

DRAINAGE REPORT

KYB – BUILDING ADDITION

**TAKENAKA (U.S.A.) CORPORATION
FRANKLIN, INDIANA**

SUBMITTED July 23, 2013

DRAINAGE ANALYSIS REPORT

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INTRODUCTION

This report outlines the storm water management system designed to serve the KYB Manufacturing Building Addition. The KYB improvements consist of a 45,900 SF building addition, parking area converted to truck maneuvering space, truck dock and a relocated landscape island.

DETENTION ANALYSIS

The improvements will be part of the existing drainage master plan for the KYB property as approved in October 2006. There is an existing wet detention pond located on the East side of the property. The project results in an increase of impervious surface on the site of 1.28 acres. When added to the proposed detention model, the CN is increased from 83 to 84. This results in a 100yr. water surface increase of 0.1 feet. The pond has adequate storage for the improvements. To accommodate the increased water surface elevation and control the allowable release rates as determined in the previous master detention model, the outlet structure riser will be raised in elevation by 0.1'. The allowable and proposed peak discharge rates for the site are as follows:

Rainfall Event	Allowable Release Rate (cfs)	Proposed Release Rate (cfs)
10 yr.	2.86 cfs	2.84 cfs
100 yr.	10.06 cfs	10.05 cfs

Results: The proposed release rates are less than the allowable.

Please refer to Section 1 for the updated proposed detention model including these improvements and basin map.

STORM SEWER

All proposed storm sewers have been designed to convey the 10yr. storm hydraulic grade line (HGL) within the crown of the pipes.

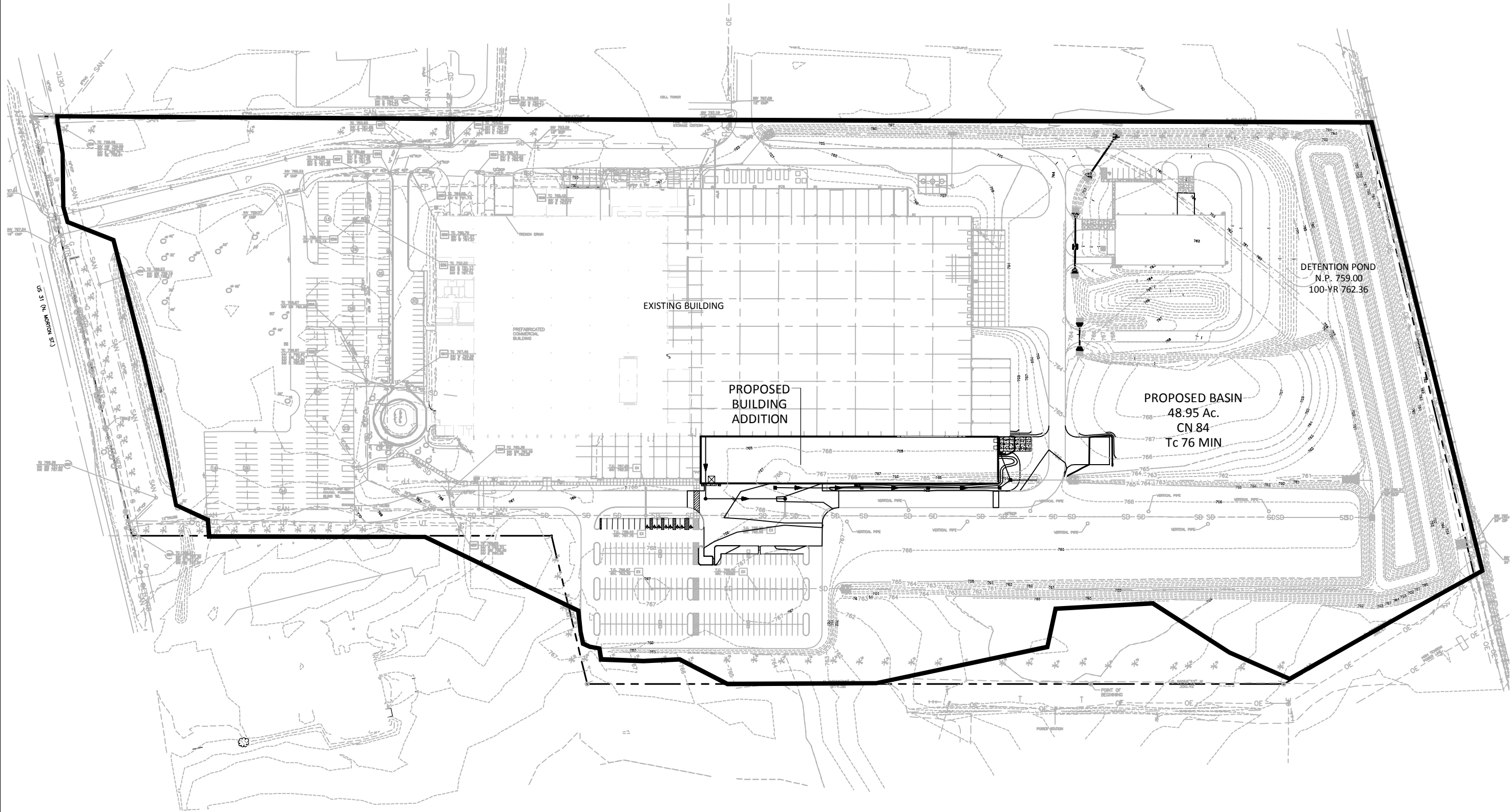
Please refer to Section 2 for all storm sewer calculations and drainage area map.

CONCLUSION

The proposed improvements have been designed in accordance with the City of Franklin requirements. The proposed storm sewer systems have been designed to adequately convey the storm water to the existing storm sewers and ultimately to the existing detention pond. Therefore, no adverse impacts are anticipated as a result of this development.

UPDATED PROPOSED MODEL

Layout Tab Name: BASINS, Images: dan sig.tti: date.tti: . Xrefs: 71090--tblk.dwg: 71090--p.dwg: 73518--g.dwg: 73518--p.dwg: 73518--x.dwg
Last Saved By: nierzwicki, 7/23/2013 12:12:10 PM
G:\DE\clients\Talenack\73518 KTB Aftermarket Prod Blg\4.0 Disciplines\Civil\Eng\Storm Design\71090--Drainage.dwg Plotted By: nierzwicki, John Plotted: July 23, 2013, 1:17:31 PM



KYB
FRANKLIN, IN

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NO.	DATE	REVISION

DRAWING TITLE		
PROJECT NO.	SCALE	DRAWING NO.
71090		
DRAWN	DATE	

Project: KYB
Location: Franklin, Indiana
Prepared by: JRN
Date: 7/23/2013

Proposed

	Area or %	CN	CN x A
Impervious (Pavement/Rooftop)	22.98	98	2252.04
Grass - C	13.45	74	995.3
Grass - B	10.07	61	614.27
Impervious (Pond)	2.45	98	240.1
			0

Total: 48.95 4101.71

Use CN: 84

PROPOSED CONDITIONS

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
Out E	BASE	100Y-12H	0.00	759.000	762.000	0.0000	0	11.34	10.045	0.00	0.000
Out E	BASE	100Y-1H	0.00	759.000	762.000	0.0000	0	3.41	1.875	0.00	0.000
Out E	BASE	100Y-24H	0.00	759.000	762.000	0.0000	0	17.68	7.940	0.00	0.000
Out E	BASE	100Y-2H	0.00	759.000	762.000	0.0000	0	3.97	2.978	0.00	0.000
Out E	BASE	100Y-3H	0.00	759.000	762.000	0.0000	0	4.66	3.410	0.00	0.000
Out E	BASE	100Y-6H	0.00	759.000	762.000	0.0000	0	6.83	9.167	0.00	0.000
Out E	BASE	10Y-12H	0.00	759.000	762.000	0.0000	0	12.85	2.790	0.00	0.000
Out E	BASE	10Y-1H	0.00	759.000	762.000	0.0000	0	3.53	0.776	0.00	0.000
Out E	BASE	10Y-24H	0.00	759.000	762.000	0.0000	0	24.42	2.844	0.00	0.000
Out E	BASE	10Y-2H	0.00	759.000	762.000	0.0000	0	4.07	1.442	0.00	0.000
Out E	BASE	10Y-3H	0.00	759.000	762.000	0.0000	0	4.77	1.623	0.00	0.000
Out E	BASE	10Y-6H	0.00	759.000	762.000	0.0000	0	7.32	2.377	0.00	0.000
Pond E	BASE	100Y-12H	11.34	762.364	762.500	0.0050	160379	5.75	27.268	11.34	10.045
Pond E	BASE	100Y-1H	3.41	761.032	762.500	0.0050	131380	1.41	55.136	3.41	1.875
Pond E	BASE	100Y-24H	17.68	762.259	762.500	0.0050	158108	11.00	16.896	17.68	7.940
Pond E	BASE	100Y-2H	3.97	761.633	762.500	0.0050	144475	1.83	56.177	3.97	2.978
Pond E	BASE	100Y-3H	4.66	761.931	762.500	0.0050	150951	2.17	51.808	4.66	3.410
Pond E	BASE	100Y-6H	6.83	762.322	762.500	0.0050	159465	3.33	41.072	6.83	9.167
Pond E	BASE	10Y-12H	12.85	761.479	762.500	0.0050	141122	5.91	16.380	12.85	2.790
Pond E	BASE	10Y-1H	3.53	760.099	762.500	0.0050	116944	1.42	28.117	3.53	0.776
Pond E	BASE	10Y-24H	24.42	761.522	762.500	0.0047	142056	11.08	10.144	24.42	2.844
Pond E	BASE	10Y-2H	4.07	760.530	762.500	0.0050	123520	1.92	30.356	4.07	1.442
Pond E	BASE	10Y-3H	4.77	760.738	762.500	0.0050	126679	2.25	27.847	4.77	1.623
Pond E	BASE	10Y-6H	7.32	761.197	762.500	0.0050	134966	3.42	23.462	7.32	2.377

PROPOSED CONDITIONS

==== Basins =====

Name: Basin Proposed	Node: Pond E	Status: Onsite
Group: BASE	Type: SCS Unit Hydrograph CN	
Unit Hydrograph: Uh484	Peaking Factor: 484.0	
Rainfall File: Huff	Storm Duration(hrs): 0.00	
Rainfall Amount(in): 0.000	Time of Conc(min): 76.00	
Area(ac): 48.950	Time Shift(hrs): 0.00	
Curve Number: 84.00	Max Allowable Q(cfs): 999999.000	
DCIA(%): 0.00		

==== Nodes =====

Name: Out E	Base Flow(cfs): 0.000	Init Stage(ft): 759.000
Group: BASE		Warn Stage(ft): 762.000
Type: Time/Stage		

Time(hrs)	Stage(ft)
0.00	759.000
30.00	759.000

Name: Pond E	Base Flow(cfs): 0.000	Init Stage(ft): 759.000
Group: BASE		Warn Stage(ft): 762.500
Type: Stage/Area		

Stage(ft)	Area(ac)
759.000	2.3800
760.000	2.6500
761.000	3.0000
762.000	3.5000

==== Cross Sections =====

Name:	Group: BASE
Encroachment: No	

Station(ft)	Elevation(ft)	Manning's N
-----	-----	-----

==== Channels =====

Name:	From Node:	Length(ft): 0.00
Group: BASE	To Node:	Count: 1
UPSTREAM	DOWNSTREAM	Friction Equation: Average Conveyance
Geometry: Trapezoidal	Trapezoidal	Solution Algorithm: Automatic
Invert(ft): 0.000	0.000	Flow: Both
TClpInitZ(ft): 9999.000	9999.000	Contraction Coef: 0.000
Manning's N: 0.000000	0.000000	Expansion Coef: 0.000
Top Clip(ft): 0.000	0.000	Entrance Loss Coef: 0.000
Bot Clip(ft): 0.000	0.000	Exit Loss Coef: 0.000
Main XSec:		Outlet Ctrl Spec: Use dc or tw
AuxElev1(ft):		Inlet Ctrl Spec: Use dn
Aux XSec1:		Stabilizer Option: None
AuxElev2(ft):		
Aux XSec2:		
Top Width(ft):		
Depth(ft):		
Bot Width(ft): 0.000	0.000	
LtSdSlp(h/v): 0.00	0.00	
RtSdSlp(h/v): 0.00	0.00	

==== Drop Structures =====

PROPOSED CONDITIONS

Name: Drop Structure	From Node: Pond E	Length(ft): 10.00
Group: BASE	To Node: Out E	Count: 1
UPSTREAM	DOWNSTREAM	Friction Equation: Average Conveyance
Geometry: Circular	Circular	Solution Algorithm: Automatic
Span(in): 24.00	24.00	Flow: Both
Rise(in): 24.00	24.00	Entrance Loss Coef: 0.500
Invert(ft): 757.600	757.500	Exit Loss Coef: 0.000
Manning's N: 0.002400	0.002400	Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000	0.000	Inlet Ctrl Spec: Use dn
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 4 for Drop Structure Drop Structure ***

Count: 1	Bottom Clip(in): 0.000	TABLE
Type: Horizontal	Top Clip(in): 0.000	
Flow: Both	Weir Disc Coef: 3.200	
Geometry: Circular	Orifice Disc Coef: 0.600	
Span(in): 24.00	Invert(ft): 761.900	
Rise(in): 24.00	Control Elev(ft): 761.900	

*** Weir 2 of 4 for Drop Structure Drop Structure ***

Count: 1	Bottom Clip(in): 0.000	TABLE
Type: Vertical: Mavis	Top Clip(in): 0.000	
Flow: Both	Weir Disc Coef: 3.200	
Geometry: Circular	Orifice Disc Coef: 0.600	
Span(in): 5.00	Invert(ft): 759.000	
Rise(in): 5.00	Control Elev(ft): 759.000	

*** Weir 3 of 4 for Drop Structure Drop Structure ***

Count: 1	Bottom Clip(in): 0.000	TABLE
Type: Horizontal	Top Clip(in): 0.000	
Flow: Both	Weir Disc Coef: 3.200	
Geometry: Circular	Orifice Disc Coef: 0.600	
Span(in): 6.00	Invert(ft): 760.000	
Rise(in): 6.00	Control Elev(ft): 760.000	

*** Weir 4 of 4 for Drop Structure Drop Structure ***

Count: 1	Bottom Clip(in): 0.000	TABLE
Type: Horizontal	Top Clip(in): 0.000	
Flow: Both	Weir Disc Coef: 3.200	
Geometry: Circular	Orifice Disc Coef: 0.600	
Span(in): 6.00	Invert(ft): 761.000	
Rise(in): 6.00	Control Elev(ft): 761.000	

=====

Name: Railroad	From Node: Pond E
Group: BASE	To Node: Out E
Flow: Both	Count: 1
Type: Vertical: Gravel	Geometry: Trapezoidal

Bottom Width(ft): 20.00
Left Side Slope(h/v): 100.00
Right Side Slope(h/v): 100.00
Invert(ft): 765.000
Control Elevation(ft): 765.000
Struct Opening Dim(ft): 9999.00

TABLE

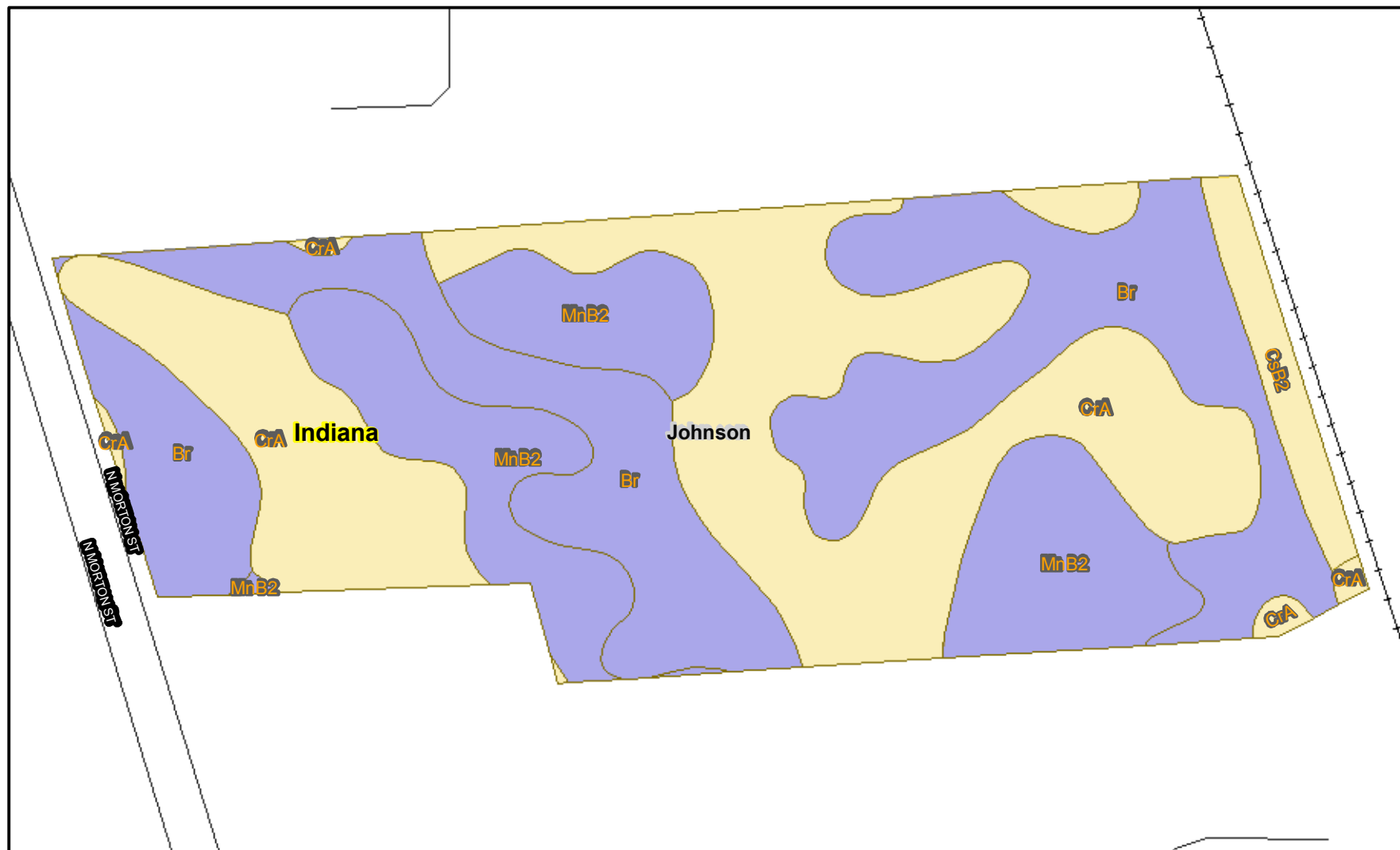
Bottom Clip(ft): 0.000
Top Clip(ft): 0.000
Weir Discharge Coef: 3.200
Orifice Discharge Coef: 0.600

=====

Name:	From Node:	Count: 1
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HYDROLOGIC GROUP RATING FOR JOHNSON COUNTY, INDIANA

KYB - Franklin, Indiana



0 40 80 160 Meters

0 100 200 400 600 800 Feet

HYDROLOGIC GROUP RATING FOR JOHNSON COUNTY, INDIANA

KYB - Franklin, Indiana

MAP LEGEND

Hydrologic Group

{Dominant Condition, <}

-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available
-  Soil Map Units
-  Cities
-  Detailed Counties
-  Detailed States
-  Interstate Highways
-  Roads
-  Rails
-  Water
-  Hydrography
-  Oceans

MAP INFORMATION

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>

Coordinate System: UTM Zone 16

Soil Survey Area: Johnson County, Indiana
Spatial Version of Data: 3
Soil Map Compilation Scale: 1:15840

Map comprised of aerial images photographed on these dates:
1998

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.

Tables - Hydrologic Group

Summary by Map Unit - Johnson County, Indiana

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Total Acres in AOI	Percent of AOI
Br	Brookston silty clay loam	B	17.5	36.8
CrA	Crosby silt loam, 0 to 2 percent slopes	C	18.4	38.9
CsB2	Crosby-Miami silt loams, 2 to 4 percent slopes, eroded	C	1.5	3.1
MnB2	Miami silt loam, 2 to 6 percent slopes, eroded	B	10.1	21.2

Description - Hydrologic Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are placed into four groups A, B, C, and D, and three dual classes, A/D, B/D, and C/D. Definitions of the classes are as follows:

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

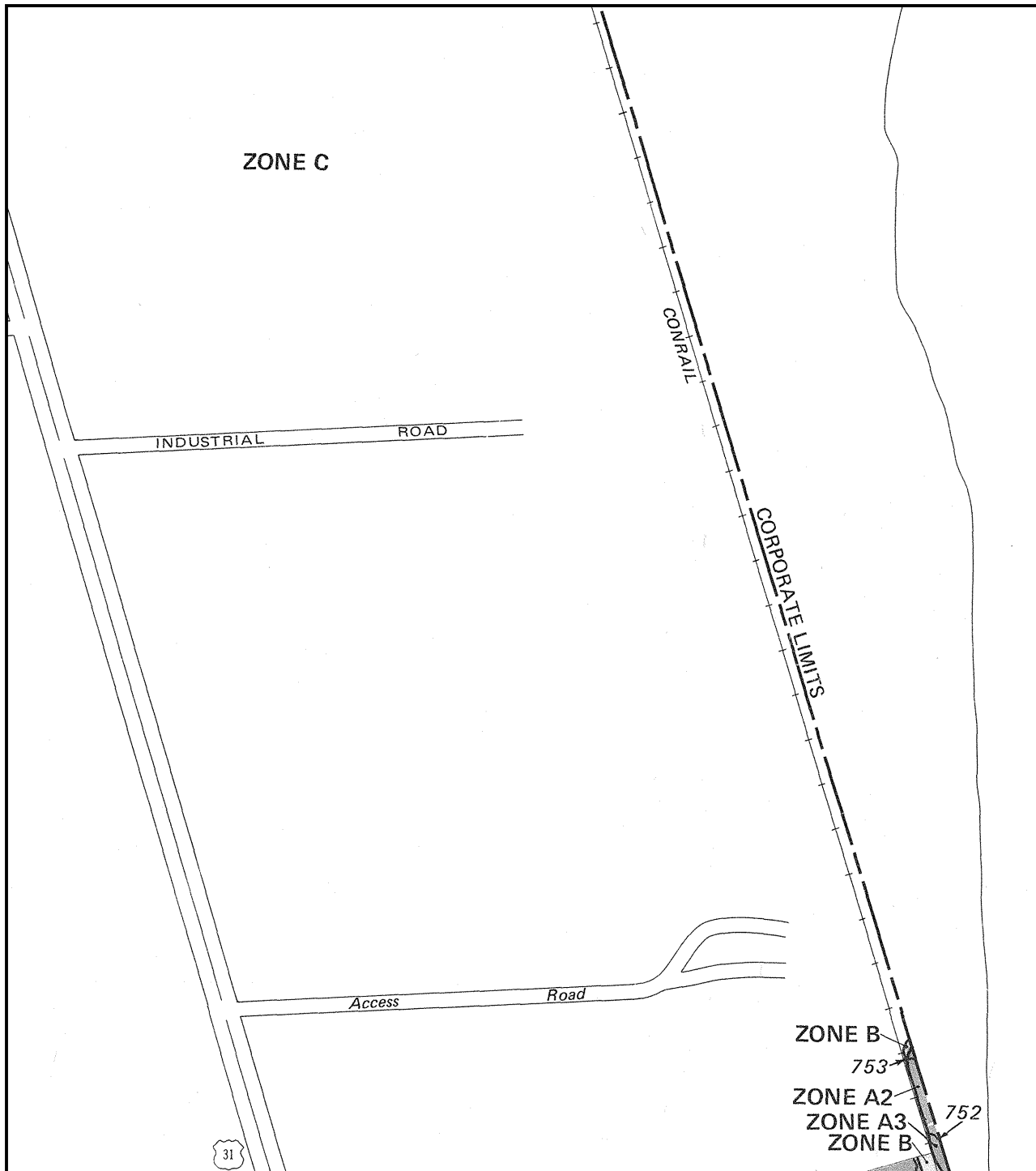
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only soils that are rated D in their natural condition are assigned to dual classes.

Parameter Summary - Hydrologic Group

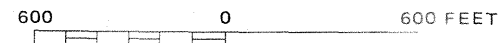
Aggregation Method: Dominant Condition

Component Percent Cutoff:

Tie-break Rule: Lower



APPROXIMATE SCALE



NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF
FRANKLIN, INDIANA
JOHNSON COUNTY

PANEL 1 OF 4
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
180114 0001 B

EFFECTIVE DATE:
APRIL 1, 1981

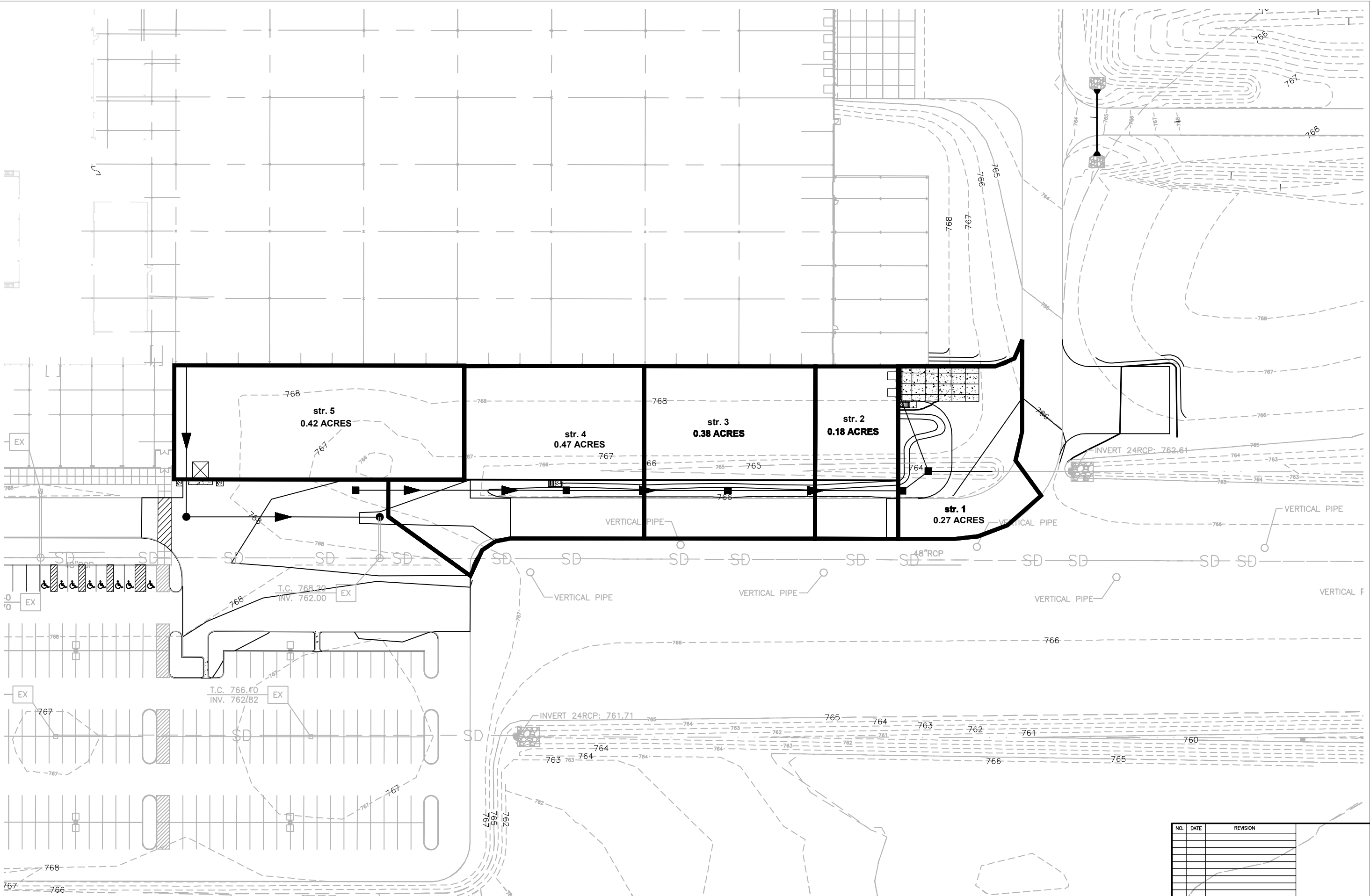


federal emergency management agency
federal insurance administration

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

STORM SEWER DESIGN

Layout Tab Name: INLETS, Images: dan.sig.tif: date.tif , Xrefs: 71090--tblk.dwg; 71090--p.dwg; 73518--g.dwg; 73518--p.dwg; 73518--x.dwg
Last Saved By: nierzwicki, 7/23/2013 12:12:10 PM
G:\DE\clients\takenaka\73518 KYB Aftermarket Prod Bldg\4.0 Disciplines\Civil\Eng\Storm Design\71090--Drainage.dwg Plotted By: nierzwicki, John Plotted: July 23, 2013, 1:19:25 PM



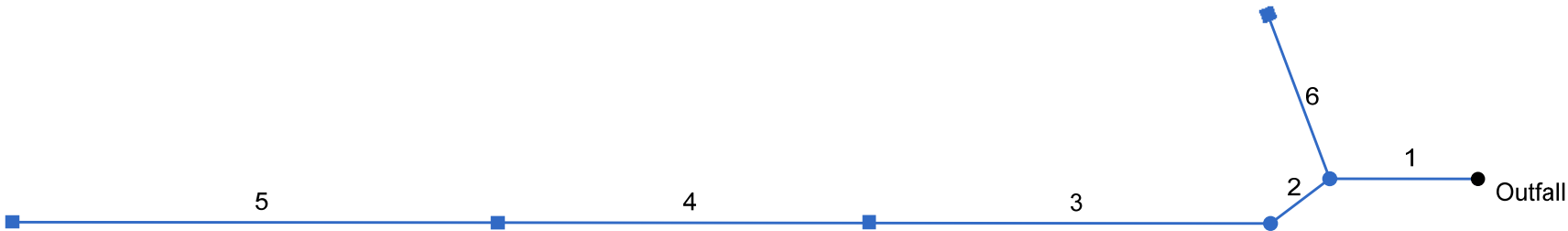
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71090			
DRAWN		DATE	

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2013 Plan



Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	48.038	0.00	1.72	0.00	0.00	1.36	5.0	8.8	5.8	7.83	9.35	3.12	24	0.15	763.06	763.13	764.56	764.61	0.00	766.63	ex-1
2	1	24.087	0.18	1.45	0.78	0.14	1.17	5.0	8.6	5.8	6.78	9.98	2.49	24	0.17	763.13	763.17	764.76	764.77	766.63	766.67	1-2
3	2	130.254	0.38	1.27	0.78	0.30	1.02	5.0	7.6	6.1	6.25	8.59	2.25	24	0.12	763.17	763.33	764.87	764.94	766.67	767.83	2-3
4	3	120.432	0.47	0.89	0.79	0.37	0.73	5.0	6.3	6.5	4.74	9.47	1.78	24	0.15	763.33	763.51	764.98	765.02	767.83	766.59	3-4
5	4	157.229	0.42	0.42	0.85	0.36	0.36	5.0	5.0	7.0	2.49	3.48	2.53	15	0.25	764.01	764.40	765.05	765.26	766.59	767.67	4-5
6	1	57.006	0.27	0.27	0.71	0.19	0.19	5.0	5.0	7.0	1.34	1.51	2.46	10	0.40	763.13	763.36	764.76	764.94	766.63	765.86	1-x
Project File: STM-2.stm																Number of lines: 6				Run Date: 7/23/2013		
NOTES:Intensity = 56.97 / (Inlet time + 9.00) ^ 0.80; Return period =Yrs. 10 ; c = cir e = ellip b = box																						

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter						Inlet			Byp Line No		
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)		Depr (in)	
1	1	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.0	Off
2	2	0.98	0.00	0.38	0.60	DrGrt	0.0	0.00	0.00	1.50	2.00	0.020	2.00	0.020	0.020	0.013	0.08	10.10	0.08	10.10	0.0	Off	
3	3	2.07	0.00	1.13	0.94	DrGrt	0.0	0.00	0.00	3.00	3.00	0.020	2.00	0.020	0.020	0.013	0.11	13.10	0.11	13.10	0.0	Off	
4	4	2.59	0.00	1.33	1.26	DrGrt	0.0	0.00	0.00	3.00	3.00	0.020	2.00	0.020	0.020	0.013	0.12	14.10	0.12	14.10	0.0	Off	
5	5	2.49	0.00	1.30	1.20	DrGrt	0.0	0.00	0.00	3.00	3.00	0.020	2.00	0.020	0.020	0.013	0.12	14.10	0.12	14.10	0.0	Off	
6	x	1.34	0.00	0.82	0.52	DrGrt	0.0	0.00	0.00	3.00	3.00	0.020	2.00	0.020	0.020	0.013	0.09	11.10	0.09	11.10	0.0	Off	

Project File: STM-2.stm

Number of lines: 6

Run Date: 7/23/2013

NOTES: Inlet N-Values = 0.016; Intensity = 56.97 / (Inlet time + 9.00) ^ 0.80; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

KYB

Weighted C Calculations

STR #: 1

Cover Type	C Value	Area (ac.)
Open Space	0.20	0.06
Impervious	0.85	0.21
Total Area =		0.27

Weighted C Value = 0.71

STR #: 2

Cover Type	C Value	Area (ac.)
Open Space	0.20	0.02
Impervious	0.85	0.16
Total Area =		0.18

Weighted C Value = 0.78

STR #: 3

Cover Type	C Value	Area (ac.)
Open Space	0.20	0.04
Impervious	0.85	0.34
Total Area =		0.38

Weighted C Value = 0.78

STR #: 4

Cover Type	C Value	Area (ac.)
Open Space	0.20	0.04
Impervious	0.85	0.43
Total Area =		0.47

Weighted C Value = 0.79

STR #: 5

Cover Type	C Value	Area (ac.)
Open Space	0.20	0
Impervious	0.85	0.42
Total Area =		0.42

Weighted C Value = 0.85