Village of Forest Park

July 27, 2015

Sewer Separation Evaluation




Presentation Overview

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- **Scale of Flooding Problem**
- **Forest Park Sewer System Background**
- **MWRD – TARP Information**
- **Summary of Computer Modeling**
- **Analysis of Three Study Areas**
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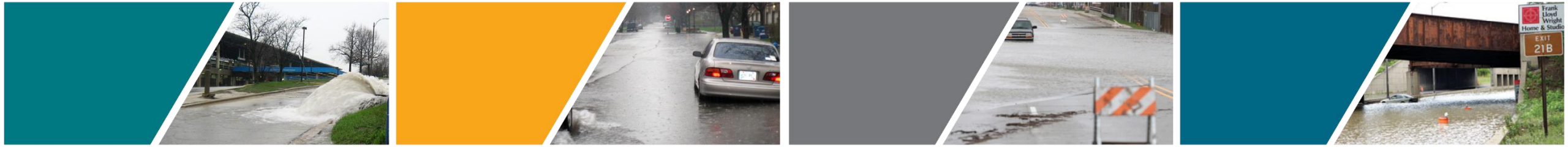
    - Define the Flood Reduction Benefits
    - July 2010 Storm Inundation Areas
  - MWRD System Benefits
  - Preliminary Cost Estimates
  - Permitting Issues
  - Potential Funding



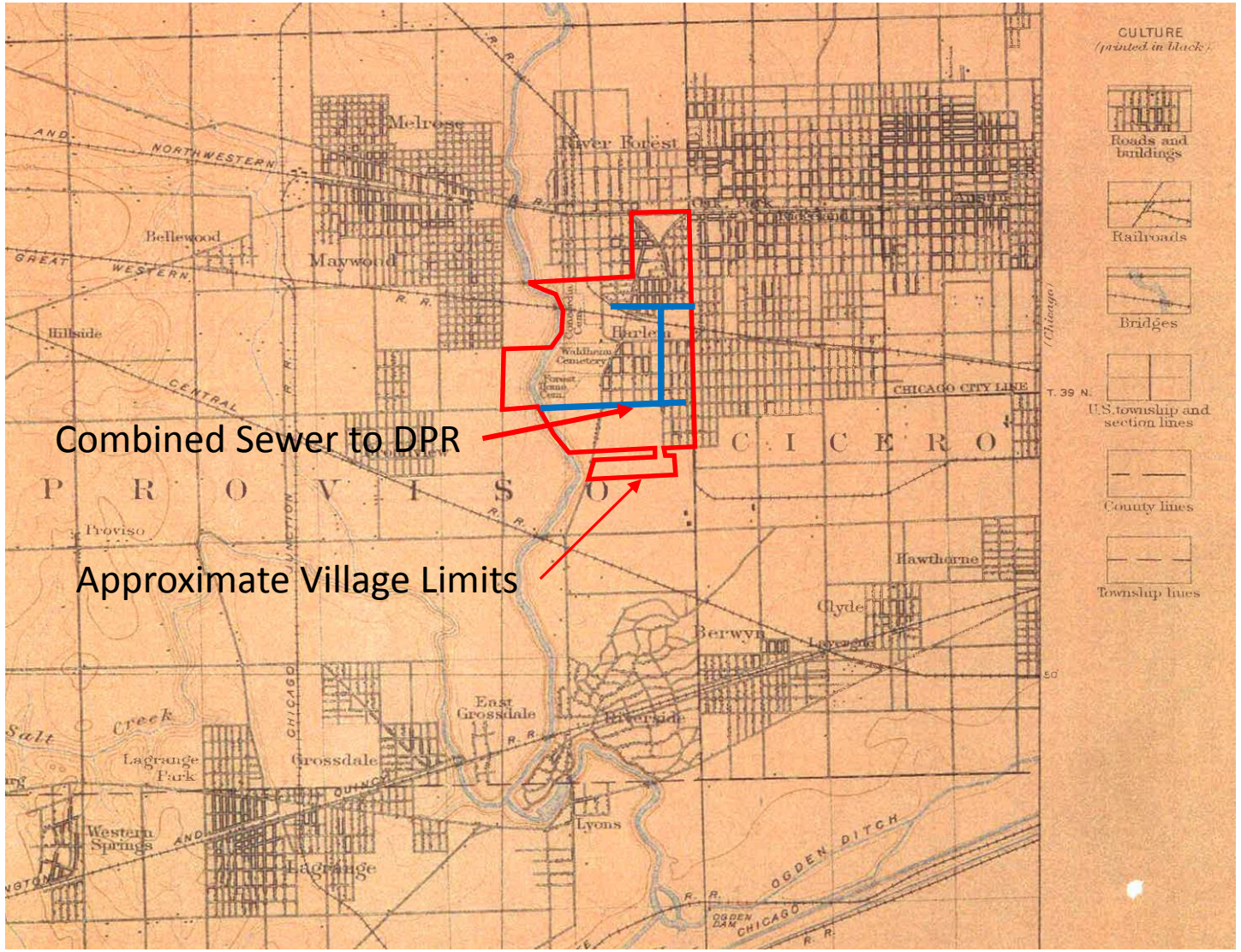
Study Background

The Village of Forest Park hired Christopher B. Burke Engineering, Ltd. **(CBBEL)** to study the existing sewer system and to investigate a potential sewer separation plan.

The objectives of the study were to:

- Evaluate the existing sewer system which consists of both relief storm sewers and combined sewers.
- Develop a separation plan that would:
  - Discharge stormwater directly to the Des Plaines River
  - Reduce the risk of future street flooding and sewer backups into homes
  - Reduce the frequency of combined sewer overflows (CSOs) to the Des Plaines River
  - Reduce the amount of stormwater treated at the MWRD sewage treatment plant

Village Sewer System

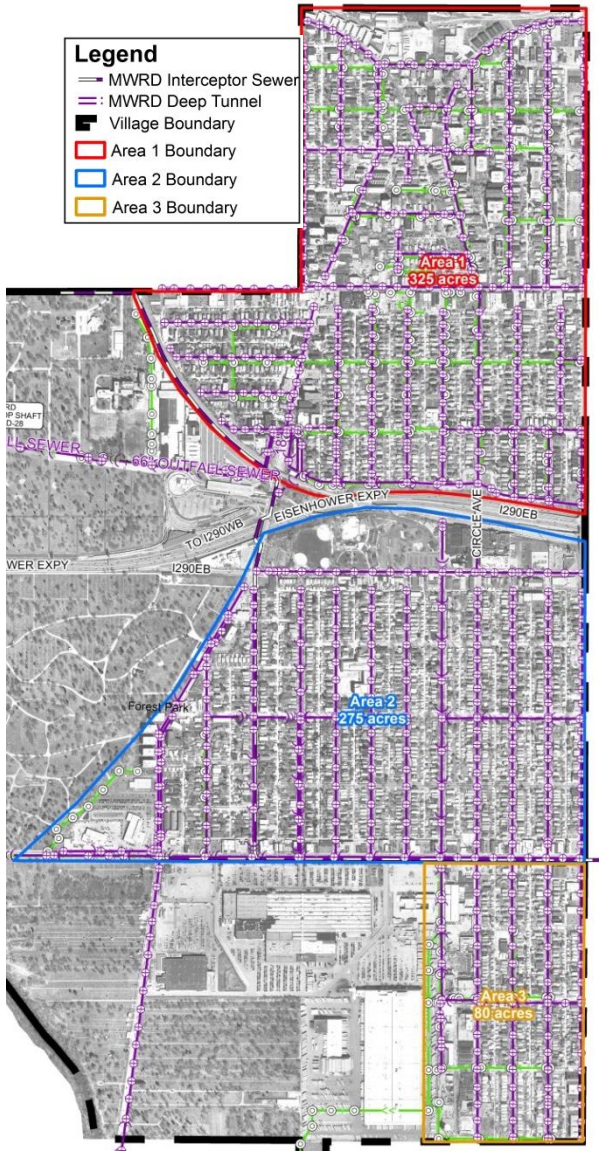


- Map is from 1902 and shows that Forest Park was already developed
- Forest Park was originally built with a combined sewer system, which is designed to convey both domestic sewage and stormwater runoff to the Des Plaines River
- Circa late 1930s, MWRD build interceptors to convey water to treatment plants

Overview of Village Sewer System

Village Area = 1,500 acres

- Area 1 (North Area) = 325 acres
  - Combined Sewer serves approximately 215 acres
  - Separate Storm Sewer serves approximately 110 acres
- Area 2 (Middle Area) = 275 acres
  - All Combined Sewer
- Area 3 (South Area) = 80 acres
  - Combined Sewer serves approximately 68 acres
  - Separate Storm Sewer serves approximately 12 acres
- Unstudied areas = 820 acres
  - Cemeteries, I-290 corridor, retail center along south side of Roosevelt Road



Village of Forest Park Drainage Problems

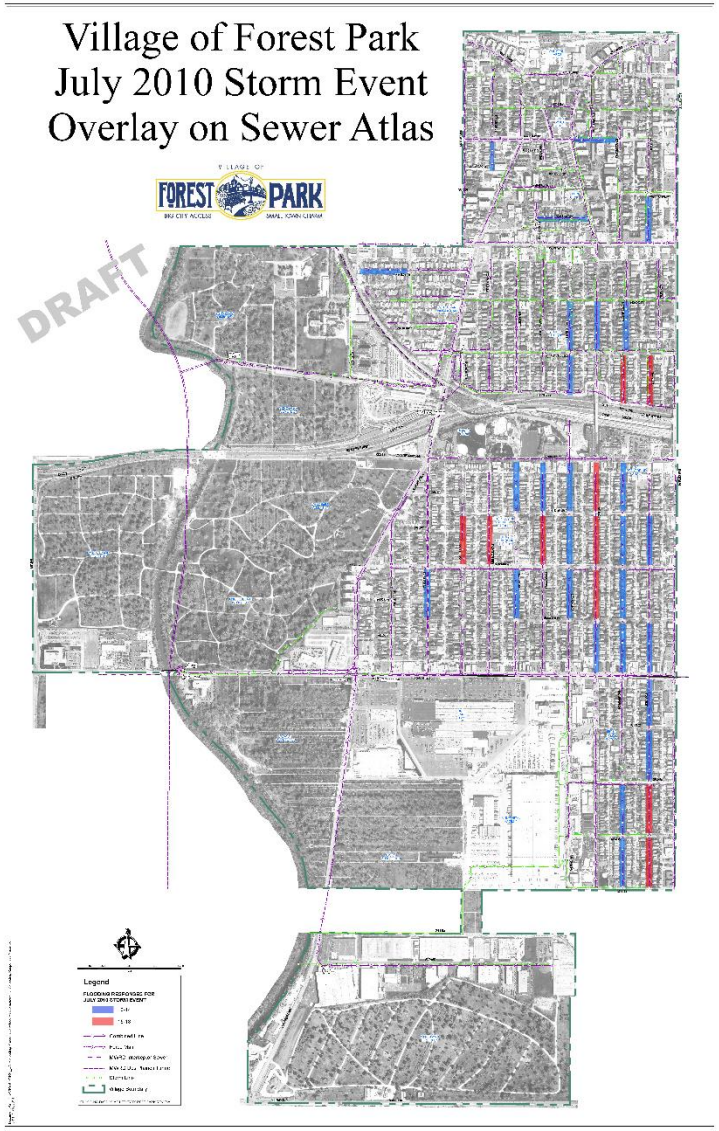
Sewer backup into basements

- Houses are hydraulically connected to combined sewer
- When combined sewers reach capacity, a combination of domestic sewage and stormwater can surcharge into basements

Street Flooding

- During severe rainfall events, combined sewers do not have sufficient capacity and stormwater surcharges into the street

Scale of Sewer Backup into Basements



Insurance Claims from July 2010 Storm Event

- Area 1 = 322
- Area 2 = 388
- Area 3 = 139

- Total = 849

Scale of Street Flooding

Area 1 – 100-year Storm Event Street Flooding

- Hannah Avenue from Adams Street to Jackson Boulevard (660 feet)
- Average Depth = 1.1 feet
- Maximum Depth = 1.3 feet
- Total Stormwater Volume in Street/Yards = 5.5 acre-feet

Equivalent Storage for 5.5 acre-feet

- Rain Barrels Required to Store 5.5 acre-feet = 32,590
- Length of Green Alley Required = 43,375 feet (8.2 miles)
- 12-inch Diameter Pipe Required = 305,000 feet (58 miles)

Scale of Street Flooding

Area 2 – 100-year Storm Event Street Flooding

- Thomas Avenue from Harrison Street to Lexington Street (660 feet)
- Average Depth = 1.0 feet
- Maximum Depth = 1.1 feet
- Total Stormwater Volume in Street/Yards = 5.2 acre-feet

Equivalent Storage for 5.2 acre-feet

- Rain Barrels Required to Store 5.2 acre-feet = 30,810
- Length of Green Alley Required = 42,900 feet (8.1 miles)
- 12-inch Diameter Pipe Required = 288,400 feet (55 miles)

Scale of Street Flooding

Area 3 – 100-year Storm Event Street Flooding

- Alley between Elgin Avenue and Marengo Avenue from Roosevelt Road to 13th Street (660 feet)
- Average Depth = 0.5 feet
- Maximum Depth = 1.0 feet
- Total Stormwater Volume in Street/Yards = 2.5 acre-feet

Equivalent Storage for 2.5 acre-feet

- Rain Barrels Required to Store 2.5 acre-feet = 14,815
- Length of Green Alley Required = 20,625 feet (3.9 miles)
- 12-inch Diameter Pipe Required = 138,650 feet (26 miles)

Flood Storage Volume

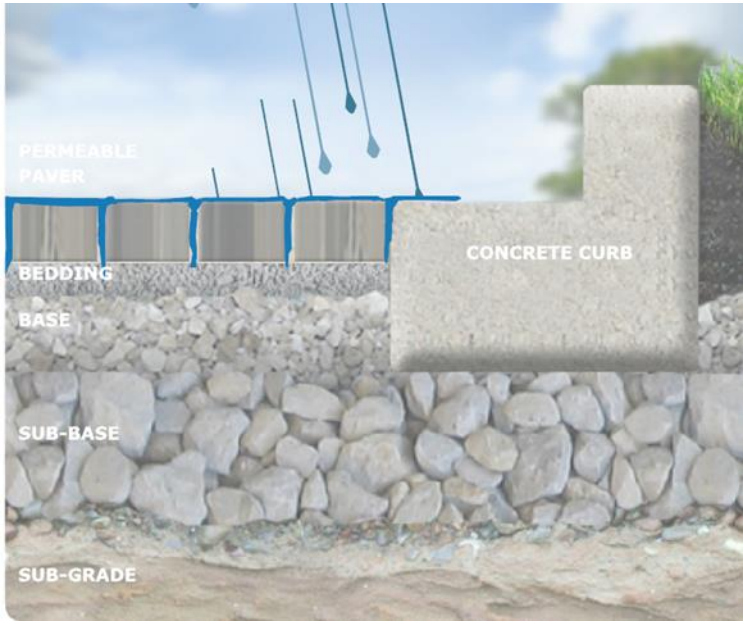
One acre-foot is the equivalent of an acre of land that is one foot deep.

The volume is approximately equivalent to:

- A flat football field with a depth of 1 foot
- 5,925 rain barrels (55 gallons each)
- 2,520 feet of roadway with pervious pavement (24' W * 2' D * 2,520' L)
- 55,462 linear feet of 12-inch diameter pipe
- 616,715 2-liter bottles
- McCook Reservoir and Deep Tunnel will have a capacity of 34,800 acre-feet after stage 2 is completed

Permeable Pavement

- The feasibility of providing storage volume using permeable pavement was analyzed.
- Using a typical street width (24 ft), the required length of street to provide one acre-foot of volume is 2,520 feet (assuming 2 ft of depth).

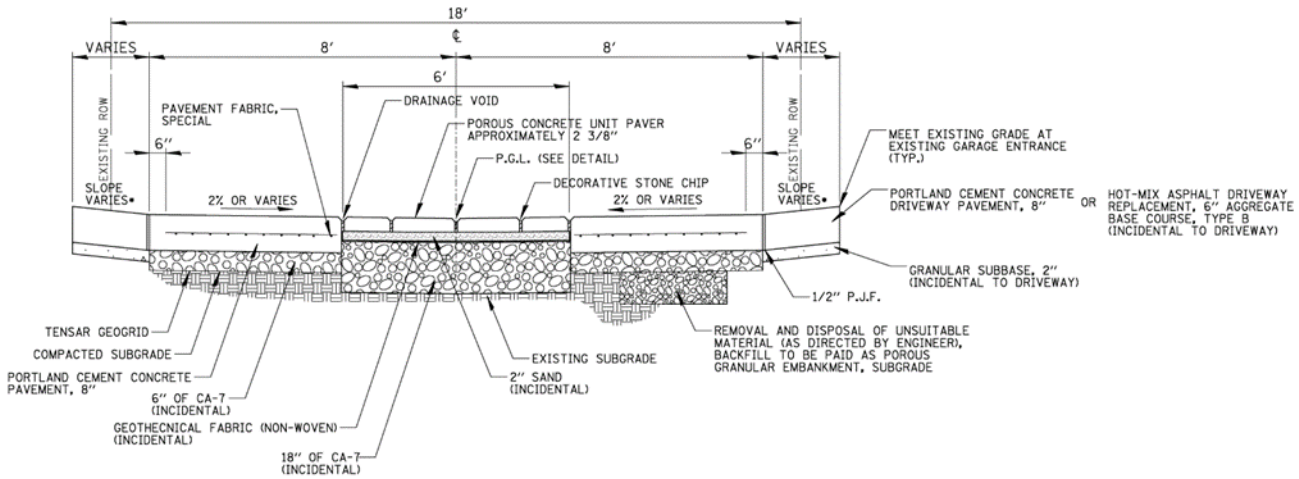


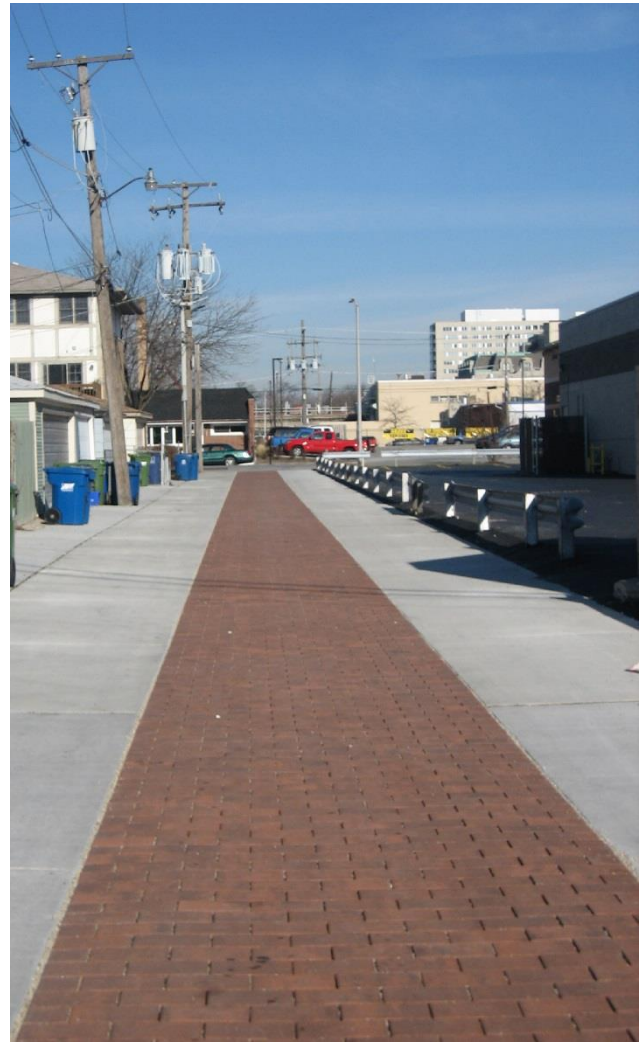
•The cost of providing one acre-foot of volume in this manner was estimated to be $1.64M, assuming the following:

- •Storage is based on 24” gravel depth (36% voids) and full utilization of that depth
- •Limited tree replacement and resetting of utilities (5 each per block)
- •Does not include replacement of existing sanitary, water, or storm utilities
- •20% contingency and 10% design/permitting

Permeable Pavement

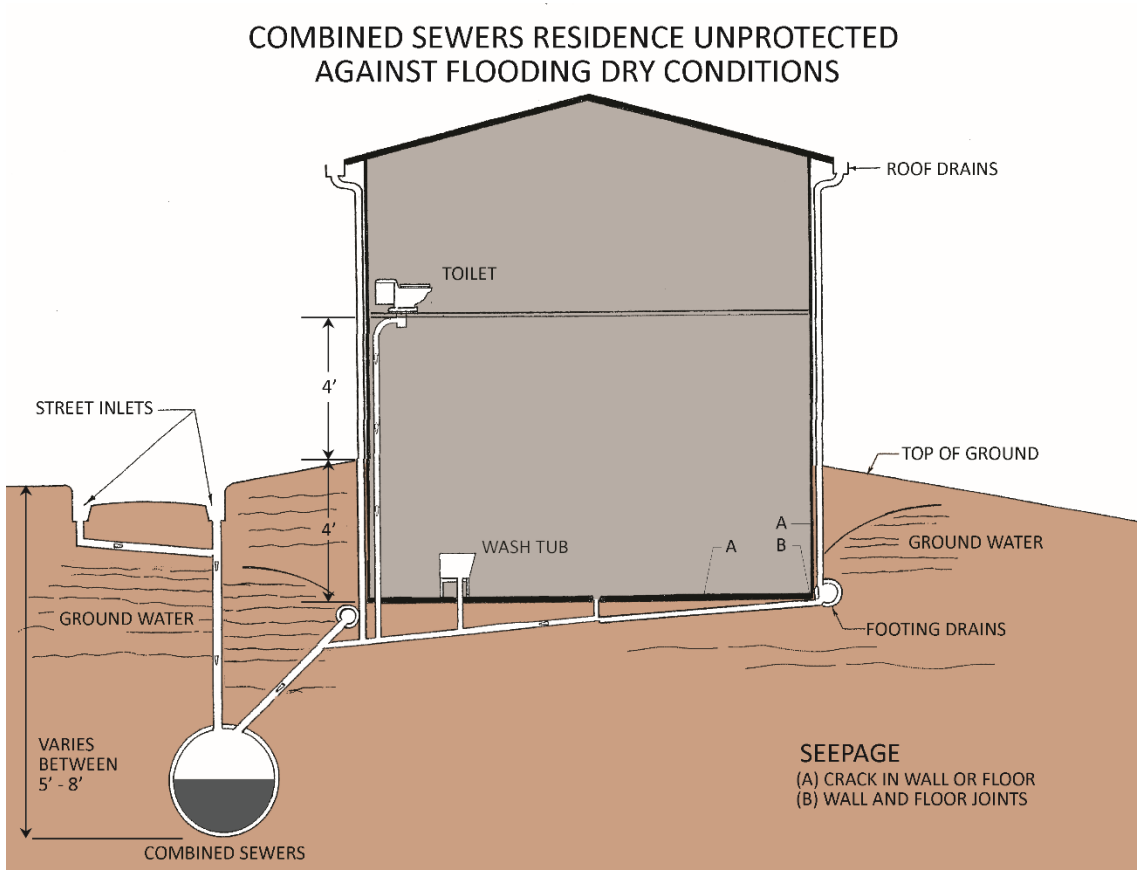
- All three study areas contain alleys that can be used for permeable pavement. These are common in many urban areas and are known as “green alleys.”
- The storage volume provided in one alley block (660 ft) for the green alley shown here is approximately 0.08 ac-ft.

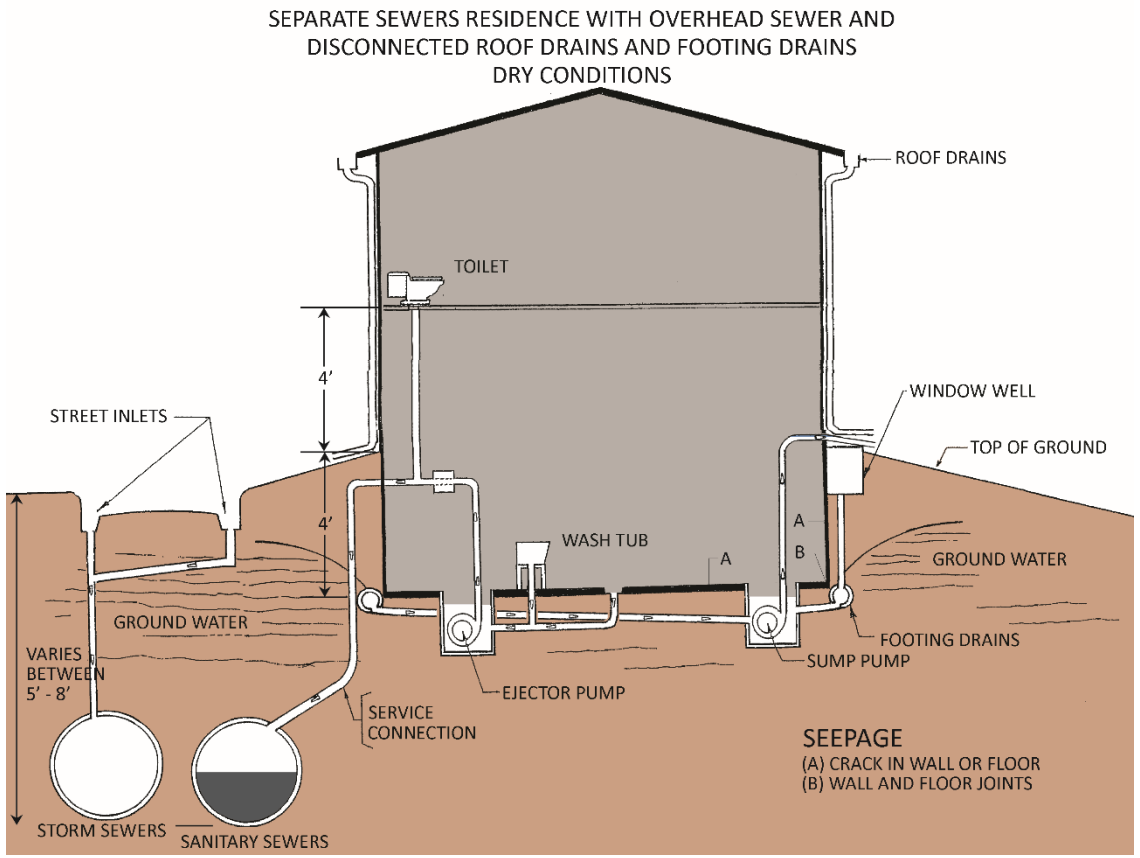




Green Alley – 50 block of Elgin/Harlem

Combined Sewer vs. Separated Sewer



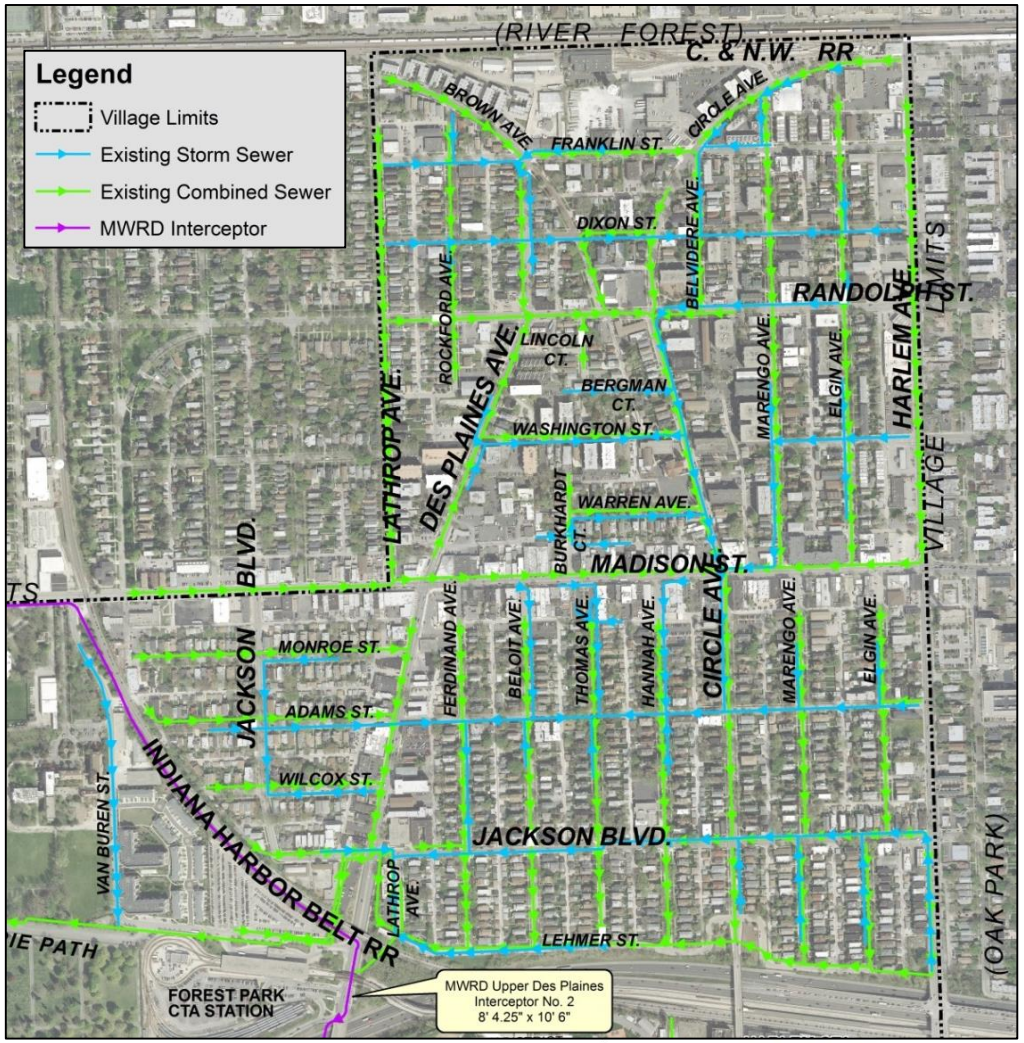


Least Protected

Most Protected

Area 1 Sewer System Background – 325 acres

- 12-inch to 18-inch combined sewers convey domestic sewage to MWRD Upper Des Plaines Interceptor No. 2 at southwest corner of Area 1.
- During dry weather, the flows are conveyed south through the Upper Des Plaines No. 2 Interceptor sewer to the MWRD Stickney Water Reclamation Plant.
- During storm periods, a portion of the captured combined sewer flows in excess of the Upper Des Plaines No. 2 Interceptor sewer capacity will be diverted to the Deep Tunnel through a 66-inch combined sewer to the drop shaft (DS D-28) located near the Des Plaines River at the Illinois Prairie Path.
- Once the Deep Tunnel has reached capacity, excess combined sewer flow will be discharged to the Des Plaines River at the Illinois Prairie Path
- 12-inch to 66-inch separate storm sewers convey stormwater to the 66-inch combined sewer at the intersection of Jackson Boulevard and Lathrop Avenue.



Area 1 Combined Sewer Overflow (CSO)

Drop Shaft at Illinois Prairie Path

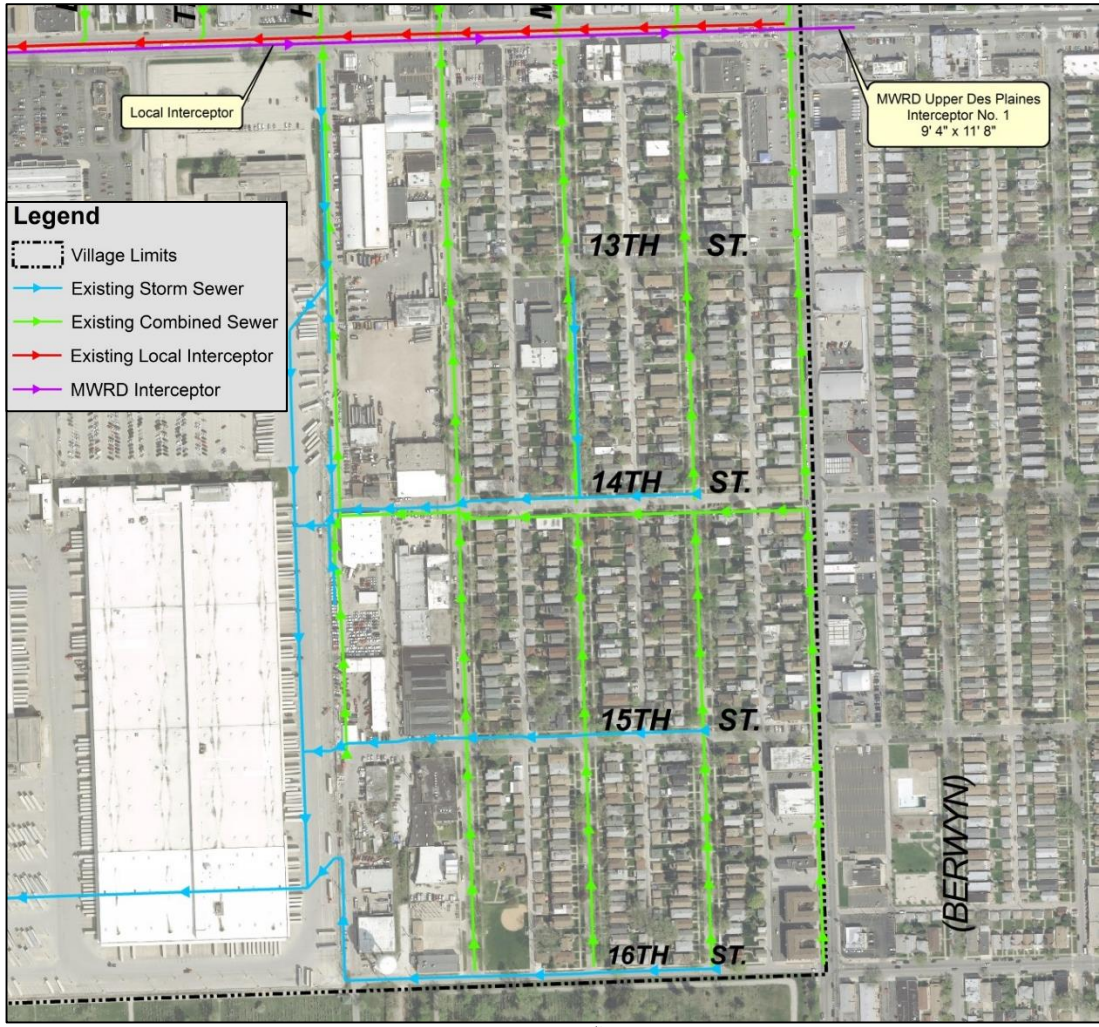
66-inch CSO Outlet at Illinois Prairie Path

Area 2 Sewer System Background – 275 acres

- 12-inch to 15-inch laterals and an 18-inch to 48-inch mainline combined sewers convey domestic sewage from north to south to a local interceptor sewer in Roosevelt Road which varies from 18-inches to 66-inches.
- During dry weather, the flows are conveyed west through the local interceptor, under the Des Plaines River, to MWRD Interceptor "Salt Creek – 2," located in 1st Avenue. From there the flows are conveyed south to the MWRD Stickney Water Reclamation Plant.
- During storm periods, a portion of the captured combined sewer flows in excess of the capacity of the local interceptor under the river, will be diverted to the Deep Tunnel through the drop shaft located near the Des Plaines River at Roosevelt Road.
- Once the Deep Tunnel has reached capacity, excess combined sewer flow will be discharged to the Des Plaines River at Roosevelt Road.

Area 3 Sewer System Background – 80 acres

- 12-inch to 15-inch combined sewers convey domestic sewage from south to north to a local interceptor sewer in Roosevelt Road which varies from 18-inches to 66-inches.
- During dry weather, the flows are conveyed west through the local interceptor, under the Des Plaines River, to MWRD Interceptor "Salt Creek – 2," located in 1st Avenue. From there the flows are conveyed south to the MWRD Stickney Water Reclamation Plant.
- During storm periods, a portion of the captured combined sewer flows in excess of the capacity of the local interceptor under the river, will be diverted to the Deep Tunnel through the drop shaft located near the Des Plaines River at Roosevelt Road.
- Once the Deep Tunnel has reached capacity, excess combined sewer flow will be discharged to the Des Plaines River at Roosevelt Road.
- 12-inch to 72-inch separate storm sewers convey stormwater to the Des Plaines River west of the intersection of Des Plaines Avenue and Greenburg Road.



MWRD Interceptor Construction – 1920s

MWRD Stickney Plant (facing northwest)

Deep Tunnel

* Photograph Provided by MWRDGC

MWRD McCook Reservoir

Stage 1 Reservoir – Operational 2017 *(Projected by MWRD)*

- Storage Volume = 3.5 BG (10,500 Acre-feet)
- Enough storage for 1.6 inches of rainfall over 250 square mile tributary to system

Final Conditions Reservoir and Deep Tunnel – Operational in approximately 2029 *(Projected by MWRD)*

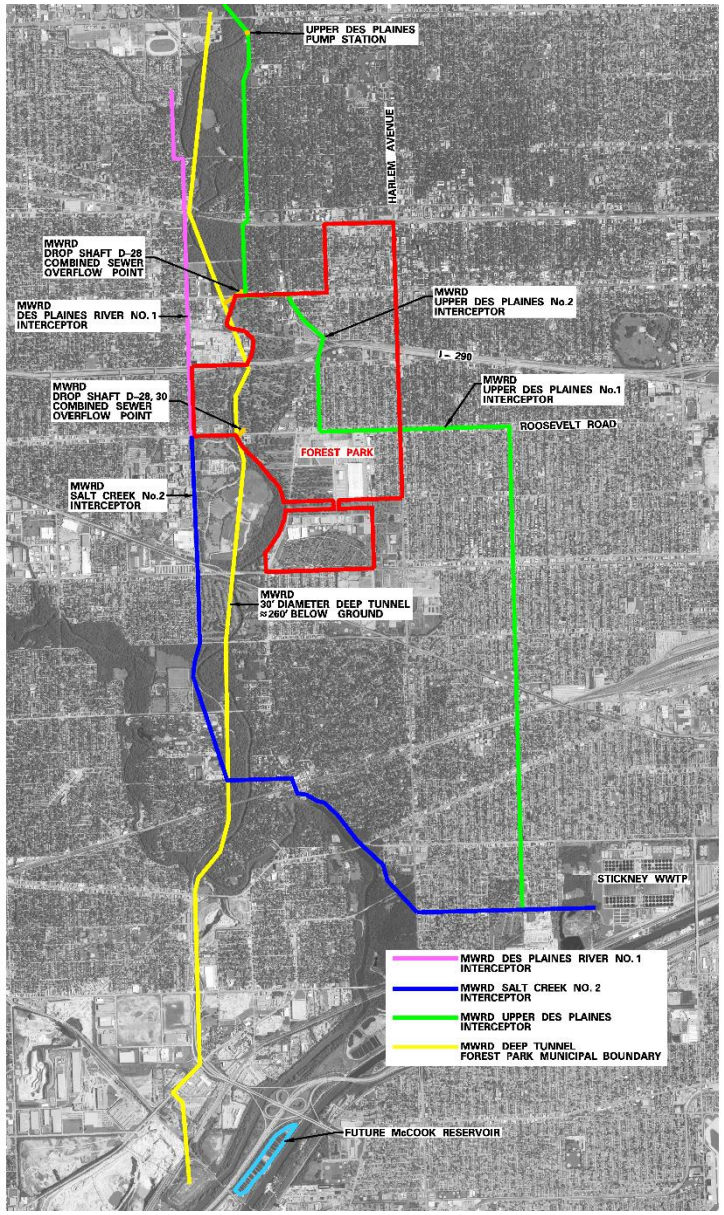
- Total Storage Volume in Reservoir and Deep Tunnel = 11.6 BG (34,800 Acre-feet)
- Enough storage for 3.8 inches of rainfall over 250 square miles tributary to system

Storm Frequency	Storm Duration	Rainfall Depth (inches)
2-year	1-hour	1.43
	24-hour	3.04
5-year	1-hour	1.79
	24-hour	3.80
10-year	1-hour	2.10
	24-hour	4.47
25-year	1-hour	2.59
	24-hour	5.51
50-year	1-hour	3.04
	24-hour	6.46
100-year	1-hour	3.56
	24-hour	7.58

Rainfall Total for Historic Events

- July 2010 – 6.6 inches over 12 hours
- April 2013 – 4.7 inches over 19 hours

Overview of MWRD Interceptor and TARP System



Communities within the TARP Service Area

Upper Des Plaines Interceptor

- Chicago
- Des Plaines
- Elmwood Park
- Franklin Park
- Harwood Heights (Sanitary)
- Maywood
- Melrose Park
- Norridge
- Northlake (Sanitary)
- Oak Park
- Park Ridge
- River Grove
- River Forest
- Rosemont (Sanitary)
- Schiller Park

Salt Creek Interceptor

- Bellwood
- Broadview
- Westchester

Combined Sewer Overflow (CSO) Information

Illinois Prairie Path CSO (DS D-28)

Year	# CSO	Duration (hours)
2008	2	19.1
2009	11	51.9
2010	12	69.5
2011	5	21.8
2012	3	12.2
2013	9	26.4
2014	6	15.2
2015	3	10.5

* Data Provided by MWRDGC

Combined Sewer Overflow (CSO) Information

Roosevelt Road CSO (DS D-28,30)

Year	# CSO	Duration (hours)
2008	2	2.3
2009	2	2.7
2010	8	66.5
2011	1	6.3
2012	0	0
2013	0	0
2014	6	17.3
2015	0	0

* Data Provided by MWRDGC

Des Plaines River WSEL vs. CSOs

	DPR WSEL When CSO Occurred	
Date	**DS D-28**	**DS D-28,30**
7-24-2010	609.7	608.5
4-18-2013	612.8	No CSO

Invert Elevation of CSO D-28 is Approximately 605

Invert Elevation of CSO D-28,30 is Approximately 604

Des Plaines River Flood Elevations (Per FEMA FIS) at Each Outfall

10-yr @ CSO D-28 = 618.9

100-yr @ CSO D-28= 621.0

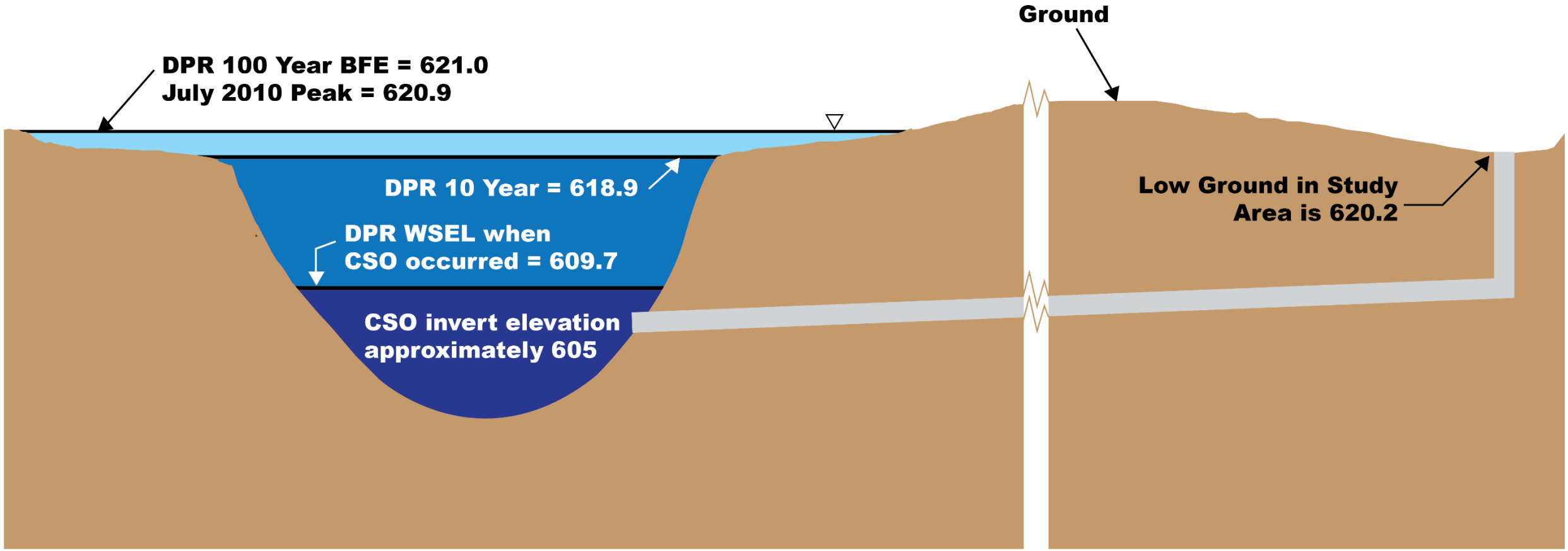
10-yr @ CSO D-28,30 = 618.0

100-yr @ CSO D-28,30 = 619.8

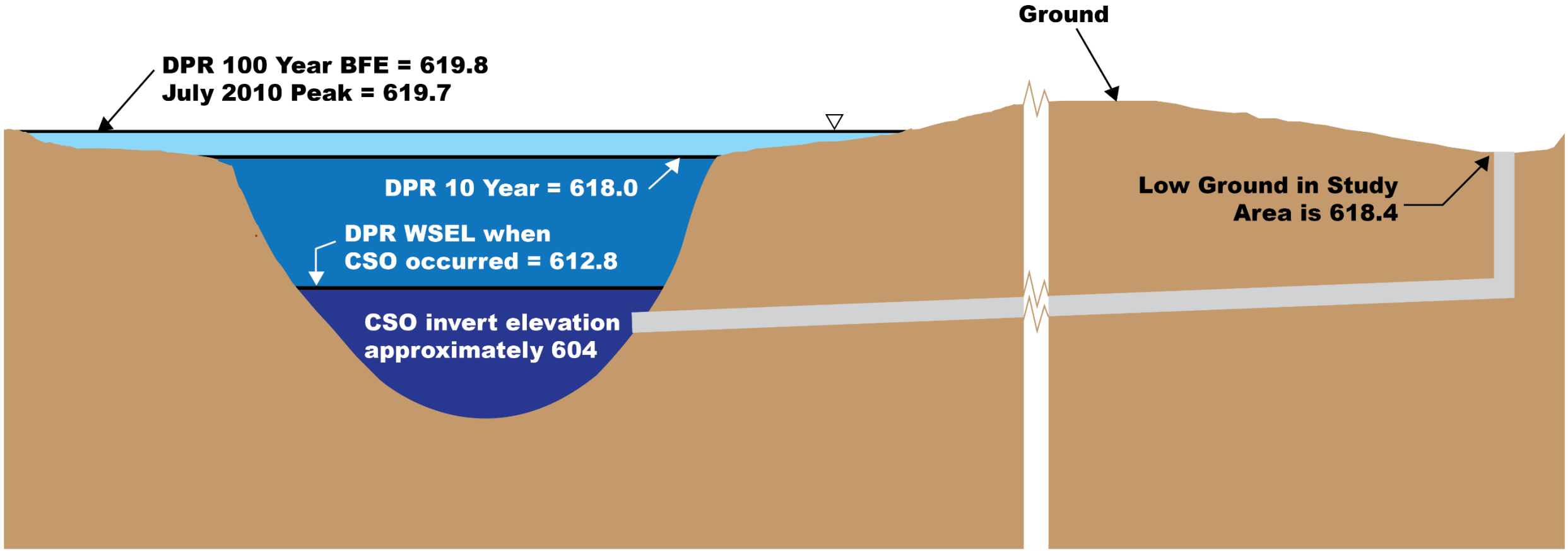
Lowest Ground Elevation in Each Area

- Area 1 is approximately 620.2
- Area 2 is approximately 618.4
- Area 3 is approximately 618.2

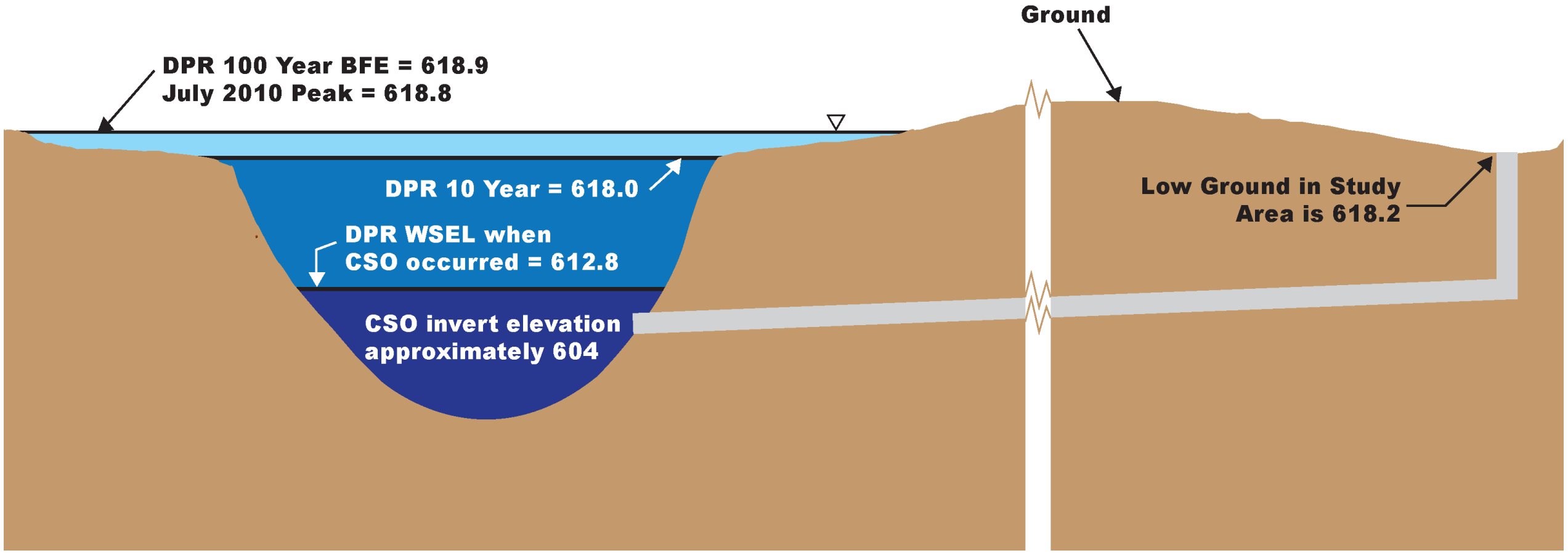
Area 1 - Des Plaines River WSEL relative to Ground and CSO – July 2010
Illinois Prairie Path – DS D-28



Area 2 - Des Plaines River WSEL relative to Ground and CSO – July 2010
Roosevelt Road – DS D-28,30



Area 3 - Des Plaines River WSEL relative to Ground and CSO – July 2010
Separate Storm Sewer Outlet @ Greenburg Road



Computer Modeling of Study Areas

Computer modeling is based on the following information:

- Historic flooding information
- Village's GIS combined sewer and storm sewer database
- Engineering drawings
- Field investigations by CBBEL staff
- Supplemental sewer system survey by CBBEL
- Cook County one-foot aerial topographic mapping

Computer Modeling of Study Areas

Hydrologic Model:

Delineated drainage boundaries and determined existing drainage patterns.

- Cook County aerial topography
- Combined & storm sewer information

Determined hydrologic parameters for drainage areas.

- Impervious Percentage (Consistent with RCN)
- Time of concentration (t_c)

Simulated flowrates and runoff volume for rainfall events using the US EPA-based XP-SWMM 2D computer model to determine stormwater runoff response.

- July 2010 storm event
- Design storm events

Computer Modeling of Study Areas

Hydraulic Model

Input existing drainage features.

- Storm and combined sewers:
  - Length
  - Diameter
  - Invert and rim elevations
  - Pipe material

Simulated stormwater runoff from storm events through drainage system using US EPA-based XP-SWMM 2D computer model.

- Overland Flooding determined using 2D feature of XP-SWMM, which uses topographic survey to determine flooding limits
- Quantified level of protection for flood problem areas
- Determined effectiveness of proposed drainage improvements

Storm Events Analyzed

Engineering analyses performed for the peak 1-, 2-, 5-, 10-, 25-, 50, and 100-year storm events.

Today, storm sewers are typically designed to convey the peak 10-year flow to meet ordinances. A storm sewer installed in 1960's typically has a +/- 5-year capacity.

The term **10-year storm** is used to define a rainfall event or recurrence interval that statistically has the same 10% chance of occurring in any given year.

Recurrence intervals in years	Probability of occurrence in any given year	Percent chance of occurrence in any given year
100	1 in 100	1
10	1 in 10	10
5	1 in 5	20
2	1 in 2	50

Historical Storm Event Analyzed

Storm intensity and duration are used to determine the recurrence intervals.

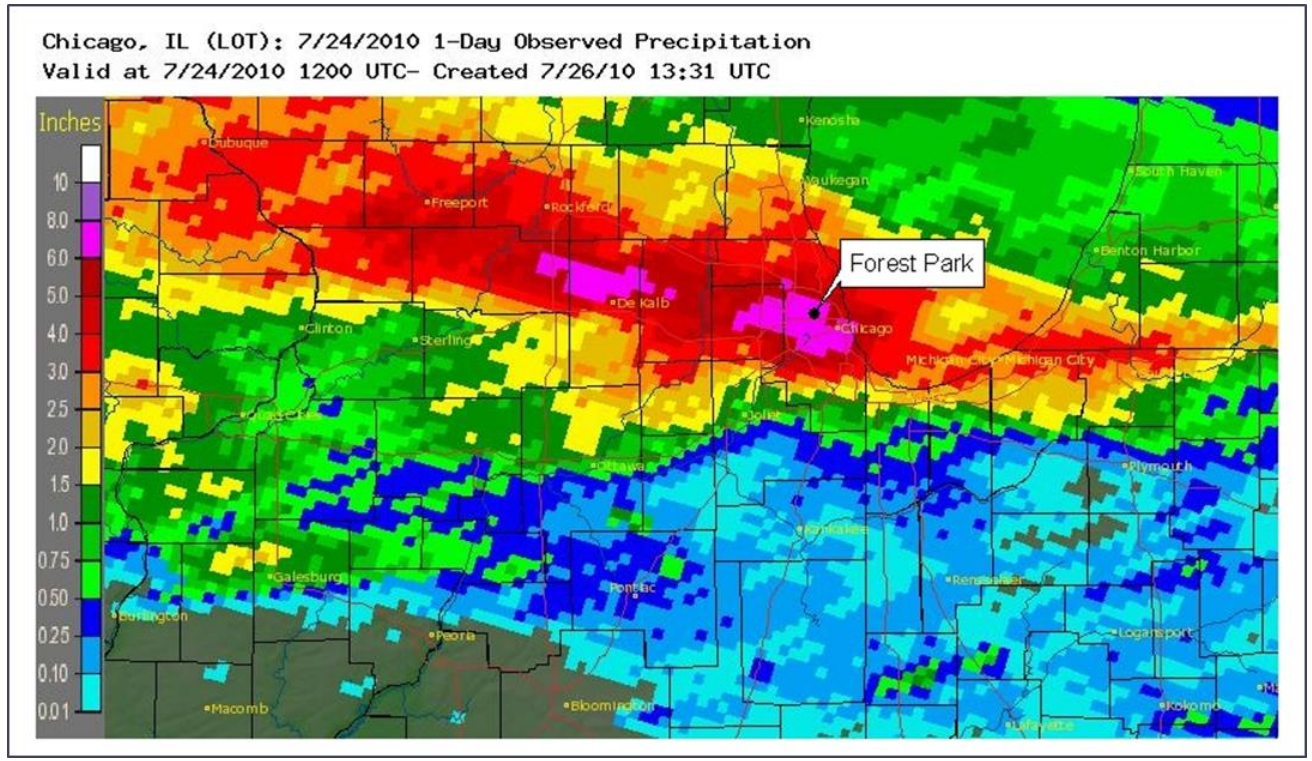
2.1 inches in 60 minutes is a 10-year event

2.1 inches in 15 minutes is a 100-year event

July 23 – 24, 2010

6.63 inches in 12 hours – Approx. 100-year event

6.83 inches in 18 hours – Just under a 100-year event



Source: National Weather Service (NWS)
http://water.weather.gov/precip

XP-SWMM Model Calibration

Observed high water elevations from July 2010 and April 2013 storm event.

Preliminary analysis showed XP-SWMM flood elevations generally lower than observed elevations.

- Hydrologic parameters were adjusted in each study area to match observed elevations.

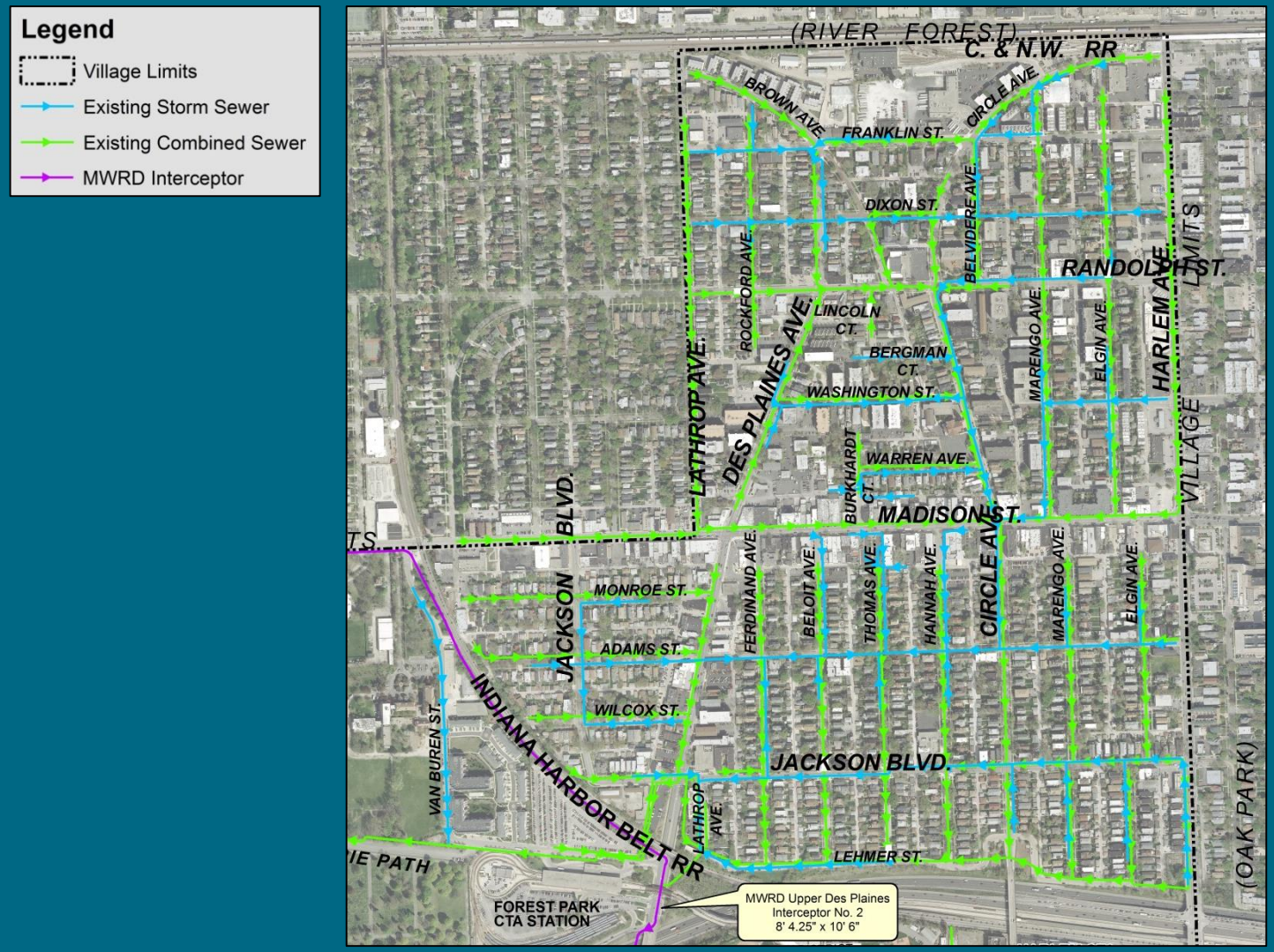
Calibrated XP-SWMM model corresponded well with observed data.

Use calibrated models to simulate design storm events.

Analysis of the Three Study Areas

- **Area 1 (North Area) = 325 acres**
  - Combined Sewer serves approximately 215 acres
  - Separate Storm Sewer serves approximately 110 acres
- **Area 2 (Middle Area) = 275 acres**
  - All Combined Sewer
- **Area 3 (South Area) = 80 acres**
  - Combined Sewer serves approximately 68 acres
  - Separate Storm Sewer serves approximately 12 acres

Area 1 (North Area)



The combined and storm sewer system drains 325 acres of tributary area.

Existing Level-of-Protection is less than a 1-year storm event.

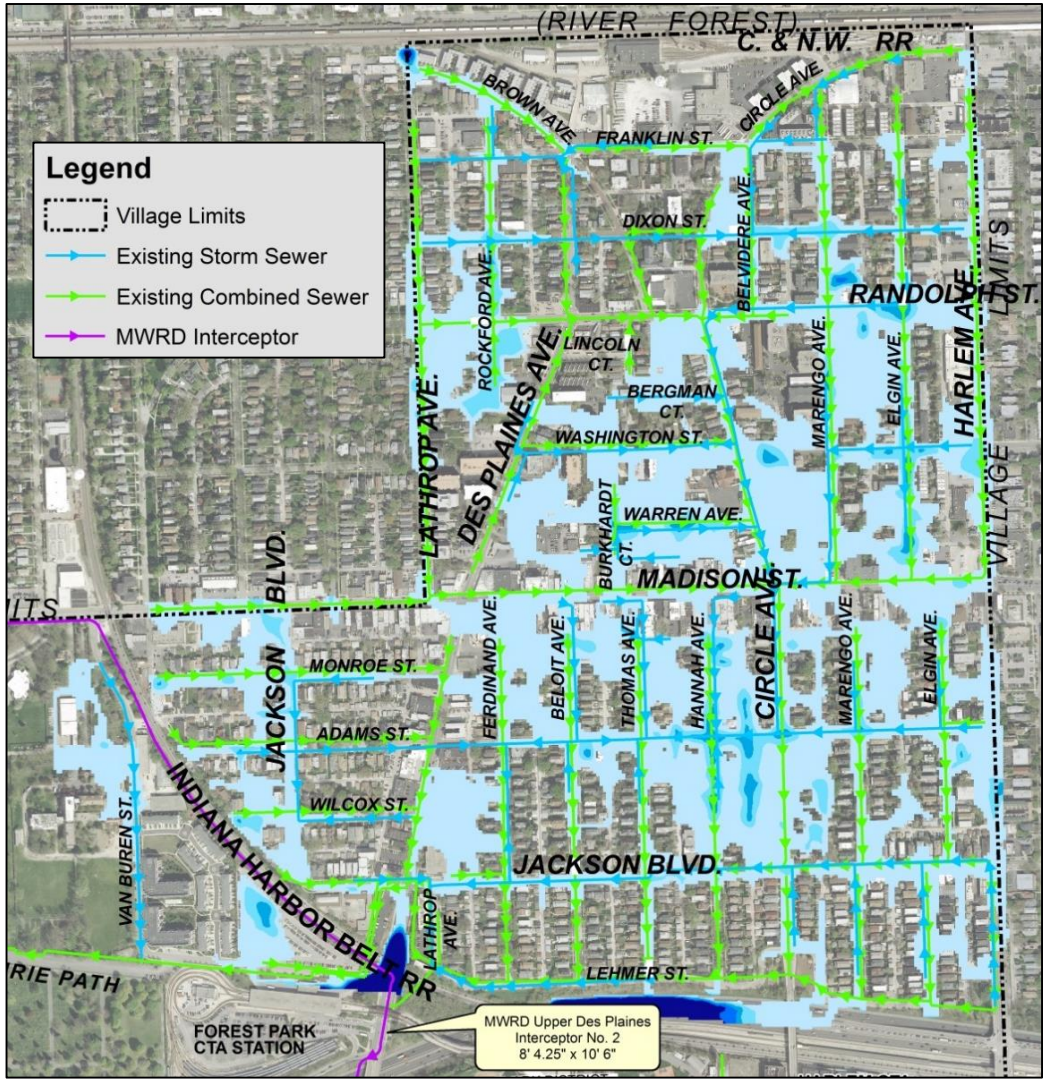
Overview of Existing Area 1

Two main issues causing flood problems in Area 1:

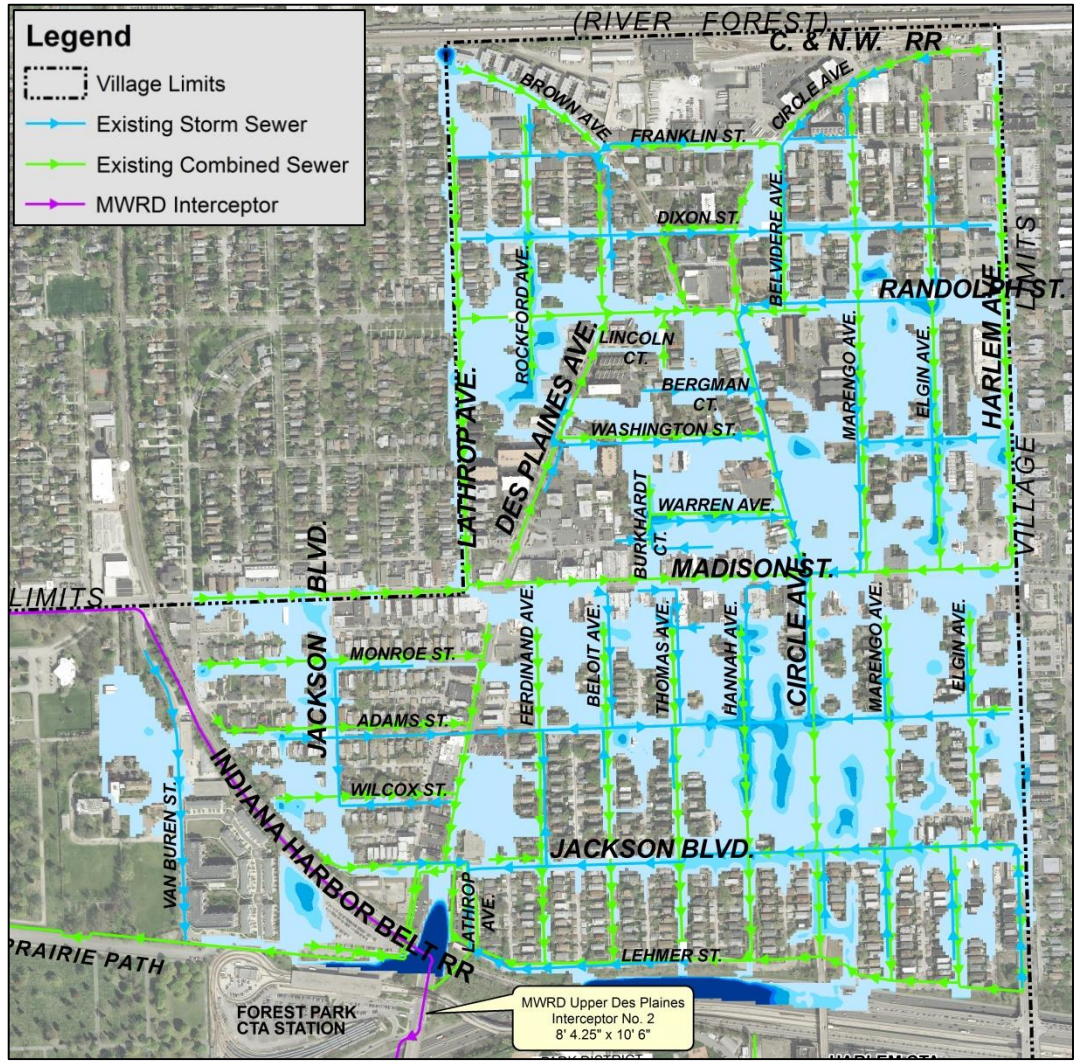
(1) **Area is Not Fully Separated –** Combined sewers drain portions of Area 1, leading to sewer backups in basements during heavy rainfall events.

(2) **Inadequate Pipe Capacity –** Storm sewer and combined sewer too small to convey even a 1-year storm event without street flooding.

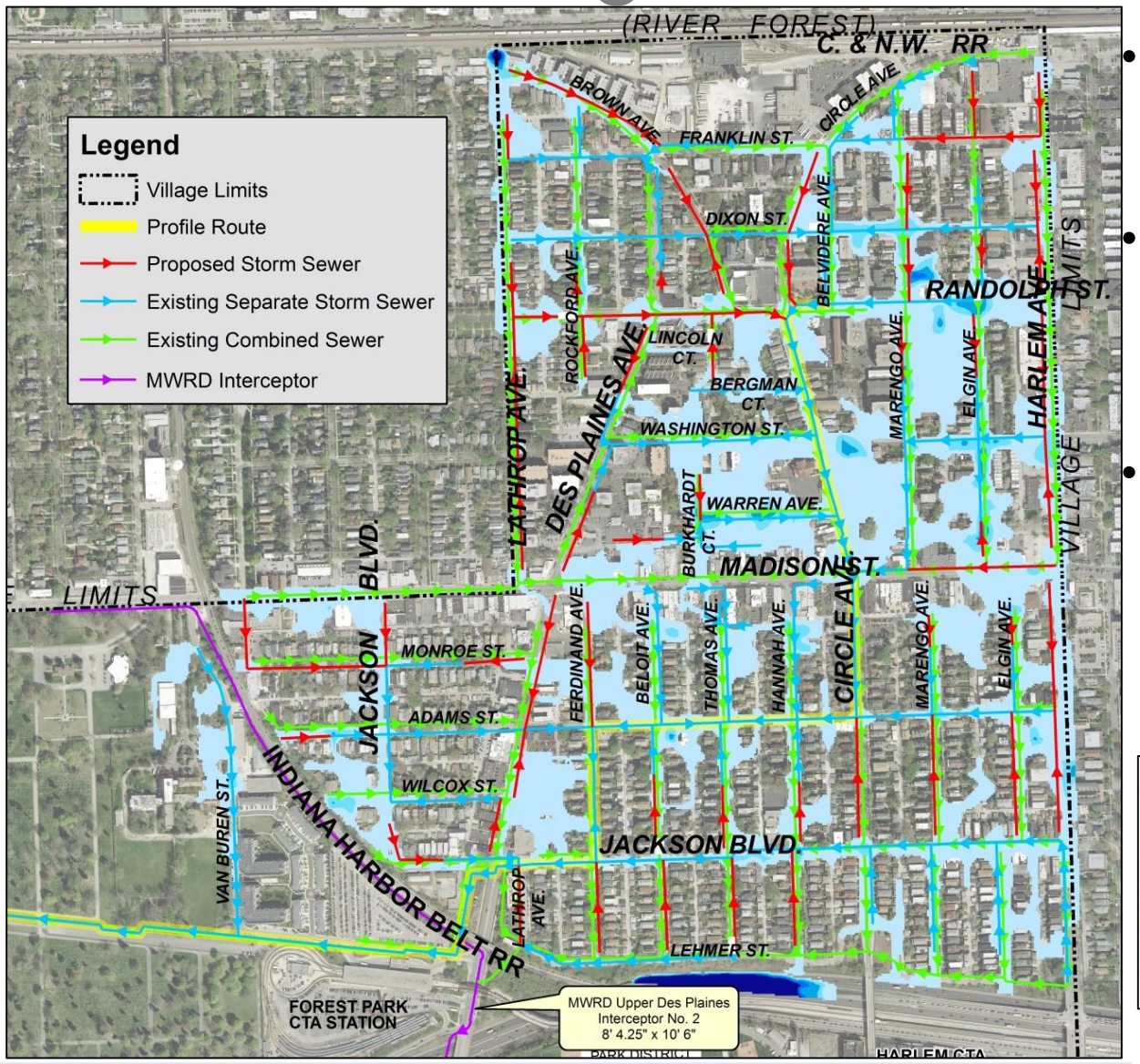
Existing Street Flooding in Area 1: 10-Year Storm Event



Existing Street Flooding in Area 1: July 2010 Storm Event



Street Flooding in Area 1 – Alternative 1: 10-Year Storm



- Convert existing 66" combined sewer in the Illinois Prairie Path to storm sewer and use as the outfall to Des Plaines River for stormwater
- Install new sanitary sewer in Illinois Prairie Path to convey wastewater from MWRD Interceptor No. 2 to deep tunnel when the Interceptor is full
- New storm sewer, ranging from 12-inch to 36-inch, as needed to completely separate sanitary sewer and storm sewer throughout Area 1

Street Flooding in Area 1 – Alternative 1: July 2010 Storm

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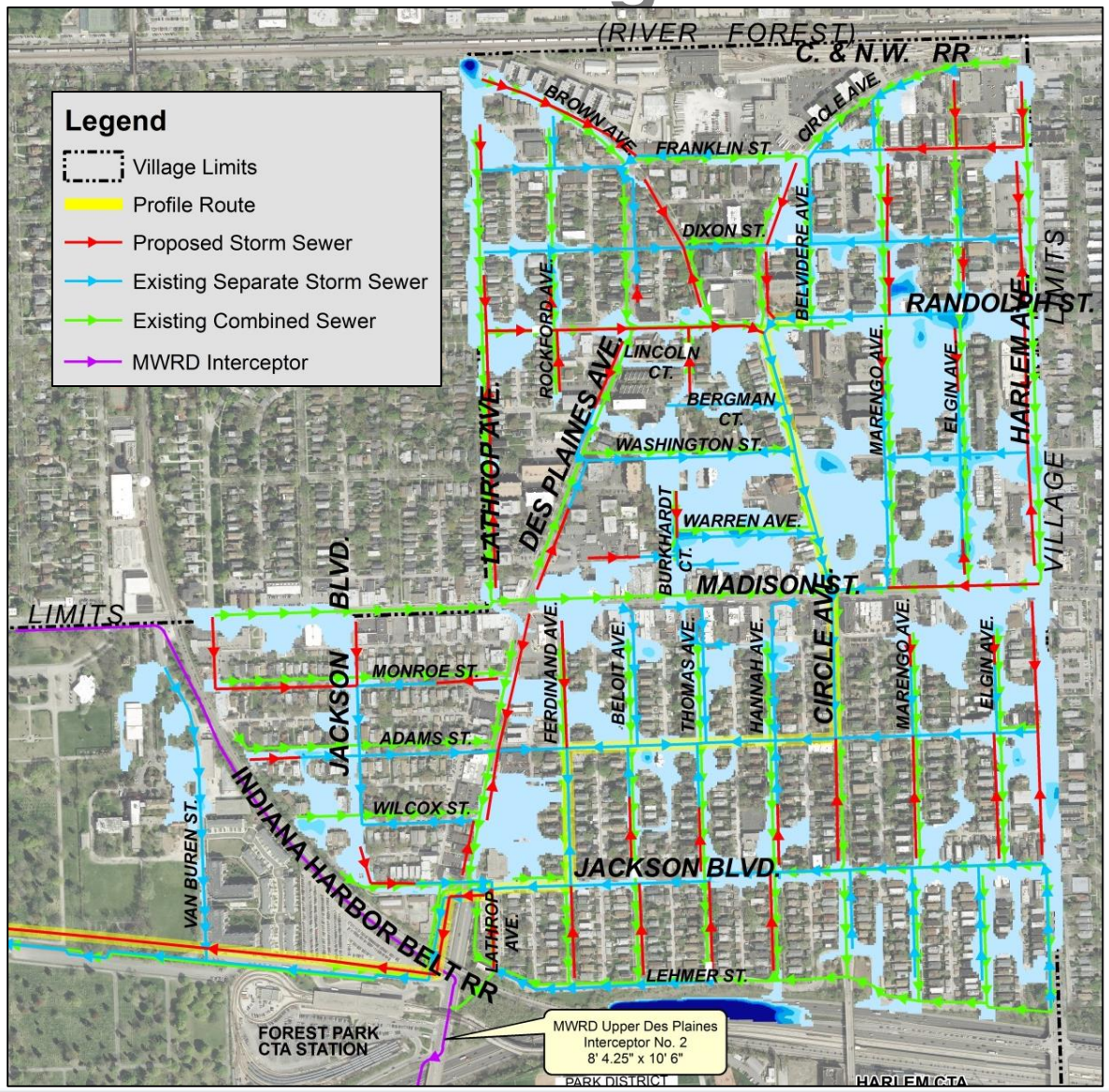
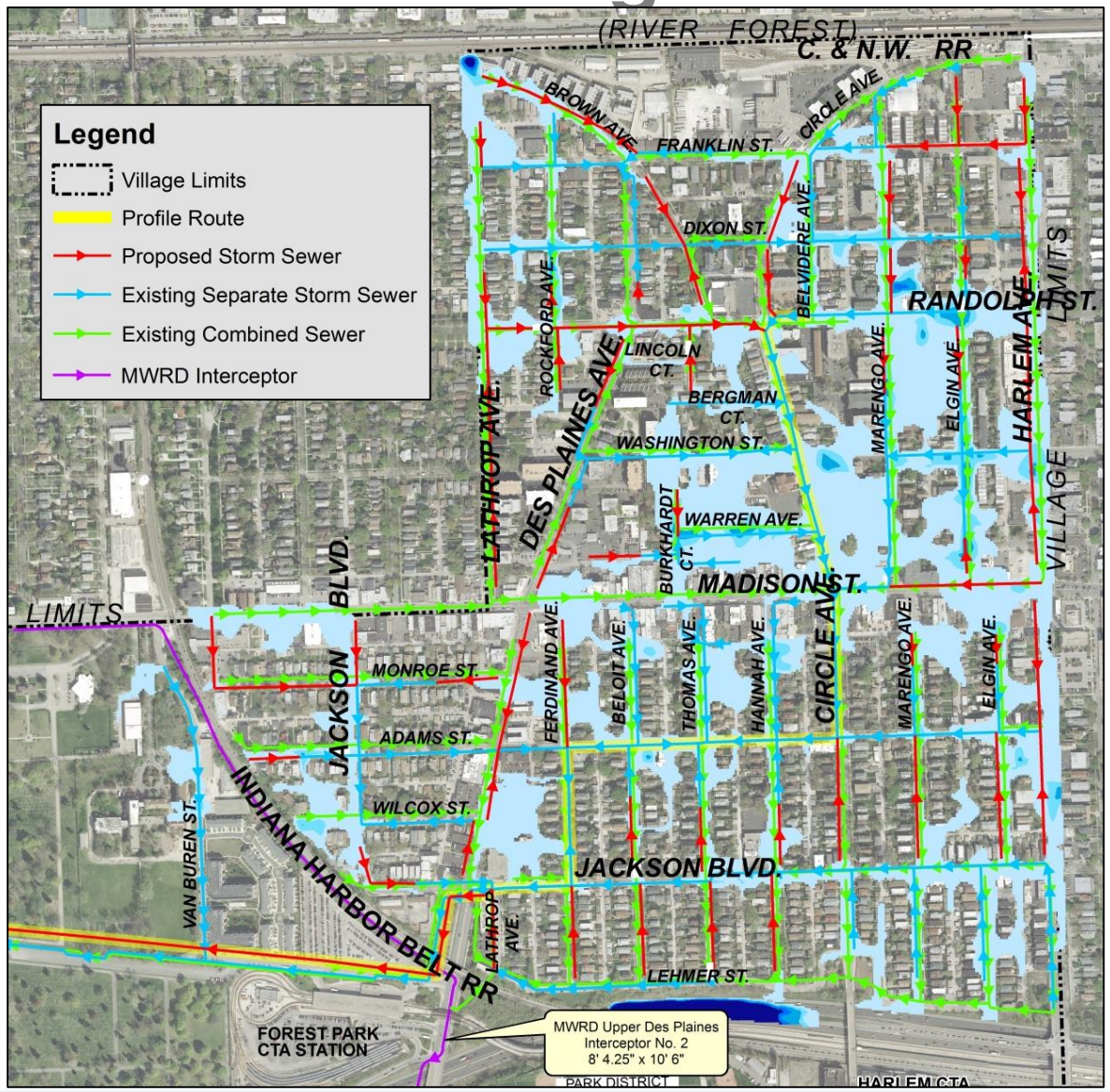
- Install new sanitary sewer in Illinois Prairie Path to convey wastewater from MWRD Interceptor No. 2 to deep tunnel when the Interceptor is full
- New storm sewer, ranging from 12-inch to 36-inch, as needed to completely separate sanitary sewer and storm sewer throughout Area 1

Street Flooding in Area 1 – Alternative 2: 10-Year Storm



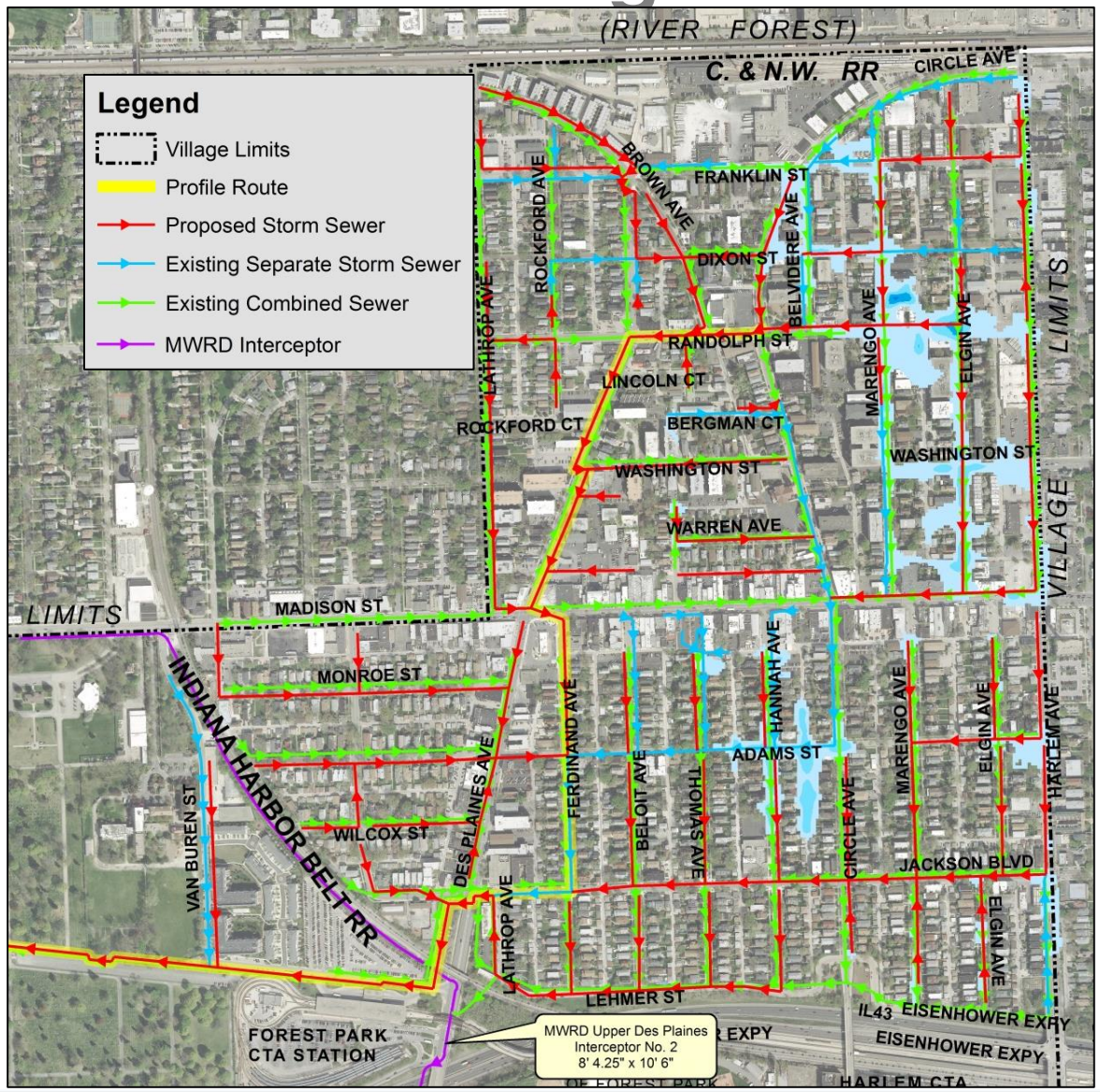
- New 96" stormwater outfall in the Illinois Prairie Path to Des Plaines River to allow for future upsizing of storm sewer system in Area 1
- New storm sewer, ranging from 12-inch to 36-inch, as needed to completely separate sanitary sewer and storm sewer throughout Area 1

Street Flooding in Area 1 – Alternative 2: July 2010 Storm



- New 96" stormwater outfall in the Illinois Prairie Path to Des Plaines River to allow for future upsizing of storm sewer system in Area 1
- New storm sewer, ranging from 12-inch to 36-inch, as needed to completely separate sanitary sewer and storm sewer throughout Area 1

Street Flooding in Area 1 – Alternative 3: 10-Year Storm

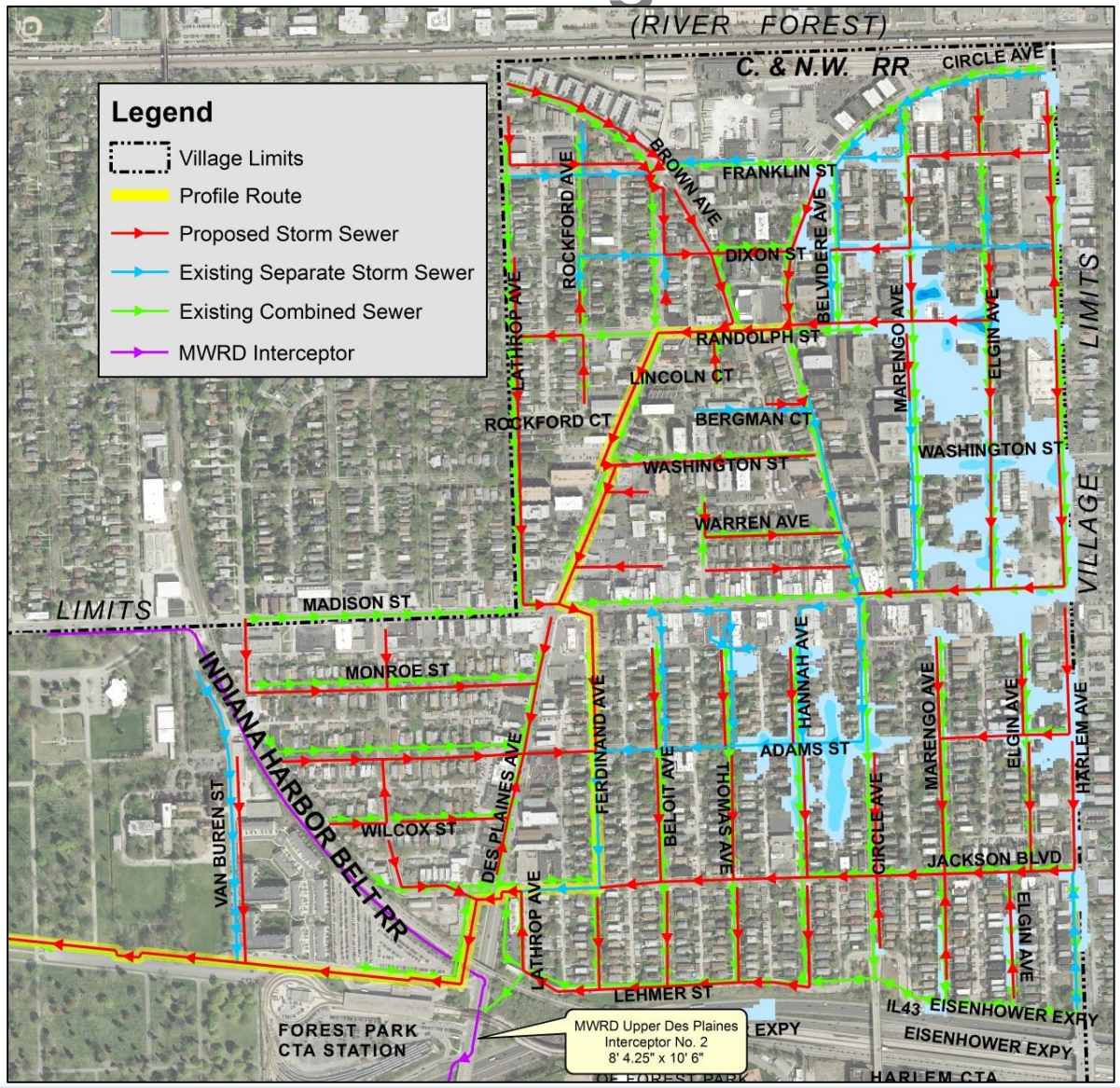


- New 96" stormwater outfall in the Illinois Prairie Path to Des Plaines River
- Enlarge existing storm sewer system with storm sewer ranging from 12-inch to 66-inch to provide greater level-of-protection than existing storm sewer and to completely separate sanitary and storm

Flood Depth (ft)

- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 12.5

Street Flooding in Area 1 – Alternative 3: July 2010 Storm



- New 96" stormwater outfall in the Illinois Prairie Path to Des Plaines River
- Enlarge existing storm sewer system with storm sewer ranging from 12-inch to 66-inch to provide greater level-of-protection than existing storm sewer and to completely separate sanitary and storm

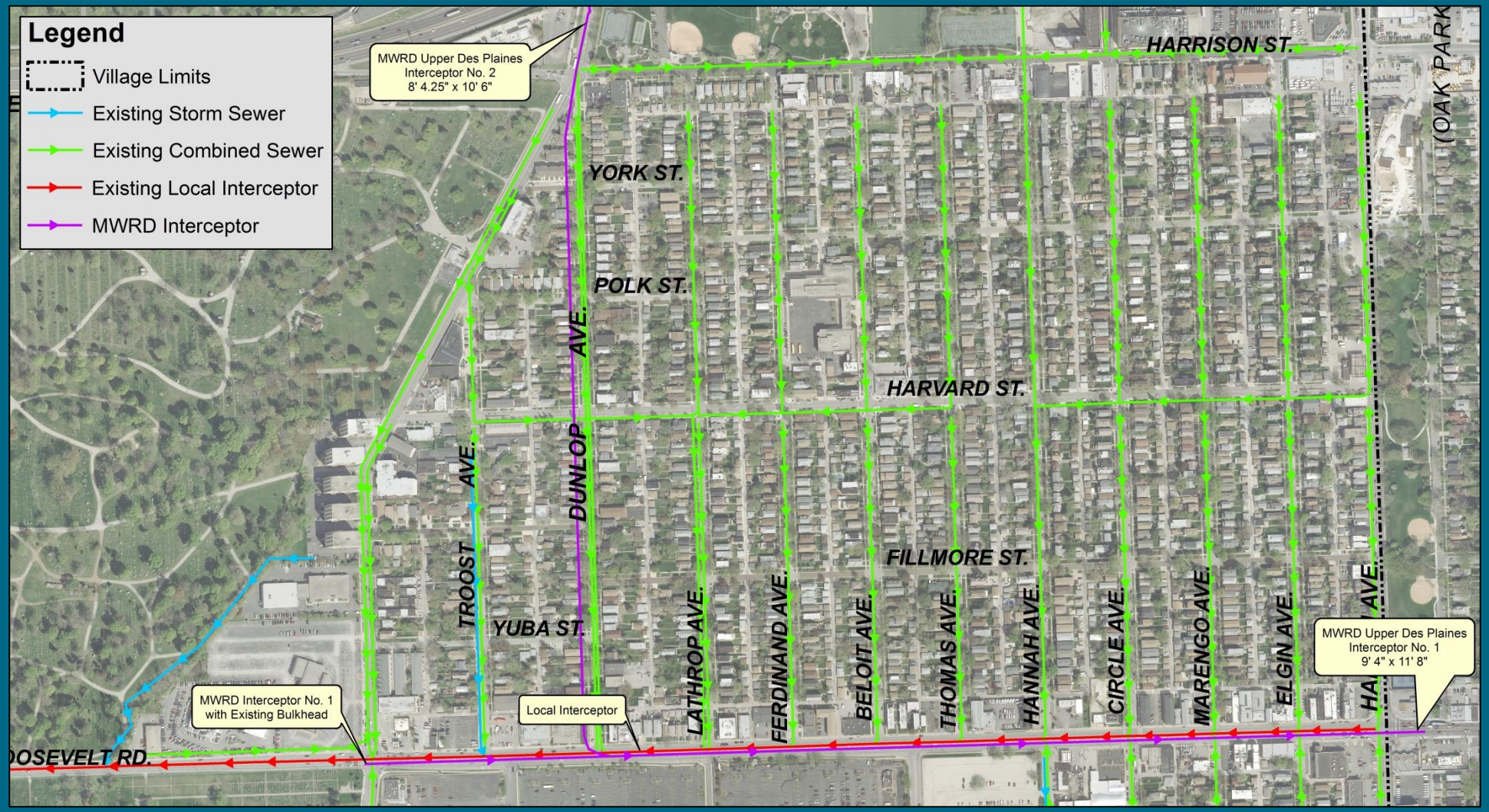
Area 1 Alternatives – Flood Reduction Benefits

- **Number of Parcels with Stormwater Encroachment from Surcharged Sewers**

	Existing Conditions	Alternative 1	Alternative 2	Alternative 3
July 2010	1,135	949	939	302
10-Year	1,120	978	937	245

- **Note: These parcels are defined as parcels in which street flooding encroaches onto the property. These parcels receive flood reduction benefits, even if they still have stormwater encroachment. The depth of the flooding encroachment is reduced with the alternatives in place.**

Area 2 (Middle Area)



The combined sewer system drains 275 acres of tributary area.

Existing Level-of-Protection is less than a 1-year storm event.

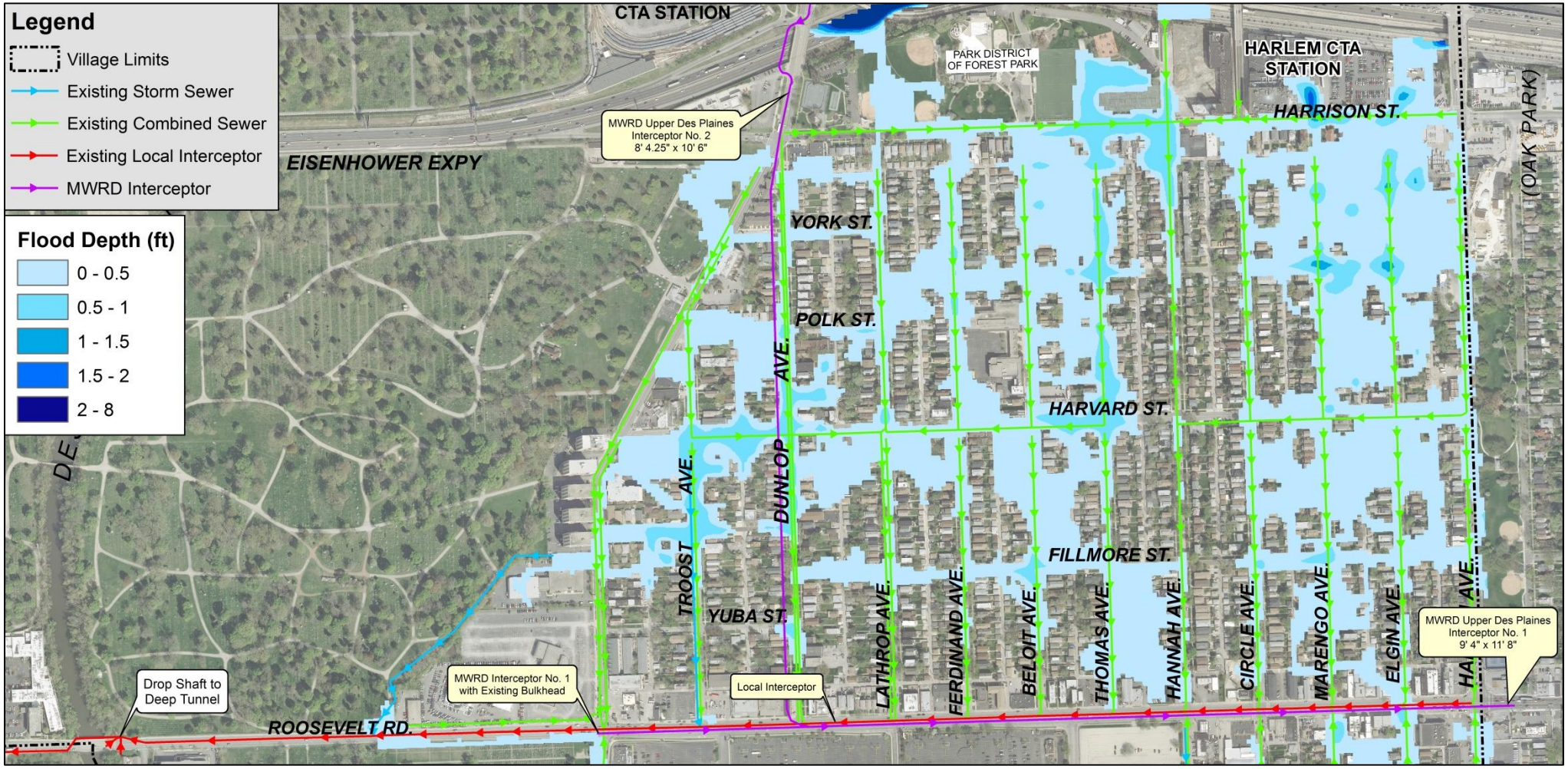
Overview of Existing Area 2

Two main issues causing flood problems in Area 1:

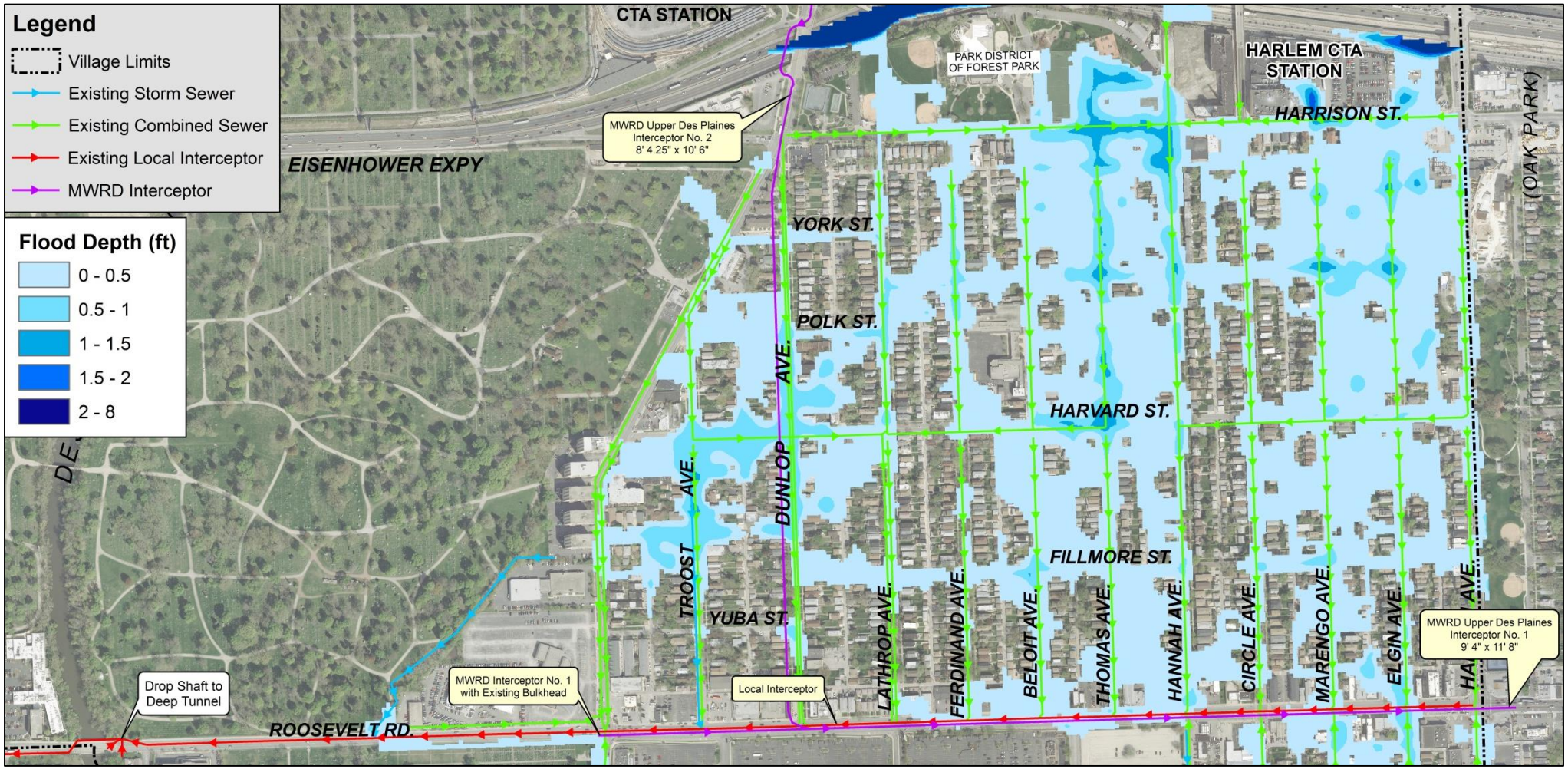
(1) **Area is Not Fully Separated –** Combined sewers drain the entire drainage area, leading to sewer backups in basements during heavy rainfall events.

(2) **Inadequate Pipe Capacity –** Combined sewer too small to convey even a 1-year storm event without street flooding.

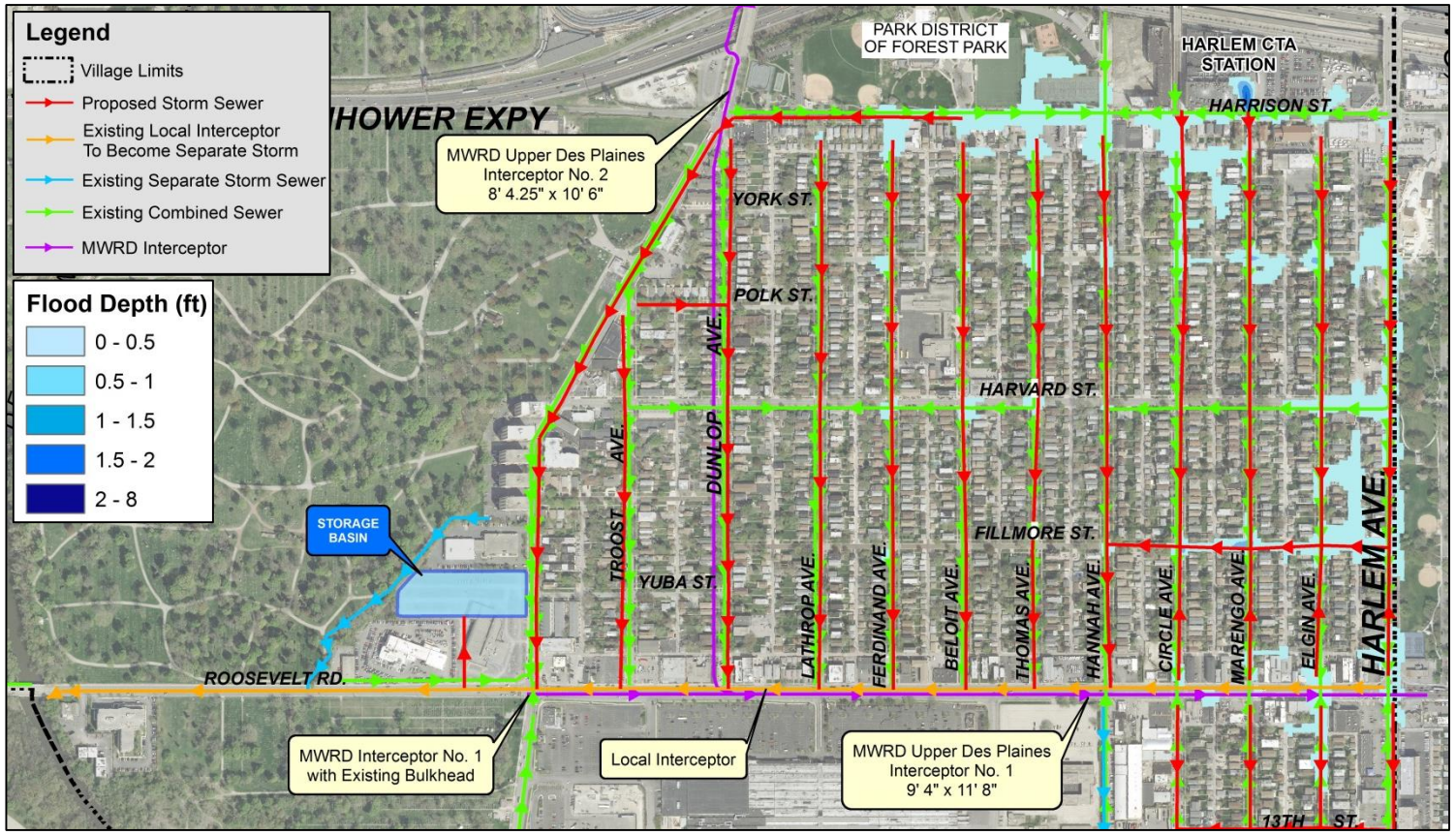
Existing Street Flooding in Area 2: 10-Year Storm Event



Existing Flooding in Area 2: July 2010 Storm Event

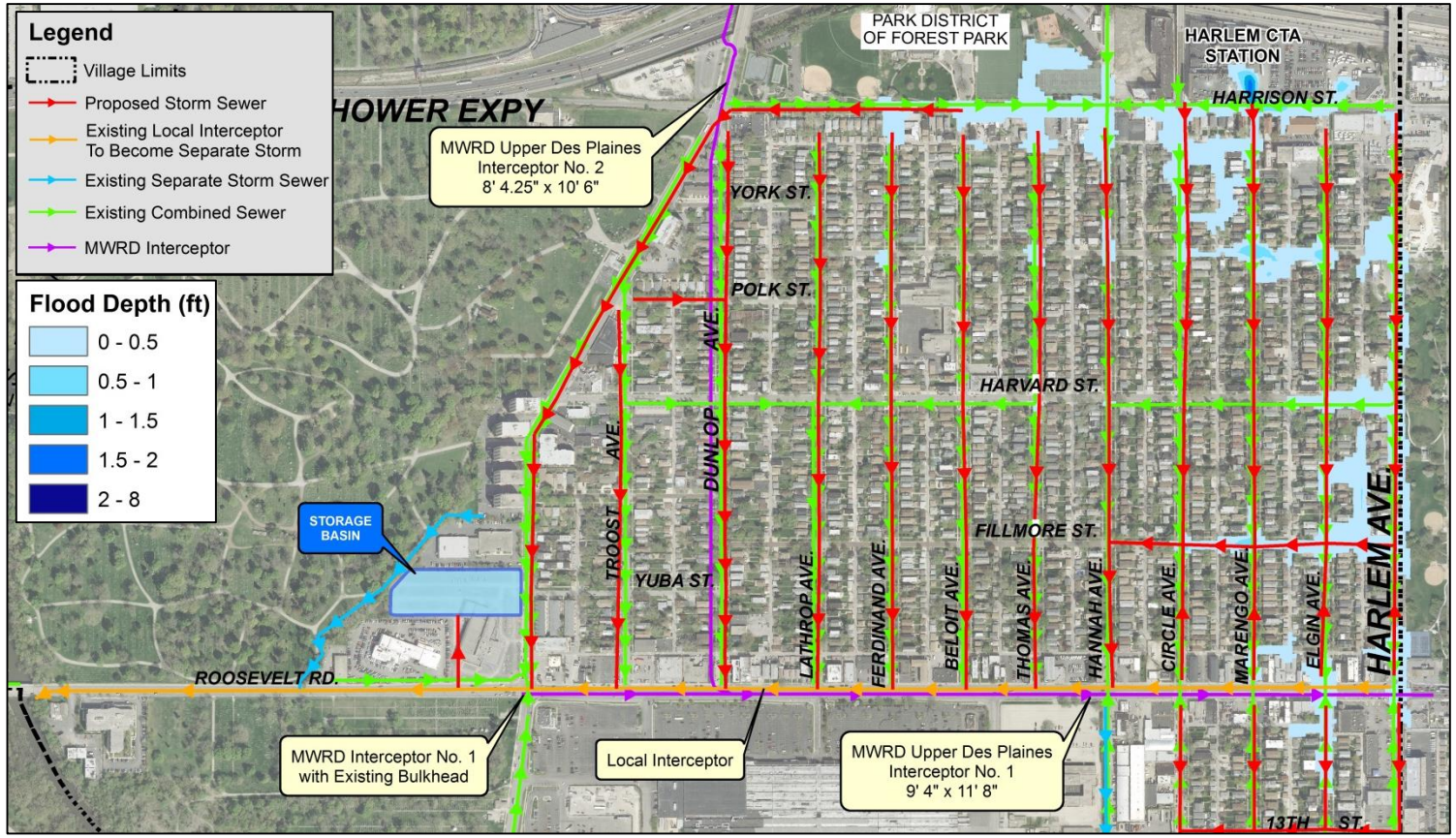


Street Flooding in Area 2 – Alternative 1A: 10-Year Storm



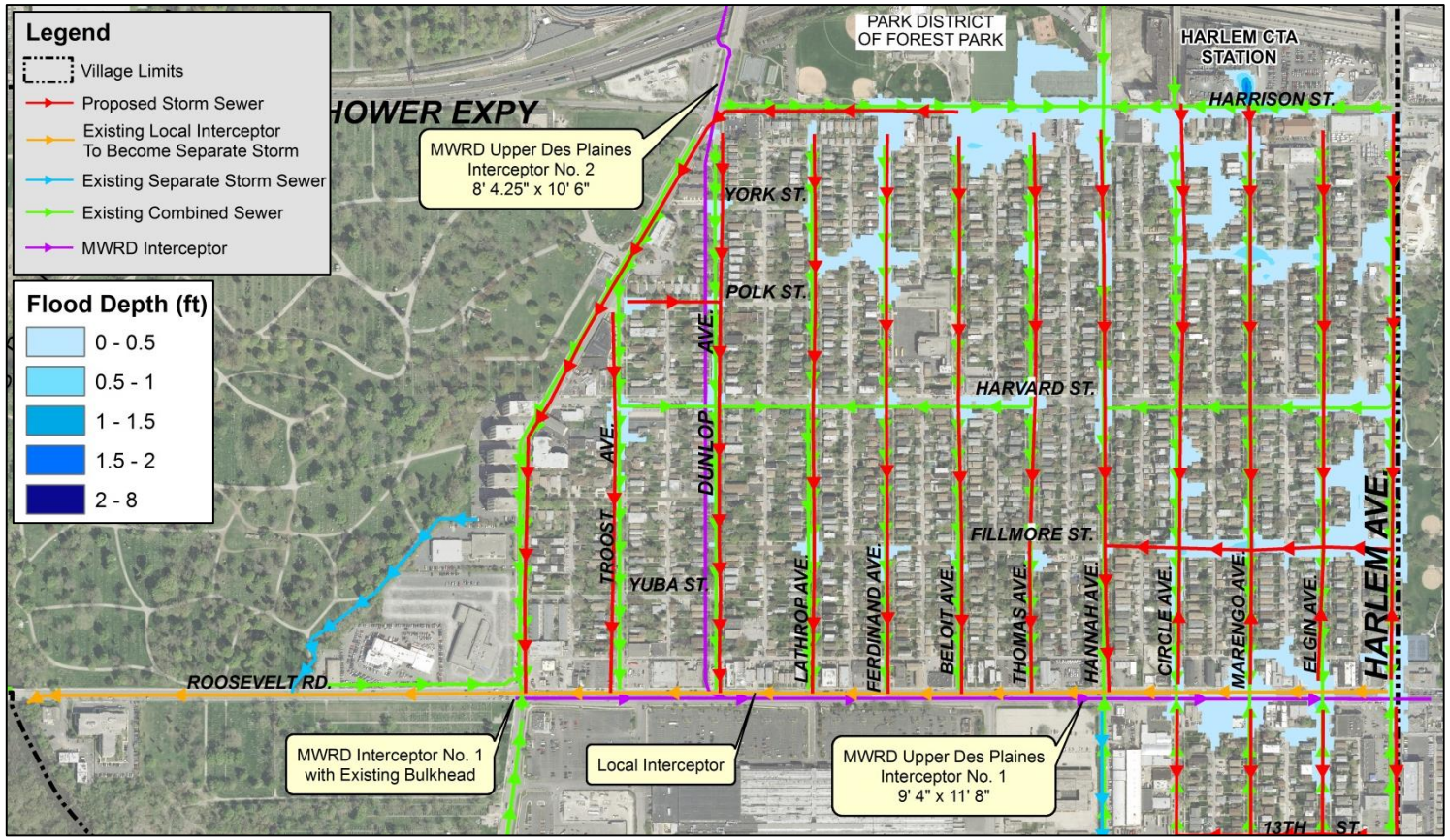
- Convert existing combined sewer in Roosevelt Road to storm sewer and use as stormwater outfall to Des Plaines River
- Include storage basin and Pump Station at Roosevelt and Des Plaines
- New storm sewer, ranging from 12-inch to 48-inch, as needed to completely separate sanitary sewer and storm sewer throughout Area 2
- Combined sewers become sanitary sewer in north-south streets
- Use MWRD Interceptor No. 1 to convey wastewater to the east

Street Flooding in Area 2 - Alternative 1A: July 2010 Storm



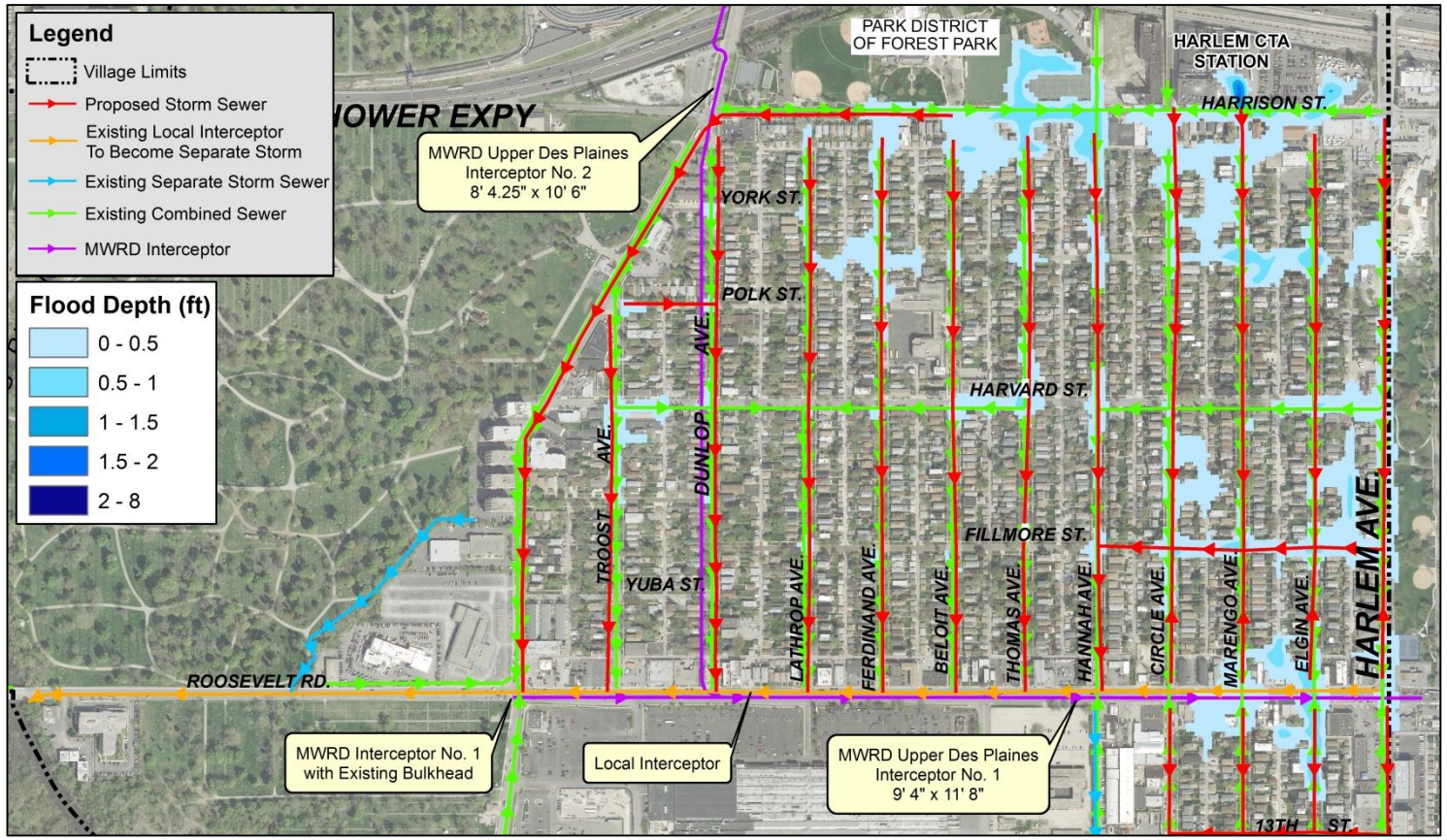
- Convert existing combined sewer in Roosevelt Road to storm sewer and use as stormwater outfall to Des Plaines River
- Include storage basin and Pump Station at Roosevelt and Des Plaines
- New storm sewer, ranging from 12-inch to 48-inch, as needed to completely separate sanitary sewer and storm sewer throughout Area 2
- Combined sewers become sanitary sewer in north-south streets
- Use MWRD Interceptor No. 1 to convey wastewater to the east

Street Flooding in Area 2 – Alternative 1B: 10-Year Storm



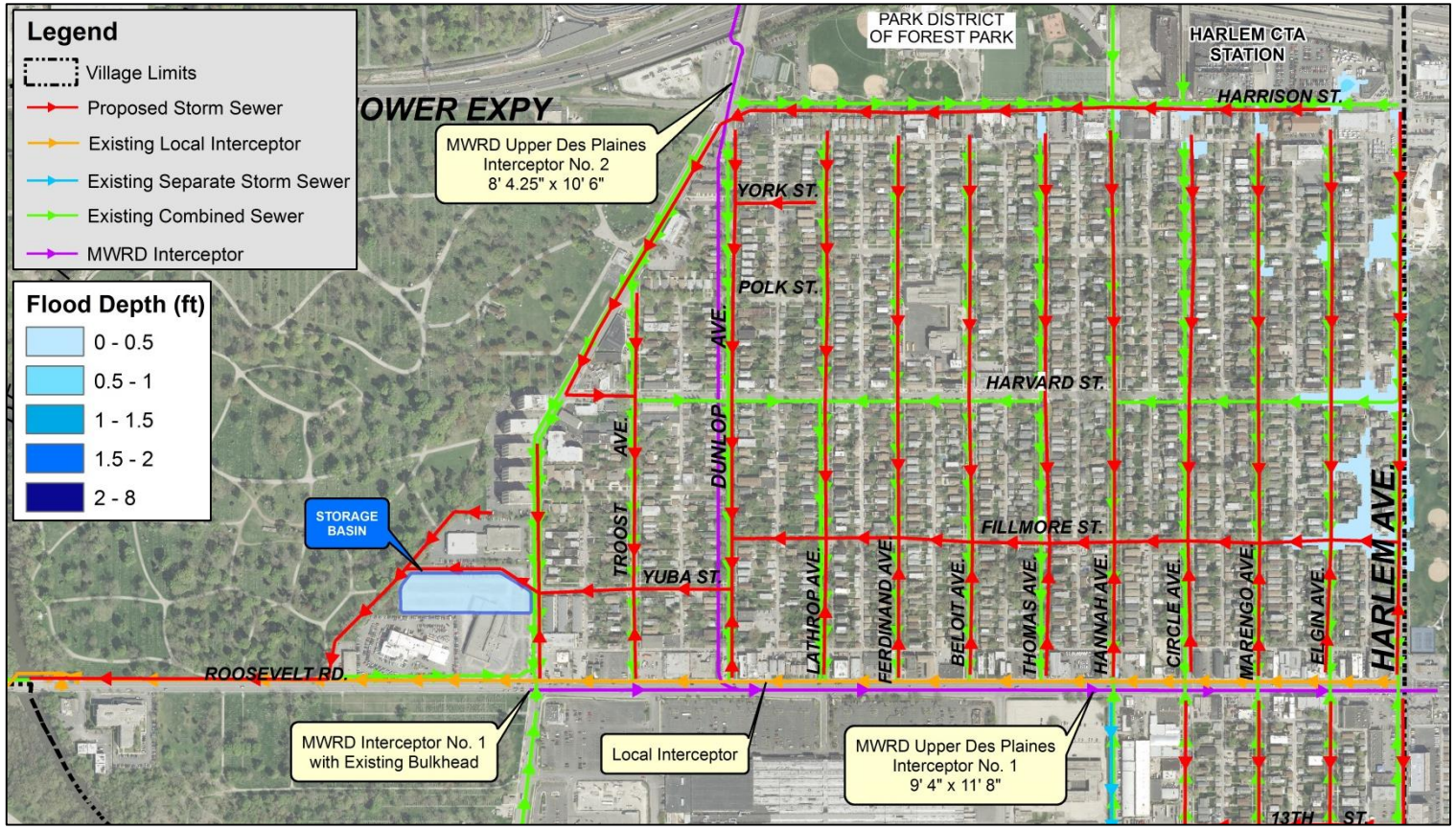
- Convert existing combined sewer in Roosevelt Road to storm sewer and use as stormwater outfall to Des Plaines River
- Does NOT include storage basin
- New storm sewer, ranging from 12-inch to 48-inch, as needed to completely separate sanitary sewer and storm sewer throughout Area 2
- Combined sewers become sanitary sewer in north-south streets
- Use MWRD Interceptor No. 1 to convey wastewater to the east

Street Flooding in Area 2 - Alternative 1B: July 2010 Storm



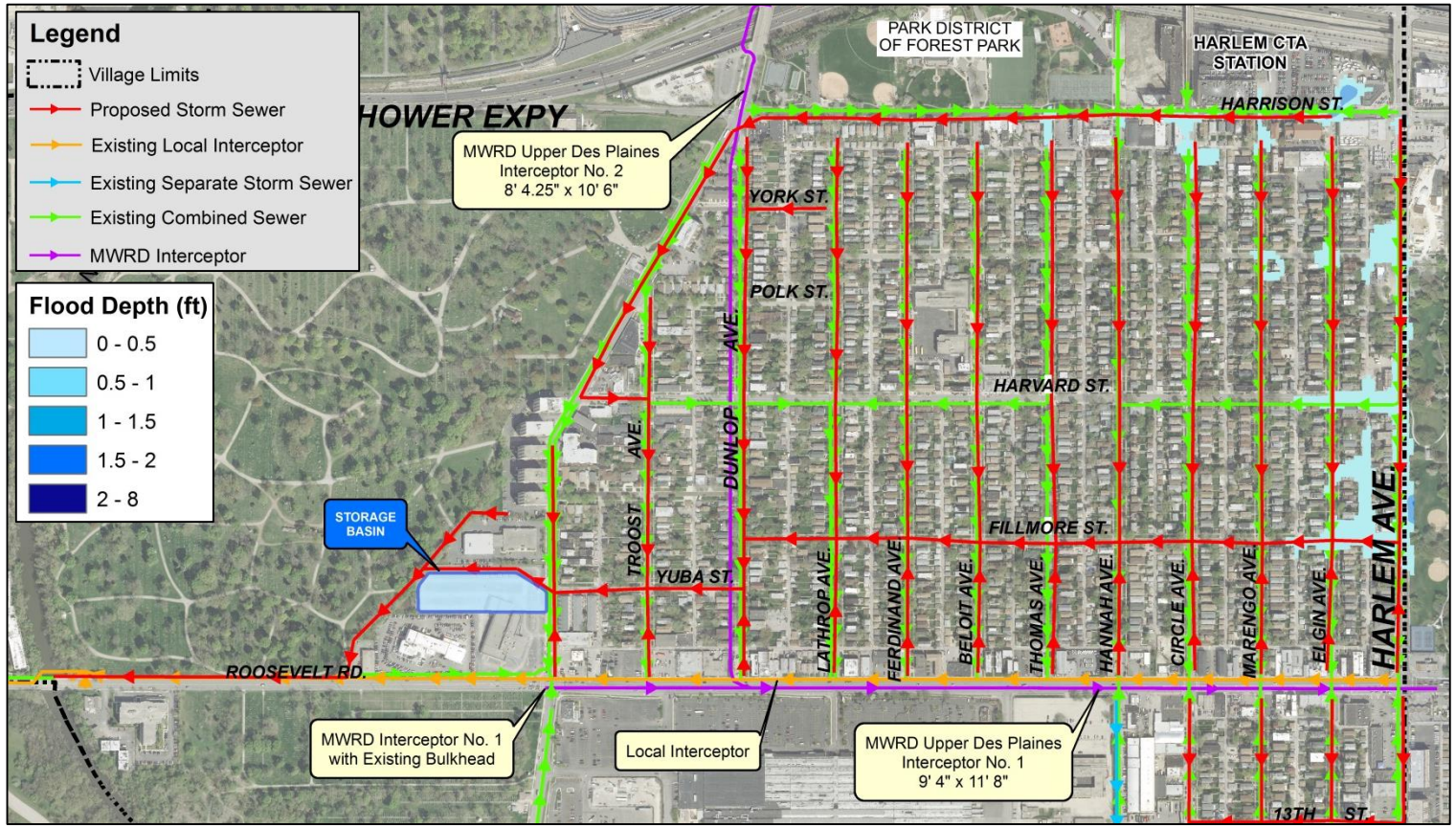
- Convert existing combined sewer in Roosevelt Road to storm sewer and use as stormwater outfall to Des Plaines River
- Does NOT include storage basin
- New storm sewer, ranging from 12-inch to 48-inch, as needed to completely separate sanitary sewer and storm sewer throughout Area 2
- Combined sewers become sanitary sewer in north-south streets
- Use MWRD Interceptor No. 1 to convey wastewater to the east

Street Flooding in Area 2 – Alternative 2A: 10-Year Storm



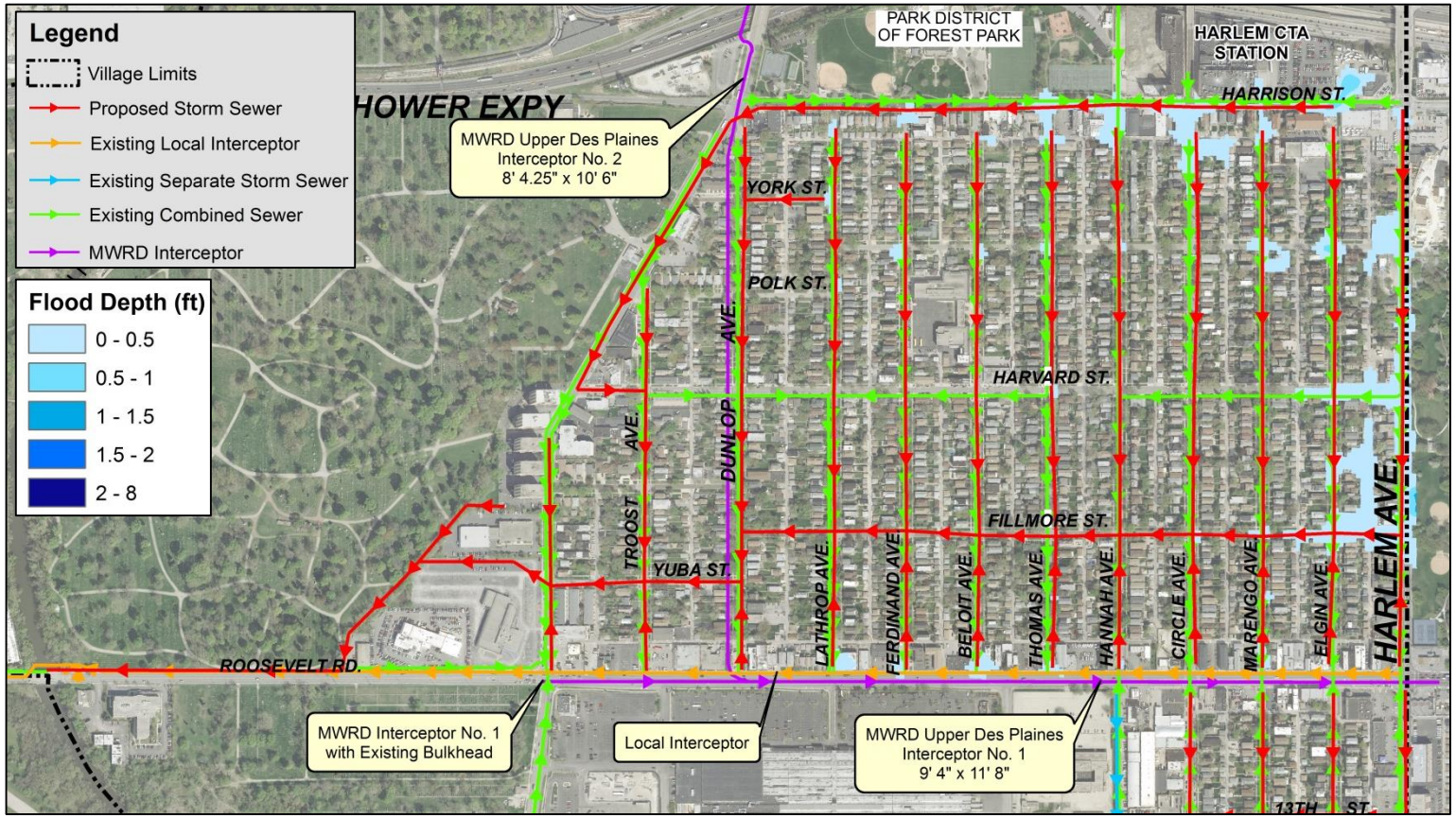
- New 84" stormwater outfall to Des Plaines River
- Include storage basin and pump station at Roosevelt Road and Des Plaines Avenue
- New storm sewers, ranging from 12-inch to 48-inch, as needed to completely separate sanitary sewer and storm sewer throughout Area 2
- Combined sewers become sanitary sewer in north-south streets
- Continue to use the local interceptor in Roosevelt Road to convey wastewater to the west

Street Flooding in Area 2 – Alternative 2A: July 2010 Storm



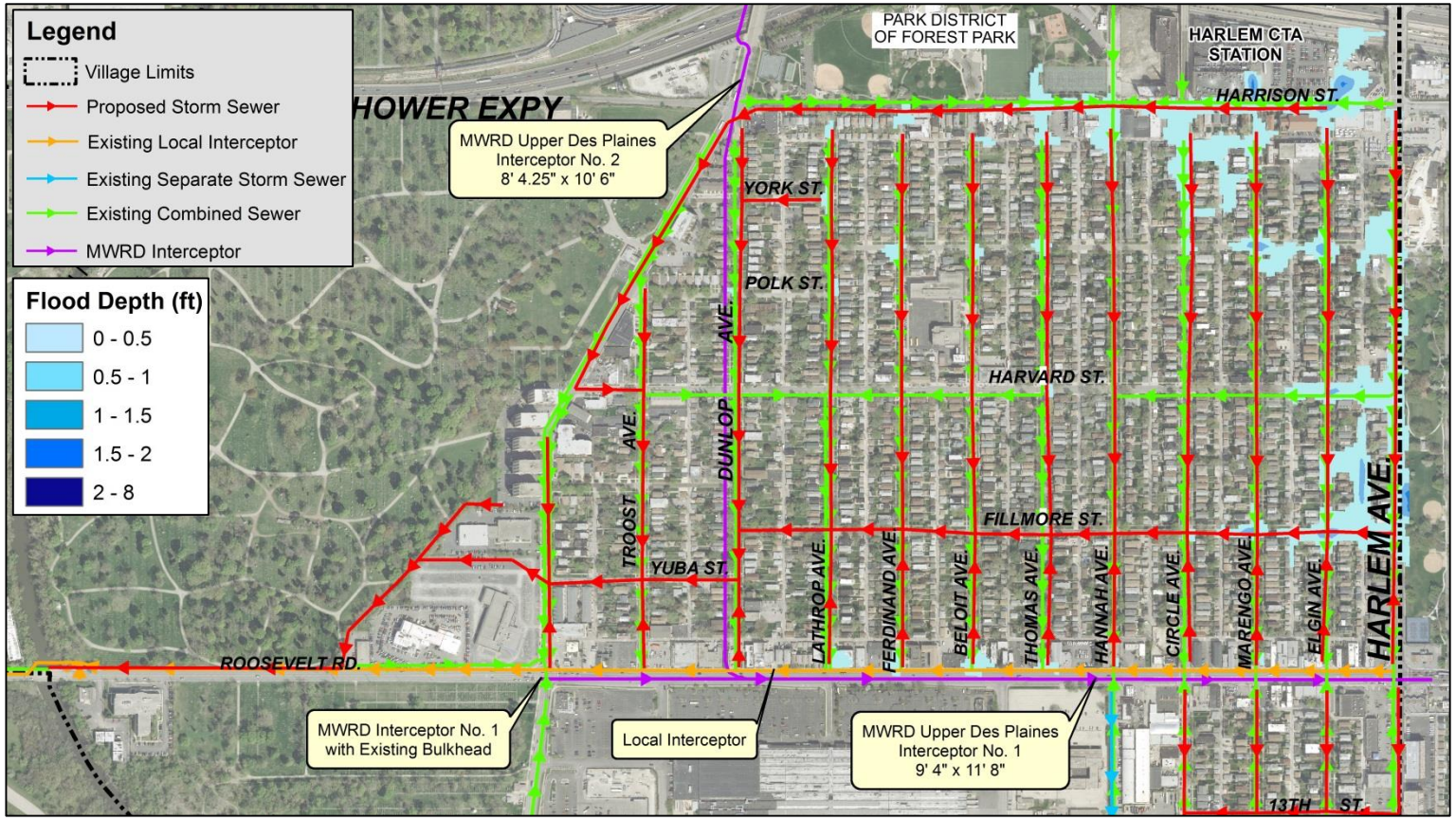
- New 84" stormwater outfall to Des Plaines River
- Include storage basin and pump station at Roosevelt Road and Des Plaines Avenue
- New storm sewer, ranging from 12-inch to 48-inch, as needed to completely separate sanitary sewer and storm sewer throughout Area 2
- Combined sewers become sanitary sewer in north-south streets
- Continue to use the local interceptor in Roosevelt Road to convey wastewater to the west

Street Flooding in Area 2 – Alternative 2B: 10-Year Storm



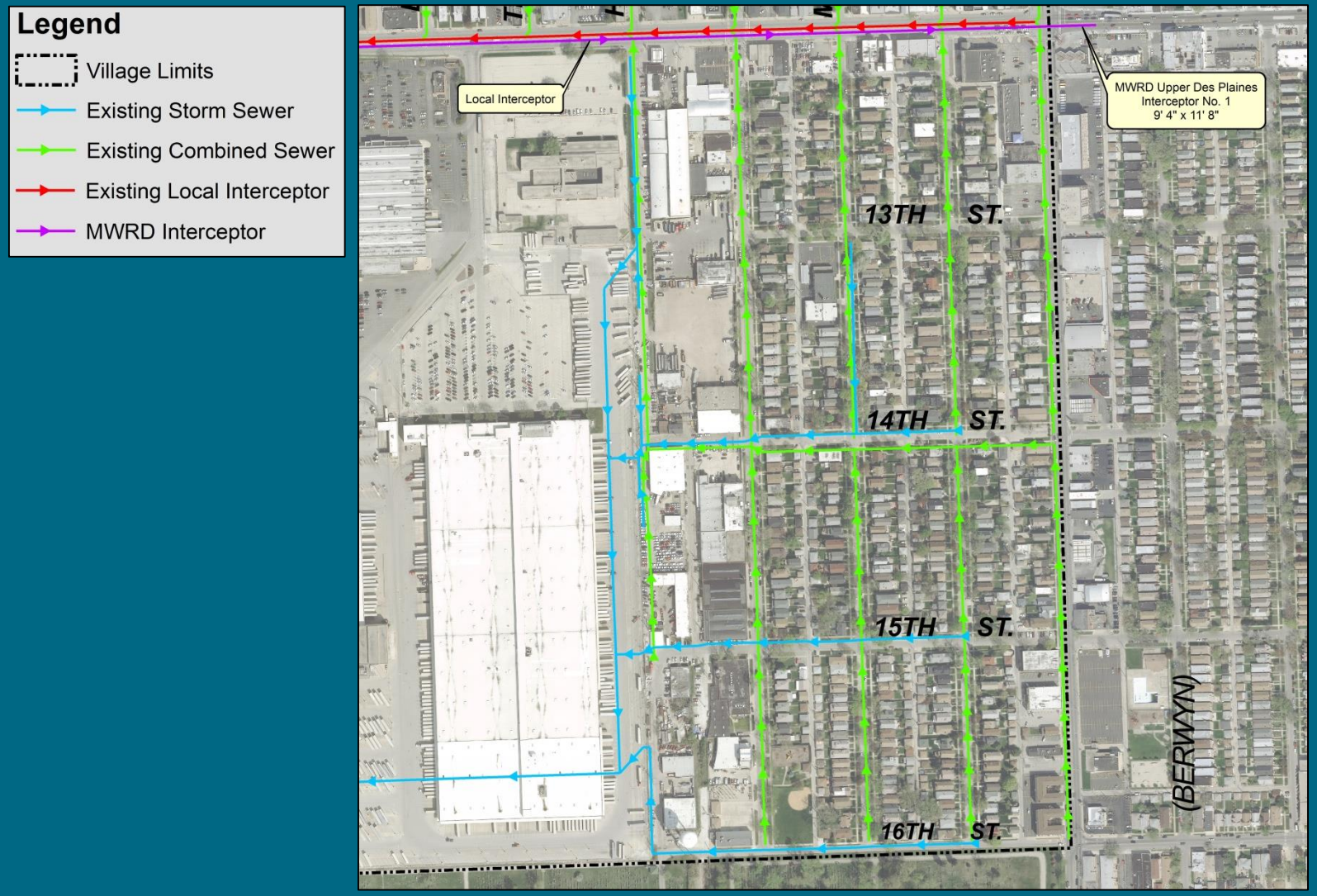
- New 84" stormwater outfall to Des Plaines River
- Does NOT include storage basin at Roosevelt Road and Des Plaines Avenue
- New storm sewers, ranging from 12-inch to 48-inch, as needed to completely separate sanitary sewer and storm sewer throughout Area 2
- Combined sewers become sanitary sewer in north-south streets
- Continue to use the local interceptor in Roosevelt Road to convey wastewater to the west

Street Flooding in Area 2 - Alternative 2B: July 2010 Storm



- New 84" stormwater outfall to Des Plaines River
- Does NOT include storage basin at Roosevelt Road and Des Plaines Avenue
- New storm sewer, ranging from 12-inch to 48-inch, as needed to completely separate sanitary sewer and storm sewer throughout Area 2
- Combined sewers become sanitary sewer in north-south streets
- Continue to use the local interceptor in Roosevelt Road to convey wastewater to the west

Area 3 (South Area)



The combined sewer system drains 80 acres of tributary area.

Existing Level-of-Protection is less than a 1-year storm event.

Overview of Existing Area 3

Two main issues causing flood problems in Area 1:

(1) **Area is Not Fully Separated –** Combined sewers drain portions of Area 3, leading to sewer backups in basements during heavy rainfall events.

(2) **Inadequate Pipe Capacity –** Storm sewer and combined sewer too small to convey even a 1-year storm event without street flooding.

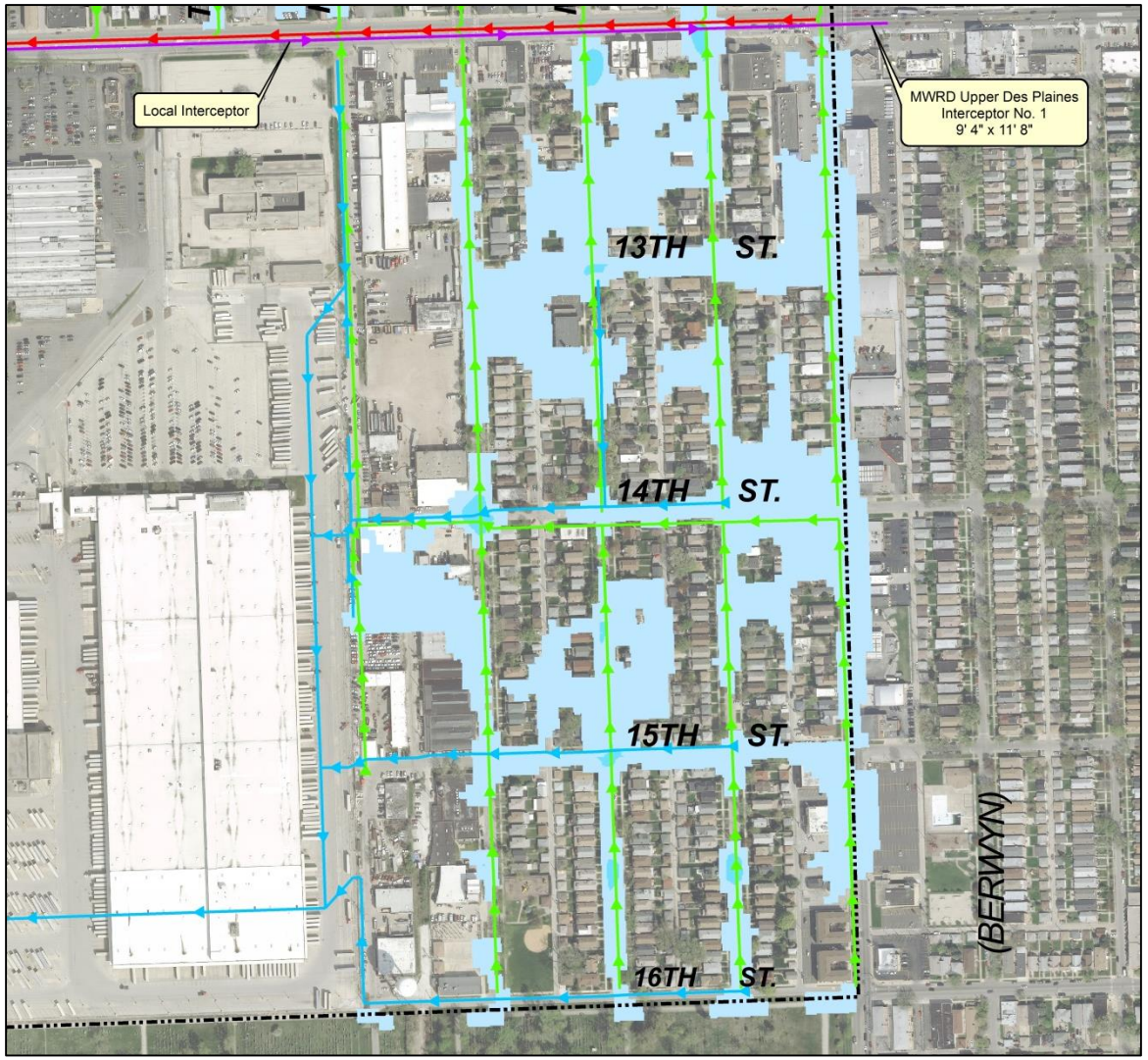
Existing Street Flooding in Area 3: 10-Year Storm Event

Legend

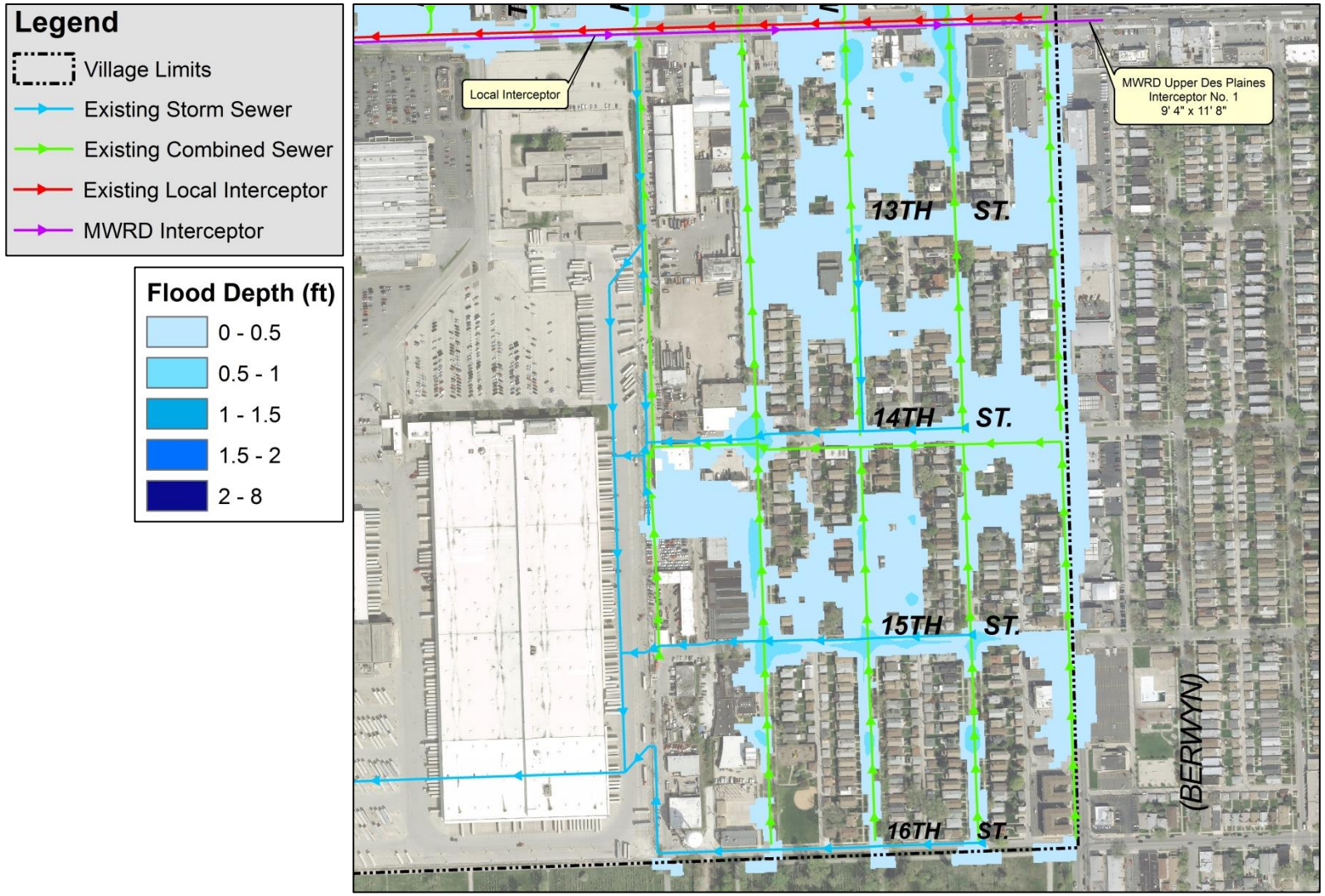
- Village Limits
- Existing Storm Sewer
- Existing Combined Sewer
- Existing Local Interceptor
- MWRD Interceptor

Flood Depth (ft)

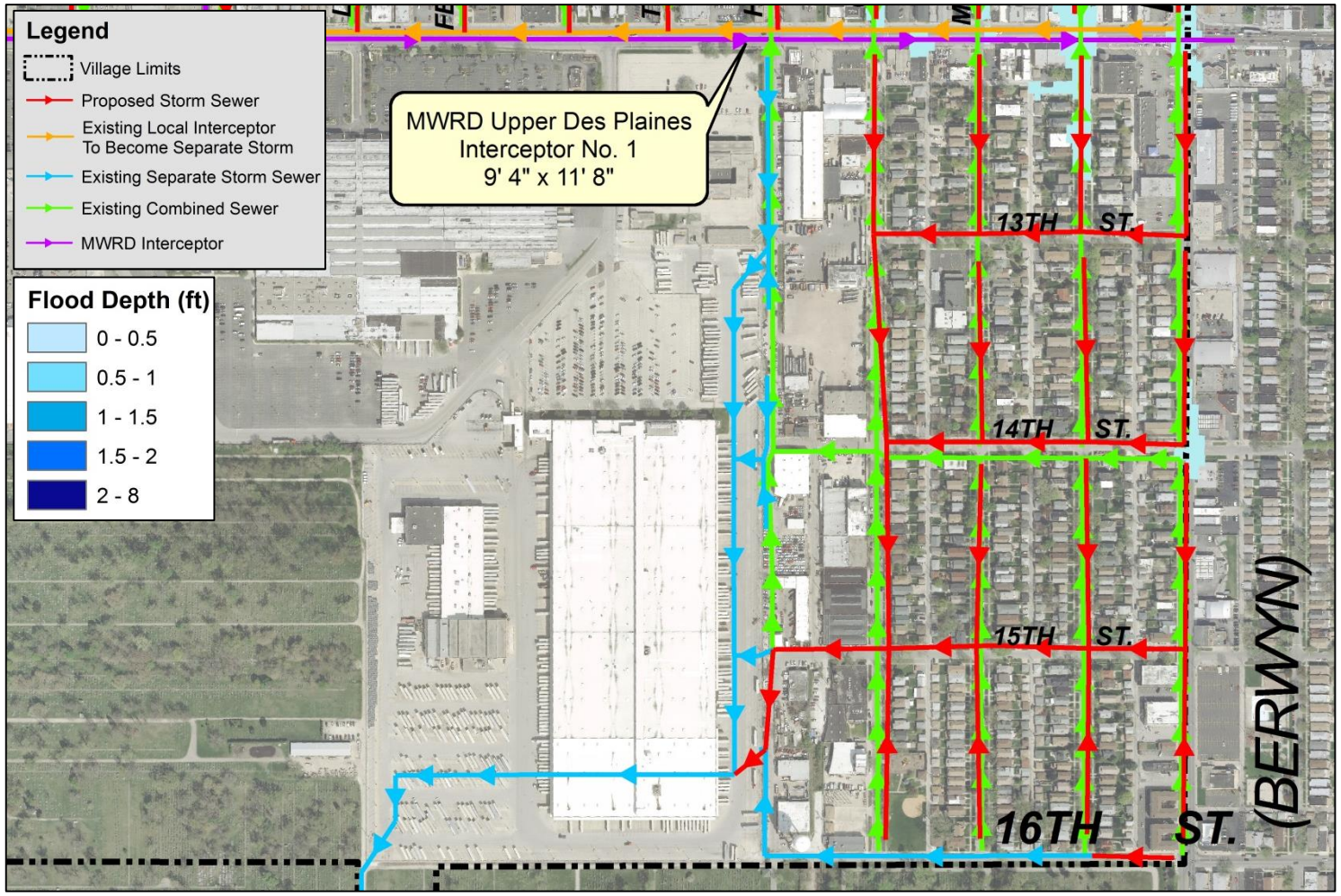
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 8



Existing Street Flooding in Area 3: July 2010 Storm Event

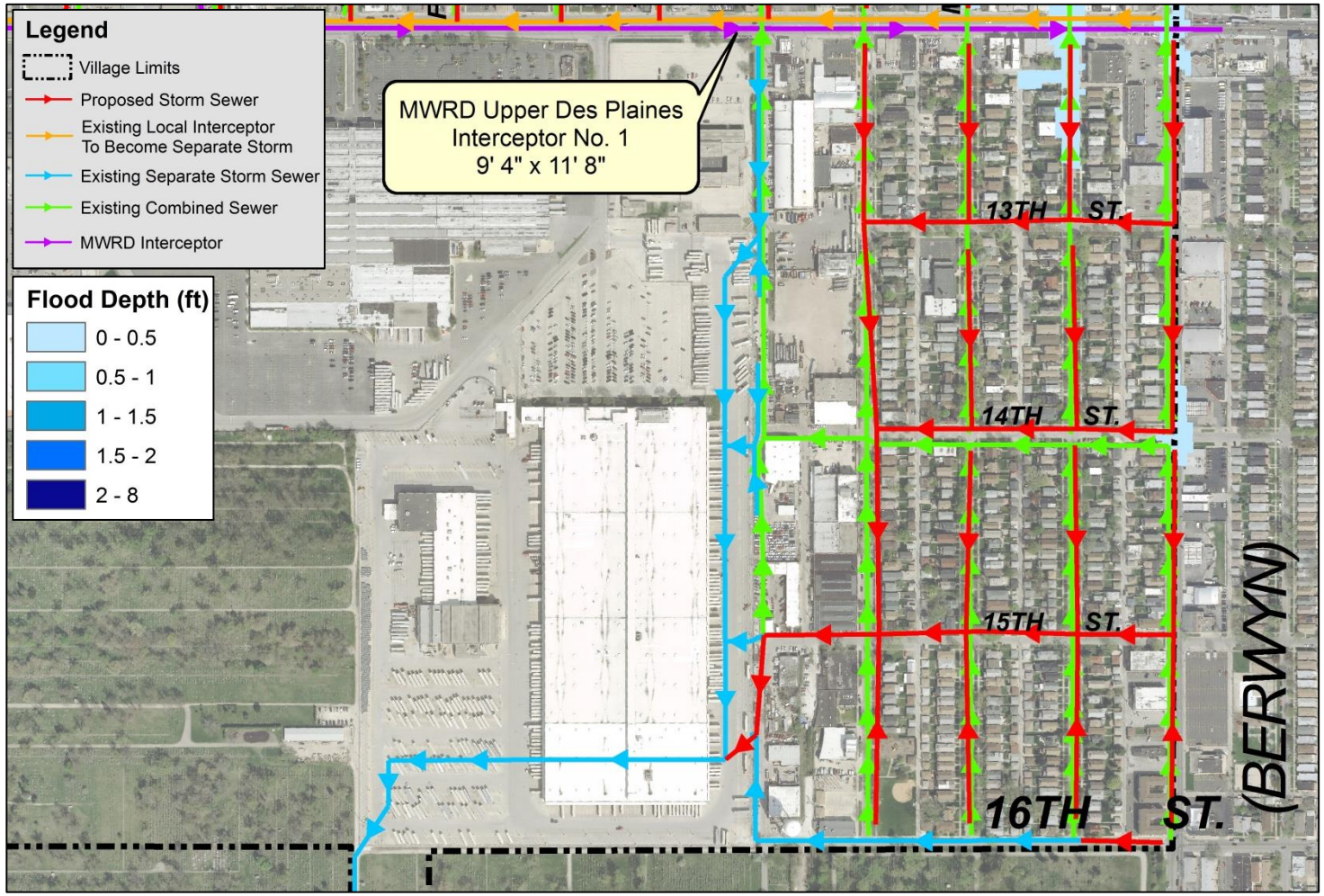


Street Flooding in Area 3 – Alternative 1: 10-Year Storm



- Utilize existing 72" outfall to Des Plaines River
- Enlarge existing storm sewer system with storm sewer ranging from 24-inch to 60-inch, to provide 10-year level-of-protection from street flooding, completely separate sanitary and storm

Street Flooding in Area 3 – Alternative 1: July 2010 Storm



- Utilize existing 72" outfall to Des Plaines River
- Enlarge existing storm sewer system with storm sewer ranging from 24-inch to 60-inch, to provide 10-year level-of-protection from street flooding, completely separate sanitary and storm

Area 2 and 3 Alternatives – Flood Reduction Benefits

- **Number of Parcels with Stormwater Encroachment from Surcharged Sewers**

	Existing Conditions	Alternative 1A	Alternative 1B	Alternative 2A	Alternative 2B
July 2010	1,505	213	436	94	185
10-Year	1,269	203	361	65	153

- **Note: These parcels are defined as parcels in which street flooding encroaches onto the property. These parcels receive flood reduction benefits, even if they still have stormwater encroachment. The depth of the flooding encroachment is reduced with the alternatives in place.**

Estimated Project Cost

Unit costs taken from recently completed projects.

- Storm sewers/trench backfill
- Manholes/catch basins
- Pavement patching/HMA removal and replacement
- Sanitary & watermain services

Assumptions in costs estimates:

- 15% Contingency
- 6% Design Engineering
- 10% Construction Engineering

Conceptual cost estimates do **not** include items such as:

- **Land acquisition**
- Temporary/permanent construction easements
- Relocation of utilities

Estimated Project Cost

Area 1 (North Area)

- Alternative 1 = $12,600,000
- Alternative 2 = $17,400,000
- Alternative 3 = $34,700,000

Area 2 (Middle Area)

- Alternative 1A = $37,000,000
- Alternative 1B = $21,200,000
- Alternative 2A = $46,400,000
- Alternative 2B = $30,600,000

Area 3 (South Area)

- Alternative 1 = $9,300,000

Permitting Requirements for Sewer Separation

IEPA Sanitary – If new sanitary sewers are required

IEPA Water – If watermain relocation is required

US Army Corps of Engineers

IDNR – Statewide Permit

MWRDGC

Village of Forest Park

Next Steps

- Village to review Sewer Separation Evaluation Conclusions
- Meet with MWRD
- Initial Coordination with other Permitting Agencies
- Consider Funding Options
- Refine Alternatives