BANNING ENGINEERING

"Your Project is Our Priority"

Drainage Narrative & Supplemental For:
City of Franklin Spec Building
End User HETSCO Inc.

October, 2014

The City of Franklin Spec Building was completed in the summer of 2013. The project consisted of a 51,350 square feet industrial shell building with minimal dock and parking areas as the end user was undetermined at that time. The drainage design accommodated full build conditions and assumed 85% impervious coverage of the 11.2 acre site. The run-off is collected via swales and storm sewer infrastructure and routed to a wet detention pond in the southeast corner of the site. During construction and in effort to reduce construction costs, the pond area was reduced slightly to accommodate what was being built at the time.

HETSCO Inc., a specialty welding and manufacturing company, has entered into contract to buy the property. To meet the needs of HETSCO, additional visitor and employee parking along with additional truck loading hard surface areas are being proposed. With this additional hard surface area, the wet pond was analyzed in its as-built condition to verify adequate volume and release rates still comply with the original design. Per the original design, the allowable release rate for the 100 year is 3.34 cfs and for the 10 year is 1.12 cfs. ICPR was used to calculate the release rates based on the additional hard surface proposed for the project (see attached calculations). As a result, the pond in its current configuration meets the allowable release rates (100 year=2.62 cfs, 10 year=0.98 cfs). The run-off curve number utilized for the original full build design was 93. As a result of the HETSCO improvements, the run-off curve number is 81 (see attached WinTR55 print).

No additional storm sewer inlets or piping are proposed for this project. For reference, the original drainage report and O&M manual are attached. It is our opinion that the HETSCO improvements comply with the original drainage design.

Banning Engineering, P.C. • 853 Columbia Road, Suite 101 • Plainfield, IN 46168
Phone: (317) 707-3700 • Fax: (317) 707-3800 • E-mail: banning@BanningEngineering.com

Existing & Proposed Conditions Franklin Building
Johnson County, Indiana

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Exz A1	Pasture, grassland or range	(good)	B	1.85	61
	Pasture, grassland or range	(good)	C	1.85	74
	Total Area / Weighted Curve Number			3.7	68
Exz B1	Pasture, grassland or range	(good)	B	3.75	61
	Pasture, grassland or range	(good)	C	3.75	74
	Total Area / Weighted Curve Number			7.5	68
Offsite Pr	Commercial & business		B	.225	92
	Commercial & business		C	.225	94
	Residential districts (1/4 acre)		B	.525	75
	Residential districts (1/4 acre)		C	.525	83
	Total Area / Weighted Curve Number			1.5	83
Pro A1	Open space; grass cover > 75%	(good)	B	3.07	61
	Open space; grass cover > 75%	(good)	C	3.07	74
	Paved; curbs and storm sewers		B	2.53	98
	Paved; curbs and storm sewers		C	2.53	98
	Total Area / Weighted Curve Number			11.2	81

11191R
Existing & Proposed Conditions Franklin Building
Johnson County, Indiana

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Exz A1							
SHEET	100	0.0200	0.150				0.180
SHALLOW	450	0.0100	0.050				0.077
					Time of Concentration		0.257
Exz B1							
SHEET	100	0.0100	0.150				0.237
SHALLOW	750	0.0100	0.050				0.129
					Time of Concentration		0.366
Offsite Pr							
SHEET	30	0.0110	0.011				0.011
					Time of Concentration		0.100
Pro A1							
SHEET	70	0.0100	0.240				0.260
CHANNEL	500					3.000	0.046
					Time of Concentration		0.306

JLM
10-13-14
10-Year

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
Outlet		BASEhuff_010yr_01hr	0.00	743.10	746.00	0.00	80	1.59	0.35	0.00	0.00
Outlet		BASEhuff_010yr_02hr	0.00	743.10	746.00	0.00	80	2.43	0.60	0.00	0.00
Outlet		BASEhuff_010yr_03hr	0.00	743.10	746.00	0.00	80	3.40	0.70	0.00	0.00
Outlet		BASEhuff_010yr_06hr	0.00	743.10	746.00	0.00	80	6.30	0.83	0.00	0.00
Outlet		BASEhuff_010yr_12hr	0.00	743.10	746.00	0.00	80	12.15	0.91	0.00	0.00
Outlet		BASEhuff_010yr_24hr	0.00	743.10	746.00	0.00	80	21.85	0.98	0.00	0.00
Pond		BASEhuff_010yr_01hr	1.49	745.00	747.00	0.00	47902	0.91	8.07	1.49	0.35
Pond		BASEhuff_010yr_02hr	2.36	745.23	747.00	0.00	48702	0.75	6.92	2.36	0.60
Pond		BASEhuff_010yr_03hr	3.33	745.36	747.00	0.00	49159	0.99	6.33	3.33	0.70
Pond		BASEhuff_010yr_06hr	6.25	745.54	747.00	0.00	49781	1.33	4.68	6.25	0.83
Pond		BASEhuff_010yr_12hr	12.10	745.65	747.00	0.00	50186	5.50	3.69	12.10	0.91
Pond		BASEhuff_010yr_24hr	21.82	745.77	747.00	0.00	50587	16.75	3.10	21.82	0.98
Str 101		BASEhuff_010yr_01hr	1.59	744.54	747.50	0.00	922	1.49	0.35	1.59	0.35
Str 101		BASEhuff_010yr_02hr	2.43	744.59	747.50	0.00	1027	2.36	0.60	2.43	0.60
Str 101		BASEhuff_010yr_03hr	3.40	744.61	747.50	0.00	1060	3.33	0.70	3.40	0.70
Str 101		BASEhuff_010yr_06hr	6.30	744.63	747.50	0.00	1094	6.25	0.83	6.30	0.83
Str 101		BASEhuff_010yr_12hr	12.15	744.65	747.50	0.00	1113	12.10	0.91	12.15	0.91
Str 101		BASEhuff_010yr_24hr	21.85	744.66	747.50	0.00	1130	21.82	0.98	21.85	0.98

JLM
10-13-14
100-Year

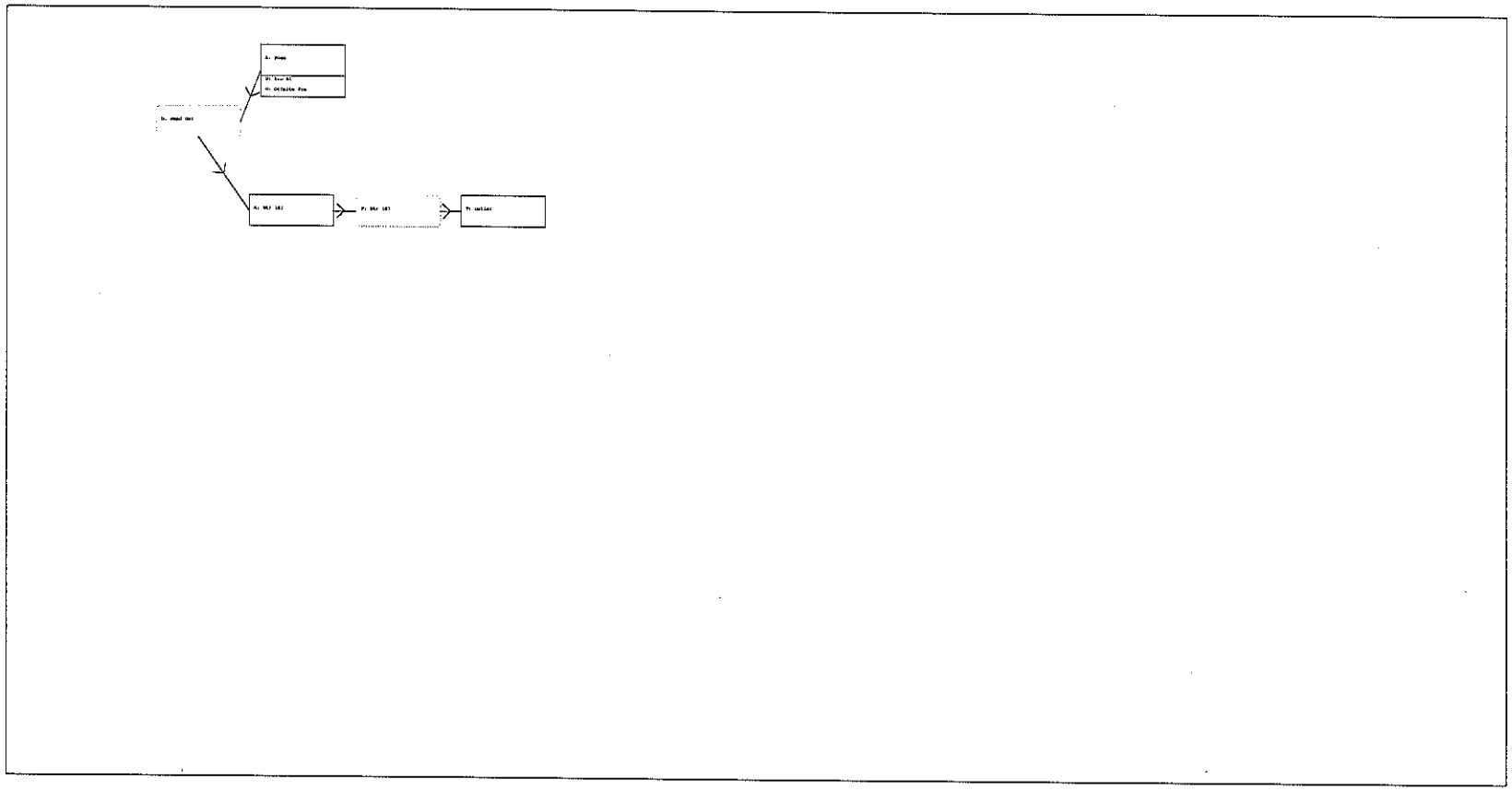
Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
Outlet		BASEhuff_100yr_01hr	0.00	743.10	746.00	0.00	80	1.52	0.92	0.00	0.00
Outlet		BASEhuff_100yr_02hr	0.00	743.10	746.00	0.00	80	2.41	1.25	0.00	0.00
Outlet		BASEhuff_100yr_03hr	0.00	743.10	746.00	0.00	80	3.35	1.58	0.00	0.00
Outlet		BASEhuff_100yr_06hr	0.00	743.10	746.00	0.00	80	6.24	2.00	0.00	0.00
Outlet		BASEhuff_100yr_12hr	0.00	743.10	746.00	0.00	80	11.12	2.13	0.00	0.00
Outlet		BASEhuff_100yr_24hr	0.00	743.10	746.00	0.00	80	19.39	2.61	0.00	0.00
Pond		BASEhuff_100yr_01hr	1.47	745.67	747.00	0.00	50253	0.50	19.04	1.47	0.92
Pond		BASEhuff_100yr_02hr	2.36	746.10	747.00	0.00	51783	0.67	18.24	2.36	1.25
Pond		BASEhuff_100yr_03hr	3.31	746.31	747.00	0.00	52623	0.83	15.35	3.31	1.58
Pond		BASEhuff_100yr_06hr	6.21	746.56	747.00	0.00	53601	1.33	11.32	6.21	2.00
Pond		BASEhuff_100yr_12hr	11.17	746.64	747.00	0.00	53926	5.34	7.26	11.17	2.13
Pond		BASEhuff_100yr_24hr	19.39	746.77	747.00	0.00	54402	16.74	5.63	19.39	2.62
Str 101		BASEhuff_100yr_01hr	1.52	744.65	747.50	0.00	1116	1.47	0.92	1.52	0.92
Str 101		BASEhuff_100yr_02hr	2.41	744.69	747.50	0.00	1183	2.36	1.25	2.41	1.25
Str 101		BASEhuff_100yr_03hr	3.35	744.74	747.50	0.00	1236	3.31	1.58	3.35	1.58
Str 101		BASEhuff_100yr_06hr	6.26	744.78	747.50	0.00	1310	6.21	2.00	6.24	2.00
Str 101		BASEhuff_100yr_12hr	11.20	744.80	747.50	0.00	1325	11.17	2.13	11.12	2.13
Str 101		BASEhuff_100yr_24hr	19.44	744.85	747.50	0.00	1375	19.39	2.62	19.39	2.61

JLM
10-13-14
ICPR Input

Nodes
A Stage/Area
V Stage/Volume
T Time/Stage
M Manhole

Basins
O Overland Flow
U SCS Unit CN
S SBUH CN
Y SCS Unit GA
Z SBUH GA

Links
P Pipe
W Weir
C Channel
D Drop Structure
B Bridge
R Rating Curve
H Breach
E Percolation
F Filter
X Exfil Trench



==========
==== Basins ====
==========

Name: Offsite Pro | Node: Pond | Status: Inactive
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):	6.00
Area(ac):	1.500	Time Shift(hrs):	0.00
Curve Number:	83.00	Max Allowable Q(cfs):	999999.000
DCIA(%):	0.00		

Name: Pro A1 | Node: Pond | 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):	18.40
Area(ac):	11.200	Time Shift(hrs):	0.00
Curve Number:	81.00	Max Allowable Q(cfs):	999999.000
DCIA(%):	0.00		

==========
==== Nodes ====
==========

Name: Outlet | Base Flow(cfs): 0.000 | Init Stage(ft): 743.100
Group: BASE | Warn Stage(ft): 746.000
Type: Time/Stage

Time(hrs)	Stage(ft)
0.00	743.100
60.00	743.100

Name: Pond | Base Flow(cfs): 0.000 | Init Stage(ft): 744.500
Group: BASE | Warn Stage(ft): 747.000
Type: Stage/Area

Overall
744.51.64
745.51.7
7461.76
7471.9
7482.03
7492.17

Stage(ft)	Area(ac)
744.500	1.0400
745.000	1.1000
746.000	1.1800
747.000	1.2700

Name: Str 101 | Base Flow(cfs): 0.000 | Init Stage(ft): 744.350
Group: BASE | Warn Stage(ft): 747.500
Type: Stage/Area

Stage(ft)	Area(ac)
743.000	0.0003
749.000	0.0003

==========
==== Pipes ====
==========

Name: Str 101 | From Node: Str 101 | Length(ft): 640.00

```
        Group: BASE                  To Node: Outlet                 Count: 2
                                                          Friction Equation: Automatic
              UPSTREAM       DOWNSTREAM                 Solution Algorithm: Most Restrictive
     Geometry: Circular      Circular                                 Flow: Both
     Span(in): 30.00         30.00                     Entrance Loss Coef: 0.50
     Rise(in): 30.00         30.00                         Exit Loss Coef: 1.00
   Invert(ft): 744.350       743.100                       Bend Loss Coef: 0.00
 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                      Stabilizer Option: None


Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


=====================================================================================
==== Drop Structures ===============================================================
=====================================================================================

         Name: Pond Out            From Node: Pond              Length(ft): 44.00
        Group: BASE                  To Node: Str 101               Count: 1

              UPSTREAM       DOWNSTREAM                 Friction Equation: Automatic
     Geometry: Circular      Circular                  Solution Algorithm: Most Restrictive
     Span(in): 12.00         12.00                                    Flow: Both
     Rise(in): 12.00         12.00                     Entrance Loss Coef: 0.500
   Invert(ft): 744.500       744.400                       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 Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall


*** Weir 1 of 3 for Drop Structure Pond Out ***
                                                                                TABLE
                 Count: 1                      Bottom Clip(in): 0.000
                  Type: Vertical: Mavis           Top Clip(in): 0.000
                  Flow: Both                    Weir Disc Coef: 3.200
              Geometry: Circular              Orifice Disc Coef: 0.600

              Span(in): 7.00                        Invert(ft): 744.500
              Rise(in): 7.00                  Control Elev(ft): 744.500

*** Weir 2 of 3 for Drop Structure Pond Out ***
                                                                                TABLE
                 Count: 1                      Bottom Clip(in): 0.000
                  Type: Vertical: Mavis           Top Clip(in): 0.000
                  Flow: Both                    Weir Disc Coef: 3.200
              Geometry: Circular              Orifice Disc Coef: 0.600

              Span(in): 7.00                        Invert(ft): 745.900
              Rise(in): 7.00                  Control Elev(ft): 745.900

*** Weir 3 of 3 for Drop Structure Pond 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: 0.600

              Span(in): 24.00                       Invert(ft): 746.700
              Rise(in): 24.00                 Control Elev(ft): 746.700


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

        Name: BMP
    Filename: S:\Projects\11191\drainage\icpr\pro\PH2\BMP.R32

     Override Defaults: Yes
```

```
    Storm Duration(hrs): 24.00
          Rainfall File: huff_indy3-50
    Rainfall Amount(in): 1.25

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          15.00

-------------------------------------------------------------------------------------------------------------------
         Name: huff_002yr_01hr
     Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_002yr_01hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 1.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 1.37

Time(hrs)       Print Inc(min)
--------------- ---------------
2.000           5.00

-------------------------------------------------------------------------------------------------------------------
         Name: huff_002yr_02hr
     Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_002yr_02hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 2.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 1.69

Time(hrs)       Print Inc(min)
--------------- ---------------
4.000           5.00

-------------------------------------------------------------------------------------------------------------------
         Name: huff_002yr_03hr
     Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_002yr_03hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 3.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 1.87

Time(hrs)       Print Inc(min)
--------------- ---------------
6.000           5.00

-------------------------------------------------------------------------------------------------------------------
         Name: huff_002yr_06hr
     Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_002yr_06hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 6.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 2.19

Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.00

-------------------------------------------------------------------------------------------------------------------
         Name: huff_002yr_12hr
     Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_002yr_12hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 12.00
          Rainfall File: Huff-indy2-50
    Rainfall Amount(in): 2.54

Time(hrs)       Print Inc(min)
--------------- ---------------
20.000          10.00

-------------------------------------------------------------------------------------------------------------------
         Name: huff_002yr_24hr
     Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_002yr_24hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: huff_indy3-50
    Rainfall Amount(in): 2.92

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

30.000 15.00

Name: huff_010yr_01hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_010yr_01hr.R32

Override Defaults: Yes
Storm Duration(hrs): 1.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 2.00

Time(hrs)	Print Inc(min)
2.000	5.00

Name: huff_010yr_02hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_010yr_02hr.R32

Override Defaults: Yes
Storm Duration(hrs): 2.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 2.46

Time(hrs)	Print Inc(min)
4.000	5.00

Name: huff_010yr_03hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_010yr_03hr.R32

Override Defaults: Yes
Storm Duration(hrs): 3.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 2.72

Time(hrs)	Print Inc(min)
6.000	5.00

Name: huff_010yr_06hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_010yr_06hr.R32

Override Defaults: Yes
Storm Duration(hrs): 6.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 3.19

Time(hrs)	Print Inc(min)
10.000	10.00

Name: huff_010yr_12hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_010yr_12hr.R32

Override Defaults: Yes
Storm Duration(hrs): 12.00
Rainfall File: Huff-indy2-50
Rainfall Amount(in): 3.70

Time(hrs)	Print Inc(min)
20.000	10.00

Name: huff_010yr_24hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_010yr_24hr.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: huff_indy3-50
Rainfall Amount(in): 4.25

Time(hrs)	Print Inc(min)
30.000	15.00

Name: huff_100yr_01hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_100yr_01hr.R32

```
      Override Defaults: Yes
    Storm Duration(hrs): 1.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 3.21

Time(hrs)       Print Inc(min)
--------------- ---------------
2.000           5.00

-------------------------------------------------------------------------------------------------------------
         Name: huff_100yr_02hr
     Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_100yr_02hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 2.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 3.97

Time(hrs)       Print Inc(min)
--------------- ---------------
4.000           5.00

-------------------------------------------------------------------------------------------------------------
         Name: huff_100yr_03hr
     Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_100yr_03hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 3.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 4.38

Time(hrs)       Print Inc(min)
--------------- ---------------
6.000           5.00

-------------------------------------------------------------------------------------------------------------
         Name: huff_100yr_06hr
     Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_100yr_06hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 6.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 5.13

Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.00

-------------------------------------------------------------------------------------------------------------
         Name: huff_100yr_12hr
     Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_100yr_12hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 12.00
          Rainfall File: Huff-indy2-50
    Rainfall Amount(in): 5.95

Time(hrs)       Print Inc(min)
--------------- ---------------
20.000          10.00

-------------------------------------------------------------------------------------------------------------
         Name: huff_100yr_24hr
     Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_100yr_24hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: huff_indy3-50
    Rainfall Amount(in): 6.84

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          15.00

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

         Name: BMP                 Hydrology Sim: BMP
     Filename: S:\Projects\11191\drainage\icpr\pro\PH2\BMP.I32

      Execute: No          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): 48.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
48.000          15.000

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

```
         Name: huff_002yr_01hr     Hydrology Sim: huff_002yr_01hr
     Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_002yr_01hr.I32

      Execute: No          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): 5.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
5.000           10.000

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

```
         Name: huff_002yr_02hr     Hydrology Sim: huff_002yr_02hr
     Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_002yr_02hr.I32

      Execute: No          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): 6.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
6.000           10.000

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

```
         Name: huff_002yr_03hr     Hydrology Sim: huff_002yr_03hr
     Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_002yr_03hr.I32

      Execute: No          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): 10.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


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

10.000 10.000

Group	Run
BASE	Yes

Name: huff_002yr_06hr Hydrology Sim: huff_002yr_06hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_002yr_06hr.I32

Execute: No 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): 15.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
15.000	10.000

Group	Run
BASE	Yes

Name: huff_002yr_12hr Hydrology Sim: huff_002yr_12hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_002yr_12hr.I32

Execute: No 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): 30.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
30.000	10.000

Group	Run
BASE	Yes

Name: huff_002yr_24hr Hydrology Sim: huff_002yr_24hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_002yr_24hr.I32

Execute: No 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): 60.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
60.000	15.000

Group	Run
BASE	Yes

Name: huff_010yr_01hr Hydrology Sim: huff_010yr_01hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_010yr_01hr.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): 5.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
1.000	5.000
5.000	10.000

Group	Run
BASE	Yes

Name: huff_010yr_02hr Hydrology Sim: huff_010yr_02hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_010yr_02hr.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): 6.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
1.000	5.000
6.000	10.000

Group	Run
BASE	Yes

Name: huff_010yr_03hr Hydrology Sim: huff_010yr_03hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_010yr_03hr.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): 10.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
10.000	10.000

Group	Run
BASE	Yes

Name: huff_010yr_06hr Hydrology Sim: huff_010yr_06hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_010yr_06hr.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): 15.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
15.000	10.000

Group	Run
BASE	Yes

Name: huff_010yr_12hr Hydrology Sim: huff_010yr_12hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_010yr_12hr.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): 30.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
30.000	10.000

Group	Run
BASE	Yes

Name: huff_010yr_24hr Hydrology Sim: huff_010yr_24hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_010yr_24hr.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): 60.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
60.000	15.000

Group	Run
BASE	Yes

Name: huff_100yr_01hr Hydrology Sim: huff_100yr_01hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_100yr_01hr.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): 5.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
1.000	5.000
5.000	10.000

Group	Run
BASE	Yes

Name: huff_100yr_02hr Hydrology Sim: huff_100yr_02hr

Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_100yr_02hr.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): 6.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
1.000	5.000
6.000	10.000

Group	Run
BASE	Yes

Name: huff_100yr_03hr Hydrology Sim: huff_100yr_03hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_100yr_03hr.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): 10.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
10.000	10.000

Group	Run
BASE	Yes

Name: huff_100yr_06hr Hydrology Sim: huff_100yr_06hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_100yr_06hr.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): 15.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
15.000	10.000

Group	Run
BASE	Yes

Name: huff_100yr_12hr Hydrology Sim: huff_100yr_12hr
Filename: S:\Projects\11191\drainage\icpr\pro\PH2\huff_100yr_12hr.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): 30.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
30.000	10.000

Group	Run
BASE	Yes

Name: huff_100yr_24hr Hydrology Sim: huff_100yr_24hr
Filename: S:\Projects\111191\drainage\icpr\pro\PH2\huff_100yr_24hr.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): 60.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
60.000	15.000

Group	Run
BASE	Yes

Beginning a Second Decade Making …"Your Project, Our Priority"

Hydrology and Hydraulic Study

of

City of Franklin Spec Building

In

Franklin
Johnson County, Indiana

Prepared for:

Runnebohm Construction
144 East Rampart Street
Shelbyville, IN 46176

September 2012

Revised: October 24, 2012

Banning Engineering, P.C. • 853 Columbia Road, Suite 101 • Plainfield, IN 46168
Phone: (317) 707-3700 • Fax: (317) 707-3800 • E-mail: banning@BanningEngineering.com

Job #11191R

Drainage Narrative for:
City of Franklin Spec Building

Existing Characteristics:

The purpose of the project is to develop approximately 11 acres of ground into an industrial spec building development. The concept includes construction of a 51,340 square feet shell building, entrance drive and small dock area for temporary parking. Due to the uncertainty of the end user, minimal improvements will be constructed at this time however, this report does make provisions for full build-out of the parcel using the City of Franklin Zoning Ordinance maximum allowable impervious lot coverage of 85%. A detention pond will be constructed to accommodate the 85% impervious coverage and is oversized to obtain the necessary fill required to build the building and future addition pads. The proposed site is located on the east side of Graham Street just north of the intersection with Bryant Drive in Franklin, Section 11, Township 11 North, Range 4 East, Franklin Township, Johnson County.

Design Criteria:

Adjoining land conditions:
North: Cultivated / Future Industrial
South: Cultivated / Future Industrial
East: Developed Industrial
West: Developed Residential

Major Existing Soil Name & Types:

CrA – Crosby (C)
Br – Brookston (B/D)

Site Drainage Analysis: (See Existing Basin Map)

After review of soil types and on site characteristics, we have determined that there are 2 drainage basins draining the parcel. A small 3.7 acre basin (Basin A1) drains to the east across a partially developed property eventually to the Commerce Parkway roadside ditch. A larger 7.5 acre basin (Basin B1) drains southeasterly eventually to the Commerce Parkway roadside ditch. There is approximately 1.5 acres of offsite drainage associated with Basin B1. Both Basins A1 and B1 are within the same watershed area and will be analyzed collectively to the Commerce Parkway roadside ditch. The entire site is currently in row crops. For the purposes of the existing conditions analysis this will be viewed as pasture using the NRCS runoff curve number methodology.

Proposed Drainage Analysis: (See Proposed Basin Map)

In the proposed developed state most site run-off will be collected via storm sewer infrastructure and routed to a proposed detention basin located in the southeast corner of the parcel. Some areas of the site will be left in it's natural state until an end user is acquired at which time parking and additional dock needs will be known and designed to route to the detention basin. The basin will also function as the main BMP for the development. The basin outlet will is designed to meet the City of Franklin

Subdivision Control Ordinance requirements and the outlet will route via pipe along the south property line to the Commerce Parkway roadside ditch. Provisions have been made in this analysis for future parking lots, docks and building expansions. Allowable discharge calculations and proposed discharges are shown in the tabulated data shown below and in attached appendices.

Proposed Model Summary:

ICPR3 was used to design the detention pond for the required 1, 2, 3, 6, 12 and 24 hour storm durations with the outlet rate for the developed 10 year and 100 year meeting the 2 year and 10 year pre-developed respectively. The pond exceeds the minimum 0.5 acre normal pool area and minimum 25% 10 feet of depth as required by the Ordinance and was oversized to utilize borrow to balance the site.

Allowable Discharges:

Design Point	Acres	2-Year Existing
Outlet	11.2	1.12 cfs

Discharges 100-Year:

Discharge Point	10-Year Allowable	10-Yr Proposed	Storage Requirements (acre*ft)
Outlet	1.12 cfs	1.05 cfs	See ICPR Input

Design Point	Acres	10-Year Existing
Outlet	11.2	3.34 cfs

Discharges 100-Year:

Discharge Point	100-Year Allowable	100-Yr Proposed	Storage Requirements (acre*ft)	
			Required	Designed
Outlet	3.34 cfs	2.18 cfs	4.0	4.0

Post Construction BMPs:
A wet pond on the southeast portion of the site will serve as the post construction BMP for development; refer to the Operation and Maintenance Manual separate from this report.

References:

Design data and methods are based on the following reference materials:

1. City of Franklin Subdivision Control Ordinance, Article 6.18 & 6.19
2. City of Franklin Zoning Ordinance, Article 7.9 (G)
3. Johnson County Soils Map
4. USGS Mapping
5. TR-55, NRCS
6. HERPICC Stormwater Drainage Manual
7. CulvertMaster V3.0, Haestad Methods, Inc.
8. FlowMaster V7.0, Haestad Methods, Inc.
9. ICPR3, Streamline Technologies

LIST OF APPENDICES

1. LOCATION MAP
2. SOILS MAP
3. FLOODPLAIN MAPPING
4. EXISTING BASIN MAP
5. EXISTING CALCULATIONS
6. EXISTING ICPR INPUT
7. PROPOSED BASIN MAP
8. PROPOSED CALCULATIONS
9. PROPOSED ICPR INPUT
10. Tc & CN CACLUATIONS
11. STORM SEWER DESIGN
12. BMP CALCULATIONS
13. EMERGENCY OVERFLOW CALCULATIONS

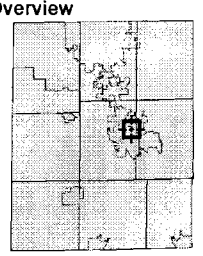
LOCATION MAP

Johnson County, IN

beacon™

Date Created: 9/7/2012

Overview



Legend

- Cities
- Townships
- Parcels

Roads

- ACCESS RAMP
- INTERSTATE
- LOCAL
- MAJOR ARTERIAL
- MAJOR COLLECTOR
- MINOR ARTERIAL
- MINOR COLLECTOR
- PRIVATE ROAD

Last Data Upload: 9/7/2012 12:09:57 AM

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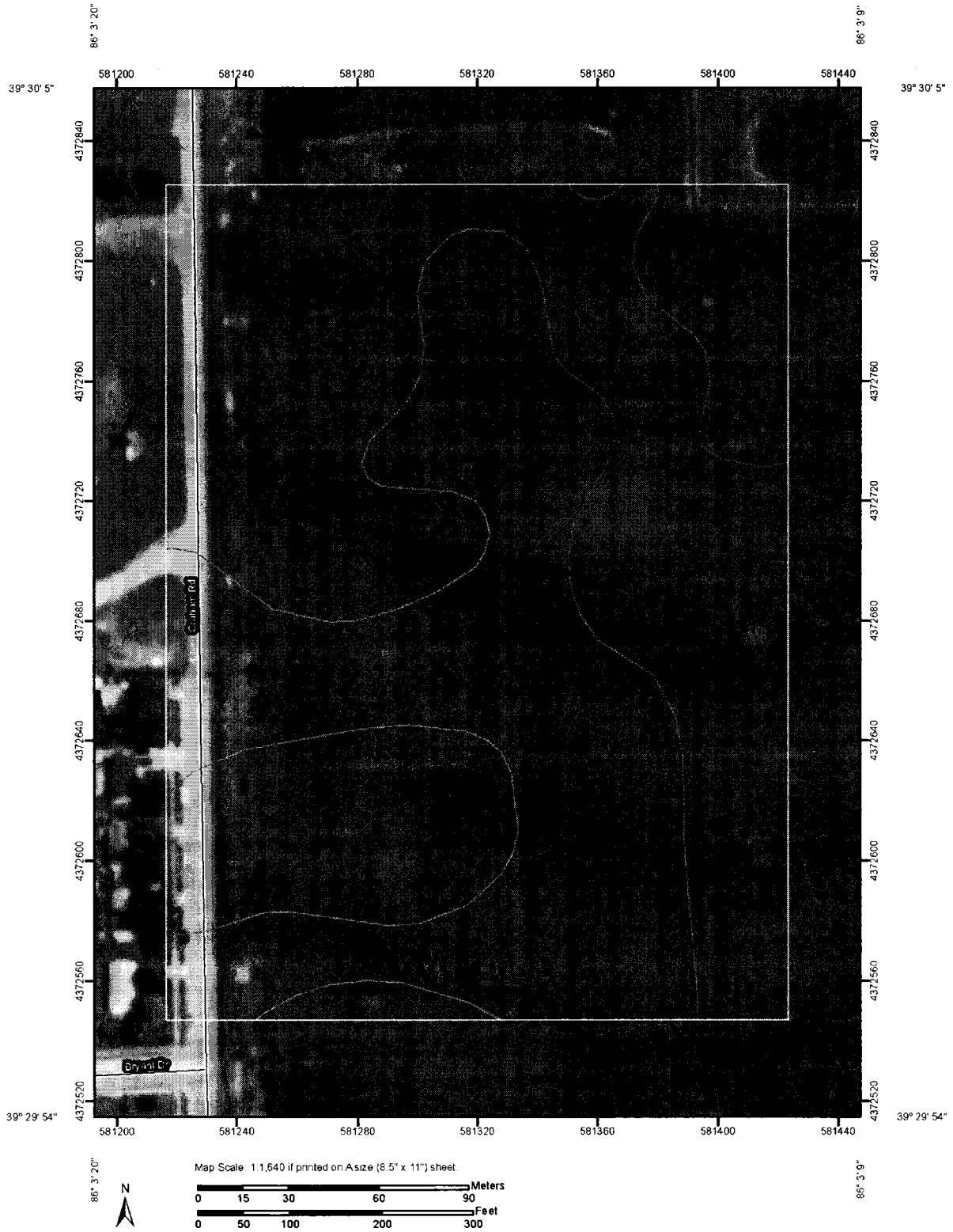
SOILS MAP

Soil Map—Johnson County, Indiana



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

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

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:1,640 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:15,840.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 16N NAD83

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

Soil Survey Area: Johnson County, Indiana
Survey Area Data: Version 16, Dec 12, 2011

Date(s) aerial images were photographed: 8/18/2003

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

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Job #11191R
Hydrology and Hydraulic Study of
City of Franklin Spec Building
Sept. 2012
Revised: October 5, 2012

Map Unit Legend

Johnson County, Indiana (IN081)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Br	Brookston silty clay loam	6.4	44.6%
CrA	Crosby silt loam, 0 to 2 percent slopes	7.9	55.4%
Totals for Area of Interest		**14.2**	**100.0%**

Job #11191R
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FLOODPLAIN MAPPING

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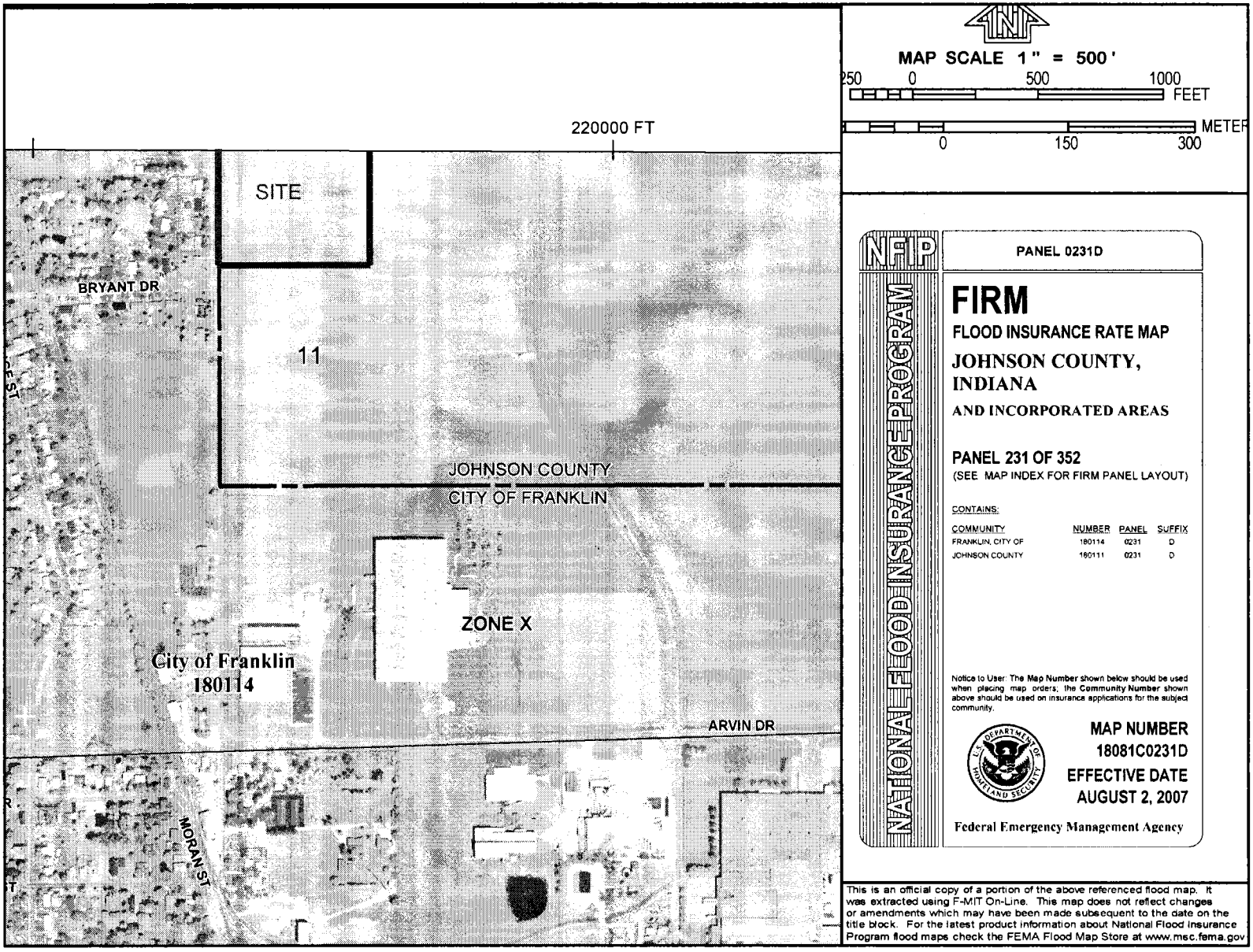
MAP SCALE 1" = 500'
0
500
1000
FEET
250
0
150
300
METER
NFIP
PANEL 0143D
FIRM
FLOOD INSURANCE RATE MAP
JOHNSON COUNTY, INDIANA
AND INCORPORATED AREAS
PANEL 143 OF 352
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
FRANKLIN, CITY OF 180144 0143 D
JOHNSON COUNTY 180111 0143 D
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.
MAP NUMBER
18081C0143D
EFFECTIVE DATE
AUGUST 2, 2007
Federal Emergency Management Agency
NATIONAL FLOOD INSURANCE PROGRAM
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov
ZONE X
MUSICLAND DR
CITY OF FRANKLIN
JOHNSON COUNTY
GRAHAM RD
SITE
582000mE



BANNING ENGINEERING

Job #11191R
Hydrology and Hydraulic Study of
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EXISTING BASIN MAP

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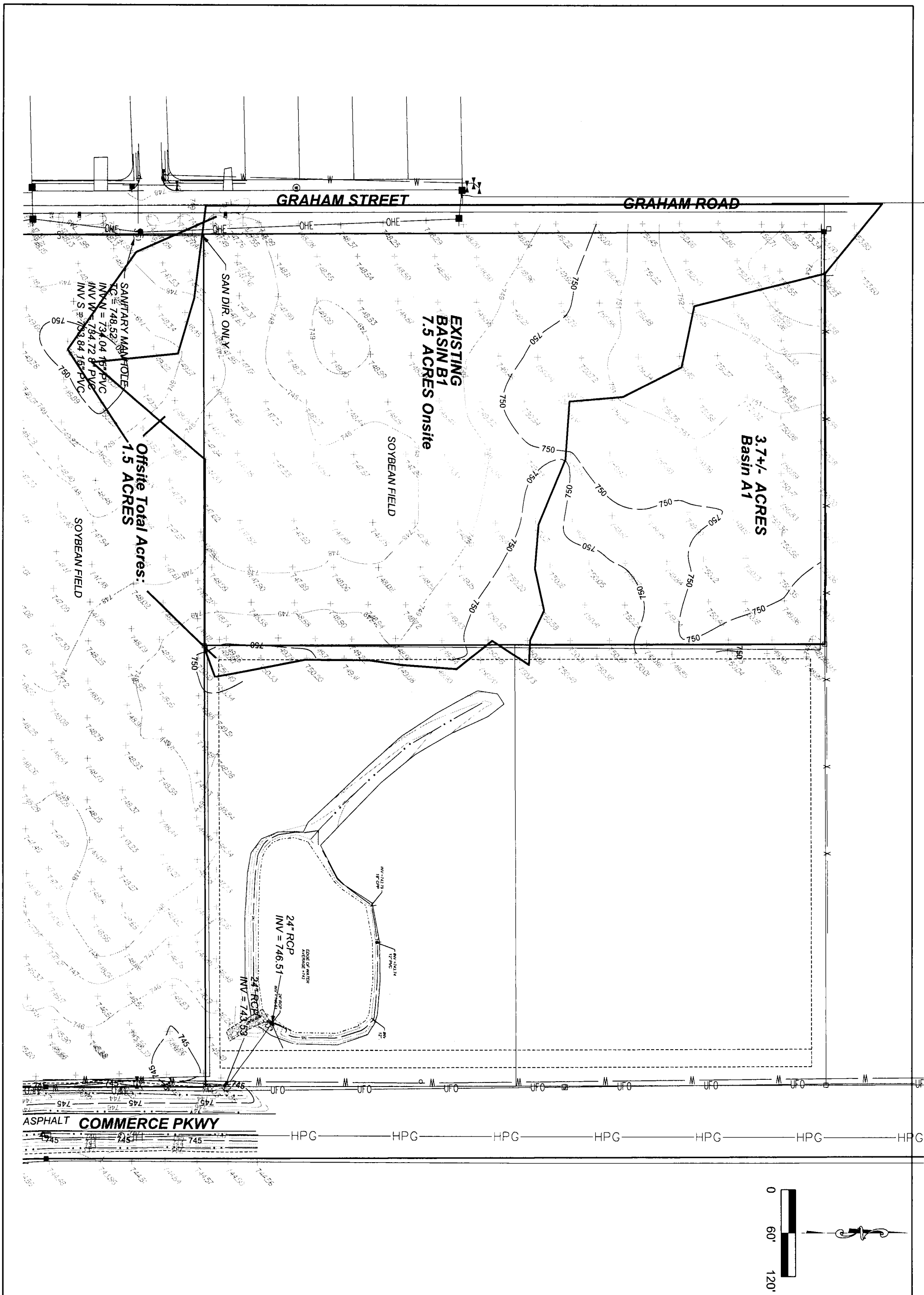

Sheet No: 1 of 1	Project No: 11191R	BANNING ENGINEERING 853 COLUMBIA ROAD, SUITE #101 PLAINFIELD, IN 46168 BUS: (317) 707-3700, FAX: (317) 707-3800 E-MAIL: Banning@BanningEngineering.com WEB: www.BanningEngineering.com		EXISTING DRAINAGE BASIN MAP CITY OF FRANKLIN SPEC BUILDING CITY OF FRANKLIN JOHNSON COUNTY, INDIANA	Designed: RRL Drawn: RRL Checked: Scale: 1"=120' Date: 9-14-12	Sym. / Revisions / Date

Job #11191R
Hydrology and Hydraulic Study of
City of Franklin Spec Building
Sept. 2012
Revised: October 5, 2012

EXISTING CALCULATIONS

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JLM
9-11-12
2-Year Existing

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
Outlet		BASEhuff_002yr_01hr	0.00	730.00	746.00	0.00	0	1.08	0.78	0.00	0.00
Outlet		BASEhuff_002yr_02hr	0.00	730.00	746.00	0.00	0	2.00	1.12	0.00	0.00
Outlet		BASEhuff_002yr_03hr	0.00	730.00	746.00	0.00	0	2.50	1.05	0.00	0.00
Outlet		BASEhuff_002yr_06hr	0.00	730.00	746.00	0.00	0	4.83	0.85	0.00	0.00
Outlet		BASEhuff_002yr_12hr	0.00	730.00	746.00	0.00	0	6.00	0.80	0.00	0.00
Outlet		BASEhuff_002yr_24hr	0.00	730.00	746.00	0.00	0	16.75	1.02	0.00	0.00

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
Outlet		BASEhuff_010yr_01hr	0.00	730.00	746.00	0.00	0	1.00	3.34	0.00	0.00
Outlet		BASEhuff_010yr_02hr	0.00	730.00	746.00	0.00	0	1.75	3.11	0.00	0.00
Outlet		BASEhuff_010yr_03hr	0.00	730.00	746.00	0.00	0	2.50	2.68	0.00	0.00
Outlet		BASEhuff_010yr_06hr	0.00	730.00	746.00	0.00	0	4.83	1.91	0.00	0.00
Outlet		BASEhuff_010yr_12hr	0.00	730.00	746.00	0.00	0	5.50	2.05	0.00	0.00
Outlet		BASEhuff_010yr_24hr	0.00	730.00	746.00	0.00	0	16.75	2.14	0.00	0.00

Job #11191R
Hydrology and Hydraulic Study of
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Sept. 2012
Revised: October 5, 2012

EXISTING ICPR INPUT

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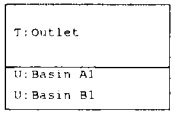
JLM
9-11-12
Existing Node Schematic

Nodes
A Stage/Area
V Stage/Volume
T Time/Stage
M Manhole

Basins
O Overland Flow
U SCS Unit CN
S SBUH CN
Y SCS Unit GA
Z SBUH GA

Links
P Pipe
W Weir
C Channel
D Drop Structure
B Bridge
R Rating Curve
H Breach
E Percolation
F Filter
X Exfil Trench



==== Basins ====

Name: Basin A1 Node: Outlet 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): 15.40
Area(ac): 3.700 Time Shift(hrs): 0.00
Curve Number: 68.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

Name: Basin B1 Node: Outlet 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): 25.20
Area(ac): 7.500 Time Shift(hrs): 0.00
Curve Number: 68.00 Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00

==== Nodes ====

Name: Outlet Base Flow(cfs): 0.000 Init Stage(ft): 730.000
Group: BASE Warn Stage(ft): 746.000
Type: Time/Stage

Time(hrs)	Stage(ft)
0.00	730.000
60.00	730.000

==== Hydrology Simulations ====

Name: huff_002yr_01hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_01hr.R32

Override Defaults: Yes
Storm Duration(hrs): 1.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 1.37

Time(hrs)	Print Inc(min)
2.000	5.00

Name: huff_002yr_02hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_02hr.R32

Override Defaults: Yes
Storm Duration(hrs): 2.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 1.69

Time(hrs)	Print Inc(min)
4.000	5.00

Name: huff_002yr_03hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_03hr.R32

Override Defaults: Yes
Storm Duration(hrs): 3.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 1.87

Time(hrs) Print Inc(min)

6.000	5.00

Name: huff_002yr_06hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_06hr.R32

Override Defaults: Yes
Storm Duration(hrs): 6.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 2.19

Time(hrs)	Print Inc(min)
10.000	10.00

Name: huff_002yr_12hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_12hr.R32

Override Defaults: Yes
Storm Duration(hrs): 12.00
Rainfall File: Huff-indy2-50
Rainfall Amount(in): 2.54

Time(hrs)	Print Inc(min)
20.000	10.00

Name: huff_002yr_24hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_24hr.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: huff_indy3-50
Rainfall Amount(in): 2.92

Time(hrs)	Print Inc(min)
30.000	15.00

Name: huff_010yr_01hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_01hr.R32

Override Defaults: Yes
Storm Duration(hrs): 1.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 2.00

Time(hrs)	Print Inc(min)
2.000	5.00

Name: huff_010yr_02hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_02hr.R32

Override Defaults: Yes
Storm Duration(hrs): 2.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 2.46

Time(hrs)	Print Inc(min)
4.000	5.00

Name: huff_010yr_03hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_03hr.R32

Override Defaults: Yes
Storm Duration(hrs): 3.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 2.72

Time(hrs)	Print Inc(min)
6.000	5.00

Name: huff_010yr_06hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_06hr.R32

```
      Override Defaults: Yes
    Storm Duration(hrs): 6.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 3.19

Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.00

-------------------------------------------------------------------------------------------------------
         Name: huff_010yr_12hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_12hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 12.00
          Rainfall File: Huff-indy2-50
    Rainfall Amount(in): 3.70

Time(hrs)       Print Inc(min)
--------------- ---------------
20.000          10.00

-------------------------------------------------------------------------------------------------------
         Name: huff_010yr_24hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_24hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: huff_indy3-50
    Rainfall Amount(in): 4.25

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          15.00

-------------------------------------------------------------------------------------------------------
         Name: huff_100yr_01hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_01hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 1.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 3.21

Time(hrs)       Print Inc(min)
--------------- ---------------
2.000           5.00

-------------------------------------------------------------------------------------------------------
         Name: huff_100yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_02hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 2.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 3.97

Time(hrs)       Print Inc(min)
--------------- ---------------
4.000           5.00

-------------------------------------------------------------------------------------------------------
         Name: huff_100yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_03hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 3.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 4.38

Time(hrs)       Print Inc(min)
--------------- ---------------
6.000           5.00

-------------------------------------------------------------------------------------------------------
         Name: huff_100yr_06hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_06hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 6.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 5.13
```

Time(hrs)	Print Inc(min)
10.000	10.00

Name: huff_100yr_12hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_12hr.R32

Override Defaults: Yes
Storm Duration(hrs): 12.00
Rainfall File: Huff-indy2-50
Rainfall Amount(in): 5.95

Time(hrs)	Print Inc(min)
20.000	10.00

Name: huff_100yr_24hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_24hr.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: huff_indy3-50
Rainfall Amount(in): 6.84

Time(hrs)	Print Inc(min)
30.000	15.00

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

Name: huff_002yr_01hr Hydrology Sim: huff_002yr_01hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_01hr.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): 5.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
1.000	5.000
5.000	10.000

Group	Run
BASE	Yes

Name: huff_002yr_02hr Hydrology Sim: huff_002yr_02hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_02hr.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): 6.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
1.000	5.000
6.000	10.000

Group	Run
BASE	Yes

Name: huff_002yr_03hr Hydrology Sim: huff_002yr_03hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_03hr.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): 10.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
10.000	10.000

Group	Run
BASE	Yes

Name: huff_002yr_06hr Hydrology Sim: huff_002yr_06hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_06hr.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): 15.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
15.000	10.000

Group	Run
BASE	Yes

Name: huff_002yr_12hr Hydrology Sim: huff_002yr_12hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_12hr.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): 30.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
30.000	10.000

Group	Run
BASE	Yes

Name: huff_002yr_24hr Hydrology Sim: huff_002yr_24hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_24hr.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): 60.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
60.000	15.000

Group	Run
BASE	Yes

Name: huff_010yr_01hr Hydrology Sim: huff_010yr_01hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_01hr.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): 5.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
1.000	5.000
5.000	10.000

Group	Run
BASE	Yes

Name: huff_010yr_02hr Hydrology Sim: huff_010yr_02hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_02hr.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): 6.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
1.000	5.000
6.000	10.000

Group	Run
BASE	Yes

Name: huff_010yr_03hr Hydrology Sim: huff_010yr_03hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_03hr.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): 10.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
10.000	10.000

Group	Run
BASE	Yes

```
--------------------------------------------------------------------------------------------------
        Name: huff_010yr_06hr     Hydrology Sim: huff_010yr_06hr
    Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_06hr.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): 15.00
    Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
       Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
15.000          10.000

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


--------------------------------------------------------------------------------------------------
        Name: huff_010yr_12hr     Hydrology Sim: huff_010yr_12hr
    Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_12hr.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): 30.00
    Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
       Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          10.000

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


--------------------------------------------------------------------------------------------------
        Name: huff_010yr_24hr     Hydrology Sim: huff_010yr_24hr
    Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_24hr.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): 60.00
    Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
       Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
60.000          15.000

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


--------------------------------------------------------------------------------------------------
        Name: huff_100yr_01hr     Hydrology Sim: huff_100yr_01hr
    Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_01hr.I32

     Execute: No          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): 5.00
    Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
```

Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
1.000	5.000
5.000	10.000

Group	Run
BASE	Yes

Name: huff_100yr_02hr Hydrology Sim: huff_100yr_02hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_02hr.I32

Execute: No 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): 6.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
1.000	5.000
6.000	10.000

Group	Run
BASE	Yes

Name: huff_100yr_03hr Hydrology Sim: huff_100yr_03hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_03hr.I32

Execute: No 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): 10.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
10.000	10.000

Group	Run
BASE	Yes

Name: huff_100yr_06hr Hydrology Sim: huff_100yr_06hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_06hr.I32

Execute: No 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): 15.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
15.000	10.000

Group	Run

BASE Yes

Name: huff_100yr_12hr Hydrology Sim: huff_100yr_12hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_12hr.I32

Execute: No 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): 30.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
30.000	10.000

Group	Run
BASE	Yes

Name: huff_100yr_24hr Hydrology Sim: huff_100yr_24hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_24hr.I32

Execute: No 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): 60.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
60.000	15.000

Group	Run
BASE	Yes

PROPOSED BASIN MAP

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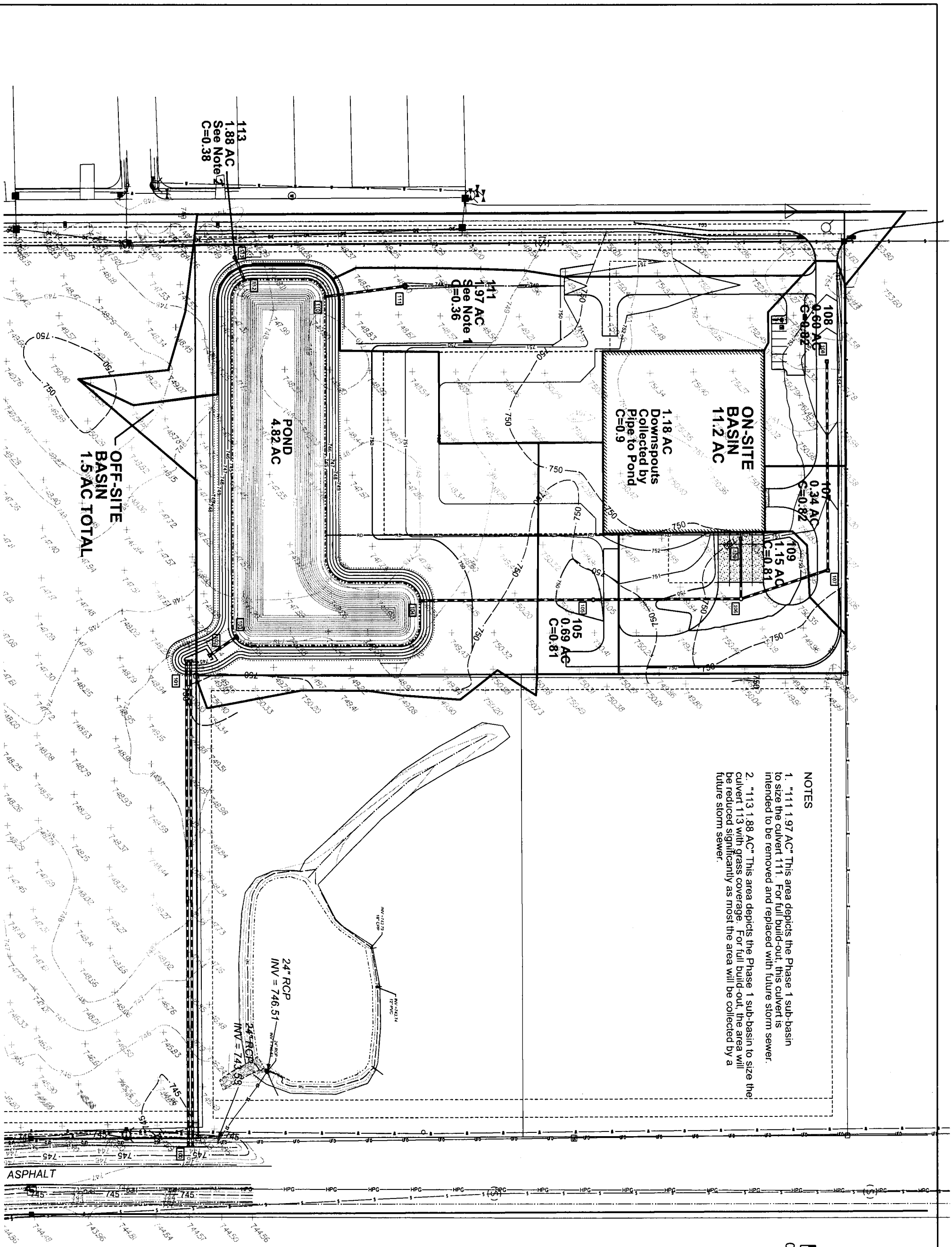

NOTES

1. "111 1.97 AC" This area depicts the Phase 1 sub-basin to size the culvert 111. For full build-out, this culvert is intended to be removed and replaced with future storm sewer.
2. "113 1.88 AC" This area depicts the Phase 1 sub-basin to size the culvert 113 with grass coverage. For full build-out, the area will be reduced significantly as most the area will be collected by a future storm sewer.

Sheet No: 1 of 1	Project No: 11191R	BANNING ENGINEERING 853 COLUMBIA ROAD, SUITE #101 PLAINFIELD, IN 46168 BUS: (317) 707-3700, FAX: (317) 707-3800 E-MAIL: Banning@BanningEngineering.com WEB: www.BanningEngineering.com	PHASE 1 DRAINAGE BASIN MAP CITY OF FRANKLIN SPEC BUILDING CITY OF FRANKLIN JOHNSON COUNTY, INDIANA

Designed: RRL	Sym.	Revisions	Date
Drawn: RRL			
Checked:			
Scale: 1"=120'			
Date: 10-2-12			

10\05\2012, 03:12 PM
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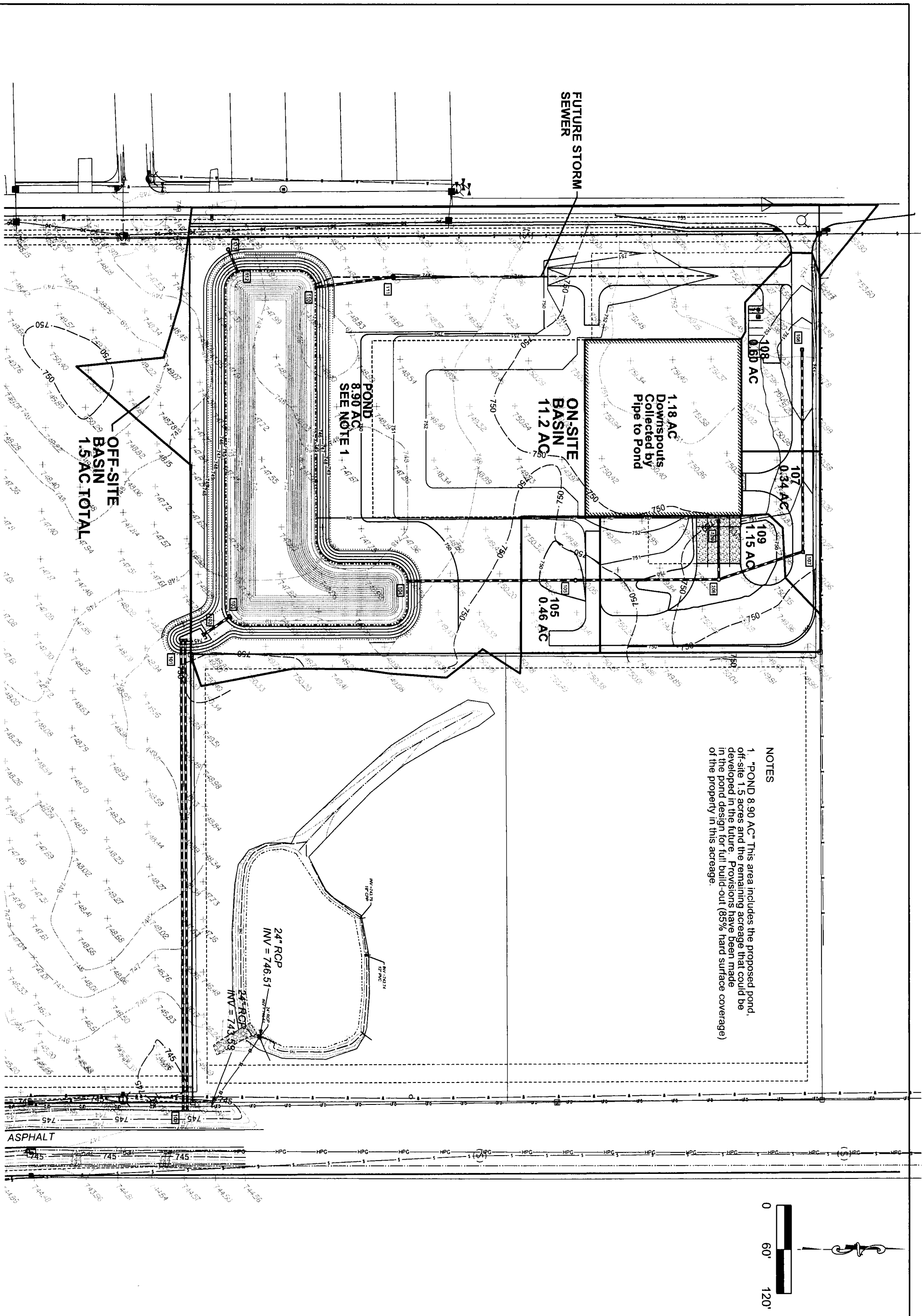


NOTES

1. "POND 8.90 AC" This area includes the proposed pond, off-site 1.5 acres and the remaining acreage that could be developed in the future. Provisions have been made in the pond design for full build-out (85% hard surface coverage) of the property in this acreage.

Sheet No: 1 of 1

Project No: 11191R

BANNING ENGINEERING
853 COLUMBIA ROAD, SUITE #101
PLAINFIELD, IN 46168
BUS: (317) 707-3700, FAX: (317) 707-3800
E-MAIL: Banning@BanningEngineering.com
WEB: www.BanningEngineering.com

FULL BUILD-OUT DRAINAGE BASIN MAP
CITY OF FRANKLIN SPEC BUILDING
CITY OF FRANKLIN
JOHNSON COUNTY, INDIANA

Designed: RRL	Sym	Revisions	Date
Drawn: RRL			
Checked:			
Scale: 1"=120'			
Date: 10-2-12			

Job #11191R
Hydrology and Hydraulic Study of
City of Franklin Spec Building
Sept. 2012
Revised: October 5, 2012

PROPOSED CALCULATIONS

BANNING ENGINEERING

JLM
10-5-12
100-Year Proposed (Onsite Only)

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
Outlet	BASEhuff_100yr_01hr	0.00	743.10	746.00	0.00	45	1.46	1.00	0.00	0.00
Outlet	BASEhuff_100yr_02hr	0.00	743.10	746.00	0.00	45	2.38	1.31	0.00	0.00
Outlet	BASEhuff_100yr_03hr	0.00	743.10	746.00	0.00	45	3.36	1.59	0.00	0.00
Outlet	BASEhuff_100yr_06hr	0.00	743.10	746.00	0.00	45	6.23	1.92	0.00	0.00
Outlet	BASEhuff_100yr_12hr	0.00	743.10	746.00	0.00	45	12.03	2.08	0.00	0.00
Outlet	BASEhuff_100yr_24hr	0.00	743.10	746.00	0.00	45	19.63	2.18	0.00	0.00
Pond	BASEhuff_100yr_01hr	1.49	745.80	747.00	0.00	75614	0.42	38.32	1.49	1.00
Pond	BASEhuff_100yr_02hr	2.37	746.14	747.00	0.00	77530	0.58	32.09	2.37	1.31
Pond	BASEhuff_100yr_03hr	3.32	746.31	747.00	0.00	78564	0.67	26.73	3.32	1.59
Pond	BASEhuff_100yr_06hr	6.23	746.52	747.00	0.00	79815	1.17	17.58	6.23	1.92
Pond	BASEhuff_100yr_12hr	12.05	746.61	747.00	0.00	80380	3.66	10.03	12.05	2.08
Pond	BASEhuff_100yr_24hr	19.72	746.69	747.00	0.00	80858	14.25	6.41	19.72	2.18
Str 101	BASEhuff_100yr_01hr	1.55	744.76	747.50	0.00	722	1.49	1.00	1.46	1.00
Str 101	BASEhuff_100yr_02hr	2.40	744.82	747.50	0.00	757	2.37	1.31	2.38	1.31
Str 101	BASEhuff_100yr_03hr	3.36	744.87	747.50	0.00	783	3.32	1.59	3.36	1.59
Str 101	BASEhuff_100yr_06hr	6.28	744.92	747.50	0.00	808	6.23	1.92	6.23	1.92
Str 101	BASEhuff_100yr_12hr	12.03	744.95	747.50	0.00	820	12.05	2.08	12.03	2.08
Str 101	BASEhuff_100yr_24hr	19.72	744.96	747.50	0.00	826	19.72	2.18	19.63	2.18

JLM
10-5-12
10-Year Proposed (Onsite Only)

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
Outlet		BASEhuff_010yr_01hr	0.00	743.10	746.00	0.00	45	1.54	0.58	0.00	0.00
Outlet		BASEhuff_010yr_02hr	0.00	743.10	746.00	0.00	45	2.39	0.75	0.00	0.00
Outlet		BASEhuff_010yr_03hr	0.00	743.10	746.00	0.00	45	3.37	0.83	0.00	0.00
Outlet		BASEhuff_010yr_06hr	0.00	743.10	746.00	0.00	45	6.32	0.93	0.00	0.00
Outlet		BASEhuff_010yr_12hr	0.00	743.10	746.00	0.00	45	12.17	0.99	0.00	0.00
Outlet		BASEhuff_010yr_24hr	0.00	743.10	746.00	0.00	45	21.85	1.05	0.00	0.00
Pond		BASEhuff_010yr_01hr	1.49	745.20	747.00	0.00	73280	0.42	19.48	1.49	0.58
Pond		BASEhuff_010yr_02hr	2.37	745.41	747.00	0.00	73824	0.58	16.76	2.37	0.75
Pond		BASEhuff_010yr_03hr	3.33	745.53	747.00	0.00	74192	0.75	14.11	3.33	0.83
Pond		BASEhuff_010yr_06hr	6.27	745.68	747.00	0.00	74976	1.17	9.61	6.27	0.93
Pond		BASEhuff_010yr_12hr	12.13	745.78	747.00	0.00	75526	3.67	5.66	12.13	0.99
Pond		BASEhuff_010yr_24hr	21.90	745.87	747.00	0.00	75974	14.25	3.83	21.90	1.05
Str 101		BASEhuff_010yr_01hr	1.54	744.66	747.50	0.00	653	1.49	0.58	1.54	0.58
Str 101		BASEhuff_010yr_02hr	2.42	744.70	747.50	0.00	684	2.37	0.75	2.39	0.75
Str 101		BASEhuff_010yr_03hr	3.37	744.72	747.50	0.00	697	3.33	0.83	3.37	0.83
Str 101		BASEhuff_010yr_06hr	6.32	744.75	747.50	0.00	711	6.27	0.93	6.32	0.93
Str 101		BASEhuff_010yr_12hr	12.17	744.76	747.50	0.00	720	12.13	0.99	12.17	0.99
Str 101		BASEhuff_010yr_24hr	21.85	744.77	747.50	0.00	727	21.90	1.05	21.85	1.05

JLM
10-5-12
100-Year Proposed (Onsite & Offsite)

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
Outlet		BASEhuff_100yr_01hr	0.00	743.10	746.00	0.00	45	1.53	1.07	0.00	0.00
Outlet		BASEhuff_100yr_02hr	0.00	743.10	746.00	0.00	45	2.36	1.55	0.00	0.00
Outlet		BASEhuff_100yr_03hr	0.00	743.10	746.00	0.00	45	3.33	1.84	0.00	0.00
Outlet		BASEhuff_100yr_06hr	0.00	743.10	746.00	0.00	45	6.21	2.20	0.00	0.00
Outlet		BASEhuff_100yr_12hr	0.00	743.10	746.00	0.00	45	11.11	2.68	0.00	0.00
Outlet		BASEhuff_100yr_24hr	0.00	743.10	746.00	0.00	45	19.38	3.28	0.00	0.00
Pond		BASEhuff_100yr_01hr	1.47	745.91	747.00	0.00	76203	0.42	41.04	1.47	1.07
Pond		BASEhuff_100yr_02hr	2.35	746.29	747.00	0.00	78430	0.58	34.95	2.35	1.55
Pond		BASEhuff_100yr_03hr	3.31	746.47	747.00	0.00	79558	0.67	29.19	3.31	1.84
Pond		BASEhuff_100yr_06hr	6.21	746.70	747.00	0.00	80924	1.17	19.36	6.21	2.20
Pond		BASEhuff_100yr_12hr	11.11	746.77	747.00	0.00	81377	3.66	11.03	11.11	2.68
Pond		BASEhuff_100yr_24hr	19.37	746.83	747.00	0.00	81732	14.25	7.17	19.37	3.28
Str 101		BASEhuff_100yr_01hr	1.53	744.78	747.50	0.00	730	1.47	1.07	1.53	1.07
Str 101		BASEhuff_100yr_02hr	2.39	744.87	747.50	0.00	779	2.35	1.55	2.36	1.55
Str 101		BASEhuff_100yr_03hr	3.33	744.91	747.50	0.00	803	3.31	1.84	3.33	1.84
Str 101		BASEhuff_100yr_06hr	6.26	744.97	747.50	0.00	827	6.21	2.20	6.21	2.20
Str 101		BASEhuff_100yr_12hr	11.12	745.03	747.50	0.00	854	11.11	2.68	11.11	2.68
Str 101		BASEhuff_100yr_24hr	19.38	745.11	747.50	0.00	882	19.37	3.28	19.38	3.28

Job #11191R
Hydrology and Hydraulic Study of
City of Franklin Spec Building
Sept. 2012
Revised: October 5, 2012

PROPOSED ICPR INPUT

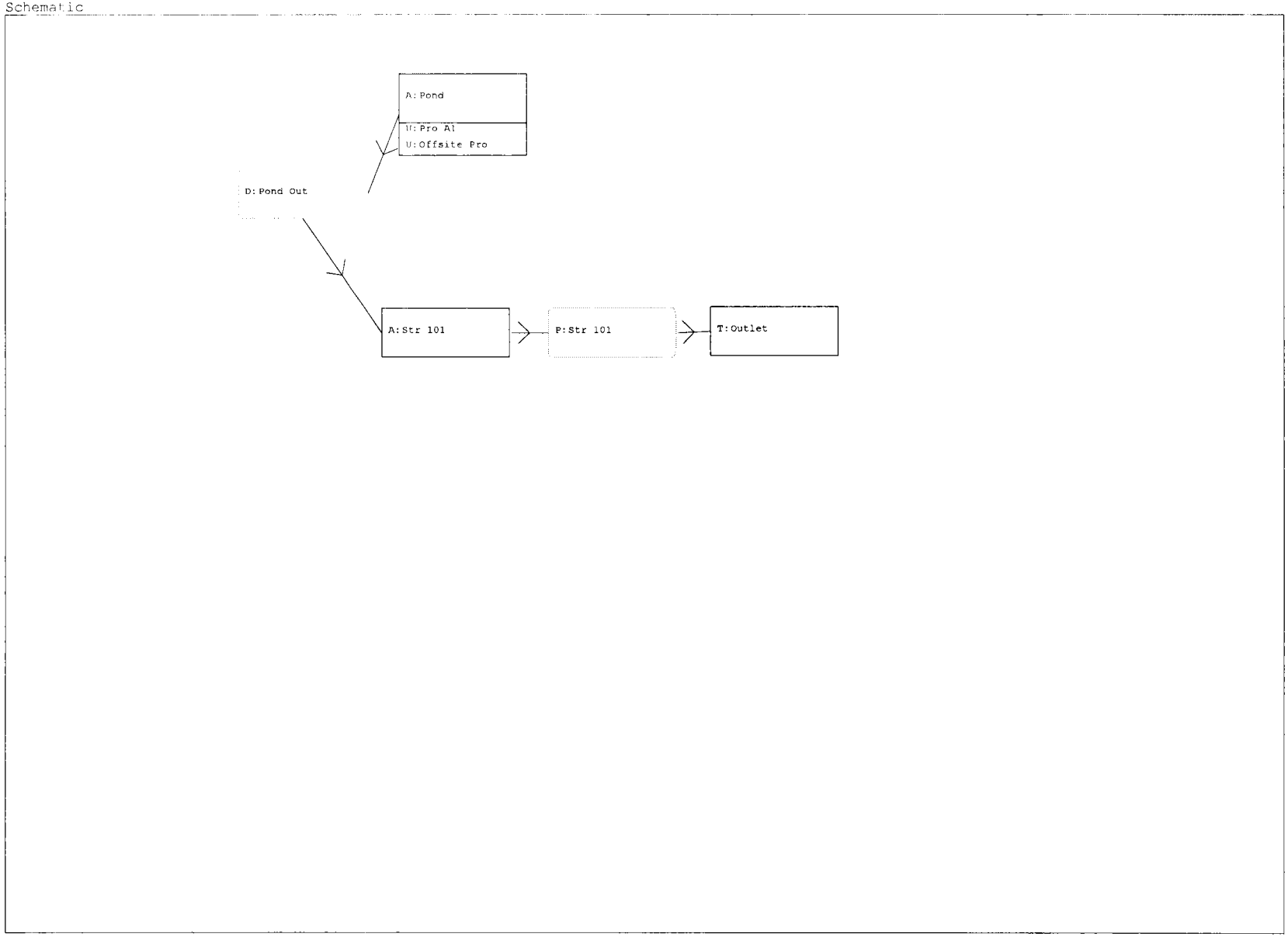
BANNING ENGINEERING

JLM
10-5-12
Proposed ICPR Node Schematic

Nodes
A Stage/Area
V Stage/Volume
T Time/Stage
M Manhole

Basins
O Overland Flow
U SCS Unit CN
S SBUH CN
Y SCS Unit GA
Z SBUH GA

Links
P Pipe
W Weir
C Channel
D Drop Structure
B Bridge
R Rating Curve
H Breach
E Percolation
F Filter
X Exfil Trench



Basins

Name: Offsite Pro
Group: BASE
Node: Pond
Type: SCS Unit Hydrograph CN
Status: Offsite

Unit Hydrograph: Uh484
Rainfall File:
Rainfall Amount(in): 0.000
Area(ac): 1.500
Curve Number: 83.00
DCIA(%): 0.00
Peaking Factor: 484.0
Storm Duration(hrs): 0.00
Time of Conc(min): 6.00
Time Shift(hrs): 0.00
Max Allowable Q(cfs): 999999.000

Name: Pro A1
Group: BASE
Node: Pond
Type: SCS Unit Hydrograph CN
Status: Onsite

Unit Hydrograph: Uh484
Rainfall File:
Rainfall Amount(in): 0.000
Area(ac): 11.200
Curve Number: 93.00
DCIA(%): 0.00
Peaking Factor: 484.0
Storm Duration(hrs): 0.00
Time of Conc(min): 18.40
Time Shift(hrs): 0.00
Max Allowable Q(cfs): 999999.000

Nodes

Name: Outlet
Group: BASE
Type: Time/Stage
Base Flow(cfs): 0.000
Init Stage(ft): 743.100
Warn Stage(ft): 746.000

Time(hrs)	Stage(ft)
0.00	743.100
60.00	743.100

Name: Pond
Group: BASE
Type: Stage/Area
Base Flow(cfs): 0.000
Init Stage(ft): 744.500
Warn Stage(ft): 747.000

745.5□1.27
746□1.33
747□1.46
748□1.58
749□1.72

Stage(ft)	Area(ac)
744.500	1.6400
745.500	1.7000
746.000	1.7600
747.000	1.9000
748.000	2.0300
749.000	2.1700

Name: Str 101
Group: BASE
Type: Stage/Area
Base Flow(cfs): 0.000
Init Stage(ft): 744.350
Warn Stage(ft): 747.500

Stage(ft)	Area(ac)
743.000	0.0003
749.000	0.0003

Pipes

Name: Str 101
Group: BASE
From Node: Str 101
To Node: Outlet
Length(ft): 640.00
Count: 2

	UPSTREAM	DOWNSTREAM		
Geometry:	Circular	Circular	Friction Equation:	Automatic
Span(in):	30.00	30.00	Solution Algorithm:	Most Restrictive
Rise(in):	30.00	30.00	Flow:	Both
Invert(ft):	744.350	743.100	Entrance Loss Coef:	0.50
Manning's N:	0.012000	0.012000	Exit Loss Coef:	1.00
Top Clip(in):	0.000	0.000	Bend Loss Coef:	0.00
Bot Clip(in):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
			Inlet Ctrl Spec:	Use dc
			Stabilizer Option:	None

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Drop Structures

Name: Pond Out | From Node: Pond | Length(ft): 44.00
Group: BASE | To Node: Str 101 | Count: 1

	UPSTREAM	DOWNSTREAM		
Geometry:	Circular	Circular	Friction Equation:	Automatic
Span(in):	12.00	12.00	Solution Algorithm:	Most Restrictive
Rise(in):	12.00	12.00	Flow:	Both
Invert(ft):	744.500	744.400	Entrance Loss Coef:	0.500
Manning's N:	0.012000	0.012000	Exit Loss Coef:	1.000
Top Clip(in):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Bot Clip(in):	0.000	0.000	Inlet Ctrl Spec:	Use dc
			Solution Incs:	10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

*** Weir 1 of 3 for Drop Structure Pond Out ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Vertical: Mavis	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Circular	Orifice Disc Coef:	0.600
Span(in):	7.00	Invert(ft):	744.500
Rise(in):	7.00	Control Elev(ft):	744.500

*** Weir 2 of 3 for Drop Structure Pond Out ***

TABLE

Count:	1	Bottom Clip(in):	0.000
Type:	Vertical: Mavis	Top Clip(in):	0.000
Flow:	Both	Weir Disc Coef:	3.200
Geometry:	Circular	Orifice Disc Coef:	0.600
Span(in):	7.00	Invert(ft):	745.900
Rise(in):	7.00	Control Elev(ft):	745.900

*** Weir 3 of 3 for Drop Structure Pond 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:	0.600
Span(in):	24.00	Invert(ft):	746.700
Rise(in):	24.00	Control Elev(ft):	746.700

Hydrology Simulations

Name: BMP
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_24hr.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00

```
         Rainfall File: huff_indy3-50
    Rainfall Amount(in): 1.25

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          15.00

-------------------------------------------------------------------------------------------------------------
        Name: huff_002yr_01hr
    Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_01hr.R32

     Override Defaults: Yes
    Storm Duration(hrs): 1.00
         Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 1.37

Time(hrs)       Print Inc(min)
--------------- ---------------
2.000           5.00

-------------------------------------------------------------------------------------------------------------
        Name: huff_002yr_02hr
    Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_02hr.R32

     Override Defaults: Yes
    Storm Duration(hrs): 2.00
         Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 1.69

Time(hrs)       Print Inc(min)
--------------- ---------------
4.000           5.00

-------------------------------------------------------------------------------------------------------------
        Name: huff_002yr_03hr
    Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_03hr.R32

     Override Defaults: Yes
    Storm Duration(hrs): 3.00
         Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 1.87

Time(hrs)       Print Inc(min)
--------------- ---------------
6.000           5.00

-------------------------------------------------------------------------------------------------------------
        Name: huff_002yr_06hr
    Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_06hr.R32

     Override Defaults: Yes
    Storm Duration(hrs): 6.00
         Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 2.19

Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.00

-------------------------------------------------------------------------------------------------------------
        Name: huff_002yr_12hr
    Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_12hr.R32

     Override Defaults: Yes
    Storm Duration(hrs): 12.00
         Rainfall File: Huff-indy2-50
    Rainfall Amount(in): 2.54

Time(hrs)       Print Inc(min)
--------------- ---------------
20.000          10.00

-------------------------------------------------------------------------------------------------------------
        Name: huff_002yr_24hr
    Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_24hr.R32

     Override Defaults: Yes
    Storm Duration(hrs): 24.00
         Rainfall File: huff_indy3-50
    Rainfall Amount(in): 2.92

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          15.00
```

Name: huff_010yr_01hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_01hr.R32

Override Defaults: Yes
Storm Duration(hrs): 1.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 2.00

Time(hrs)	Print Inc(min)
2.000	5.00

Name: huff_010yr_02hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_02hr.R32

Override Defaults: Yes
Storm Duration(hrs): 2.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 2.46

Time(hrs)	Print Inc(min)
4.000	5.00

Name: huff_010yr_03hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_03hr.R32

Override Defaults: Yes
Storm Duration(hrs): 3.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 2.72

Time(hrs)	Print Inc(min)
6.000	5.00

Name: huff_010yr_06hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_06hr.R32

Override Defaults: Yes
Storm Duration(hrs): 6.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 3.19

Time(hrs)	Print Inc(min)
10.000	10.00

Name: huff_010yr_12hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_12hr.R32

Override Defaults: Yes
Storm Duration(hrs): 12.00
Rainfall File: Huff-indy2-50
Rainfall Amount(in): 3.70

Time(hrs)	Print Inc(min)
20.000	10.00

Name: huff_010yr_24hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_24hr.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: huff_indy3-50
Rainfall Amount(in): 4.25

Time(hrs)	Print Inc(min)
30.000	15.00

Name: huff_100yr_01hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_01hr.R32

Override Defaults: Yes

```
    Storm Duration(hrs): 1.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 3.21

Time(hrs)       Print Inc(min)
--------------- ---------------
2.000           5.00

------------------------------------------------------------------------------------------------------------
         Name: huff_100yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_02hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 2.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 3.97

Time(hrs)       Print Inc(min)
--------------- ---------------
4.000           5.00

------------------------------------------------------------------------------------------------------------
         Name: huff_100yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_03hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 3.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 4.38

Time(hrs)       Print Inc(min)
--------------- ---------------
6.000           5.00

------------------------------------------------------------------------------------------------------------
         Name: huff_100yr_06hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_06hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 6.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 5.13

Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.00

------------------------------------------------------------------------------------------------------------
         Name: huff_100yr_12hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_12hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 12.00
          Rainfall File: Huff-indy2-50
    Rainfall Amount(in): 5.95

Time(hrs)       Print Inc(min)
--------------- ---------------
20.000          10.00

------------------------------------------------------------------------------------------------------------
         Name: huff_100yr_24hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_24hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: huff_indy3-50
    Rainfall Amount(in): 6.84

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          15.00

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

         Name: BMP                 Hydrology Sim: BMP
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\pro\BMP.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): 48.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages:                        Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
48.000          15.000

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

-------------------------------------------------------------------------------------------------
         Name: huff_002yr_01hr     Hydrology Sim: huff_002yr_01hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_01hr.I32

      Execute: No          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): 5.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages:                        Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
5.000           10.000

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

-------------------------------------------------------------------------------------------------
         Name: huff_002yr_02hr     Hydrology Sim: huff_002yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_02hr.I32

      Execute: No          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): 6.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages:                        Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
6.000           10.000

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

-------------------------------------------------------------------------------------------------
         Name: huff_002yr_03hr     Hydrology Sim: huff_002yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_03hr.I32

      Execute: No          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): 10.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages:                        Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.000
```

Group	Run
BASE	Yes

Name: huff_002yr_06hr Hydrology Sim: huff_002yr_06hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_06hr.I32

Execute: No 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): 15.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
15.000	10.000

Group	Run
BASE	Yes

Name: huff_002yr_12hr Hydrology Sim: huff_002yr_12hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_12hr.I32

Execute: No 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): 30.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
30.000	10.000

Group	Run
BASE	Yes

Name: huff_002yr_24hr Hydrology Sim: huff_002yr_24hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_002yr_24hr.I32

Execute: No 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): 60.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
60.000	15.000

Group	Run
BASE	Yes

Name: huff_010yr_01hr Hydrology Sim: huff_010yr_01hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_01hr.I32

Execute: No 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): 5.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
5.000           10.000

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


-------------------------------------------------------------------------------------------------
         Name: huff_010yr_02hr     Hydrology Sim: huff_010yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_02hr.I32

      Execute: No          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): 6.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
6.000           10.000

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


-------------------------------------------------------------------------------------------------
         Name: huff_010yr_03hr     Hydrology Sim: huff_010yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_03hr.I32

      Execute: No          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): 10.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.000

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


-------------------------------------------------------------------------------------------------
         Name: huff_010yr_06hr     Hydrology Sim: huff_010yr_06hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_06hr.I32

      Execute: No          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): 15.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


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

15.000	10.000

Group	Run
BASE	Yes

Name: huff_010yr_12hr Hydrology Sim: huff_010yr_12hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_12hr.I32

Execute: No 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): 30.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
30.000	10.000

Group	Run
BASE	Yes

Name: huff_010yr_24hr Hydrology Sim: huff_010yr_24hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_010yr_24hr.I32

Execute: No 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): 60.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
60.000	15.000

Group	Run
BASE	Yes

Name: huff_100yr_01hr Hydrology Sim: huff_100yr_01hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_01hr.I32

Execute: No 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): 5.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
1.000	5.000
5.000	10.000

Group	Run
BASE	Yes

Name: huff_100yr_02hr Hydrology Sim: huff_100yr_02hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_02hr.I32

```
     Execute: No          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): 6.00
    Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
       Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
6.000           10.000

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

```
        Name: huff_100yr_03hr     Hydrology Sim: huff_100yr_03hr
    Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_03hr.I32

     Execute: No          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): 10.00
    Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
       Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.000

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

```
        Name: huff_100yr_06hr     Hydrology Sim: huff_100yr_06hr
    Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_06hr.I32

     Execute: No          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): 15.00
    Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
       Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
15.000          10.000

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

```
        Name: huff_100yr_12hr     Hydrology Sim: huff_100yr_12hr
    Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_12hr.I32

     Execute: No          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): 30.00
    Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
       Boundary Stages:                         Boundary Flows:
```

Time(hrs)	Print Inc(min)
30.000	10.000

Group	Run
BASE	Yes

Name: huff_100yr_24hr Hydrology Sim: huff_100yr_24hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\exz\huff_100yr_24hr.I32

Execute: No 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): 60.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
60.000	15.000

Group	Run
BASE	Yes

Job #11191R
Hydrology and Hydraulic Study of
City of Franklin Spec Building
Sept. 2012
Revised: October 5, 2012

Tc & CN CALCULATIONS

BANNING ENGINEERING

Existing & Proposed Conditions Franklin Building
Johnson County, Indiana

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Exz A1							
SHEET	100	0.0200	0.150				0.180
SHALLOW	450	0.0100	0.050				0.077
					Time of Concentration		0.257
Exz B1							
SHEET	100	0.0100	0.150				0.237
SHALLOW	750	0.0100	0.050				0.129
					Time of Concentration		0.366
Offsite Pr							
SHEET	30	0.0110	0.011				0.011
					Time of Concentration		0.100
Pro A1							
SHEET	70	0.0100	0.240				0.260
CHANNEL	500					3.000	0.046
					Time of Concentration		0.306

Existing & Proposed Conditions Franklin Building
Johnson County, Indiana

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Exz A1	Pasture, grassland or range	(good)	B	1.85	61
	Pasture, grassland or range	(good)	C	1.85	74
	Total Area / Weighted Curve Number			3.7	68
Exz B1	Pasture, grassland or range	(good)	B	3.75	61
	Pasture, grassland or range	(good)	C	3.75	74
	Total Area / Weighted Curve Number			7.5	68
Offsite Pr	Commercial & business		B	.225	92
	Commercial & business		C	.225	94
	Residential districts (1/4 acre)		B	.525	75
	Residential districts (1/4 acre)		C	.525	83
	Total Area / Weighted Curve Number			1.5	83
Pro A1	Commercial & business		B	5.6	92
	Commercial & business		C	5.6	94
	Total Area / Weighted Curve Number			11.2	93

Job #11191R
Hydrology and Hydraulic Study of
City of Franklin Spec Building
Sept. 2012
Revised: October 5, 2012

STORM SEWER CALCULATIONS

BANNING ENGINEERING

STORM SEWER DESIGN CALCULATIONS
-RATIONAL METHOD-

PROJECT:	Franklin	STORM:	10 Year
JOB #:	11191R	COMPUTED BY:	RRL
DATE:	10/2/12	SHEET NO.:	

STRUCTURE		BASINS							COMPOSITE BASINS				TRAVEL
FROM	TO	BASIN #	c	A (acres)	c*A	Tc (min)	I (in/hr)	Q (cfs)	SUM (c*A)	Tc (min)	I (in/hr)	Q (cfs)	TIME (min)
113	112	113	0.38	1.88	0.71	23	3.62	2.59	0.71	23	3.62	2.59	0.17
111	110	111	0.36	1.97	0.71	17	4.27	3.03	0.71	17	4.27	3.03	0.60
108	107	108	0.82	0.60	0.49	11	5.26	2.59	0.49	11	5.26	2.59	1.53
107	106	107	0.82	0.34	0.28	11	5.26	1.47	0.77	13	4.88	3.76	0.67
106	105	106	0.00	0.00	0.00	5	6.98	0.00	1.70	14	4.71	8.01	1.09
105	104	105	0.81	0.69	0.56	5	6.98	3.90	2.26	15	4.55	10.29	1.28
109	106	109	0.81	1.15	0.93	10	5.48	5.10	0.93	10	5.48	5.10	0.44

STORM SEWER DESIGN CALCULATIONS
-COMPOSITE C-VALUES-

PROJECT: Franklin | STORM: 10 Year
JOB #: 11191R | COMPUTED BY: RRL
DATE: 10/2/12 | SHEET NO.:

BASINS						COMPOSITE BASINS				
BASIN #	c	Area (ft^2)	Area (acres)	c*A		BASIN #	c	Area (acres)	c*A	
							0	0	0	
113	0.85	17424	0.40	0.34		113	0.38	1.88	0.71	
113	0.25	64469	1.48	0.37			0	0	0	
						111	0.36	1.97	0.71	
111	0.90	8586	0.20	0.18			0	0	0	
111	0.30	77227	1.77	0.53			0	0	0	
						108	0.82	0.6	0.49	
108	0.90	22216	0.51	0.46		107	0.82	0.34	0.28	
108	0.30	3902	0.09	0.03		106	0	0	0	
						105	0.81	0.69	0.56	
107	0.90	12589	0.29	0.26			0	0	0	
107	0.30	2221	0.05	0.02			0	0	0	
						109	0.81	1.15	0.93	
109	0.90	42580	0.98	0.88			0	0	0	
109	0.30	7514	0.17	0.05			0	0	0	
							0	0	0	
105	0.90	25548	0.59	0.53			0	0	0	
105	0.30	4508	0.10	0.03			0	0	0	
							0	0	0	
							0	0	0	
							0	0	0	
							0	0	0	
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							0	0	0	
							0	0	0	

Time of Concentration Worksheet
Based on TR-55

PROJECT: Franklin
JOB #: 11191R

Typical values for Manning's n			
Overland Flow		Channel Flow	
short grass	0.15	grass	0.03
dense grass	0.24	concrete	0.015
pavement	0.011	rip-rap	0.035

2 year, 24 hour rainfall = 2.66 inches
minimum T_c = 5 minutes

	Overland flow seg. 1				Overland flow seg. 2				Shallow Concentrated Flow					Channel Flow								T_c
Basin name	Length (ft)	S %	n	T_t (min)	Length (ft)	S %	n	T_t (min)	Length (ft)	S %	Paved/Un (P or U)	Vel. (ft/s)	T_t (min)	Length (ft)	a (s.f.)	Pw (ft)	r (ft)	S %	n	Vel. (ft/s)	T_t (min)	(min)
				0				0					0								0	
113	100	1	0.15	14				0	730	0.8	U	1.4	9								0	23
				0				0					0								0	
111	76	1	0.15	11				0	260	0.5	P	1.4	3	200						1.50	2	17
				0				0					0								0	
				0				0					0								0	
108	66	1	0.15	10				0	160	1	P	2	1								0	11
107	66	1	0.15	10				0	140	1	P	2	1								0	11
106				0				0					0								0	5
105	100	1	0.01	2				0	70	0.5	P	1.4	1								0	5
				0				0					0								0	
				0				0					0								0	
109	50	1	0.15	8				0	140	0.5	P	1.4	2								0	10
				0				0					0								0	
				0				0					0								0	
				0				0					0								0	
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STORM SEWER DESIGN CALCULATIONS
-PIPE DESIGN-

PROJECT:	Franklin	STORM:	10 Year
JOB #:	11191R	COMPUTED BY:	RRL
DATE:	10/2/12	SHEET NO.:	

STRUCTURE FROM	STRUCTURE TO	DESIGN Q (cfs)	L (ft)	DIA. (in)	SLOPE %	CAP. Q (cfs)	VEL. (ft/s)	RIM ELEV. UP	RIM ELEV. DOWN	INVERT ELEV. UP	INVERT ELEV. DOWN	COVER (ft)	down-stream cover
113	112	2.59	30	12	0.67	2.93	3.74	747.00	749.00	744.70	744.50	1.13	3.33
111	110	3.03	108	15	0.30	3.56	2.90	747.00	749.00	744.82	744.50	0.76	3.08
108	107	2.59	275	12	0.55	2.66	3.38	750.00	750.00	747.57	746.06	1.26	2.77
107	106	3.76	121	15	0.40	4.11	3.35	750.00	749.68	746.06	745.58	2.52	2.68
106	105	8.01	196	21	0.26	8.13	3.38	749.68	749.50	745.58	745.07	2.14	2.47
105	104	10.29	230	24	0.25	11.38	3.62	749.50	749.00	745.07	744.50	2.20	2.27
109	106	5.10	79	15	0.65	5.24	4.27	748.85	749.68	746.09	745.58	1.34	2.68

STR'S 107 & 108

Inlet Capacity for Neenah R-3402-E 24x24-inch opening 2 5/8 X 6 1/2 inch openings

Area = 2.1 square feet Weir = 8 linear feet

Head,ft	Orifice Q, cfs	Weir Q, cfs	Actual Dishchage, cfs	50% Clogged
0	0.0	0.0	0.0	0.0
0.1	3.2	0.8	0.8	0.4
0.2	4.5	2.2	2.2	1.1
0.25	5.1	3.1	3.1	1.6
0.3	5.5	4.1	4.1	2.0
0.4	6.4	6.3	6.3	3.1
* 0.5	7.1	8.8	7.1	3.6 *
0.58	7.7	11.0	7.7	3.9
0.67	8.3	13.6	8.3	4.1
0.8	9.0	17.7	9.0	4.5
1	10.1	24.8	10.1	5.1
1.25	11.3	34.7	11.3	5.7
1.5	12.4	45.6	12.4	6.2
1.75	13.4	57.4	13.4	6.7
2	14.3	70.1	14.3	7.1

STR'S 105, 111, 113

Inlet Capacity for Neenah R-4342 23 inch round Ditch Casting

Area = 2 square feet Weir = 6 linear feet

Head,ft	Orifice Q, cfs	Weir Q, cfs	Actual Dishchage, cfs	50% Clogged
0	0.0	0.0	0.0	0.0
0.1	3.0	0.6	0.6	0.3
0.2	4.3	1.7	1.7	0.8
0.25	4.8	2.3	2.3	1.2
0.3	5.3	3.1	3.1	1.5
0.4	6.1	4.7	4.7	2.4
0.5	6.8	6.6	6.6	3.3
0.75	8.3	12.1	8.3	4.2
1	9.6	18.6	9.6	4.8
1.25	10.8	26.0	10.8	5.4
1.5	11.8	34.2	11.8	5.9
1.75	12.7	43.1	12.7	6.4
2	13.6	52.6	13.6	6.8

STR 109

Inlet Capacity for Neenah R-3403-F 24x36-inch opening 1 5/8 X 10 1/2 inch openings

Area = 3.2 square feet Weir = 10.6 linear feet

Head,ft	Orifice Q, cfs	Weir Q, cfs	Actual Dishchage, cfs	50% Clogged
0	0.0	0.0	0.0	0.0
0.1	4.9	1.0	1.0	0.5
0.2	6.9	2.9	2.9	1.5
0.25	7.7	4.1	4.1	2.1
0.3	8.4	5.4	5.4	2.7
0.4	9.7	8.3	8.3	4.2
* 0.5	10.9	11.6	10.9	5.4 *
0.58	11.8	14.6	11.8	5.9
0.67	12.6	18.0	12.6	6.3
0.8	13.8	23.5	13.8	6.9
1	15.4	32.9	15.4	7.7
1.25	17.2	45.9	17.2	8.6
1.5	18.9	60.4	18.9	9.4
1.75	20.4	76.1	20.4	10.2
2	21.8	92.9	21.8	10.9

Worksheet
Worksheet for Circular Channel

Project Description	
Worksheet	Roof Drains
Flow Element	Circular Chann
Method	Manning's For
Solve For	Discharge

Input Data		
Mannings Coeffic	0.010	
Channel Slope	004500	ft/ft
Depth	1.75	ft
Diameter	21.0	in

Results		
Discharge	13.82	cfs
Flow Area	2.4	ft²
Wetted Perime	5.50	ft
Top Width	0.00	ft
Critical Depth	1.38	ft
Percent Full	100.0	%
Critical Slope	0.004832	ft/ft
Velocity	5.74	ft/s
Velocity Head	0.51	ft
Specific Energ	2.26	ft
Froude Numbe	0.00	
Maximum Disc	14.86	cfs
Discharge Full	13.82	cfs
Slope Full	0.004500	ft/ft
Flow Type	Subcritical	

PHASE 1 BLDG + FUTURE ADDITION

$C = 0.9$

$I = 5.48$ ($T_c = 10$ min)

$A = 240' \times 504' = 2.78$ Ac.

$Q = CIA$

$= .9(5.48)(2.78)$

$Q = 13.71$ CFS < 13.82 CFS → ok

Worksheet
Worksheet for Circular Channel

Project Description	
Worksheet	Roof Drains
Flow Element	Circular Chann
Method	Manning's For
Solve For	Discharge

Input Data		
Mannings Coeffic	0.010	
Channel Slope	004500	ft/ft
Depth	1.50	ft
Diameter	18.0	in

Results		
Discharge	9.16	cfs
Flow Area	1.8	ft²
Wetted Perime	4.71	ft
Top Width	0.00	ft
Critical Depth	1.17	ft
Percent Full	100.0	%
Critical Slope	0.004955	ft/ft
Velocity	5.18	ft/s
Velocity Head	0.42	ft
Specific Energ	1.92	ft
Froude Numbe	0.00	
Maximum Disc	9.85	cfs
Discharge Full	9.16	cfs
Slope Full	0.004500	ft/ft
Flow Type	Subcritical	

$A = 1.79$ AC

$Q = CIA$

$= .9(5.48)\,1.79$

$Q = 8.83$ CFS $<$ 9.16 CFS $\rightarrow$ OK

Worksheet
Worksheet for Circular Channel

Project Description	
Worksheet	Roof Drains
Flow Element	Circular Chann
Method	Manning's For
Solve For	Discharge

Input Data		
Mannings Coeffic	0.010	
Channel Slope	004500	ft/ft
Depth	1.25	ft
Diameter	15.0	in

Results		
Discharge	5.63	cfs
Flow Area	1.2	ft²
Wetted Perime	3.93	ft
Top Width	0.00	ft
Critical Depth	0.96	ft
Percent Full	100.0	%
Critical Slope	0.005112	ft/ft
Velocity	4.59	ft/s
Velocity Head	0.33	ft
Specific Energ	1.58	ft
Froude Numbe	0.00	
Maximum Disc	6.06	cfs
Discharge Full	5.63	cfs
Slope Full	0.004500	ft/ft
Flow Type	Subcritical	

$A = 1.10 \text{ CFS}$

$Q = CIA$

$= .9(5.48)(1.1)$

$Q = 5.43 \text{ cfs} < 5.63 \text{ cfs} \rightarrow \text{OK}$

Worksheet
Worksheet for Circular Channel

Project Description	
Worksheet	Roof Drains
Flow Element	Circular Chann
Method	Manning's For
Solve For	Discharge

Input Data		
Mannings Coeffic	0.010	
Channel Slope	004500	ft/ft
Depth	1.00	ft
Diameter	12.0	in

Results		
Discharge	3.11	cfs
Flow Area	0.8	ft²
Wetted Perime	3.14	ft
Top Width	0.00	ft
Critical Depth	0.76	ft
Percent Full	100.0	%
Critical Slope	0.005322	ft/ft
Velocity	3.96	ft/s
Velocity Head	0.24	ft
Specific Energ	1.24	ft
Froude Numbe	0.00	
Maximum Disc	3.34	cfs
Discharge Full	3.11	cfs
Slope Full	0.004500	ft/ft
Flow Type	Subcritical	

$A = 0.55\ Ac$

$Q = CIA$

$= .9(5.48)(.55)$

$Q = 2.71\ cfs < 3.11\ cfs \rightarrow OK$

Job #11191R
Hydrology and Hydraulic Study of
City of Franklin Spec Building
Sept. 2012
Revised: October 5, 2012

BMP CALCULATIONS

BANNING ENGINEERING

Basin Name:	Pro A1
Group Name:	BASE
Simulation:	BMP
Node Name:	Pond
Basin Type:	SCS Unit Hydrograph
Unit Hydrograph:	Uh484
Peaking Fator:	484.0
Spec Time Inc (min):	2.45
Comp Time Inc (min):	2.45
Rainfall File:	huff_indy3-50
Rainfall Amount (in):	1.25
Storm Duration (hrs):	24.00
Status:	Onsite
Time of Conc (min):	18.40
Time Shift (hrs):	0.00
Area (ac):	11.200
Vol of Unit Hyd (in):	1.00
Curve Number:	93.000
DCIA (%):	0.000
Time Max (hrs):	16.80
Flow Max (cfs):	0.88
Runoff Volume (in):	0.65
Runoff Volume (ft3):	26466.12

~ 0.61 ACRE X FT TOTAL RUNOFF
X 0.20 REQUIRED AFTER 24HR
0.122 AC X FT

JLM
10-5-12
BMP Time Series

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
BMP	Pond	BASE	0.00	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	0.26	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	0.50	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	0.77	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	1.02	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	1.27	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	1.52	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	1.77	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	2.02	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	2.27	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	2.52	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	2.77	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	3.02	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	3.27	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	3.52	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	3.77	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	4.02	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	4.27	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	4.52	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	4.77	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	5.02	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	5.27	744.50	747.00	71438	0.00	0.00	0.0	0.0
BMP	Pond	BASE	5.52	744.50	747.00	71439	0.01	0.00	0.0	0.0
BMP	Pond	BASE	5.77	744.50	747.00	71439	0.01	0.00	0.0	0.0
BMP	Pond	BASE	6.02	744.50	747.00	71439	0.02	0.00	0.0	0.0
BMP	Pond	BASE	6.27	744.50	747.00	71440	0.02	0.00	0.0	0.0
BMP	Pond	BASE	6.52	744.50	747.00	71441	0.03	0.00	0.0	0.0
BMP	Pond	BASE	6.77	744.50	747.00	71442	0.03	0.00	0.0	0.0
BMP	Pond	BASE	7.02	744.50	747.00	71443	0.04	0.00	0.0	0.0
BMP	Pond	BASE	7.27	744.50	747.00	71445	0.05	0.00	0.0	0.0
BMP	Pond	BASE	7.52	744.50	747.00	71446	0.06	0.00	0.0	0.0
BMP	Pond	BASE	7.77	744.50	747.00	71449	0.07	0.00	0.0	0.0
BMP	Pond	BASE	8.02	744.50	747.00	71451	0.08	0.00	0.0	0.0
BMP	Pond	BASE	8.27	744.51	747.00	71454	0.09	0.00	0.0	0.0
BMP	Pond	BASE	8.52	744.51	747.00	71457	0.10	0.00	0.0	0.0
BMP	Pond	BASE	8.77	744.51	747.00	71460	0.10	0.00	0.0	0.0
BMP	Pond	BASE	9.02	744.51	747.00	71464	0.11	0.00	0.0	0.0
BMP	Pond	BASE	9.27	744.51	747.00	71467	0.12	0.00	0.0	0.0
BMP	Pond	BASE	9.52	744.51	747.00	71471	0.12	0.00	0.0	0.0
BMP	Pond	BASE	9.77	744.51	747.00	71476	0.16	0.00	0.0	0.0
BMP	Pond	BASE	10.02	744.52	747.00	71483	0.25	0.00	0.0	0.0
BMP	Pond	BASE	10.27	744.52	747.00	71491	0.28	0.00	0.0	0.0
BMP	Pond	BASE	10.52	744.52	747.00	71501	0.30	0.00	0.0	0.0
BMP	Pond	BASE	10.77	744.53	747.00	71511	0.32	0.00	0.0	0.0
BMP	Pond	BASE	11.02	744.53	747.00	71522	0.33	0.00	0.1	0.0
BMP	Pond	BASE	11.27	744.54	747.00	71533	0.35	0.00	0.1	0.0
BMP	Pond	BASE	11.52	744.54	747.00	71544	0.36	0.00	0.1	0.0
BMP	Pond	BASE	11.77	744.55	747.00	71557	0.38	0.00	0.1	0.0
BMP	Pond	BASE	12.02	744.55	747.00	71569	0.40	0.00	0.1	0.0
BMP	Pond	BASE	12.27	744.56	747.00	71585	0.54	0.01	0.1	0.0
BMP	Pond	BASE	12.52	744.56	747.00	71604	0.64	0.01	0.1	0.0
BMP	Pond	BASE	12.77	744.57	747.00	71625	0.67	0.01	0.1	0.0
BMP	Pond	BASE	13.02	744.58	747.00	71647	0.70	0.01	0.1	0.0
BMP	Pond	BASE	13.27	744.59	747.00	71670	0.72	0.01	0.1	0.0
BMP	Pond	BASE	13.52	744.60	747.00	71693	0.74	0.02	0.2	0.0
BMP	Pond	BASE	13.77	744.61	747.00	71717	0.76	0.02	0.2	0.0
BMP	Pond	BASE	14.02	744.62	747.00	71742	0.78	0.02	0.2	0.0

JLM
10-5-12
BMP Time Series

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
BMP	Pond	BASE	14.27	744.63	747.00	71767	0.80	0.03	0.2	0.0
BMP	Pond	BASE	14.52	744.64	747.00	71792	0.81	0.03	0.2	0.0
BMP	Pond	BASE	14.77	744.65	747.00	71817	0.80	0.04	0.2	0.0
BMP	Pond	BASE	15.02	744.65	747.00	71842	0.81	0.04	0.3	0.0
BMP	Pond	BASE	15.27	744.66	747.00	71868	0.82	0.05	0.3	0.0
BMP	Pond	BASE	15.52	744.67	747.00	71893	0.83	0.05	0.3	0.0
BMP	Pond	BASE	15.77	744.68	747.00	71919	0.84	0.06	0.3	0.0
BMP	Pond	BASE	16.02	744.69	747.00	71945	0.85	0.06	0.3	0.0
BMP	Pond	BASE	16.27	744.70	747.00	71970	0.86	0.07	0.3	0.0
BMP	Pond	BASE	16.52	744.71	747.00	71996	0.87	0.08	0.4	0.0
BMP	Pond	BASE	16.77	744.72	747.00	72022	0.87	0.08	0.4	0.0
BMP	Pond	BASE	17.02	744.73	747.00	72045	0.70	0.09	0.4	0.0
BMP	Pond	BASE	17.27	744.74	747.00	72062	0.52	0.10	0.4	0.0
BMP	Pond	BASE	17.52	744.74	747.00	72075	0.49	0.10	0.4	0.0
BMP	Pond	BASE	17.77	744.75	747.00	72088	0.49	0.10	0.4	0.0
BMP	Pond	BASE	18.02	744.75	747.00	72100	0.49	0.11	0.4	0.0
BMP	Pond	BASE	18.27	744.76	747.00	72113	0.49	0.11	0.5	0.0
BMP	Pond	BASE	18.52	744.76	747.00	72125	0.50	0.12	0.5	0.0
BMP	Pond	BASE	18.77	744.77	747.00	72138	0.50	0.12	0.5	0.0
BMP	Pond	BASE	19.02	744.77	747.00	72150	0.50	0.12	0.5	0.0
BMP	Pond	BASE	19.27	744.78	747.00	72162	0.49	0.13	0.5	0.0
BMP	Pond	BASE	19.52	744.78	747.00	72172	0.36	0.13	0.5	0.0
BMP	Pond	BASE	19.77	744.78	747.00	72179	0.32	0.13	0.5	0.0
BMP	Pond	BASE	20.02	744.79	747.00	72185	0.32	0.13	0.5	0.0
BMP	Pond	BASE	20.27	744.79	747.00	72191	0.32	0.14	0.5	0.0
BMP	Pond	BASE	20.52	744.79	747.00	72196	0.32	0.14	0.5	0.0
BMP	Pond	BASE	20.77	744.79	747.00	72202	0.32	0.14	0.5	0.1
BMP	Pond	BASE	21.02	744.79	747.00	72208	0.32	0.14	0.5	0.1
BMP	Pond	BASE	21.27	744.80	747.00	72214	0.32	0.14	0.5	0.1
BMP	Pond	BASE	21.52	744.80	747.00	72219	0.32	0.15	0.6	0.1
BMP	Pond	BASE	21.77	744.80	747.00	72224	0.29	0.15	0.6	0.1
BMP	Pond	BASE	22.02	744.80	747.00	72228	0.24	0.15	0.6	0.1
BMP	Pond	BASE	22.27	744.80	747.00	72231	0.23	0.15	0.6	0.1
BMP	Pond	BASE	22.52	744.80	747.00	72234	0.23	0.15	0.6	0.1
BMP	Pond	BASE	22.77	744.81	747.00	72236	0.23	0.15	0.6	0.1
BMP	Pond	BASE	23.02	744.81	747.00	72239	0.23	0.15	0.6	0.1
BMP	Pond	BASE	23.27	744.81	747.00	72241	0.23	0.15	0.6	0.1
BMP	Pond	BASE	23.52	744.81	747.00	72244	0.23	0.15	0.6	0.1
BMP	Pond	BASE	23.77	744.81	747.00	72246	0.23	0.16	0.6	0.1
BMP	Pond	BASE	24.02	744.81	747.00	72248	0.22	0.16	0.6	0.1
BMP	Pond	BASE	24.27	744.81	747.00	72248	0.06	0.16	0.6	0.1
BMP	Pond	BASE	24.52	744.81	747.00	72244	0.01	0.15	0.6	0.1
BMP	Pond	BASE	24.77	744.81	747.00	72239	0.00	0.15	0.6	0.1
BMP	Pond	BASE	25.02	744.80	747.00	72234	0.00	0.15	0.6	0.1
BMP	Pond	BASE	25.27	744.80	747.00	72229	0.00	0.15	0.6	0.1
BMP	Pond	BASE	25.52	744.80	747.00	72224	0.00	0.15	0.6	0.1
BMP	Pond	BASE	25.77	744.80	747.00	72219	0.00	0.15	0.6	0.1
BMP	Pond	BASE	26.02	744.80	747.00	72215	0.00	0.14	0.6	0.1
BMP	Pond	BASE	26.27	744.80	747.00	72210	0.00	0.14	0.6	0.1
BMP	Pond	BASE	26.52	744.79	747.00	72205	0.00	0.14	0.6	0.1
BMP	Pond	BASE	26.77	744.79	747.00	72201	0.00	0.14	0.6	0.1
BMP	Pond	BASE	27.02	744.79	747.00	72196	0.00	0.14	0.6	0.1
BMP	Pond	BASE	27.27	744.79	747.00	72192	0.00	0.14	0.6	0.1
BMP	Pond	BASE	27.52	744.79	747.00	72187	0.00	0.14	0.6	0.1
BMP	Pond	BASE	27.77	744.78	747.00	72183	0.00	0.13	0.6	0.1
BMP	Pond	BASE	28.02	744.78	747.00	72179	0.00	0.13	0.6	0.1
BMP	Pond	BASE	28.27	744.78	747.00	72174	0.00	0.13	0.6	0.1

PEAK

PEAK ELEVATION

JLM
10-5-12
BMP Time Series

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
BMP	Pond	BASE	28.52	744.78	747.00	72170	0.00	0.13	0.6	0.1
BMP	Pond	BASE	28.77	744.78	747.00	72166	0.00	0.13	0.6	0.1
BMP	Pond	BASE	29.02	744.78	747.00	72162	0.00	0.13	0.6	0.2
BMP	Pond	BASE	29.27	744.78	747.00	72158	0.00	0.13	0.6	0.2
BMP	Pond	BASE	29.52	744.77	747.00	72154	0.00	0.12	0.6	0.2
BMP	Pond	BASE	29.77	744.77	747.00	72150	0.00	0.12	0.6	0.2
BMP	Pond	BASE	30.02	744.77	747.00	72146	0.00	0.12	0.6	0.2
BMP	Pond	BASE	30.27	744.77	747.00	72142	0.00	0.12	0.6	0.2
BMP	Pond	BASE	30.52	744.77	747.00	72138	0.00	0.12	0.6	0.2
BMP	Pond	BASE	30.77	744.77	747.00	72134	0.00	0.12	0.6	0.2
BMP	Pond	BASE	31.02	744.76	747.00	72130	0.00	0.12	0.6	0.2
BMP	Pond	BASE	31.27	744.76	747.00	72126	0.00	0.12	0.6	0.2
BMP	Pond	BASE	31.52	744.76	747.00	72122	0.00	0.11	0.6	0.2
BMP	Pond	BASE	31.77	744.76	747.00	72119	0.00	0.11	0.6	0.2
BMP	Pond	BASE	32.02	744.76	747.00	72115	0.00	0.11	0.6	0.2
BMP	Pond	BASE	32.27	744.76	747.00	72111	0.00	0.11	0.6	0.2
BMP	Pond	BASE	32.52	744.76	747.00	72108	0.00	0.11	0.6	0.2
BMP	Pond	BASE	32.77	744.75	747.00	72104	0.00	0.11	0.6	0.2
BMP	Pond	BASE	33.02	744.75	747.00	72101	0.00	0.11	0.6	0.2
BMP	Pond	BASE	33.27	744.75	747.00	72097	0.00	0.11	0.6	0.2
BMP	Pond	BASE	33.52	744.75	747.00	72094	0.00	0.11	0.6	0.2
BMP	Pond	BASE	33.77	744.75	747.00	72090	0.00	0.10	0.6	0.2
BMP	Pond	BASE	34.02	744.75	747.00	72087	0.00	0.10	0.6	0.2
BMP	Pond	BASE	34.27	744.75	747.00	72084	0.00	0.10	0.6	0.2
BMP	Pond	BASE	34.52	744.75	747.00	72080	0.00	0.10	0.6	0.2
BMP	Pond	BASE	34.77	744.74	747.00	72077	0.00	0.10	0.6	0.2
BMP	Pond	BASE	35.02	744.74	747.00	72074	0.00	0.10	0.6	0.2
BMP	Pond	BASE	35.27	744.74	747.00	72071	0.00	0.10	0.6	0.2
BMP	Pond	BASE	35.52	744.74	747.00	72067	0.00	0.10	0.6	0.2
BMP	Pond	BASE	35.77	744.74	747.00	72064	0.00	0.10	0.6	0.2
BMP	Pond	BASE	36.02	744.74	747.00	72061	0.00	0.10	0.6	0.2
BMP	Pond	BASE	36.27	744.74	747.00	72058	0.00	0.09	0.6	0.2
BMP	Pond	BASE	36.52	744.74	747.00	72055	0.00	0.09	0.6	0.2
BMP	Pond	BASE	36.77	744.73	747.00	72052	0.00	0.09	0.6	0.2
BMP	Pond	BASE	37.02	744.73	747.00	72049	0.00	0.09	0.6	0.2
BMP	Pond	BASE	37.27	744.73	747.00	72046	0.00	0.09	0.6	0.2
BMP	Pond	BASE	37.52	744.73	747.00	72043	0.00	0.09	0.6	0.2
BMP	Pond	BASE	37.77	744.73	747.00	72040	0.00	0.09	0.6	0.2
BMP	Pond	BASE	38.02	744.73	747.00	72037	0.00	0.09	0.6	0.2
BMP	Pond	BASE	38.27	744.73	747.00	72034	0.00	0.09	0.6	0.2
BMP	Pond	BASE	38.52	744.73	747.00	72031	0.00	0.09	0.6	0.2
BMP	Pond	BASE	38.77	744.73	747.00	72028	0.00	0.09	0.6	0.2
BMP	Pond	BASE	39.02	744.72	747.00	72026	0.00	0.09	0.6	0.2
BMP	Pond	BASE	39.27	744.72	747.00	72023	0.00	0.08	0.6	0.2
BMP	Pond	BASE	39.52	744.72	747.00	72020	0.00	0.08	0.6	0.2
BMP	Pond	BASE	39.77	744.72	747.00	72017	0.00	0.08	0.6	0.2
BMP	Pond	BASE	40.02	744.72	747.00	72015	0.00	0.08	0.6	0.2
BMP	Pond	BASE	40.27	744.72	747.00	72012	0.00	0.08	0.6	0.2
BMP	Pond	BASE	40.52	744.72	747.00	72009	0.00	0.08	0.6	0.2
BMP	Pond	BASE	40.77	744.72	747.00	72007	0.00	0.08	0.6	0.2
BMP	Pond	BASE	41.02	744.72	747.00	72004	0.00	0.08	0.6	0.3
BMP	Pond	BASE	41.27	744.72	747.00	72001	0.00	0.08	0.6	0.3
BMP	Pond	BASE	41.52	744.71	747.00	71999	0.00	0.08	0.6	0.3
BMP	Pond	BASE	41.77	744.71	747.00	71996	0.00	0.08	0.6	0.3
BMP	Pond	BASE	42.02	744.71	747.00	71994	0.00	0.08	0.6	0.3
BMP	Pond	BASE	42.27	744.71	747.00	71991	0.00	0.08	0.6	0.3
BMP	Pond	BASE	42.52	744.71	747.00	71989	0.00	0.08	0.6	0.3

JLM
10-5-12
BMP Time Series

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
BMP	Pond	BASE	42.77	744.71	747.00	71986	0.00	0.08	0.6	0.3
BMP	Pond	BASE	43.02	744.71	747.00	71984	0.00	0.07	0.6	0.3
BMP	Pond	BASE	43.27	744.71	747.00	71981	0.00	0.07	0.6	0.3
BMP	Pond	BASE	43.52	744.71	747.00	71979	0.00	0.07	0.6	0.3
BMP	Pond	BASE	43.77	744.71	747.00	71977	0.00	0.07	0.6	0.3
BMP	Pond	BASE	44.02	744.71	747.00	71974	0.00	0.07	0.6	0.3
BMP	Pond	BASE	44.27	744.70	747.00	71972	0.00	0.07	0.6	0.3
BMP	Pond	BASE	44.52	744.70	747.00	71970	0.00	0.07	0.6	0.3
BMP	Pond	BASE	44.77	744.70	747.00	71967	0.00	0.07	0.6	0.3
BMP	Pond	BASE	45.02	744.70	747.00	71965	0.00	0.07	0.6	0.3
BMP	Pond	BASE	45.27	744.70	747.00	71963	0.00	0.07	0.6	0.3
BMP	Pond	BASE	45.52	744.70	747.00	71960	0.00	0.07	0.6	0.3
BMP	Pond	BASE	45.77	744.70	747.00	71958	0.00	0.07	0.6	0.3
BMP	Pond	BASE	46.02	744.70	747.00	71956	0.00	0.07	0.6	0.3
BMP	Pond	BASE	46.27	744.70	747.00	71954	0.00	0.07	0.6	0.3
BMP	Pond	BASE	46.52	744.70	747.00	71952	0.00	0.07	0.6	0.3
BMP	Pond	BASE	46.77	744.70	747.00	71949	0.00	0.07	0.6	0.3
BMP	Pond	BASE	47.02	744.69	747.00	71947	0.00	0.07	0.6	0.3
BMP	Pond	BASE	47.27	744.69	747.00	71945	0.00	0.06	0.6	0.3
BMP	Pond	BASE	47.52	744.69	747.00	71943	0.00	0.06	0.6	0.3
BMP	Pond	BASE	47.77	744.69	747.00	71941	0.00	0.06	0.6	0.3
BMP	Pond	BASE	48.01	744.69	747.00	71939	0.00	0.06	0.6	0.3

PEAK ELEVATION TIME
+24 HOURS
0.3 AC*FT
REMAINING
0.12 REQUIRED
ADEQUATE

Job #11191R
Hydrology and Hydraulic Study of
City of Franklin Spec Building
Sept. 2012
Revised: October 5, 2012

EMERGENCY OVERFLOW CALCULATIONS

BANNING ENGINEERING

Worksheet for Pressure Pipe - 1

Project Description

Friction Method	Manning Formula
Solve For	Elevation at 1

Input Data

Pressure 1	0.00	psi
Pressure 2	0.00	psi
Elevation 2	744.60	ft
Length	598.00	ft
Roughness Coefficient	0.012	
Diameter	2.50	ft
Discharge	25.65	ft^3/s

X2 = 51.30 CFS REQUIRED

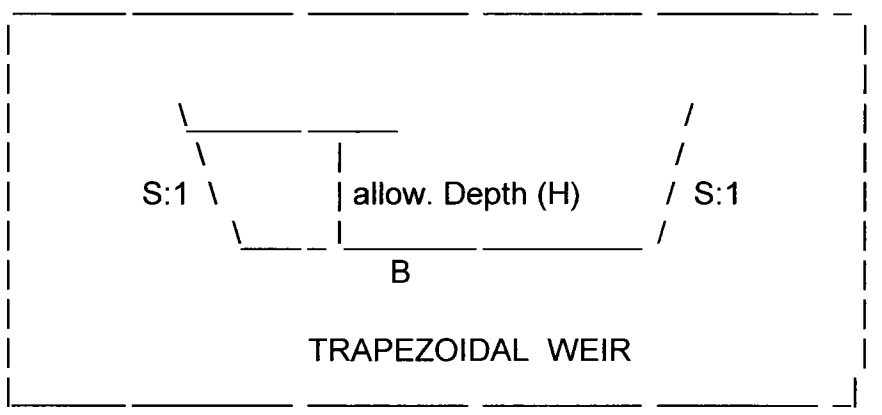
Results

Elevation 1	746.59	ft
Headloss	1.99	ft
Energy Grade 1	747.02	ft
Energy Grade 2	745.02	ft
Hydraulic Grade 1	746.59	ft
Hydraulic Grade 2	744.60	ft
Flow Area	4.91	ft^2
Wetted Perimeter	7.85	ft
Velocity	5.23	ft/s
Velocity Head	0.42	ft
Friction Slope	0.00333	ft/ft

WEIR CAPACITY

PROJECT NAME: Franklin Building
DESIGNER: JLM
DATE: 10/5/2012
JOB No.: 11191R

Purpose: To compute the maximum discharge for a weir section and compare it to the requied design discharge.



INPUT:

Enter Weir No. :	Pond Overflow	
Enter Bottom Width, (B):	30	ft.
Enter Side Slopes, (S):	4 : 1	
Enter Allowable Depth (H):	0.65	ft.

OUTPUT CALCULATIONS:

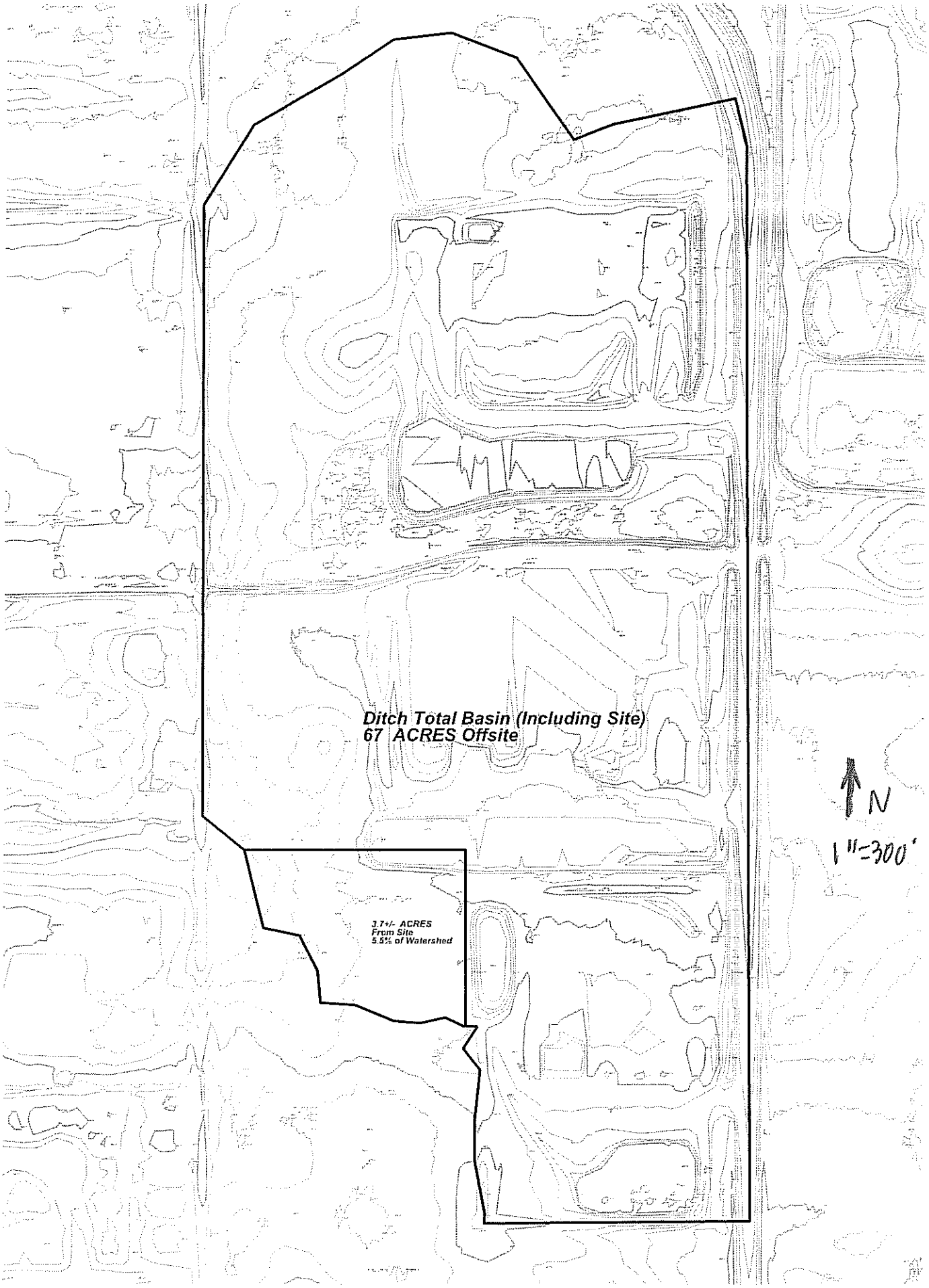
Area :	21.19	sft.	
Velocity :	2.50	fps.	
Discharge :	52.9	cfs.	Q=3.367(b)(H)^(3/2) Cipolletti Weir Equation

SUMMARY:

Pond Inflow :	41.04	
Design Discharge :	51	cfs.
Maximum Discharge :	53	cfs.

SATISFACTORY

DITCH CAPACITY


Ditch Total Basin (Including Site)
67 ACRES Offsite
3.7+/- ACRES
From Site
5.5% of Watershed
N
1"=300'

Worksheet for Trapezoidal Channel - 1

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.030	← UPDATED CORRECTED n-VALUE
Channel Slope	0.00200	ft/ft
Normal Depth	3.00	ft
Left Side Slope	5.50	ft/ft (H:V)
Right Side Slope	6.00	ft/ft (H:V)
Bottom Width	5.00	ft

Results

Discharge	207.95	ft^3/s ← UPDATED DITCH CAPACITY
Flow Area	66.75	ft^2
Wetted Perimeter	40.02	ft
Top Width	39.50	ft
Critical Depth	2.02	ft
Critical Slope	0.01258	ft/ft
Velocity	3.12	ft/s
Velocity Head	0.15	ft
Specific Energy	3.15	ft
Froude Number	0.42	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.00	ft
Critical Depth	2.02	ft
Channel Slope	0.00200	ft/ft
Critical Slope	0.01258	ft/ft

JLM
10-26-12
Predeveloped Ditch Watershed
10-Year

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
Outlet	BASEhuff_010yr_01hr		0.00	730.00	746.00	0.00	0	1.17	33.51	0.00	0.00
Outlet	BASEhuff_010yr_02hr		0.00	730.00	746.00	0.00	0	1.83	29.87	0.00	0.00
Outlet	BASEhuff_010yr_03hr		0.00	730.00	746.00	0.00	0	2.50	24.33	0.00	0.00
Outlet	BASEhuff_010yr_06hr		0.00	730.00	746.00	0.00	0	2.00	20.90	0.00	0.00
Outlet	BASEhuff_010yr_12hr		0.00	730.00	746.00	0.00	0	5.67	19.13	0.00	0.00
Outlet	BASEhuff_010yr_24hr		0.00	730.00	746.00	0.00	0	16.75	16.98	0.00	0.00

$\frac{33.51 CFS}{67 AC} = 0.50 CFS/AC$

$0.50 \times 3.7 AC = 1.85 CFS$

THIS FLOW IS GREATER THAN THE POST DEVELOPED 100-YEAR FLOW FROM SITE.

JLM
10-25-12
Predeveloped Ditch Watershed
100-Year

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
Outlet	BASEhuff_100yr_01hr	0.00	730.00	746.00	0.00	0	1.08	82.77	0.00	0.00
Outlet	BASEhuff_100yr_02hr	0.00	730.00	746.00	0.00	0	1.08	67.55	0.00	0.00
Outlet	BASEhuff_100yr_03hr	0.00	730.00	746.00	0.00	0	1.25	63.67	0.00	0.00
Outlet	BASEhuff_100yr_06hr	0.00	730.00	746.00	0.00	0	1.83	51.47	0.00	0.00
Outlet	BASEhuff_100yr_12hr	0.00	730.00	746.00	0.00	0	5.50	39.89	0.00	0.00
Outlet	BASEhuff_100yr_24hr	0.00	730.00	746.00	0.00	0	16.75	32.12	0.00	0.00

$\frac{82.7 \text{ CFS}}{67 \text{ AC}} = 1.23 \text{ CFS/AC}$

$1.23 \times 3.7 \text{ AC} = 4.57 \text{ CFS}$

THIS FLOW IS GREATER THAN THE POST DEVELOPED 100-YEAR FLOW FROM SITE

11191R
Johnson County Spec Building
Johnson County, Indiana

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Ditch							
SHEET	100	0.0070	0.170				0.279
SHALLOW	1330	0.0050	0.050				0.324
CHANNEL	1770					3.000	0.164
					Time of Concentration		0.767

11191R
Johnson County Spec Building
Johnson County, Indiana

Sub-Area Land Use and Curve Number Details

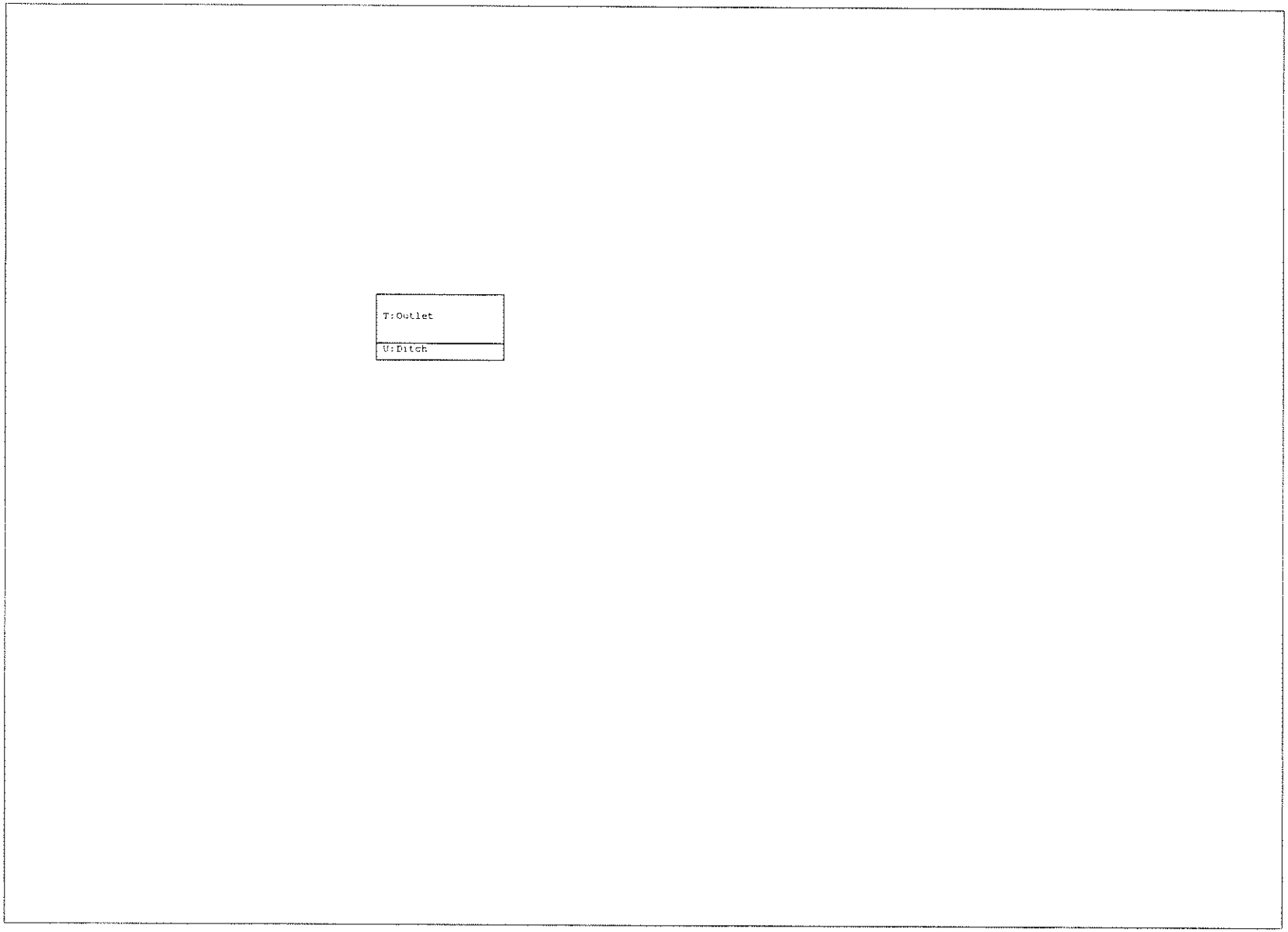
Sub-Area Identifier	Land Use			Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Ditch	Row Crop	SR + Crop residue	(good)	B	40.2	75
	Row Crop	SR + Crop residue	(good)	C	26.8	82
	Total Area / Weighted Curve Number				67	78

JLM
10-25-12
Predeveloped Ditch Watershed
Node Schematic

Nodes
A Stage/Area
V Stage/Volume
T Time/Stage
M Manhole

Basins
O Overland Flow
U SCS Unit CN
S SBUH CN
Y SCS Unit GA
Z SBUH GA

Links
P Pipe
W Weir
C Channel
D Drop Structure
B Bridge
R Rating Curve
H Breach
E Percolation
F Filter
X Exfil Trench



JLM
10-25-12
Predeveloped Ditch Watershed
ICPR Input

```
================================================================================
==== Basins ====================================================================
================================================================================

         Name: Ditch                    Node: Outlet                 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): 46.00
            Area(ac): 67.000                  Time Shift(hrs): 0.00
        Curve Number: 78.00             Max Allowable Q(cfs): 999999.000
             DCIA(%): 0.00


================================================================================
==== Nodes =====================================================================
================================================================================

      Name: Outlet              Base Flow(cfs): 0.000          Init Stage(ft): 730.000
     Group: BASE                                              Warn Stage(ft): 746.000
      Type: Time/Stage


      Time(hrs)       Stage(ft)
--------------- ---------------
           0.00         730.000
          60.00         730.000

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

         Name: huff_002yr_01hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_002yr_01hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 1.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 1.37

Time(hrs)       Print Inc(min)
--------------- ---------------
2.000           5.00

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

         Name: huff_002yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_002yr_02hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 2.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 1.69

Time(hrs)       Print Inc(min)
--------------- ---------------
4.000           5.00

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

         Name: huff_002yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_002yr_03hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 3.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 1.87

Time(hrs)       Print Inc(min)
--------------- ---------------
6.000           5.00

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

         Name: huff_002yr_06hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_002yr_06hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 6.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 2.19
```

JLM
10-25-12
Predeveloped Ditch Watershed
ICPR Input

Time(hrs)	Print Inc(min)
10.000	10.00

Name: huff_002yr_12hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_002yr_12hr.R32

Override Defaults: Yes
Storm Duration(hrs): 12.00
Rainfall File: Huff-indy2-50
Rainfall Amount(in): 2.54

Time(hrs)	Print Inc(min)
20.000	10.00

Name: huff_002yr_24hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_002yr_24hr.R32

Override Defaults: Yes
Storm Duration(hrs): 24.00
Rainfall File: huff_indy3-50
Rainfall Amount(in): 2.92

Time(hrs)	Print Inc(min)
30.000	15.00

Name: huff_010yr_01hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_010yr_01hr.R32

Override Defaults: Yes
Storm Duration(hrs): 1.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 2.00

Time(hrs)	Print Inc(min)
2.000	5.00

Name: huff_010yr_02hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_010yr_02hr.R32

Override Defaults: Yes
Storm Duration(hrs): 2.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 2.46

Time(hrs)	Print Inc(min)
4.000	5.00

Name: huff_010yr_03hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_010yr_03hr.R32

Override Defaults: Yes
Storm Duration(hrs): 3.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 2.72

Time(hrs)	Print Inc(min)
6.000	5.00

Name: huff_010yr_06hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_010yr_06hr.R32

Override Defaults: Yes
Storm Duration(hrs): 6.00
Rainfall File: Huff-indy1-50
Rainfall Amount(in): 3.19

Time(hrs)	Print Inc(min)
10.000	10.00

```
         Name: huff_010yr_12hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_010yr_12hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 12.00
          Rainfall File: Huff-indy2-50
    Rainfall Amount(in): 3.70

Time(hrs)       Print Inc(min)
--------------- ---------------
20.000          10.00

-------------------------------------------------------------------------------------------------------------
         Name: huff_010yr_24hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_010yr_24hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: huff_indy3-50
    Rainfall Amount(in): 4.25

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          15.00

-------------------------------------------------------------------------------------------------------------
         Name: huff_100yr_01hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_100yr_01hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 1.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 3.21

Time(hrs)       Print Inc(min)
--------------- ---------------
2.000           5.00

-------------------------------------------------------------------------------------------------------------
         Name: huff_100yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_100yr_02hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 2.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 3.97

Time(hrs)       Print Inc(min)
--------------- ---------------
4.000           5.00

-------------------------------------------------------------------------------------------------------------
         Name: huff_100yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_100yr_03hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 3.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 4.38

Time(hrs)       Print Inc(min)
--------------- ---------------
6.000           5.00

-------------------------------------------------------------------------------------------------------------
         Name: huff_100yr_06hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_100yr_06hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 6.00
          Rainfall File: Huff-indy1-50
    Rainfall Amount(in): 5.13

Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.00

-------------------------------------------------------------------------------------------------------------
         Name: huff_100yr_12hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_100yr_12hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 12.00
```

```
          Rainfall File: Huff-indy2-50
    Rainfall Amount(in): 5.95

Time(hrs)       Print Inc(min)
--------------- ---------------
20.000          10.00

-------------------------------------------------------------------------------------------------------------
         Name: huff_100yr_24hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_100yr_24hr.R32

      Override Defaults: Yes
    Storm Duration(hrs): 24.00
          Rainfall File: huff_indy3-50
    Rainfall Amount(in): 6.84

Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          15.00

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

         Name: huff_002yr_01hr     Hydrology Sim: huff_002yr_01hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_002yr_01hr.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): 5.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
5.000           10.000

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


-------------------------------------------------------------------------------------------------------------
         Name: huff_002yr_02hr     Hydrology Sim: huff_002yr_02hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_002yr_02hr.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): 6.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
       Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
1.000           5.000
6.000           10.000

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


-------------------------------------------------------------------------------------------------------------
         Name: huff_002yr_03hr     Hydrology Sim: huff_002yr_03hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_002yr_03hr.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): 10.00
```

```
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages:                        Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
10.000          10.000

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

-------------------------------------------------------------------------------------------------------
         Name: huff_002yr_06hr     Hydrology Sim: huff_002yr_06hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_002yr_06hr.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): 15.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages:                        Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
15.000          10.000

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

-------------------------------------------------------------------------------------------------------
         Name: huff_002yr_12hr     Hydrology Sim: huff_002yr_12hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_002yr_12hr.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): 30.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages:                        Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          10.000

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

-------------------------------------------------------------------------------------------------------
         Name: huff_002yr_24hr     Hydrology Sim: huff_002yr_24hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_002yr_24hr.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): 60.00
     Min Calc Time(sec): 0.5000              Max Calc Time(sec): 60.0000
        Boundary Stages:                        Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
60.000          15.000

Group           Run
--------------- -----
```

BASE Yes

Name: huff_010yr_01hr Hydrology Sim: huff_010yr_01hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_010yr_01hr.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): 5.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
1.000	5.000
5.000	10.000

Group	Run
BASE	Yes

Name: huff_010yr_02hr Hydrology Sim: huff_010yr_02hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_010yr_02hr.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): 6.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
1.000	5.000
6.000	10.000

Group	Run
BASE	Yes

Name: huff_010yr_03hr Hydrology Sim: huff_010yr_03hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_010yr_03hr.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): 10.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
10.000	10.000

Group	Run
BASE	Yes

Name: huff_010yr_06hr Hydrology Sim: huff_010yr_06hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_010yr_06hr.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): 15.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
15.000          10.000

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

-------------------------------------------------------------------------------------------------------------
         Name: huff_010yr_12hr     Hydrology Sim: huff_010yr_12hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_010yr_12hr.132

      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): 30.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
30.000          10.000

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

-------------------------------------------------------------------------------------------------------------
         Name: huff_010yr_24hr     Hydrology Sim: huff_010yr_24hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_010yr_24hr.132

      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): 60.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


Time(hrs)       Print Inc(min)
--------------- ---------------
60.000          15.000

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

-------------------------------------------------------------------------------------------------------------
         Name: huff_100yr_01hr     Hydrology Sim: huff_100yr_01hr
     Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_100yr_01hr.132

      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): 5.00
     Min Calc Time(sec): 0.5000               Max Calc Time(sec): 60.0000
        Boundary Stages:                         Boundary Flows:


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

1.000	5.000
5.000	10.000

Group	Run
BASE	Yes

Name: huff_100yr_02hr Hydrology Sim: huff_100yr_02hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_100yr_02hr.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): 6.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
1.000	5.000
6.000	10.000

Group	Run
BASE	Yes

Name: huff_100yr_03hr Hydrology Sim: huff_100yr_03hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_100yr_03hr.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): 10.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
10.000	10.000

Group	Run
BASE	Yes

Name: huff_100yr_06hr Hydrology Sim: huff_100yr_06hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_100yr_06hr.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): 15.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
15.000	10.000

Group	Run
BASE	Yes

Name: huff_100yr_12hr Hydrology Sim: huff_100yr_12hr

Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_100yr_12hr.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): 30.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
30.000	10.000

Group	Run
BASE	Yes

Name: huff_100yr_24hr Hydrology Sim: huff_100yr_24hr
Filename: \\Fs-2\sdata\Projects\11191\drainage\icpr\ditch\huff_100yr_24hr.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): 60.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
60.000	15.000

Group	Run
BASE	Yes

BMP Operations and Maintenance Manual for City of Franklin Spec Building

Johnson County, IN

beacon™

Date Created: 9/7/2012

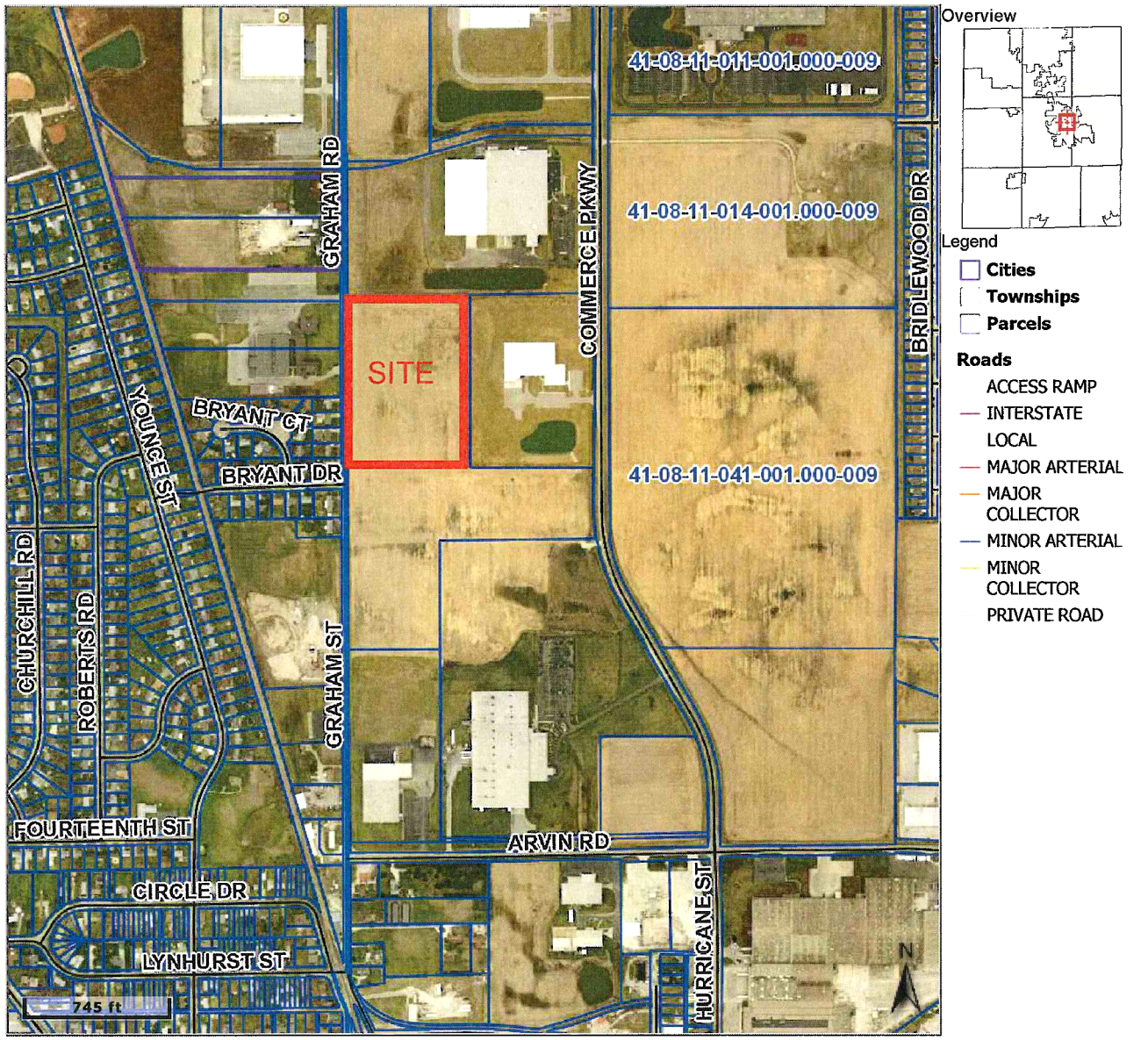


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Table of Contents

1. Administrative Information
   a. BMP Owner Information
   b. Cost Responsibility
   c. Right-of-Entry
2. BMP Locations
   a. Driving Directions
   b. BMP Location Map
3. Wet Ponds
   a. Description
   b. Landscaping
   c. Maintenance Considerations
   d. Maintenance Schedule
   e. Pond Details
4. References

1. Administrative Information:

BMP Owner Information

Name:
Primary Contact:
Street Address:
City/State/Zip Code:
Business Phone Number:
Cell Phone Number:
E-mail Address:

Cost Responsibility

As a condition of the City of Franklin, Subdivision Control Ordinance, it must be stated that any cost incurred during the maintenance of any of the following described Best Management Practices, BMPs, shall be incurred by the owner listed above. If at the time of this submittal no owner is listed, one shall be provided once construction of the BMP is completed. In the event that ownership changes, responsibility for maintaining the BMPs shall change accordingly. It is the responsibility of the preceding owner to pass the information contained within this document to the new owner.

Right-of-Entry

As a condition of the City of Franklin, Subdivision Control Ordinance, it must be stated that the owner declared above shall allow entry by City of Franklin personnel to inspect the BMPs described within this manual. City personnel shall be granted access when, and only when they are inspecting the BMPs.

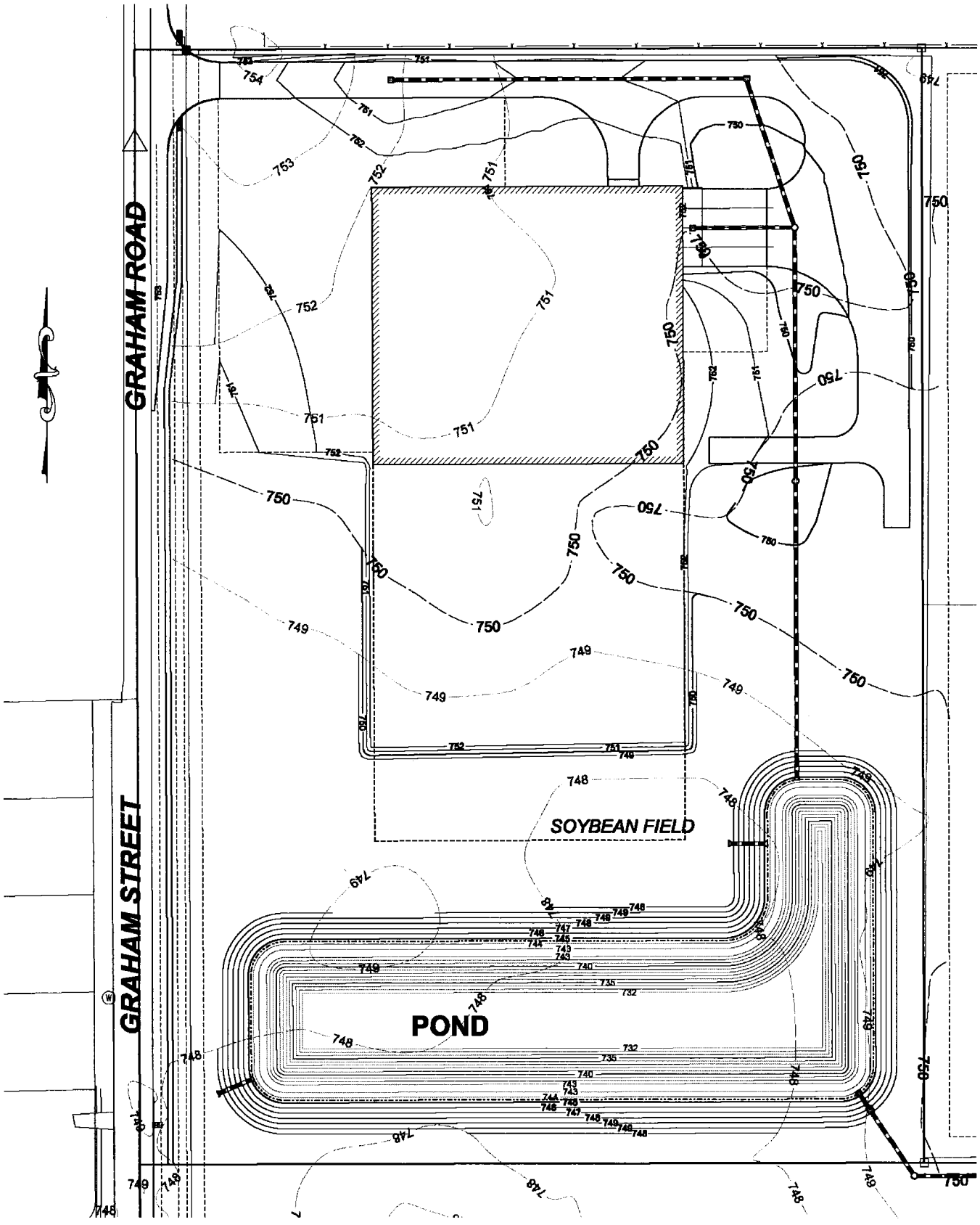
2. BMP Locations:

The project is located on the northeast corner of Graham Street and Bryant Drive in Franklin, Indiana.

Driving Directions

From the intersection of Arvin Road and Commerce Parkway in Franklin, Indiana travel west on Arvin Road approximately 1/3 mile to Graham Street. Turn north on Graham Street and travel approximately 1/3 mile. Pond is on the east side of Graham Street.

BMP Location Map:



3 Wet Ponds:

Description

The wet pond or retention pond is a facility which removes sediment, Biochemical Oxygen Demand (BOD), organic nutrients, and trace metals from stormwater runoff. This is accomplished by slowing down stormwater using an in-line permanent pool or pond effecting settling of pollutants. The wet pond is similar to a dry pond, except that a permanent volume of water is incorporated into the design. The drainage area should be such that an adequate base flow is maintained in the pond. Biological processes occurring in the permanent pond pool aid in reducing the amount of soluble nutrients present in the water, such as nitrate and ortho-phosphorus (Schueler, 1987)

Landscaping

Grass or other suitable vegetative cover shall be provided along the banks of the detention storage basin. Vegetative cover around detention facilities should be maintained as appropriate. The City will not be responsible for maintenance of the detention pond and bank slopes.

Maintenance Considerations

Regular maintenance and inspection practices are needed. The table below outlines these practices.

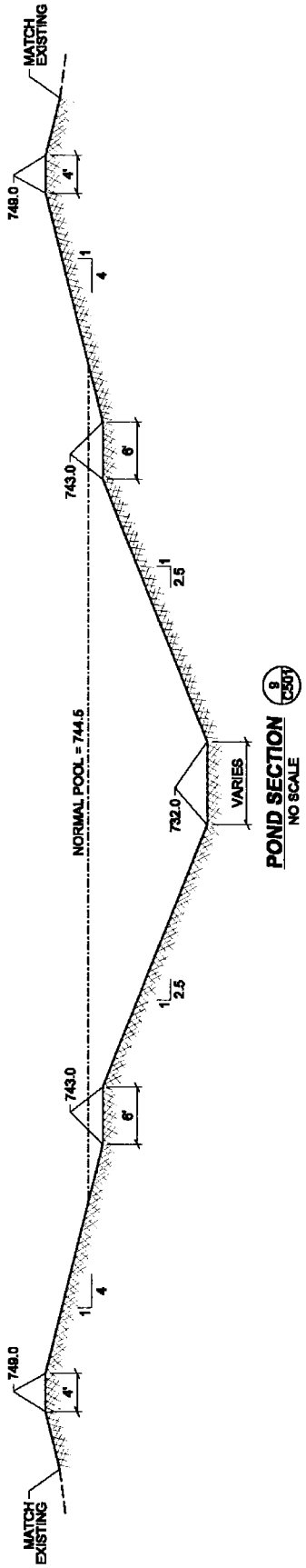
Activity	Schedule
• If wetland components are included, inspect for invasive vegetation.	Semi-annual inspection
• Inspect for damage. • Note signs of hydrocarbon build-up, and deal with appropriately. • Monitor for sediment accumulation in the facility and forebay. • Examine to ensure that inlet and outlet devices are free of debris and operational.	Annual inspection
• Repair undercut or eroded areas.	As needed maintenance
• Clean and remove debris from inlet and outlet structures. • Mow side slopes.	Monthly maintenance
• Manage and harvest wetland plants.	Annual maintenance (if needed)
• Remove sediment from pond.	5- to 7-year maintenance
• Monitor sediment accumulations, and remove sediment when the pool volume has become reduced significantly or the pond becomes eutrophic.	20- to 50-year maintenance

Maintenance Schedule Pond

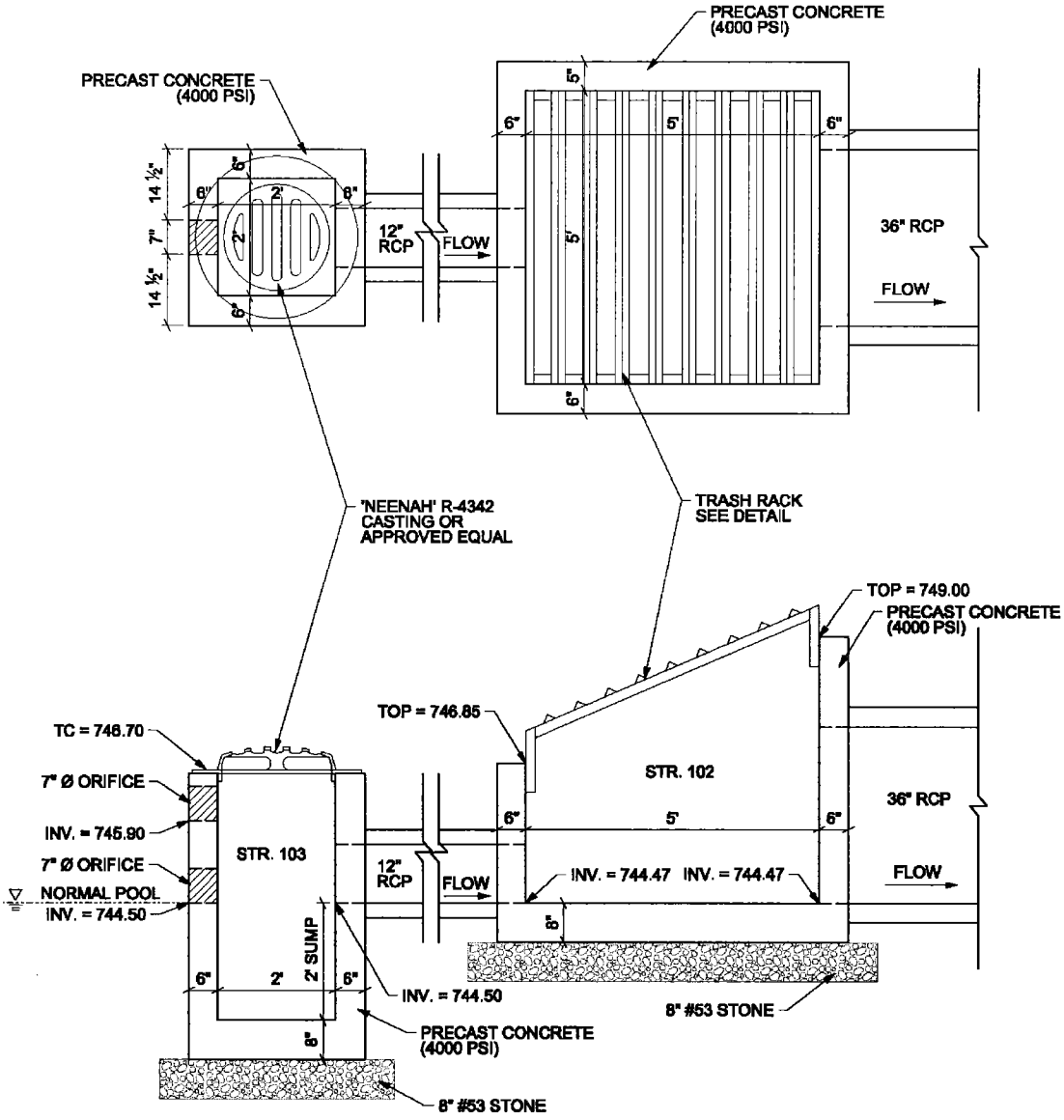
Date Installed:_____

Month After Installation	1	2	3	4	5	6	7	8	9	10	11	12
Clean and remove debris from inlet and outlet structures	X	X	X	X	X	X	X	X	X	X	X	X
Mow side slopes	X	X	X	X	X	X	X	X	X	X	X	X
Inspect for damage												X
Note signs of hydrocarbon build-up, and deal with appropriately												X
Inspect for invasive plant species and deal with appropriately						X						X

Pond Details, Pond Cross Section:



Pond Details, Pond Outlet:



STORM STRUCTURES 102 & 103 (13 / C501)
NO SCALE

5. References:

1) City of Franklin, Indiana Subdivision Control Ordinance
2) National Menu of Best Management Practices for Stormwater Phase II, July 2005, United States Environmental Protection Agency