INDOT Hydraulics: Design Guidance

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NextLevel INDIANA

Overview

- Mark
  - Replacement in-kind aka when do I need to do calculations?
  - Expectations for 2023
- Alex
  - Website Updates
  - HRA Design –vs- Review Requests
  - Median Drains
  - Spread
- Jim
  - Common Design Exceptions
  - Infiltration
  - Cutoff Walls

“Replacement in-kind”

- Eliminated in 2013

3. In-Kind Culvert Replacement.

Due to site and cost considerations, small structures and culverts may be replaced in kind. Replacement in kind means that the existing structure can be replaced with a new structure having the same span, the same rise, and the same shape as the existing structure. Current policy requirements including but not limited to, sumping depth, cutoff walls, and roadway serviceability, continue to apply to the proposed structure.

Site Criteria. A candidate for an in-kind structure replacement will meet the following site criteria:

a. The existing culvert size meets or exceeds the minimum pipe size for the facility.

b. No record of flooding complaints at the structure.

c. No history of road overtopping at the required roadway serviceability, per INDOT Maintenance Division.

d. No evidence of scour issues at the outlet, including but not limited to scour holes, or structure undermining.

e. No known debris problems.

Hydraulic Parameters. Hydraulic modeling will be required to consider a replacement in kind structure. The following hydraulic parameters need to be met before a structure can be replaced in kind.

a. The existing backwater depth is less than 3 ft. See Section 201-2.0 for definitions.

“Replacement in-kind”

- Each culvert should be hydraulically designed. – IDM 203-2.02

What to do with the calculations?

- Proposed span 36” or greater, all median drainage – INDOT Hydraulics Review




- Proposed span < 36”, include all calculations with roadway submittal packages


Expectations for 2023

- Design manual
- Online training
- Annual hybrid c
- New Director o n ID 421947
  - Also have tw
    - Highway

Content

- Website Updates
- Riprap – IDM Figure 203-2D
- Median Drains
- Spread Updates

Website Update

- Developing Design Guidance:
  - Steel Liners
  - Median Drain
  - Infiltration Ponds
- Coordinate Generator for Corrugated Metal Pipe Arches (CMPA) Liners
- Minimum pipe size that can be lined
  - If structure is already at the minimum size, then only a CIPP liner can be used.
  - If structure is under minimum size, it cannot be lined.
- Keep Memo Templates Up to Date
  - Check version numbers
- Submitting requests to the HRA
  - HRA Project Type Flow Chart

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CMPA Coordinate Generator

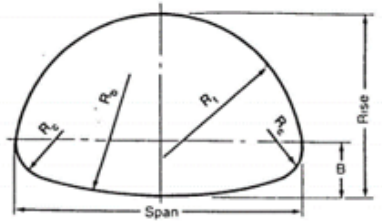
- Fill in yellow highlighted Cells
- HY8 error in structure sizes
  - Current 18” Corner Radii
  - Spreadsheet corrects this error

CMPA Coordinate Generator

Input values				
FROM SURVEY				
Measured Span		in		
Measured Rise		in		
inlet invert		ft		
outlet invert		ft		
FROM HY8				
Nearest Actual Size (inches)	choose			
Nominal size in HY8 and lis	#N/A	#N/A		
span	#N/A	in	#N/A	ft
rise	#N/A	in	#N/A	ft
waterway area	#N/A	sf		
n-value	#N/A			
Br (Bottom Radius)	#N/A	in	#N/A	ft
Tr (Top Radius)	#N/A	in	#N/A	ft
Cr (Corner Radius)	#N/A	in	#N/A	ft
B	#N/A	in	#N/A	ft

Calculations (do not touch cells)		
center of corner radius	#N/A	#N/A
y=k+sqrt(r^2-(x-h)^2)		
k-top	#N/A	
k-side	#N/A	
h-side	#N/A	
k-bottom	#N/A	

American Iron and Steel Institute, 1994
“Handbook of Steel Drainage & Highway Construction Products”



Output Plot for HY8			
	x	y1	y2
1	#N/A	#N/A	#N/A
2	#N/A	#N/A	#N/A
3	#N/A	#N/A	#N/A
4	#N/A	#N/A	#N/A
5	#N/A	#N/A	#N/A
6	#N/A	#N/A	#N/A
7	#N/A	#N/A	#N/A
8	#N/A	#N/A	#N/A
9	#N/A	#N/A	#N/A
10	0.000	#N/A	#N/A
11	#N/A	#N/A	#N/A
12	#N/A	#N/A	#N/A
13	#N/A	#N/A	#N/A
14	#N/A	#N/A	#N/A
15	#N/A	#N/A	#N/A
16	#N/A	#N/A	#N/A
17	#N/A	#N/A	#N/A
18	#N/A	#N/A	#N/A
19	#N/A	#N/A	#N/A

Calculated Area Check
#N/A

This workbook is to be used for liners of CMPA's. Please fill in the yellow highlighted cells on this page. The HY8 parameters can be found for each of the CMPA sizes in the structure size table in HY8. The surveyed span and rise will be illustrated by black dashed lines on the HDPE and Steel liner tabs, but all liners use the pipe size chosen in HY8.

Once filled out, The output plot can be used to paste into HY8 and the liner inverts adjusted in HY8 by the floor thickness

CMPA Coordinate Generator

- Fill in yellow highlighted Cells
- HY8 error in structure sizes
  - Current 18” Corner Radii
  - Copy cells for existing and place into user defined coordinates in HY8

CMPA Coordinate Generator

Input values			
FROM SURVEY			
Measured Span		in	
Measured Rise		in	
inlet invert		ft	
outlet invert		ft	
FROM HY8			
Nearest Actual Size (inches)	79x62.5		
Nominal size in HY8 and lis	81x59	*current 18 in. corner radii	
span	79	in	6.583333 ft
rise	62.5	in	5.208333 ft
waterway area	27.4	sf	
n-value	0.028		
Br (Bottom Radius)	82.625	in	6.885417 ft
Tr (Top Radius)	39.5	in	3.291667 ft
Cr (Corner Radius)	20.875	in	1.739583 ft
B	23.75	in	1.979167 ft

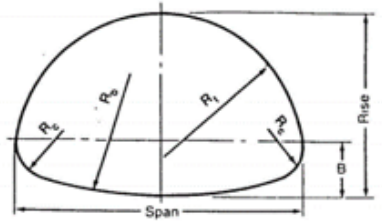
Calculations (do not touch cells)	
center of corner radius	1.552
y=k+sqrt(r^2-(x-h)^2)	
k-top	1.916666667
k-side	1.979166667
h-side	1.552
k-bottom	6.885416667

*According to the Modern Sewer Design handbook provided by the American Iron and Steel Institute, HY8 provides the nominal spans and rises for the "current 18 in or less corner radii" instead of the actual spans and rises. This results in misshaped pipe arches and miscalculates the flow capacity of the pipe. Please use the output plot to the right for this CMPA as a user defined shape in HY8 to correct this issue.

Output Plot for HY8			
	x	y1	y2
1	-3.292	1.9792	1.9792
2	-3.109	2.9985	1.2028
3	-2.743	3.7362	0.7112
4	-2.377	4.1934	0.4356
5	-1.829	4.6536	0.2617
6	-1.463	4.8654	0.1572
7	-1.097	5.0201	0.0880
8	-0.731	5.1260	0.0390
9	-0.366	5.1880	0.0097
10	0.000	5.2083	0.0000
11	0.366	5.1880	0.0097
12	0.731	5.1260	0.0390
13	1.097	5.0201	0.0880
14	1.463	4.8654	0.1572
15	1.829	4.6536	0.2617
16	2.377	4.1934	0.4356
17	2.743	3.7362	0.7112
18	3.109	2.9985	1.2028
19	3.292	1.9792	1.9792

Calculated Area Check
27.12

American Iron and Steel Institute, 1994
“Handbook of Steel Drainage & Highway Construction Products”



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Once filled out, The output plot can be used to paste into HY8 and the liner inverts adjusted in HY8 by the floor thickness

CMPA Coordinate Generator

- Liners
  - HDPE (High Density Polyethylene)
  - CIPP
  - Paved Invert
  - Steel
- Includes solid wall and profile wall liners
- Updated periodically per supplier information

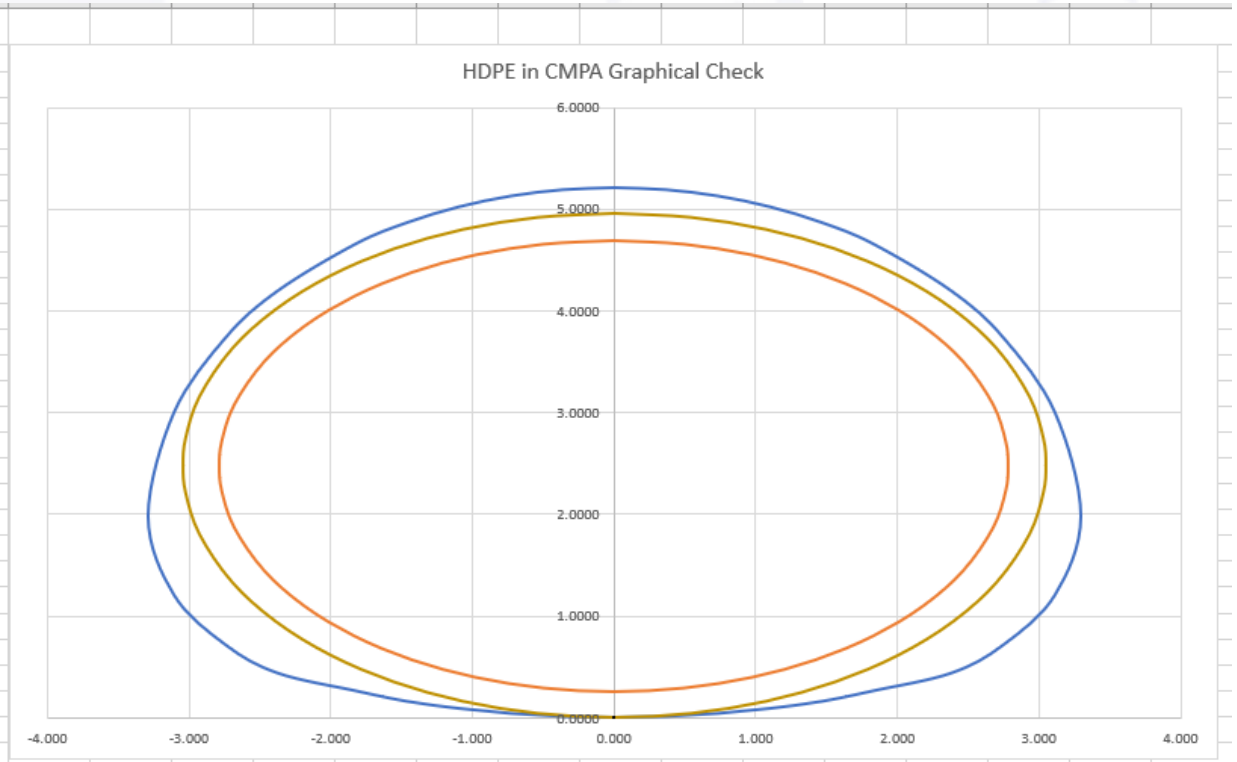
HDPE Coordinate Generator

Input values		
	radius	
Host Pipe Span	79	in
Host Pipe Rise	62.5	in
Grout Thickness	3	in
User Defined Max Rise (optional)		in
Liner Max Outer Rise	59.5	in
largest possible	25	(index no.)
Chosen Liner Size		(index no.)
Liner Type	profile wall	

Resulting Liner		
Open Area	19.38	sq ft
Equivilent Outer Diameter	66.30	in
Equivelent Inner Diameter	60.00	in
Outer span	6.09	ft
Outer Rise	4.96	ft
Inner Span	5.57	ft
Inner Rise	4.43	ft
Wall Thickness	0.26	ft
Inlet Invert	0.26	ft
Outlet Invert	0.26	ft

For the HDPE liner, 2 lines are optional to adjust the inputs if necessary. Please check the graph to assure proper area is available for grout between the liner and host pipe and adjust as necessary. The liner size is index based with the higher numbers being the larger pipe sizes.

Output Plot for HY8			
	x	y1	y2
1	-2.783	2.479	2.479
2	-2.767	2.720	2.238
3	-2.678	3.084	1.874
4	-2.468	3.504	1.454
5	-2.183	3.854	1.104
6	-1.832	4.148	0.810
7	-1.425	4.383	0.575
8	-0.975	4.555	0.403
9	-0.495	4.661	0.298
10	0.000	4.696	0.263
11	0.495	4.661	0.298
12	0.975	4.555	0.403
13	1.425	4.383	0.575
14	1.832	4.148	0.810
15	2.183	3.854	1.104
16	2.468	3.504	1.454
17	2.678	3.084	1.874
18	2.767	2.720	2.238
19	2.783	2.479	2.479



CMPA Coordinate Generator

- Liners
  - HDPE
  - CIPP (Cured in place pipe)
  - Paved Invert
  - Steel

- Error will occur if structure is too big for a CIPP
  - It will not draw the liner

CIPP Coordinate Generator

Input values		
	radius	
B	23.75	in
Rt	3.166667	ft
Rb	6.885417	ft
Corner	20.875	in

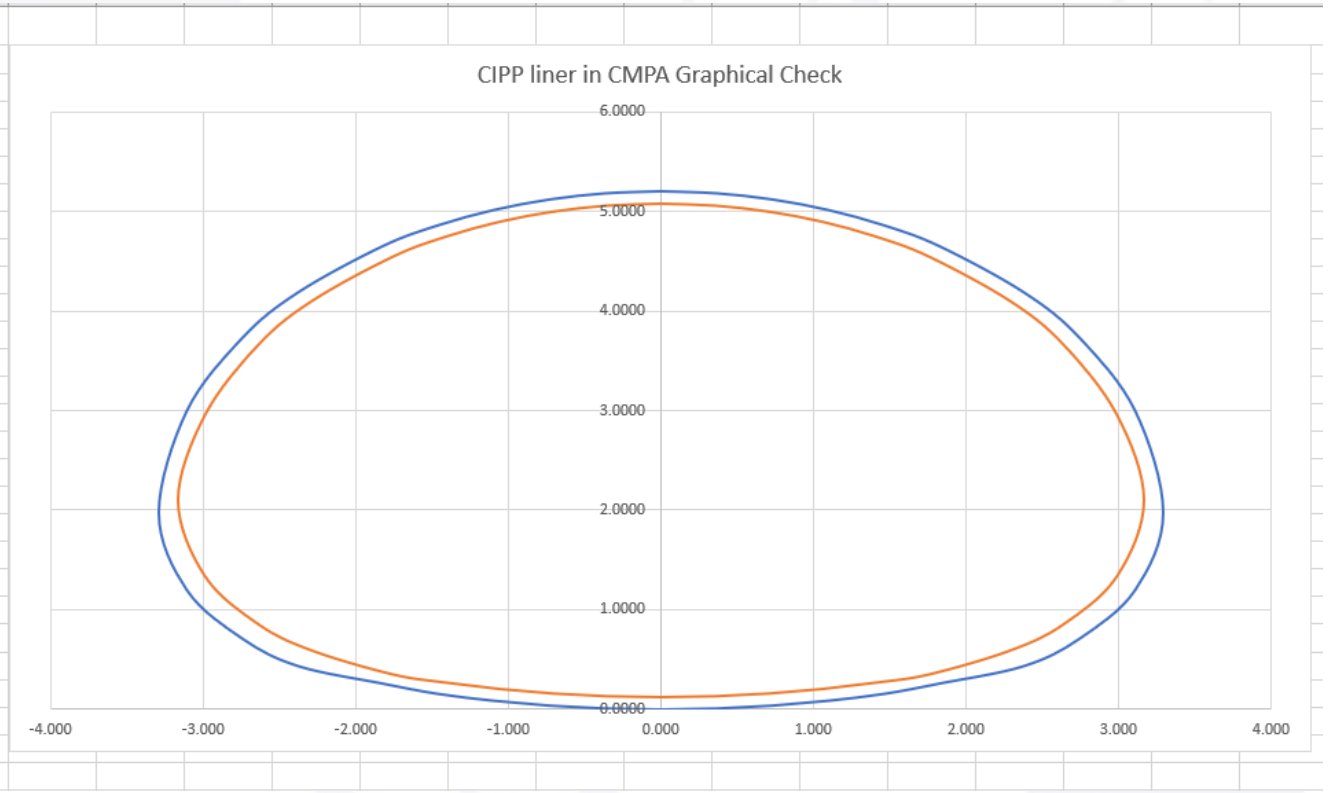
Output		
appx waterway area	24.69	sf
span	6.333333	ft
rise	4.96	ft
CIPP thickness	1.5	in
inlet invert	0.13	ft
Outlet invert	0.13	ft

76 in
59.5 in

Calculations (do not touch cells)	
center of corner radius	1.427
y=k+sqrt(r^2-(x-h)^2)	
k-top	1.79
k-side	1.979167
h-side	1.427
k-bottom	6.885417

Output Plot for HY8			
	x	y1	y2
1	-3.167	1.9792	1.9792
2	-2.991	2.8325	1.2169
3	-2.639	3.5421	0.7311
4	-2.287	3.9819	0.4670
5	-1.759	4.4247	0.2285
6	-1.407	4.6284	0.1454
7	-1.056	4.7772	0.0814
8	-0.704	4.8792	0.0361
9	-0.352	4.9387	0.0090
10	0.000	4.9583	0.0000
11	0.352	4.9387	0.0090
12	0.704	4.8792	0.0361
13	1.056	4.7772	0.0814
14	1.407	4.6284	0.1454
15	1.759	4.4247	0.2285
16	2.287	3.9819	0.4670
17	2.639	3.5421	0.7311
18	2.991	2.8325	1.2169
19	3.167	1.9792	1.9792

Calculated Area Check
24.69



CMPA Coordinate Generator

- Liners
  - HDPE
  - CIPP
  - Paved Invert
  - Steel
- Error will occur if structure is too small for a Paved Invert
  - It will not draw the liner

Paved Invert Coordinate Generator

Input values

	radius	
B	23.75	in
Rt	3.29	ft
Rb	6.47	ft
Corner	20.88	in
Output Values		
appx waterway area	25.25	sf
span	6.58	ft
rise	4.79	ft
Paved invert Thickness	5.00	in
Inlet invert	0.42	ft
outlet invert	0.42	ft

79 in
57.5 in

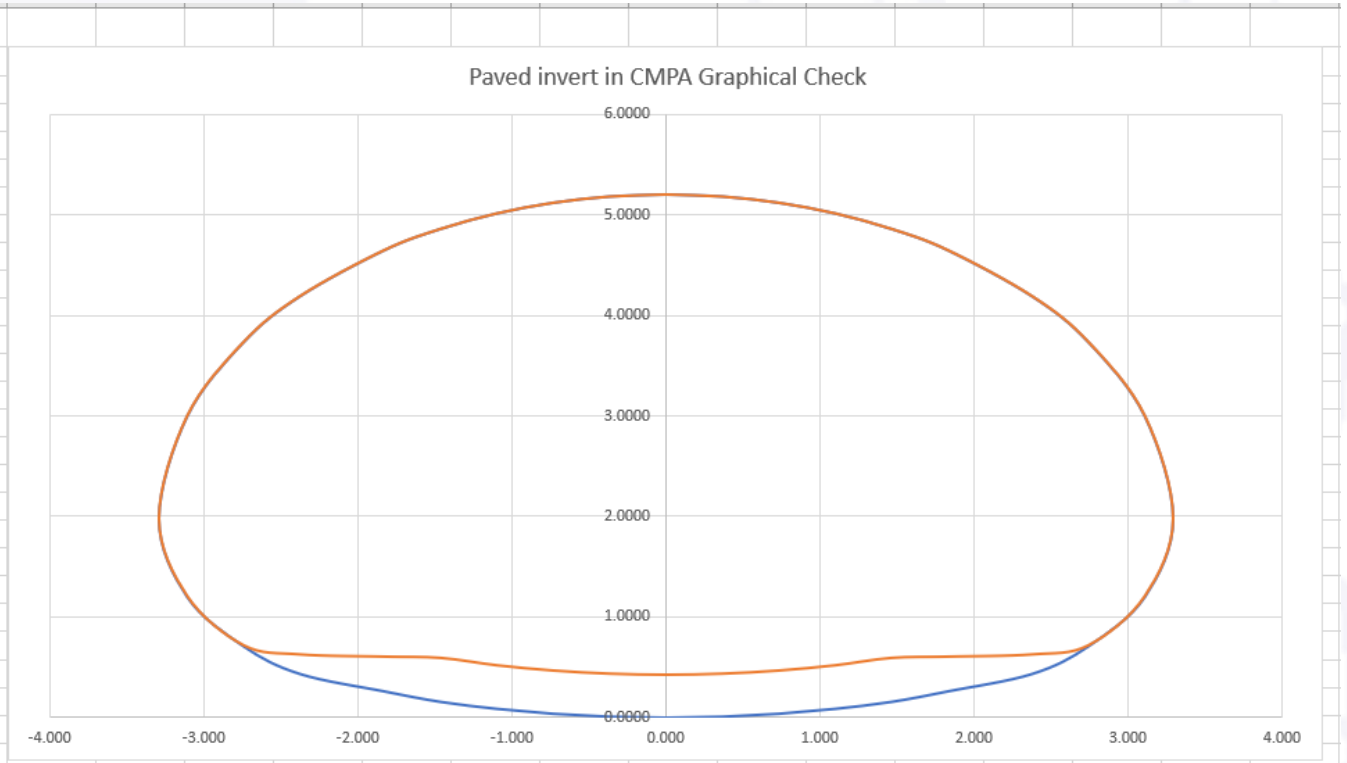
Calculations (do not touch cells)

center of corner radius	1.552
y=k+sqrt(r^2-(x-h)^2)	
k-top	1.916667
k-side	1.979167
h-side	1.552
k-bottom	6.46875

Output Plot for HY8

	x	y1	y2
1	-3.292	1.9792	1.9792
2	-3.109	2.9985	1.2028
3	-2.743	3.7362	0.7112
4	-2.377	4.1934	0.6193
5	-1.829	4.6536	0.5972
6	-1.463	4.8654	0.5843
7	-1.097	5.0201	0.5104
8	-0.731	5.1260	0.4582
9	-0.366	5.1880	0.4270
10	0.000	5.2083	0.4167
11	0.366	5.1880	0.4270
12	0.731	5.1260	0.4582
13	1.097	5.0201	0.5104
14	1.463	4.8654	0.5843
15	1.829	4.6536	0.5972
16	2.377	4.1934	0.6193
17	2.743	3.7362	0.7112
18	3.109	2.9985	1.2028
19	3.292	1.9792	1.9792

Calculated Area Check
25.25



CMPA Coordinate Generator

- Liners
  - HDPE
  - CIPP
  - Paved Invert
  - Steel

- Error will occur if structure is too small for a steel liner
  - It will draw but will recommend points to be fixed
  - Note states that liner size is not available

Steel Liner Coordinate Generator

Input values

	radius	
B	23.75	in
Rt	2.96	ft
Rb	6.89	ft
Corner	20.88	in
Output Values		
appx waterway area	21.92	sf
span	5.92	ft
rise	4.71	ft
Grout Thickness Top	4.00	in
Grout Thickness Sides	3.00	in
Liner Wall Thickness	1.00	in
inlet invert	0.08	ft
outlet invert	0.08	ft

71 in
56.5 in

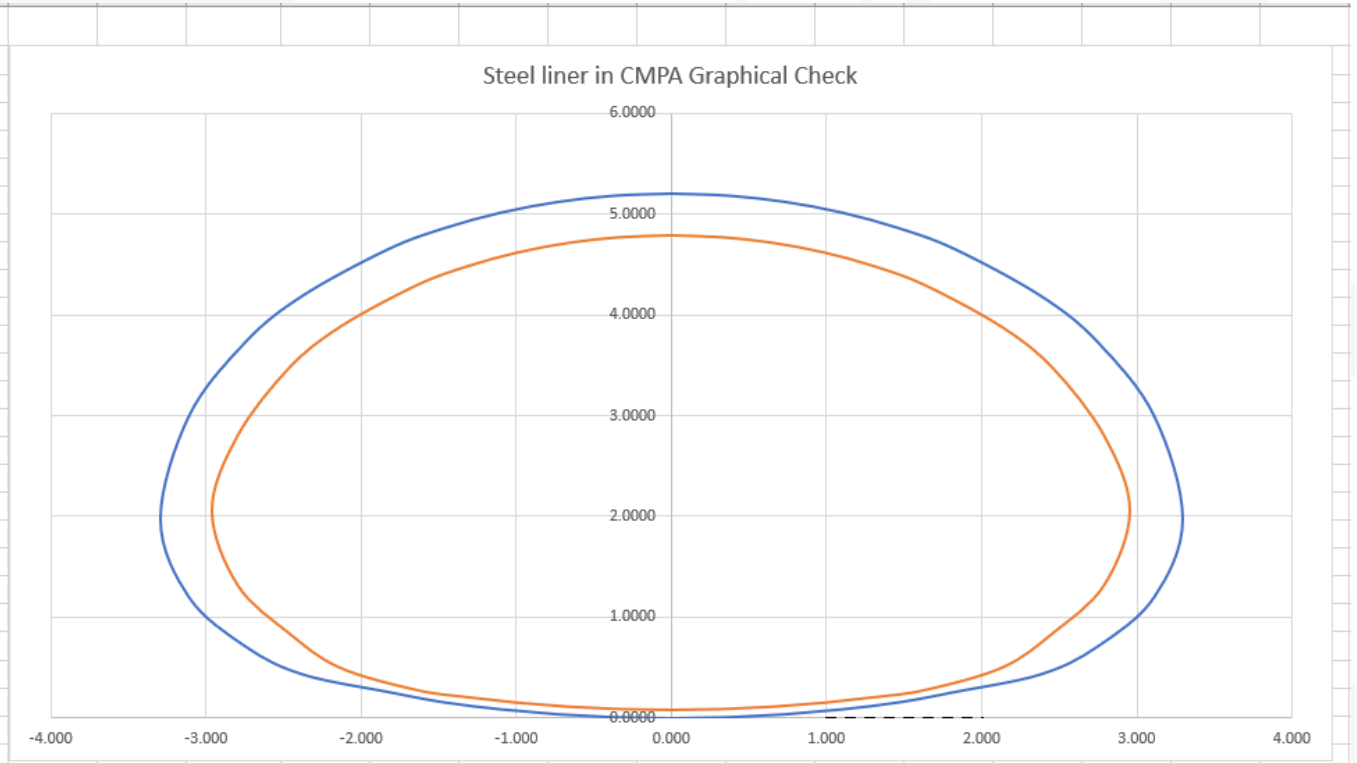
Calculations (do not touch cells)

center of corner radius	1.219
y=k+sqrt(r^2-(x-h)^2)	
k-top	1.75
k-side	1.979167
h-side	1.219
k-bottom	6.89

Output Plot for HY8

	x	y1	y2
1	-2.958	1.9792	1.9792
2	-2.794	2.7173	1.2411
3	-2.465	3.3853	0.7658
4	-2.137	3.7962	0.4206
5	-1.644	4.2098	0.1990
6	-1.315	4.4001	0.1267
7	-0.986	4.5391	0.0710
8	-0.657	4.6344	0.0315
9	-0.329	4.6900	0.0079
10	0.000	4.7083	0.0000
11	0.329	4.6900	0.0079
12	0.657	4.6344	0.0315
13	0.986	4.5391	0.0710
14	1.315	4.4001	0.1267
15	1.644	4.2098	0.1990
16	2.137	3.7962	0.4206
17	2.465	3.3853	0.7658
18	2.794	2.7173	1.2411
19	2.958	1.9792	1.9792

Calculated Area Check
21.92

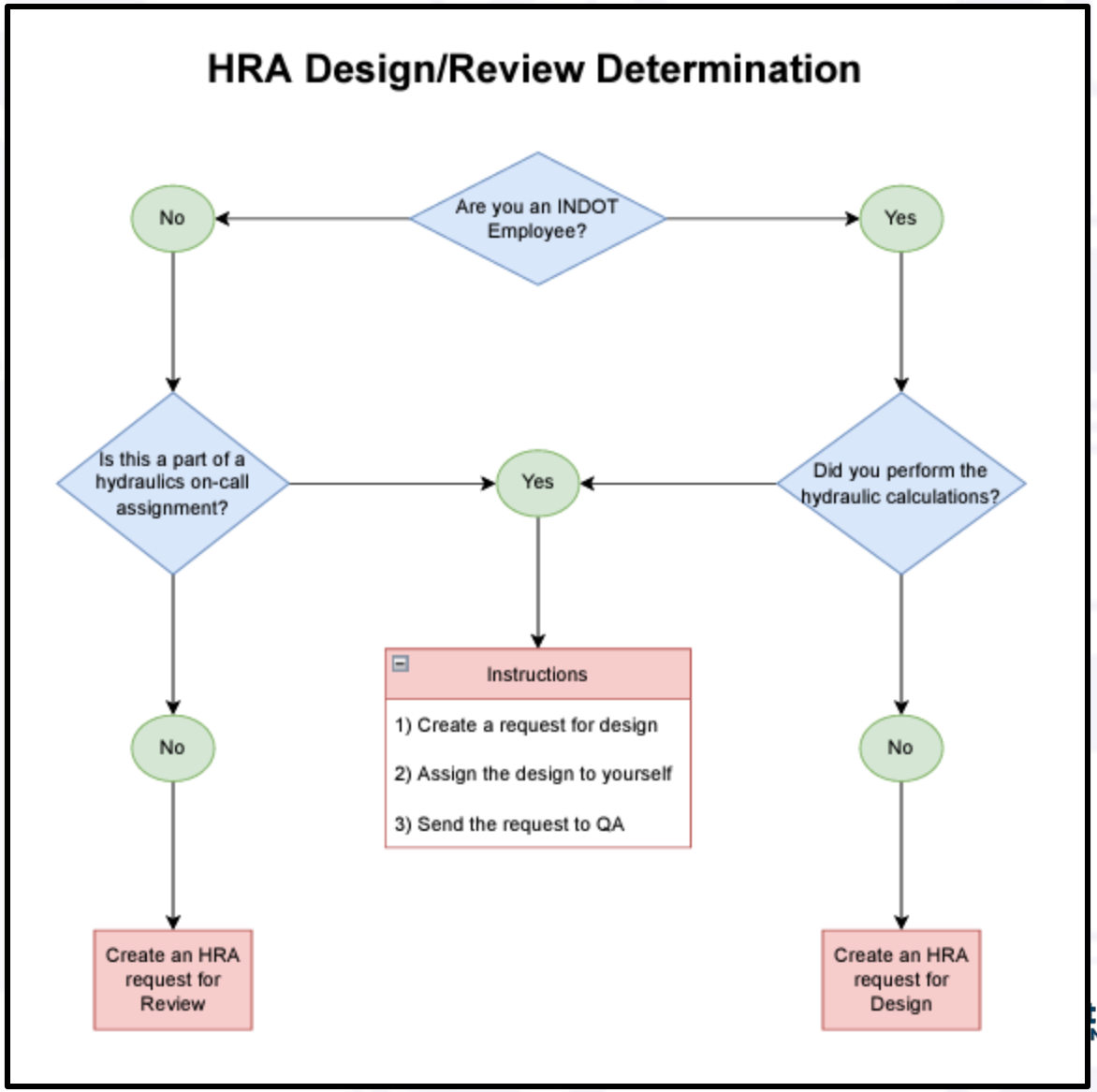


Website Update

- Developing Design Guidance:
  - Steel Liners
  - Median Drain
  - Infiltration Ponds
- Coordinate Generator for CMPA Liners
- Minimum pipe size that can be lined
  - If structure is already at the minimum size, then only a CIPP liner can be used.
  - If structure is under minimum size, it cannot be lined.
- Keep Memo Templates Up to Date
  - Check version numbers
- Submitting requests to the HRA
  - HRA Project Type Flow Chart

HRA Design-vs-Review

- Design projects include:
  - District requests that are designed by INDOT Hydraulics
  - A person from another INDOT department designs and we QA
  - An on-call designs and INDOT Hydraulics QA's
- Review projects include:
  - Consultant performed calculations
- The Website Flow Chart provides instruction on which item to choose and how far the requester should continue into the request process.



Riprap – IDM Figure 203-2D

Riprap Sizing for Erosion Protection		Velocity, v (fps)			
		v<6.5	6.5≤v<10	10≤v<13	v>13
Span of Structure, x	x≤2'	Revetment	Revetment	Revetment	Revetment
	2'<x≤2.5'	Revetment	Class 1	Class 1	Class 1
	2.5'<x≤3'	Revetment	Class 1	Class 2	Class 2
	x>3'	Revetment	Class 1	Class 2	Energy Dissipator
Stream Protection		Revetment	Class 1	Class 2	Class 2

Notes:

1. If clear-zone or other issues prohibit the use of the required erosion-protection method, the Office of Hydraulics should be contacted for additional instructions.
2. Substitution of partially grouted riprap of one size smaller than that recommended in the table may be used.

STREAM VELOCITY FOR EROSION PROTECTION
Figure 203-2D
[Rev. Jan. 2023]

INDOT Median Drain Policy

GUIDANCE

- INDOT has limited hydraulic guidance for median drains in the Indiana Design Manual (IDM)
- Developing Design Guidance is given on median drains on the Hydraulics Website
  - https://www.in.gov/indot/engineering/hydraulic-engineering/
- IDM to be updated with median drain policy in the near future

Median Drain Risks

- Lack of Redundancy
  - Water will go on or over the roadway if drainage fails
  - The road is the emergency spillway
  - Medians are typically on major corridors and/or divided highways
    - High Traffic Volume (traffic delays, commute times increase)
    - High Travel Speeds (safety)
    - Economy (commerce affected)
- All median drains are always subject to INDOT Hydraulics Review

Tailwater Conditions

- Downstream Ditch Normal Depth
  - New median and storm sewer outlets shall be a minimum of 12” above the downstream ditch flow line
  - 6" may be used but the ditch hydraulic grade line (HGL) shall be checked for impact to the median
- Detention Hydraulic Grade Line (HGL)
  - Q100 for ditches
  - Q50 for storm sewers
- Receiving Water -Joint Probability
  - IDM Fig. 203-2G
- Existing storm sewer
  - Assume full flow of downstream system if not an INDOT asset
  - Check with owner of downstream system if they are good with higher flows (if necessary)

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Medians: Interstate ATL vs. Non-Interstate

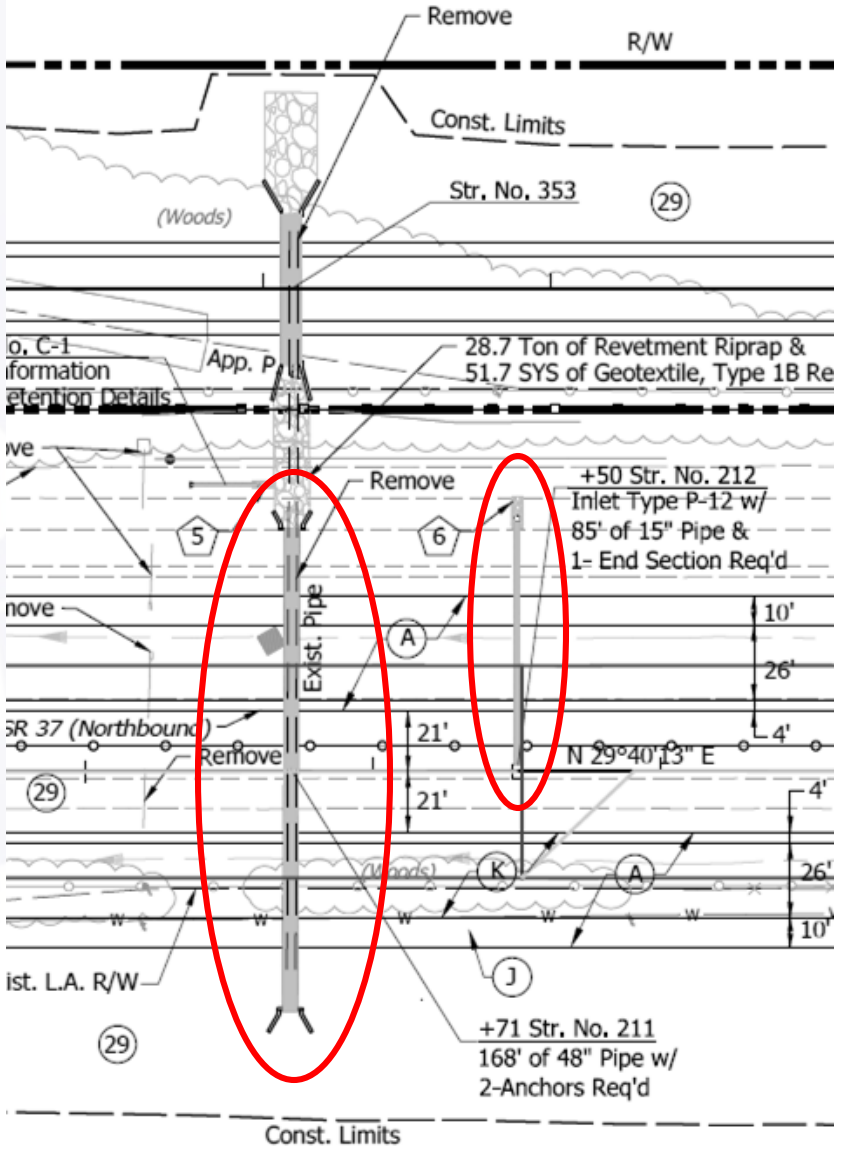
- Interstate Added Travel Lanes (ATL)
  - AEP1% (Q100) Serviceability
- Non-Interstate
  - AEP2% (Q50) Serviceability

Median Drain Design Factors

- Minimum pipe size 12” Inner Diameter (ID)
- Minimal rational C for pavement – 0.90
- No detention is allowed in the median or under pavement
- Slotted drains shall not be used in the drainage calcs but a trench drain may as long as it has a minimum width of 12”
- 1’ contour map for drainage areas
- No drainage from an outside ditch should be brought into median drainage system

Median Drain Design Factors

- Flanking Inlets required at all Sag inlet locations
  - Required on both sides if flow comes from both directions
  - If flow comes from only 1 direction, then only one flanking inlet is needed
- When possible, median drains shall have a separate pipe to the outside.
  - Exception: Flanking inlets may be connected to the primary inlet
  - Exception: inlets on other side of barrier wall may be connected



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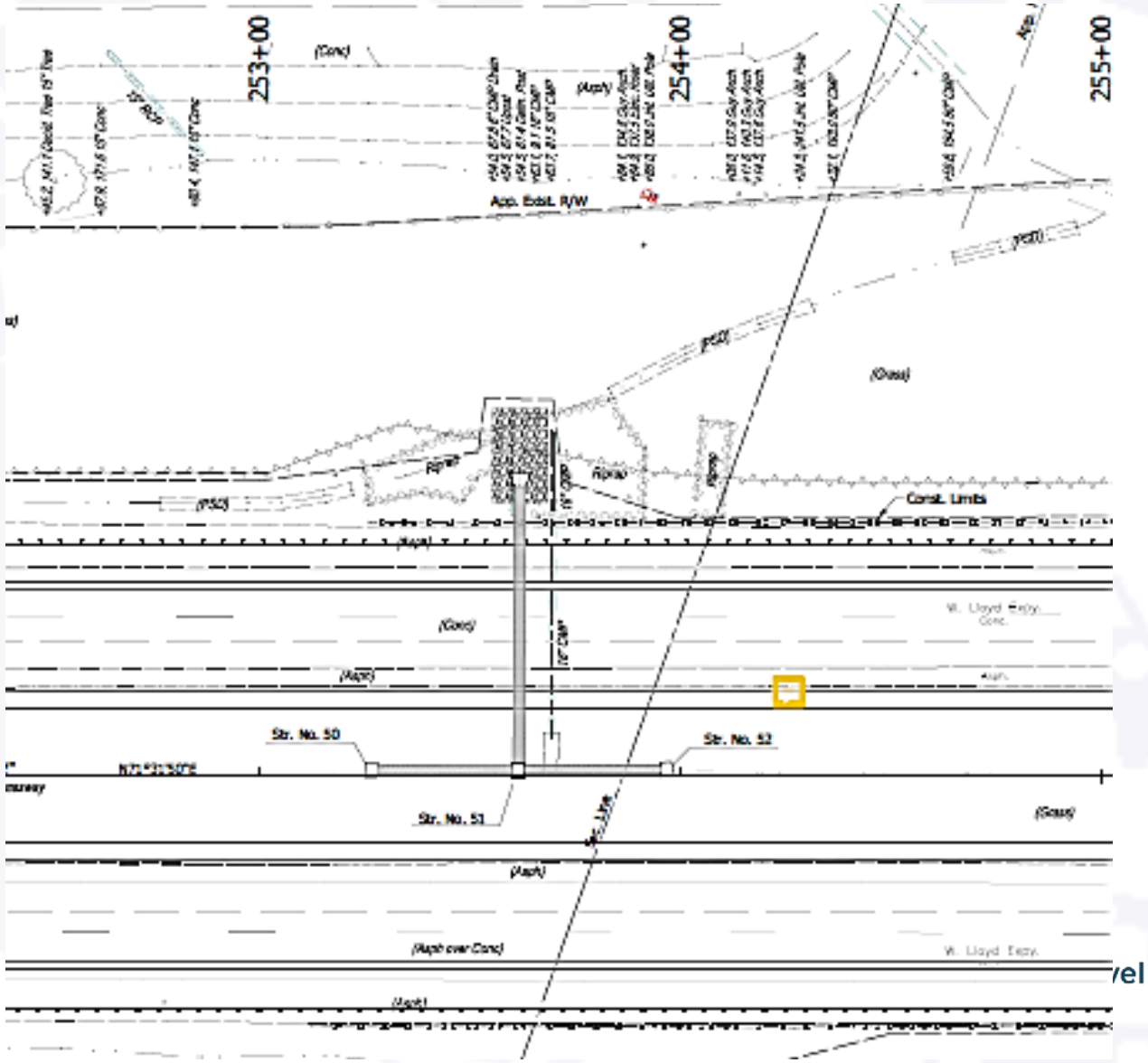

Median Drain Design Factors

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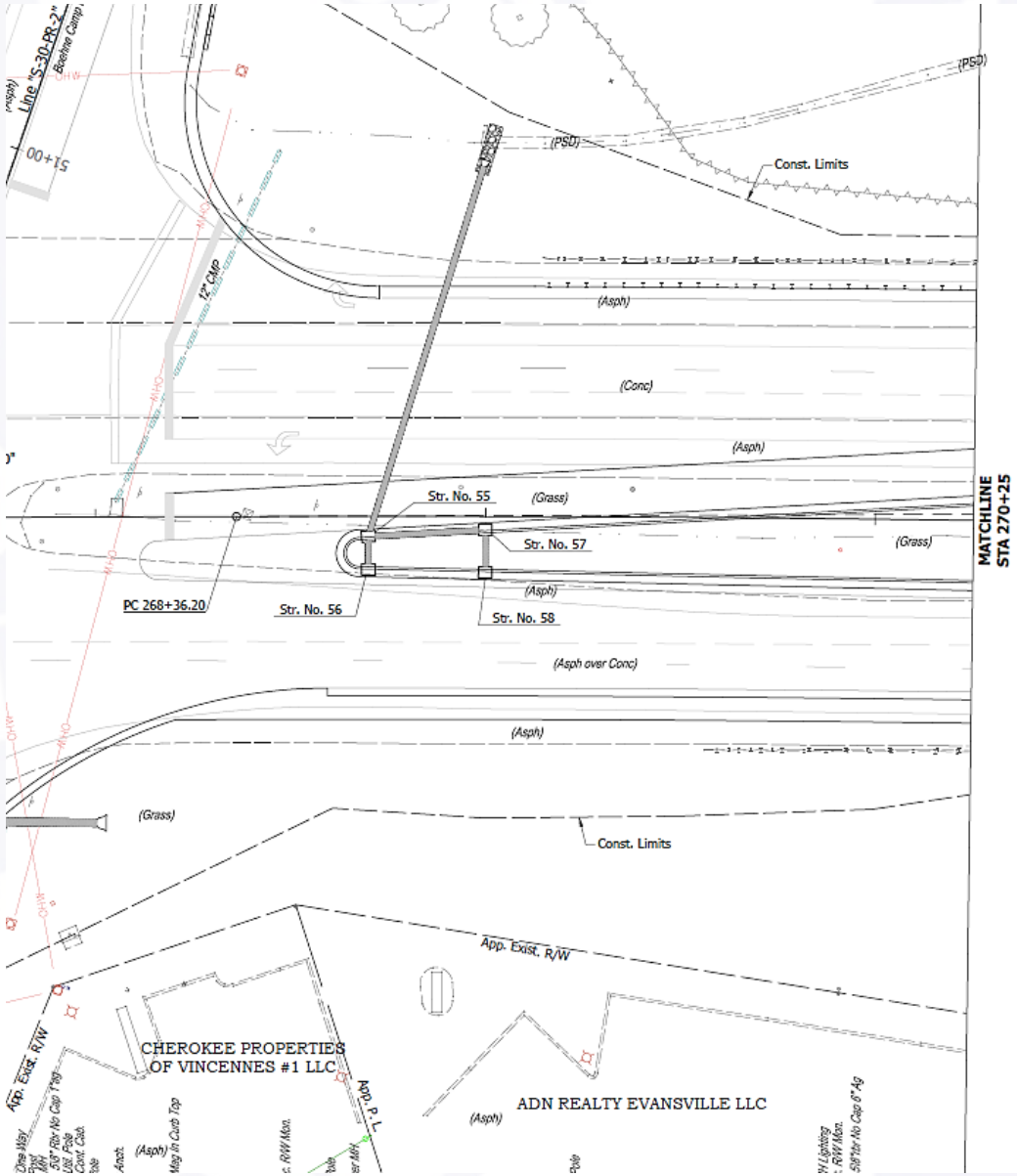


Inlet Types

- Preferred
  - Non-Paved Medians: Type N-12 inlets
    - P-12 inlets if N-12 cannot geometrically fit
  - Paved Medians: Type 5 inlets
- Not recommended
  - Type E7 inlets

N-12 Inlet

Type 5 Inlet

E7 Inlet

Inlet Types

- Preferred
  - Non-Paved Medians: Type N-12 inlets
    - P-12 inlets if N-12 cannot geometrically fit
  - Paved Medians: Type 5 inlets
- Not recommended
  - Type E7 inlets

N-12 Inlet

Type 5 Inlet

P-12 Inlet

P-Inlet Spread Calculations – At a Sag

COMPUTE INTERCEPTION OF A P-12 INLET AT A SAG POINT

Project:			
Str. Number:		Designed by:	
Station:		Date:	

Instructions: Fill in the yellow highlighted cells and adjust the trial depth until the compute flow (green highlight below) nearly matches the design discharge.

By using this spreadsheet, the user agrees to take full responsibility to evaluate the results and ensure that they are correct.

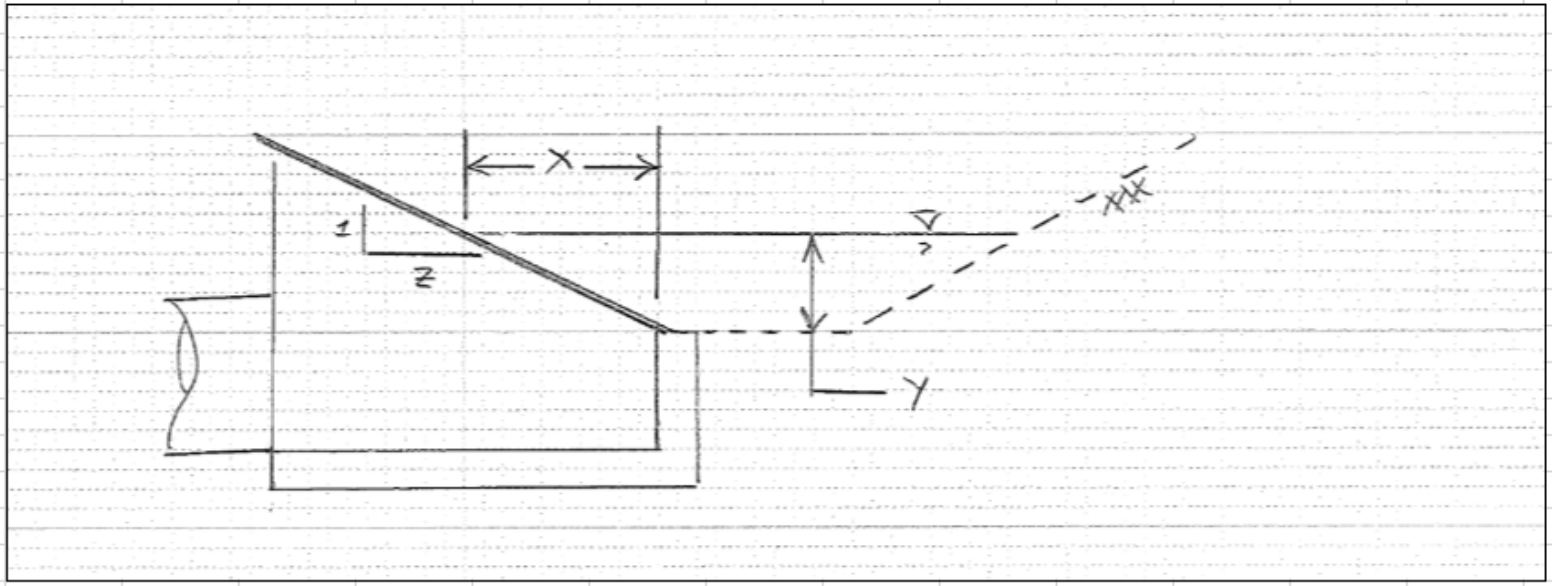
Data Entry

Design Discharge:		cfs
z:		:1
Weir C:	varies	
Orifice C:	0.6	
Enter trial depth:		feet (y)

(Trial and error until Computed Q = entered Discharge)

Results

Computed Q	Error
#DIV/0!	#DIV/0!



NextLevel INDIANA

P-Inlet Spread Calculations – On Grade

P-12A INLETS ON GRADE - FLOW INTERCEPTION

Computed by:		Date:	
Project:			
Str. #:			

DATA ENTRY

To use, fill in yellow highlighted cells.

Ditch Type:		
Inlet side:		
Discharge:		cfs
Longitudinal slope:		ft/ft

Enter ditch cross section data:

Point Number	Segment Type*	X	Elevation	Mannings n
1	Left shoulder			
2	Left slope			
3	Right slope			
4	Right shoulder			
5	-End point-			
-				

* Type is marked at the start of the segment

Background

Grate width:	2.39	feet (along flow direction)
Grade Length:	3.77	feet (along ditch slope)
Splash-over velocity:	4.84	ft/sec

Check: Will inlet fit?

Left:	No
Right:	No

By using this spreadsheet, the user agrees to take full responsibility to evaluate the results and ensure that they are correct.

RESULTS SUMMARY

Flow depth: #VALUE! feet

NextLevel INDIANA

Typical Spread Standards

Type of Facility	Design Frequency	Allowable Spread, T
Freeway	2% Annual EP	Edge of travel lane
Non-Freeway, ≥ 4 Lanes	10 % Annual EP	Across one-half travel lane
Two-Lane Facility	10 % Annual EP	4 ft onto travel lane
Bridge Deck, Non-Freeway $V \geq 50$ mph $V < 50$ mph	10 % Annual EP 10% Annual EP	Edge of travel lane 3 ft onto travel lane
Ramp $V \geq 50$ mph $V < 50$ mph	10% Annual EP 10% Annual EP	Edge of travel lane 3 ft onto travel lane

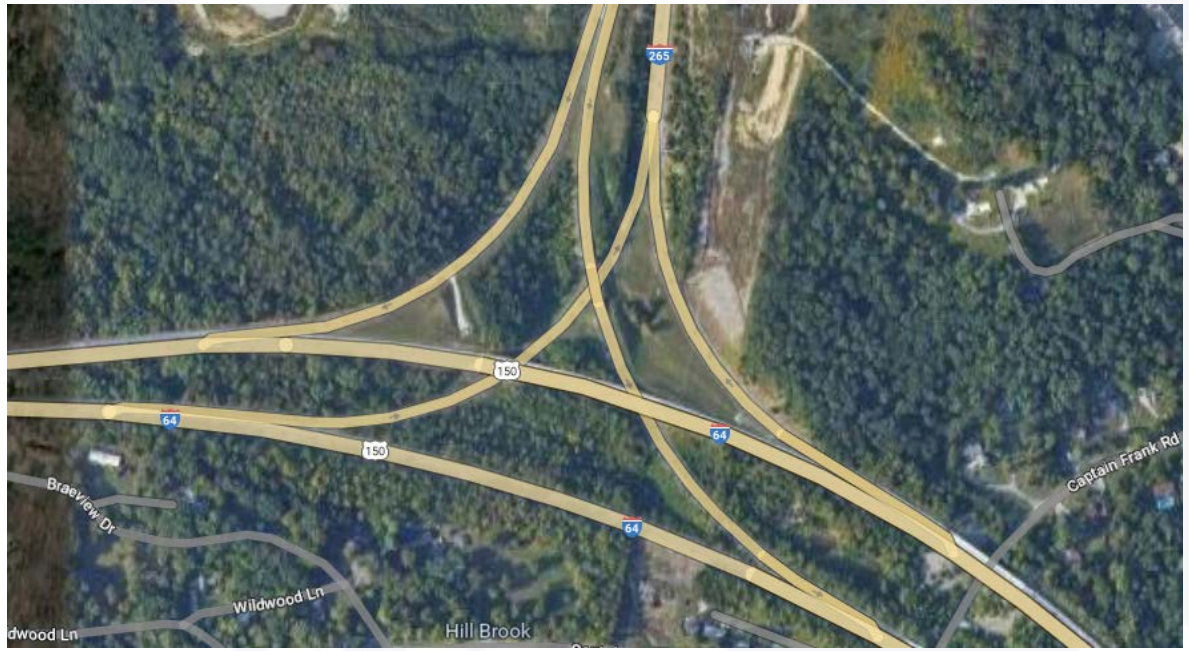
Note:Consideration for a 2% annual EP storm event should be used when in a depressed area. See Section 203-4.04(10)

DESIGN FREQUENCY AND ALLOWABLE WATER SPREAD

Figure 203-4A

Interstate to Interstate Ramps

- Ramps at interstate to interstate interchanges shall have matching serviceability requirements to normal interstate lanes.



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Note:Consideration for a 2% annual EP storm event should be used when in a depressed area. See Section 203-4.04(10)

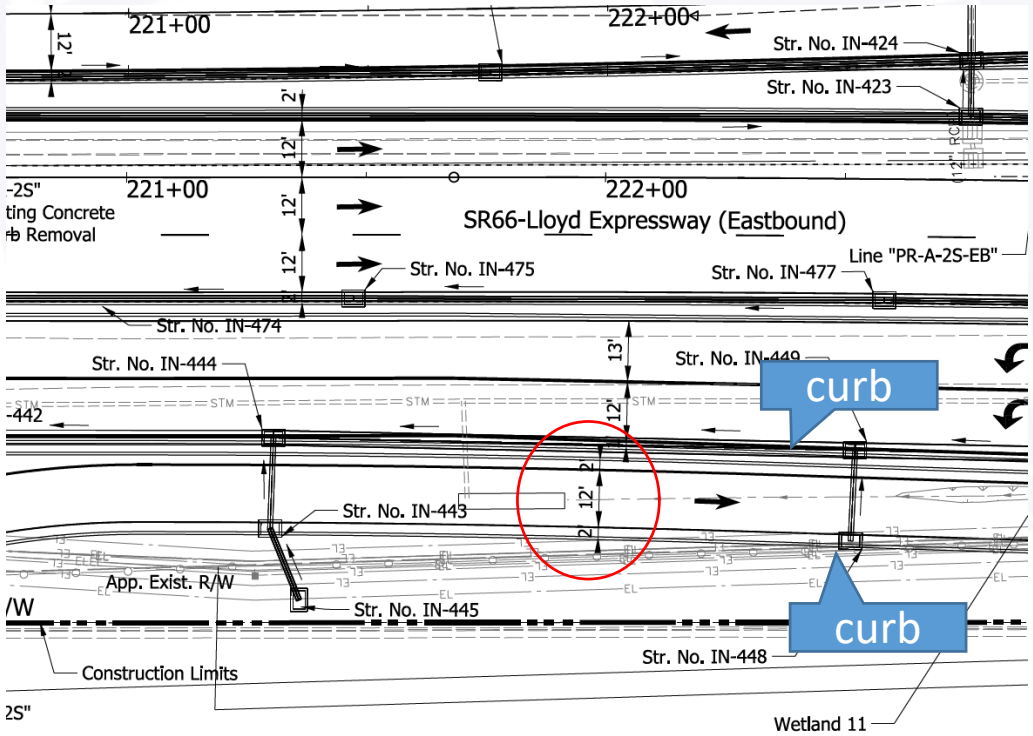
DESIGN FREQUENCY AND ALLOWABLE WATER SPREAD

Figure 203-4A

NextLevel INDIANA

Curb Confined Lanes

- ***Single*** lanes confined by curbs on each side have a maximum spread of 4 ft into travel lane.
  - This includes facilities that are over 4 lanes total
  - Displaced left intersections



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Freeway	2% Annual EP	Edge of travel lane
~~Non-Freeway, ≥ 4 Lanes~~	~~10 % Annual EP~~	~~Across one-half travel lane~~
Two-Lane Facility	10 % Annual EP	4 ft onto travel lane
Bridge Deck, Non-Freeway $V \geq 50$ mph $V < 50$ mph	10 % Annual EP 10% Annual EP	Edge of travel lane 3 ft onto travel lane
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Note:Consideration for a 2% annual EP storm event should be used when in a depressed area. See Section 203-4.04(10)

DESIGN FREQUENCY AND ALLOWABLE WATER SPREAD

Figure 203-4A

Curb Confined Lanes

Hydraulics Design Exemptions

Exemptions are Sometimes Allowed

- Can provide significant cost savings without incurring unreasonable risk
- Often requires coordination with Hydraulics before submittal
- Provide supporting documentation

Hydraulics Design Exemptions

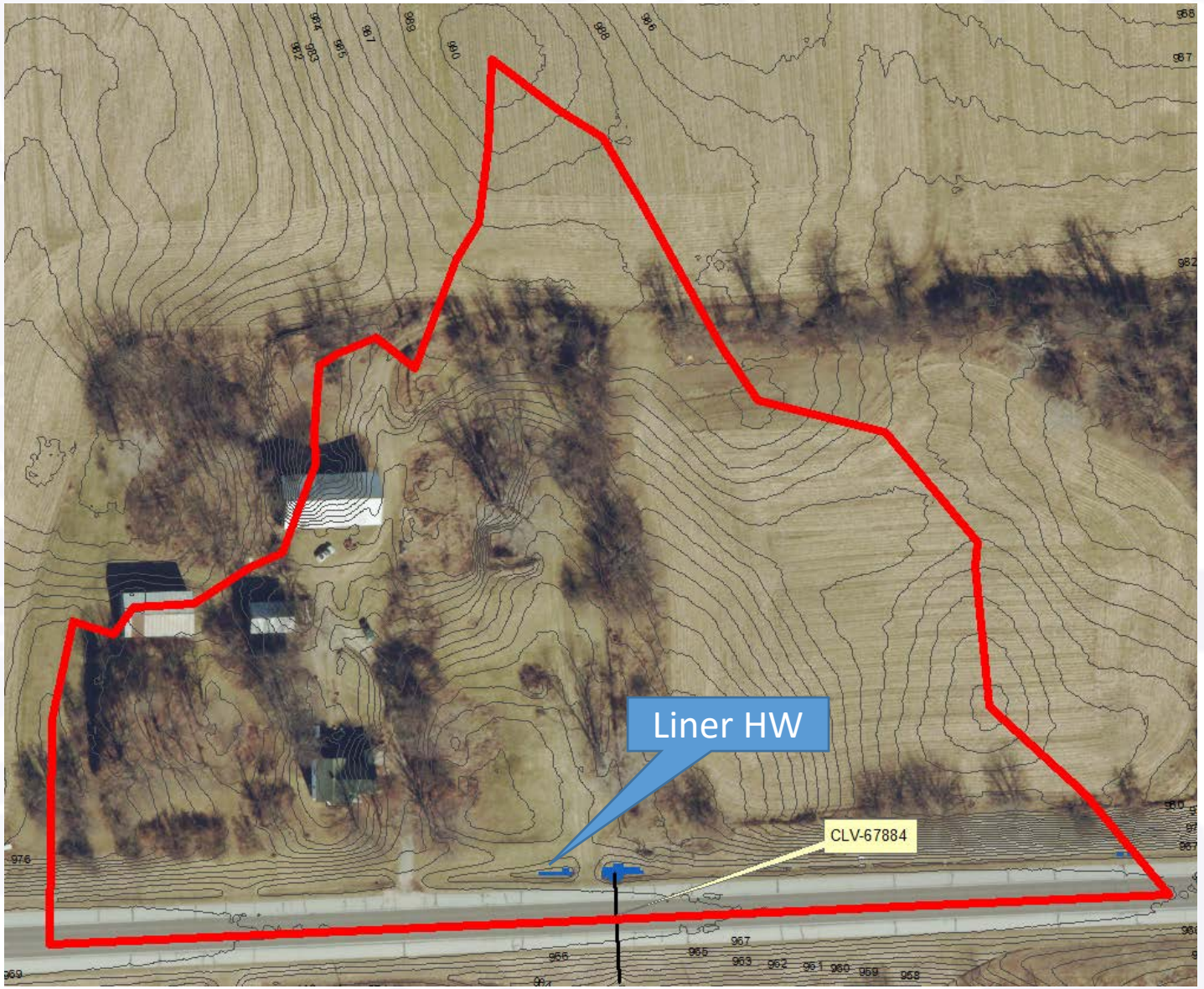
Pipe Liner – Allowing an Increase in Headwater (HW)

- No road overtopping
- Proposed headwater is contained
  - In the upstream channel or
  - Contained in ROW or
  - Contained in a deep wooded ravine
- Does not negatively affect upstream properties or structures

Hydraulics Exemption Considerations

Pipe Liner – Allowing an Increase in Headwater (HW)

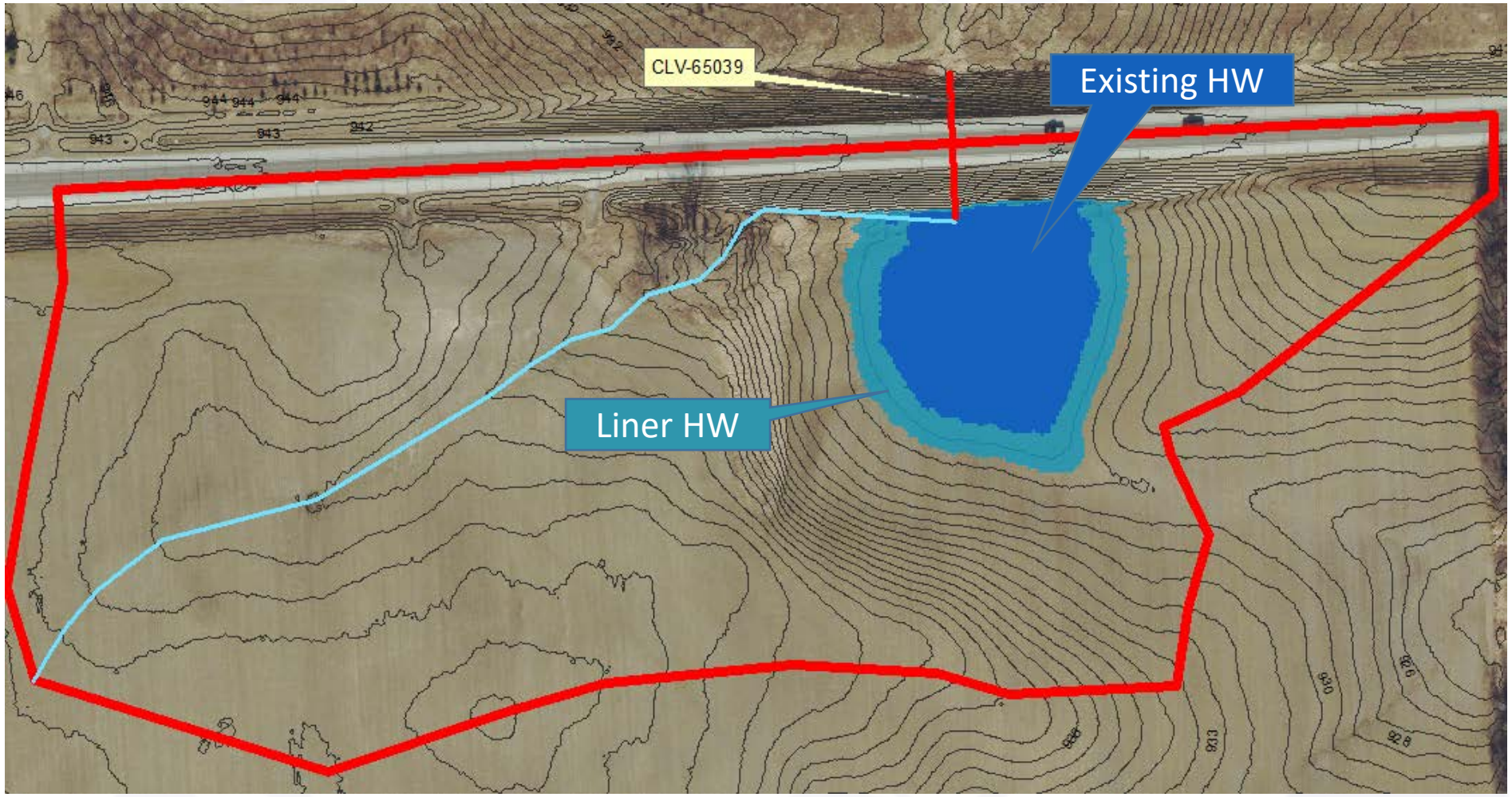
To the right is an example of when we would allow an increase in the headwater.



Hydraulics Exemption Considerations

Pipe Liner – Allowing an Increase in Headwater (HW)

This is an example where we <u>would not</u> allow an increase.



Hydraulics Exemption Considerations

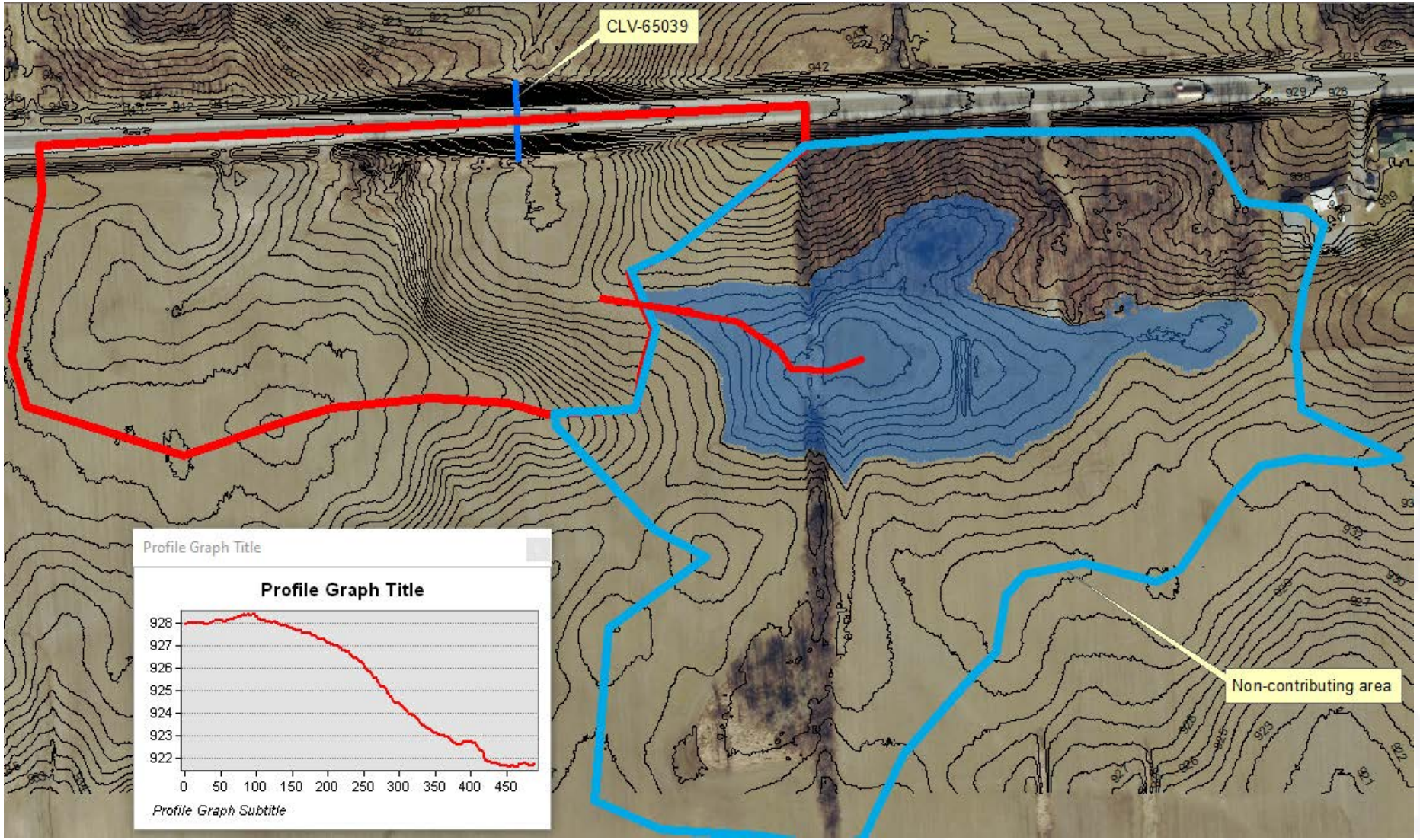
Structure Replacement - Match Existing Performance

- Model shows overtopping during a small Q (say 10% of Q_{100})
- Checked with district maintenance and County Surveyor no known flood history
- The topography shows the water jumps to another drainage area
- That there is significant natural storage
- Concerns with downstream restrictions

Hydraulics Exemption Considerations

Non-contributing Drainage Areas

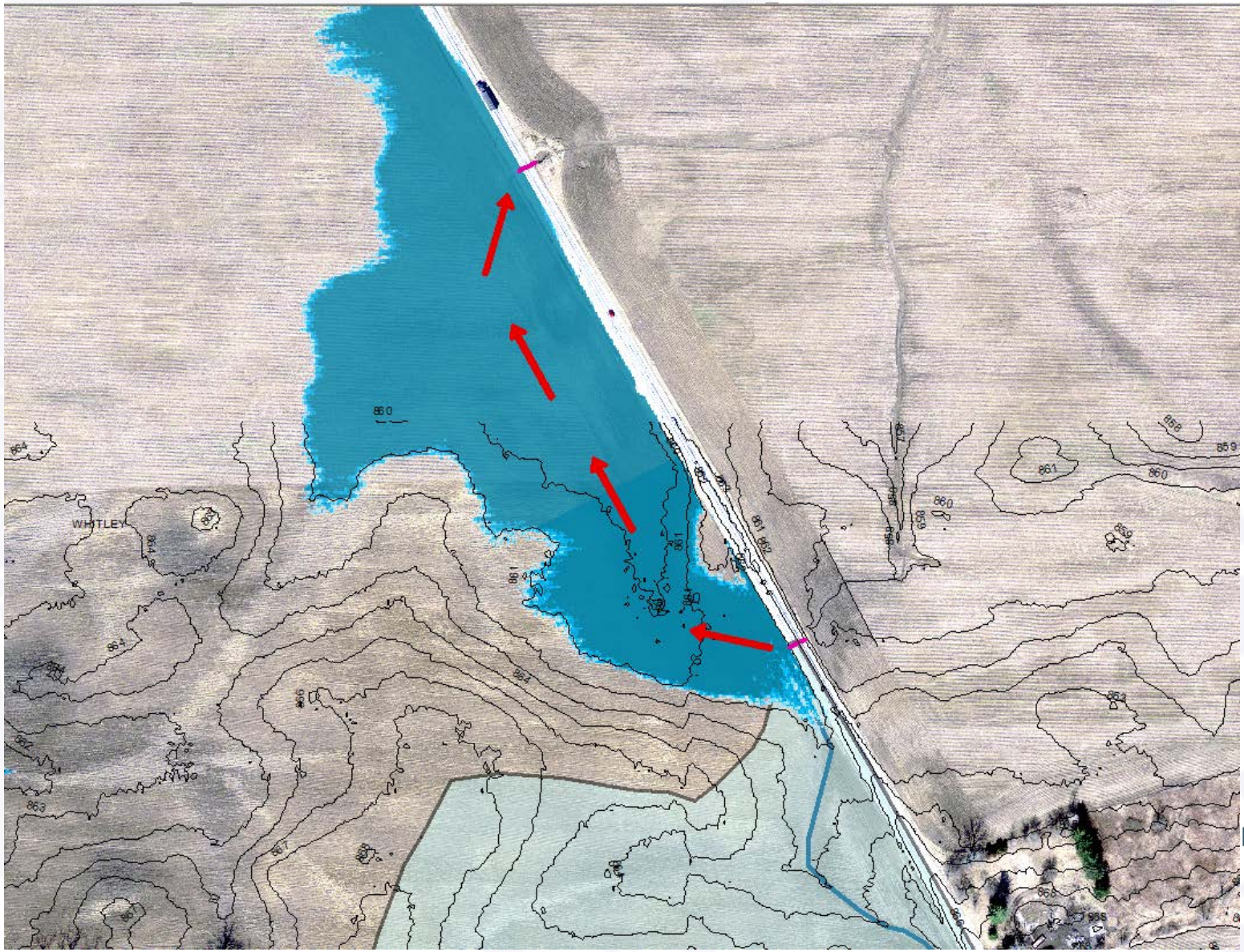
Areas that have natural storage that is greater than the potential runoff generated by the drainage area.



Hydraulics Exemption Considerations

Structure Replacement - Match Existing Performance

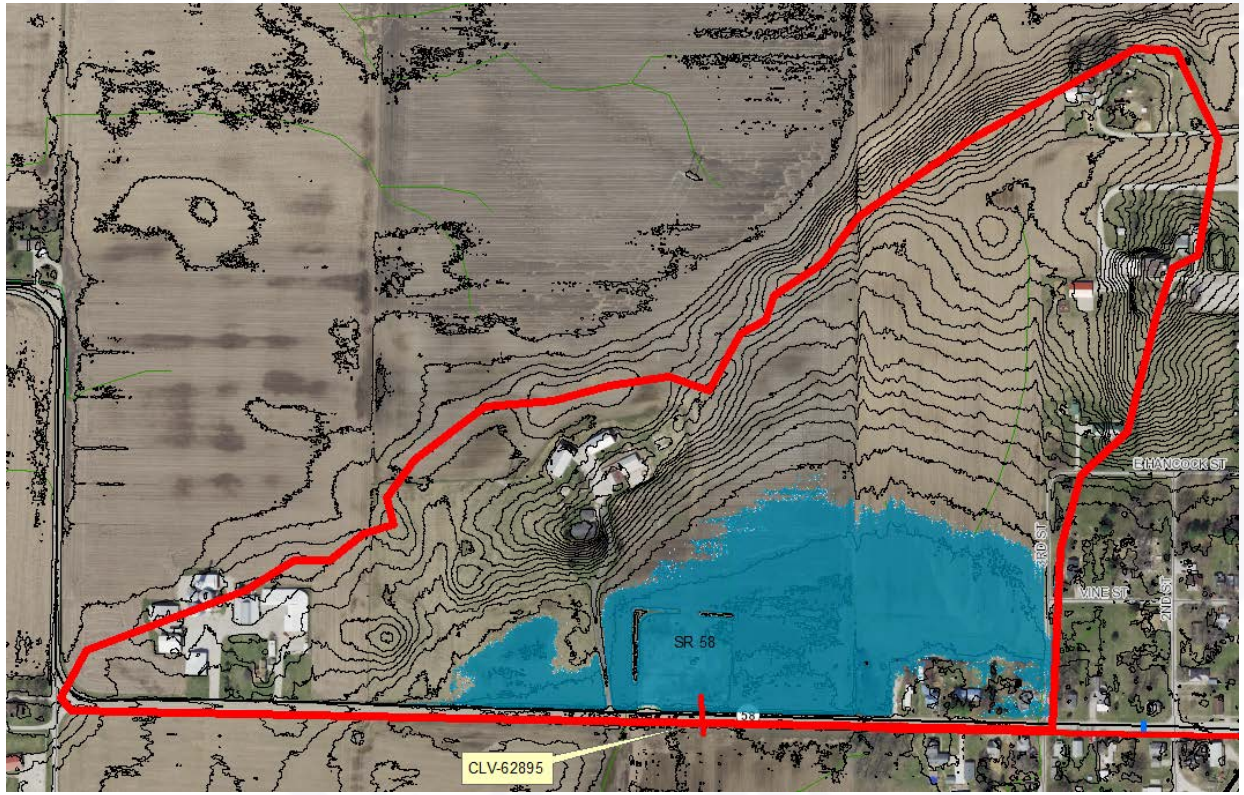
Water leaves the drainage area before it can reach the road elevation.



Hydraulics Exemption Considerations

Structure Replacement - Match Existing Performance

Significant natural storage in the drainage area



Hydraulics Exemption Considerations

Using the Existing Outlet Depth to Calculate the Backwater (BW)

- Culvert with no downstream channel
- Outlet depth is greater than the natural TW
- Existing outlet depth can be used for calculating the existing and proposed BW

Infiltration Basins

Infiltration should only used after all other designs have been considered

- Cannot provide positive slope for ditching
- Storm sewer system not feasible

Check Natural Resources Conservation Service (NRCS) soil data

- Soils should be classified as sand
- Check seasonable high ground water should be at least 2 feet below the proposed bottom elevation of the basin

Infiltration Basins

Infiltration Basin Testing – INDOT Geotechnical Guidelines

https://www.in.gov/indot/engineering/files/percolation-Infiltration-guidelines.pdf

- Provide infiltration tests at the bottom of basin elevation
- Measure depth to groundwater measurements table during testing
- Presoaking required prior to testing
- Testing should be done during the wet season if possible

Infiltration Basins

Consider Redundancy

- Consider the overflow routing if infiltration fails
- Even if the basin can’t be completely drained due to elevation, provide overflow ditching or piping so that the road or adjacent properties are not impacted
- Connect multiple basins if possible

Infiltration Basins

Consider Construction Impacts

- Construction in cut only (not fill areas)

- Erosion and Sediment Control
  - Should not be used as a sediment basin
  - Runoff from disturbed areas should be diverted until stabilized
  - The surface and side slopes of the infiltration basin should be stabilized immediately after grading

- Prevent Compaction of Soils
  - Should not be used for equipment storage or material staging
  - Other than grading the infiltration area should not be driven on

NextLevel INDIANA

Cutoff Walls

Design Memo 22-24 Revised

Cutoff walls are now required for all box structures with a concrete bottom.

Used to prevent piping along the culvert barrel and undermining at the culvert end.

- If bedding material (i.e. crushed stone, b borrow, etc.) is present, the cutoff wall should extend 6 inches below the bedding material.
- If bedding material is not present, the depth of the cutoff wall should be a minimum of 20 inches below the bottom of the culvert.

Q & A

Stay up to Date

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- INDOT Hydraulics email
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- INDOT Hydraulics Website
  - https://www.in.gov/indot/engineering/hydraulic-engineering/

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