



MDE Field Data Collection Tool utilized for Limited Detailed Modeling

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AECOM Water – Watershed Concepts



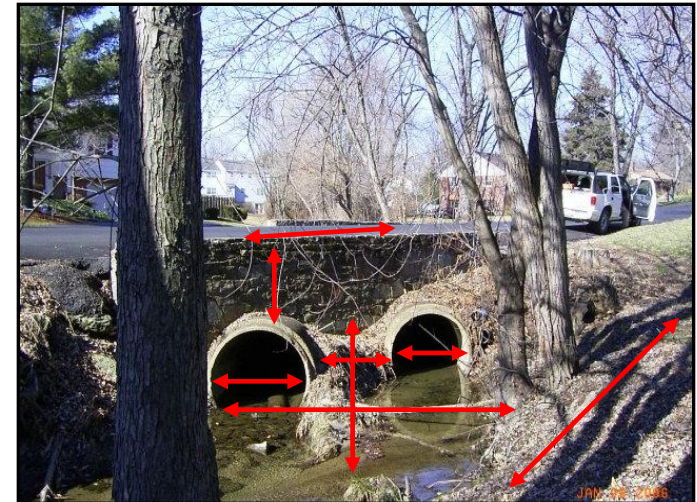


Overview

- Maryland floodplain mapping update
- MDE Field Data Collection Tool
 - Reason for development
 - Implementation and development
 - Data Collection Process
 - Future possibilities
- Limited Detailed Study (Enhanced Approximate)
 - Review of FEMA study types
 - Link between MDE data collection tool and LDS
 - LDS approach
 - DFIRM Integration

Maryland Floodplain Mapping Update

- FEMA funded 13 MD counties to be updated with digital flood insurance rate maps
- MDE as the CTP recognized several opportunities:
 - Leverage new LIDAR dataset for the state
 - New hydrology by University of Maryland
 - Select the USACE for engineering support
 - Utilize Maryland Environmental Services for field data collection
- Key dataset was missing
 - Culvert crossings!



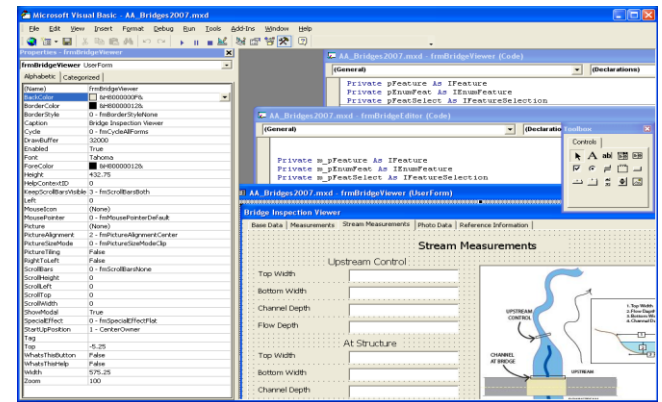
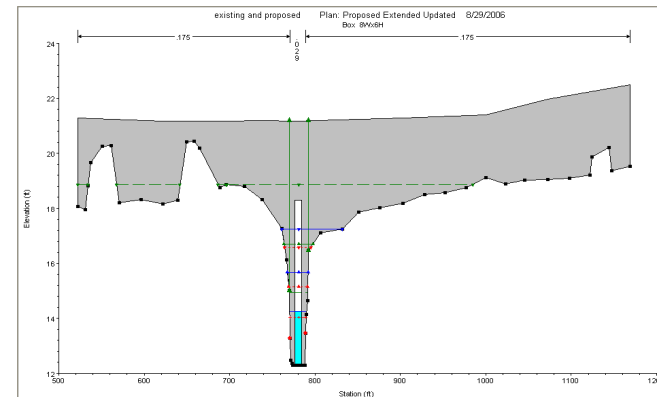


MDE Field Data Collection Tool

- Reasons for development
 - In need of structure survey data for modeling
 - Field data collection is expensive
 - Limited budget

- Implementation and development
 - Data to be georeferenced (ArcPad)
 - Data in standard format
 - Data intelligent enough for multiple applications
 - Direct link to photos, sketches, and notes

 - Visual Basics Programming by MES



Field Data Collection Process



MDE - Bridge Inspection

General Info | Structure Information | Measurements | Ancillary Data | Attributes | Geography

Number of Spans in Main Unit: 3
 Number of Approach Spans: 0000
 Length of Maximum Span: 0003
 Structure Length (ft): 000004
 Curb or Sidewalk Widths - Left (ft):
 Curb or Sidewalk Widths - Right (ft):
 Bridge Roadway Width - Deck to Curb:
 Deck Width - Out to Out (ft):
 Total Number of Spans: 001
 Span Length - L.1:
 Span Length - L.2:
 Span Length - L.3:
 Span Length - L.4:
 Span Length - L.5:
 Span Length - L.6:
 Span Length - L.7:
 Span Length - L.8:
 Number of Continuous Spans: N

Measurements

NBS Bridge Length:
 Bridge Median Width:
 Shoulder Width on Structure - Left:
 Shoulder Width on Structure - Right:
CLEARANCES:
 Minimum Vertical Underclearance Reference Feature (X code): N
 Bridge Roadway Underclearance (XXX - XXX ft): 76
 Minimum Vertical Underclearance on Right - Ref. Feature (X code):
 Minimum Lateral Underclearance on Left (100 ft): 599
 Minimum Lateral Underclearance on Right (100 ft): 600
 Number of Cuts/Culverts and Pipes: 010
 Rise (Culverts and Pipes): 010
 Span of Cuts (Culverts and Pipes): 0000
 Horizontal Clearance (under): 0000
 Centerline Length of Culverts and Pipes: 215

Ancillary Data | Attributes

Indicate the Appraisal Ratings
 Waterway Accuracy:
 Scour Critical Bridges:
 Design Year Storm:
 Year High Water Elevation - Latest:
 Drainage Area:
 High Water Elevation:
 Sk:

PHOTOS:
 Deck - Photos:
 Utilities Under Structure: 0
 Deck - Upstream:
 Utilities Under Structure: 0
 Deck - Downstream:



MDE - Bridge Inspection

General Info | Structure Information | Measurements | Ancillary Data | Attributes | Geography

STRUCTURE NUMBER INFO:
 File Type: [N/A]
 Pre Coded Zeros: 0000X
 County: 13
 Structure Number: P138
 Type of Structure: [R]

FOOTING:
 Abutment Material: [N]
 Abutment - Type of File:
 Abutment - Code:
 Pier Material: [N/A]
 Pier - Type of File:
 Pier Code:

RAIL BING FENCING:
 Railing Material:
 Railing Type:
 Railing Material:
 Railing Type:
 Fencing Material:
 Fencing Type:

STRUCTURE TYPE INFO:
 Main - Kind of Material:
 Main - Type of Design and/or Construction:
 Approach Spans - Kind of Material and/or Design:
 Approach Spans - Type of Design and/or Construction:
 Supplemental Structure Type - Approach Spans:
 Supplemental Structure Type - Main:

Widened and/or Extended (1st): [N/A]
 Widened and/or Extended (2nd): [N/A]
 Widened and/or Extended (3rd): [N/A]
 Deck Surface: [Not applicable]
 Slope Protection - Type:
 Parcel:

SUBSTRUCTURE:
 Abutment - Material:
 Abutment - Type:
 Abutment - Code:
 Pier - Material:
 Pier Type:
 Pier Code:

Import of Field Data into ArcMap

Export Form from Arc/Pad

Result: Shapefile Database in Arc/Map

MDE - Bridge Inspection

General Info | Structure Information | Measurements | Ancillary Data | Attributes | Geography

STRUCTURE NUMBER INFO:

File Type:

Pre Coded Zeros:

County:

Structure Number:

Type of Structure:

FOOTING:

Abutment Material:

Abutment - Type of Pile:

Abutment - Code:

Pier Material:

Pier Type of Pile:

Pier Code:

RAILING\FENCING:

Railing Material:

Railing Type:

Railing Material:

Railing Type:

Fencing Material:

Fencing Type:

STRUCTURE TYPE INFO:

Main - Kind of Material:

Main - Type of Design and/or Construction:

Approach Spans - Kind of Material and/or Design:

Approach Spans - Type of Design and/or Constrcn:

Supplemental Structure Type - Approach Spans:

Supplemental Structure Type - Main:

Widened and/or Extended (1st):

Widened and/or Extended (2nd):

Widened and/or Extended (3rd):

Deck Surface:

Slope Protection - Type:

Paracel:

SUBSTRUCTURE:

Abutment - Material:

Abutment - Type:

Abutment - Code:

Pier - Material:

Pier Type:

Pier Code:



ArcView GIS 3.2a

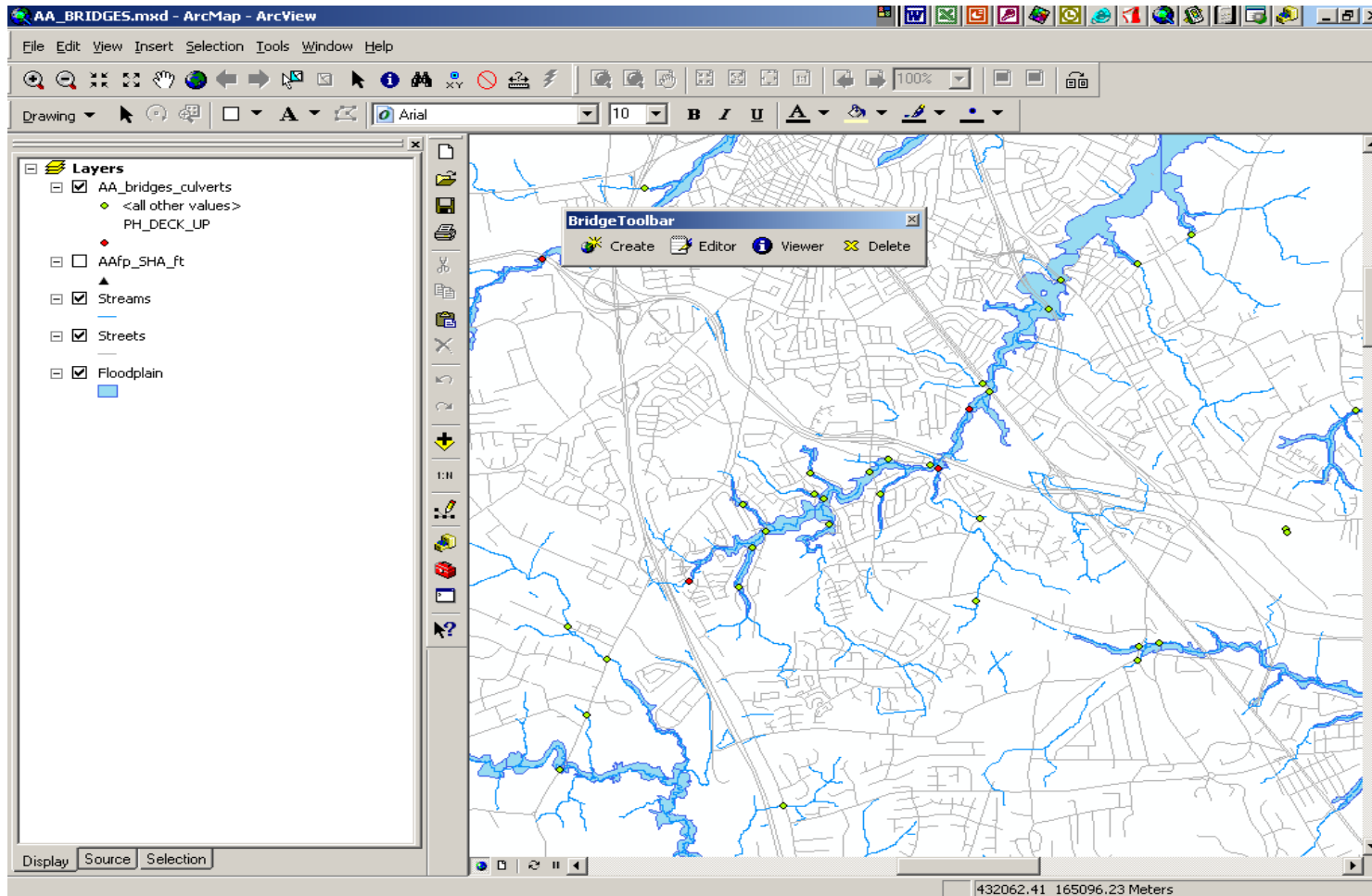
File Edit Table Field Window Help

0 of 754 selected

Attributes of Sha_wb_m214_structures.shp

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Point	1800010.009	162400.100	PT32-008-371	162400010		214	IN	AB	SHA	E30	S17	358.000000	0.00
Point	1800010.008	162400.101	PT32-008-371	162400010		214	IN	AB	SHA	S17	S16	358.000000	0.00
Point	1800010.007	162400.102	PT32-008-371	162400010		214	IN	AB	SHA	S16	E28	358.000000	0.00
Point	1800010.006	162400.103	PT32-008-371	162400010		214	IN	AB	SHA	N03	S15	354.000000	70.00
Point	1800010.005	162400.104	PT32-008-371	162400010		214	IN	AB	SHA	S15	E28	354.000000	90.00
Point	1800010.004	162400.105	PT32-008-371	162400010		214	IN	AB	SHA	E28	E28	354.000000	90.00
Point	1800010.003	162400.106	PT32-008-371	162400010		214	IN	AB	SHA	S14	E28	353.000000	73.00
Point	1800010.002	162400.107	PT32-008-371	162400010		214	IN	AB	SHA	E28	E510	353.000000	73.00
Point	1800010.001	162400.108	PT32-008-371	162400010		214	EW	AB	SHA	E510		353.000000	82.00
Point	1800020.006	162400.200	PT32-008-371	162400020		214	IN	AB	SHA	E24	E25	350.000000	42.00
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Point	1800020.004	162400.202	PT32-008-371	162400020		214	IN	AB	SHA	K2	S12	350.000000	8.00
Point	1800020.003	162400.203	PT32-008-371	162400020		214	IN	AB	SHA	S12	S13	350.000000	65.00
Point	1800020.002	162400.204	PT32-008-371	162400020		214	IN	AB	SHA	S13	E58	350.000000	80.00
Point	1800020.001	162400.205	PT32-008-371	162400020		214	EW	AB	SHA	E58		350.000000	91.00
Point	1800021.002	162400.210	PT32-008-371	162400021		214	EWCS	AB	SHA	EWCE10	EWCE11	351.000000	30.00
Point	1800021.001	162400.211	PT32-008-371	162400021		214	EWCE	AB	SHA	EWCE11		351.000000	55.00
Point	1800022.002	162400.220	PT32-008-371	162400022		214	IN	AB	SHA	E26	PC20	351.000000	89.00
Point	1800022.001	162400.221	PT32-008-371	162400022		214	PC	AB	SHA	PC20		351.000000	62.00
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Point	1800040.007	162400.402	PT32-008-371	162400040		214	IN	AB	SHA	S4	E11	244.000000	29.00
Point	1800040.006	162400.403	PT32-008-371	162400040		214	IN	AB	SHA	E11	S5	244.000000	48.00

Field Data in ArcMap



Field Data in ArcMap Cont.



AA_BRIDGES.mxd - ArcMap - ArcView

File Edit View Insert Selection Tools Window Help

100%

Drawing

Bridge Inspection Viewer

Base Data | Measurements | Photo Data

General Information

MDE Bridge #:	AA080306FS-3	Northing:	166604.924268305
Inspection Date:	08/03/2006	Easting:	429314.862938933
Inspectors:	FK	Elevation:	0
SHA Plan File:		County Plan File:	

Hydraulic Opening Information

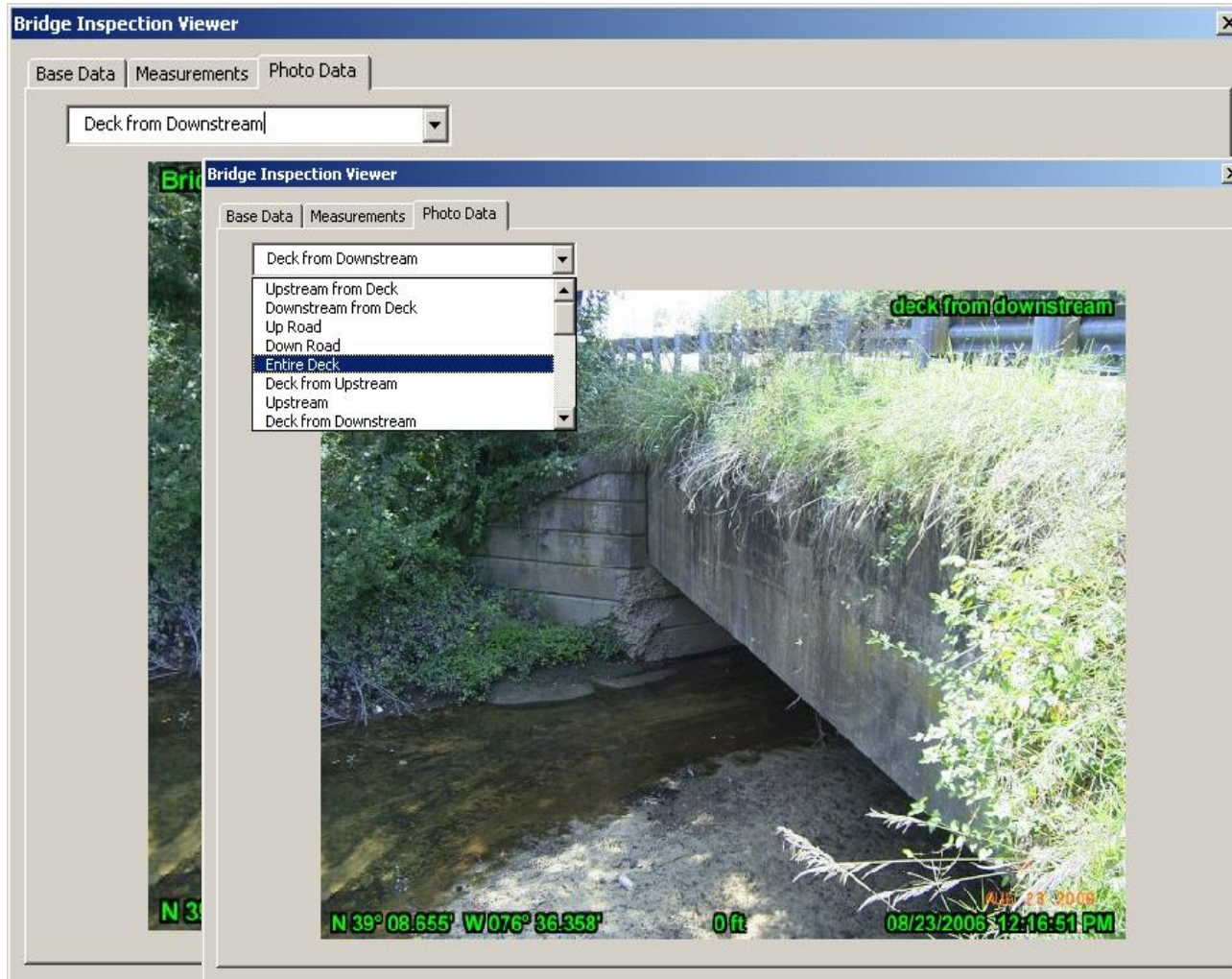
Opening Type:	Culvert	Channel Type:	Earth Embankment
Top Width (ft):	0	Channel Depth (ft):	1
Bottom Width (ft):	0	(from top of bank to stream bed)	
Center Width (ft):	48	Channel Width (ft):	50
(for round pipes)		(at top of bank)	

Structure Information

Main-Material:	C_Steel	<input type="checkbox"/> Wing Walls	Type:	
Main-Design:	19_Culvert		Left	Right
<input checked="" type="checkbox"/> Survey Completed		Upstream Angles:	0	0
		Downstream Angles:	0	0

432957.81 163231.82 Meters

Field pictures (Auto upload)



State\County road & bridge plans



Microsoft Excel - 3190005A.xls

File Edit View Insert Format Tools Data Window Help

Arial 10 B I U

H10 =

	A	B	C	D	E	F	G
1	Culvert ID						
2	3190005A						
3	Q YR	DISCHARGE					
4	1	183					
5	2	267					
6	10	601					
7	25	751					
8	50	884					
9	100	1099					
10	Tc (min)						hours
11	CN						
12	Area (Ac)						sq/ miles
13	Elevation adjustment	30					
14							
15	FIELD DATA						
16	inlet elevation	13.76	13.78				
17	outlet elevation	14.88	15.08	0.2			
18	Number of barrels	1					
19	Shape	CIRCULAR		span	rise		
20	Material	Concrete					
21	Inlet	headwall and wingwalls 45 degrees					
22	Inlet depression	no					
23	culvert length	70					
24	DWNS channel elev	16.78	13.22				
25	DWNS channel elev 2	15.82	14.18				
26	length	41.3					
27	Downstream XS	Stat	Elevation	Elevation correctd	Downstream XS	Stat	Elevat
28					24		
29		0	10.13		49	0	13
30		22.5	12.9		71.5	22.5	13
31		27	15.08		76	27	13
32		30.4	16.17		79.4	30.4	13
33		30.8	16.81		79.8	30.8	13
34		33	17.15		80	33	13

DISCHARGE

INPUT TO HY8

Road to top of culvert	10.92
inlet elevation	16.24
outlet elevation	15.12
culvert length	70
number of barrels	1
shape	CIRCULAR
material	Concrete
Inlet	headwall and wing
Depression	no
Slope	-0.02324

AS BUILT
MAR 11 1981

REFERENCES: GENERAL STRUCTURAL NOTES ELEVATIONS

SHEET NO. 1

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
BUREAU OF BRIDGE DESIGN
STEEL GURCH BRIDGE
ON RELOCATED MARYLAND ROUTE 32
OVER RELOCATED SULFUR ROAD
QUINCY PLAN

SCALE AS SHOWN DATE OCT., 1978 CONTRACT NO. 882-B01-779

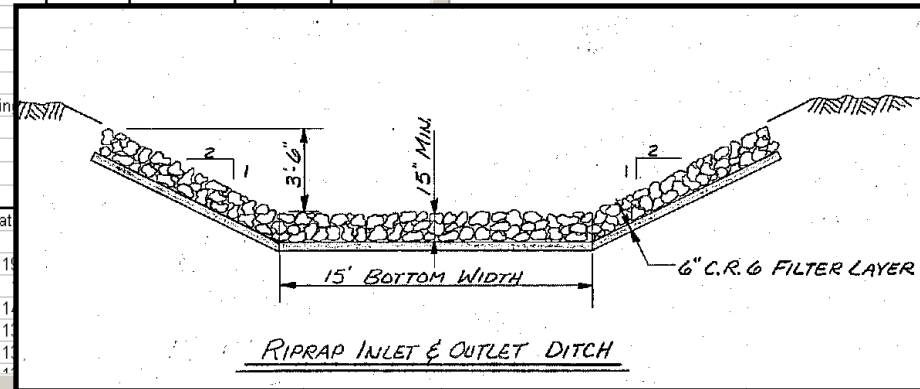
DESIGNED BY J.N.C./F.T.
DRAWN BY J.L.S.
CHECKED BY S.P.

E.S.F.

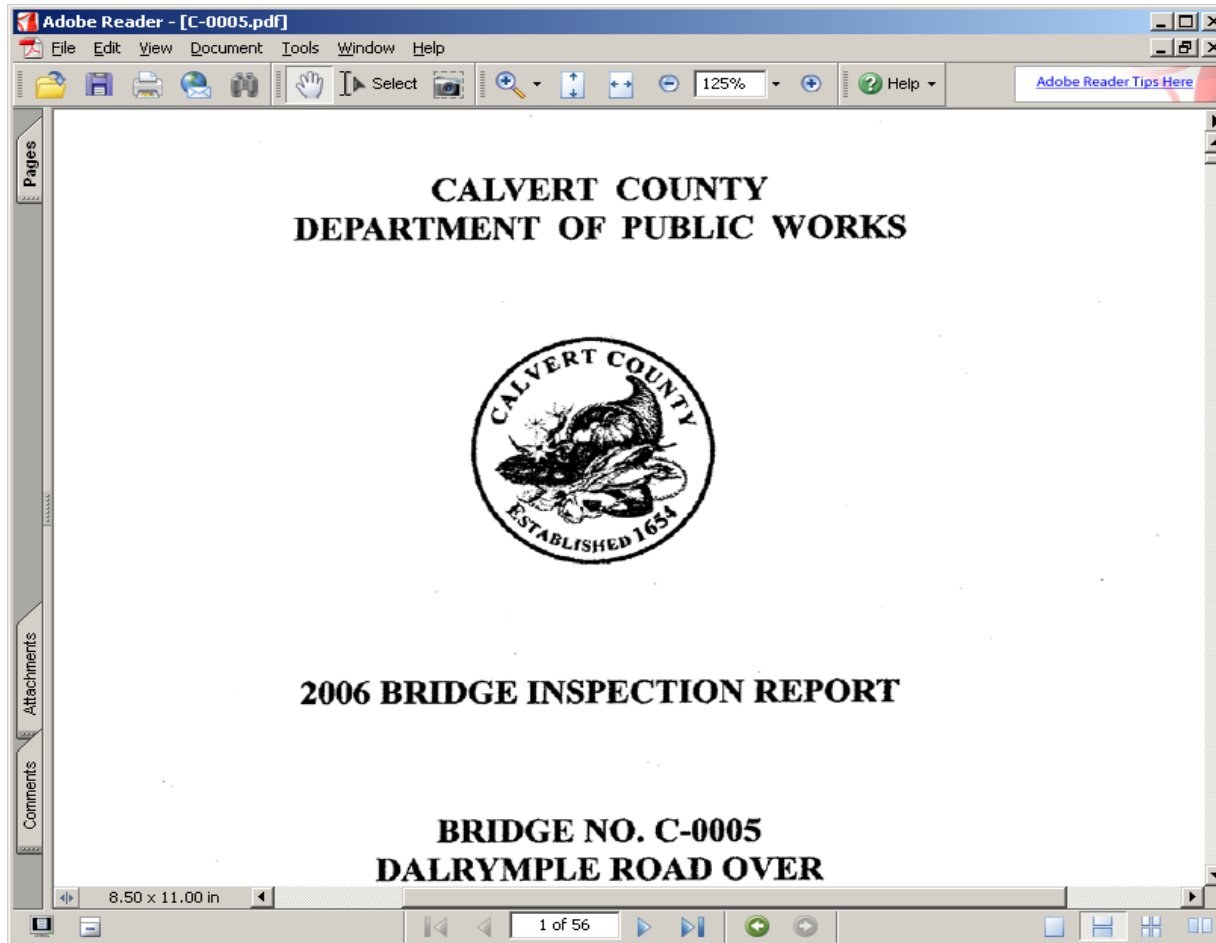
687 24 216

Sheet No. 14 of 15

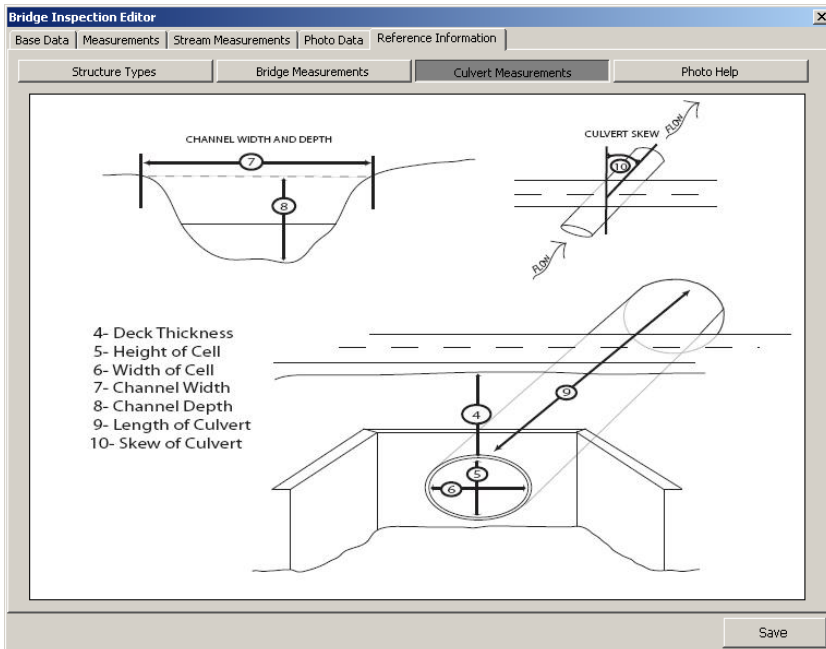
File No. 2 Packet No. 13 Folder No. 3



Scour Reports (reduced data entry)



Reference information



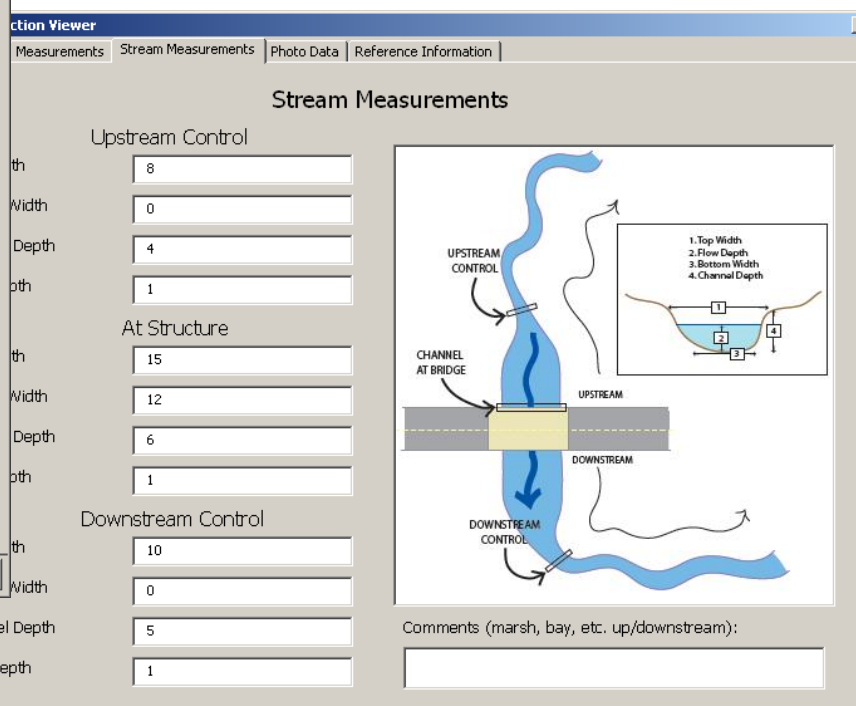
Bridge Inspection Editor

Base Data | Measurements | Stream Measurements | Photo Data | Reference Information

Structure Types | Bridge Measurements | **Culvert Measurements** | Photo Help

4- Deck Thickness
5- Height of Cell
6- Width of Cell
7- Channel Width
8- Channel Depth
9- Length of Culvert
10- Skew of Culvert

Save



Action Viewer

Measurements | Stream Measurements | Photo Data | Reference Information

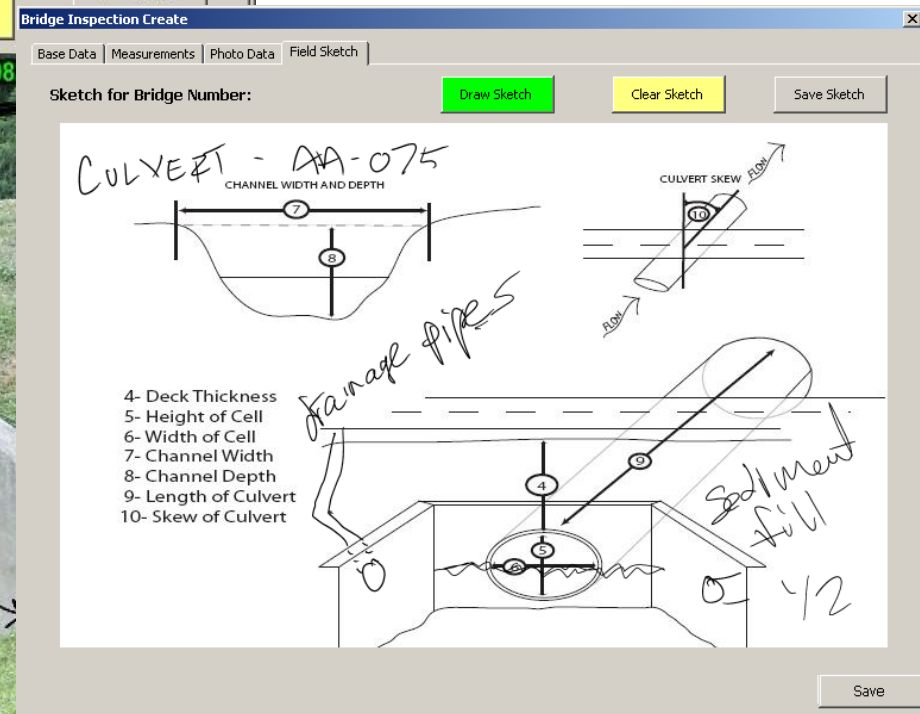
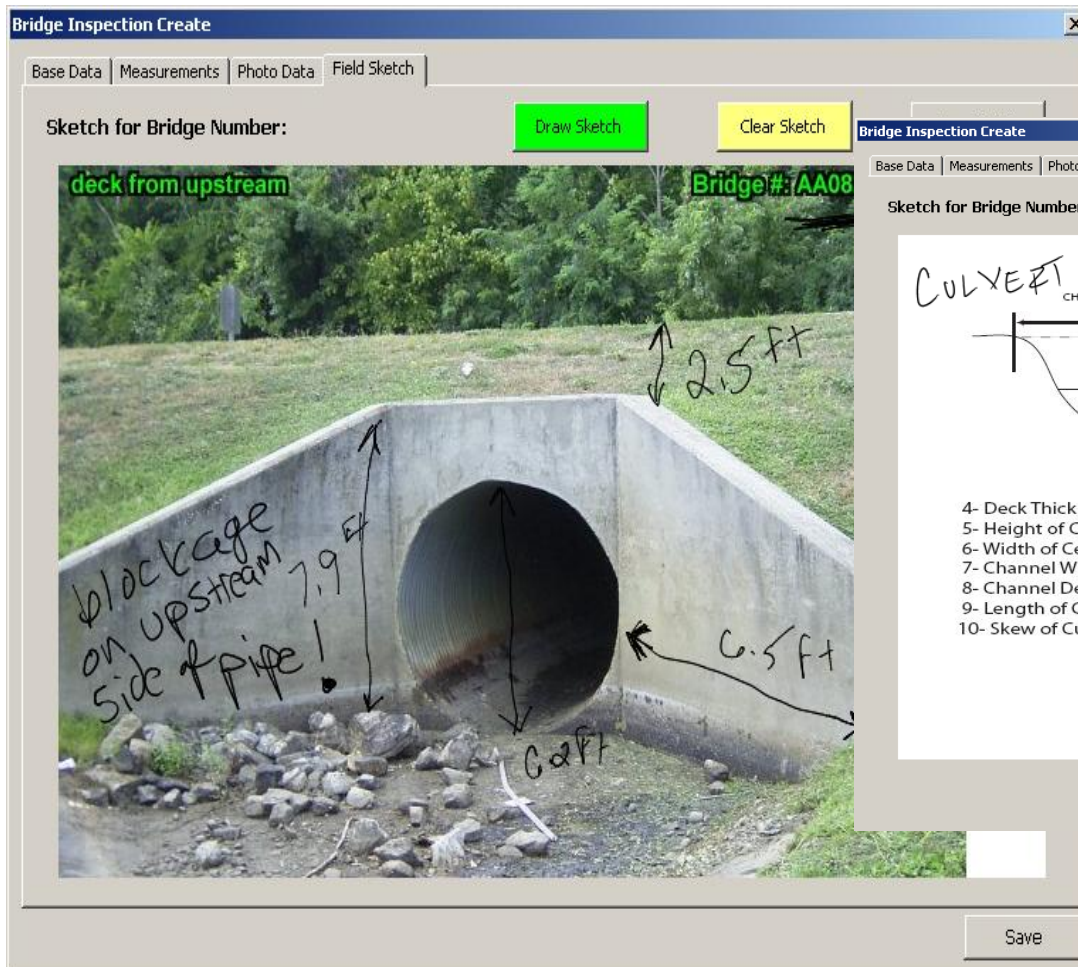
Stream Measurements

Upstream Control	th	<input type="text" value="8"/>
	Width	<input type="text" value="0"/>
	Depth	<input type="text" value="4"/>
	Depth	<input type="text" value="1"/>
At Structure	th	<input type="text" value="15"/>
	Width	<input type="text" value="12"/>
	Depth	<input type="text" value="6"/>
	Depth	<input type="text" value="1"/>
Downstream Control	th	<input type="text" value="10"/>
	Width	<input type="text" value="0"/>
Channel Depth		<input type="text" value="5"/>
Flow Depth		<input type="text" value="1"/>

Channel Depth:
Flow Depth:

Comments (marsh, bay, etc. up/downstream):

Digital sketch tool





Future Opportunity for Collection Tool

- .NET development
- LiDAR Integration (3D)
- Integrate Permit and Field Data w/ Models
- Multiple Users – GIS Tool (MDE)
- GIS Hydro (Inventory tool for Models)
- Web access (Likely) / GeoDatabase
- Wetland Assessment Tools (at MDE)

FEMA Study Types - LDS

- FEMA Study Types
 - Detailed Study
 - 1%, 0.2%, FW
 - Approximate Zone A
 - Redelineation

- FEMA Limited Detailed Modeling (Enhanced approximate)
 - Limited structure survey
 - No cross section survey (taken from terrain)
 - 1% annual chance flood hazard delineated
 - placement of BFEs and XS on DFIRM possible



General Survey Requirements for LDS

LDS Requirement	MDE Survey tool
Survey Notes	✓
Survey Sketch	✓
Survey Coordinates	✓
4 Photos (US face & Channel; DS face & Channel)	✓
Measurements	✓

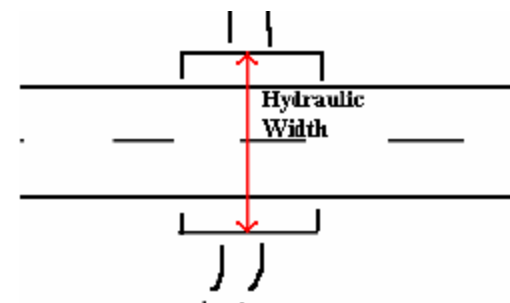
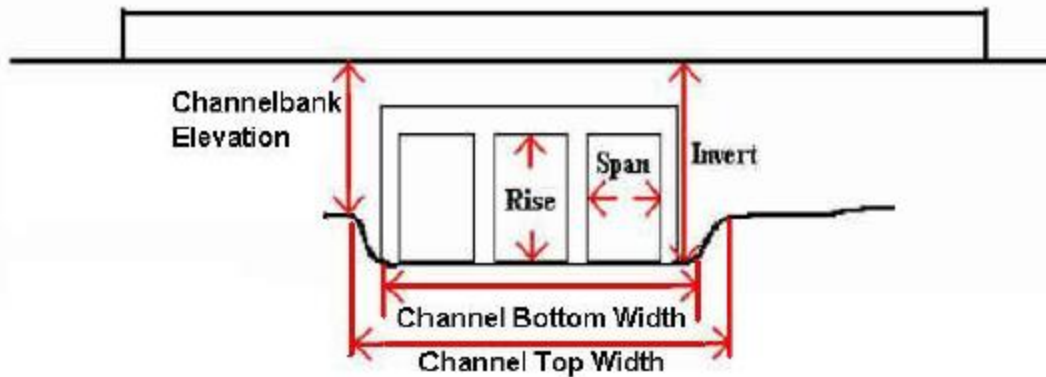
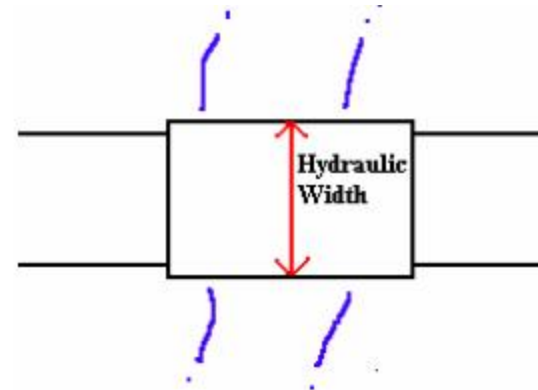
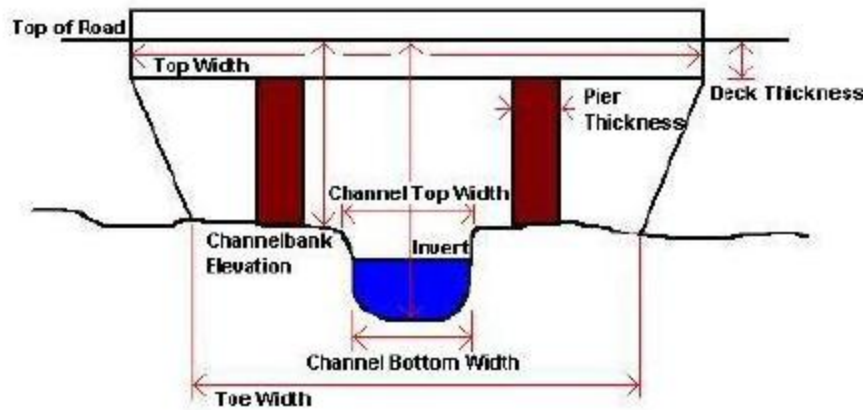




Collected Information

- TOR – Top of Road elevation
- Hydraulic width, Pier and Deck dimensions
- Culvert size, length and material
- Channel Measurements
 - Taken at upstream face of the structure
 - Top width
 - Bottom width
 - Channel bank elevations
 - invert

Graphics

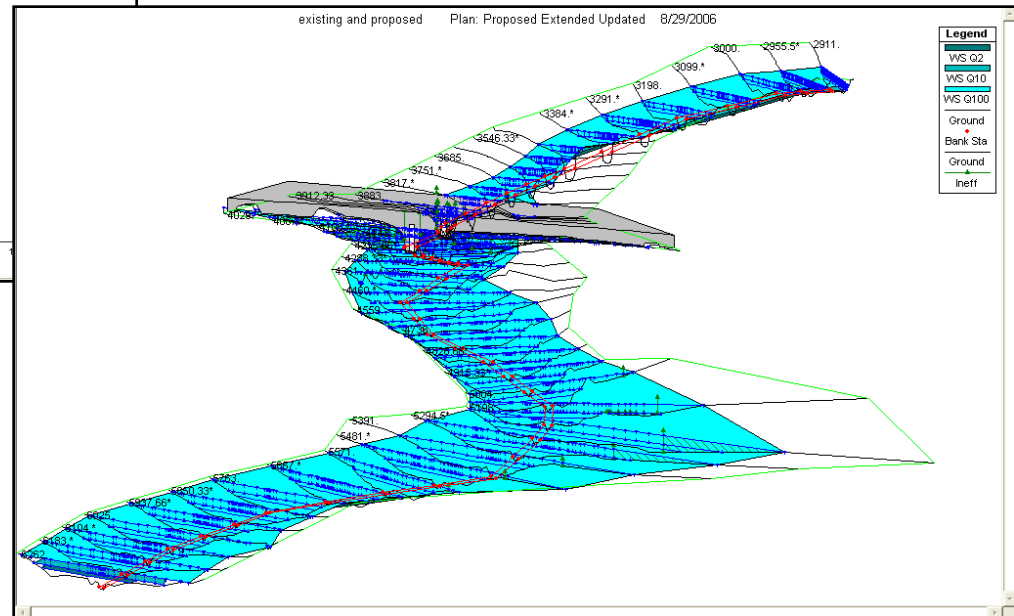
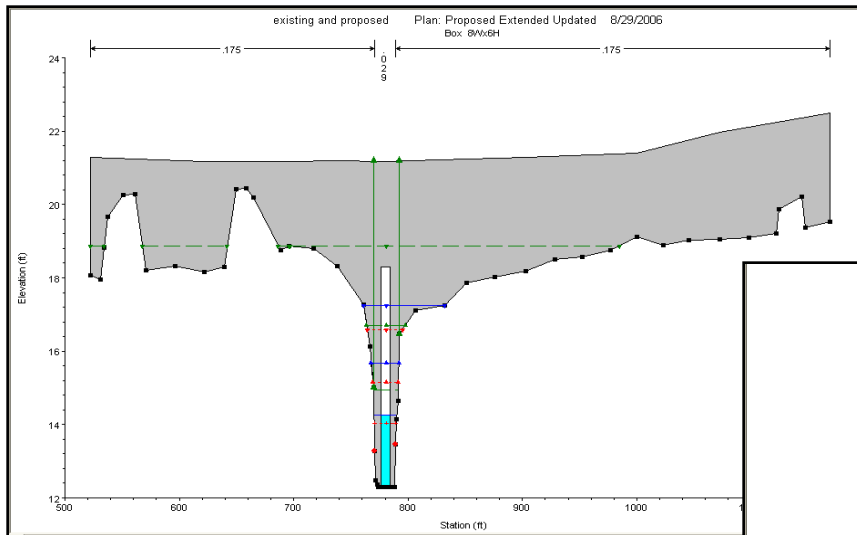




Utilization of survey data for LDS

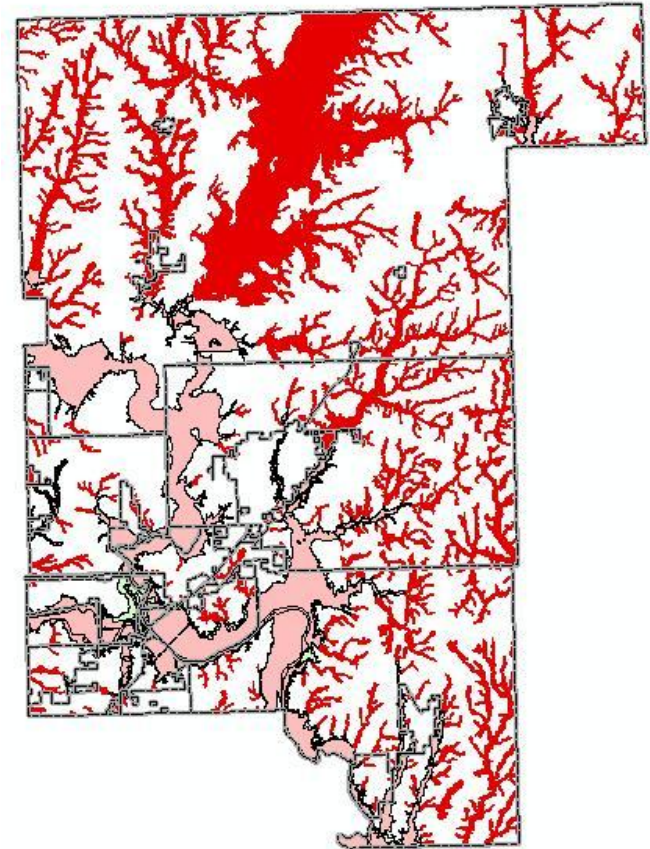
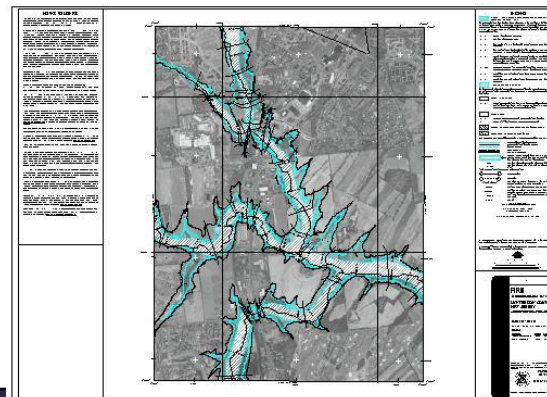
- Survey data gets imported into Open Inventory Module of WISE
- Stored in database format and can be edited and blended with terrain data
- Export to txt format for HEC RAS import
- Modeling performed in HEC RAS
- Boundary delineation performed within WISE
 - GeoRAS

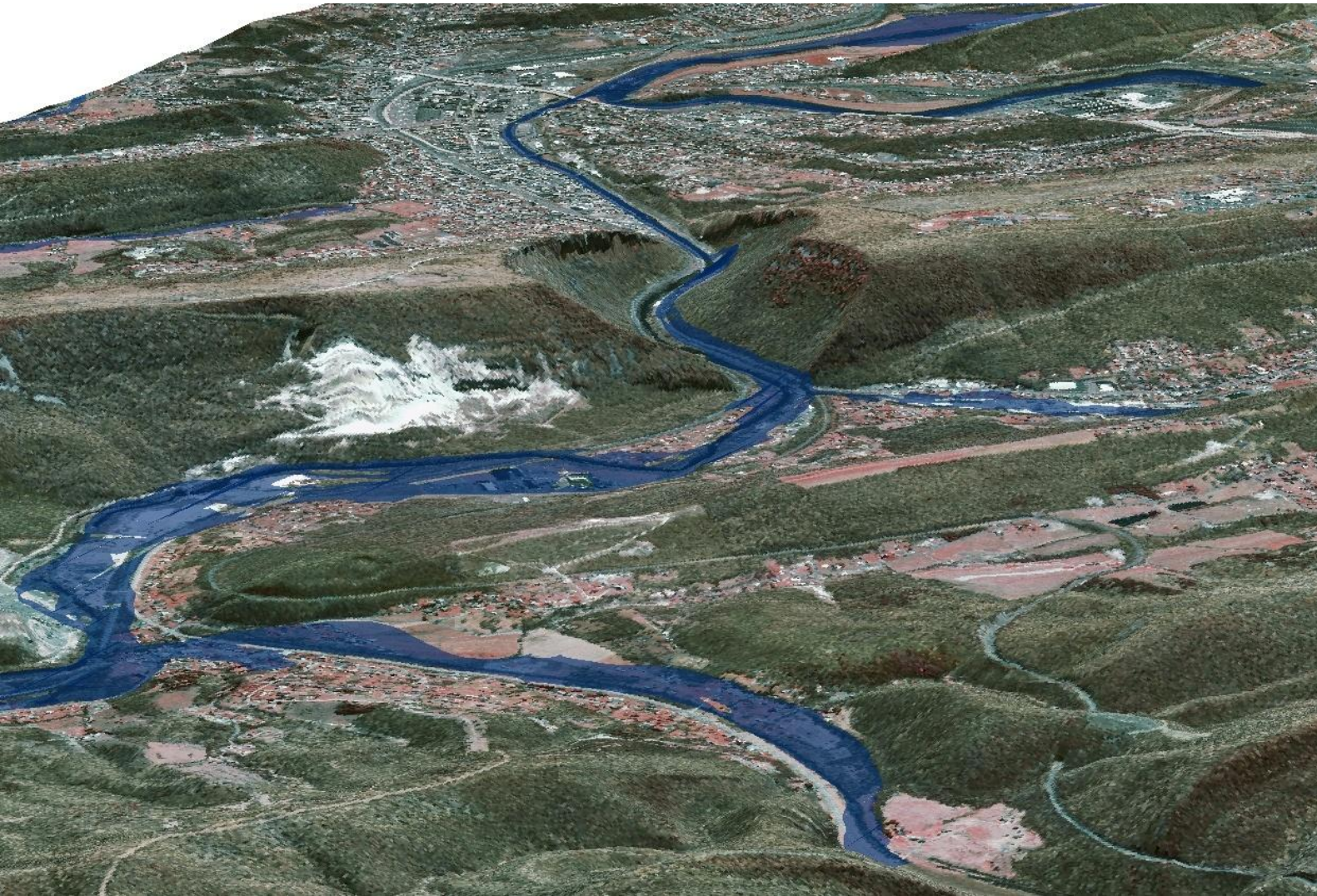
Survey data for in HEC RAS



DFIRM Production

- Merging of boundary data
- Base data prep
- DFIRM DB creation (GIS)
- Panel border creation
- Annotation







Questions?