

**FINAL DRAINAGE REPORT**  
**for**  
**AmeriQual Group LLC**  
**Vanderburgh County, Indiana**  
Project No.: 7296.1.003-B  
October 05, 2022

**Prepared For:**  
AmeriQual Group, LLC  
18200 US Hwy 41 N  
Evansville, IN 47725

**Prepared By:**  
Morley  
4800 Rosebud Ln.  
Newburgh, IN 47630  
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A handwritten signature in black ink, appearing to read "J. Elrod".

10/05/2022



**MORLEY**

ARCHITECTS | ENGINEERS | SURVEYORS

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## **Introduction**

AmeriQual Group is proposing a new truck loading area at the southwest end of the existing property. The site is located at 18200 Hwy 41 N, Evansville, IN and is within the Highway 41 Impacted Drainage Area. The site is within Section 29, Township 4 South, Range 10 West located in Scott Township, Vanderburgh County. Please refer to the location map provided within this report for further details.

## **Existing Conditions**

### **Site Conditions**

The site is an existing industrial site. The proposed area to be developed drains via sheet flow to the tributary of Pond Flat Ditch, south of the site. The current condition of the proposed site is gravel and lawn area with mild slopes.

### **Soils Information**

The Soil Survey of Vanderburgh County indicates the soils to be Birds silt loam (Bd) with 0 to 2 percent slopes, frequently flooded. Please refer to the attached soils map.

### **Floodplain Information**

The property lies within Zone AE. The site was scaled on the Flood Insurance Rate Map (FIRM) for Vanderburgh County, Indiana, Community Panel Number 18163C0045D, dated March 17, 2011. Please refer to the enclosed excerpt from this map.

## **Proposed Development**

The proposed project is the addition of pavement for a truck loading area, parking and a detention basin. The expected proposed impervious surface included within the development is approximately 16,600 SF.

### **The proposed design of the drainage control system**

The projected is within the Highway 41 Impacted Drainage Area, the basin was designed to hold a 100-year storm event.

The storm system is designed to closely replicate the existing drainage patterns while capturing a large portion of the runoff created from the site and discharging only a minimal amount of runoff undetained. Only a small portion along the east edge of the proposed improvements is expected to leave the site undetained to the south. Generally, these areas follow these drainage patterns in the existing condition.

The storm system is comprised of a dry detention basin with an outlet structure. In general, runoff from the proposed improvements will be directed to the basin via sheet flow. The basin will reduce the amount of post-developed runoff leaving the site to the allowable release rate, as determined by the associated pre-developed subbasins.



## Results of the Analysis

Analysis of the pre-developed site delineated one (1) subbasin, as shown on the pre-developed subbasin exhibit. The Time of Concentration calculations and  $Q_{10}$  values are shown for the pre-developed subbasin. Detailed calculations are included as an attachment.

Pre-Developed Subbasin:

- Area = 0.83 acres
- C = 0.48
- $T_c$  = 5.00 mins
- $Q_{10}$  = 2.65 CFS

For the analysis of post-developed runoff conditions, a 100-year storm event was analyzed. The storm water detention basin was sized for a 100-year storm event using the Form 800.

Once developed the project site will discharge most of its runoff into the dry basin. The detention basin will detain the stormwater runoff and slowly release it to the south towards the tributary of Pond Flat itch. A smaller area of the proposed development runoff will be undetained, the undetained runoff was accounted for in the calculation of the release rate from the detention basin.

- Developed undetained area = 0.1 acres
- Developed detained area = 0.73 acres
- Undetained runoff rate = 0.87 CFS
- Allowable Basin Release Rate = 1.78 CFS (2.65 CFS – 0.87 CFS)
- Actual Basin Release Rate = 1.63 CFS

## Basin Maintenance Report

This brief report will highlight the dry detention basins' design and maintenance in accordance with the latest Vanderburgh County Drainage Ordinance Section 13.04.440, Technical Memorandums and supplements. The dry basin slopes to the outlet structure and the water will discharge through the weir.

Maintenance of the basin shall include but is not limited to: mowing, removing debris and obstructions; removal of overgrown vegetation, mitigating erosion, and any other requirements set forth by the Vanderburgh County Drainage Board.

No tree limbs, trunks, refuse from legally burnt vegetation, nor construction waste, demolition materials, or other man-made material may be buried within the area in which an impounding structure will be located. Notice shall be placed on construction drawings noting the prohibition to the burying of any such materials.

**Maps showing individual drainage areas within the project subdivided for use in the analysis thereof**

All calculations, and exhibits are enclosed within this report.

**Summary**

The proposed development is truck loading area, parking and a detention basin. This report has provided analysis and proposed conditions which ultimately lessen the overall drainage impact of the project site.

Total Pre-Developed Release  $Q_{10} = 2.65$  CFS

Basins Developed Release  $Q_{100} = 1.63$  CFS

Undetained Developed Release  $Q_{100} = 0.87$  CFS

Total Developed Release  $Q_{100} = 2.50$  CFS

Overall, the developed project will release less stormwater runoff during the 100-year storm than its pre-developed area during the 10-year storm. The proposed improvements calculations meet and exceed the requirements for the Highway 41 Impacted Drainage Area.

# Vicinity Map

Approximate Project Site

US Hwy 41

41

US Hwy 41

41

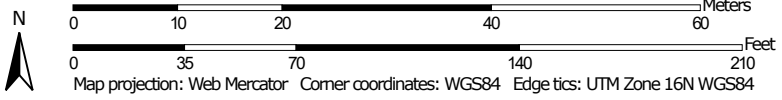


Soil Map—Vanderburgh County, Indiana



Soil Map may not be valid at this scale.

Map Scale: 1:723 if printed on A landscape (11" x 8.5") sheet.



### MAP LEGEND

**Area of Interest (AOI)**

 Area of Interest (AOI)




















**Soils**

 Soil Map Unit Polygons

 Soil Map Unit Lines


 Soil Map Unit Points

**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


**Water Features**

 Streams and Canals

**Transportation**

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

**Background**

 Aerial Photography

### MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

**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 map measurements.

Source of Map: Natural Resources Conservation Service  
 Web Soil Survey URL:  
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Vanderburgh County, Indiana  
 Survey Area Data: Version 21, Sep 9, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 24, 2020—Dec 9, 2020

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

## Map Unit Legend

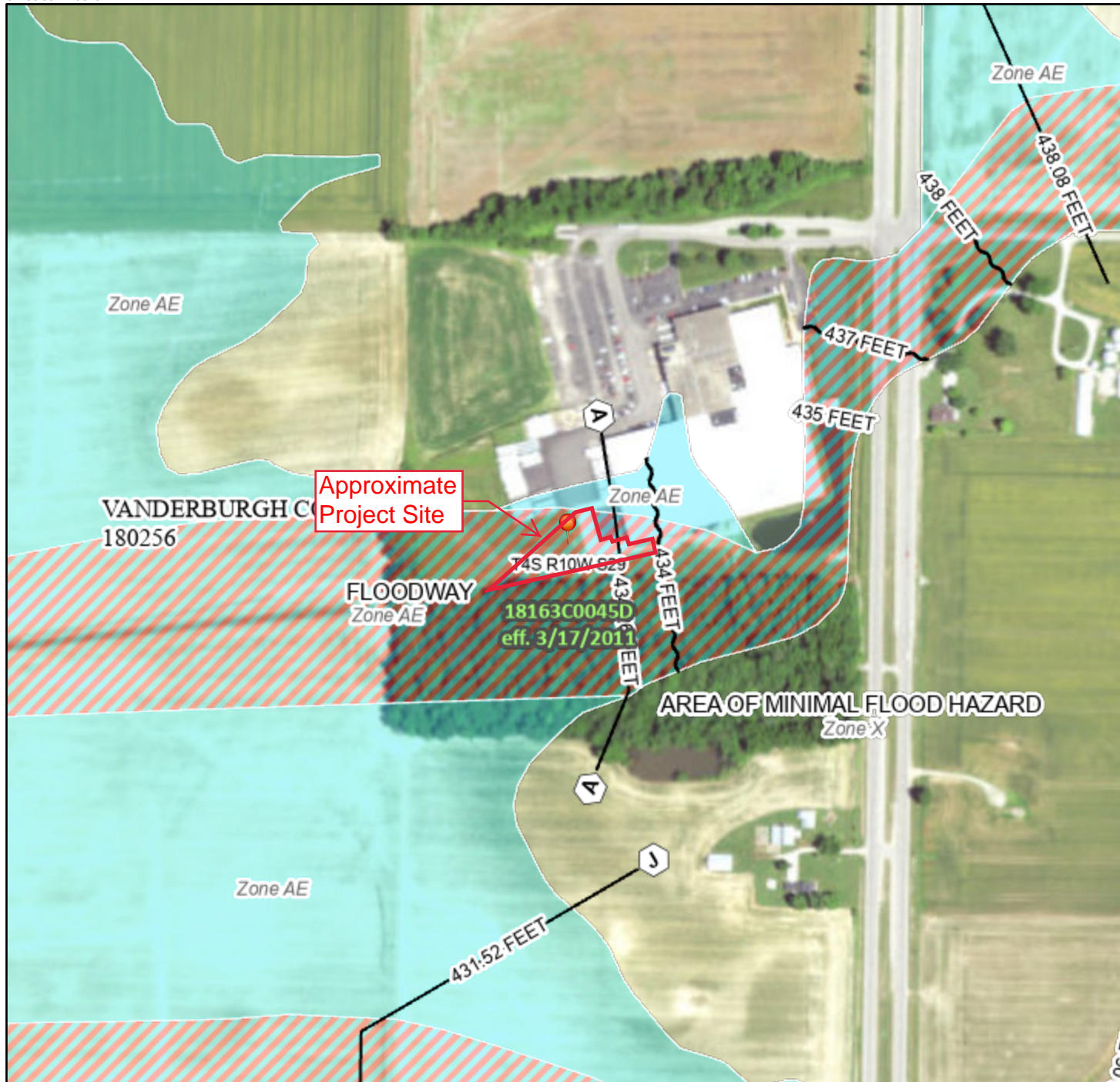
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Bd	Birds silt loam, 0 to 2 percent slopes, frequently flooded	0.8	100.0%
<b>Totals for Area of Interest</b>		<b>0.8</b>	<b>100.0%</b>



# National Flood Hazard Layer FIRMMette



87°33'33"W 38°8'47"N



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

- |                                    |  |   |
|------------------------------------|--|---|
| <b>SPECIAL FLOOD HAZARD AREAS</b>  |  | Without Base Flood Elevation (BFE)<br>Zone A, V, A99  |
|                                    |  | With BFE or Depth Zone AE, AO, AH, VE, AR   |
|                                    |  | Regulatory Floodway   |
| <b>OTHER AREAS OF FLOOD HAZARD</b> |  | 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X |
|                                    |  | Future Conditions 1% Annual Chance Flood Hazard Zone X  |
|                                    |  | Area with Reduced Flood Risk due to Levee. See Notes. Zone X  |
|                                    |  | Area with Flood Risk due to Levee Zone D  |
| <b>OTHER AREAS</b>                 |  | NO SCREEN Area of Minimal Flood Hazard Zone X   |
|                                    |  | Effective LOMRs   |
|                                    |  | Area of Undetermined Flood Hazard Zone D  |
| <b>GENERAL STRUCTURES</b>          |  | Channel, Culvert, or Storm Sewer  |
|                                    |  | Levee, Dike, or Floodwall   |
| <b>OTHER FEATURES</b>              |  | 20.2 Cross Sections with 1% Annual Chance Water Surface Elevation   |
|                                    |  | 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation   |
|                                    |  | Coastal Transect  |
|                                    |  | Base Flood Elevation Line (BFE)   |
|                                    |  | Limit of Study  |
|                                    |  | Jurisdiction Boundary   |
|                                    |  | Coastal Transect Baseline   |
|                                    |  | Profile Baseline  |
|                                    |  | Hydrographic Feature  |
| <b>MAP PANELS</b>                  |  | Digital Data Available  |
|                                    |  | No Digital Data Available   |
|                                    |  | Unmapped  |
- The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.



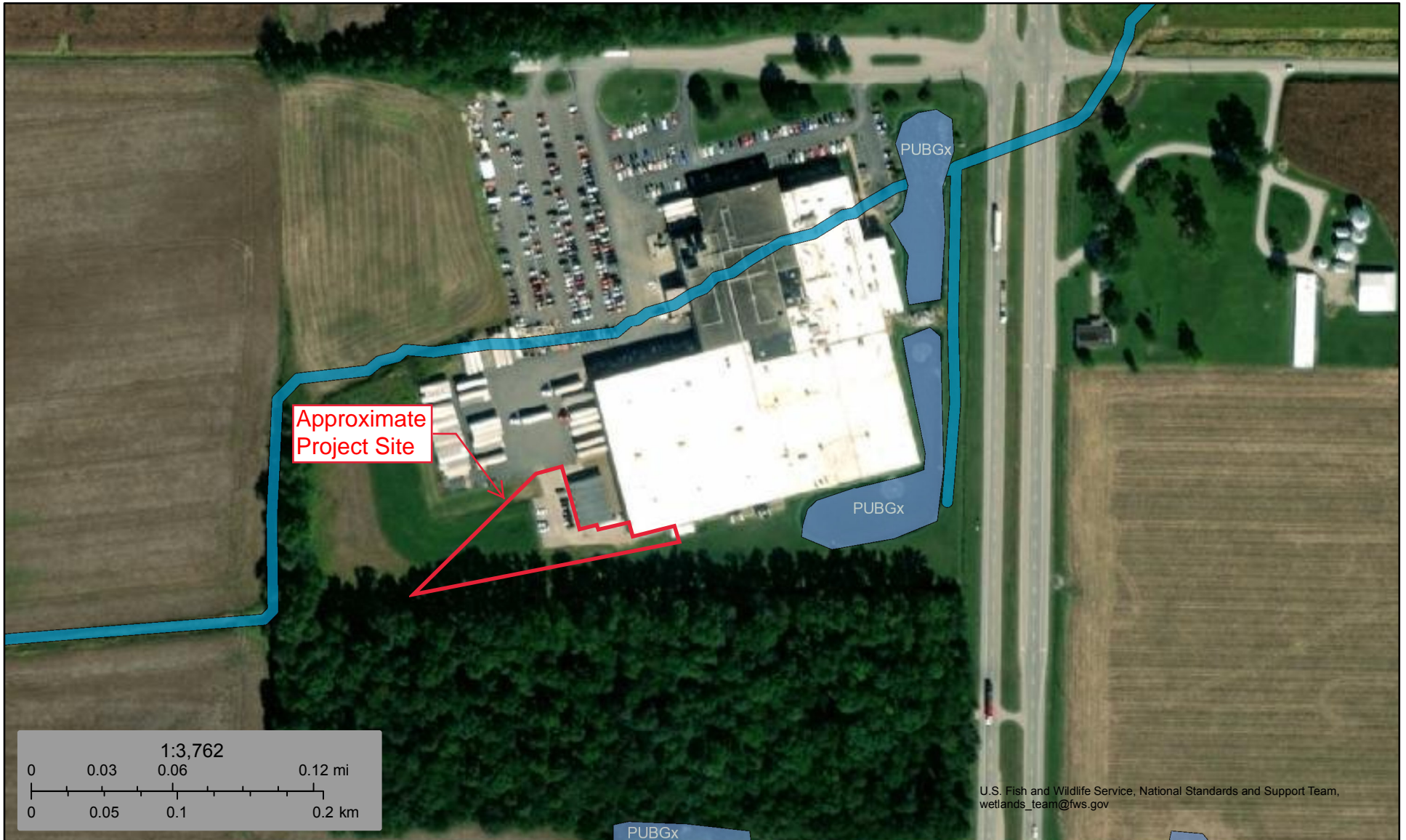
87°32'55"W 38°8'19"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards


The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/15/2022 at 9:57 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



September 15, 2022

### Wetlands

- |  |   |  |
|--|---|--|
|  Estuarine and Marine Deepwater |  Freshwater Emergent Wetland       |  Lake     |
|  Estuarine and Marine Wetland   |  Freshwater Forested/Shrub Wetland |  Other    |
|  |  Freshwater Pond                   |  Riverine |

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Map navigation controls: Zoom in (+), Zoom out (-), Home, Full Screen, etc.

Map navigation controls: Search, Layers, Full Screen, etc.

Approximate Project Site



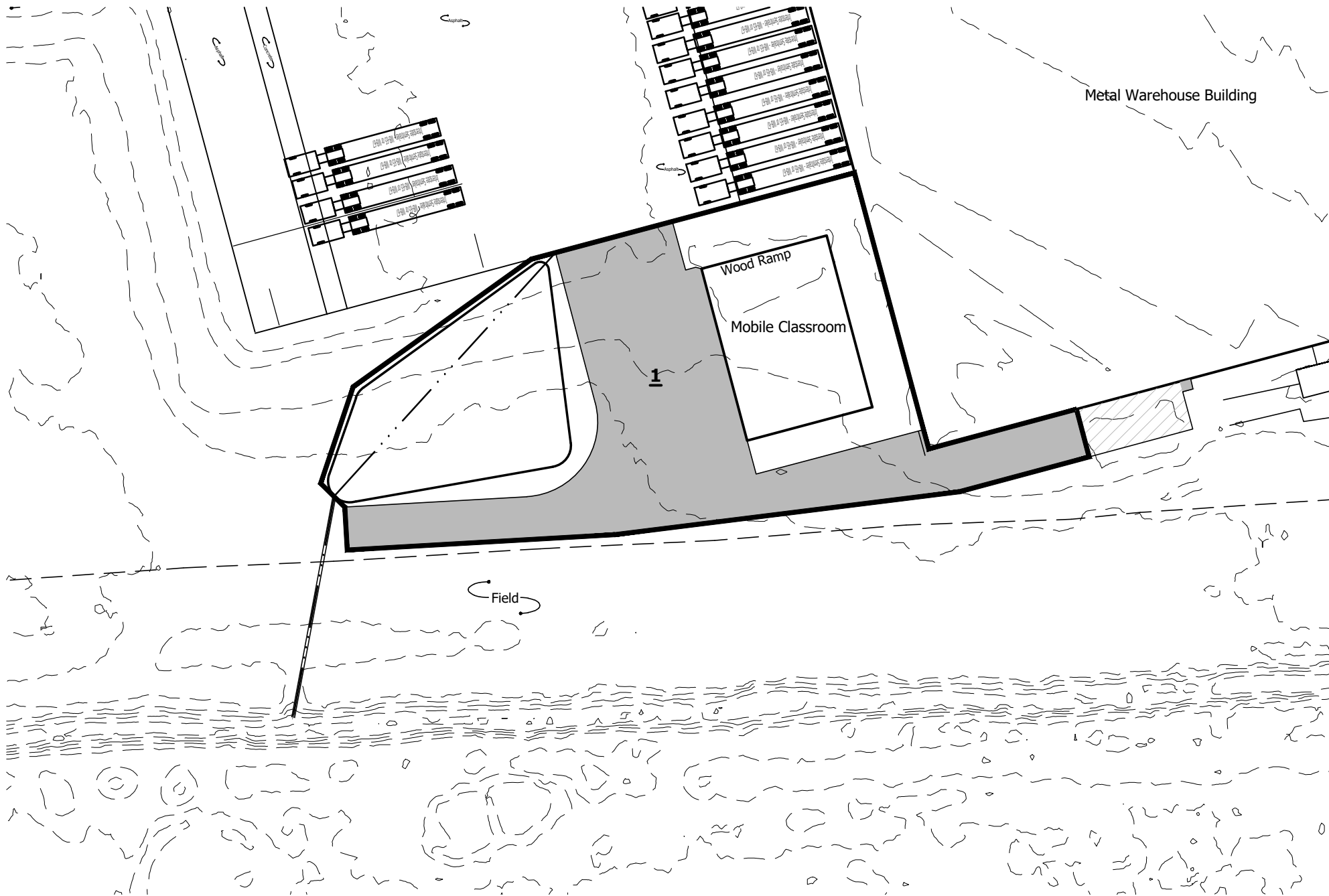
**Pond Flat Ditch-Headwaters**

Idem Huc14 Nrca Usda In Area	0
Perimeter	32917.09675
Inhu14	2289
Inhu14 Id	2339
Huc 8	05120113
Huc 11	05120113110
Huc 14	05120113110010
Hu Name	Pond Flat Ditch-Headwaters

Zoom to

Selected features:0

40 m  
200 ft



**Peak Runoff Calculation**

**Pre-Developed Site**

**Area (Ac) = 0.83                      Area (Sf) = 35,953**

**Weighted Runoff Coefficient**

Surface	Area		=			c	A*c
Structures & Pavement (<2%)	1,429	S.F.	=	0.03	AC.	0.92	0.03
Structures & Pavement (2-5%)		S.F.	=	0.00	AC.	0.94	0.00
Structures & Pavement (5-10%)		S.F.	=	0.00	AC.	0.96	0.00
Structures & Pavement (>10%)	5,010	S.F.	=	0.12	AC.	0.98	0.11
Gravel (25 yr Storm)		S.F.	=	0.00	AC.	0.60	0.00
Gravel (50-100 yr Storm)	11,736	S.F.	=	0.27	AC.	0.65	0.18
Lawn (<2%)	4,434	S.F.	=	0.10	AC.	0.15	0.02
Lawn (2-5%)	2,558	S.F.	=	0.06	AC.	0.25	0.01
Lawn (5-10%)		S.F.	=	0.00	AC.	0.40	0.00
Lawn (>10%)		S.F.	=	0.00	AC.	0.55	0.00
Woodland Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Woodland Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Woodland Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Woodland Hilly (10-30%)		S.F.	=	0.00	AC.	0.48	0.00
Pasture Flat (<2%)		S.F.	=	0.00	AC.	0.12	0.00
Pasture Flat (2-5%)		S.F.	=	0.00	AC.	0.24	0.00
Pasture Rolling (5-10%)		S.F.	=	0.00	AC.	0.36	0.00
Pasture Hilly (>10%)		S.F.	=	0.00	AC.	0.48	0.00
Cultivated (<2%)	10,786	S.F.	=	0.25	AC.	0.20	0.05
Cultivated (2-5%)		S.F.	=	0.00	AC.	0.35	0.00
Cultivated (5-10%)		S.F.	=	0.00	AC.	0.50	0.00
Cultivated (>10%)		S.F.	=	0.00	AC.	0.65	0.00
Bare Soil		S.F.	=	0.00	AC.	0.72	0.00
Water		S.F.	=	0.00	AC.	1.00	0.00
				0.83			0.40

**Wc = 0.48**

**Time of Concentration**

Overland Flow

Length, L (max 300ft) = 91 feet                       $t_o$  = Overland Flow Tc  
 Slope, S = 1.70%                       $t_o$  =  $[0.42 * (L^{0.8}) * (n^{0.8})] / [P^{0.5} * (S^{0.4})]$   
 Manning Coefficient, n = 0.035                       $t_o$  = 2.98 min  
 $P_{2/24}$  = 3.3

Shallow Flow

Length, L (Paved or Unpaved) Unpaved = 0 feet                       $V$  =  $16.1345 * (S^{0.5})$   
 Slope, S = 1.00%                      = 1.613 ft/s = 96.81 ft/min  
 Velocity, V = 1.61 ft/sec                       $t_s$  = Shallow Flow Tc  
     $t_s$  = (L/V) = 0.00 min

Shallow Flow

Length, L (Paved or Unpaved) Unpaved = 0 feet                       $V$  =  $16.1345 * (S^{0.5})$   
 Slope, S = 1.00%                      = 1.613 ft/s = 96.81 ft/min  
 Velocity, V = 1.61 ft/sec                       $t_s$  = Shallow Flow Tc  
     $t_s$  = (L/V) = 0.00 min

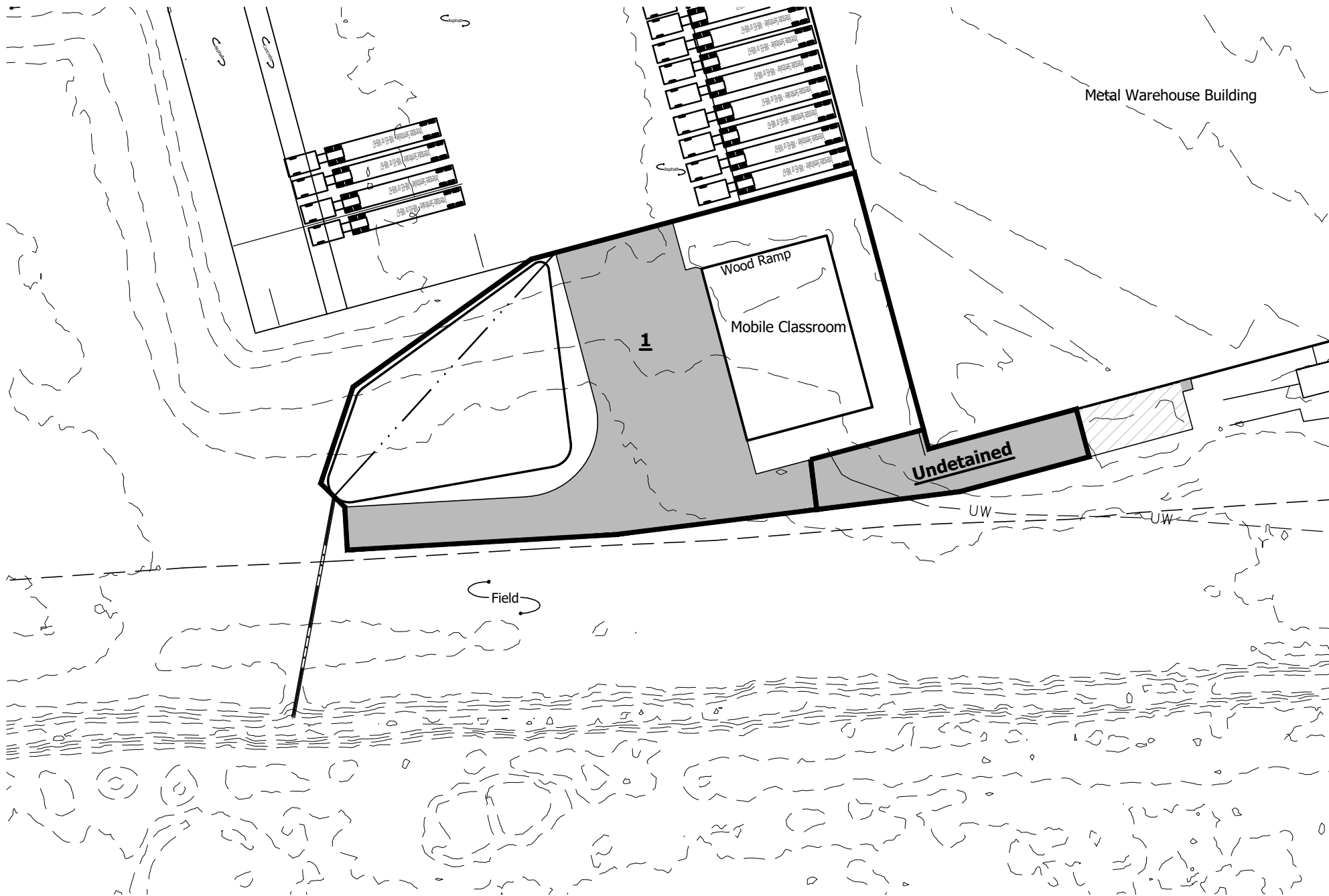
$t$  = Total Time of Concentration  
 $t$  =  $\Sigma t_o + \Sigma t_s + \Sigma t_c$   
 $t$  = 2.98 (Min 5 Minutes)  
    0.05  
    Hour

**Intensity (Vanderburgh Co.)**

$I_2$  = 5.02 in/hr  
 $I_{10}$  = 6.66 in/hr  
 $I_{25}$  = 7.81 in/hr  
 $I_{100}$  = 9.95 in/hr

**Peak Runoff Rate**

$Q_{yr} = CiA$   
 $Q_2$  = 2.00 cfs  
 $Q_{10}$  = 2.65 cfs  
 $Q_{25}$  = 3.10 cfs  
 $Q_{100}$  = 3.96 cfs



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## Post-Developed Subbasin Exhibit

Ameriquel Group, LLC

18200 Highway 41 North, Evansville, IN 47725

Designed By:  
JAE

Drawn By:  
AN

Filename:

Job Number:  
7296.1.003-B

Date:  
9/15/2022

7296 Civil Base 2022.09.14







**VANDERBURGH COUNTY DRAINAGE BOARD  
FORM 800**

PROJECT: **Ameriqua**                      DETENTION FACILITY DESIGN RETURN PERIOD:    **100 YRS**  
 DESIGNER: **JAE**                      7296                      RELEASE RATE RETURN PERIOD:    **10 YRS**

UNDEVELOPED WATERSHED AREA (Au)                      **0.83**                      ACRES  
 TIME OF CONCENTRATION (UNDEVELOPED WATERSHED)                      **5.00**                      MINUTES  
 RAINFALL INTENSITY (Iu):                      6.655                      INCHES/HR  
 UNDEVELOPED RUNOFF COEFFICIENT (Cu):                      **0.48**  
 UNDEVELOPED RUNOFF RATE (Q = Cu\*Iu\*A):                                           2.65    CFS  
 DEVELOPED WATERSHED AREA (Ad) - contributing to basin                      **0.73**                      ACRES  
 DEVELOPED RUNOFF COEFFICIENT (Cd):                      **0.69**  
 UNDETAINED RUNOFF Rate                                           0.87    CFS  
 ALLOWABLE PIPE RELEASE RATE                                           1.78    CFS  
 ACTUAL DISCHARGE PIPE OUTFLOW                                           **1.63**    CFS

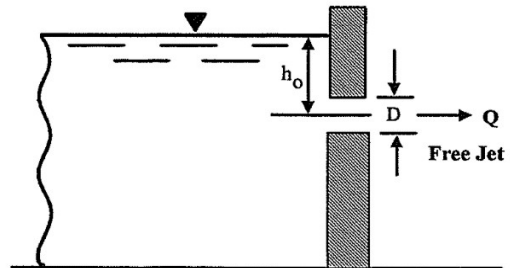
STORM DURATION Td (HRS)	RAINFALL INTENSITY Id (INCH/HR)	INFLOW RATE I(Td) (Cd*Id*Ad) (CFS)	OUTFLOW RATE Q (actual) (CFS)	STORAGE RATE I(Td)-Q (CFS)	REQUIRED STORAGE (I(Td)-Q)*Td/12 (ACRE.FT)			
0.08	9.951	5.01	1.63	3.38	0.02			
0.17	8.053	4.06	1.63	2.43	0.03			
0.25	6.677	3.36	1.63	1.73	0.04			
0.50	4.214	2.12	1.63	0.49	0.02			
0.67	3.289	1.66	1.63	0.03	0.00			
0.75	2.943	1.48	1.63	-0.15	-0.01			
1.00	2.936	1.48	1.63	-0.15	-0.01			
1.50	2.252	1.13	1.63	-0.50	-0.06			
2.00	1.844	0.93	1.63	-0.70	-0.12			
2.50	1.571	0.79	1.63	-0.84	-0.17			
3.00	1.374	0.69	1.63	-0.94	-0.23			
4.00	1.107	0.56	1.63	-1.07	-0.35			
5.00	0.933	0.47	1.63	-1.16	-0.48			
6.00	0.811	0.41	1.63	-1.22	-0.61			
7.00	0.719	0.36	1.63	-1.27	-0.73			
8.00	0.648	0.33	1.63	-1.30	-0.86			
9.00	0.590	0.30	1.63	-1.33	-0.99			
10.00	0.543	0.27	1.63	-1.36	-1.12			

PEAK STORAGE (ACRE-FT)	0.04
PEAK STORAGE (CUBIC FT)	1,560

**BASIN DISCHARGE AND STORAGE VOLUME**

**Orifice:**  $Q = C_d A_o \sqrt{2gh_o}$  LTAP 6.3.2

Pipe Dia. **8** (inch)  
 D (inch) **6.00** Orifice diameter  
 A<sub>o</sub> (s.f.) **0.20** Area of orifice  
 g (f/s<sup>2</sup>) **32.2** Acceleration due to gravity  
 H (ft) **2.00** Head at Inlet  
 h<sub>o</sub> (ft) **1.75** Head at center of orifice  
 C<sub>d</sub> **0.61** Discharge coefficient



Q= 1.27 CFS

Not used

**Pipe Flow:**  $Q = A_p \left( \frac{h_p}{\frac{K_e + K_o}{2g} + \frac{2.87n^2L}{D^{4/3}}} \right)^{1/2}$  LTAP 6.3.5

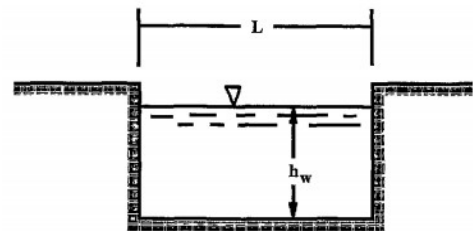
Pipe Dia. **8** (inch)  
 A<sub>p</sub> (s.f.) **0.35** Area of Pipe  
 n **0.012** Manning roughness coef.  
 g (f/s<sup>2</sup>) **32.2** Acceleration due to gravity  
 H (ft) **2.00** Head at invert  
 h<sub>p</sub> (ft) **1.67** Head at center of pipe  
 L (ft) **13** Length of pipe  
 K<sub>e</sub> **0.85** Entrance Loss  
 K<sub>o</sub> **1.00** Outlet Loss

Q= 2.31 CFS

Not used

**Rectangular Weir:**  $Q = \frac{2}{3} C_d \sqrt{2g} L h_w^{3/2}$  LTAP 6.3.3

L (ft) **0.5** Length of the weir  
 g (f/s<sup>2</sup>) **32.2** Acceleration due to gravity  
 h<sub>w</sub> (ft) **1.00** Head above weir  
 C<sub>d</sub> **0.61** Discharge coefficient



Q= 1.63 CFS

Not used

**Storage:**

Stage	Surface Area (S.F.)	Cum. Storage Vol. (C.F.)	Notes
432	0		Outlet
433	3,244	1,622	100 Year Water Elev.
433.2	7,630	2,709	TOB Elevation
Available Storage:		2,709	0.06 AC-FT
Required: (Peack x 10%)		1,716	0.04 AC-FT
		63%	Basin Capacity