.73	
50-year	Q (Pre)	162.8	141.92	103.77	116.09	46.86	34.22	BNDRY
	Q (Post)	153.13	133.63	102.47	114	45.16	33.6	
100-year	Q (Pre)	183.18	160.16	116.74	124.07	52.3	39.08	BNDRY
	Q (Post)	173.04	151.56	116.27	122.41	50.46	38.18	

Lesson 5 - Pre/Post Examples

Wawa Example – Post Conditions

FDOT Critical Storm Analysis – Boundary Node Pond 1-2

➢ 100-year 4-hour max stage = 73.37-ft (NAVD88)
➢ Provides 1.23-ft of freeboard

| Return Period | Max | Duration | | | | | | Receiving Water |
		1-Hour	2-Hour	4-hour	8-hour	24-hour	72-hour	
2-year	Stage (Pre)	71.3	71.34	71.34	71.3	70.74	70.62	Pond 1-2
	Stage (Post)	71.37	71.48	71.53	71.44	70.22	70.01	
5-year	Stage (Pre)	71.6	71.67	71.71	71.65	70.89	70.74	Pond 1-2
	Stage (Post)	71.84	71.97	72.1	72	70.57	70.24	
10-year	Stage (Pre)	71.78	71.95	72.01	71.96	71.01	70.81	Pond 1-2
	Stage (Post)	72.1	72.32	72.44	72.37	70.9	70.4	
25-year	Stage (Pre)	72.09	72.24	72.41	72.31	71.1	70.89	Pond 1-2
	Stage (Post)	72.48	72.62	72.84	72.73	71.18	70.61	
50-year	Stage (Pre)	72.33	72.58	72.71	72.64	71.19	70.98	Pond 1-2
	Stage (Post)	72.76	72.96	73.12	73.04	71.48	70.87	
100-year	Stage (Pre)	72.58	72.88	73.03	72.81	71.29	71.07	Pond 1-2
	Stage (Post)	73.02	73.22	73.37	73.18	71.74	71.15	

Lesson 5 - Pre/Post Examples

icpr4

Wawa Example – Post Conditions

SJRWMD & City of Casselberry Analysis

➤ Peak flows less for post conditions

➤ 1.45-ft freeboard

Node Max Conditions [Existing]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
EX. BNDRY	025YR024HR WMD	69.37	63.08	0.0031	166.07	0.00	0
EX. BNDRY	MEAN ANNUAL	69.37	63.08	0.0031	72.54	0.00	0
EX. DBI-2	025YR024HR WMD	74.19	67.46	0.0010	160.17	160.04	3894
EX. DBI-2	MEAN ANNUAL	74.19	64.91	0.0010	72.06	71.49	3873
EX. POND 1-2	025YR024HR WMD	74.50	72.78	0.0010	27.06	9.46	29704
EX. POND 1-2	MEAN ANNUAL	74.50	71.39	0.0010	13.43	6.42	24353

Node Max Conditions [Proposed]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
PR. BNDRY	025YR024HR WMD	0.00	63.08	0.0031	158.47	0.00	0
PR. BNDRY	MEAN ANNUAL	0.00	63.08	0.0031	68.97	0.00	0
PR. DBI-2	025YR024HR WMD	74.19	67.23	0.0010	152.37	152.26	3913
PR. DBI-2	MEAN ANNUAL	74.19	64.81	0.0010	68.48	67.92	3891
PR. POND 1-2	025YR024HR WMD	0.00	73.15	0.0010	29.62	7.90	28286
PR. POND 1-2	MEAN ANNUAL	0.00	71.54	0.0010	26.99	6.91	21999

Wawa Example – Post Conditions

SJRWMD & City of Casselberry Analysis
Treatment Recovery

Lesson 5 - Pre/Post Examples

icpr4

Wawa Example – Post Conditions

SJRWMD & City of Casselberry Analysis
Treatment Recovery

General | Output Time Increments | Resources & Lookup Tables | **Tolerances & Options** |

Time Marching	SAOR ▼	Intial Abstraction Recovery Time	24
Maximum Iterations	6	Include ET for Manual Basins	☐
Over-Relaxation Weighting Factor	0.5		
dZ Tolerance	0.001	Simple / Manual Basin Rainfall Opt.	No Rainfall ▼
Maximum dZ	1	OF Region Rainfall Opt.	Global ▼
Link Optimizer Tolerance	0.0001	Rainfall Name	
		Rainfall Amount	0
Edge Length Option	Automatic ▼	Storm Duration	0
Default Damping Threshold (2D)	0.005	Default Damping Threshold (1D)	0.005
Minimum Node Surface Area (2D)	1	Minimum Node Surface Area (1D)	113
Energy Switch (2D)	Energy ▼	Energy Switch (1D)	Energy ▼

Lesson 5 - Pre/Post Examples

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Wawa Example – Post Conditions

SJRWMD & City of Casselberry Analysis
Treatment Recovery

Sim: TREAT

Top of Treatment
Volume = 69.39-ft
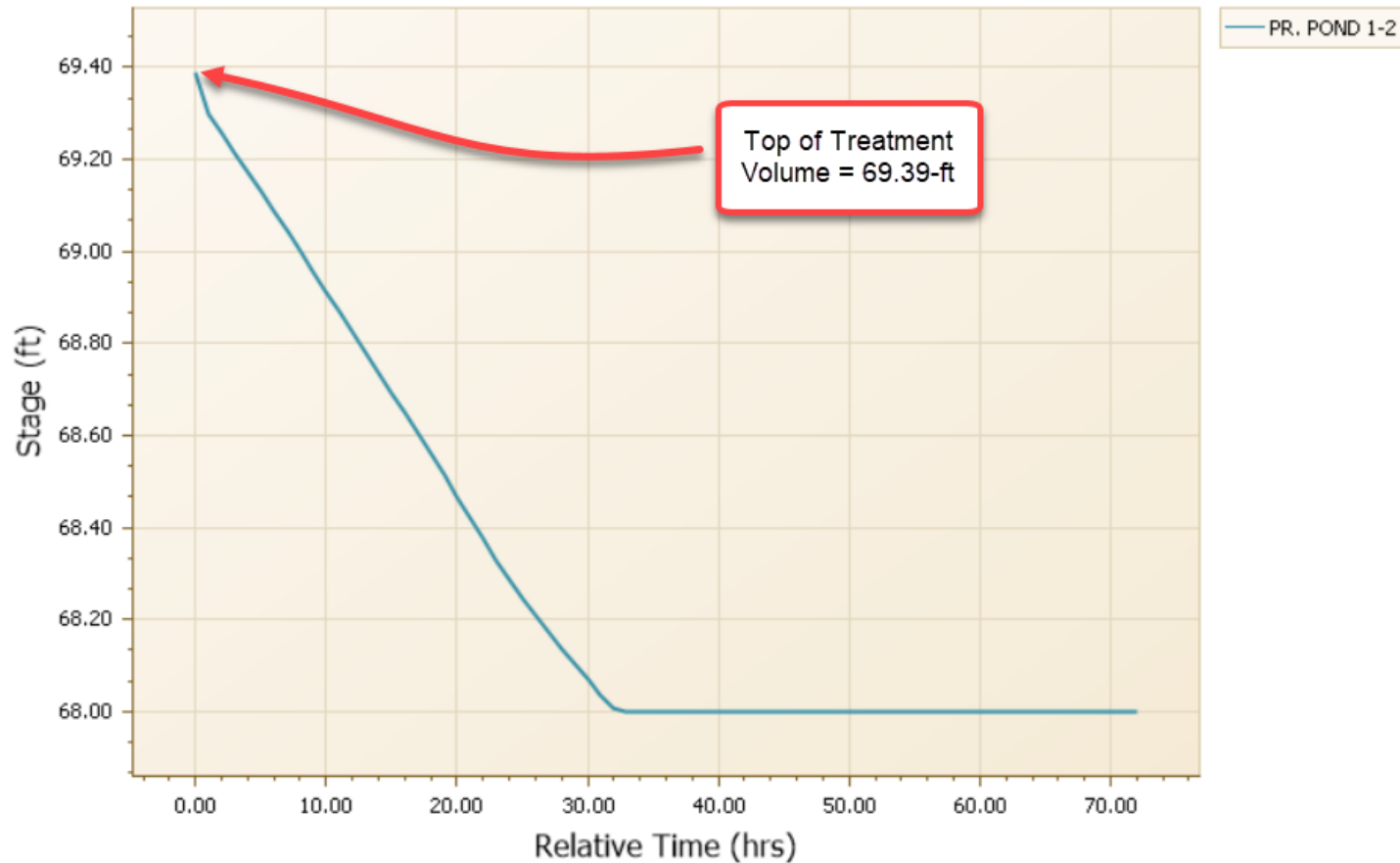
Wawa Example – Post Conditions

SJRWMD & City of Casselberry Analysis
Treatment Recovery

	Sim	Node Name	Relative Time [hrs]	Stage [ft]
	TREAT	PR. POND 1-2	29.0061	68.10
	TREAT	PR. POND 1-2	30.0061	68.07
	TREAT	PR. POND 1-2	31.0061	68.04
	TREAT	PR. POND 1-2	32.0061	68.01
	TREAT	PR. POND 1-2	33.0034	68.00
	TREAT	PR. POND 1-2	34.0003	68.00
	TREAT	PR. POND 1-2	35.0003	68.00
	TREAT	PR. POND 1-2	36.0003	68.00
	TREAT	PR. POND 1-2	37.0003	68.00
	TREAT	PR. POND 1-2	38.0003	68.00
	TREAT	PR. POND 1-2	39.0003	68.00

Recovers Treatment
Volume at ~33 hrs

Wawa Example – Post Conditions

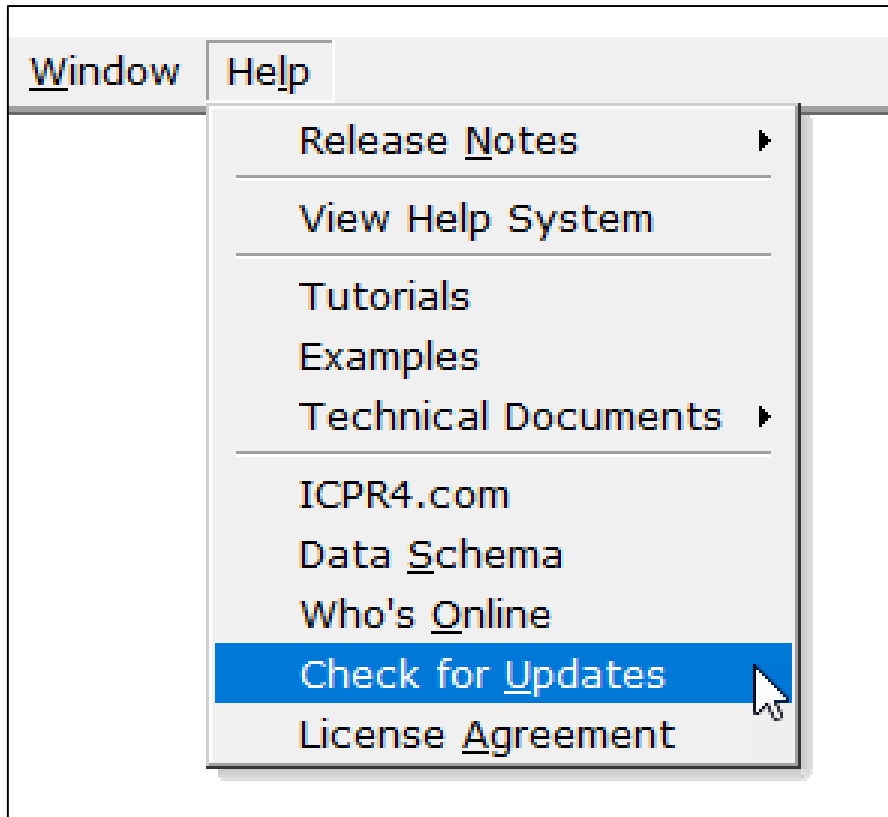Groundwater Mounding Treatment Recovery

Lesson 5 - Pre/Post Examples

Wawa Example

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