RAMSEY-WASHINGTON
METRO WATERSHED DISTRICT

Beltline Resiliency Study Workshop

December 17, 2019

BARR

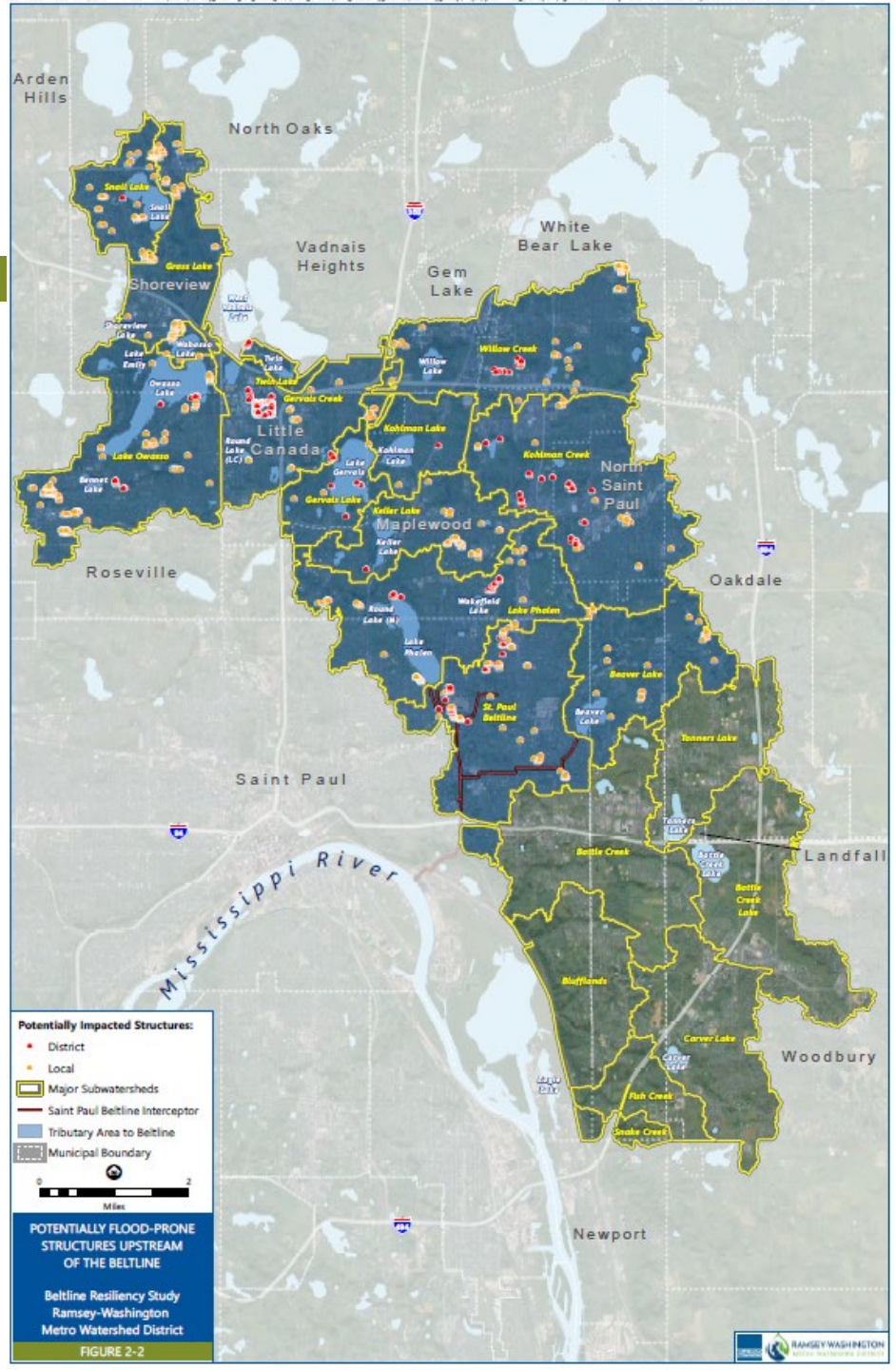
Overview

- Overview
- Methodology (Section 2)
  - Identification of potentially flood-prone structures
  - Study limitations
- Resiliency Study Phases (Section 3)
  - Evaluation of potential system modifications
  - Overview of *major* potential modifications
- Recommended next steps (Section 5)

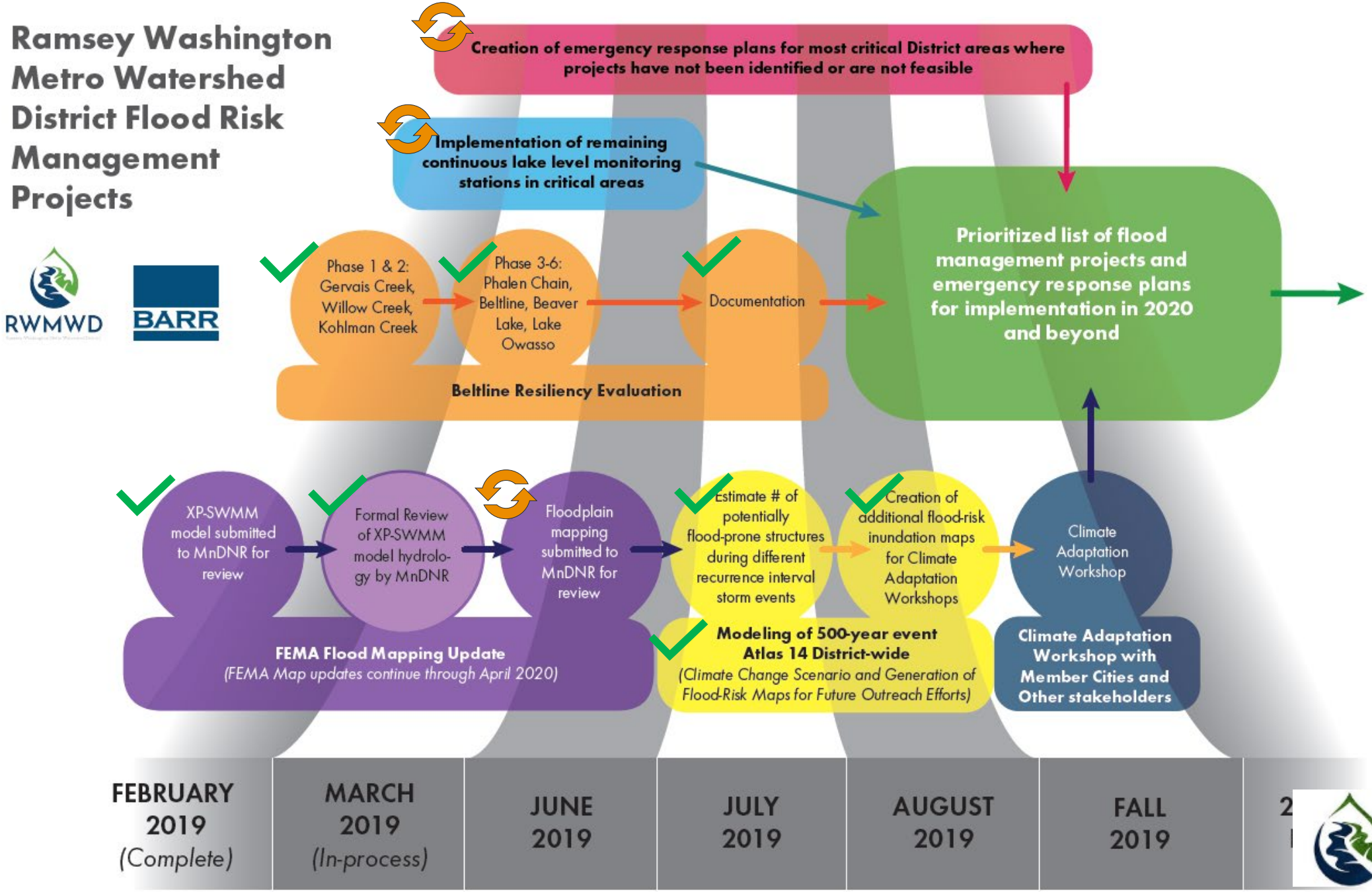
Overview

Beltline Resiliency Study (project status update)

- *The purpose of this study is to:*
  - *evaluate system-level flood damage reduction options, including real-time mechanical alteration of Lake Phalen and Keller Lake channel outlet structures, as well as other critical system infrastructure, to actively manage stormwater runoff from flood-prone areas tributary to the Beltline storm sewer in an effort to reduce flood levels that would otherwise impact homes.*



Ramsey Washington Metro Watershed District Flood Risk Management Projects



Background (2018 memo)

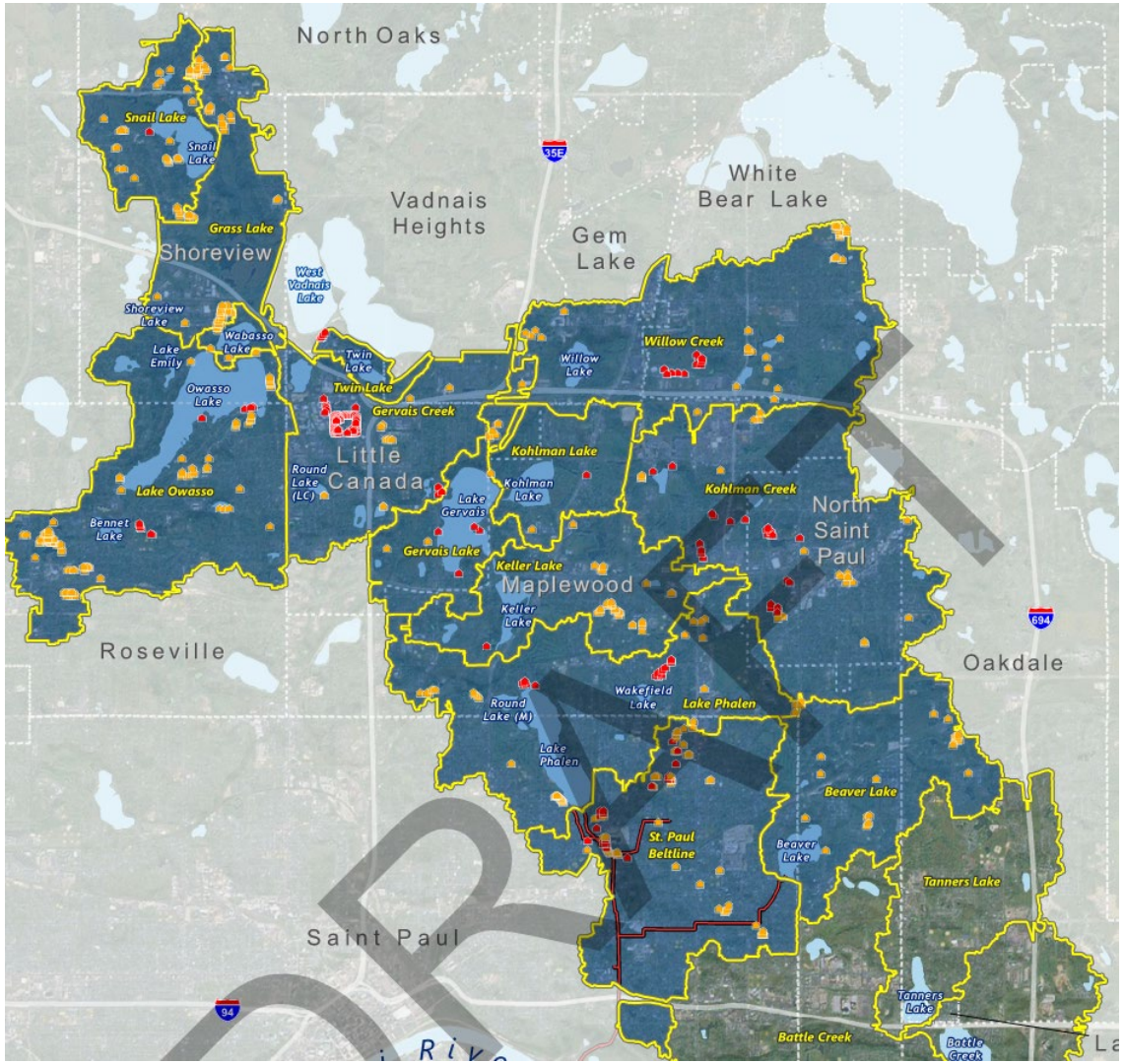
Beltline Resiliency Study started spring 2018.

Plan to inform future decisions related to flood-risk reduction

Section 2 - Methodology

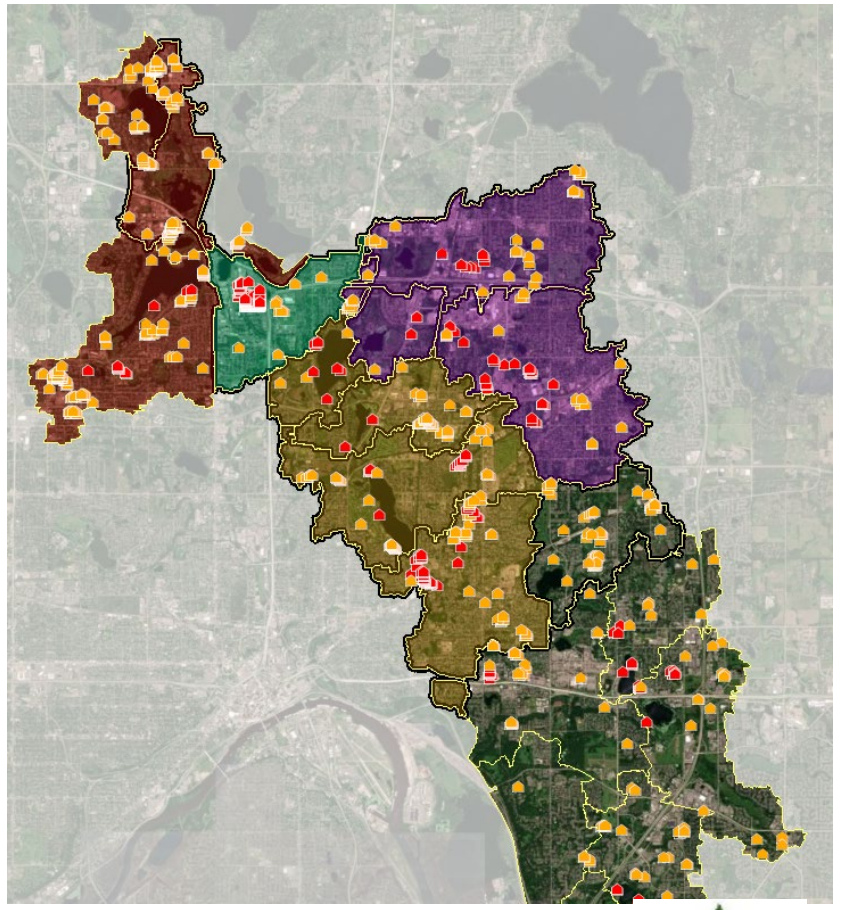
Identification of potentially-flood prone structures
(Sections 1.1 & 2.1)

- Inundation area intersects building outline
- Potential District Flood-Risk Areas
  - Near District managed water bodies, facilities, or previous projects
- Local Flood-Risk Areas
  - All other buildings



Study phases (Section 2.0)

- Phase 1 – Gervais Creek
- Phase 2 – Grass Lake (requested by Managers in 2019)
- Phase 3 – Willow Creek & Kohlman Creek
- Phase 4 – Phalen Chain
- Phase 5 – Beaver Lake



Evaluation of system modifications (Section 2.2)

1. Store water
2. Change direction of flow
3. Increase flow

- Reduce conveyance capacity
- Provide flood-storage
  - New ponds or underground storage
  - Increase storage in existing ponds
- Modify overflows
- Modify storm sewer system
- Mechanical operation of outlet structures
- Increase conveyance capacity
- Provide flood-storage in parks or other existing open spaces

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Study Limitations (Section 2.3)

- One possible option for mitigating District flood-risk areas
- Did not evaluate permitting requirements
- Did not request comments or input from other stakeholders
- Only limited survey information was available
- Used public data or information provided by municipalities or public agencies
- Planning-level evaluation
- Does not optimize cost; consider buy-outs, or emergency response plans
- Does not consider “new” Beltline Interceptor
- Does not provide freeboard
- Does not consider climate change
- Does not convey water to other Districts

Section 3 - Study phases

Study phases

- Each phase summarizes
  - Current flooding concerns
  - Potential system modifications
  - Flooding concerns following system modifications
- No recommendations regarding prioritization
  - General sequencing considerations

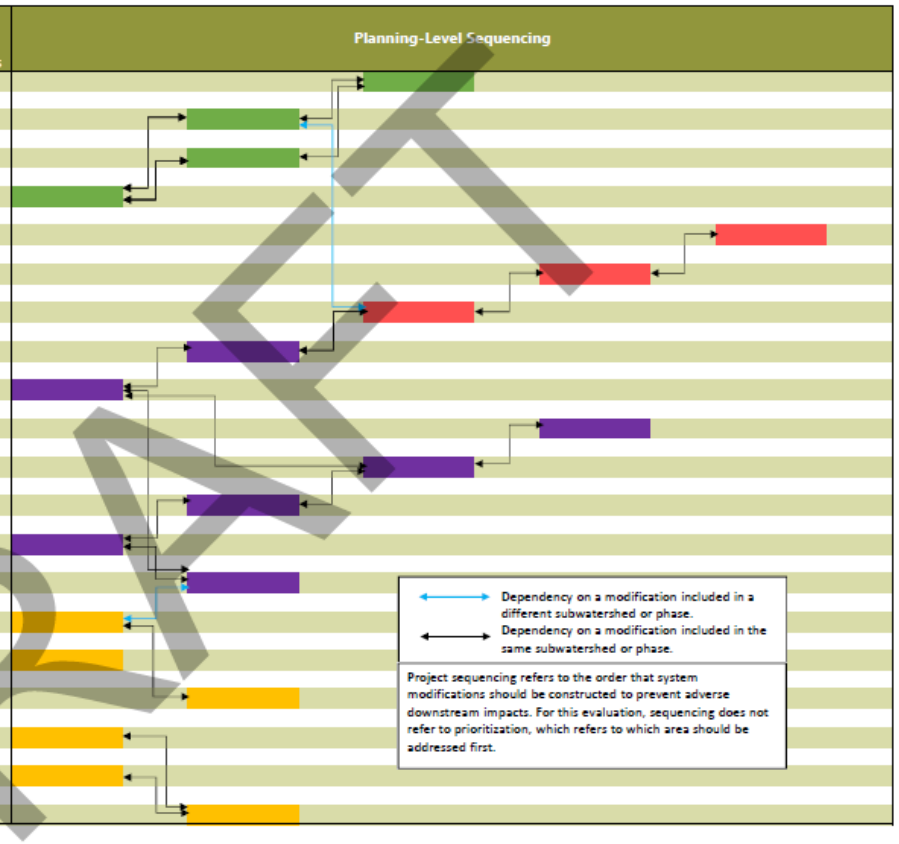
Beltline Resiliency Study web map

- Web map
- https://maps.barr.com/RWMWD/BeltlineResiliency/StoryMapSeries/index.html

General sequencing (Appendix A)

Figure A-1. Planning-Level Sequencing Schematic

Step	Description	Prerequisite System Modifications
1A	Ryan Drive & North Star Estates	1B,1C
1B	Mndot Diversion	1D
1C	West Industrial Diversion	1D
1D	Gervais Creek	
2A	Victoria Street	2B
2B	Lake Owasso	2A
2C	Wabasso, Grass Lake & West Vadnais Lake	1B
3A	Highway 61N	3B
3B	Willow Lake	
3C	Saint Paul Ecology Center	3D
3D	PCU Pond	3E
3E	Casey Lake	3F
3F	West Of White Bear Avenue North	
3G	Kohlman Basin	3B,3F,4A
4A	Lake Phalen And Keller Lake Outlet Structures	
4B	Wakefield Lake	
4C	Phalen Village	4A
4D	Duluth Street Recreational Center	
4E	Hoyt Pond	
4F	Ames Lake	4D,4E



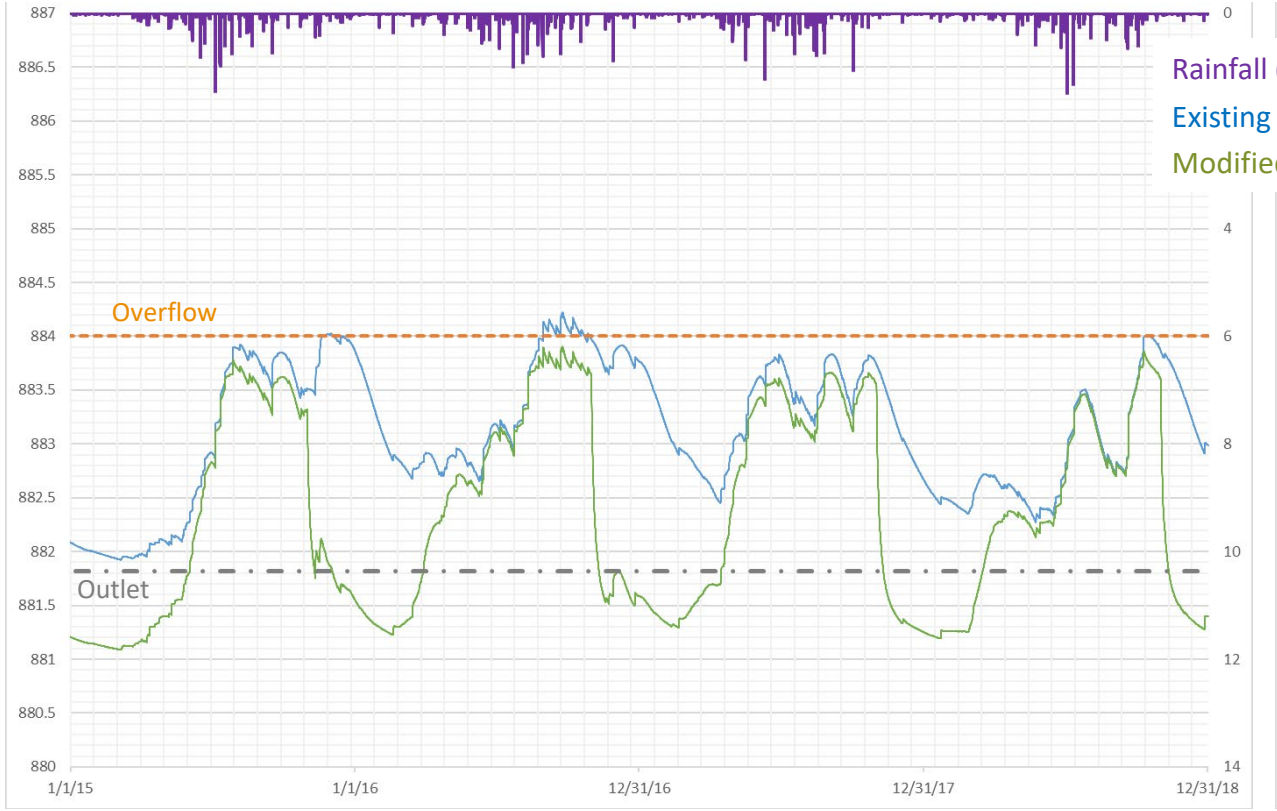
Section 5 – Conclusions

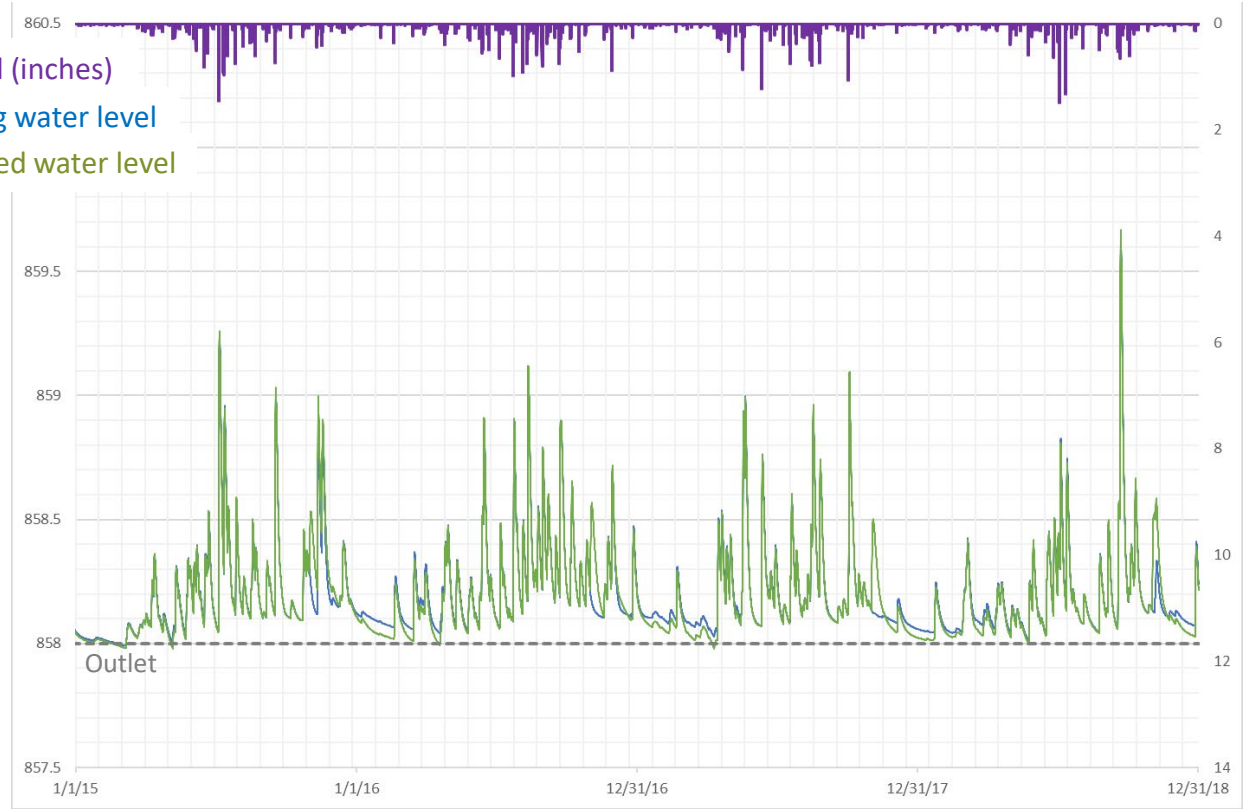
Next steps

1. Active management of Lake Phalen and Keller Lake control structures
2. Additional evaluation of MnDOT diversion
3. Feasibility studies for providing floodplain storage
4. Feasibility evaluation or stakeholder engagement near Ames Lake
5. Stakeholder review

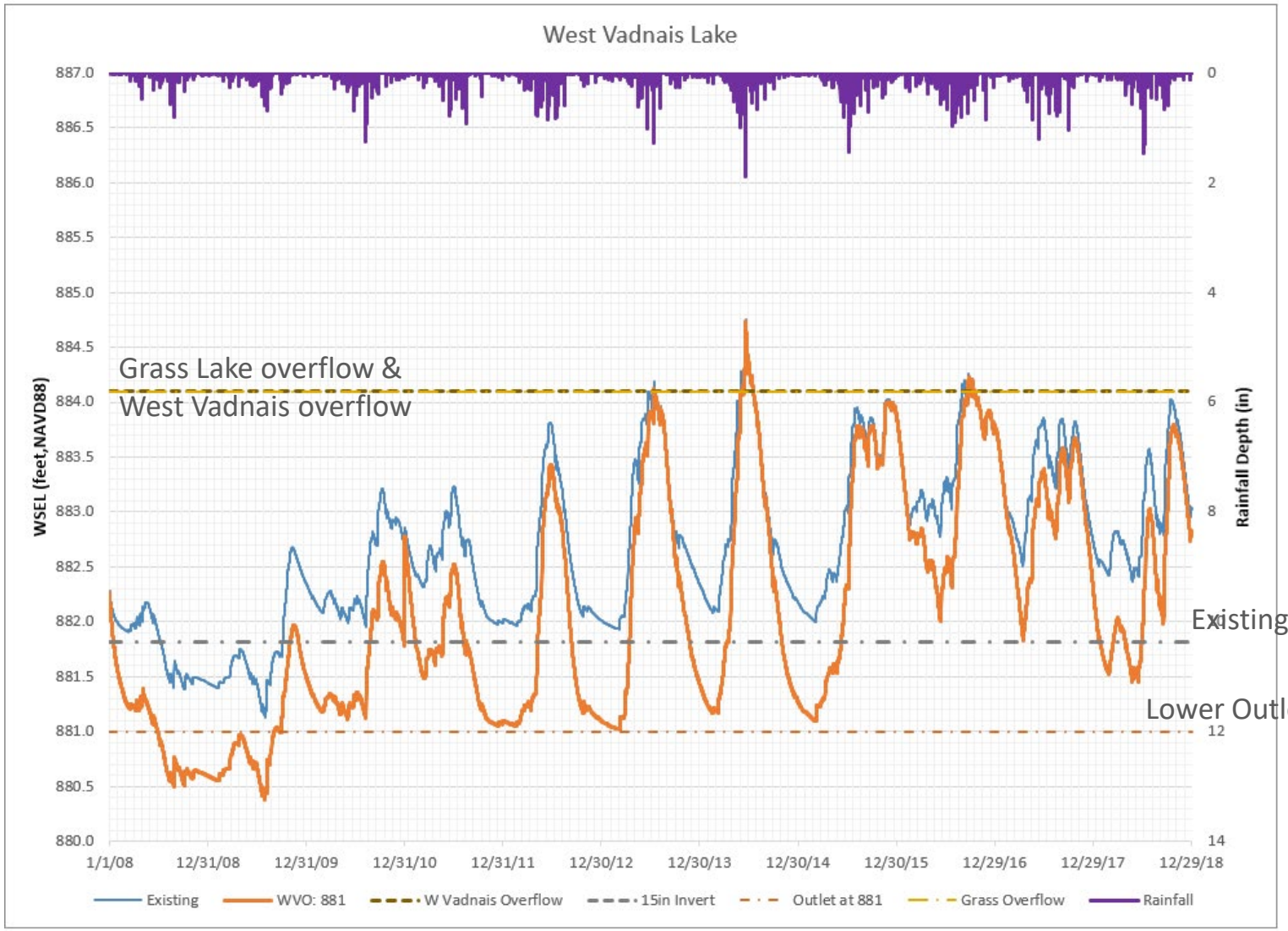
West Vadnais outlet – seasonal operation

- West Vadnais Lake
  - Reduces duration of high water levels
  - Small reduction in peak water levels
- Gervais Lake
  - Increase in water levels during seasonal operation
  - Reduction in spring water levels
  - No change in summer water levels





West Vadnais Outlet modification

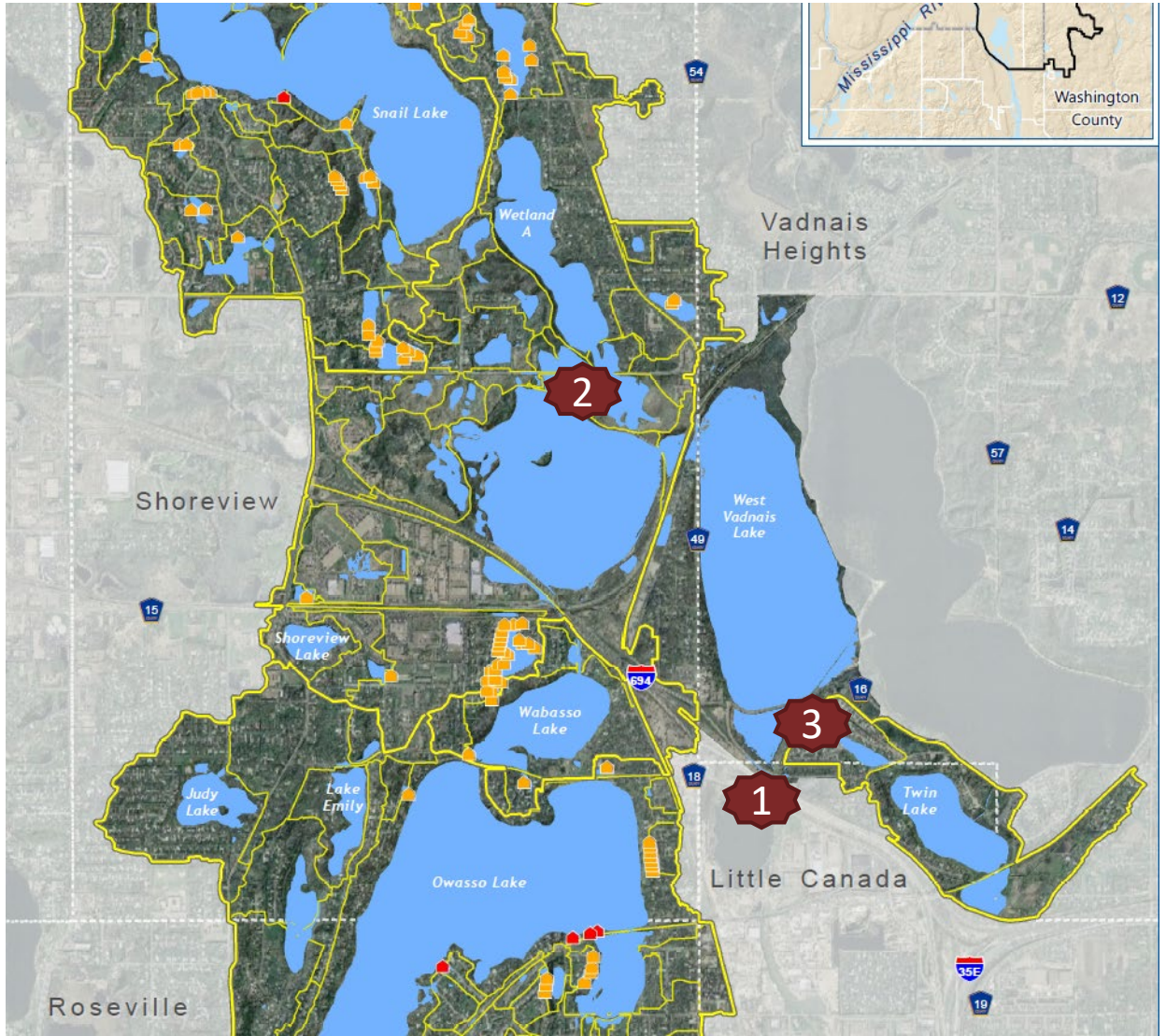


Existing Outlet: 881.8

Lower Outlet: 881.0

Grass Lake/West Vadnais Lake outlet

1. West Vadnais Outlet
   - No change in peak rate
   - Small change in peak WSEL
2. Overflow to Wetland A
   - Reduction in overflow volume
   - Reduction in overflow duration
3. Overflow to Twin Lake
   - Reduction in overflow volume
   - Reduction in overflow duration



West Vadnais Lake outlet modification

Overflows to Wetland A & Twin Lake

West Vadnais Lake outlet

Existing Conditions

Outlet Modification

West Vadnais Lake outlet modification

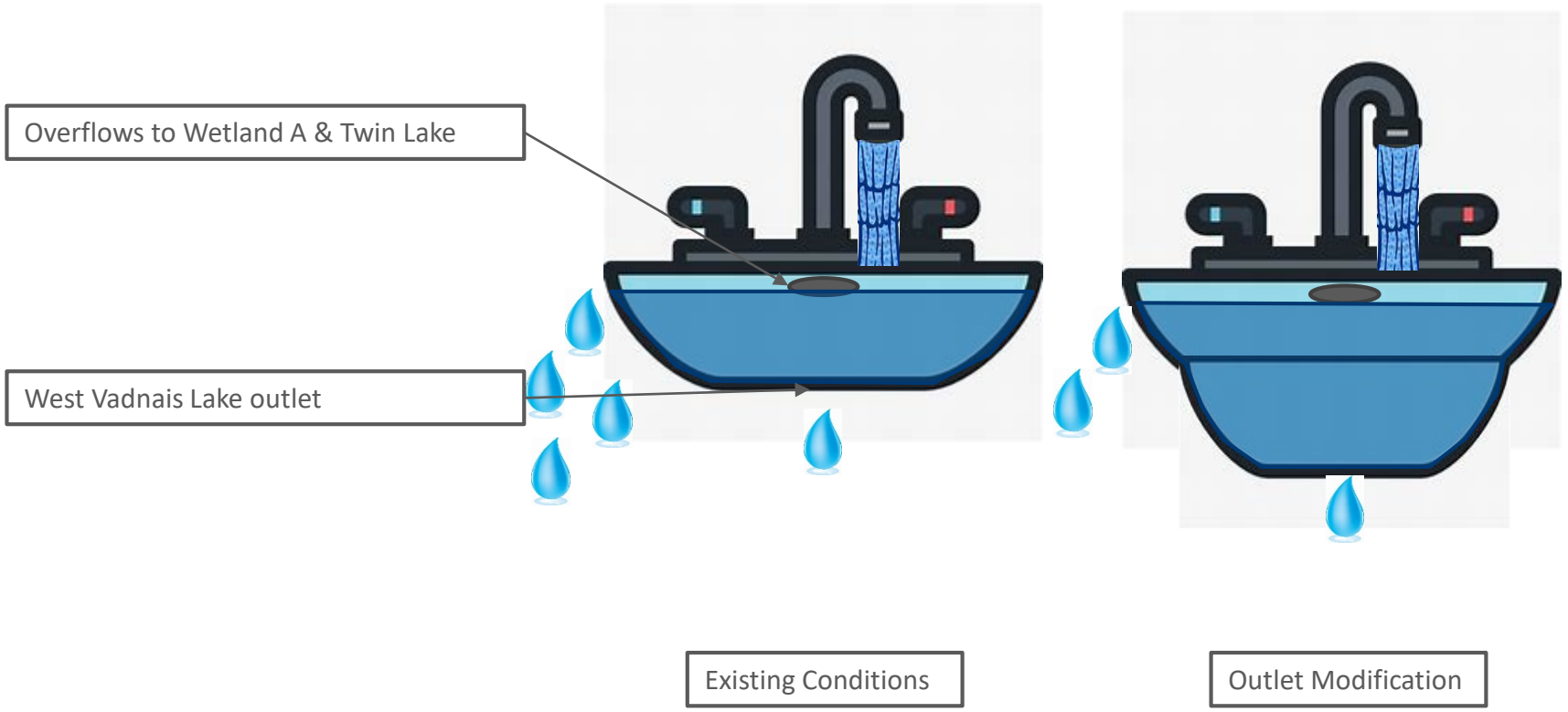
Overflows to Wetland A & Twin Lake

West Vadnais Lake outlet

Existing Conditions

Outlet Modification

West Vadnais Lake outlet modification



Alternate High-Flow Lake Owasso Outlet

- Black Tern Pond already at capacity
- Connection to Owasso Basin results in additional impacted structures
- Connection to Gervais Creek
  - Potential for multiple utility conflicts
  - May have limited benefit for long duration events
  - Larger impacts to Gervais Lake water levels

Section 1 - Intoduction

Background & Intended Use

Does….

- Provides general sequencing guidance
- Provides planning-level concepts for potential system modifications
- Provides one approach to mitigate flood-risk

Does NOT….

- Prioritize specific projects/locations
- Provide feasibility-level analysis
- Identifies optimized approach to mitigate flood-risk

Section 4 – Concept planning-level opinion of probable construction cost

Concept planning-level opinion of probable construction cost (Section 4)

Table 4-5 Opinions of Probable Cost for System Modifications Upstream of Beltline

System Modification	Description	Removed Structures	Low Cost (-50%) ($)	High Cost (+100%) ($)
Phase 1	Gervais Lake	101	$10,264,000	$41,049,000
Phase 2	Grass Lake	10	$20,584,000	$82,332,000
Phase 3	Willow Creek & Kohlman Creek	41	$53,102,000	$212,400,000
Phase 4	Phalen Chain of Lakes	75	$58,030,000	$232,111,000
TOTAL			**$141,980,000**	**$567,892,000**

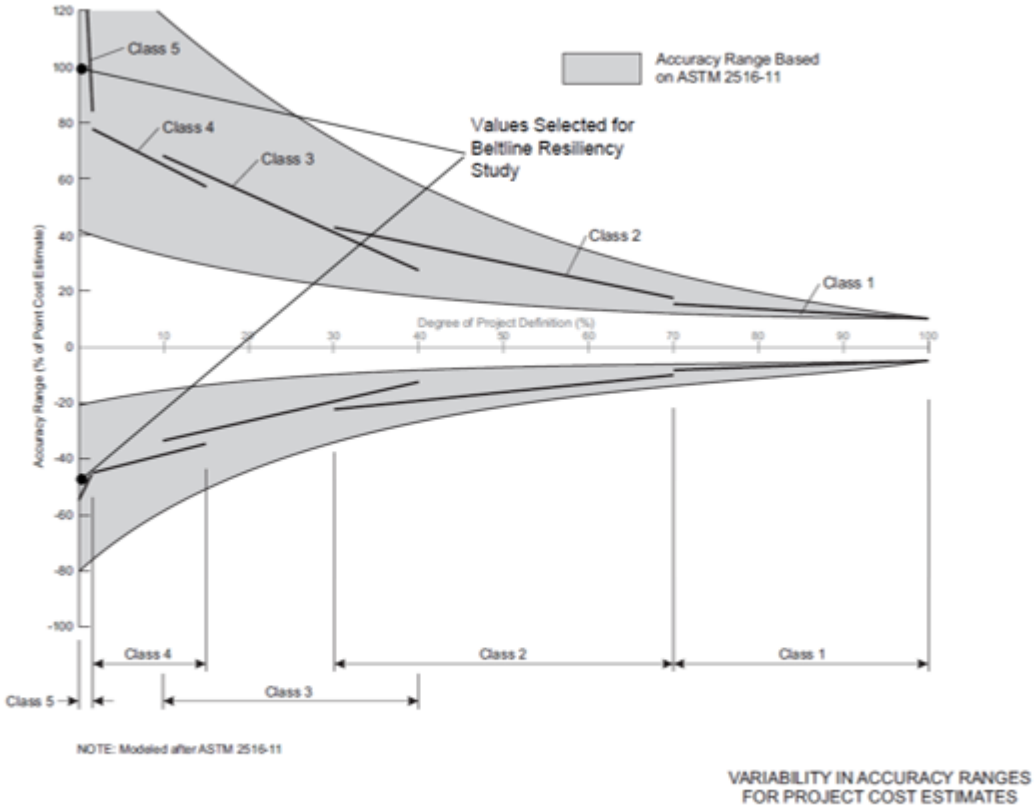


Figure 4-1 Relationship between Cost Accuracy and Degree of Project Definition

Complementary Evaluations

- Alternate high-flow Lake Owasso outlet
- Seasonal operation of West Vadnais outlet
- Larger West Vadnais outlet
- Beaver Lake outlet benefits/impacts

West Vadnais Outlet modification

West Vadnais Outlet modification

West Vadnais outlet modifications

West Vadnais outlet modifications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West Vadnais outlet – seasonal operation

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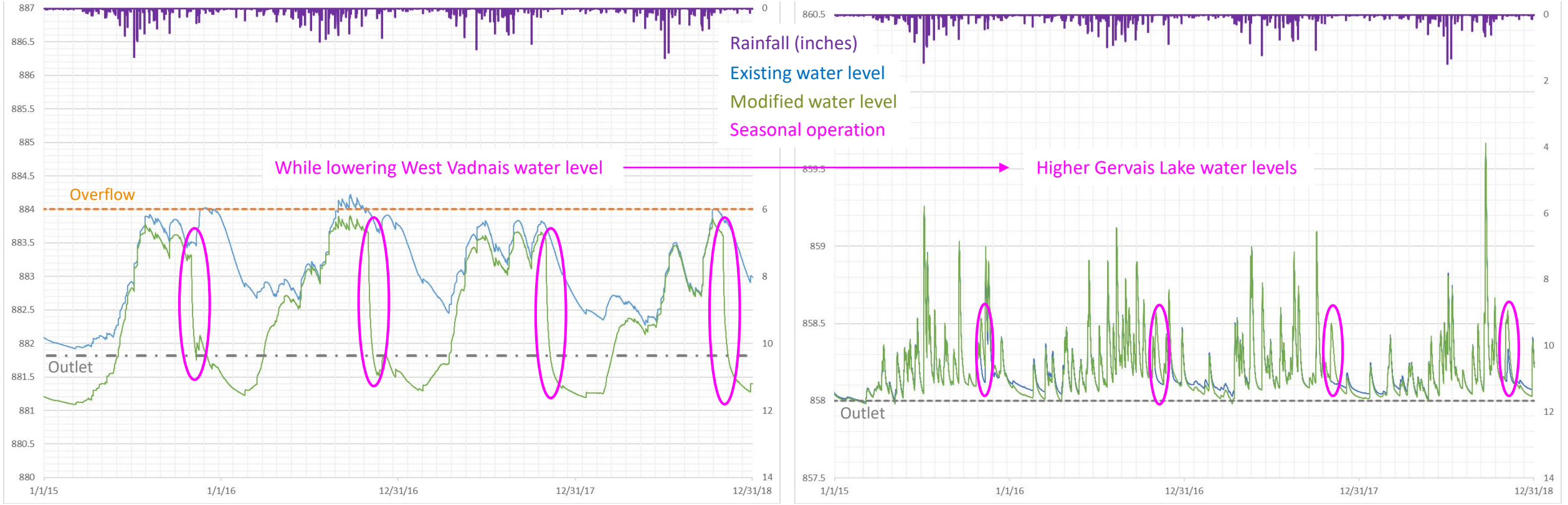
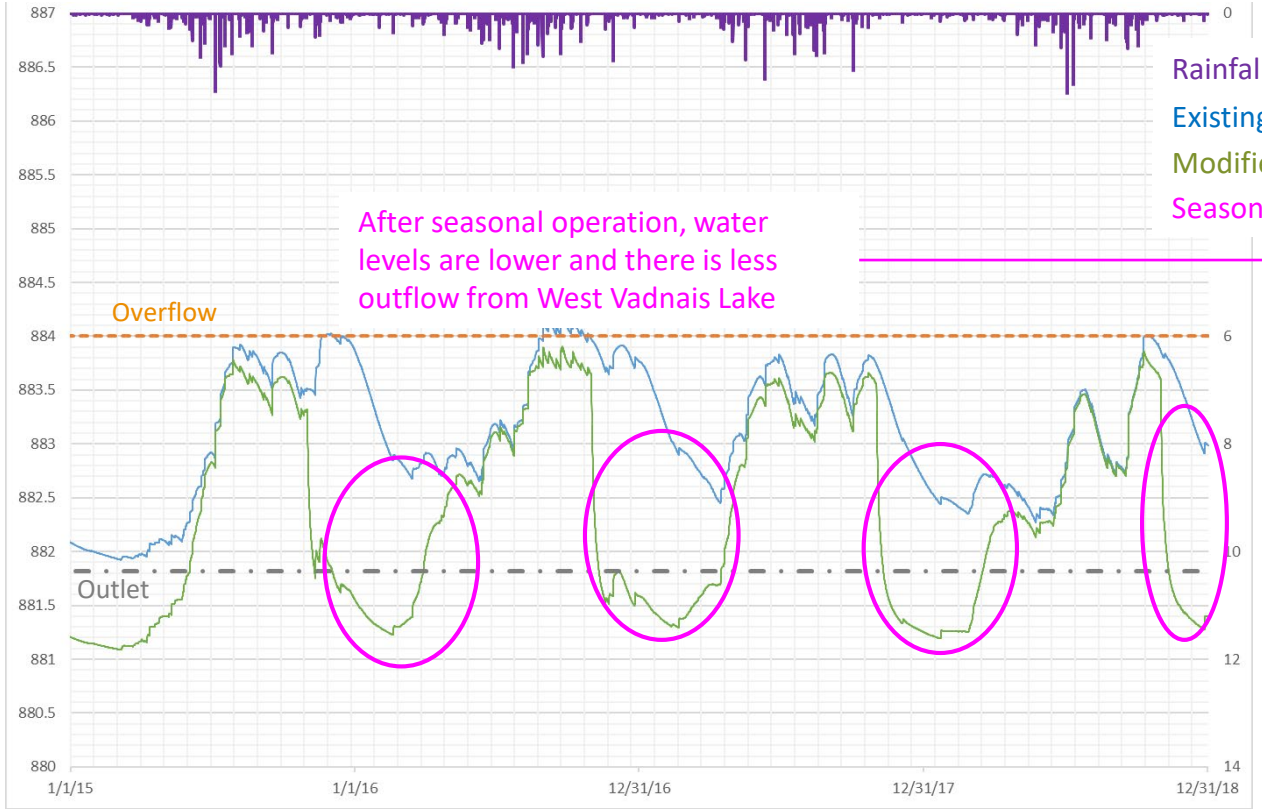


West Vadnais outlet – seasonal operation

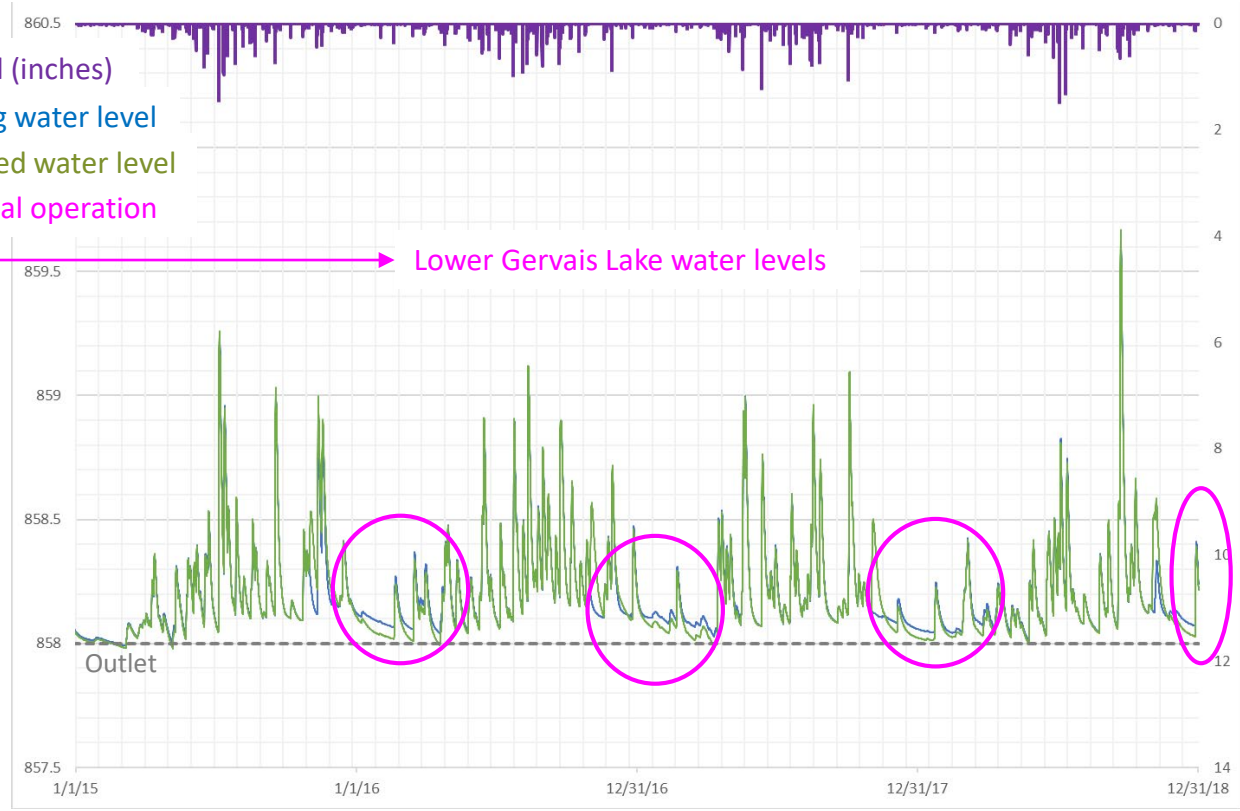
- West Vadnais Lake
  - Reduces duration of high water levels
  - Small reduction in peak water levels
- Gervais Lake
  - Increase in water levels during drawdown
  - Reduction in spring water levels
  - No change in summer water levels



Rainfall (inches)
Existing water level
Modified water level
Seasonal operation

After seasonal operation, water levels are lower and there is less outflow from West Vadnais Lake

Lower Gervais Lake water levels



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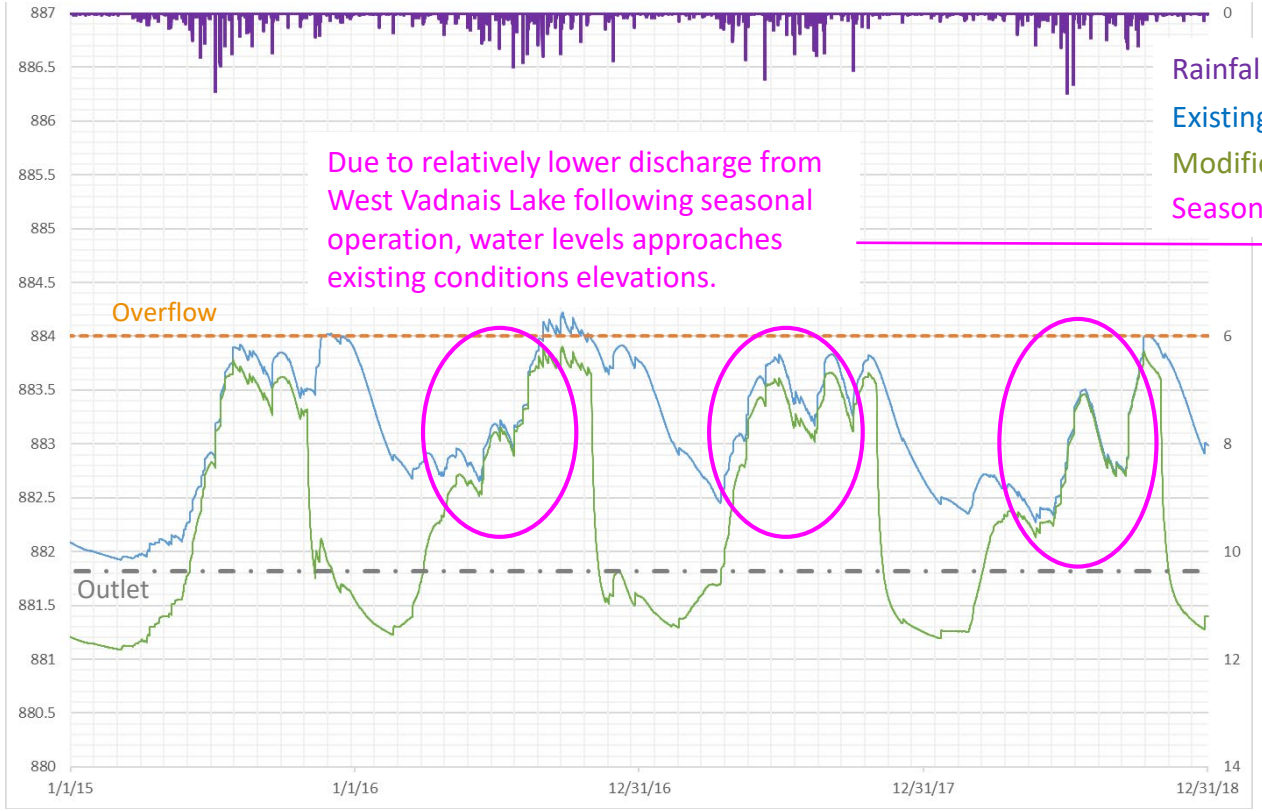
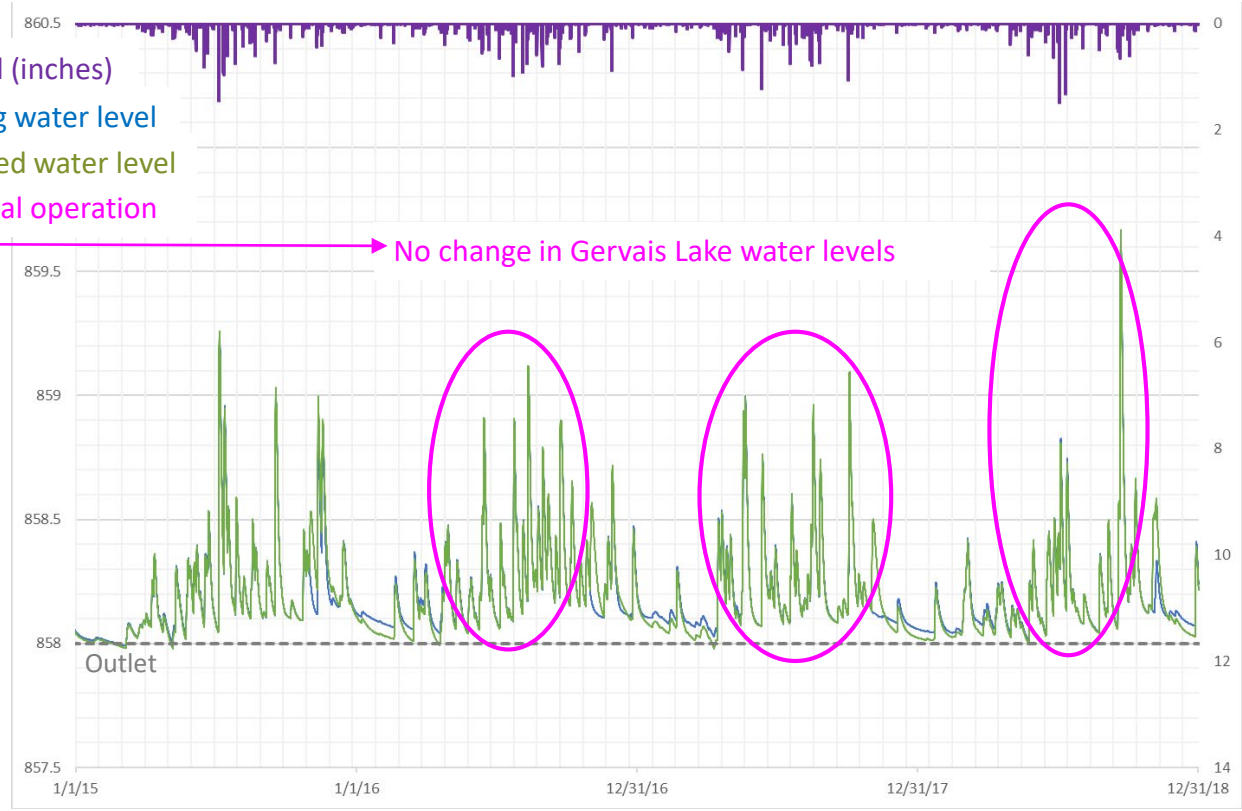
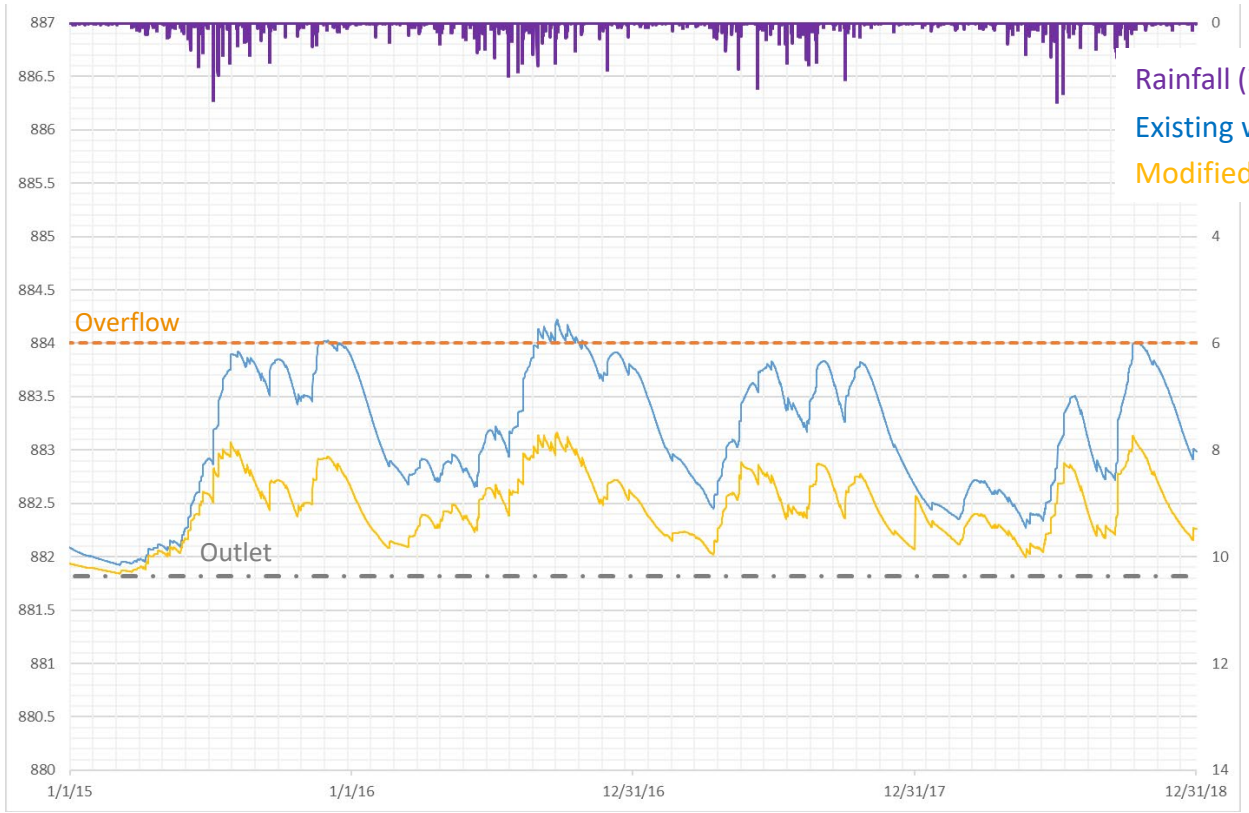
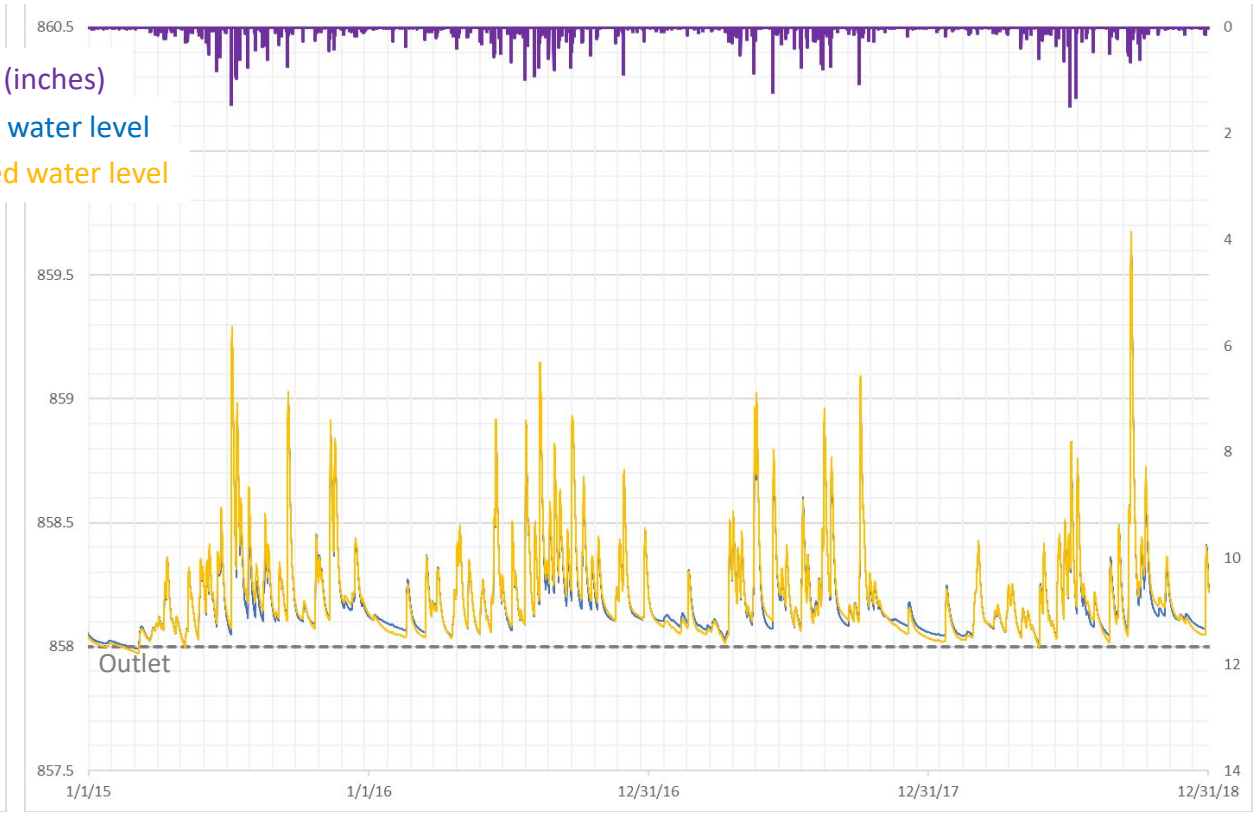




West Vadnais outlet – increase capacity

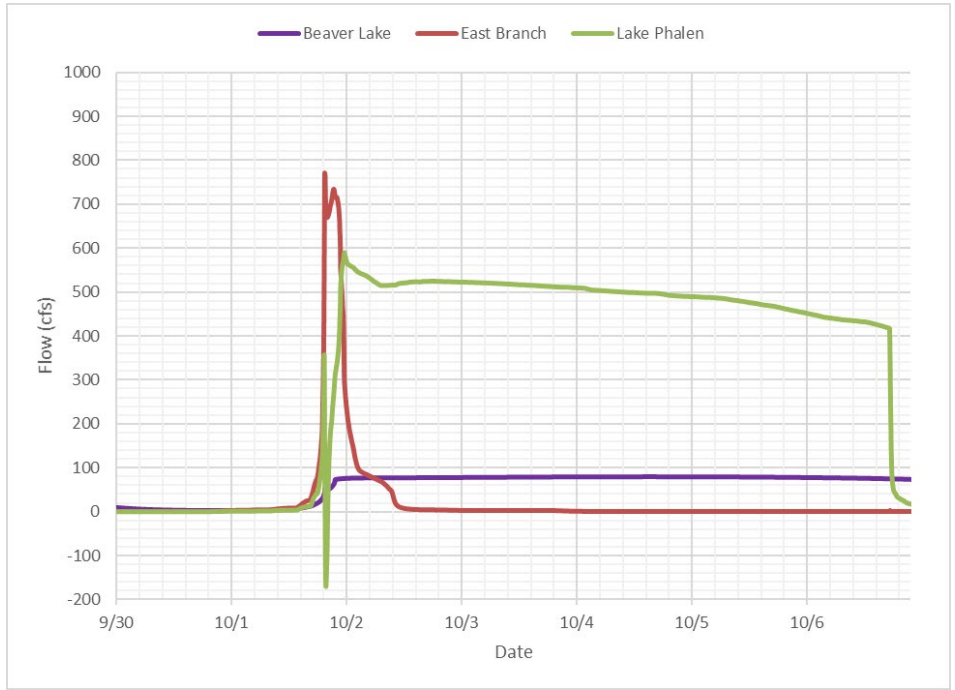
- West Vadnais Lake
  - Reduces peak water levels
  - Reduces duration of high water levels
- Gervais Lake
  - Increases peak water levels without other system modifications
  - Reduction in baseflow elevation

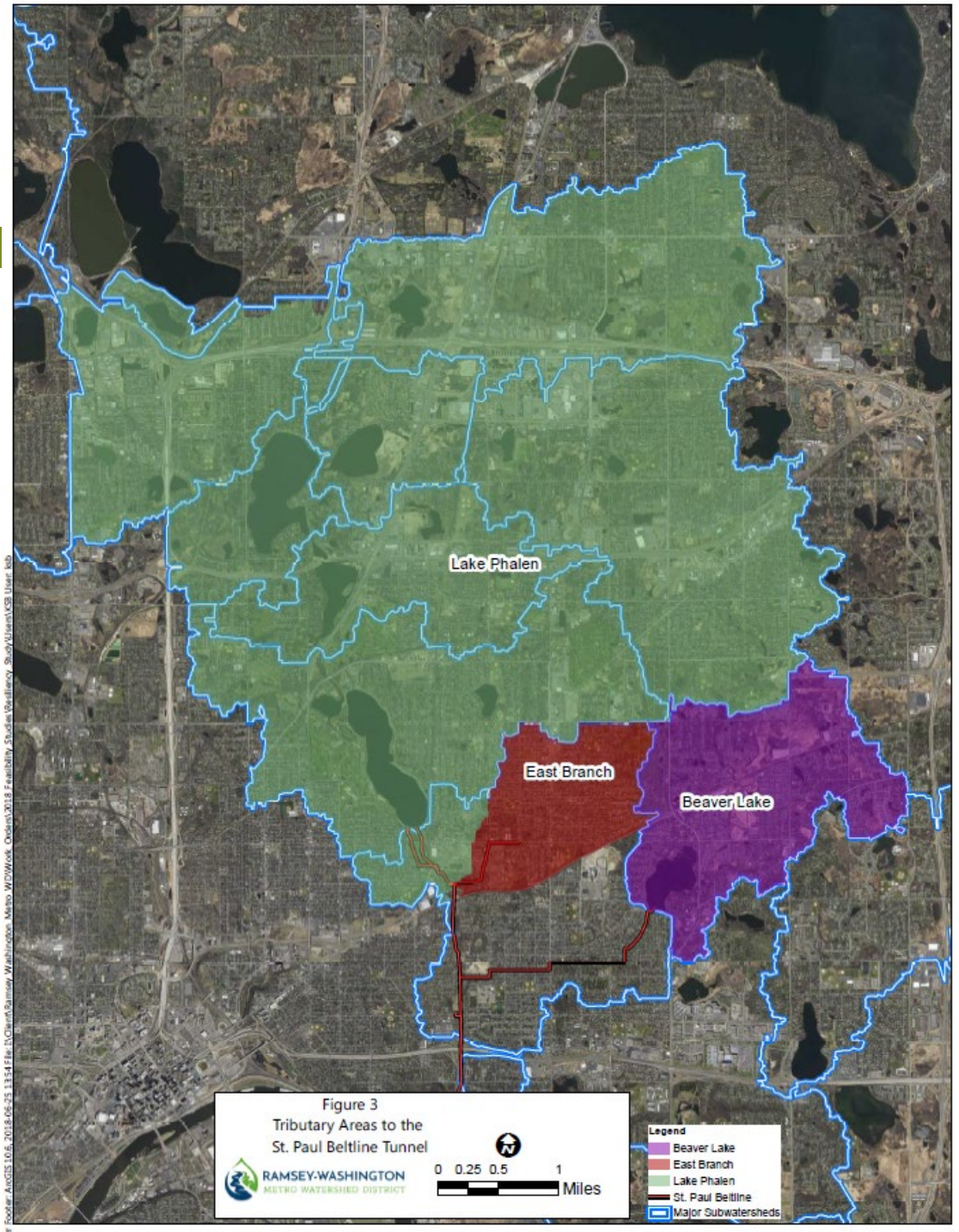




Beaver Lake Outlet

- No structures identified within the Beaver Lake floodplain
- Operation of the outlet does not result in lower elevations in Lake Phalen or Ames Lake





Board discussion items

- Check on discussion items/questions for each section
  - What is a “significant” increase in water levels?
  - Where is it ok to store water on park land?...Kohlman Creek? Wetland A? other locations?
  - What policy should District work towards…Provide flood-risk reduction for events up to ###-year event? Or something else…
- Call out modifications in 2020 budget

Items to "Hit"

- Explain Owasso shunt
  - Why is outlet to West Vadnais Lake in the study?
  - What is impact of high-flow shunt if outlet connected to:
    - Black tern pond
    - Owasso basin
    - S Owasso Blvd
- Explain why WV outlet modification included rather than:
  - Seasonal drawdown
    - Explain benefits in terms of duration…..where is there benefit from lowering outlet or seasonal drawdown?
- Explain why we didn't include outlet from Wetland A.
  - Note that several storage alternatives in Kohlman Creek subwatershed are to meet flood-risk reduction requirements on the Phalen Chain.
  - Outlet from Snail and Wetland A would require additional modifications to provide storage or convey water to the river
- Where are there structures that can be operated?
- How do other projects like Twin Lake outlet or West Vadnais bypass "fit" into Resiliency study?