



VILLAGE OF WILMETTE
STORMWATER
ACTION PLAN

Separate Storm Sewer Study Update

September 24, 2015



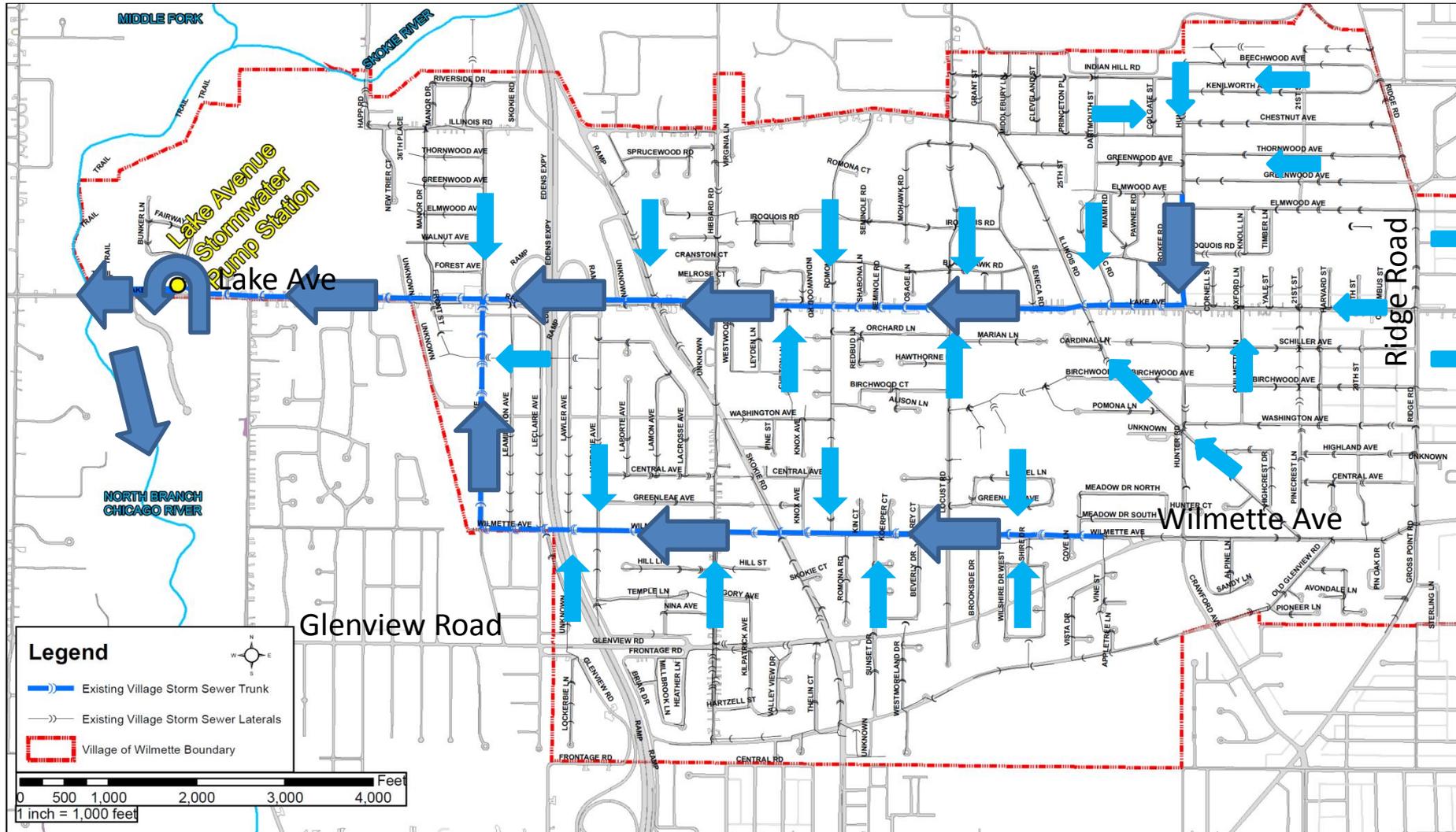


Outline of Presentation

- Summary of January 28th Presentation
- Presentation of Revised Alternatives
- Summary of Benefits and Costs
- Sample Phasing Plan
- Questions

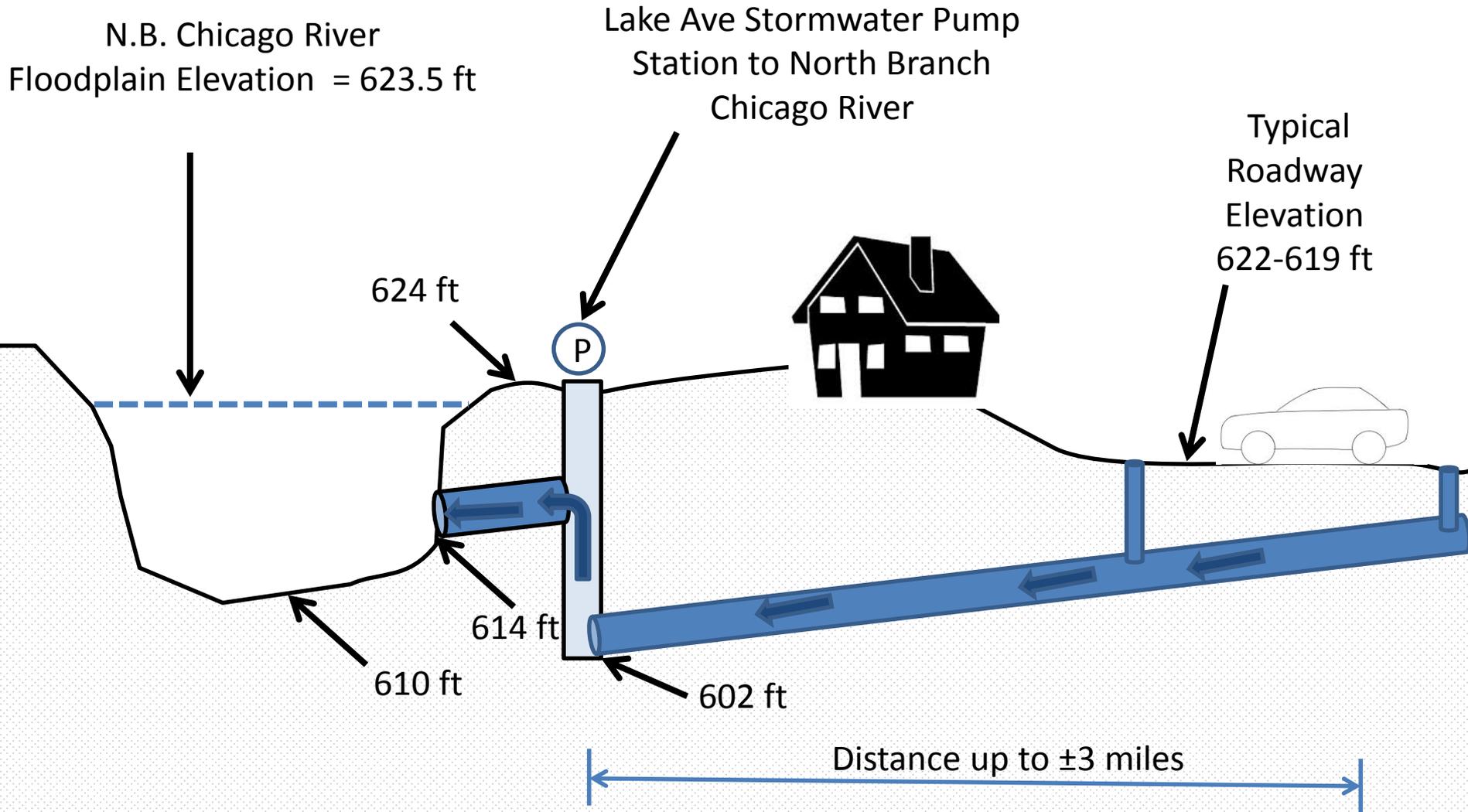
- 100-year storm event – Storm event with a 1% chance in occurring in any given year.
- 10-year storm event – Storm event with a 10% chance of occurring in any given year.
- 2-year storm event – Storm event with a 50% chance of occurring in any given year.
- Depth of flooding – Depth of standing water in the street.
- (cfs) cubic feet per second – flowrate measurement of water
- Acre-foot – Volume measurement for stormwater
 - 1 acre of land 1 foot deep
 - A flat football field with a depth of 1 foot
 - 616,715 2-liter bottles
 - 325,828 gallons

Existing Drainage System

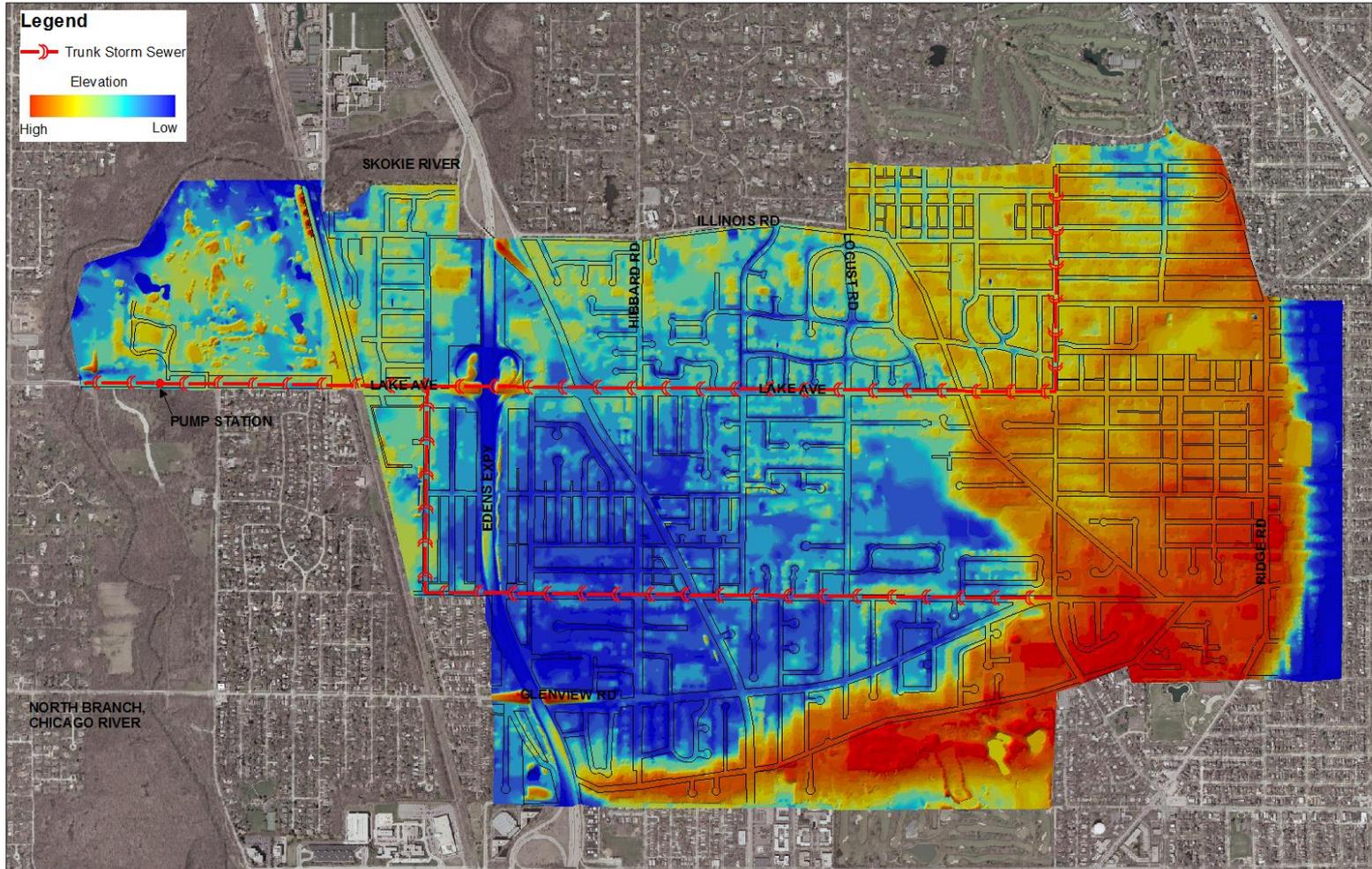


Limitations of Existing System

- Reliance on Storm Sewers and Pump Station



- Topographic Limitations



- Highly developed residential area
- Developed prior to modern stormwater management practices
 - Limited stormwater storage
 - Storm sewer undersized compared to modern design standards
 - No overland flow paths
- Limited open space
- No easy place to safely store or send runoff

- Stormwater model development
 - Incremental approach to develop a plan
 - Comprehensive analysis
 - Identify underutilized segments and/or restrictions
 - Identify potential improvements
- Calibration from monitoring & flood events
 - April 2013, May 2014 and June 2014



Existing Conditions Model Results

- Storm sewer system has 2-year capacity
- 10-Year storm event
 - Street flooding up to 2 feet in depth
- 100-year storm event
 - Street flooding up to 3 feet in depth
- April 2013 storm event
 - Equivalent to a 25-year storm event
 - Street flooding over 2.5 feet in depth
- June 2014 storm event
 - Equivalent to a 5-year storm event
 - Street flooding reported



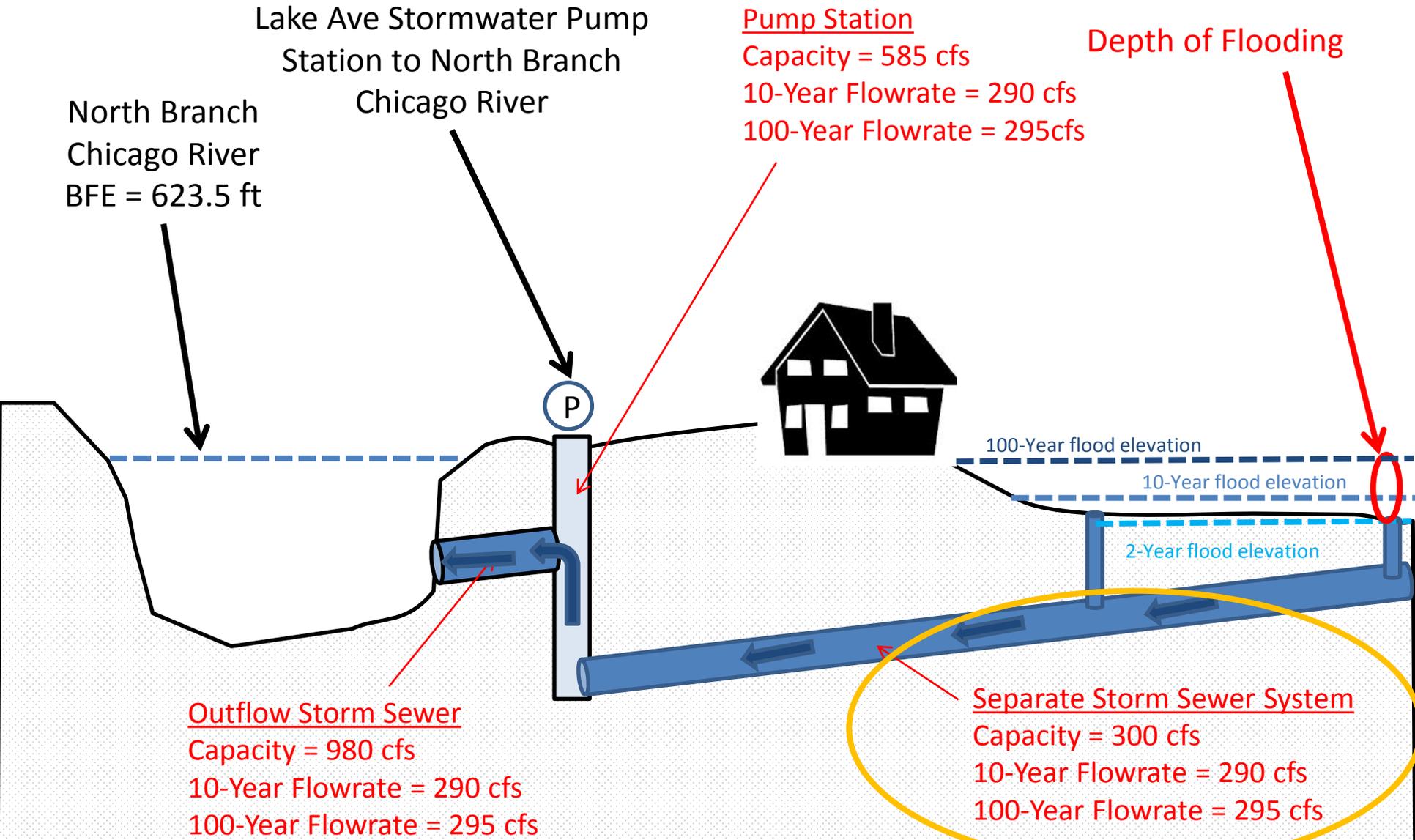
Existing Conditions Model Results

Estimated Number of Structures Impacted by Flooding

Return Interval Storm Event	Number of Structures*
10-year	120
25-year	280
50-year	480
100-year	700

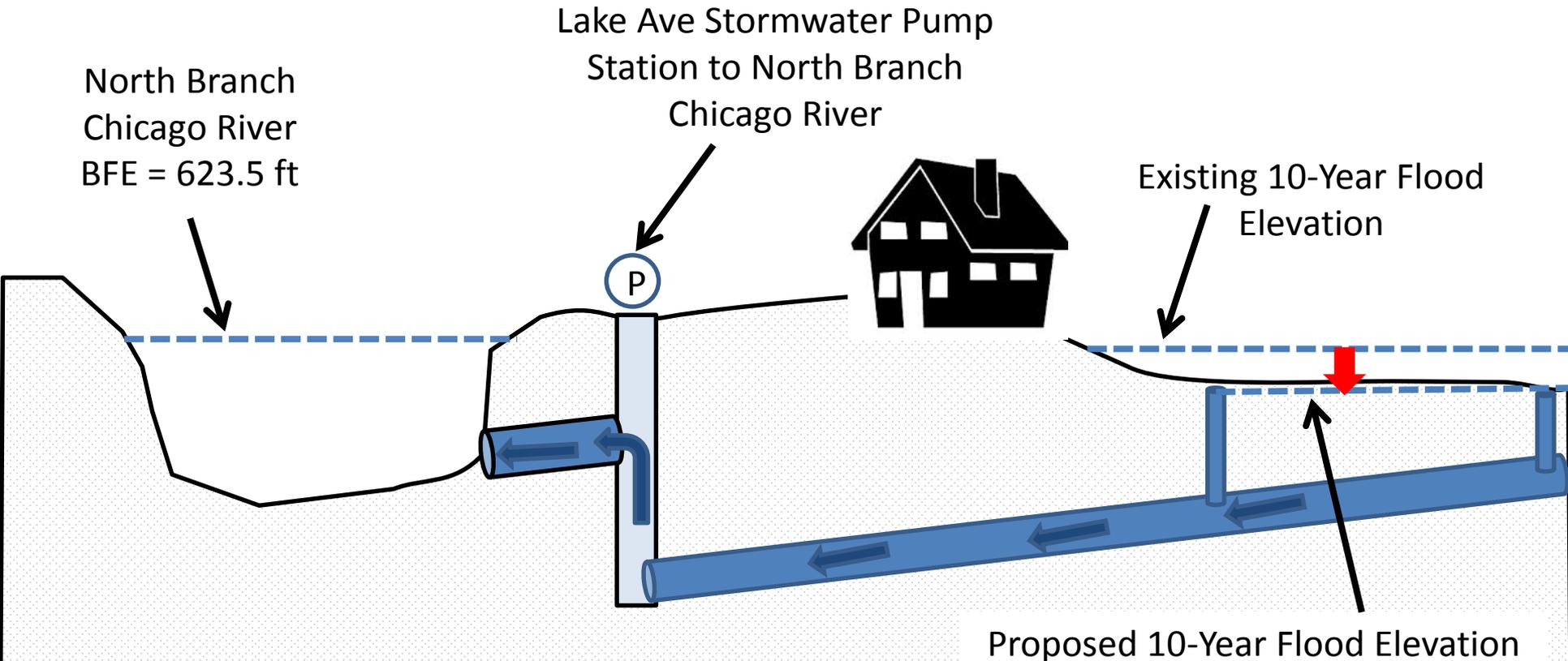
*Structure impacted when flood level is within 1 foot of highest lot elevation

Identification of System Bottlenecks



Proposed Drainage Improvements

- Goal: 10-Year System Capacity per August 2014 MSC meeting
 - Reduce 10-year flood elevation below pavement elevation
 - Similar to design standard for new construction



- Short Term Projects

- Residential flood-proofing
- High capacity inlets
- Connection to Glenview system



- Green Infrastructure

- Village owned property (roadside bioswales and islands)
- Privately owned property (rain gardens and rain barrels)
- Ordinance requirements, maintenance and limited flood reduction benefits

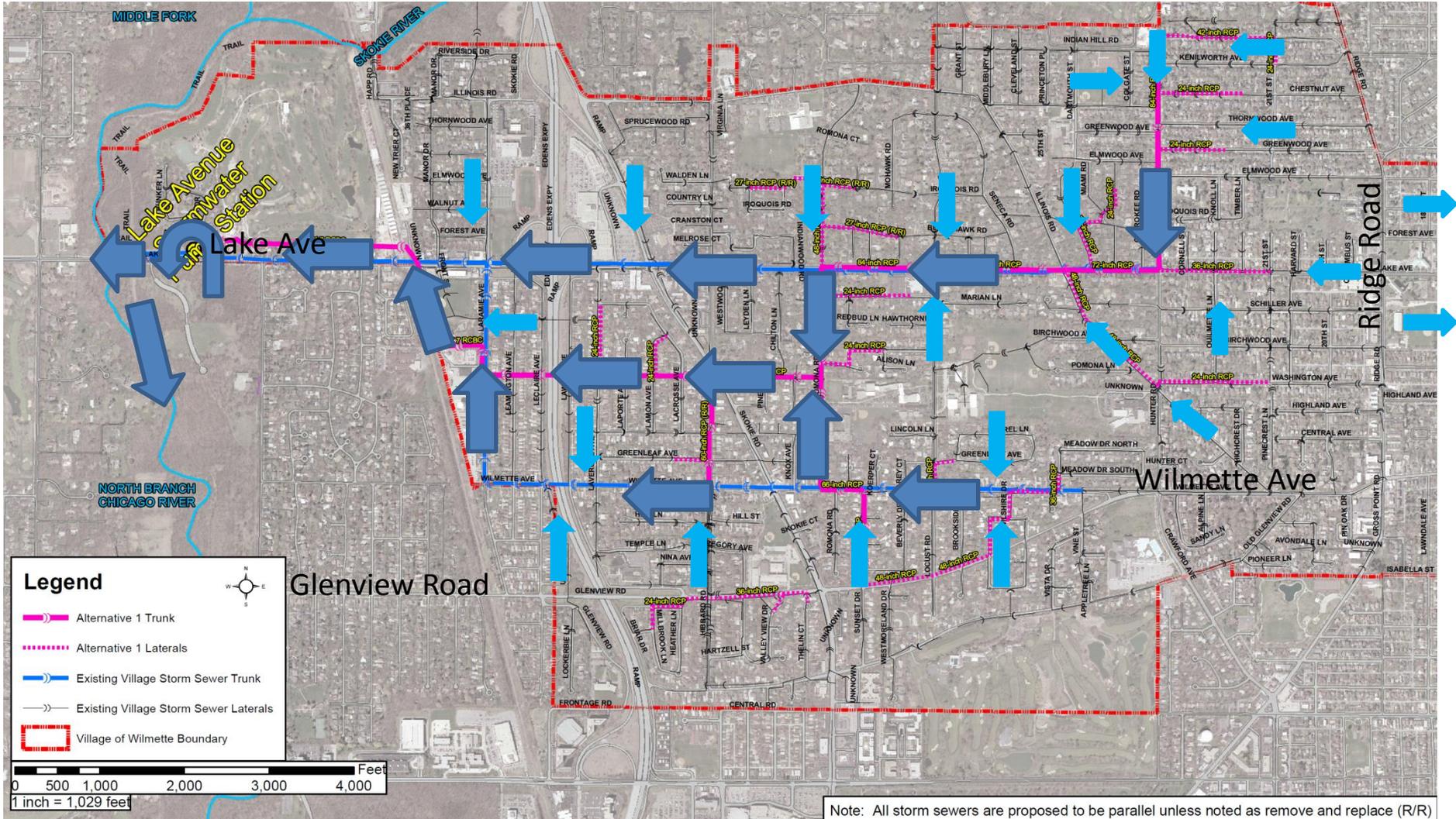
- Long Term Capital Projects

- Alternative 1 – Relief Sewer System
- Alternative 2 – Centralized Storage at Community Playfield
- Alternative 3 – Neighborhood Stormwater Storage

- Project Benefits

- 10-year flood elevation at or below street level at all locations (except Alternative 3)
- Reduction in street flooding depth and duration for all storm events
- Reduction in structures impacted by flooding

- Relief Storm Sewer System



- Add relief storm sewers to match pump station capacity
- Large diameter pipes & long distance
 - 21,000 linear feet of trunk storm sewer
 - 21,000 linear feet of lateral storm sewer
- Addition of 6th Variable Frequency Drive (VFD) pump (backup) at pump station
 - Redundancy and efficiency purposes only

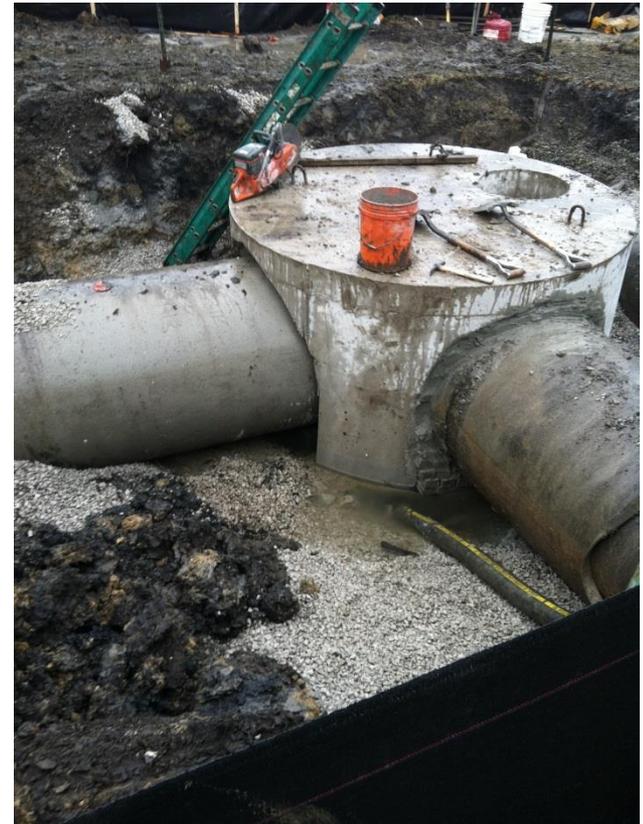
- Project Costs

- Engineer's Estimate = \$75 Million

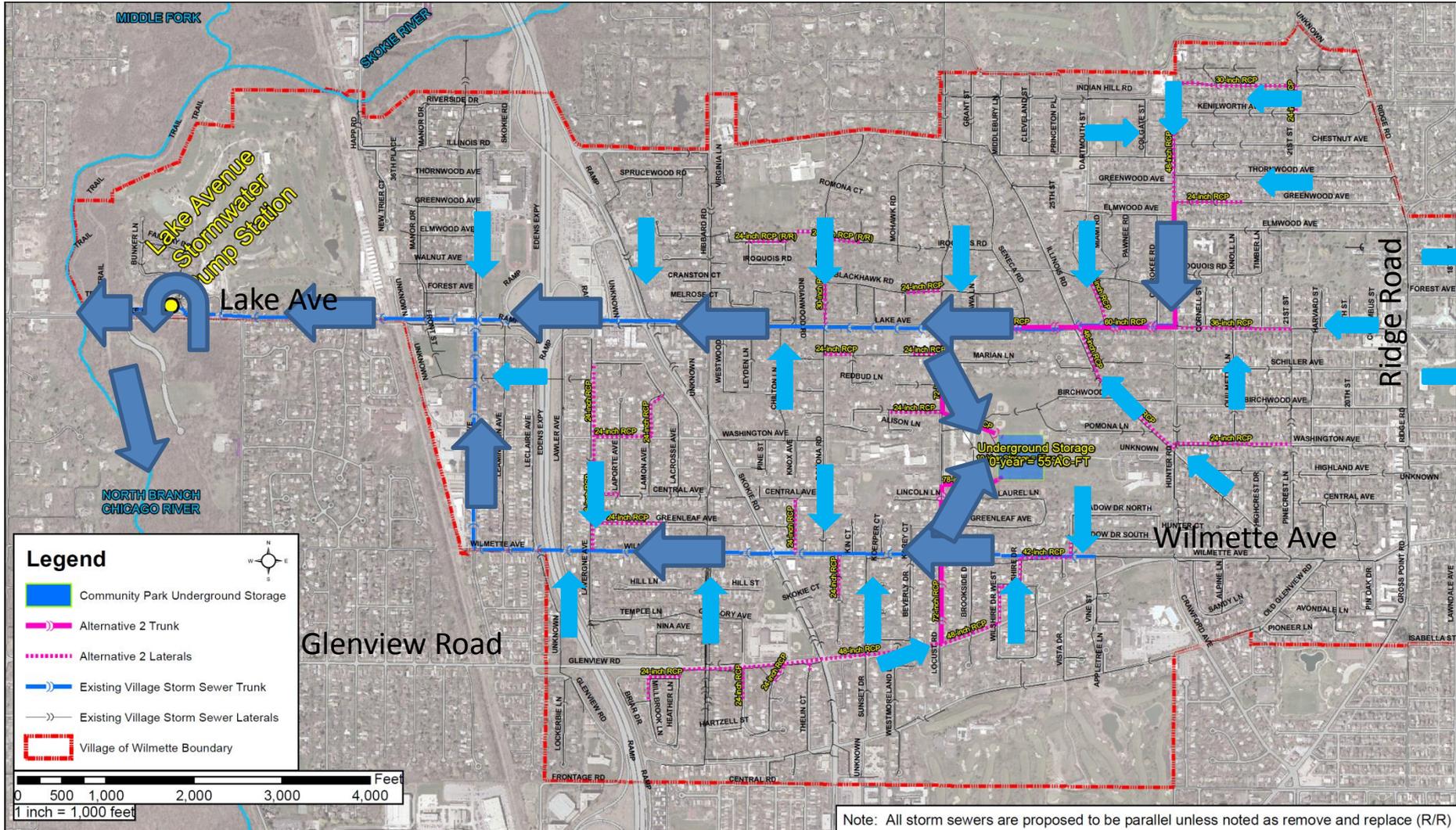
- Contingency = 20%
 - Engineering costs included
 - 2014 Dollars

- Other Costs

- Long project duration
 - Significant traffic disruption
 - Utility conflicts
 - Golf course disruption



- Centralized Storage at Community Playground



- Centralized Storage at Community Playfield
 - Storing water in system to reduce flowrates
 - 55 acre-ft (18 million gallons) of underground stormwater storage
 - Lift station required to dewater storage after storm
 - 6 acre footprint
 - 10,000 linear feet of trunk line upgrades
 - 25,000 linear feet of lateral sewer upgrades
 - Addition of 6th Variable Frequency Drive (VFD) pump (backup) at pump station
 - Redundancy and efficiency purposes only

- Project Costs

- Engineer's Estimate = \$70 Million

- 2014 dollars
 - Engineering costs included
 - 20% contingency

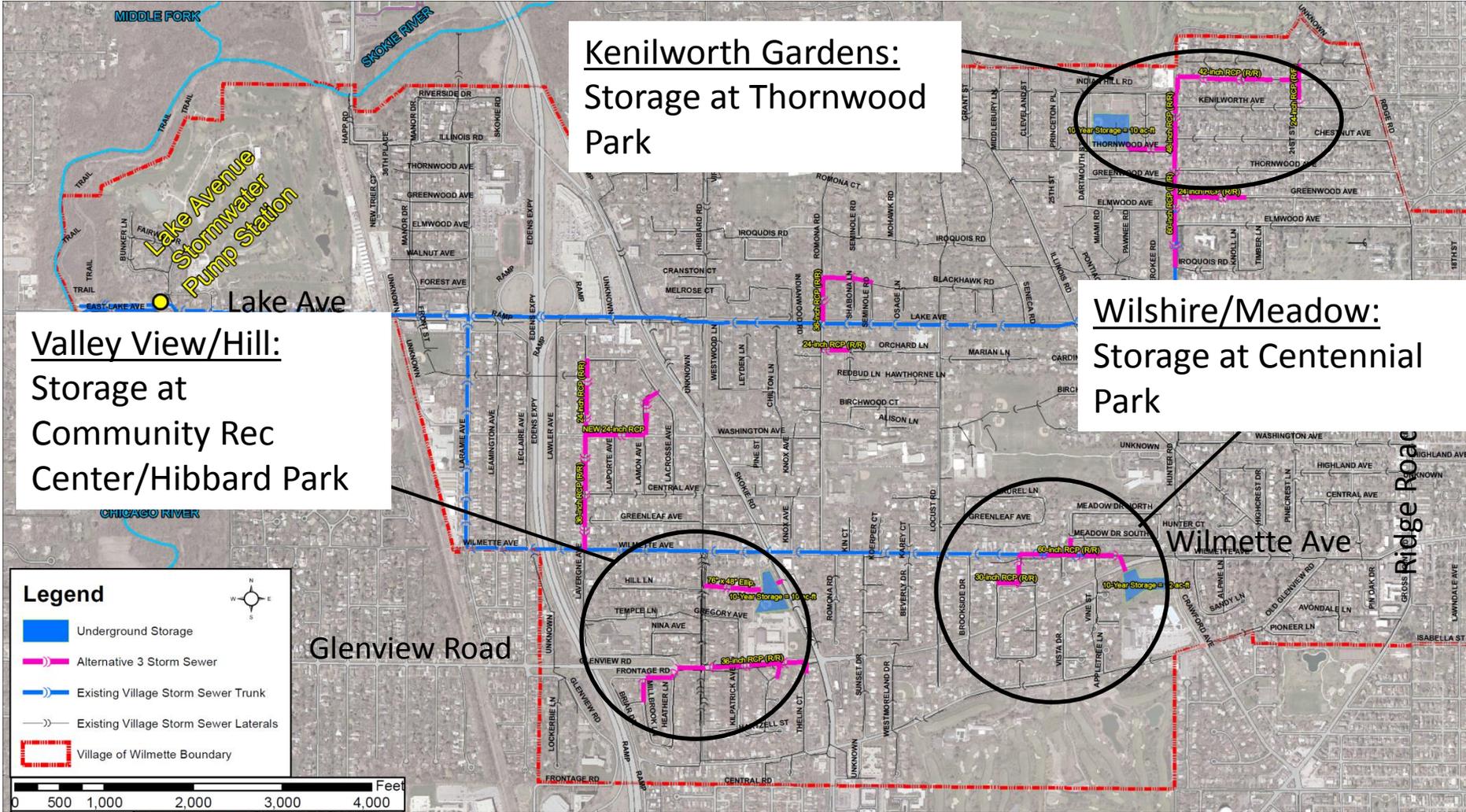
- Other Costs

- Long project duration
 - Significant park disruption
 - Roadway disruption
 - Utility conflicts



Photo of Underground Storage Installation in Northbrook, IL

- Neighborhood Stormwater Storage



- Smaller underground storage at 3 parks
- Total storage volume = 32 acre-ft
 - Thornwood Park: 10 acre-ft
 - Centennial Park: 12 acre-ft
 - Community Rec Center: 10 acre-ft
- 2,700 linear feet of trunk storm sewers
- 11,500 linear feet of lateral storm sewers
- Project can be more easily phased
- Does not provide 10-year level of protection to all residents
- Addition of 6th Variable Frequency Drive (VFD) pump (backup) at pump station
 - Redundancy and efficiency purposes only

• Project Costs

- Engineer's Estimate = \$44 Million

- Contingency = 20%
- Engineering costs included
- 2014 Dollars

- Other Costs

- Multiple & significant park disruption
- Roadway disruption
- Utility conflicts
- Does not provide significant flood reduction to all locations





Capital Projects - Benefits and Costs

			Alternative 1	Alternative 2	Alternative 3	
		Design Storm	Existing	Relief Storm Sewer System	Centralized Stormwater Storage at Community Playfield	Neighborhood Stormwater Storage
Benefits	Number of structures impacted by flooding (% reduction)					
	10-year	120	0 (100%)	0 (100%)	50 (58%)	
	25-year	280	60 (79%)	90 (67%)	160 (43%)	
	50-year	480	190 (60%)	240 (50%)	320 (33%)	
	100-year	700	370 (47%)	490 (30%)	570 (19%)	
	Street Flooding Depth in feet (Minimum - Maximum)					
	10-year	0.3 - 2.2	0.0	0.0	0.0 - 2.2	
	25-year	0.5 - 2.7	0.0 - 1.7	0.1 - 1.8	0.3 - 2.6	
	50-year	0.6 - 3.0	0.0 - 2.2	0.5 - 2.3	0.5 - 2.9	
	100-year	0.6 - 3.3	0.0 - 2.6	0.6 - 2.7	0.6 - 3.2	
Costs	Total Cost	--	\$75 Million	\$70 million	\$44 million	
	Cost per Structure Protected for 100-year event	--	\$227,273	\$333,333	338,462	

- Reduction in:
 - Frequency and depth of flooding for all impacted structures
 - Infiltration into sanitary sewer system
 - Inflow into sanitary system
 - Basement seepage
 - Yard flooding
- Improved access during storm events
- Increased pump station flexibility
- Increased property values

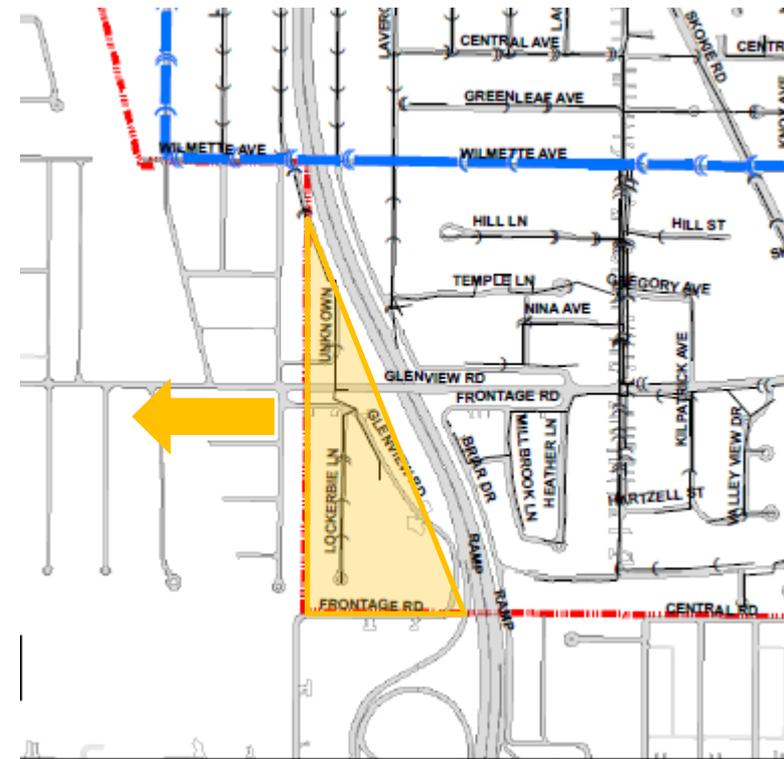


End of Summary

The Following Slides Include the
New Analysis

- **Glenview Connection**
 - Connection to Glenview storm sewer system
 - Reduce water flowing to Wilmette storm sewer system
 - Provide better drainage for 25 acres in SW corner of Village
 - Potential for “quick win”
- **Revisions to Alternatives 1-3**
 - New goal of minor ponding in Right of Way for 10-year event
 - Potential for cost savings as compared to original alternatives
 - Alternatives 1A, 2A, 3A
- **Alternative 2 Revisions**
 - Above ground storage in Community Park
 - Goal of no street flooding for the 10-year event
 - Potential for cost savings as compare to original Alternative 2
 - Alternatives 2.1 and 2.2

- Stand-alone short term project
- Inter-Jurisdictional coordination
- Glenview Drainage Projects
 - Phase 1 East of Harms
 - Pump Station
 - Backflow preventers
 - Phase 2 East of Harms
 - Storm sewer improvements
 - Designed for 10-year level of service
 - Designed to include 25 acres from Wilmette

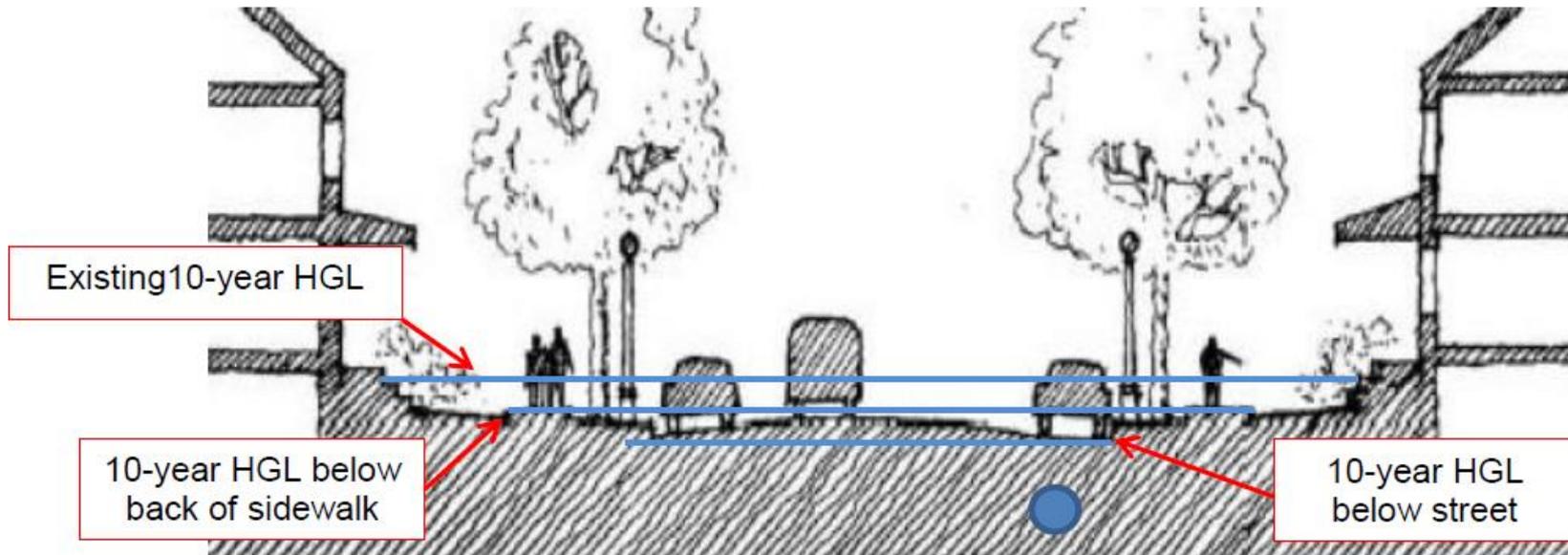


- Proposed Wilmette Connection
 - Limited by existing and proposed Glenview system
 - Pump Station
 - Storm sewer system
 - 10-Year level of service
- Existing Wilmette System
 - 2-Year level of service
- Proposed Wilmette Improvements
 - New 30-inch storm sewer on Lockerbie Lane
 - New 36-inch storm sewer on Glenview Road
 - Backflow preventers



- Project Costs
 - Engineer's Estimate = \$900,500
 - 2015 dollars
 - Engineering costs included
 - 20% contingency
 - Other Costs
 - Utility conflicts
- Project Benefits
 - 10-Year level of service for local drainage system
 - 5 structures with increased protection from 10-year to 50-year level of protection
 - Negligible benefit to remainder of separate storm sewer system

- Revisions to Alternatives 1-3
 - New goal of minor ponding in Village Right of Way (ROW) for 10-year event to back of sidewalk or 6-8 inches in depth
 - Significant reduction in flood depths as compared to existing conditions



- Project Benefits

- Reduce 10-year street flooding to back of sidewalk (approximately 6-8 inches) in all areas (except Alternative 3A)
- Reduction in street flooding duration and depth
- Reduction in structures impacted by flooding

- Unquantified Benefits

- Reduction in:
 - Frequency and depth of flooding for all impacted structures
 - Infiltration into sanitary sewer system
 - Inflow into sanitary system
 - Basement seepage
 - Yard flooding
- Improved access during storm events
- Increased pump station flexibility
- Increased property values

- Project Components and Cost
 - Relief storm sewer system
 - Similar layout as Alternative 1
 - Proposed storm sewer size decreased by approximately 6 inches in diameter
 - Cost reduced from \$75M to \$68M vs Alternative 1
 - Similar utility conflicts and traffic disruption

- Project Benefits
 - Number of structures impacted by flooding

Return Interval Storm Event	Number of Structures Impacted*			% Reduction	
	Existing Conditions	Alternative 1	Alternative 1A	Alt 1	Alt 1A
10-year	120	0	0	100	100
25-year	280	60	95	79	66
50-year	480	190	235	60	51
100-year	700	370	430	47	38

*Structure impacted when flood level is within 1 foot of highest lot elevation

- Project Components and Cost
 - Underground stormwater storage at Community Park
 - Similar layout as Alternative 2
 - Proposed storm sewer size decreased by approximately 6 inches in diameter
 - Underground storage decreased by 10% to 50 acre-ft
 - Cost reduced from \$70M to \$63M vs Alternative 2
 - Similar park disruptions as Alternative 2

- Project Benefits
 - Number of structures impacted by flooding

Return Interval Storm Event	Number of Structures Impacted*			% Reduction	
	Existing Conditions	Alternative 2	Alternative 2A	Alt 2	Alt 2A
10-year	120	0	0	100	100
25-year	280	90	115	67	60
50-year	480	240	290	50	40
100-year	700	490	540	30	23

*Structure impacted when flood level is within 1 foot of highest lot elevation

- Project Components and Cost
 - Similar layout as Alternative 3
 - Proposed storage at each park decreases by 10%
 - Thornwood Park = 8.2 acre-ft
 - Community Rec Center/Hibbard Park = 8.3 acre-ft
 - Centennial Park = 10.8 acre-ft
 - Proposed storm sewer size decreased by approximately 6 inches in diameter
 - Cost reduced from \$44.0M to \$39.1M vs Alternative 3

- Project Benefits
 - Number of structures impacted by flooding

Return Interval Storm Event	Number of Structures Impacted*			% Reduction	
	Existing Conditions	Alternative 3	Alternative 3A	Alt 3	Alt 3A
10-year	120	50	50	58	58
25-year	280	160	170	43	39
50-year	480	320	350	33	27
100-year	700	570	605	19	14

*Structure impacted when flood level is within 1 foot of highest lot elevation

- Revisions to Alternative 2
 - Goal of reducing 10-year flood elevation below street level
 - Use above ground storage in lieu of underground storage at Community Park to reduce costs



Underground Stormwater Storage

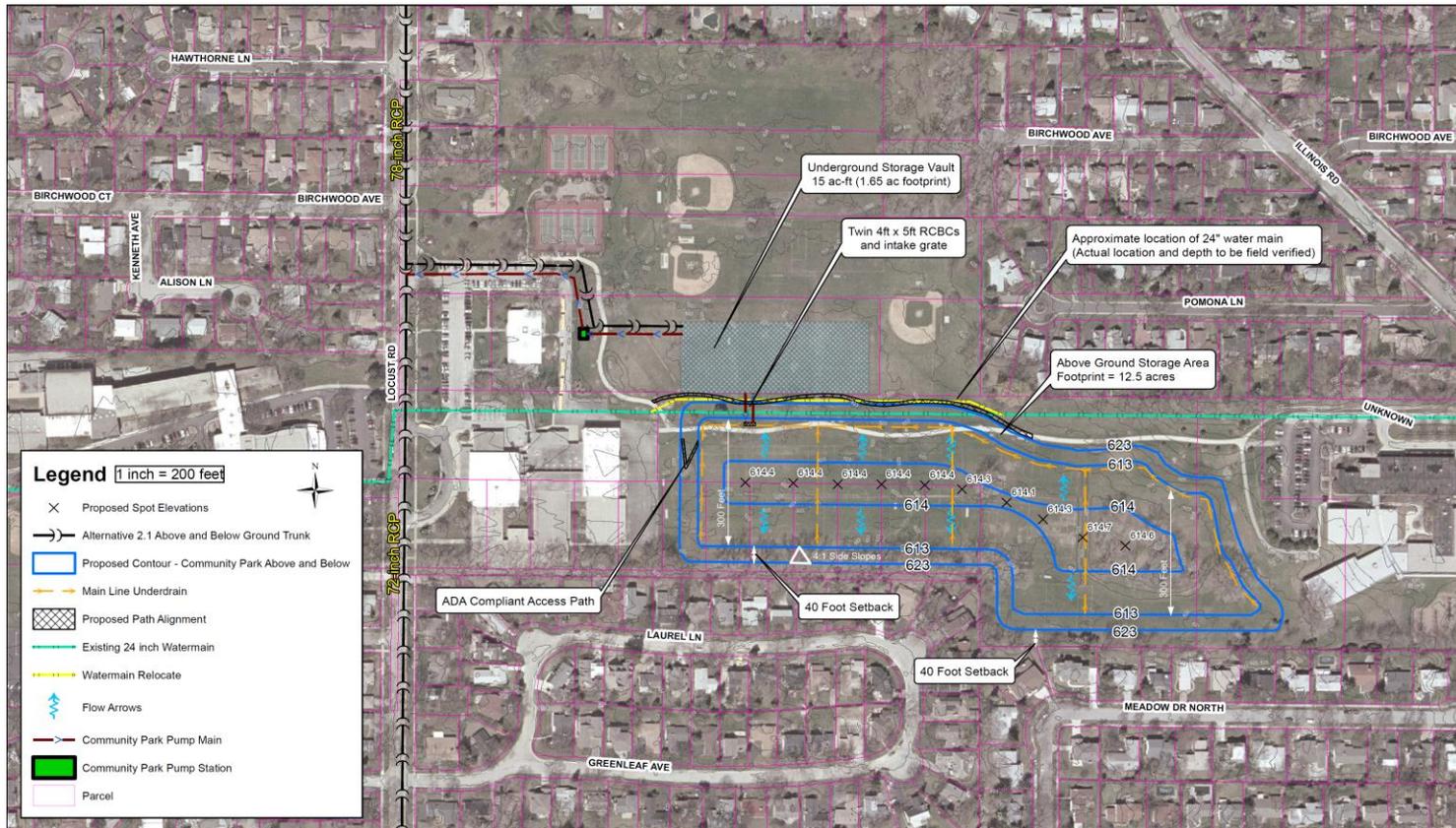


Above Ground Stormwater Storage

- **Project Components**
 - Sloped bottom with underdrains for enhanced drainage
 - Adequate bottom dimensions for existing soccer fields
 - Potential to add new park amenities
 - Designed to fill only when storm sewer systems near capacity
 - Water first enters at 6-month return interval storm event
 - 1.3 inches of rain over 3 hours
 - 40 foot setback along property lines for tree preservation
 - Alternative 2.1 will require pump station but smaller storm sewers under Locust Road
 - Will likely require relocation of existing 24-inch watermain and path within park

Alternative 2.1

- Primarily above ground storage with dry bottom for ballfields
- Total storage for 10-year event = 50 acre-ft at elevation 618 ft
- Depth from existing ground to bottom = 9-10 feet
- Storm sewer layout similar layout as Alternative 2



• Project Benefits

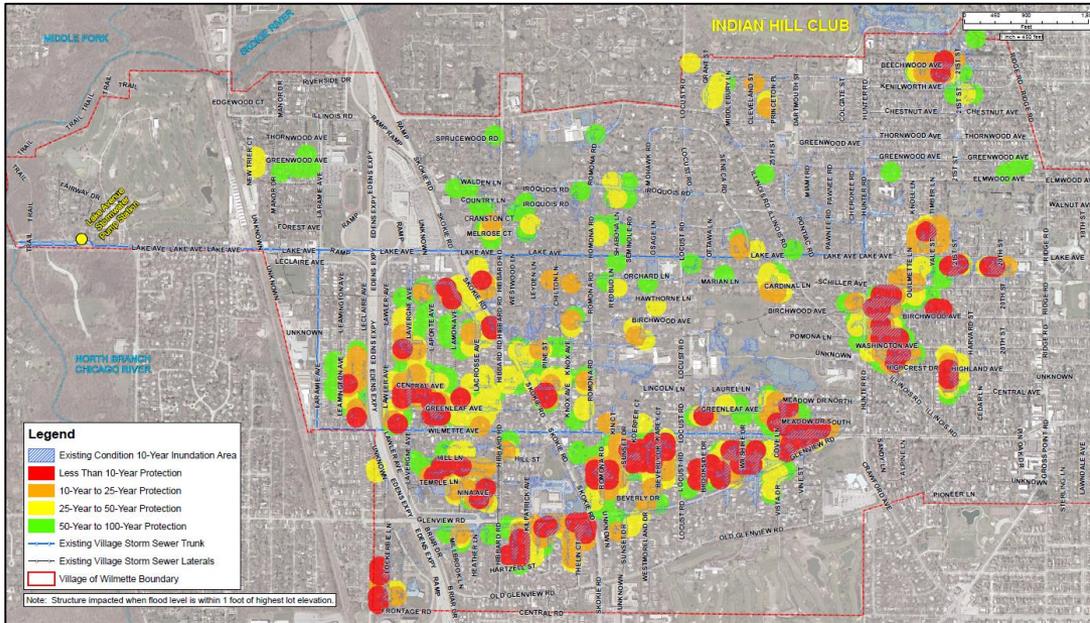
- 10-year flood elevation at or below street elevation at locations adjacent to storage
- Increased pump station flexibility
- 100-year storm event street flooding depth reductions:

Location	Existing Flood Depth (ft)	Alternative 2 Proposed Flood Depth (ft)	Alternative 2.1 Proposed Flood Depth (ft)	Alternative 2.2 Proposed Flood Depth (ft)
Average All Study Areas	2.0	1.8	1.5	1.6
Valley View Lane	1.4	1.3	1.0	1.2
Beechwood Ave.	3.0	2.8	2.6	2.6
Wilshire Dr.	2.4	2.3	1.7	2.1

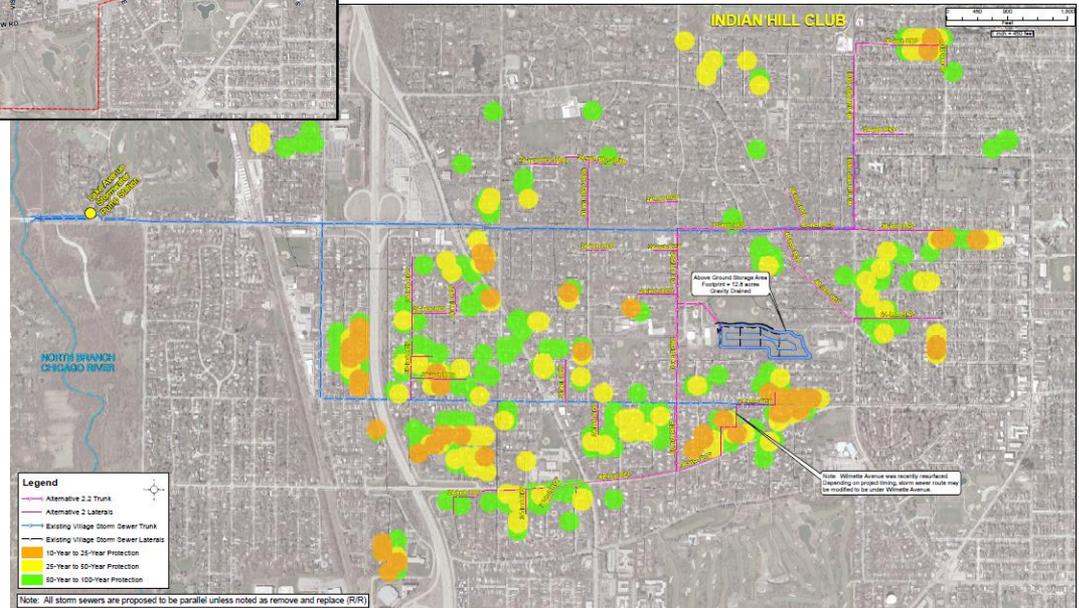
• Project Benefits

- Reduction in duration of street flooding
- Reduction in inflow/infiltration to sanitary system
- Improved access during storm events
- Reduction in structures impacted for 100-yr event:

Return Interval Storm Event	Number of Structures Impacted*				% Reduction		
	Existing Conditions	Alternative 2	Alternative 2.1	Alternative 2.2	Alt. 2	Alt 2.1	Alt 2.2
10-year	120	0	0	0	100	100	100
25-year	280	90	60	60	67	79	79
50-year	480	240	180	200	50	63	58
100-year	700	490	415	440	30	41	37



Existing Conditions— Residential Structures Impacted



Alternative 2.2 – Residential Structures Impacted

- Similar Projects



Pottawattomi Park – Tinley Park



Washington Park – Downers Grove

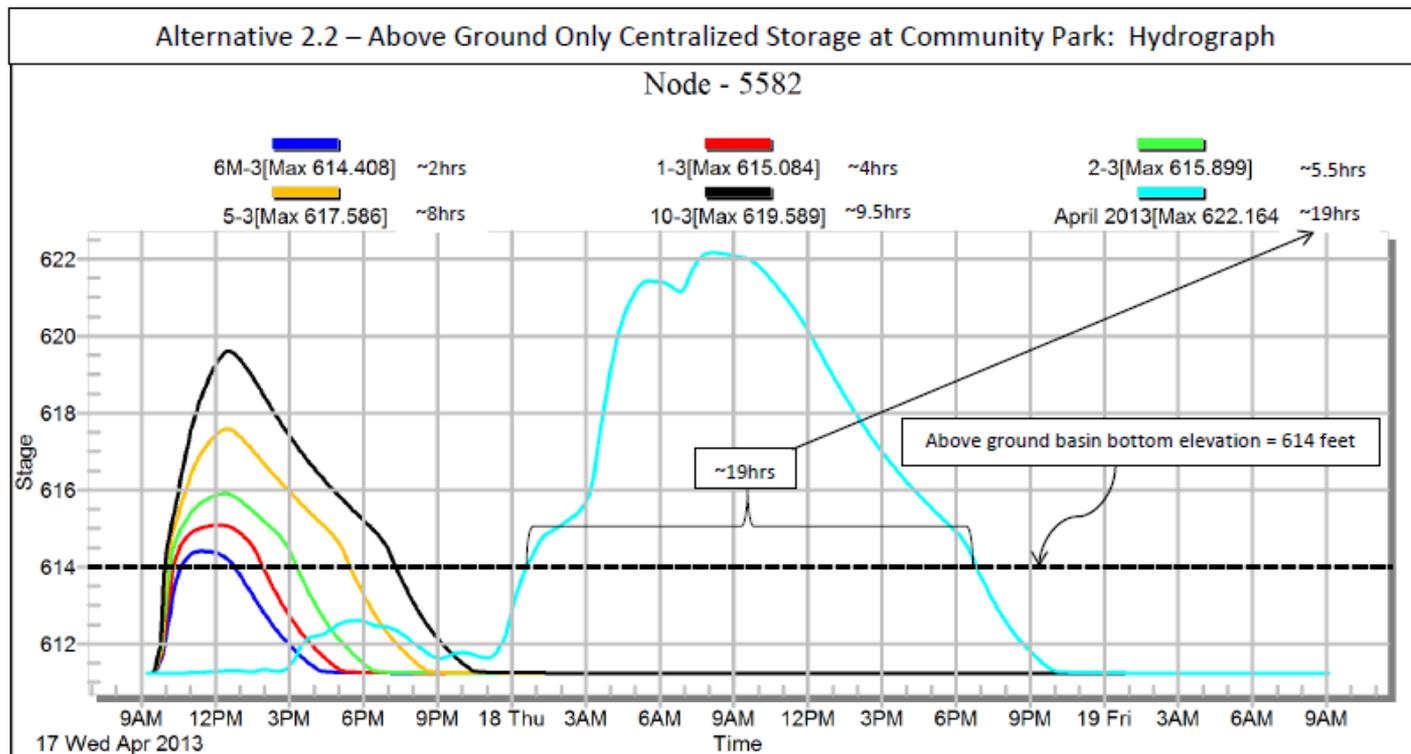


Parkside Park – Roselle

• System Performance

Stage Hydrograph - Length of time stormwater is in the storage basin (hours).

Graph depicts the elevation of water (stage) on the y-axis versus time on the x-axis within the Community Playfield Storage Basin.



Note 1: Above ground only storage alternative is gravity drained.

Note 2: 6M-3 refers to the 6-month, 3-hour (1.3 inches over 3 hours) design storm event, 1-3 refers to the 1-year, 3-hour design storm event, 2-3 refers to 2-year, 3-hour storm event, etc.

- **Project Costs**
 - **Alternative 2.1**
 - Cost reduced from \$70M to \$59.5M vs Alternative 2
 - **Alternative 2.2**
 - Cost reduced from \$70M to \$53.0M vs Alternative 2
- **Other Costs**
 - Significant park disruption
 - Tree removal within footprint
 - Traffic disruption
 - Utility conflicts

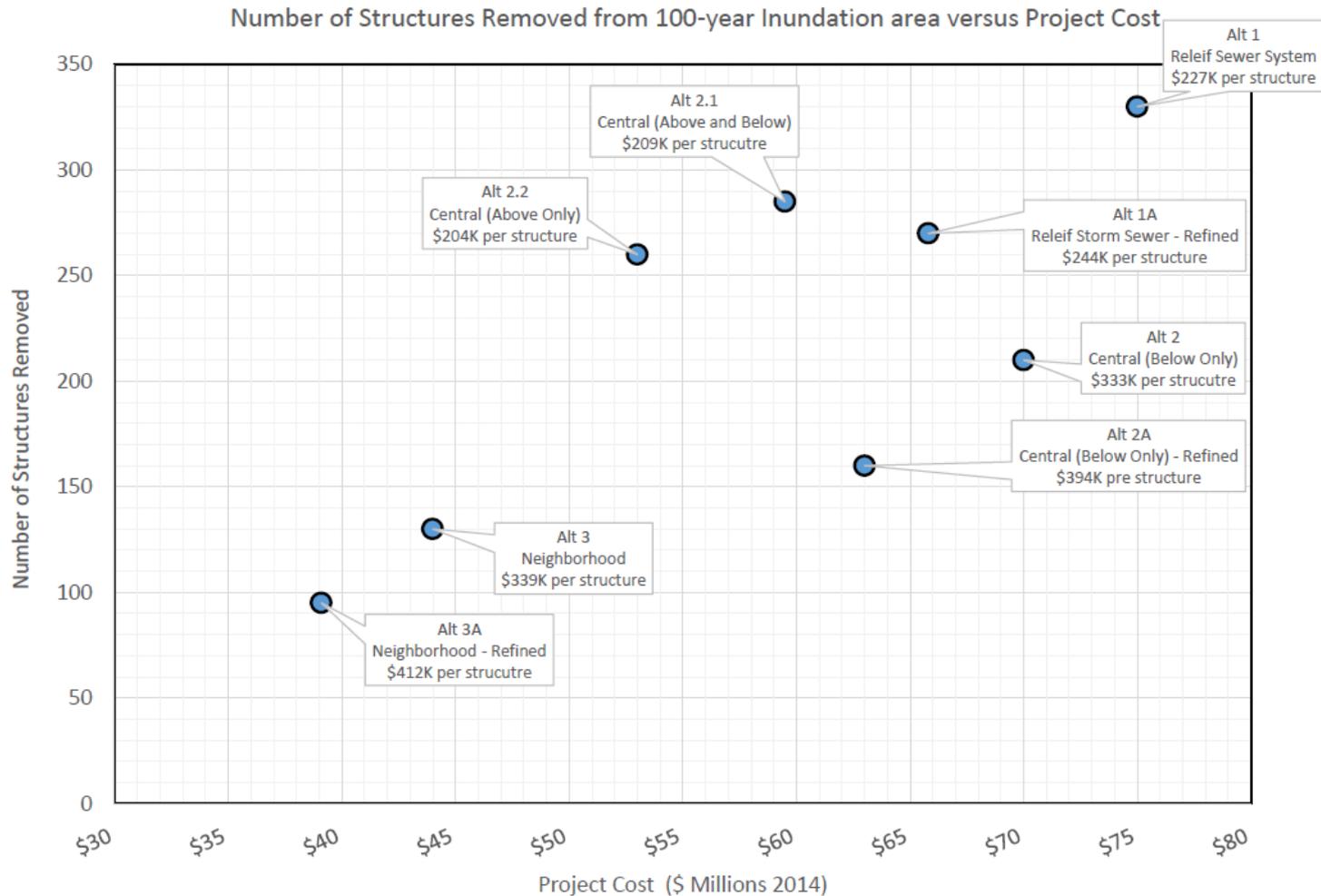


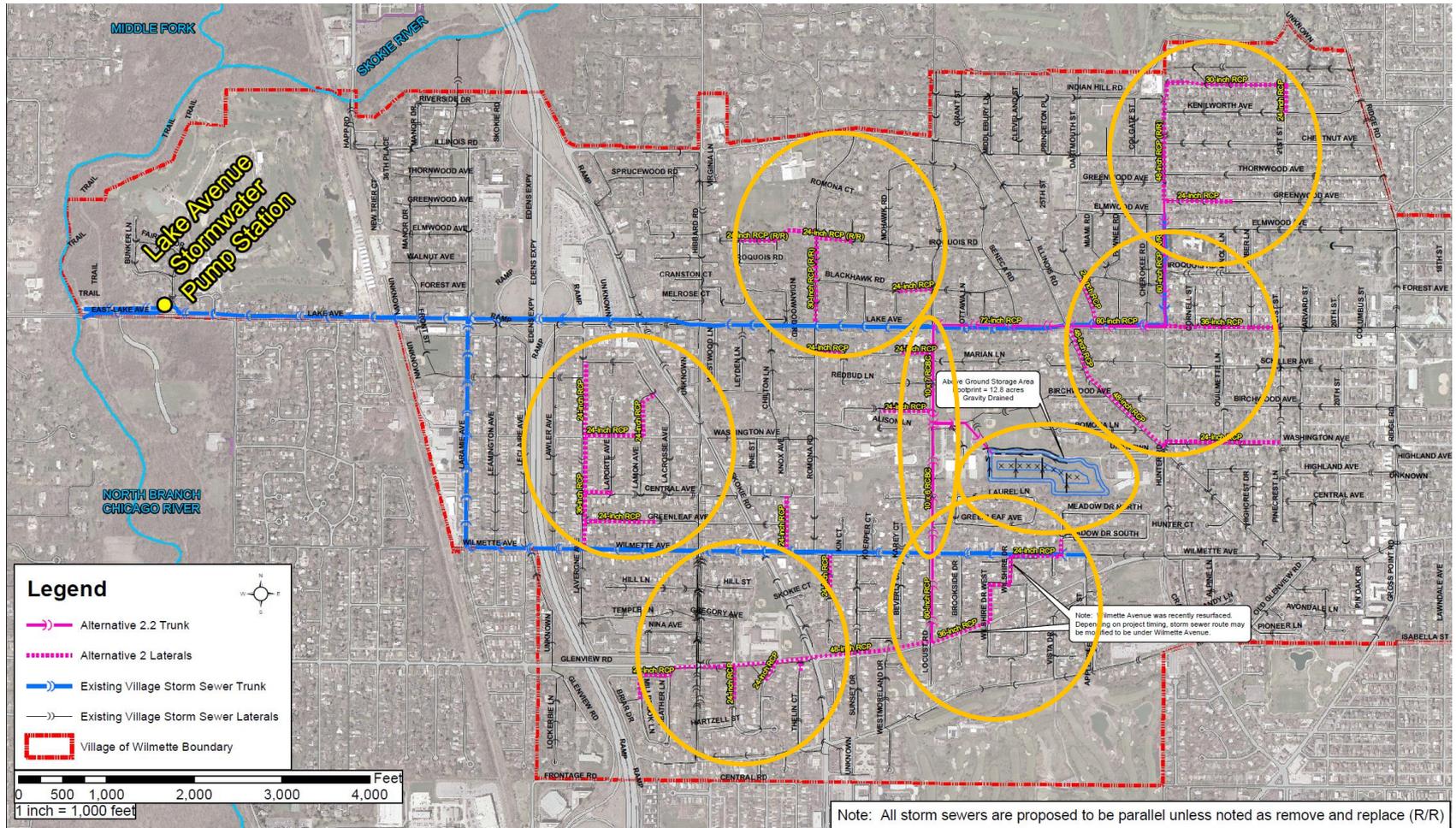
Capital Projects - Benefits and Costs

Design Storm	Existing Conditions	Alternative 1	Alternative 1A	Alternative 2	Alternative 2A	Alternative 2.1	Alternative 2.2	Alternative 3	Alternative 3A	
		Relief Storm Sewer System	Relief Storm Sewer System	Underground Stormwater Storage at Community Playfield	Underground Stormwater Storage at Community Playfield	Combination Stormwater Storage at Community Playfield	Above Ground Stormwater Storage at Community Playfield	Neighborhood Stormwater Storage	Neighborhood Stormwater Storage	
Number of structures impacted by flooding (% reduction)										
10-year	120	0 (100%)	0 (100%)	0 (100%)	0 (100%)	0 (100%)	0 (100%)	50 (58%)	50 (58%)	
25-year	280	60 (79%)	95 (66%)	90 (67%)	115 (60%)	60 (79%)	60 (79%)	160 (43%)	170 (39%)	
50-year	480	190 (60%)	235 (51%)	240 (50%)	290 (40%)	180 (63%)	200 (58%)	320 (33%)	350 (27%)	
100-year	700	370 (47%)	430 (38%)	490 (30%)	540 (23%)	415 (41%)	440 (37%)	570 (19%)	605 (14%)	
Street Flooding Depth in feet (Minimum - Maximum)										
10-year	0.3 - 2.2	0.0	0.0 - 0.8	0.0	0.0 - 0.8	0.0	0.0	0.0 - 2.2	0.0 - 2.2	
25-year	0.5 - 2.7	0.0 - 1.7	0.0 - 1.9	0.1 - 1.8	0.2 - 1.8	0.0 - 1.7	0.0 - 1.6	0.3 - 2.6	0.3 - 2.6	
50-year	0.6 - 3.0	0.0 - 2.2	0.0 - 2.3	0.5 - 2.3	0.5 - 2.3	0.3 - 2.2	0.0 - 2.2	0.5 - 2.9	0.5 - 2.9	
100-year	0.6 - 3.3	0.0 - 2.6	0.0 - 2.7	0.6 - 2.7	0.6 - 2.7	0.6 - 2.6	0.6 - 2.6	0.6 - 3.2	0.6 - 3.2	
Costs	Total Cost	--	\$75 Million	\$65.8 million	\$70 million	\$63 million	\$59.5 million	\$53.0 million	\$44 million	\$39.1 million
	Cost per Structure Protected for 100-year event	--	\$227,273	\$243,700	\$333,333	\$393,750	\$208,772	\$203,846	\$338,462	\$411,579



Capital Projects - Benefits and Costs





Phase 1 – Flood Storage (Years 1-2):

\$10.6 million*

Phase 1a – Locust Road Storm Sewers (Years 2-4):

\$7.0 million*

Phase 2 – Storm Sewers (Years 5 and beyond):

\$34.6 million*

Total (with Locust Road Savings)

\$52.2 million*

*2014 Dollars



End of Presentation

Questions

