

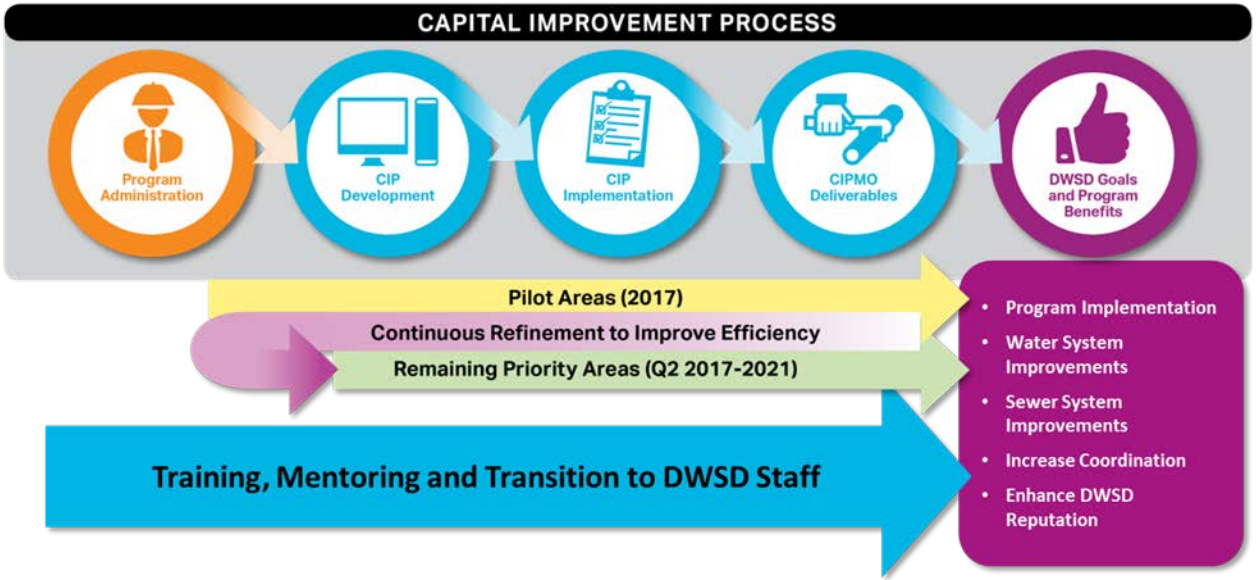
DWSD Water Board Briefing
CIPMO Progress

2 May 2018, 2:30pm, DWSD Randolph

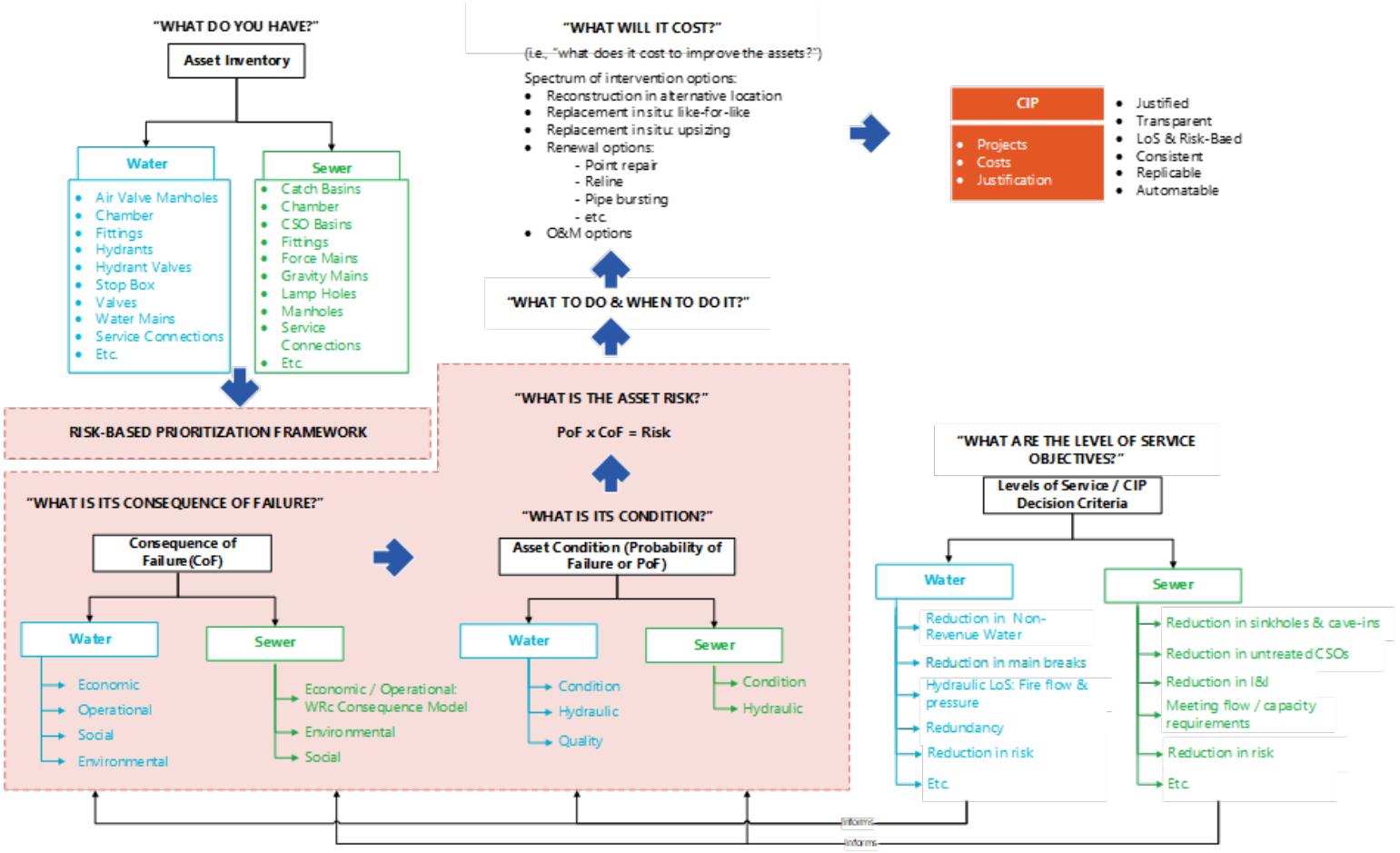
Mike McClure, Program Manager
Devan Thomas, Planning Manager

AECOM

CS-1812: Capital Improvement Planning Management Organization



Asset Management is the Foundation of our Planning Process



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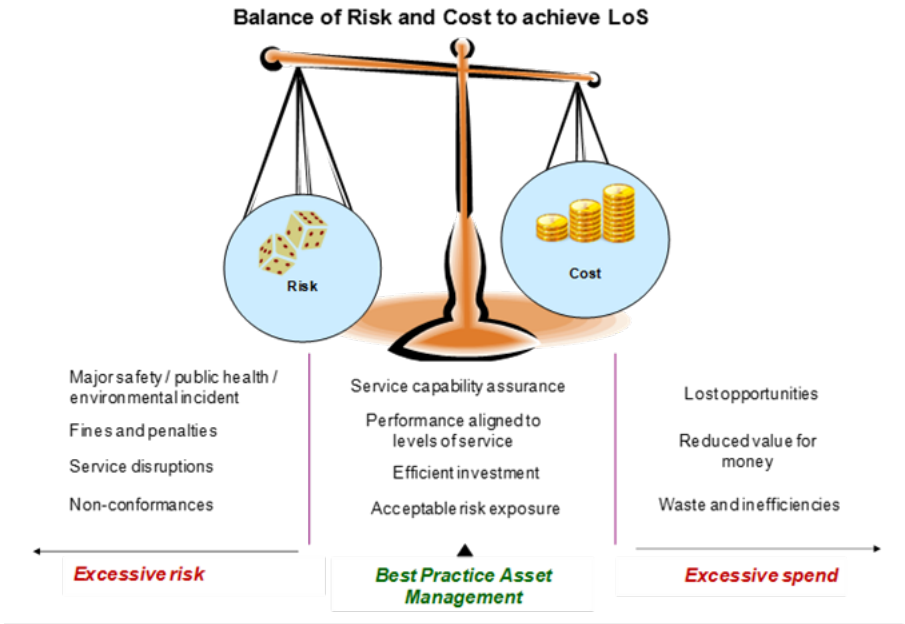
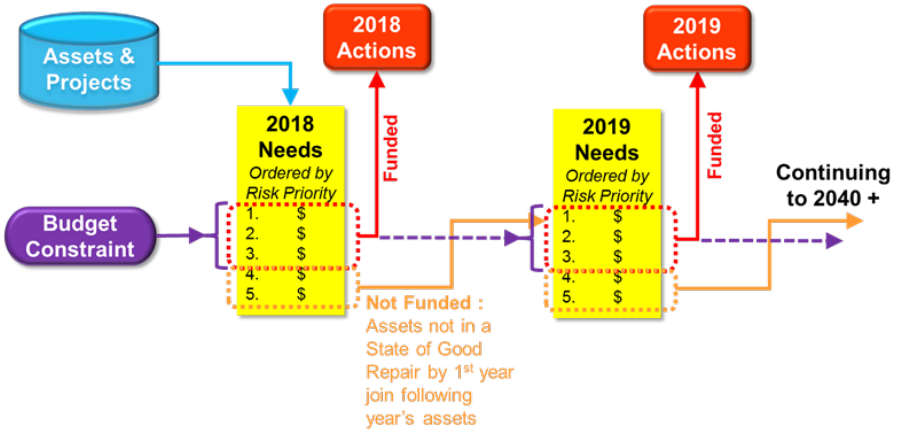
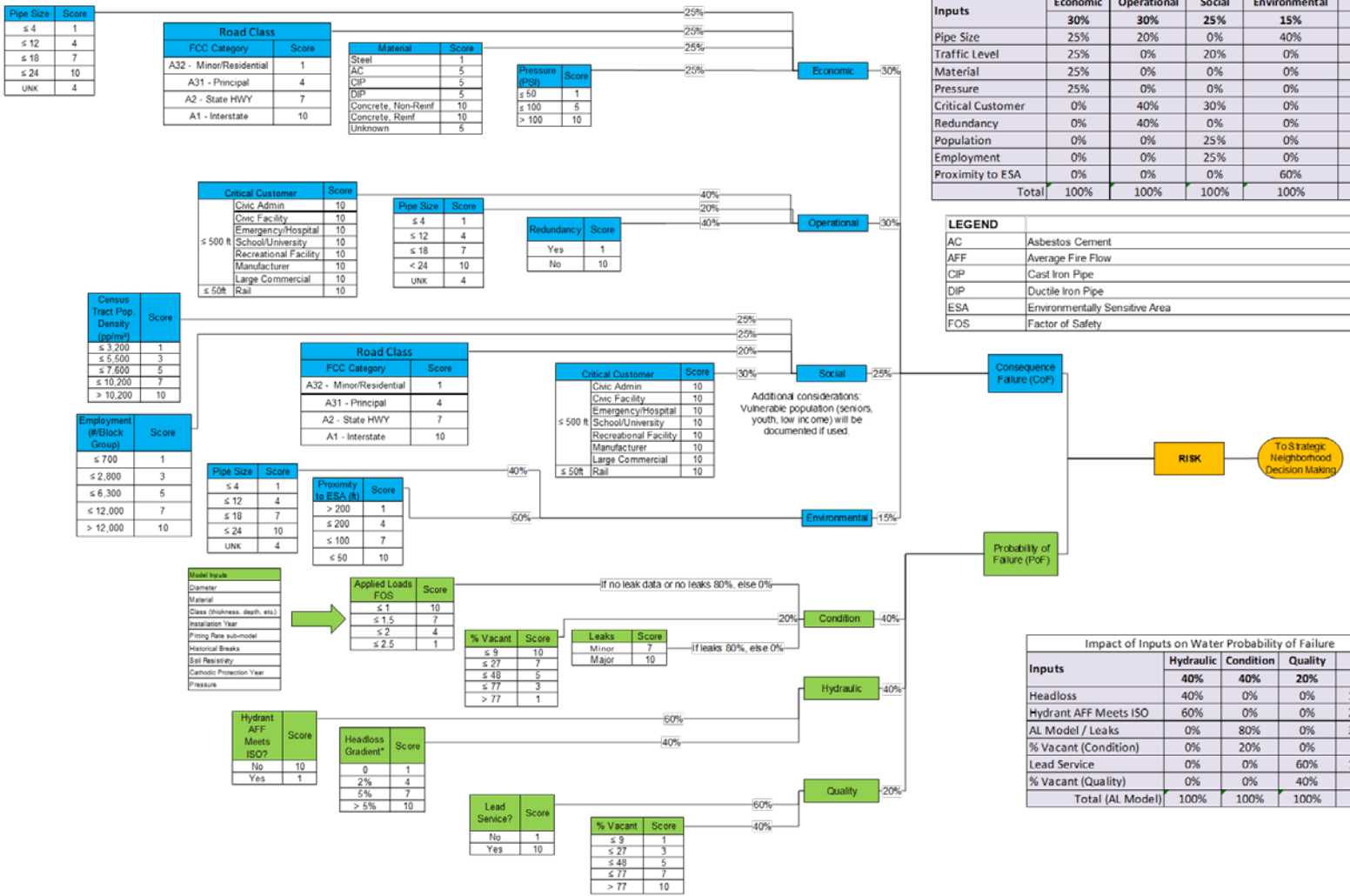
Creating Defensible, Systematic and Repeatable CIPs





DWSD
RISK FRAMEWORK - WATER



Impact of Inputs on Water Consequence of failure					
Inputs	**Economic**	**Operational**	**Social**	**Environmental**	**Total**
	30%	**30%**	**25%**	**15%**	**100%**
Pipe Size	25%	20%	0%	40%	19.5%
Traffic Level	25%	0%	20%	0%	12.5%
Material	25%	0%	0%	0%	7.5%
Pressure	25%	0%	0%	0%	7.5%
Critical Customer	0%	40%	30%	0%	19.5%
Redundancy	0%	40%	0%	0%	12.0%
Population	0%	0%	25%	0%	6.3%
Employment	0%	0%	25%	0%	6.3%
Proximity to ESA	0%	0%	0%	60%	9.0%
Total	100%	100%	100%	100%	100%

LEGEND	
AC	Asbestos Cement
AFF	Average Fire Flow
CIP	Cast Iron Pipe
DIP	Ductile Iron Pipe
ESA	Environmentally Sensitive Area
FOS	Factor of Safety

Impact of Inputs on Water Probability of Failure				
Inputs	**Hydraulic**	**Condition**	**Quality**	**Total**
	40%	**40%**	**20%**	**100%**
Headloss	40%	0%	0%	16.0%
Hydrant AFF Meets ISO	60%	0%	0%	24.0%
AL Model / Leaks	0%	80%	0%	32.0%
% Vacant (Condition)	0%	20%	0%	8.0%
Lead Service	0%	0%	60%	12.0%
% Vacant (Quality)	0%	0%	40%	8.0%
Total (AL Model)	100%	100%	100%	100%

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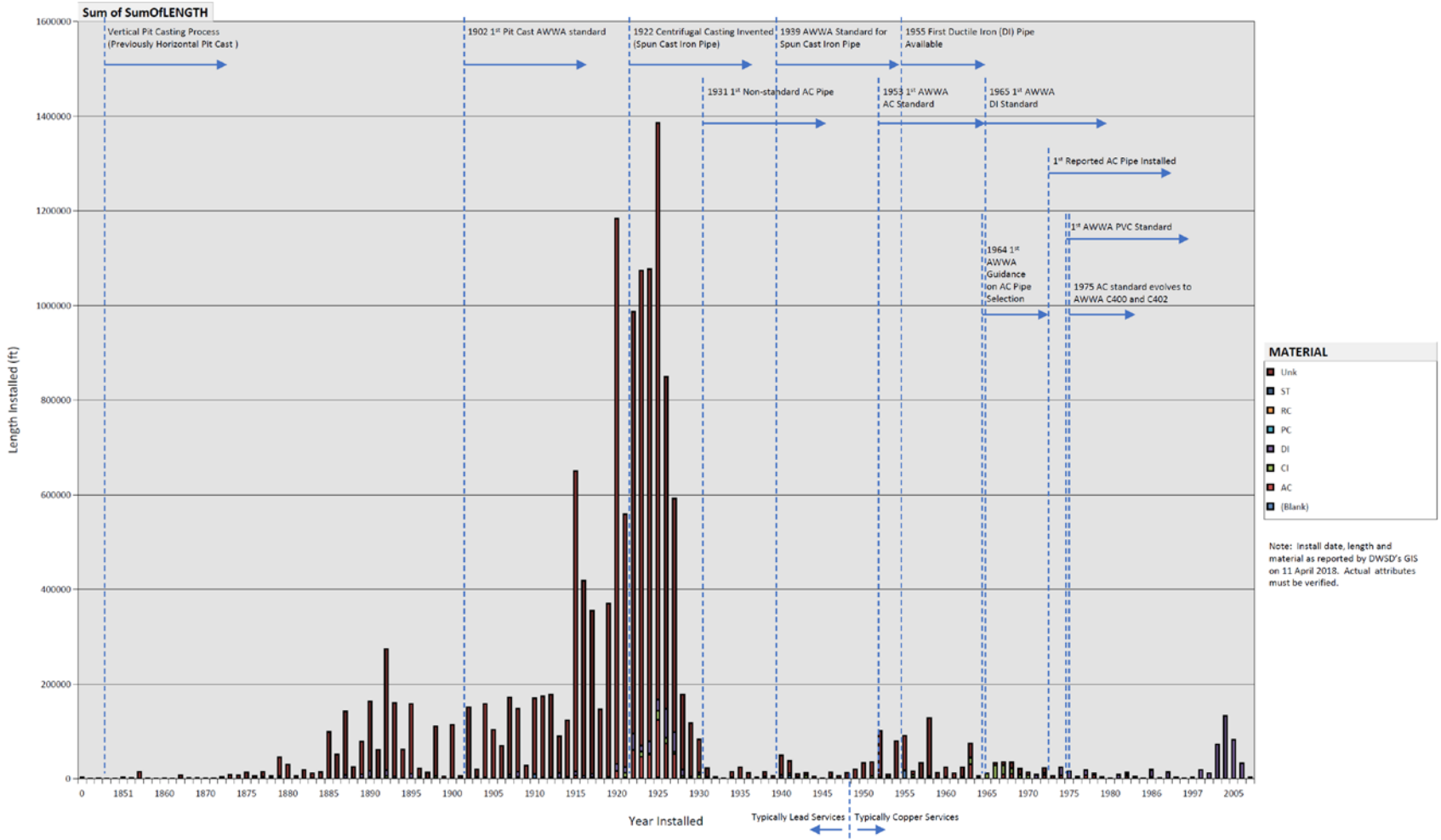
Summary of Pipe Vintages Found in Detroit

OPERATEDBY
DWSD



Note: Install date, length and material as reported by DWSD's GIS on 11 April 2018. Actual attributes must be verified.

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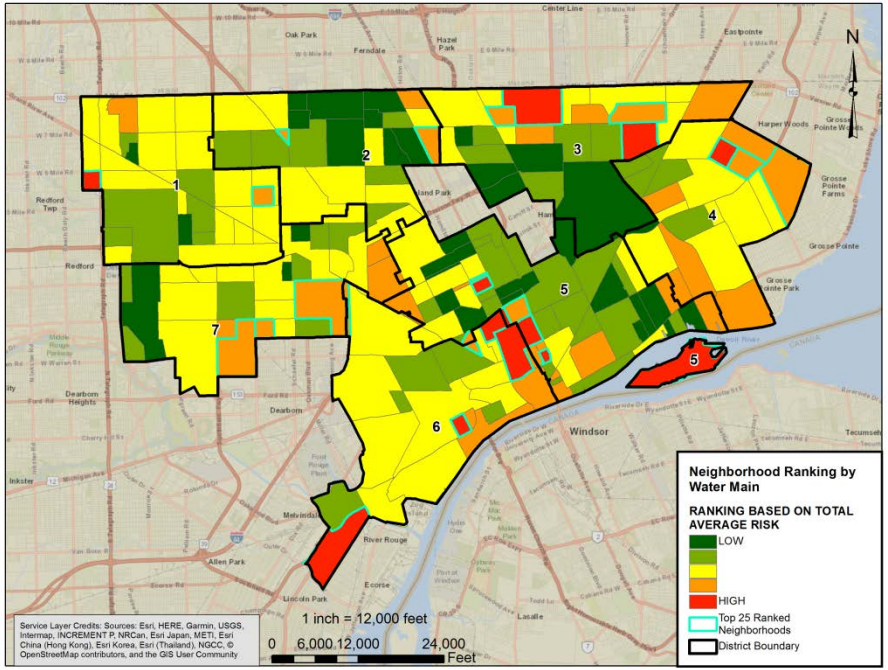
Water Main Neighborhoods by Risk

Neighborhood	Average Pipe Risk Score	Length Weighted Average Risk (LWAR)	Total Pipe Length (ft)	Rank	PDD 20-Minute Neighborhood	Current / Recent Planning Study	Recent Demolition Activity*	Council District	PDD Score	Planning Score	Demo Score	Total	Final Rank
Brewster Douglas	16.34	16.58	10,588	1	Yes	Yes	Yes	5	1.4	1.4	1.4	20.54	1
New Center Commons	15.97	18.11	17,249	2	Yes	No	No	5	1.4	0	0	17.37	4
Hubbard Farms	15.67	16.58	25,659	3	Yes	Yes	Yes	6	1.4	1.4	1.4	19.87	2
Belle Isle	15.29	15.76	61,551	4	No	No	No	5	0	0	0	15.29	19
Medical Center	15.18	15.72	47,870	5	Yes	No	No	5	1.4	0	0	16.58	8
Midtown	15.16	15.57	116,817	6	Yes	No	Yes	6	1.4	0	1.4	17.96	3
Von Steuben	15.08	14.32	94,439	7	No	No	Yes	3	0	0	1.4	16.48	9
South of Six	14.97	16.95	23,743	8	No	No	Yes	1	0	0	1.4	16.37	10
Wayne State	14.97	15.69	47,639	9	Yes	No	No	6	1.4	0	0	16.37	11
Farwell	14.91	16.45	140,575	10	No	No	Yes	3	0	0	1.4	16.31	12
Derby	14.43	16.48	34,021	11	No	No	Yes	4	0	0	1.4	15.83	14
Boynton	14.38	13.63	129,936	12	No	No	Yes	6	0	0	1.4	15.78	15
Cornerstone Village	14.08	14.62	155,760	13	Yes	No	Yes	4	1.4	0	1.4	16.88	5
Pulaski	14.02	13.31	82,583	14	No	No	Yes	3	0	0	1.4	15.42	16
Barton-McFarland	13.96	14.39	195,761	15	No	No	Yes	7	0	0	1.4	15.36	17
Fiskhorn	13.93	15.31	30,241	16	No	No	Yes	7	0	0	1.4	15.33	18
Tri-Point	13.81	14.92	8,117	17	No	No	No	2	0	0	0	13.81	25
Virginia Park	13.81	15.47	5,851	18	Yes	Yes	No	5	1.4	1.4	0	16.61	6
Grixdale Farms	13.80	15.62	48,164	19	Yes	No	Yes	2	1.4	0	1.4	16.60	7
West Woodbridge	13.77	13.96	25,995	20	Yes	No	Yes - very little	6	1.4	0	0	15.17	20
Belmont	13.62	15.77	31,014	21	No	No	Yes	1	0	0	1.4	15.02	21
Cultural Center	13.60	13.97	37,824	22	Yes	No	No	5	1.4	0	0	15.00	22
Yorkshire Woods	13.59	14.63	43,560	23	No	No	Yes	4	0	0	1.4	14.99	23
Pershing	13.47	14.84	34,919	24	No	No	Yes	3	0	0	1.4	14.87	24
Warren Ave Community	13.47	13.85	119,118	25	Yes	No	Yes	7	1.4	0	1.4	16.27	13



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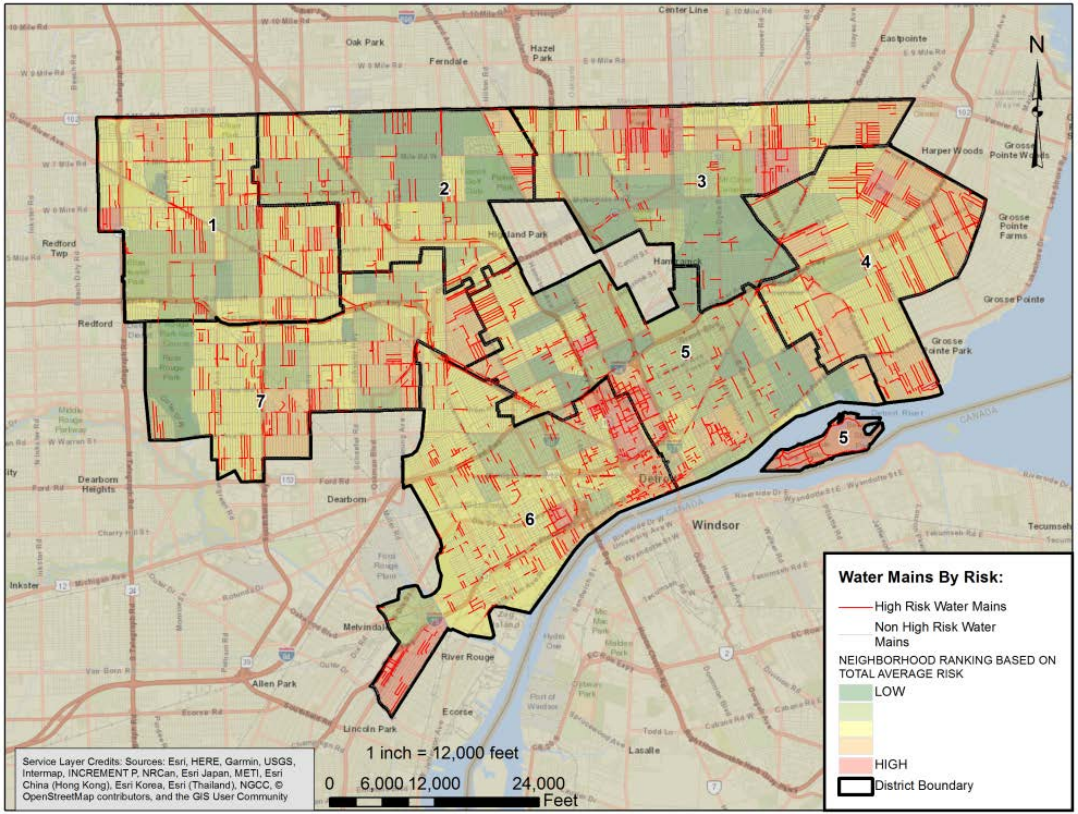
High Risk Water Mains



Water

Consequence of Failure	1	2	3	4	5	Miles of Pipe	
1	Future Assessment	Schedule Assessment	Assess Soon	Assess Now	Assess Now	399	15%
2	Future Assessment	Future Assessment	Schedule Assessment	Assess Soon	Assess Now	355	13%
3	Future Assessment	Future Assessment	Future Assessment	Schedule Assessment	Assess Soon	613	22%
4	Fix on Failure	Fix on Failure	Fix on Failure	Future Assessment	Schedule Assessment	516	19%
5	Fix on Failure	Fix on Failure	Fix on Failure	Future Assessment	Future Assessment	843	31%
						2725	

Probability of Failure

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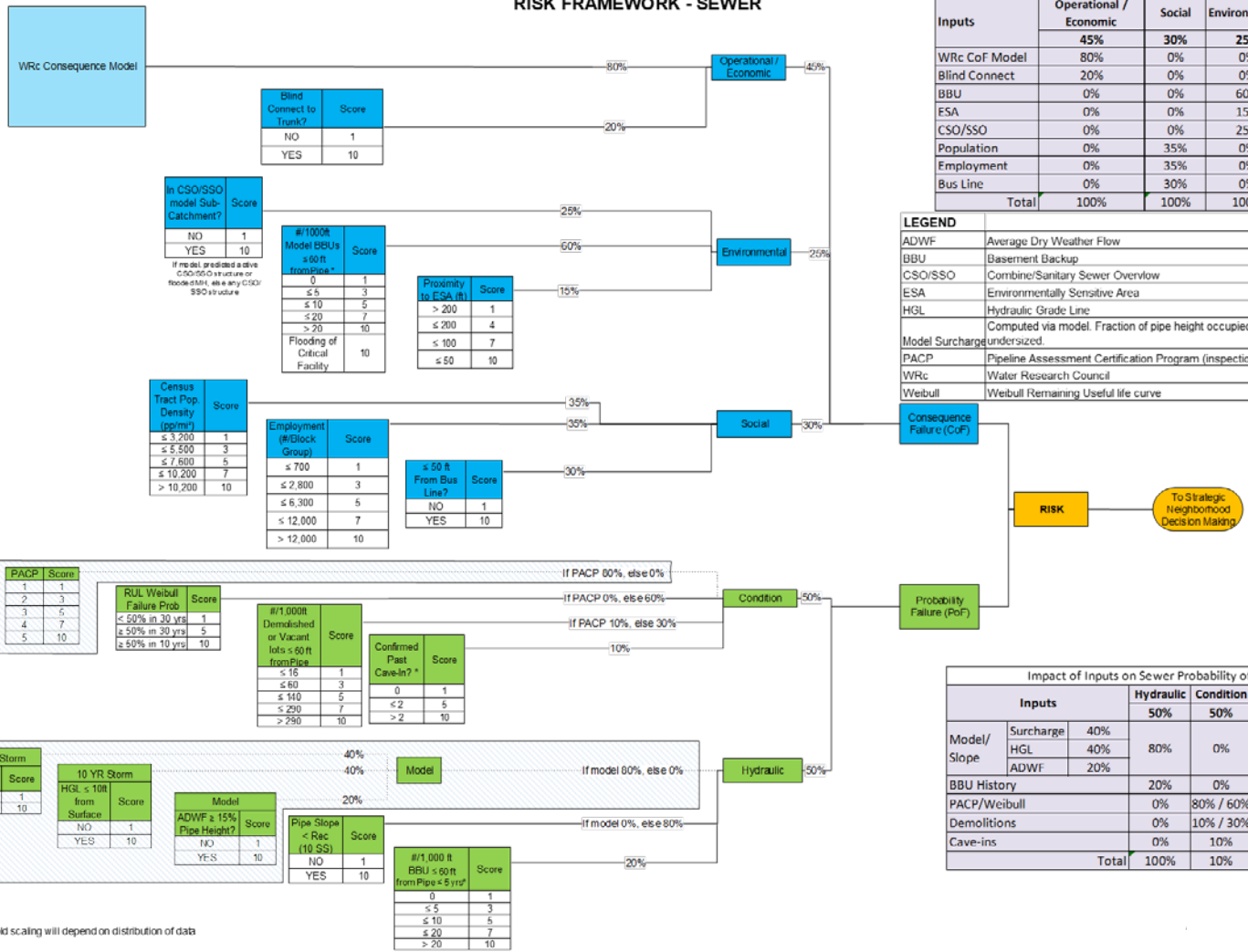
RISK FRAMEWORK - SEWER



*Final threshold scaling will depend on distribution of data

Impact of Inputs on Sewer Structural Consequence of Failure				
Inputs	**Operational / Economic**	**Social**	**Environmental**	**Total**
	45%	**30%**	**25%**	**100%**
WRc CoF Model	80%	0%	0%	36%
Blind Connect	20%	0%	0%	9%
BBU	0%	0%	60%	15%
ESA	0%	0%	15%	4%
CSO/SSO	0%	0%	25%	6%
Population	0%	35%	0%	10.5%
Employment	0%	35%	0%	10.5%
Bus Line	0%	30%	0%	9%
Total	100%	100%	100%	100%

LEGEND	
ADWF	Average Dry Weather Flow
BBU	Basement Backup
CSO/SSO	Combine/Sanitary Sewer Overvlow
ESA	Environmentally Sensitive Area
HGL	Hydraulic Grade Line
Model Surcharge	Computed via model. Fraction of pipe height occupied. Value of 2 means pipe undersized.
PACP	Pipeline Assessment Certification Program (inspection standard)
WRc	Water Research Council
Weibull	Weibull Remaining Useful life curve

Impact of Inputs on Sewer Probability of Failure						
Inputs			**Hydraulic**	**Condition**	**Model Elements**	**Total**
			50%	**50%**		**100%**
Model/ Slope	Surcharge	40%	80%	0%	16.00%	40.0%
	HGL	40%			16.00%	
	ADWF	20%			8.00%	
BBU History			20%	0%		10.0%
PACP/Weibull			0%	80% / 60%		40% / 30%
Demolitions			0%	10% / 30%		5% / 15%
Cave-ins			0%	10%		5.0%
Total			100%	10%		100.0%

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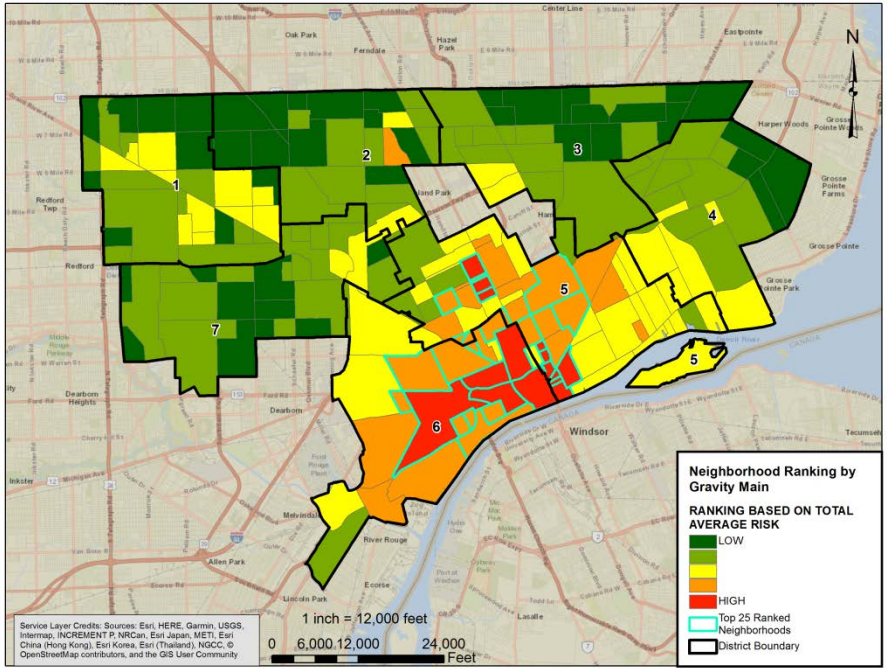
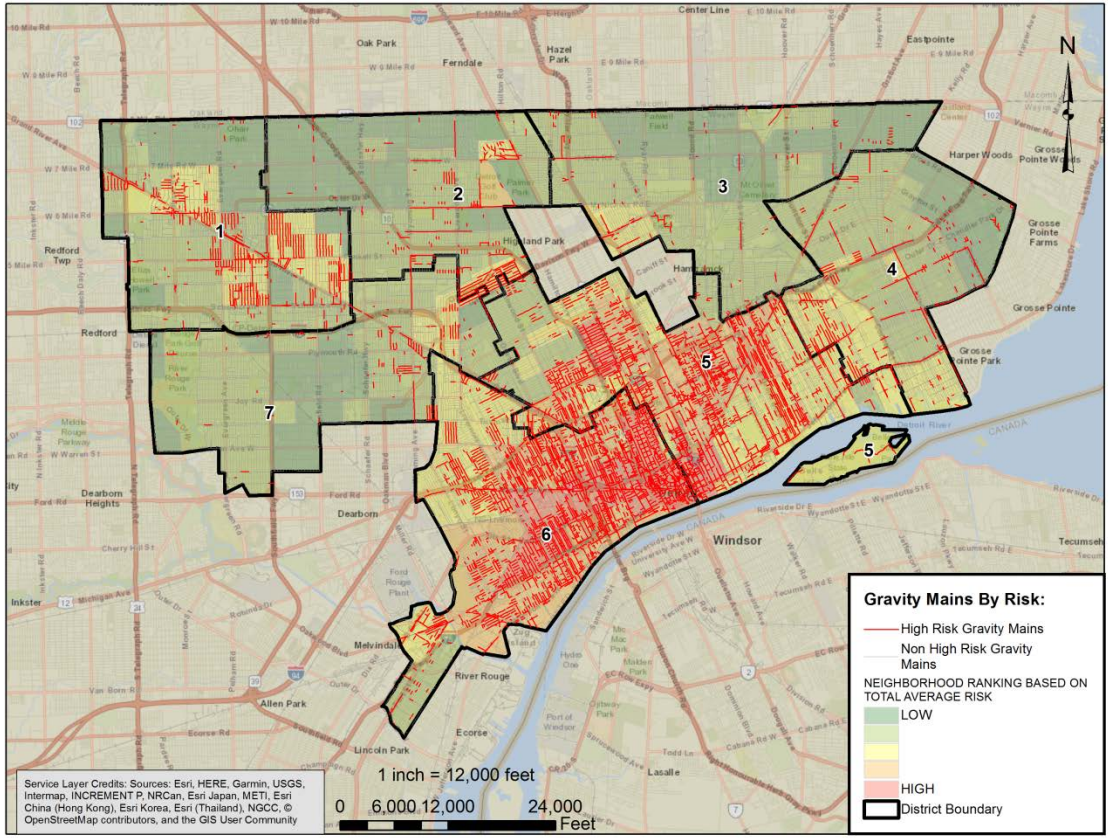
Gravity Main Neighborhoods by Risk

Neighborhood	Average Sewer Risk Score	Length Weighted Average Risk (LWAR)	Total Sewer Length (ft)	Rank	PDD 20-Minute Neighborhood	Current / Recent Planning Study	Recent Demolition Activity*	Council District	PDD Score	Planning Score	Demo Score	Total	Final Rank
Downtown	18.20	19.35	186,785	1	Yes	Yes	No	6	1.6	1.6	0	21.40	2
Greektown	17.76	18.50	10,035	2	Yes	Yes	No	5	1.6	1.6	0	20.96	3
Midtown	17.31	18.84	118,974	3	Yes	No	Yes	6	1.6	0	1.6	20.51	6
Brewster Douglas	16.87	17.11	13,950	4	Yes	Yes	Yes	5	1.6	1.6	1.6	21.67	1
New Center Commons	16.31	16.54	21,436	5	Yes	No	No	5	1.6	0	0	17.91	8
Foxtown	16.21	16.86	21,108	6	Yes	Yes	No	6	1.6	1.6	0	19.41	13
New Center	16.18	16.72	18,495	7	Yes	No	No	5	1.6	0	0	17.78	14
North Corktown	16.17	17.19	93,757	8	Yes	No	Yes - very little	6	1.6	0	0	17.77	15
Lafayette Park	16.11	16.88	46,477	9	Yes	Yes	Yes - very little	5	1.6	1.6	0	19.31	9
Brewster Homes	15.90	17.23	13,172	10	Yes	Yes	Yes	5	1.6	1.6	1.6	20.70	4
Southwest Detroit	15.80	15.84	329,888	11	Yes	Yes	Yes - very little	6	1.6	1.6	0	19.00	10
Piety Hill	15.63	15.75	35,322	12	Yes	Yes - partially	Yes	5	1.6	0	1.6	18.83	5
Corktown	15.60	16.79	89,987	13	Yes	Yes	Yes	6	1.6	1.6	1.6	20.40	11
Hubbard Farms	15.27	15.82	22,748	14	Yes	Yes	Yes	6	1.6	1.6	1.6	20.07	16
Virginia Park	15.17	15.71	2,987	15	Yes	Yes	No	5	1.6	1.6	0	18.37	7
LaSalle Gardens	15.16	15.15	36,578	16	No	No	Yes	5	0	0	1.6	16.76	17
Medical Center	15.11	15.03	24,409	17	Yes	No	No	5	1.6	0	0	16.71	18
Poletown East	15.07	15.36	209,584	18	Yes - partially	No	Yes	5	0	0	1.6	16.67	12
West Woodbridge	15.04	15.34	25,726	19	Yes	Yes - partially	Yes - very little	6	1.6	0	0	16.64	19
Michigan-Martin	14.98	14.51	26,629	20	No	No	Yes	6	0	0	1.6	16.58	20
McDougall	14.94	15.16	130,678	21	Yes - partially	No	Yes	5	0	0	1.6	16.54	21
Chadsey Condon	14.90	14.92	183,411	22	No	No	Yes	6	0	0	1.6	16.50	22
Core City	14.86	15.46	158,249	23	No	No	Yes	6	0	0	1.6	16.46	23
Wayne State	14.73	15.25	43,290	24	Yes	No	No	6	1.6	0	0	16.33	24
West Side Industrial	14.69	15.61	74,524	25	No	No	Yes	6	0	0	1.6	16.29	25



High Risk Gravity Mains (Sewers)



Sewer

Consequence of Failure	1	2	3	4	5	Miles of Pipe	
1	Future Assessment	Schedule Assessment	Assess Soon	Assess Now	Assess Now	716	23%
2	Future Assessment	Future Assessment	Schedule Assessment	Assess Soon	Assess Now	228	7%
3	Future Assessment	Future Assessment	Future Assessment	Schedule Assessment	Assess Soon	1158	36%
4	Fix on Failure	Fix on Failure	Fix on Failure	Future Assessment	Schedule Assessment	1033	32%
5	Fix on Failure	Fix on Failure	Fix on Failure	Future Assessment	Future Assessment	45	1%
	Probability of Failure					3179	

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Approaches to Condition Assessment (CA)

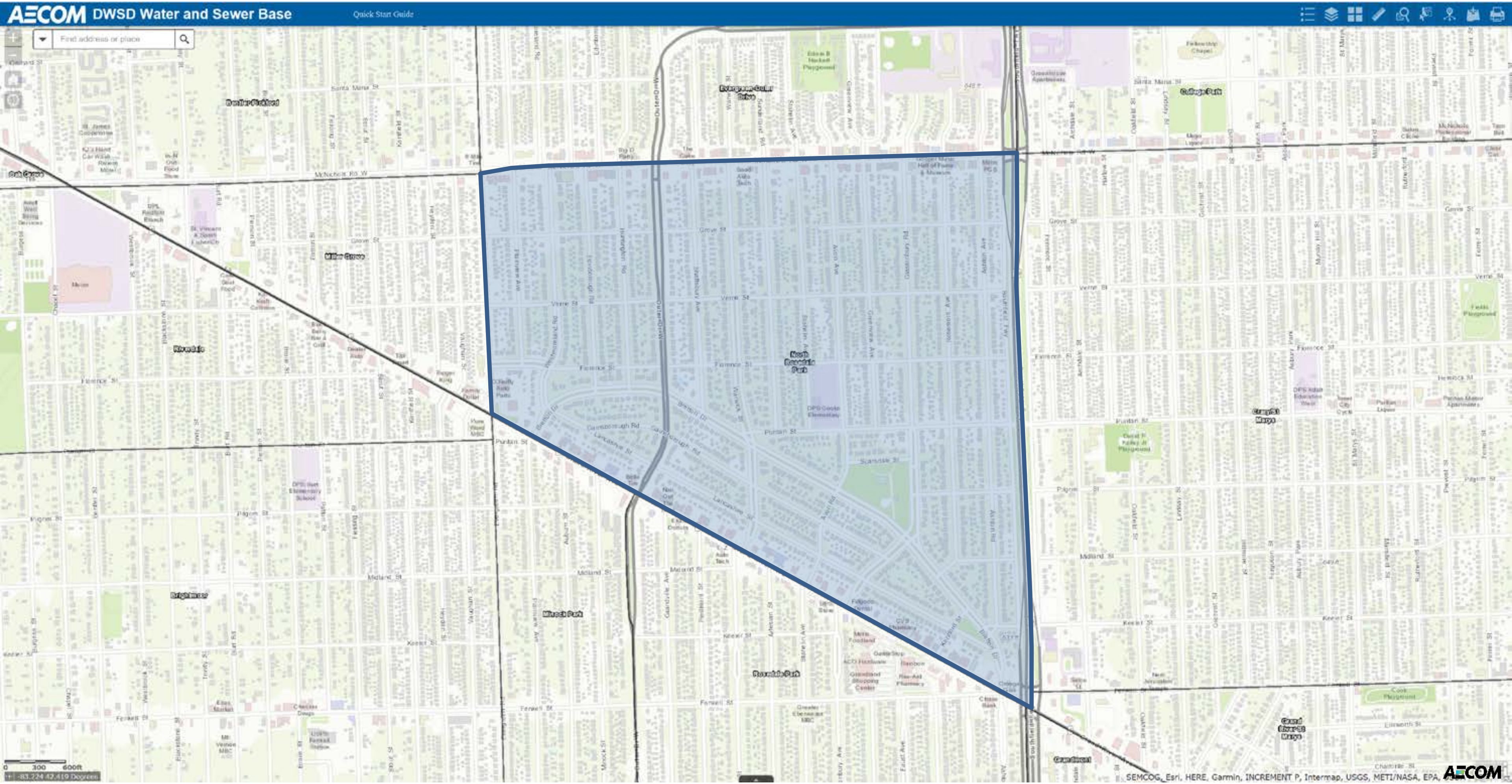
- **Group 1: Pilot Areas**
  - Develop, test and refine prioritization process
  - AECOM procures and delivers CA activities and develops CIPs
  - Pilot Area 1 – North Rosedale Park, Cornerstone Village (completed)
  - Pilot Area 2 – Jefferson Chalmers (CA in summer 2018)
  - Pilot Area 3 – Brightmoor, Miller Grove, Minock Park, Riverdale, and Rosedale Park (CA in su
- **Group 2: Priority Neighborhoods**
  - Perform CA and undertake work to reduce risk and improve Level of Service
  - AECOM identifies areas, DWSD procures and manages CA and AECOM develops CIPS
  - Priority Neighborhoods under discussion
- **Group 3: Priority Assets Not Included in Priority Neighborhoods**
  - Perform CA on critical individual assets to identify needs and immediate projects
  - AECOM identifies areas, DWSD procures and manages CA and AECOM develops CIPS
  - Priority Assets to be discussed
- **Total of CA in Groups 1, 2 and 3 must identify sufficient volume of projects to meet CIP target**

Cornerstone Village Rehabilitation

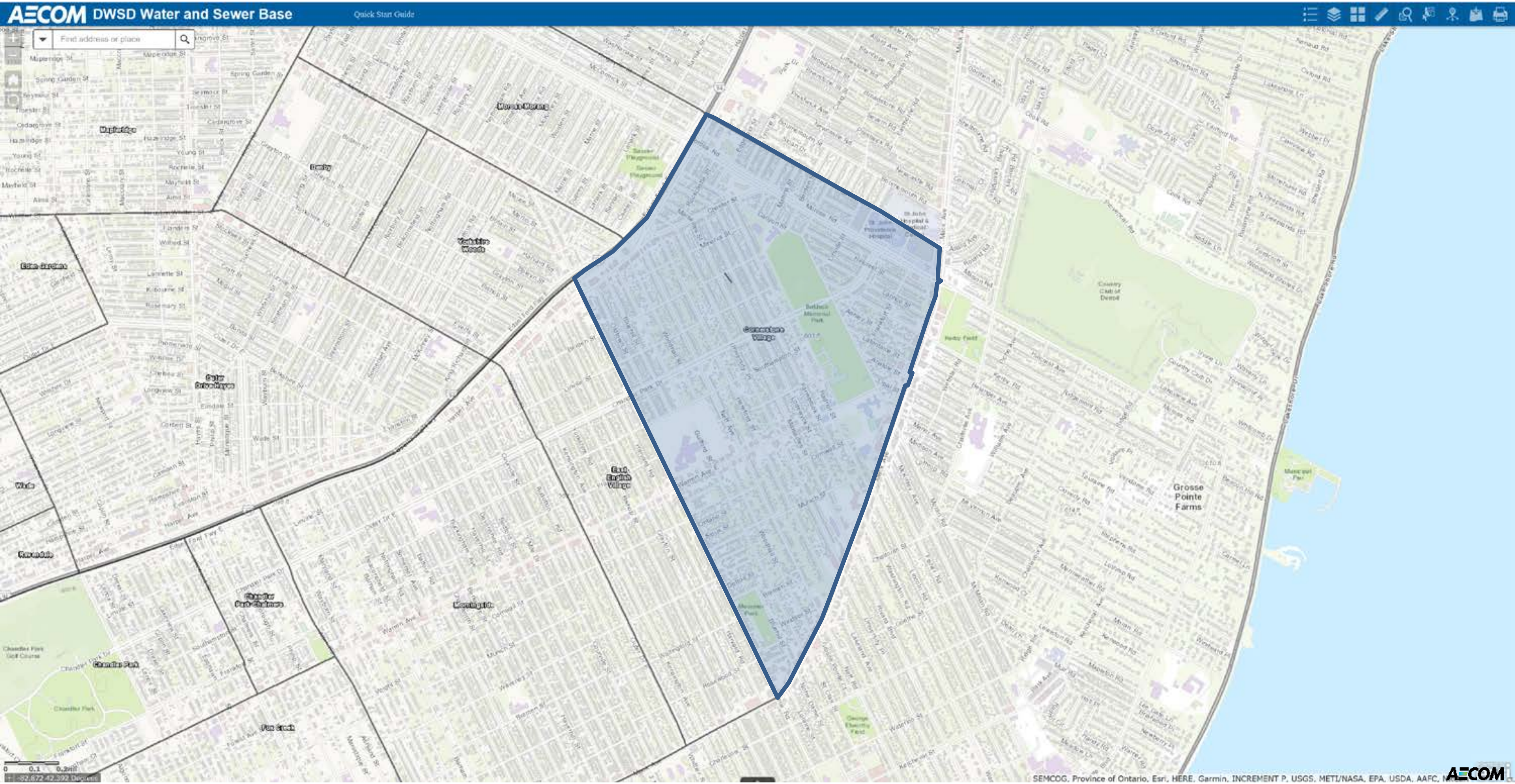
Water System Construction	$ 6,774,075
Sewer System Construction	$13,813,800
Total Construction	$20,587,875

North Rosedale Park Rehabilitation

Water System Construction	$ 6,641,250
Sewer System Construction	$11,954,250
Total Construction	$18,595,500
Grand Total Construction	$39,183,375



DWSD Water and Sewer Base
Quick Start Guide
Find address or place
McNichols Rd W
Grove St
Verne St
Florence St
Puritan St
Midland St
Keeler St
Fenkell St
Miller Grove
Riverdale
Brightmoor
Minock Park
Rosedale Park
College Park
0 300 600ft
SEMCOG, Esri, HERE, Garmin, INCREMENT P, Intermap, USGS, METI/NASA, EPA,


AECOM DWSD Water and Sewer Base
Quick Start Guide
Find address or place
Cornerstone Village
East English Village
Morningside
Grosse Pointe Farms
Country Club of Detroit
SEMCOG, Province of Ontario, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA, AAFC, N
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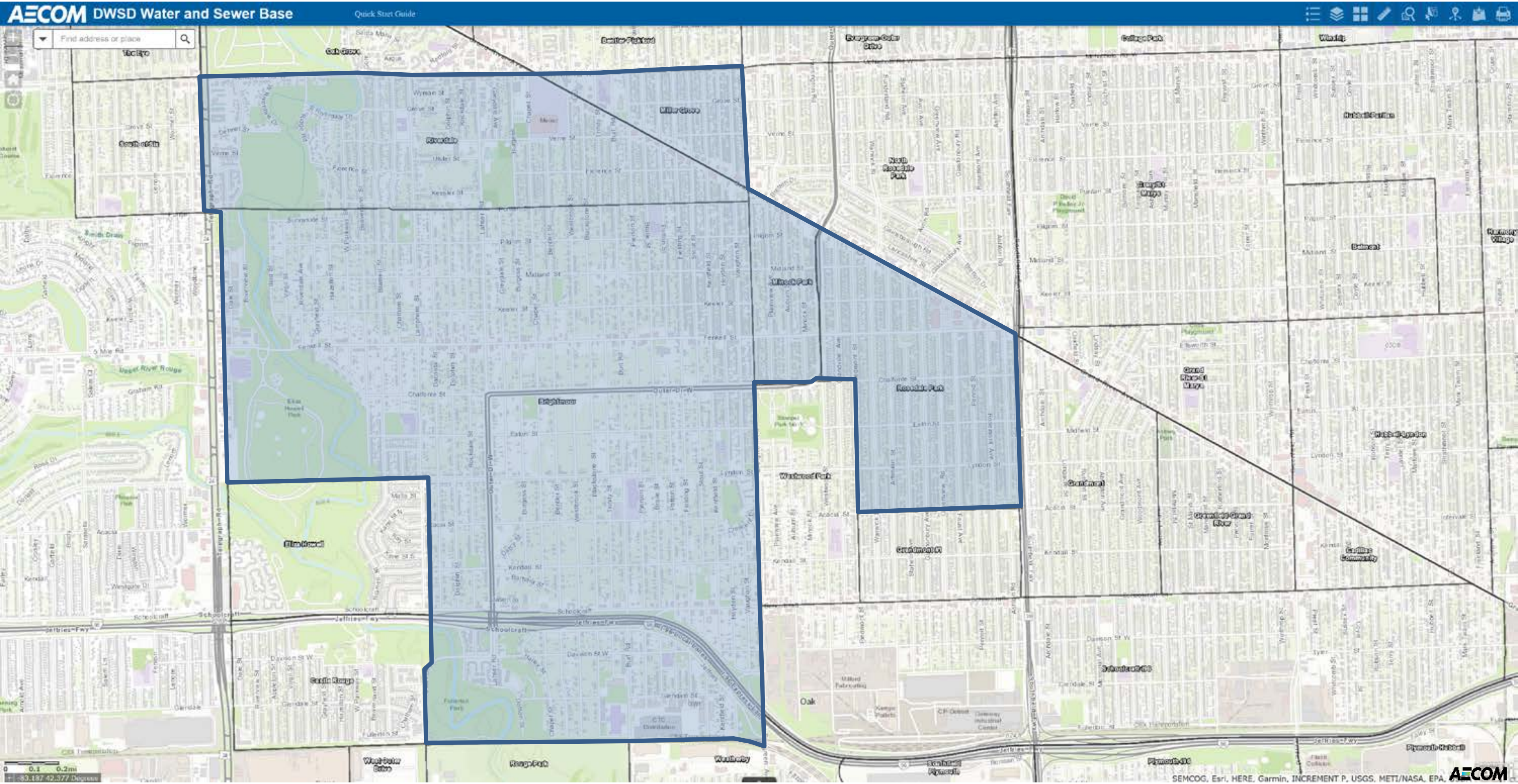
AECOM DWSD Water and Sewer Base
Quick Start Guide
Find address or place
Riverdale
Miller Grove
Minock Park
Rosedale Park
Brightmoor
Westwood Park
Grandmont
Eliza Howell
Castle Rouge
Schoolcraft
Jeffries Fwy
Outer Dr W
Telegraph Rd
Rouge Park
Oak
SEMCOG, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA,
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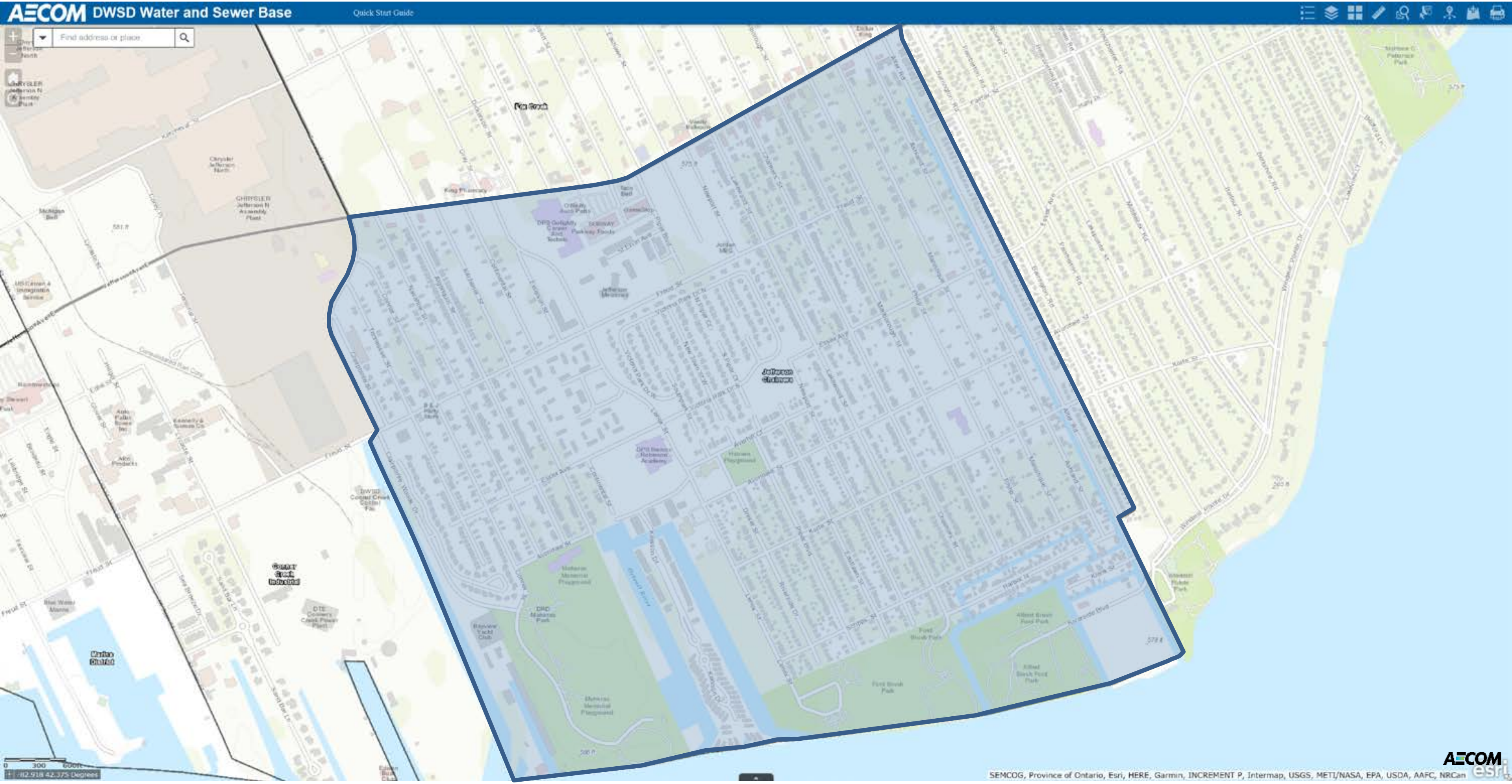

AECOM DWSD Water and Sewer Base
Quick Start Guide
Find address or place
Jefferson Chalmers
Conner Creek Industrial
Marina District
SEMCOG, Province of Ontario, Esri, HERE, Garmin, INCREMENT P, Intermap, USGS, METI/NASA, EPA, USDA, AAFC, NRCan
AECOM
esri

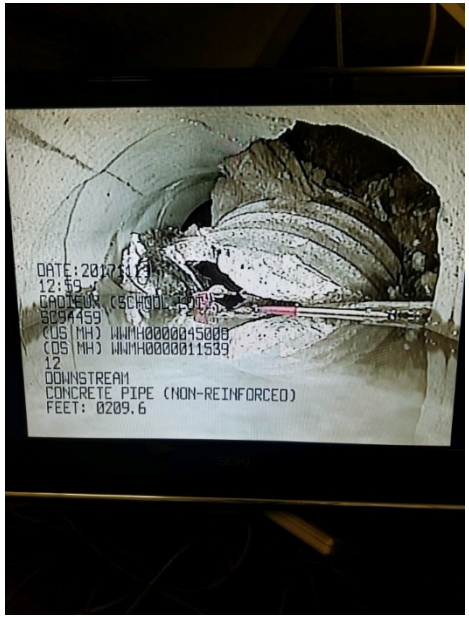
Field Data Collection

- CCTV Sewer System Inspections
- Panoramo Manhole Inspections
- Hydrant Flow Testing
- Watermain C-Factor Testing
- Watermain Leak Detection
- Sewer System Flow Monitoring

Locating manholes in snowy conditions

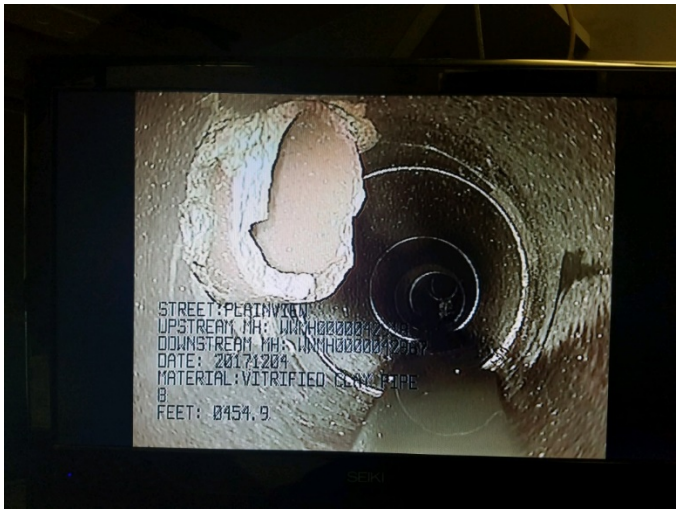
MH Inspection truck with cold and snow conditions

Pipe Defects



Collapsed pipe generates a grade 5 defect, again we let DWSD know immediately.

Cross bore through pipe



Protruding Tap

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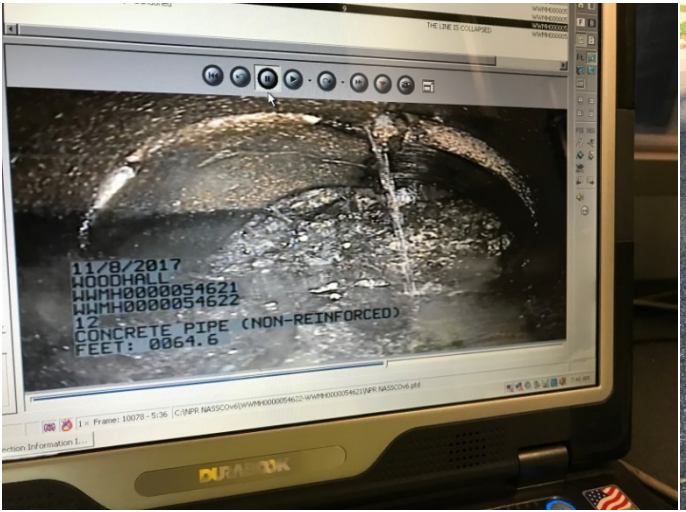
Pipe Defects



Pipe Collapse

Pavement depression at collapse site

Root balls found in lateral, very common in abandoned house lots

Encountering Cross Bores

Cross-bore with roots and cutter

Marking Location of Cross Bore

Excavated Cross-bore and cutter

Cross Bores

Cross bore with roots

Excavated gas and sewer lines

Resolving Cross Bores

Repaired gas line. Sewer still needs to be repaired.

Working at cross-bore site. Orange line is jet cleaning line behind cross-bore

Pilot Study – Lessons Learned

- **Extensive cleaning required to perform CCTV inspections. Opportunity to improve levels of service with improved maintenance practices.**
- **System leakage can be significantly reduced in the short term by providing leak detection surveys and regular maintenance. Open services (non-revenue water) to abandoned houses needs to be closely monitored and addressed.**
- **Manholes located in backyards/alleys limit access and create maintenance and capital improvement challenges.**
- **Wastewater service connections from abandoned/demolished houses accelerate instances of root intrusion**
- **Multiple crossbores encountered – particularly with gas services carelessly installed by DTE – that damage DWSD infrastructure, accelerate deterioration and create immediate maintenance issues. Development of formal policies to coordinate with DTE (and other utilities) and correct crossbores is required.**
- **Highest risk sewers are downtown where diameters are larger and impact greater. Highest risk watermains are dispersed through the City and driven by pipe vintage (i.e. Non-standard Spun Cast).**
- **Risk assessment approach will continue to evolve over time and will improve with the collection of additional condition assessment data. With this data, the ability to refine and characterize asset risk and optimize maintenance and replacement programs will improve.**