Committee Meeting

October 29, 2015

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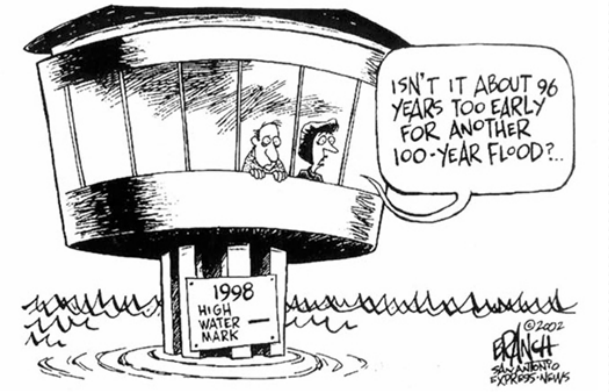
CITY OF WESTLAKE
440-617-4145

WHAT IS A 100 YEAR FLOOD EVENT?

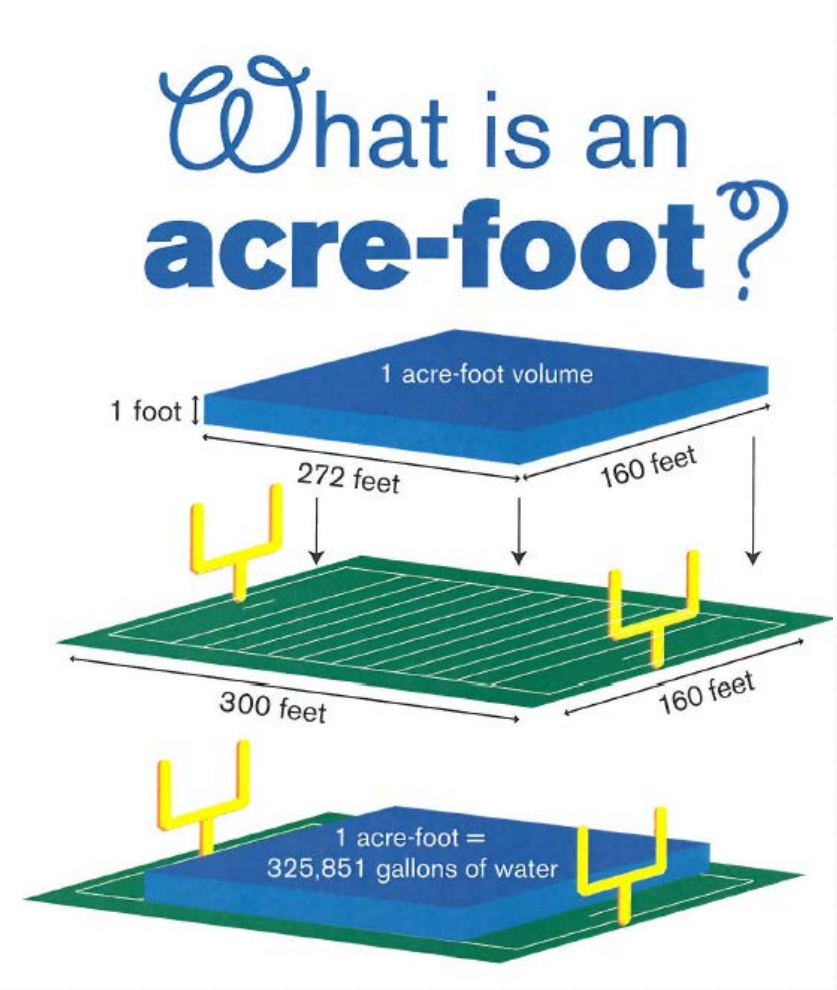
1. The term **“100-year flood”** is a term often used to describe a flood that has a 1% chance of occurring in any year.
2. Phrase could be misleading, and often causes people to believe these floods happen every 100 years on average.
3. The truth is, these floods can happen quite close together, or not for long stretches of time, but the risk of such floods remains constant from year to year.

Rainfall (inches) for given recurrence interval

Duration	2-month	3-month	4-month	6-month	9-month	1-year	2-year	5-year	10-year	25-year	50-year	100-year
10-day	1.70	2.05	2.36	2.78	3.19	3.47	4.29	5.34	6.17	7.30	8.19	9.14
5-day	1.37	1.64	1.86	2.15	2.47	2.69	3.34	4.23	4.95	5.96	6.82	7.74
72-hr	1.26	1.48	1.67	1.94	2.23	2.42	2.99	3.72	4.34	5.31	6.15	7.09
48-hr	1.18	1.38	1.53	1.78	2.04	2.22	2.75	3.42	3.99	4.87	5.66	6.55
24-hr	1.12	1.31	1.43	1.65	1.88	2.04	2.50	3.10	3.60	4.39	5.11	5.89
18-hr	1.06	1.23	1.34	1.56	1.77	1.92	2.35	2.91	3.38	4.13	4.80	5.54
12-hr	0.97	1.13	1.24	1.43	1.63	1.77	2.17	2.70	3.13	3.82	4.45	5.12
6-hr	0.84	0.98	1.07	1.24	1.41	1.53	1.88	2.32	2.70	3.29	3.83	4.42
3-hr	0.72	0.84	0.92	1.06	1.21	1.31	1.60	1.98	2.30	2.81	3.27	3.77
2-hr	0.65	0.76	0.83	0.96	1.09	1.18	1.45	1.80	2.09	2.55	2.96	3.42
1-hr	0.53	0.61	0.67	0.78	0.88	0.96	1.17	1.46	1.69	2.06	2.40	2.77
30-min	0.41	0.48	0.52	0.61	0.69	0.75	0.93	1.15	1.33	1.62	1.89	2.18
15-min	0.30	0.35	0.38	0.45	0.51	0.55	0.68	0.84	0.97	1.19	1.38	1.59
10-min	0.24	0.28	0.30	0.35	0.40	0.43	0.52	0.65	0.76	0.92	1.07	1.24
5-min	0.13	0.15	0.17	0.19	0.22	0.24	0.30	0.37	0.43	0.53	0.61	0.71



RETENTION BASIN VOLUMES



WOODRUFF DRAINAGE STUDY

- 3 PUBLISHED REPORTS
  - 1978
  - 1980
  - 1987
- REPORT ESTABLISHED ORDINANCES ON RETENTION
- SIX STREAMS WERE STUDIED ALONG WITH 14 PROPOSED RETENTION BASINS (#)
  - SCHWARTZ CREEK
  - PORTER CREEK (2)
  - **CAHOON CREEK (9)**
  - SPERRY CREEK (2)
  - WOLF CREEK
  - WISCHMEYER CREEK (1)

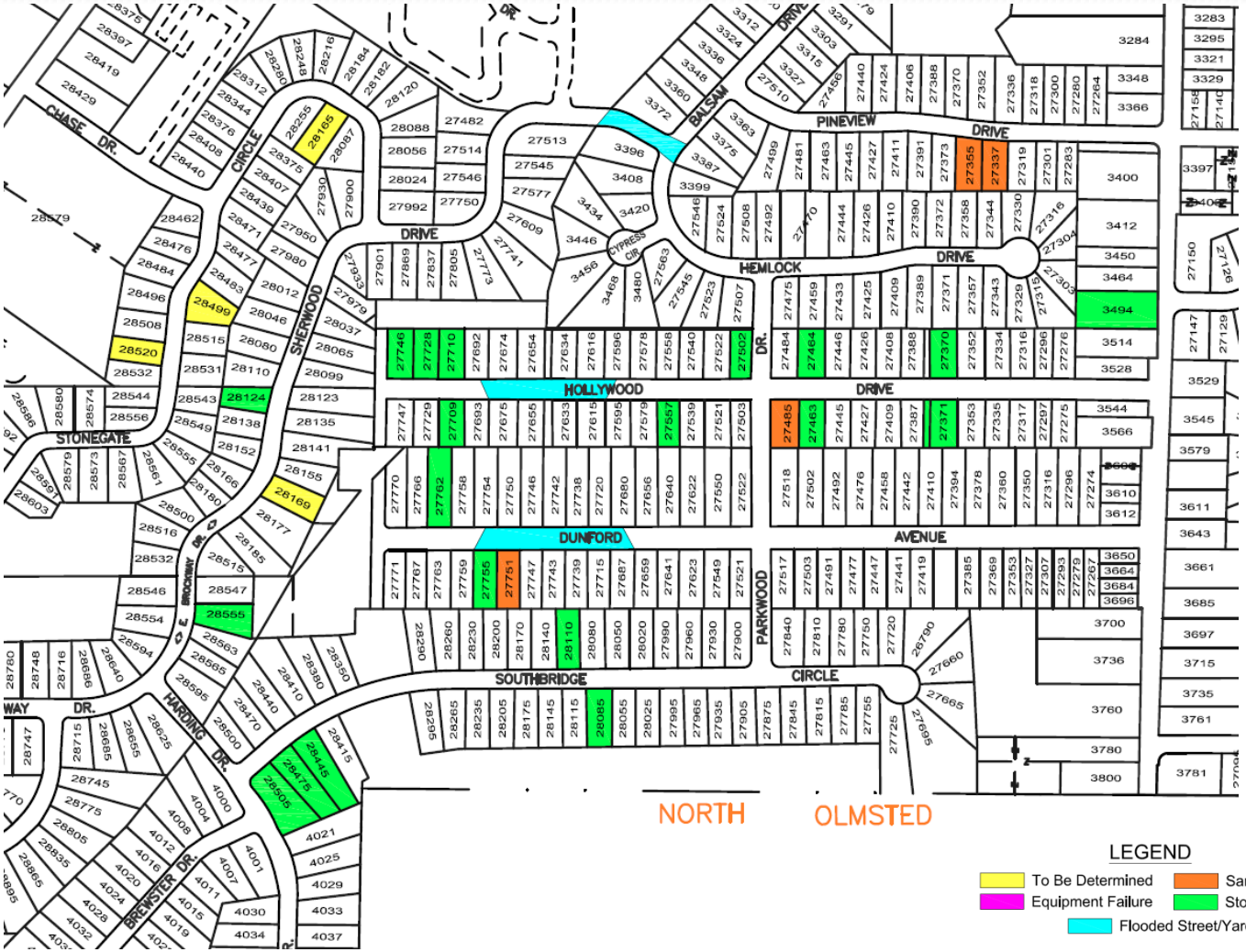
CAHOON CREEK

- MAJORITY OF ISSUES ARE WITHIN THE CAHOON CREEK WATERSHED

- CAHOON CREEK – 9 PROPOSED BASINS
  - BASINS COMPLETED TO WOODRUFF DESIGN
    - COOLEY (WESTCHESTER WOODS CONDOS)
    - PINEVIEW
  - BASINS PARTIALLY DEVELOPED WITH SUBDIVISION
    - ROSE (OAKWOOD LANE) 12% (1.4/13) ACRE-FT)
    - KIRK (WOODPATH) 22% (10/45)
    - COSTELLO (BRETTON WOODS) 31% (14/45)*
    - WESTWOOD (SOUTHWOOD) 20% (2.8/14)

**EXPANDED EAST OF CROCKER ROAD*

FLOODING AREAS (2011)



FLOODING AREAS (2011)

PURPOSE OF REPORT

- IS IT POSSIBLE TO LOWER THE WATER ELEVATION OF THE FOLLOWING DITCHES OR STREAMS DURING A MAJOR RAIN EVENT (100-YEAR)?
  - DOVER DITCH
  - KIRK LATERAL
  - ROSE LATERAL
  - WESTWOOD LATERAL

- ALL THESE LOCATIONS ARE IN THE SAME PART OF THE CITY WITH SURFACE FLOODING THAT IS UPSTREAM FROM CAHOON CREEK

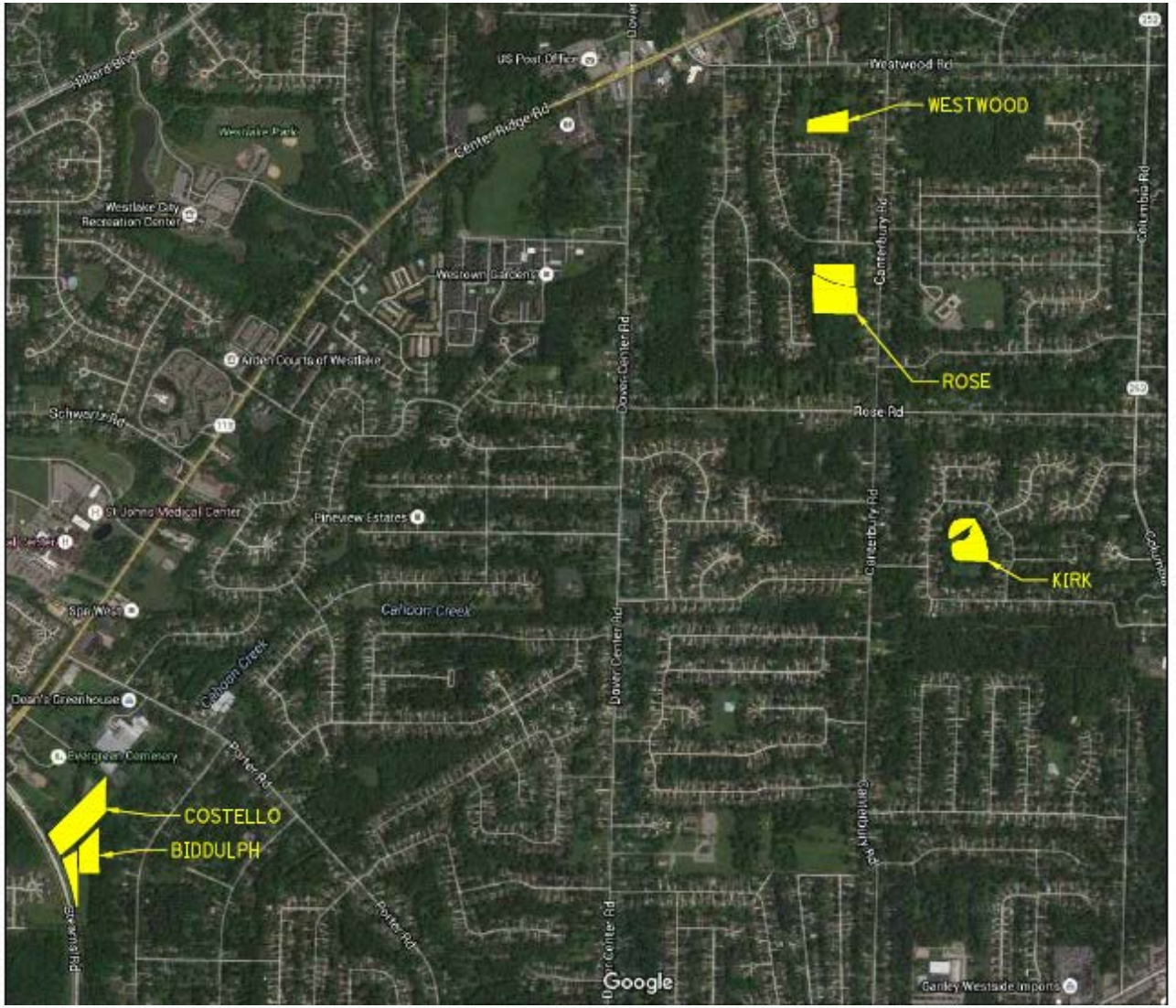
SCOPE OF SERVICES

- R.E. WARNER PERFORMED THE STUDY
  - ENGINEER- PETER D. ZWICK, P.E.
- SCOPE OF SERVICES
  - REVIEW WOODRUFF REPORT
  - OBTAIN HYDRAULIC MODEL FROM FEMA
  - CONCEPTUAL DESIGN OF 5 BASIN IMPROVEMENTS:
    - ROSE
    - KIRK
    - WESTWOOD
    - COSTELLO
    - BIDDULPH
  - RUN HYDRAULIC MODEL TO DETERMINE HOW MUCH THE FLOOD ELEVATION WOULD DECREASE DURING VARIOUS RAIN EVENTS.
  - DEVELOP OPINION OF PROBABLE COST
  - PRIORITIZE PROJECTS BASED ON COST-BENEFIT

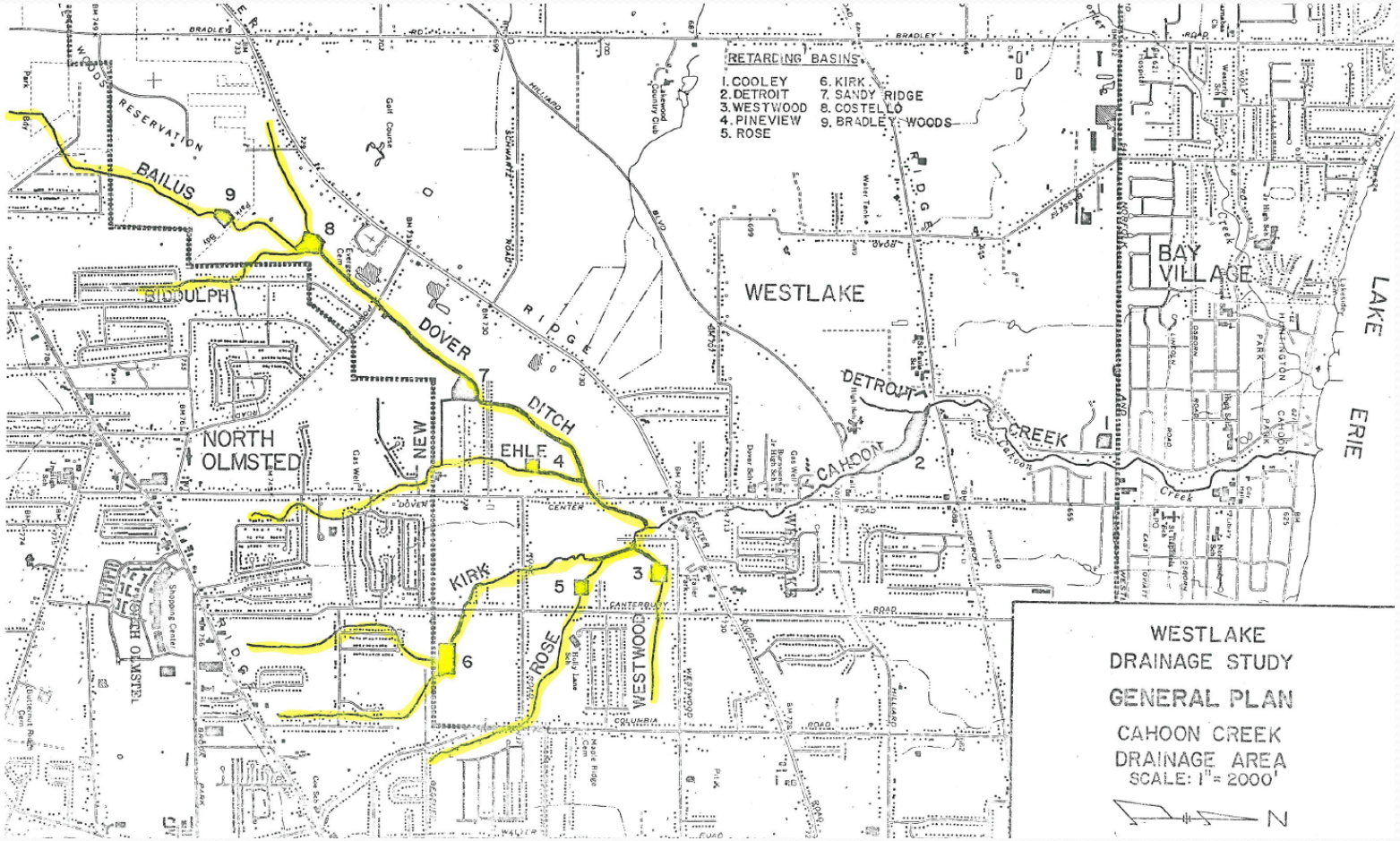
R.E. WARNER & ASSOCIATES Inc.

FEMA

CONCEPTUAL BASIN LOCATIONS



CAHOON CREEK

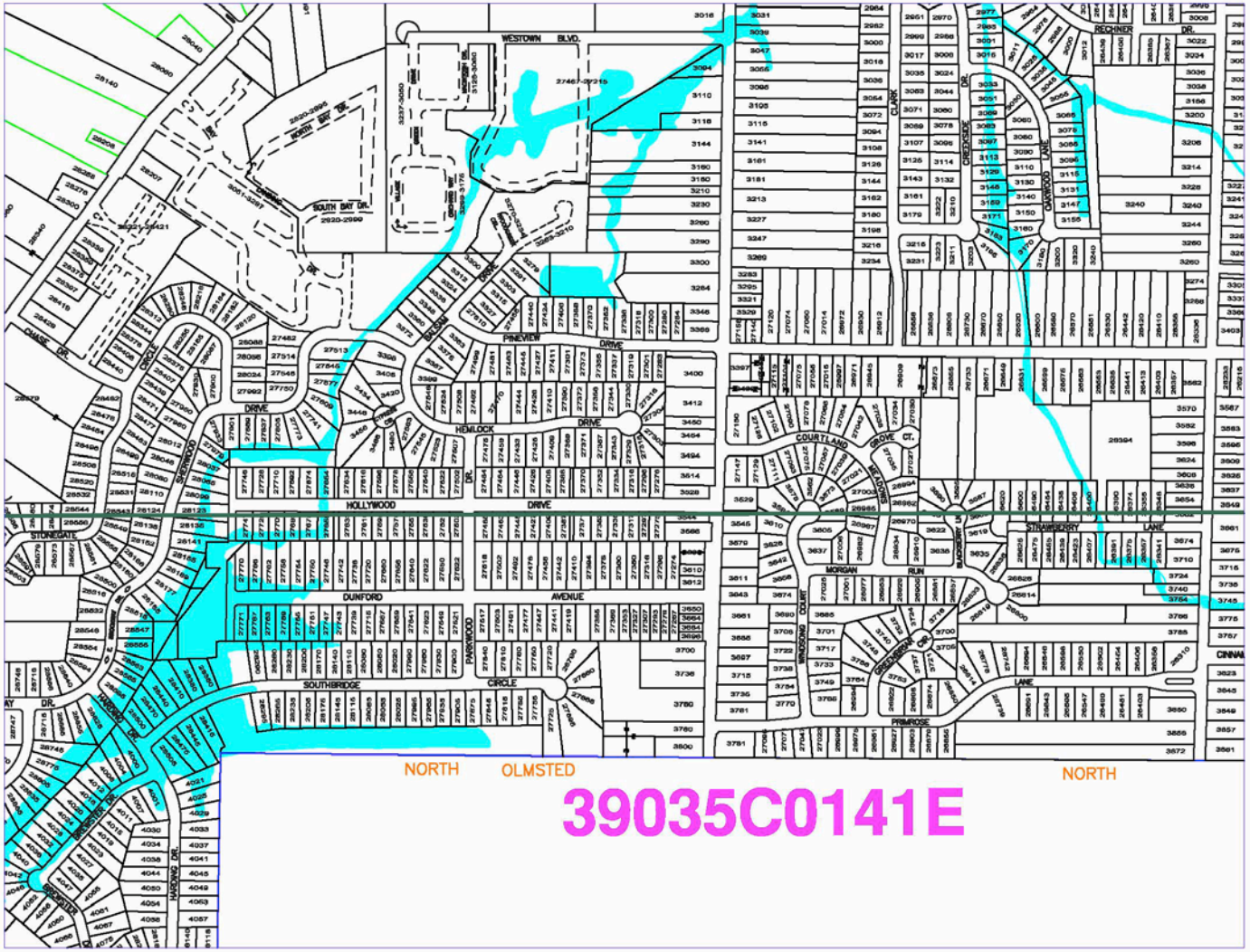


R.E. WARNER STUDY AREA

F.E.M.A.

- 1979-FLOOD INSURANCE RATE MAPS
  - HYDRAULIC MODELING
  - ESTABLISH LOCATIONS THAT WILL HAVE SURFACE FLOODING DURING A 100-YEAR RAIN EVENT (SPECIAL FLOOD HAZARD AREAS)
- 2010 NEW MAPS GENERATED
  - NO HYDRAULIC MODELING
  - UPDATED DATUM (BENCHMARK)
- SINCE NO NEW MAPS WERE GENERATED, R.E. WARNER HAD TO DEVELOP A MODEL FROM RAW FEMA DATA. THIS DELAYED THE FINDINGS.

2010 FEMA FLOOD PLAIN MAP



CONCEPTUAL BASIN SIZE

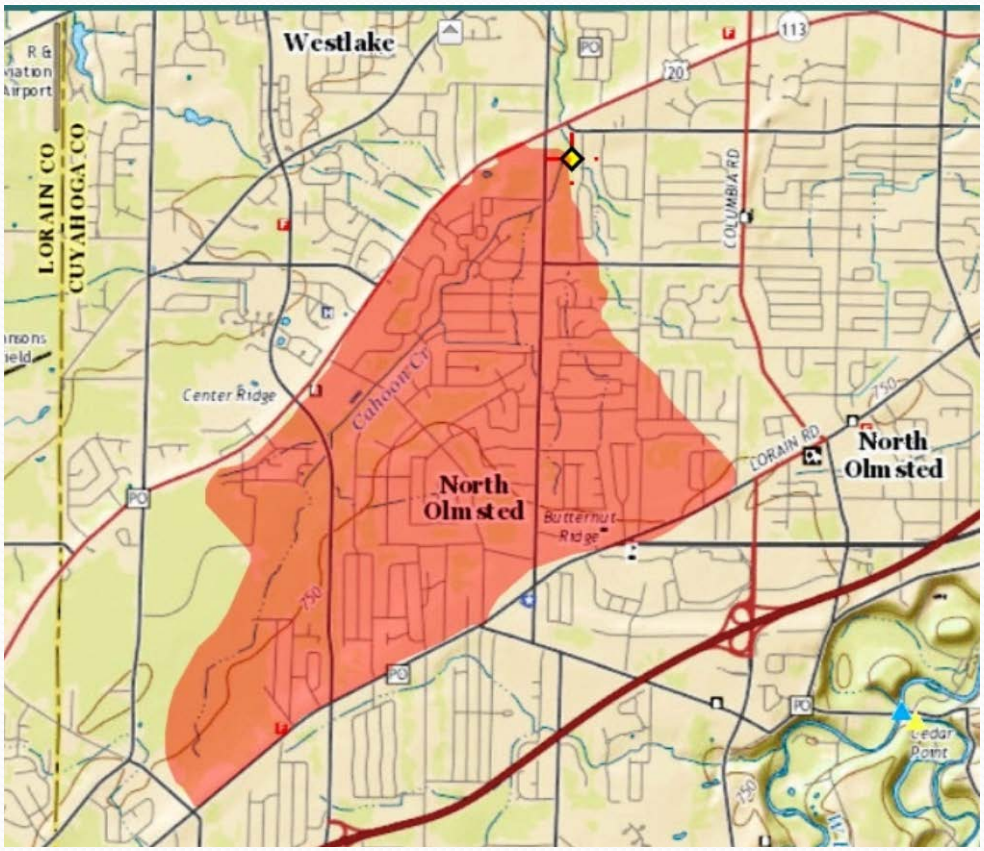
	PROPOSED			
	ACRE-FT	**DEPTH (FT)**	**AREA (SF)**	**COST**
WESTWOOD	3	3	63,000	$700,000
ROSE	10	2.5	192,000	$1,900,000
KIRK	6	3	96,700	$1,300,000
COSTELLO	18	5	160,000	$2,500,000
BIDDULPH	10	6	96,920	$1,300,000
TOTAL				**$7,700,000**

NOTE:

THE VOLUME IN ACRE-FT IS THE STORAGE FOR A 100-YEAR RAIN EVENT. THE ACTUAL VOLUME OF THE BASIN IS LARGER.

CAHOON CREEK

- DRAINS TO LAKE ERIE
- WATERSHED OF 5.38 SQUARE MILES



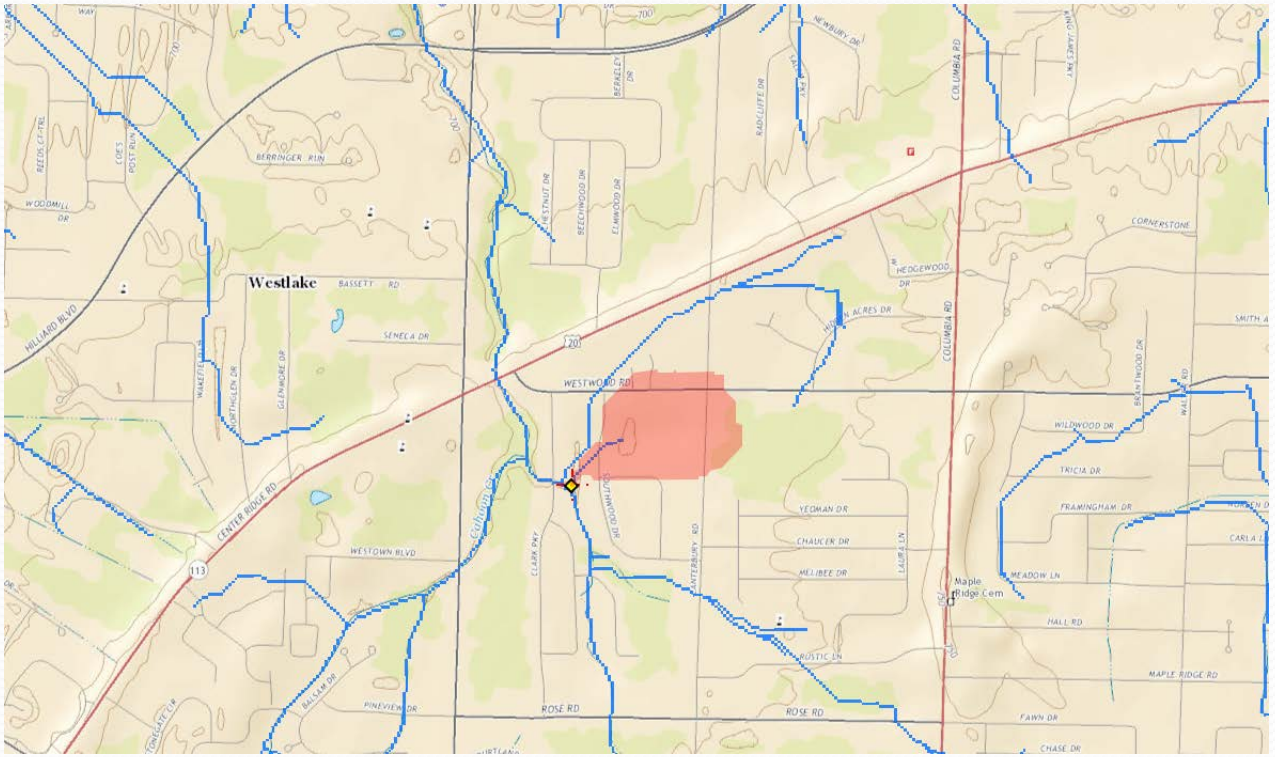
MODELING

- 6 SCENARIOS WERE MODELED WITH A 10, 25 AND 100 YEAR RAIN EVENT. (#) IS MAX. LOWERING IN FEET DERING A 100 YEAR EVENT.
  - #1 -ALL BASINS (2.6’)
  - #2- COSTELLO AND BIDDULPH (2.38’)
  - #3- WESTWOOD ONLY (.36’)
  - #4- KIRK ONLY (1.03’)
  - #5- ROSE ONLY (.91’)
  - #6- COSTELLO AND EXPANDED BIDDULPH (2.6’)

- THE FOLLOWING SHEETS ILLUSTRATE THE EFFECTS OF A 100 YEAR RAIN EVENT.

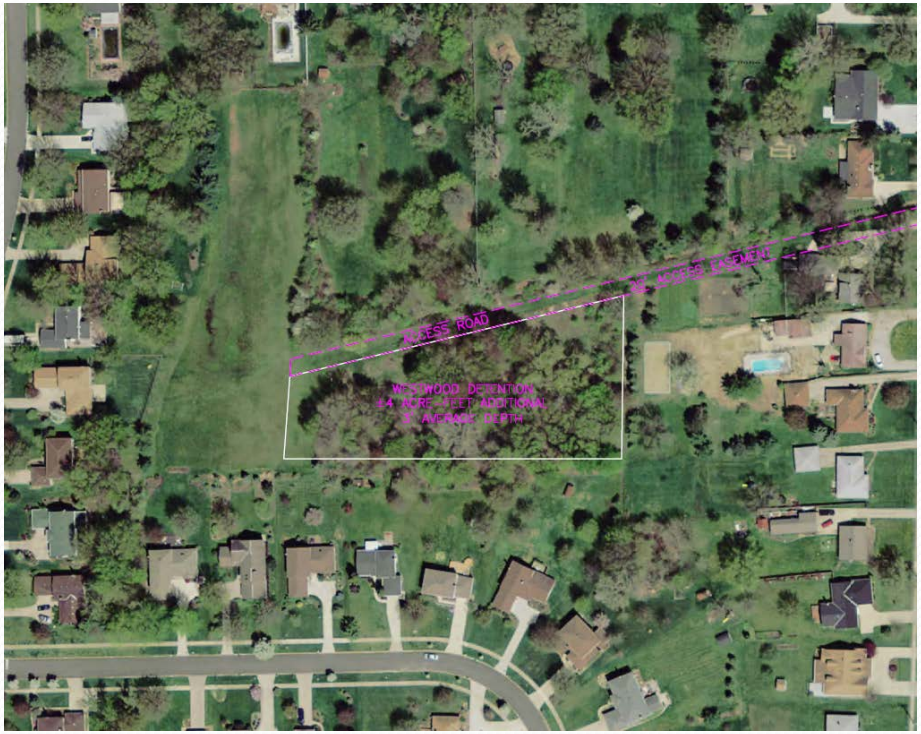
WESTWOOD LATERAL

- DRAINS TO KIRK LATERAL
- WATERSHED OF .06 SQUARE MILES



WESTWOOD

- NEAR SOUTHWOOD DRIVE
- EXPANSION OF EX. BASIN TO THE EAST



WESTWOOD

WESTWOOD

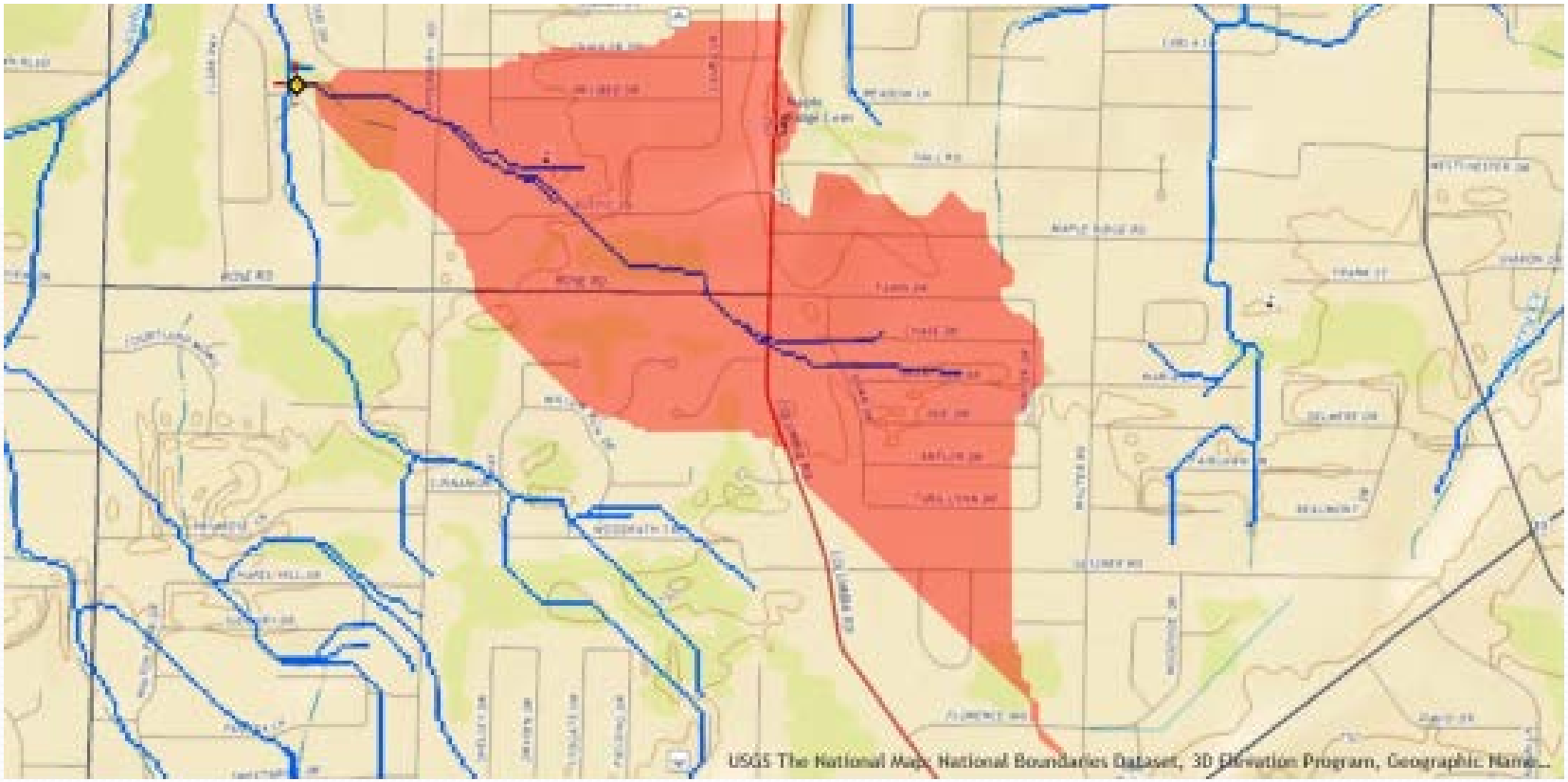
- ONLY LOWERS WATER ELEVATION CLOSE TO BASIN

WATER SURFACE ELEVATION DECREASE

- .2’ TO .5’
- .5’ TO 1’
- 1’ TO 2’
- 2’ <

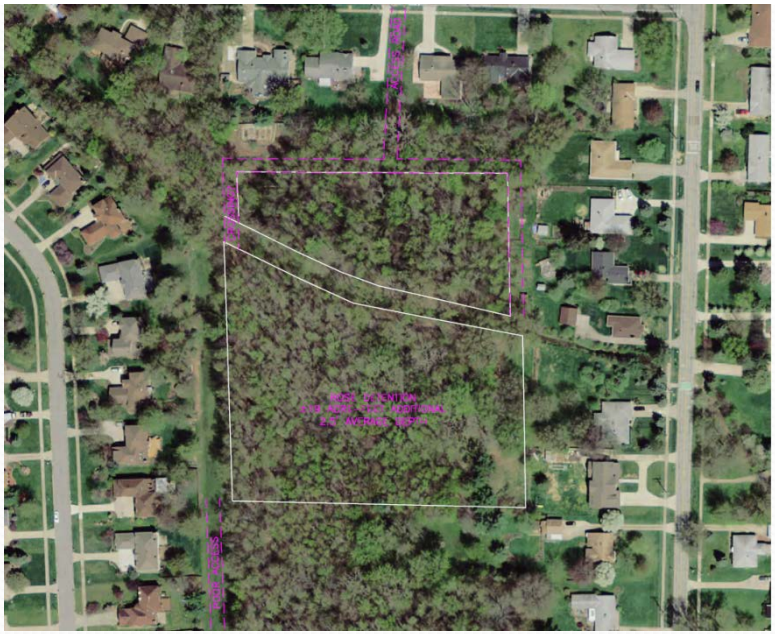
ROSE LATERAL

- DRAINS TO KIRK LATERAL
- WATERSHED OF .57 SQUARE MILES



ROSE BASIN

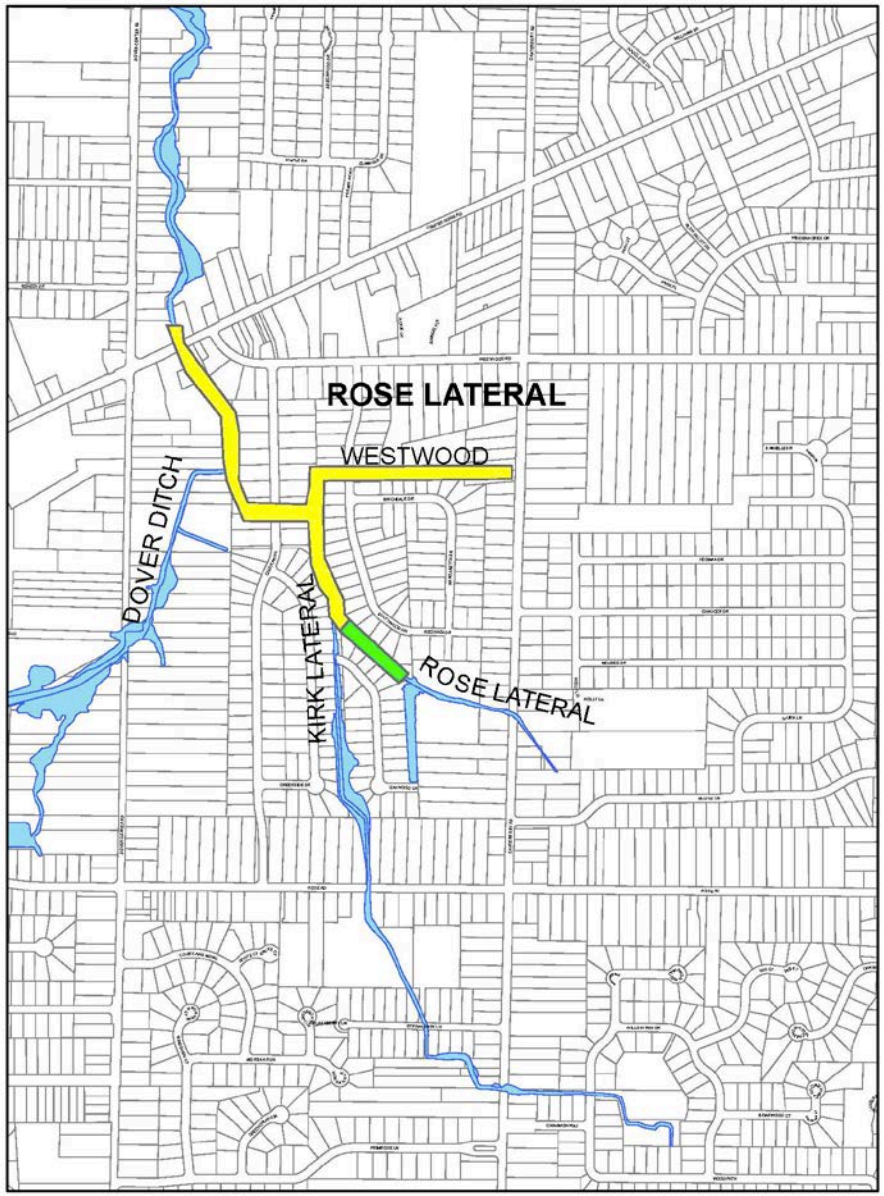
- OAKWOOD RETENTION BASIN IS EXPANDED TO THE EAST ALONG THE REAR YARDS OF CANTERBURY
- CITY OWNED PROPERTY
- ENVIRONMENTAL STUDY
  - POSSIBLE HARDWOOD WETLAND



ROSE BASIN

ROSE BASIN

- ONLY LOWERS WATER ELEVATION CLOSE TO BASIN

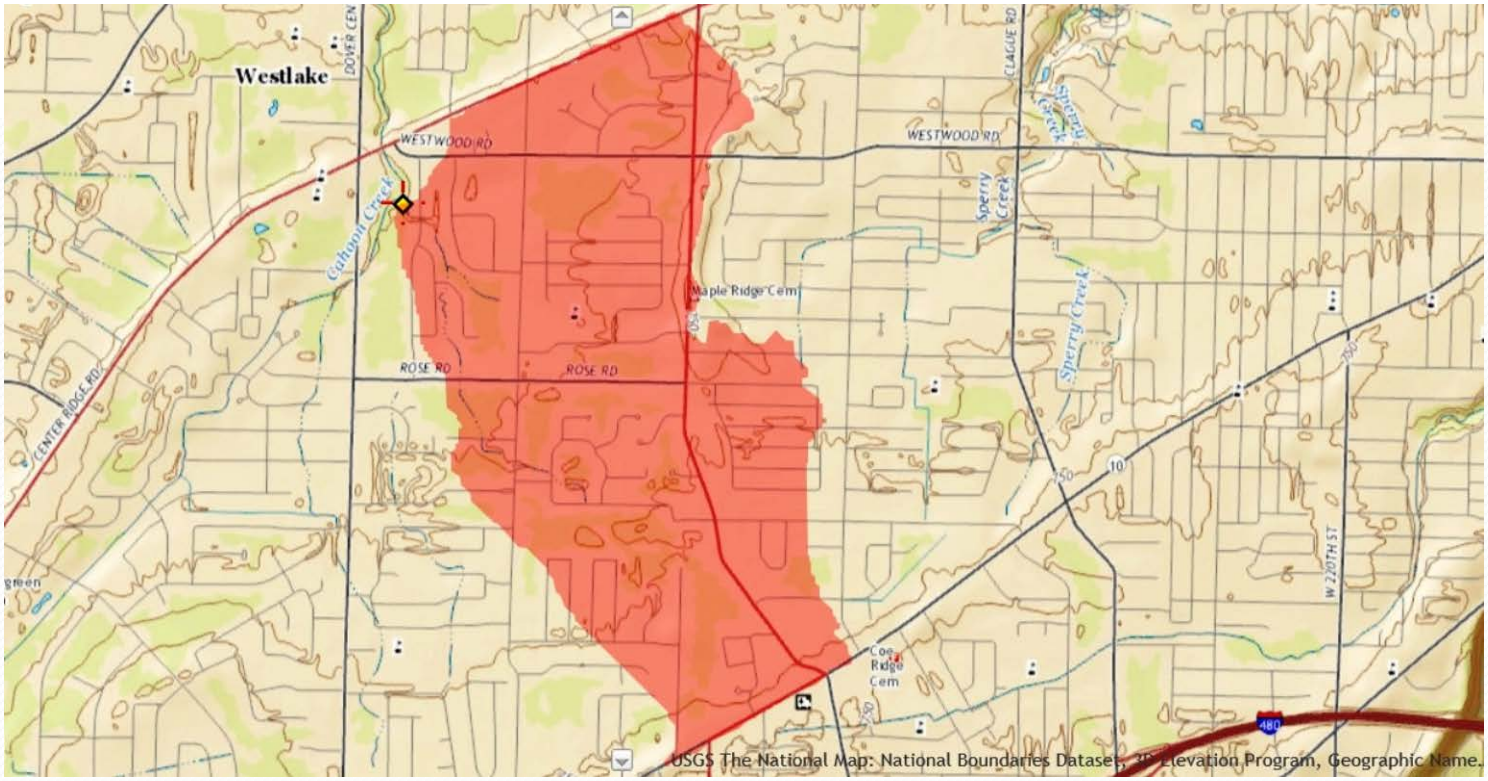


WATER SURFACE ELEVATION DECREASE

- .2’ TO .5’
- .5’ TO 1’
- 1’ TO 2’
- 2’ <

KIRK LATERAL

- DRAINS TO CAHOON CREEK
- SUB-TRIBUTARIES ARE ROSE AND WESTWOOD
- WATERSHED OF 1.96 SQUARE MILES



KIRK BASIN

- WOODPATH RETENTION BASIN EXPANDED
- CITY OWNED PROPERTY

KIRK

KIRK

KIRK BASIN

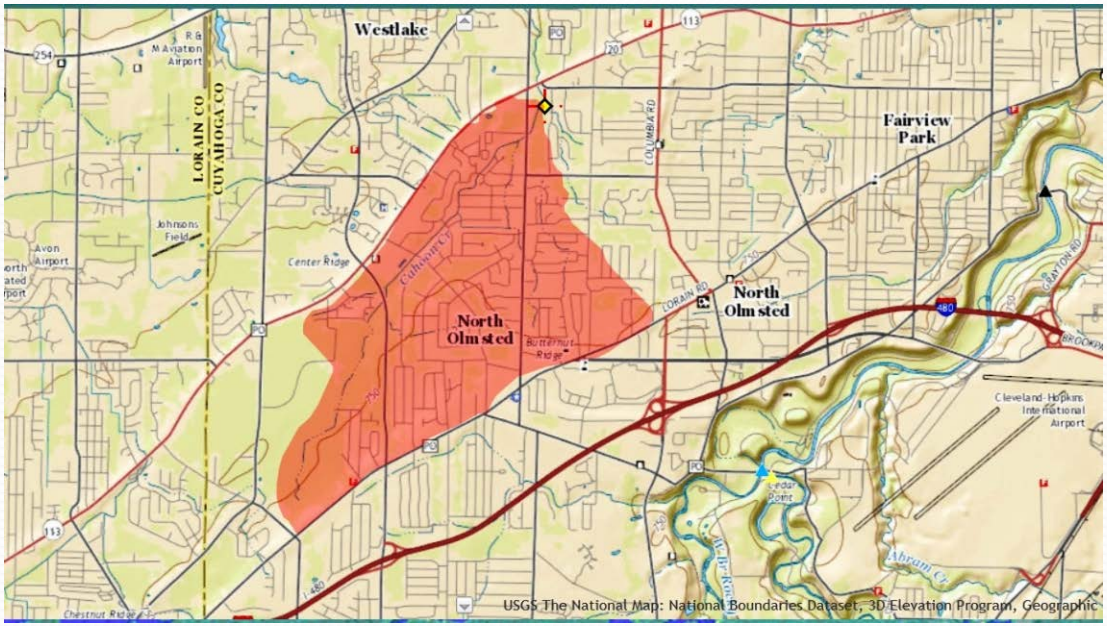
- LOWERS A GOOD PORTION OF KIRK LATERAL

WATER SURFACE ELEVATION DECREASE

- .2’ TO .5’
- .5’ TO 1’
- 1’ TO 2’
- 2’ <

DOVER DITCH

- DRAINS TO CAHOON CREEK
- SUB-TRIBUTARIES EHLE, BAILUS AND BIDDULPH
- WATERSHED OF 3.44 SQUARE MILES



COSTELLO / BIDDULPH

- EXPAND EXISTING BASINS AT CEMETERY AND BASIN ALONG CROCKER ROAD
- NEED ABOUT 5 ACRES FROM METRO HOSPITAL. VERBAL AGREEMENT FOR LAND IN LIEU OF STORM WATER CREDITS

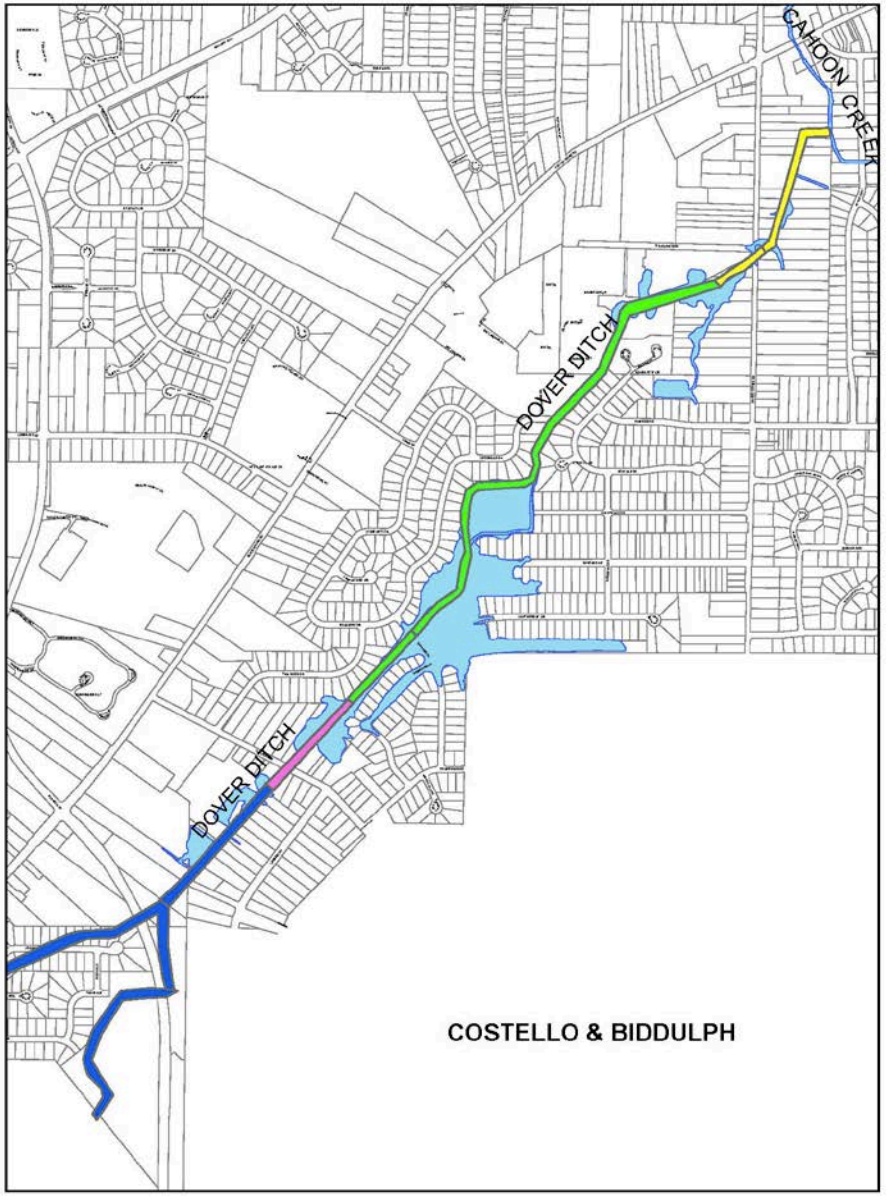
COSTELLO (BRETTON WOODS)

COSTELLO / BID

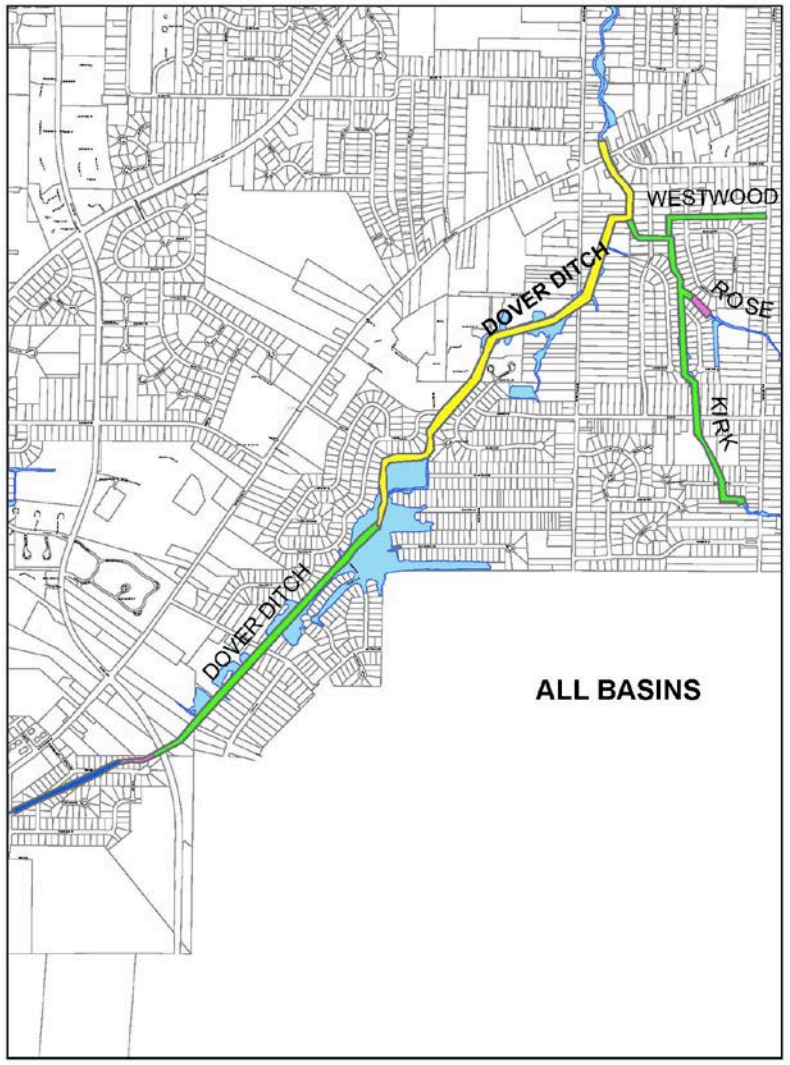
- ALL OF DOVER DITCH IS LOWERED

WATER SURFACE ELEVATION DECREASE

- .2’ TO .5’
- .5’ TO 1’
- 1’ TO 2’
- 2’ <



ALL BASINS

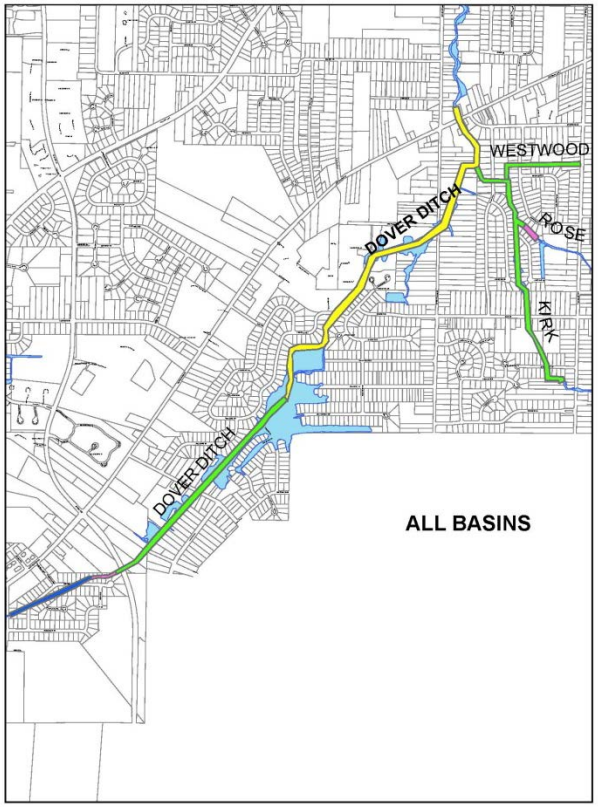


WATER SURFACE ELEVATION DECREASE

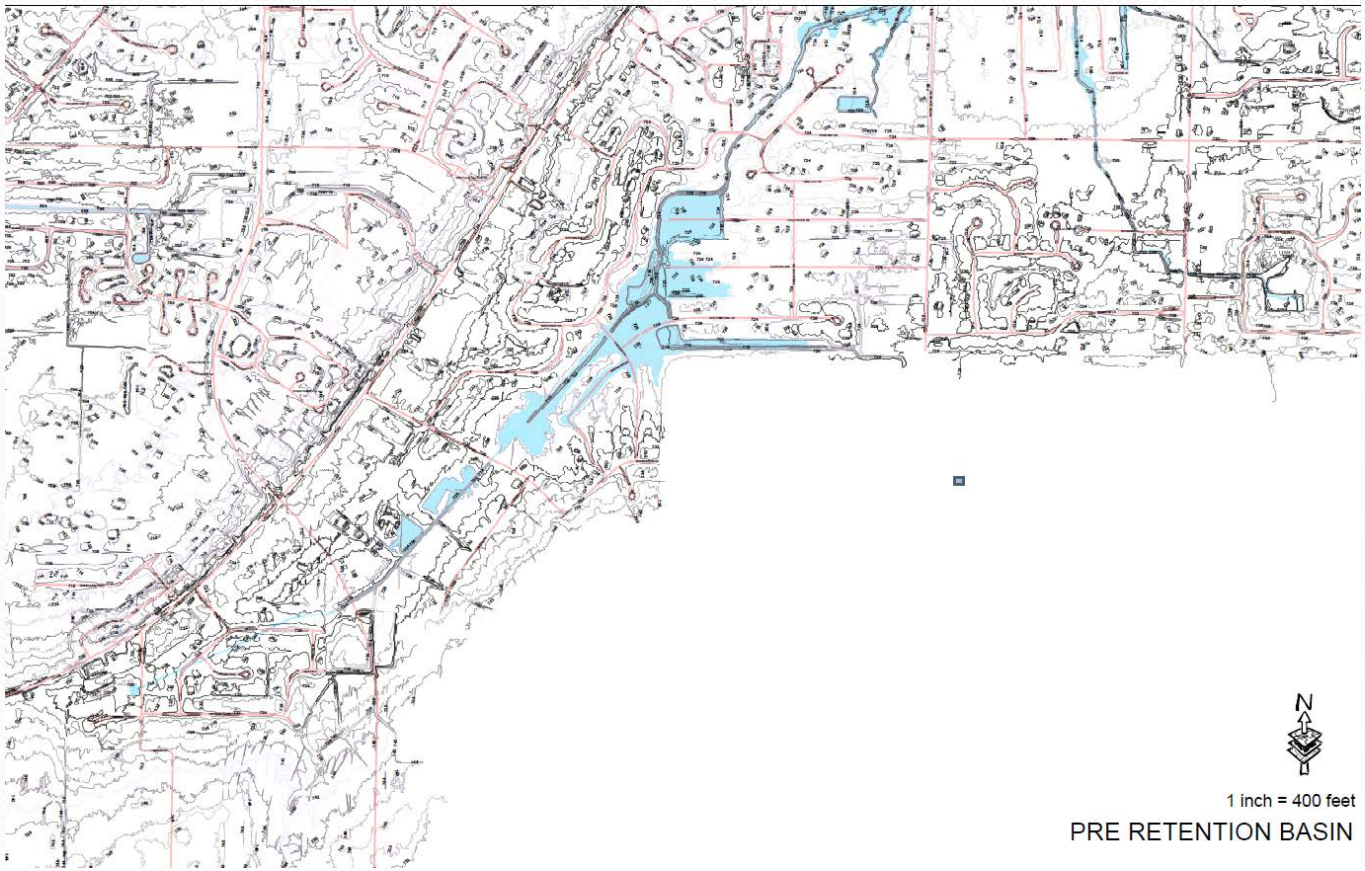
- .2’ TO .5’
- .5’ TO 1’
- 1’ TO 2’
- 2’ <

KIRK COMPARED TO ALL

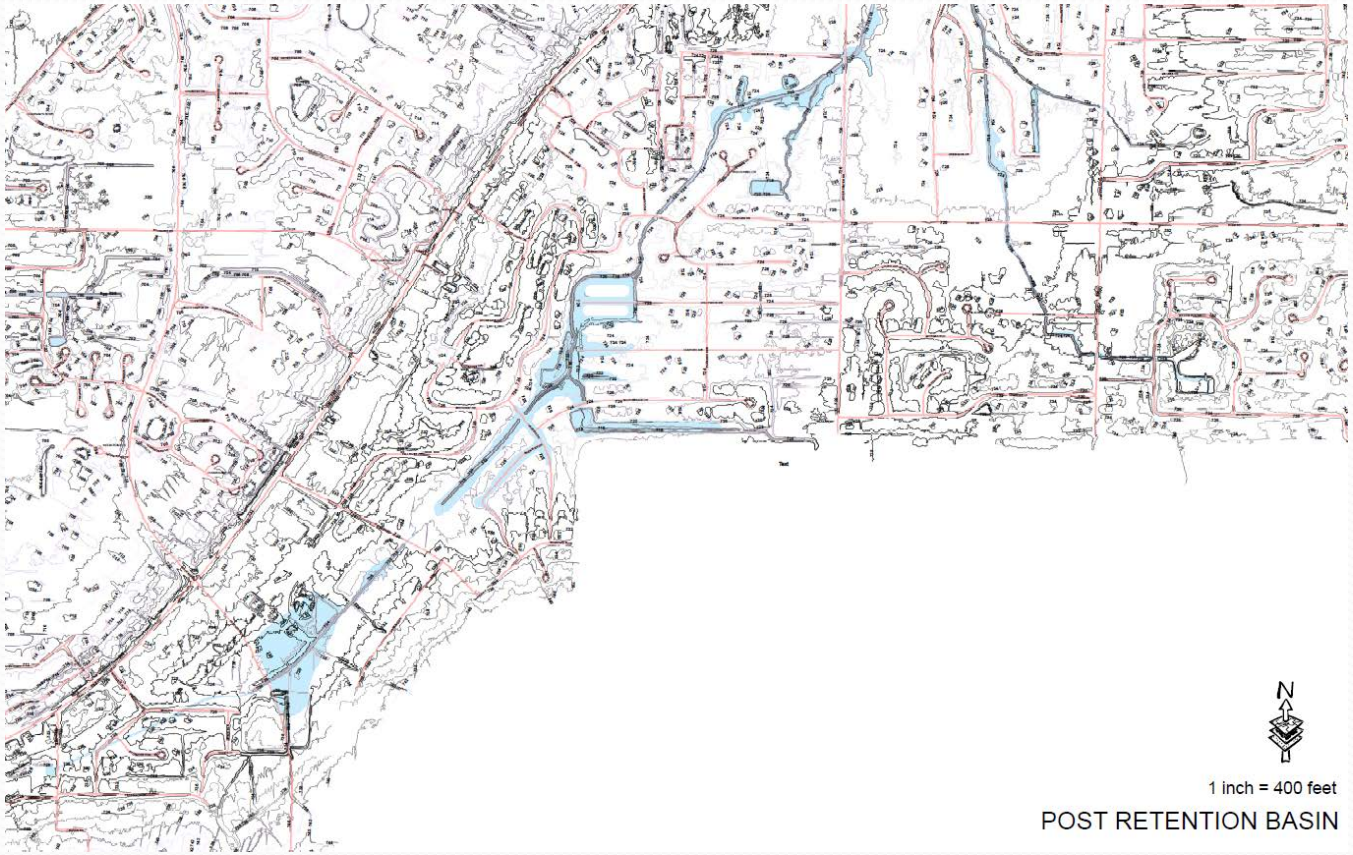
- MAJORITY OF FLOODED AREAS DON'T CHANGE BETWEEN ALL AND WITH KIRK ONLY WITHIN THE KIRK TRIBUTARY



CURRENT FLOODPLAIN-DOVER DITCH



POST FLOODPLAIN-DOVER DITCH



PRIORITIZATION

RANK	BASIN	EST. COST	COST / ACRE FT	RATIO
1	BIDDULPH	$1,300,000	$130,000	3.11
3	COSTELLO	$2,500,000	$138,889	2.77
2	KIRK	$1,300,000	$216,667	2.75
4	WESTWOOD	$700,000	$233,333	2.74
5	ROSE	$1,900,000	$190,000	1.17

RATIO-

AVERAGE REDUCTION IN FLOOD ELEVATION (100 YEAR),
MULTIPLIED BY THE EFFECTIVE LENGTH,
MULTIPLIED BY A NORMALIZATION FACTOR (1,000),
DIVIDED BY COST

FINAL THOUGHTS

- PERFORM THE BIDDULPH/COSTELLO IMPROVEMENTS
- MONITOR AND REFINE MODEL
- EVALUATE FUTURE PROJECTS

THE END

- QUESTIONS OR COMMENTS