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LAKE ST. LOUIS SEWER IMPROVEMENT PROGRAM

PEER REVIEW 90% REPORT

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AGENDA

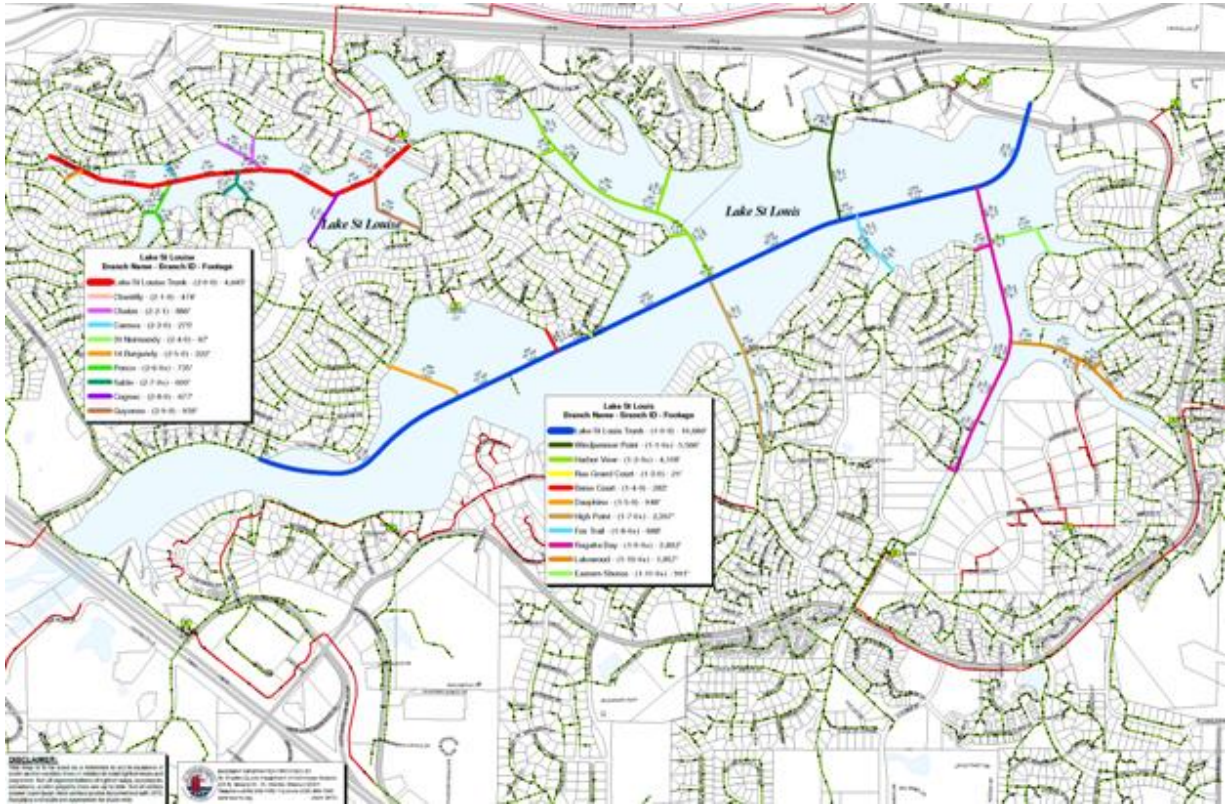
Sewer Inspection Feasibility
Program Objectives
Alternatives
Selection Criteria Matrix
Conclusions & Recommendations

SEWER INSPECTION

SEWER INSPECTION FEASIBILITY

Subaqueous Trunk Sewers

- **Lake St. Louis**
  - 3,000 feet – 12-inch
  - 3,364 feet – 16-inch
  - 2,655 feet – 18-inch
  - 4,642 feet – 24-inch
- **Lake St. Louise**
  - 4,645 feet – 8-inch



- **Additional Length of 8-inch & 10-inch Collectors/Laterals**

SEWER INSPECTION

REVIEW OF INSPECTION TECHNOLOGIES

- **Pipe Wall Condition Assessment**
  - Pure Technologies
  - Pipeline Inspection & Condition Analysis Corporation (PICA)
- **Closed Circuit Television (CCTV)**
  - Doetsch Environmental
  - Hibbard Inshore
  - Interactive Pipeline Inspection (IPI)
  - RedZone Robotics

SEWER INSPECTION

SEWER INSPECTION FEASIBILITY

CCTV

- **Phased Approach Begin With Inspection**
  - Crawler for 12” and Smaller Diameter
  - Floating or Crawler for 16” and Larger Diameter
- **Limited by Access and Length of Cable**
- **Cleaning**
- **Locate**

SEWER INSPECTION FEASIBILITY

External Inspection

- Excavation Required
- Not Directly Related to Conditions Under the Lake
- Provide Data on Corrosion Potential of Soils
- Conduct Non-destructive Testing on Pipe to Determine Wall Thickness
- Tap Pipe/Collect Coupon for Analysis

SEWER INSPECTION FEASIBILITY

Conclusions

- Inspection is Feasible; Limited by Access/Length of Cable
- Inspection Can Start Prior to Cleaning
- CCTV Inspection will Provide Information to Determine if Extent of Cleaning
- External Inspection will Provide Data on Condition of Pipe

SEWER INSPECTION

SEWER INSPECTION FEASIBILITY

Recommendation: Inspect the Subaqueous Sewers

- ***Determine Program Urgency.*** The condition may warrant a more aggressive schedule or it may give the District confidence to choose a longer schedule.
- ***Know Sewer Location.*** In case the ERP needs to be implemented before the SIP is implemented and to reduce cost in future phases due to the fact that the District can give Contractors the location of assets with certainty.
- ***Repair Ahead of Failure.*** The investigation may identify a defect that can be repaired cost-effectively once the location is known and the extent of the defect is understood — before it fails without the full scope and expense of the ERP.
- ***Give Confidence.*** The existing sewers are a substantial asset with a potential service life of another 50 years. Knowing the condition will give the District confidence it its decision, which ever alternative is chosen.

PROGRAM OBJECTIVES

- **CONVEYANCE CAPACITY.** Provide sewage conveyance capacity for the design peak hourly flow to prevent or eliminate sanitary sewer overflows (SSOs).
- **ACCESS.** Provide suitable access to conveyance infrastructure (sewers, pump stations, etc.) for inspection, operation, maintenance, and repair/rehabilitation.
- **MITIGATE SUBAQUEOUS RISKS.** Address or mitigate the risk associated with a subaqueous sewer system and the consequences of such a failure.

ALTERNATIVE 1 – USE EXISTING SUBAQUEOUS SEWERS (IN AS-IS CONDITION)

- lowest initial investment
- nothing to address CAPACITY or ACCESS
- reactive approach – Emergencies Cost More
- if existing sewer system is in fair or good condition, this alternative may rate much higher
- condition is presently unknown

ALTERNATIVE 2 – REHABILITATE EXISTING SUBAQUEOUS SEWERS

- **highest initial capital investment**
  - CIPP will require access at 1,000-foot intervals (41 instead 13)
  - submersible manholes $953,400 each
- **does nothing to address limited conveyance capacity**
- **will require marine support for O&M access.**

ALTERNATIVE 3 – LIFT STATIONS AND FORCE MAINS

- undesirable residential proximity to sewage pump stations
- property value diminution 5% to 15% + easements
- lower risk profile
- OPTION: Consolidate Pump Stations
- OPTION: Pump Station in Street
- Professional Landscaping Designs
- **NEED MORE DATA**
  - geotechnical, hydrogeological and survey information

ALTERNATIVE 4 – REROUTE GRAVITY SEWERS (MICRO-TUNNELING)

- substantial initial investment
- increasing conveyance capacity
- better access to the sewer system
- similar risks due to under-lake installation

ALTERNATIVE 5 – HYBRID
LSL: REHABILITATE SEWERS /// LSLE: LIFT STATIONS)

- leverages the cost effectiveness of the lift station alternative (Alt 3) for Lake St. Louise
- otherwise its performance against the selected parameters closely mirrors Alternative 2

ALTERNATIVES 6 & 6A – DRAIN LAKE
NEW SEWERS (ALT 6) // REHAB SEWERS (ALT 6A)

- drain lake for preferable sewer construction conditions
- not feasible to construct in one off-season period
- economic impact could be substantial

ALTERNATIVES

Selection Criteria Matrix	ALT 1 Use Sewers (As-Is Condition)	ALT 2 Rehab Existing Sewers	ALT 3 Lift Stations and Force Mains	ALT 4 Reroute Sewers (Micro-Tunneling)	ALT 5 Hybrid ALT 2 LSL ALT 3 LSLe	ALT 6 Replace Sewers (Drained Lake)	ALT 6A Rehab Sewers (Drained Lake)
ALTERNATIVES REPORT -- Capital Cost:	$3.7 M	$35.4 M	$21.9 M	$75.0 M	$36.2 M		
ALTERNATIVES REPORT -- Total PW Cost:	$3.7 M	$35.4 M	$28.6 M	$75.0 M	$41.6 M		
ENGINEERING REPORT -- Capital Cost:			$32.6 M				
PEER REVIEW -- Capital Cost:	**$0.3 M**	**$74.7 M**	**$36.7 M**	**$70.6 M**	**$55.6 M**	**$36.0 M**	**$25.4 M**
PEER REVIEW -- Design Life (years)	**?**	**100**	**50**	**100**	**100/50**	**100**	**100**
PEER REVIEW -- Life Cycle Cost:	**$36.8 M**	**$61.5 M**	**$45.3 M**	**$57.3 M**	**$50.6 M**	**$30.8 M**	**$22.3 M**

ALTERNATIVES

Selection Criteria Matrix		ALT 1		ALT 2		ALT 3		ALT 4		ALT 5		ALT 6		ALT 6A	
		Use Sewers (As-Is Condition)		Rehab Existing Sewers		Lift Stations and Force Mains		Reroute Sewers (Micro-Tunneling)		Hybrid ALT 2 LSL ALT 3 LSLe		Replace Sewers (Drained Lake)		Rehab Sewers (Drained Lake)	
Selection Criteria	Weight	Rating / Score													
Low Capital Cost	20%	10	2.0	1	0.2	5	1.0	1	0.2	3	0.6	5	1.0	7	1.4
Low Life Cycle Cost	10%	6	0.6	1	0.1	4	0.4	2	0.2	3	0.3	8	0.8	10	1.0
Low Property Value Impact	10%	9	0.9	10	1.0	1	0.1	7	0.7	6	0.6	5	0.5	5	0.5
Keeps Lakes In Service	15%	1	0.2	5	0.8	9	1.4	9	1.4	5	0.8	1	0.2	1	0.2
Capacity Upgrade	4%	1	0.0	1	0.0	9	0.4	10	0.4	6	0.2	9	0.4	1	0.0
O&M - Best Accessibility	4%	1	0.0	3	0.1	10	0.4	7	0.3	5	0.2	3	0.1	3	0.1
O&M - Low Frequency	4%	4	0.2	9	0.4	3	0.1	9	0.4	5	0.2	9	0.4	9	0.4
O&M - Low Complexity	4%	1	0.0	7	0.3	5	0.2	8	0.3	5	0.2	7	0.3	7	0.3
Low Impact - Aesthetics/Odor	4%	3	0.1	9	0.4	1	0.0	8	0.3	5	0.2	9	0.4	9	0.4
Low Disruption During Const.	4%	1	0.0	10	0.4	3	0.1	5	0.2	5	0.2	1	0.0	1	0.0
Low Ind. Property Owner Impact	4%	9	0.4	9	0.4	1	0.0	4	0.2	5	0.2	9	0.4	9	0.4
Low Constructability/Risk	5%	1	0.1	3	0.2	9	0.5	1	0.1	5	0.3	5	0.3	5	0.3
Low Risk of Operational Failure	6%	1	0.1	7	0.4	3	0.2	8	0.5	5	0.3	7	0.4	7	0.4
Low Consequence of Operational Failure	6%	1	0.1	2	0.1	8	0.5	2	0.1	5	0.3	2	0.1	2	0.1
TOTAL SCORE:		**4.6**		**4.7**		**5.2**		**5.1**		**4.5**		**5.1**		**5.4**	

CONCLUSIONS

- missing key information
- flat decision matrix scores - indistinguishable between alternatives.
- no one alternative strongly outperformed
- with additional information, a clearer forward path may be identified

RECOMMENDATIONS

- **investigate existing sewer system…REDUCE UNKNOWNS**
- **locate, clean, inspect, assess the condition of the sewers**
  - *Determine Program Urgency*
  - *Know Sewer Location*
  - *Repair Ahead of Failure*
  - *Give Confidence*

ALTERNTIVES

RECOMMENDATIONS

- **build on this peer review**
- **collect pertinent data to evaluate consolidation**
  - bedrock, soil permeability and survey information
- **develop the pump stations in the street concept**
- **develop professional landscaping designs to reduce visual impacts / review with the impacted residents**
- **detailed evaluation of select alternatives and options**
  - modeling
  - design two or three alternatives to the preliminary design level

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