

Happy Valley Flood Mitigation Project

Toby Spalding, PE
City Engineer
City of Radcliff

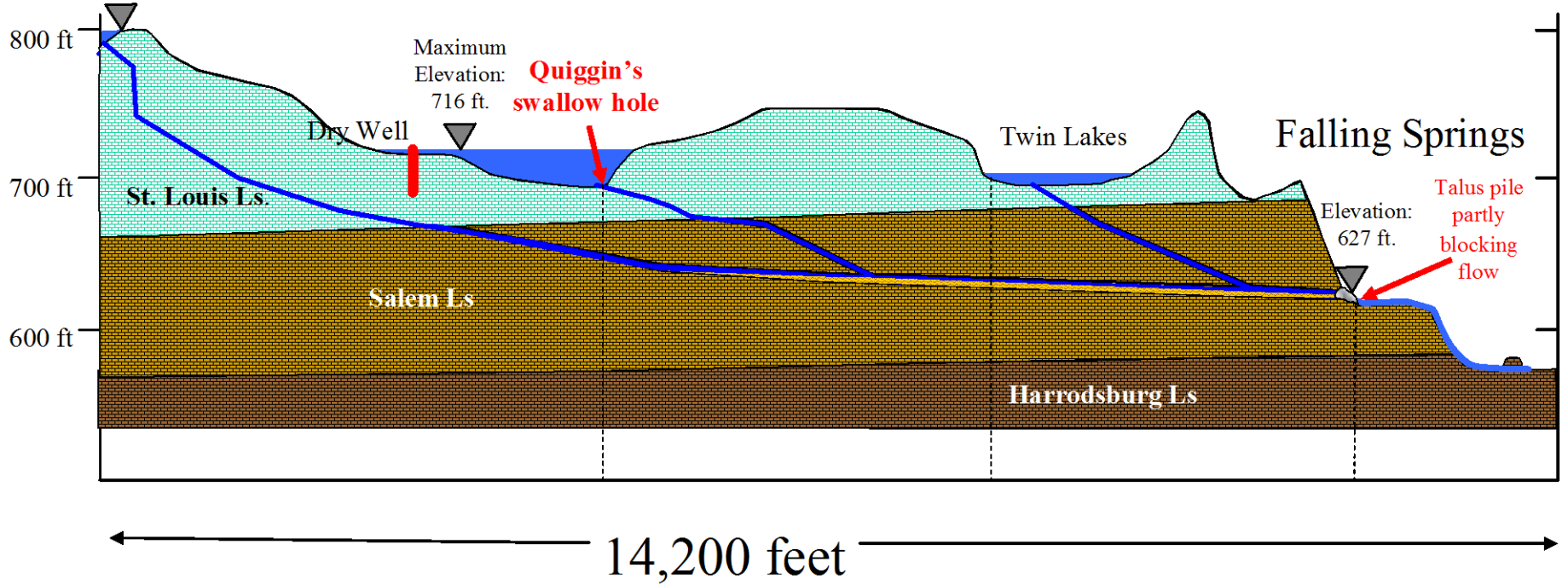


Neal Crawford, PE
Project Manager
Qk4, Inc.

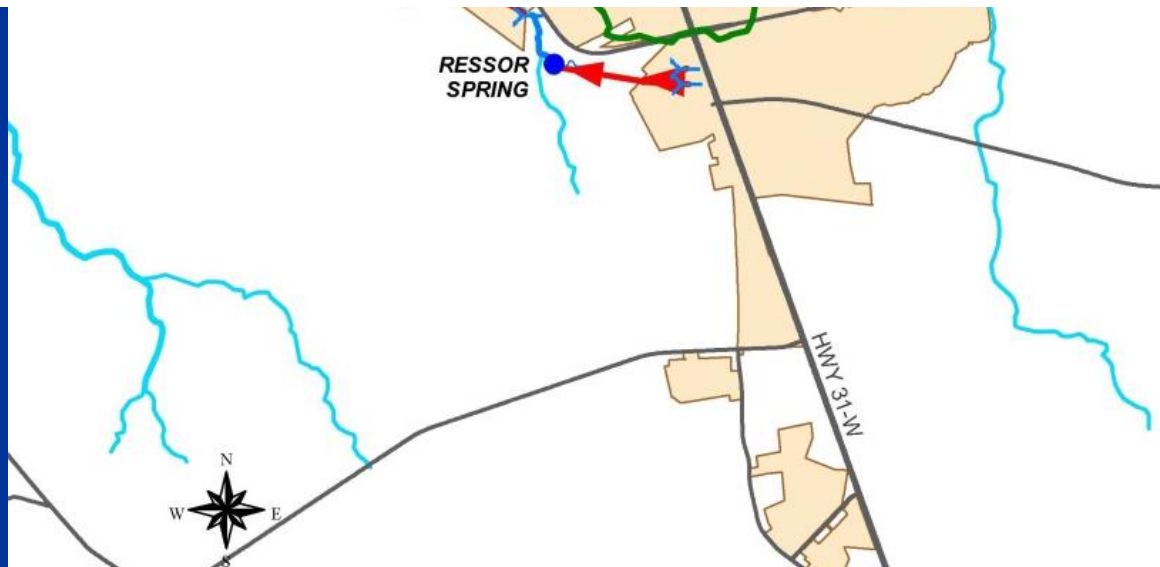


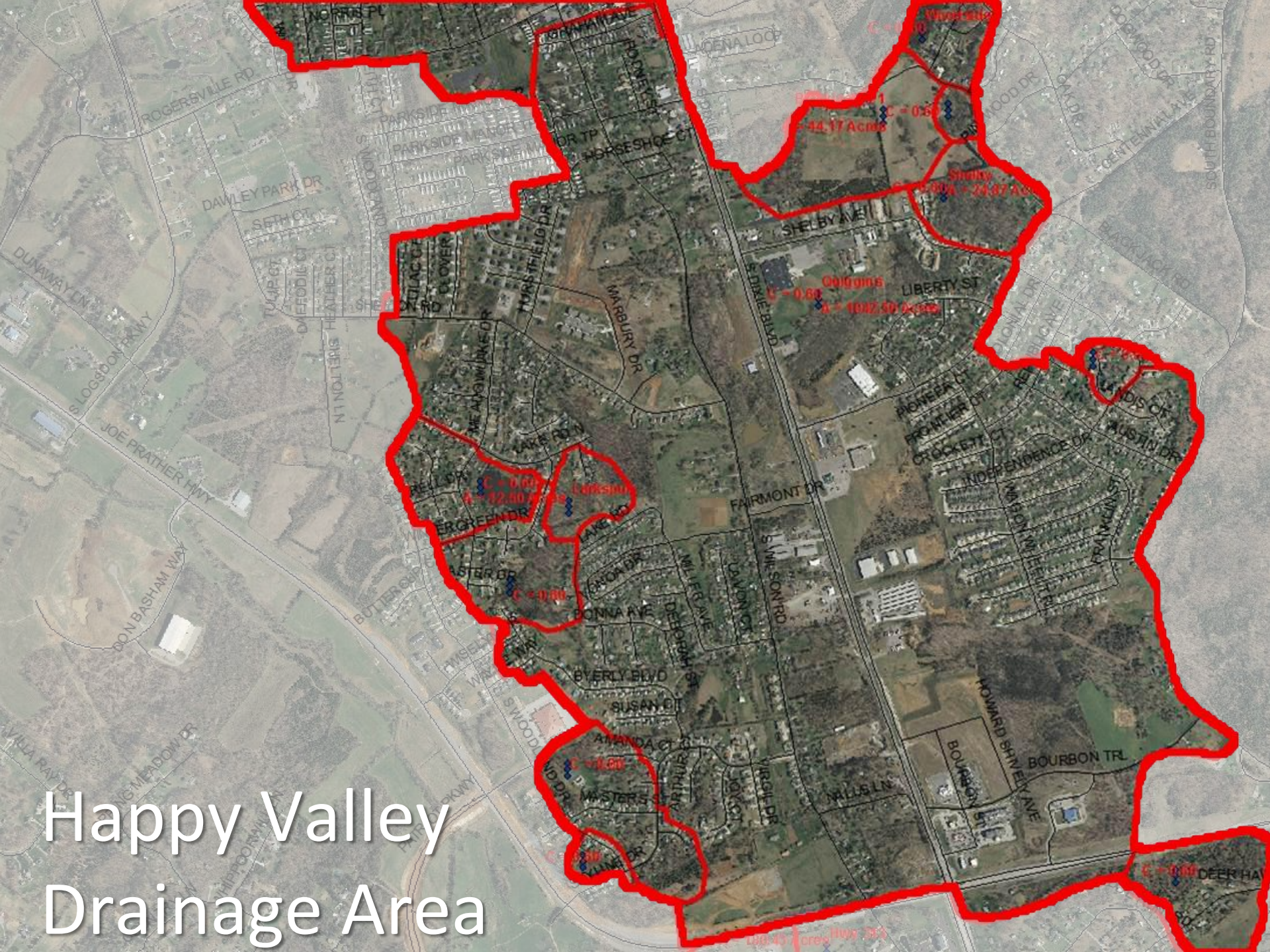
Maximum Head at
Lake Road swallow hole
Elevation 770 ft.

“Happy Valley”

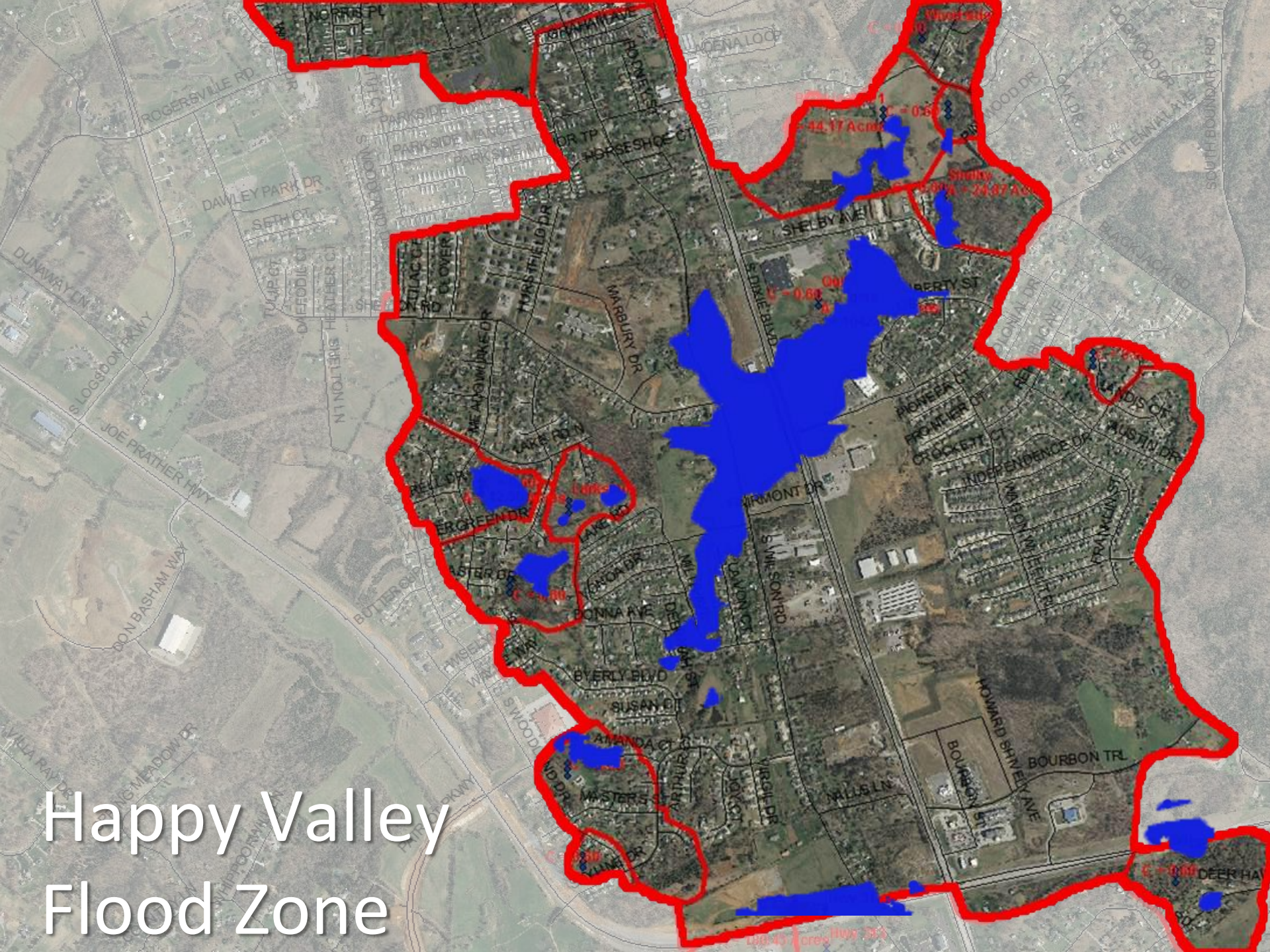


Quiggins
Sink Hole





Happy Valley Drainage Area



Happy Valley Flood Zone



Happy Valley Flooding Problems

2008 4 4



Happy Valley Flooding Problems

2008 4 4



1997

Happy Valley Flooding Problems



1997

Happy Valley Flooding Problems



1997

Happy Valley Flooding Problems



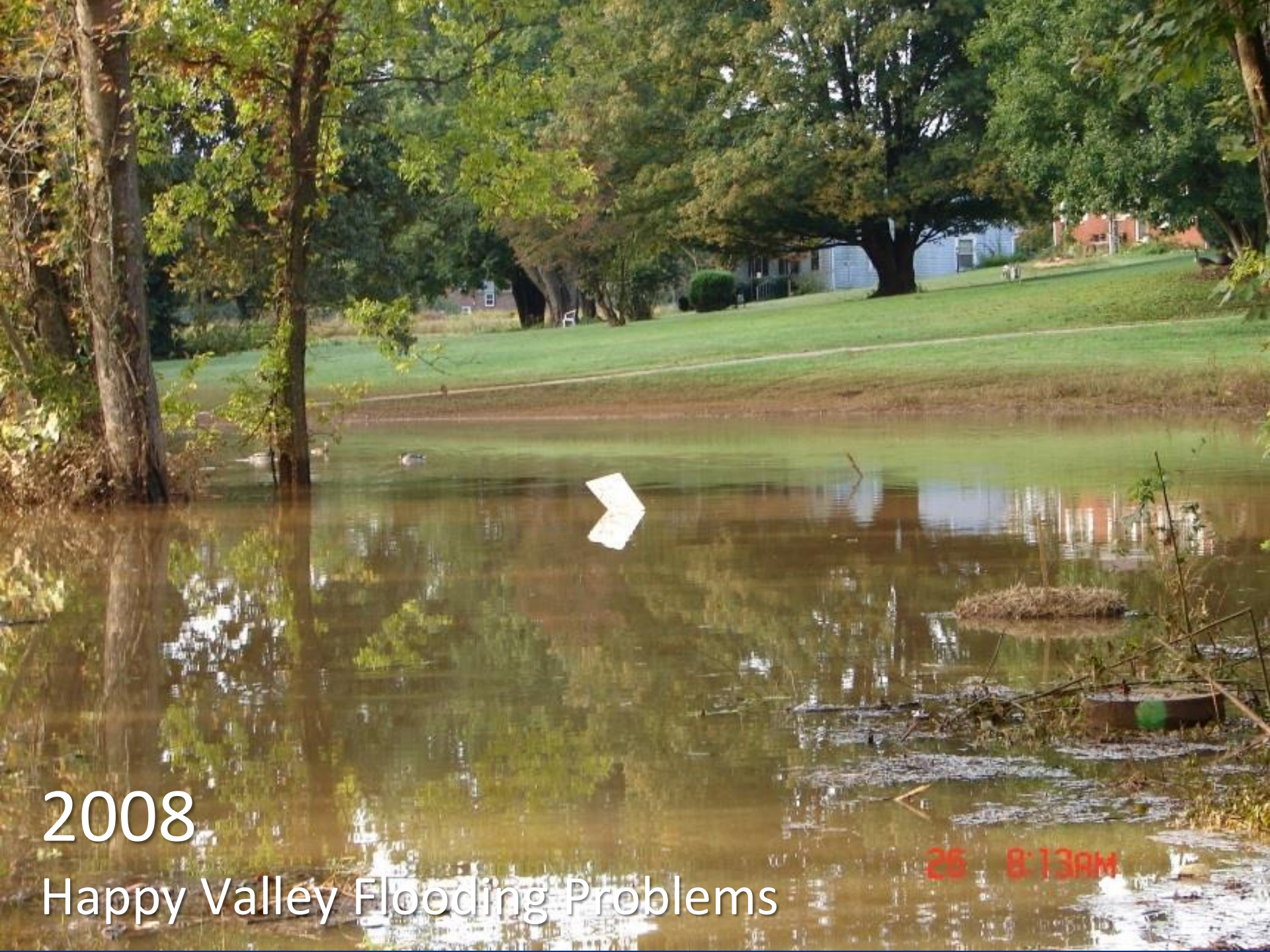
1997

Happy Valley Flooding Problems



1997

Happy Valley Flooding Problems



2008

Happy Valley Flooding Problems

25 8:13AM



2008

Happy Valley Flooding Problems

2008

4

4



2008

Happy Valley Flooding Problems

2008 4 4



2008

Happy Valley Flooding Problems

2008 4 4



Liberty Street Acquisition Project

- Grant process 2009.
- 2970 & 2980 Liberty Street.
- Federal Grant award of \$161,550 with a 12% State match & 13% local match.
- Purchased homes according to FEMA acquisition process.
- Fire Dept. burned the homes for training.
- Closed out in January 2012.



HAPPY VALLEY FLOOD CONTROL GRANT APPLICATION

December 2008

- Applied for grant
- Denied due to lack of supporting documentation

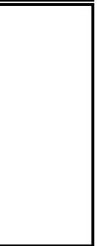
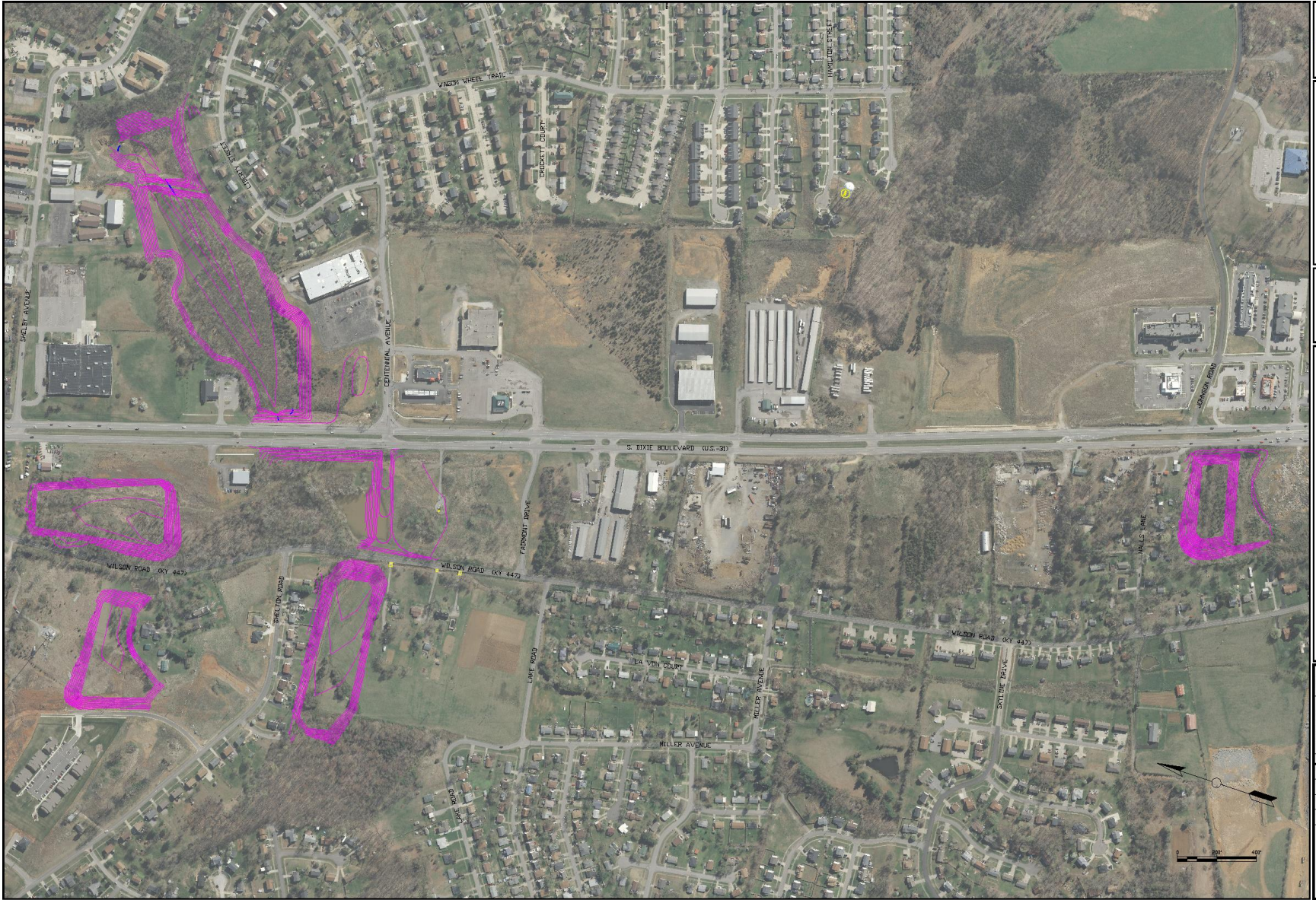
February 2009

- Began hydraulic study / design
- Eventually led to award

April 2009

- Re-applied for grant





HAPPY VALLEY FLOOD CONTROL PROJECT
RADCLIFF, KENTUCKY
HARRISON COUNTY, KENTUCKY
PROPOSED BASINS

DATE	DESCRIPTION

PROJECT NUMBER:	
DRAWN BY:	ENGINEER BY:
DATE:	DATE:
SCALE:	SCALE:
PROJECT:	PROJECT:

Radcliff Storm Water Utility



FINAL REPORT

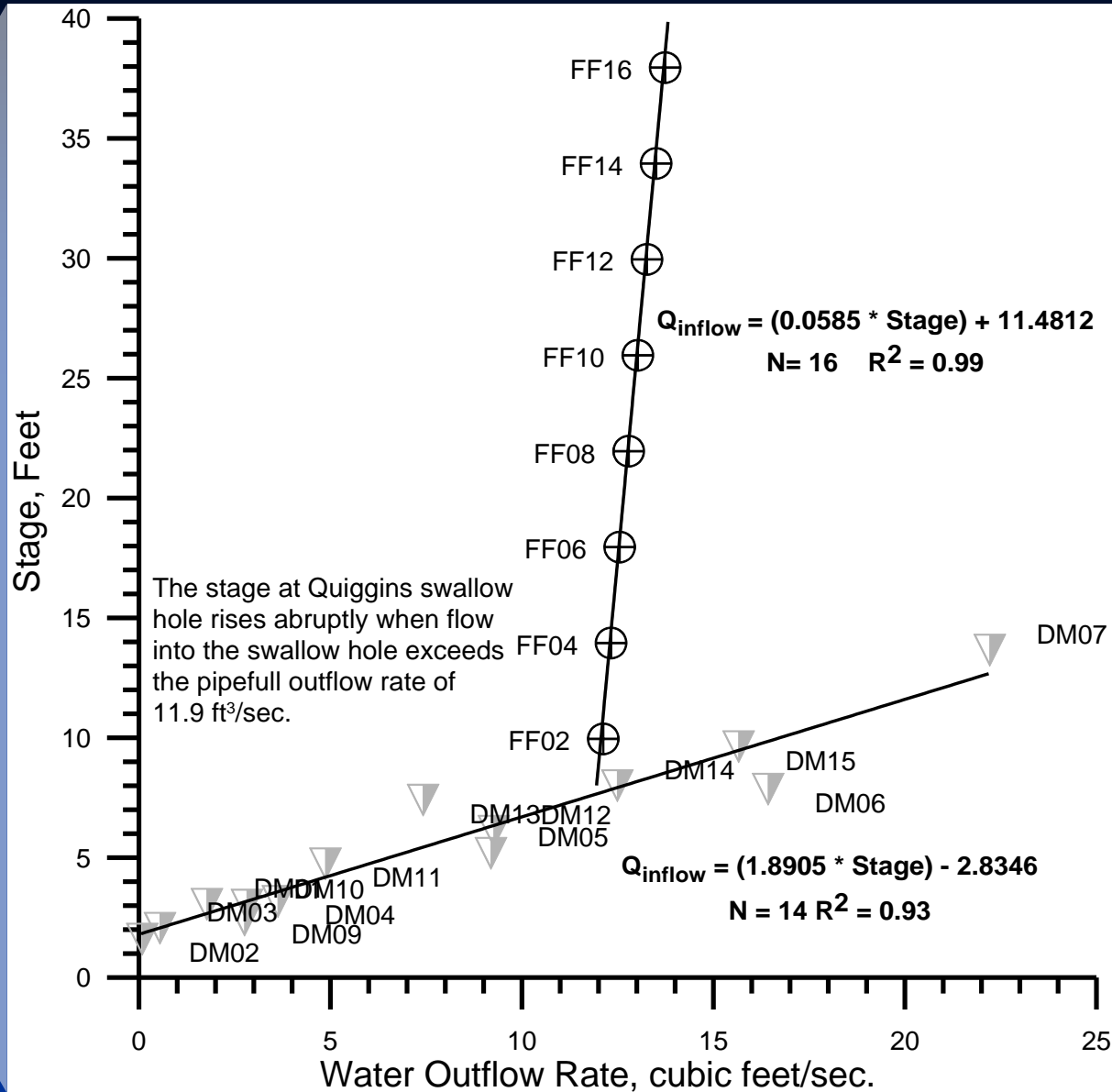
Hydrogeology of Karst Related Flooding, Happy Valley Karst Valley
(Quiggins Swallow Hole)
Radcliff, Kentucky, Hardin County

Prepared Under Contract with the Army Corp of Engineers,
For the City of Radcliff
USACOE Project W9128U-05-P-0105

September 30, 2006

James C. Currents, Coordinator for Karst Studies,
Randall L. Paylor, Karst Hydrologist,
And Anita Spears, Field Technician

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228 Mining and Mineral Resources Building
Lexington, KY, 40506-0107
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Quiggins Sinkhole Analysis



Hydraulic Study

Storage Volume with Associated Rainfall and South Wilson Road Closure Duration, Existing Conditions								
Elevation	Ex. Storage	Ex. Storage	Watershed	Net	Runof	Total	Recession	Recession
n	Cu.Yd.	Ac.-Ft.	Acres	Rainfall	f	Rainfall	Time	Time
Feet				Inches	Ratio	Inches	Hours	Days
720.9	148933	92	1069.4	1.04	0.57	1.82	0	0.0
721.0	152957	95	1069.4	1.06	0.58	1.83	3	0.1
721.5	173075	107	1069.4	1.20	0.58	2.08	15	0.6
722.0	193194	120	1069.4	1.34	0.59	2.28	28	1.2
722.5	215724	134	1069.4	1.50	0.59	2.54	42	1.8
723.0	238253	148	1069.4	1.66	0.60	2.76	56	2.3
723.5	263438	163	1069.4	1.83	0.60	3.05	72	3.0
724.0	288622	179	1069.4	2.01	0.61	3.29	88	3.7
724.5	316460	196	1069.4	2.20	0.61	3.61	106	4.4
725.0	344297	213	1069.4	2.39	0.62	3.86	123	5.1
725.5	374859	232	1069.4	2.61	0.62	4.21	142	5.9
726.0	405421	251	1069.4	2.82	0.63	4.48	162	6.7
726.5	439190	272	1069.4	3.05	0.63	4.85	183	7.6
727.0	472959	293	1069.4	3.29	0.64	5.12	204	8.5
727.5	510344	316	1069.4	3.55	0.64	5.55	228	9.5
728.0	547729	340	1069.4	3.81	0.65	5.86	251	10.5
728.5	589087	365	1069.4	4.10	0.65	6.30	277	11.6
729.0	630445	391	1069.4	4.38	0.66	6.64	303	12.6
729.5	675762	419	1069.4	4.70	0.66	7.12	332	13.8
730.0	721079	447	1069.4	5.02	0.67	7.49	361	15.0
730.5	771697	478	1069.4	5.37	0.67	8.01	392	16.4
731.0	822314	510	1069.4	5.72	0.68	8.41	424	17.7
731.5	879128	545	1069.4	6.11	0.68	8.99	460	19.2
732.0	935942	580	1069.4	6.51	0.69	9.43	496	20.7
732.5	1000981	620	1069.4	6.96	0.69	10.09	537	22.4
733.0	1066019	661	1069.4	7.41	0.70	10.59	578	24.1
733.2	1094437	678	1069.4	7.61	0.70	10.93	596	24.8

NOAA Frequencies, Existing			
ARI	4-day	Elevation	Recession
Years	Inches	Feet	Days
1	3.86	725.0	5.1
2	4.61	726.2	7.1
5	5.62	727.6	9.7
10	6.43	728.7	12.0
25	7.56	730.1	15.2
50	8.47	731.1	17.8
100	9.42	732.0	20.6
200	10.41	732.8	23.5
*1997	10.93	733.2	24.8

NOAA Freq., Post Quiggins +4			
ARI	4-day	Elevation	Recession
Years	Inches	Feet	Days
1	3.86	<720.9	N/A
2	4.61	<720.9	N/A
5	5.62	722.3	1.5
10	6.43	723.7	3.2
25	7.56	725.4	5.6
50	8.47	726.7	7.6
100	9.42	728.0	9.9
200	10.41	729.3	12.9
*1997	10.93	730.0	14.4

Evaluated Rainfall Data from 1993-2008.
 Calibrated hydrologic model based on 1997 and 2008
 known flood elevations and rainfall amounts.



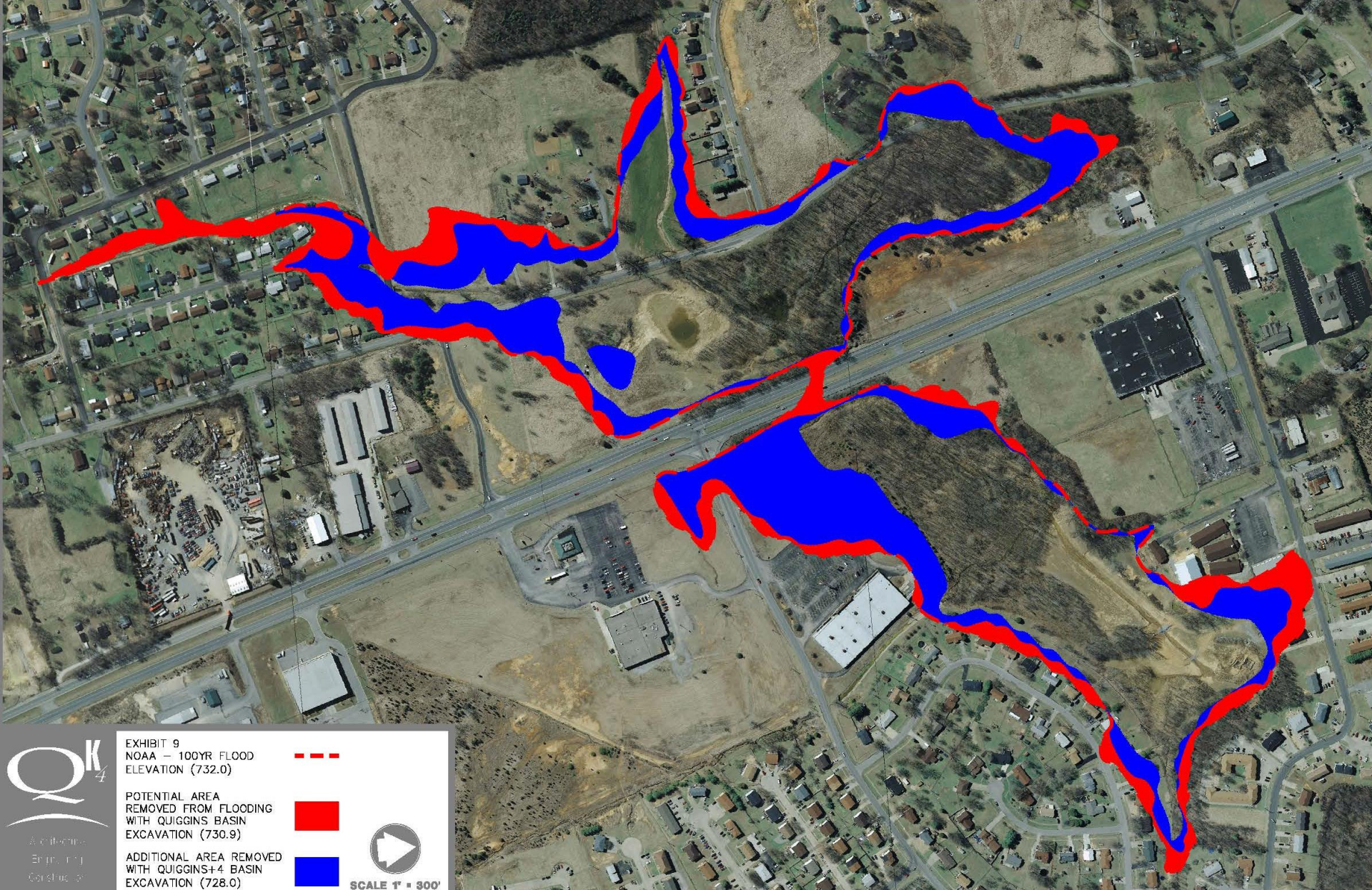


EXHIBIT 9
NOAA - 100YR FLOOD
ELEVATION (732.0)



POTENTIAL AREA
REMOVED FROM FLOODING
WITH QUIGGINS BASIN
EXCAVATION (730.9)



ADDITIONAL AREA REMOVED
WITH QUIGGINS+4 BASIN
EXCAVATION (728.0)



SCALE 1" = 300'

Hydraulic Study



Grant Application



DESIGN

401

CHANGE ORDERS

INVOICES

PROPOS

MISCELLAEUS

PERMITTING

GRANT APP

APP. "H"

MISCELLANEOUS

APPLICATION

FY 2008 HMGP DR-1757

COST ESTIMATES

PRELIM DESIGN

DR 1818 GRANT

DR 1818

FY 2009 PDM GRANT

FY 2009 PDM GRANT



FEMA Grant Project



Project Scope

Acquire approximately 36 acres of undeveloped land to be utilized as detention basins, designating the area “greenspace” and increasing the storm-water run-off storage capacity for the Quiggins Sinkhole. The proposed design will alleviate flood hazards to homes and to the City’s two most critical transportation arteries, S. Wilson and US 31-W.



Projected Schedule

October 2015 – March 2016

- Update project costs
- FEMA approval of updated budget

April 2016 – November 2018

- Design & Acquisitions
- Construction
- FEMA project closeout



Current Status

- FEMA **approved funding** request for additional \$1,231,569.14 (Updating 2008 construction and property acquisition values)
- FEMA currently evaluating proposal for scope change to include Alternate basin in lieu of the Cato Basin.
- Turner Lane Basin and Quiggins Basin designed and under construction.
- Wilson Road Basin designed and construction commencing soon
- Song Basin under design.



Turner Lane Basin



CITY OF RADCLIFF



Engineering Planning
Groundbreaking by Design.

TURNER LANE STORMWATER BASIN HAPPY VALLEY FLOOD MITIGATION PROJECT

CONTRACTOR: PHILLIPS BROTHERS
CONSTRUCTION, LLC
CONSTRUCTION COST: \$616,581

FUNDED IN PART BY FEMA & KYEM



FEMA



For information call Radcliff City Hall at (270) 351-4714





Turner Lane Basin





Turner Lane Basin

2008 9 29



Turner Lane Basin



EARTHWORK SUMMARY						
Name	Cut Factor	Fill Factor	2D Area	Cut	Fill	Net
Turner Lane Basin Area	1.000	1.050	361,488.21 Sq. Ft.	35,646.52 Cu. Yd.	29,908.27 Cu. Yd.	5,737.25 Cu. Yd. <Cut>
Proposed Fill Area	1.000	1.050	73,252.88 Sq. Ft.	130.38 Cu. Yd.	4,755.54 Cu. Yd.	4,625.17 Cu. Yd. <Fill>

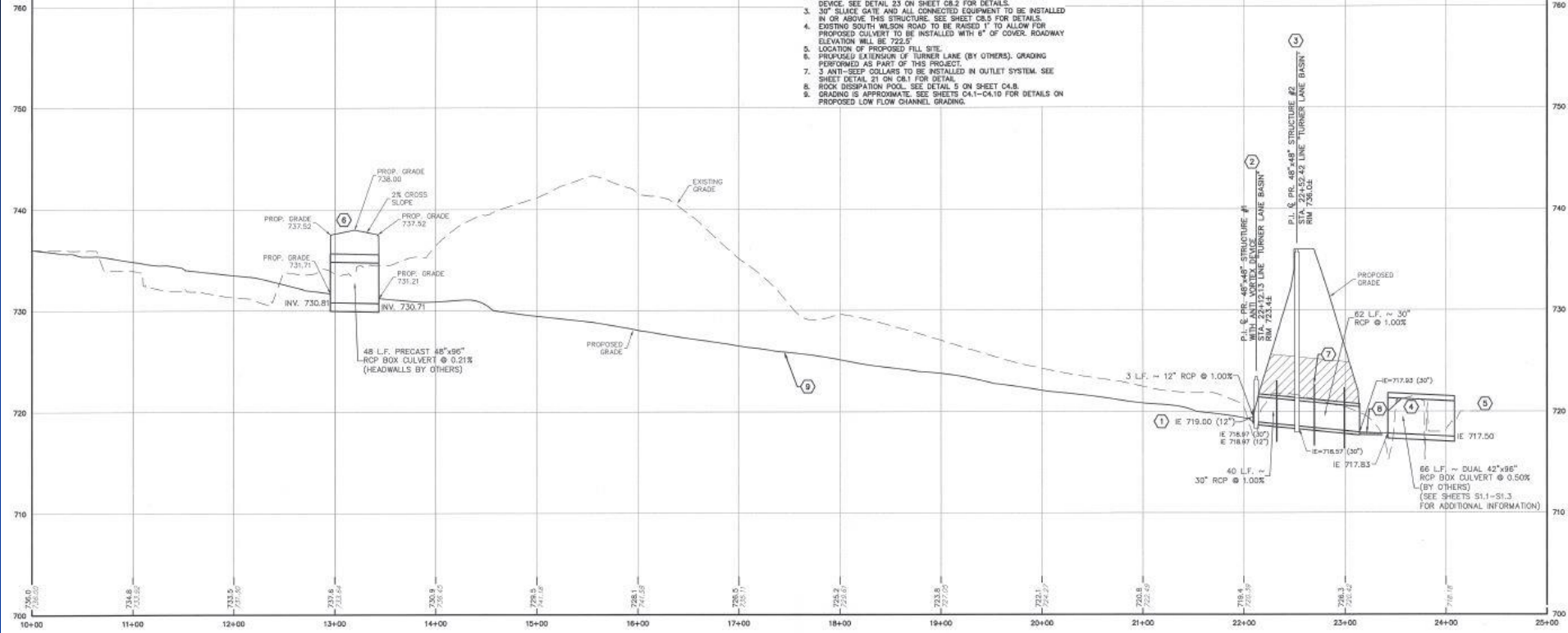


Turner Lane Basin



KEYNOTES

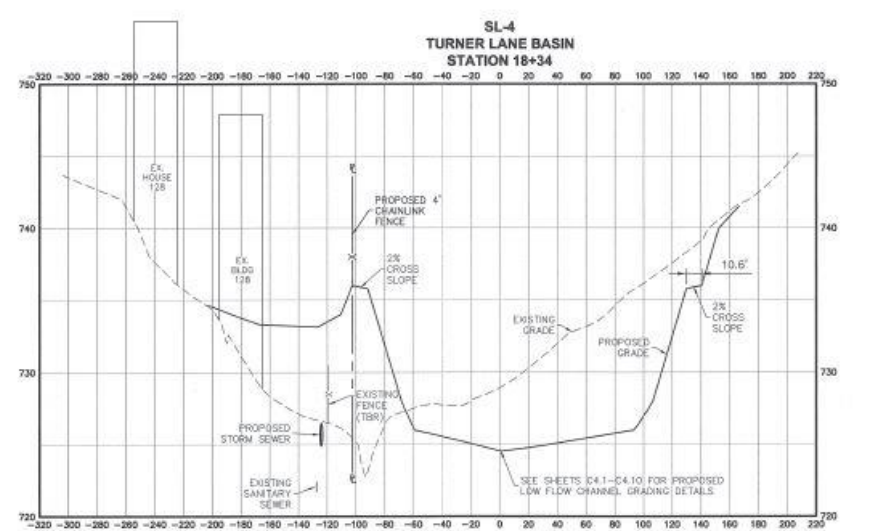
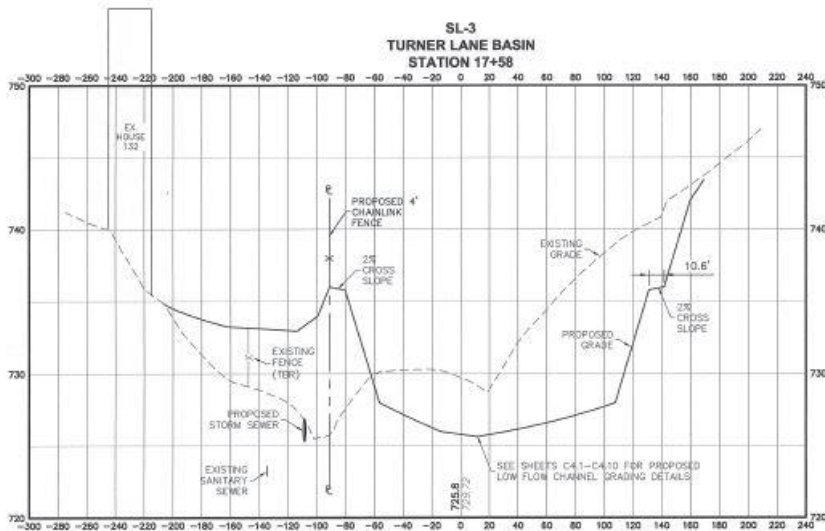
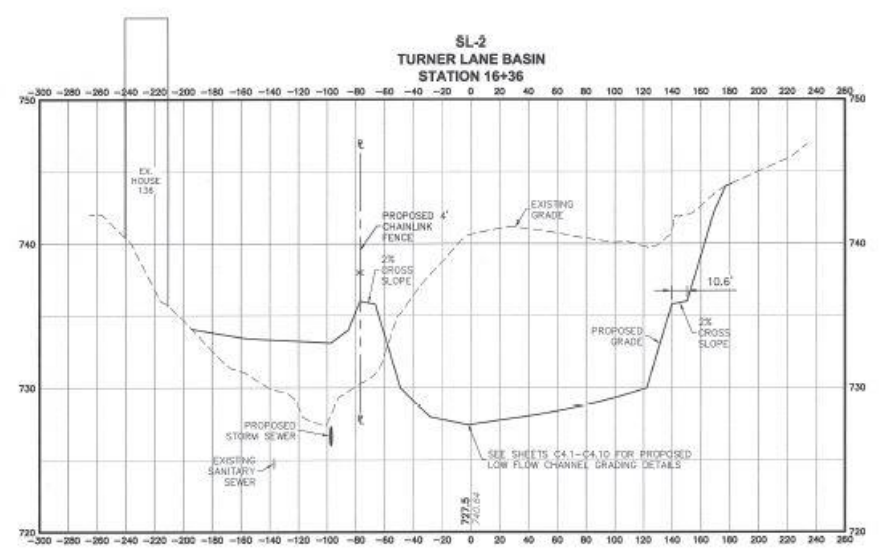
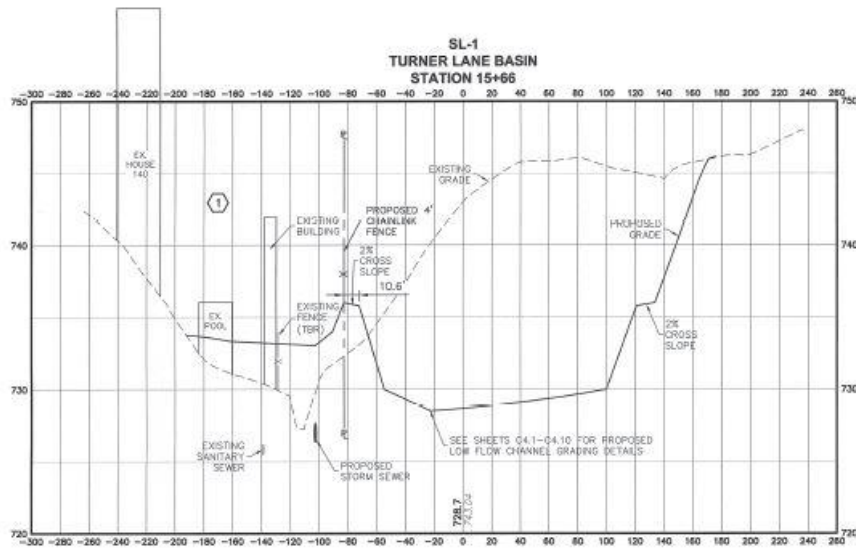
1. CONTRACTOR SHALL INSTALL SIZE 22"W x 22"H x 7'H StormRox TRASH RACK OR APPROVED EQUAL. SEE DETAIL 22 ON SHEET CB.2 FOR DETAILS.
2. INSTALL 36" ROUND StormRox TRASH RACK WITH ANTI-VORTEX DEVICE. SEE DETAIL 23 ON SHEET CB.2 FOR DETAILS.
3. 30" SLUICE GATE AND ALL CONNECTED EQUIPMENT TO BE INSTALLED IN OR ABOVE THIS STRUCTURE. SEE SHEET CB.3 FOR DETAILS.
4. EXISTING SOUTH WILSON ROAD TO BE RAISED 1' TO ALLOW FOR PROPOSED CULVERT TO BE INSTALLED WITH 6" OF COVER. ROADWAY ELEVATION WILL BE 722.5.
5. LOCATION OF PROPOSED FILL SITE.
6. PROPOSED EXTENSION OF TURNER LANE (BY OTHERS). GRADING PERFORMED AS PART OF THIS PROJECT.
7. 3 ANTI-SLEEP COLLARS TO BE INSTALLED IN OUTLET SYSTEM. SEE SHEET DETAIL 21 ON CB.1 FOR DETAIL.
8. ROCK DISSIPATION POOL. SEE DETAIL 5 ON SHEET CA.8.
9. GRADING & APPROXIMATE. SEE SHEETS CA.1-CA.10 FOR DETAILS ON PROPOSED LOW FLOW CHANNEL GRADING.



LINE TURNER LANE BASIN PROFILE
1"=50' H 1"=5' V

Turner Lane Basin





Turner Lane Basin





Turner Lane Basin



Turner Lane Basin Video



Quiggins Basin



CITY OF RADCLIFF



Engineering Planning
Groundbreaking by Design.

QUIGGINS STORMWATER BASIN

HAPPY VALLEY FLOOD MITIGATION PROJECT

CONTRACTOR: RAME
CONTRACTING
CONSTRUCTION COST: \$1,828,146

FUNDED IN PART BY FEMA & KYEM



FEMA



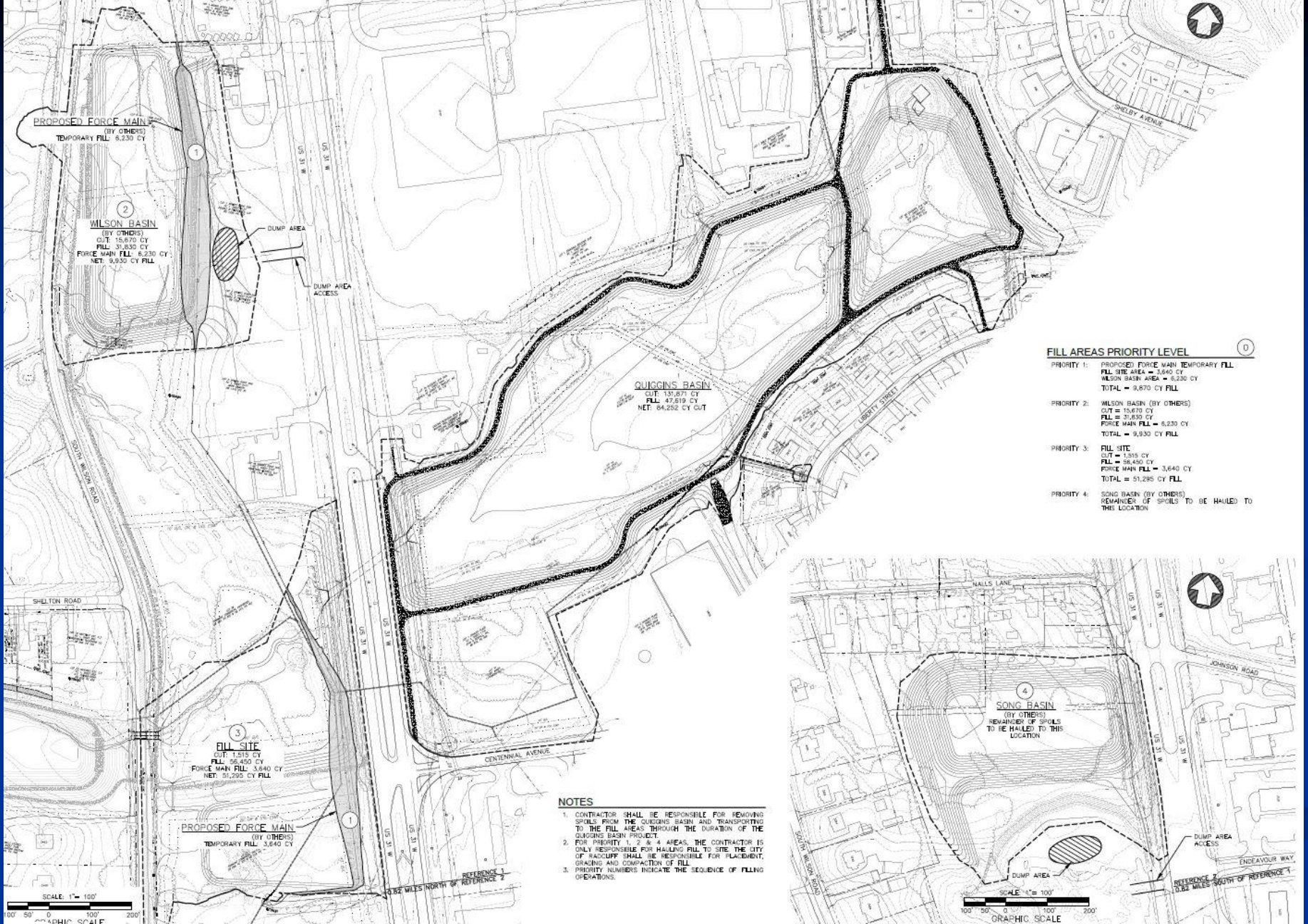
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Quiggins Basin





Quiggins Basin





Quiggins Basin

2008 9 29



Quiggins Basin



Quiggins Basin



Dixie Blvd

ATM Plus
Citizens Bank

Liberty St

Liberty St

Crestwood Ave

Quiggins Basin



Quiggins Basin



Quiggins Basin



Quiggins Basin



Quiggins Basin

2016 11 21



KYTC Hauling Permit

KYTC Hauling Permit Project Cost Savings

- Special KYTC hauling permit acquired by City to allow contractor to utilize articulated trucks (off-road trucks) to haul spoils across US 31 W.
 - City provided temporary signal modifications and guard rail removal.
 - Allows contractor to reduce the hauling distance and number of trips required due to increased capacity of articulated trucks.
- Contractor in process of Hauling approx. 84,000 CY



KYTC Hauling Permit Cost Savings Realized

- Average Hauling Costs ~ \$6 - \$10 / CY
- Quiggins Basin Savings = \$306,900
 - Actual Hauling Cost = \$4.35 / CY





Stream Restoration



Rock Hauling

Rock Hauling Video



Stream Restoration Cost Savings Methods

- City staff MSHA trained to select stone needed for project direct from the quarry.
- Special KYTC hauling permit acquired by City to allow articulated trucks (off-road trucks) to haul stone from quarry to site.
 - City provided temporary street closures and fire/police escort.
- 599 tons of boulders purchased (\$25/ton or \$2.17 / LF)
- Hauling took 27 trucks (\$6.76/ton or \$0.59 / LF)
- City purchased all other stream stabilization stone required @ \$5.32 / LF



Stream Restoration Cost Savings Realized

- Average Stream Restoration Costs ~ \$132 - \$137 / LF
- Turner Lane Basin Savings = \$74,030
 - Actual Stream Restoration Cost = \$72.58 / LF
- Quiggins Basin Savings = \$317,770
 - Actual Stream Restoration Cost = \$61.10 / LF
- **Total Project Savings to Date = \$391,800**





Road and
Box Culvert

2017 2 21



Road and
Box Culvert

2017 2 21



Road and
Box Culvert

2017 2 17



Road and Box Culvert

2017 2 24



Wilson Road Basin

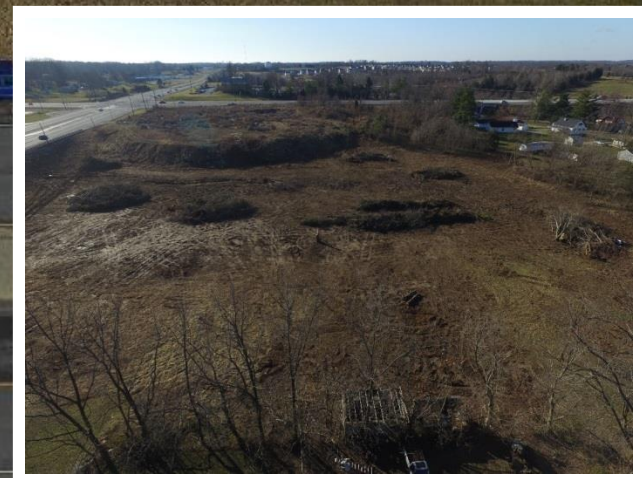




Wilson Road Basin



Song Basin





Alternate Basin

Summary

Proposed Basin	Top Elevation	Storage Below Top (Ac-Ft)	Storage Below Emergency Spillway (Ac-Ft)
Turner	736	33.1	29.2
Wilson	737	40.7	36.3
Song	784	28	23.2
Wal-Mart	780	63.4	63.4
Alternate	744	26.1	19.7
Subtotal		191.3	171.8
Quiggins Basin	728 (100 Yr. Floodplain)	375	
Total		566.3	



Questions?

Happy Valley Flood Mitigation Project

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