

White Bear Lake Area Comprehensive Plan Study 9B

Model and Evaluate Raising White Bear Lake Outlet
Elevation - Update

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October 21, 2025

Scope of Study

- Data collection and screening-level GIS assessment of high-risk areas, survey lake outlets
- Develop 1D/2D model of White Bear Lake
- Assess risks to infrastructure
- Estimated Costs
- Advantages/Disadvantages of Outlet Modification

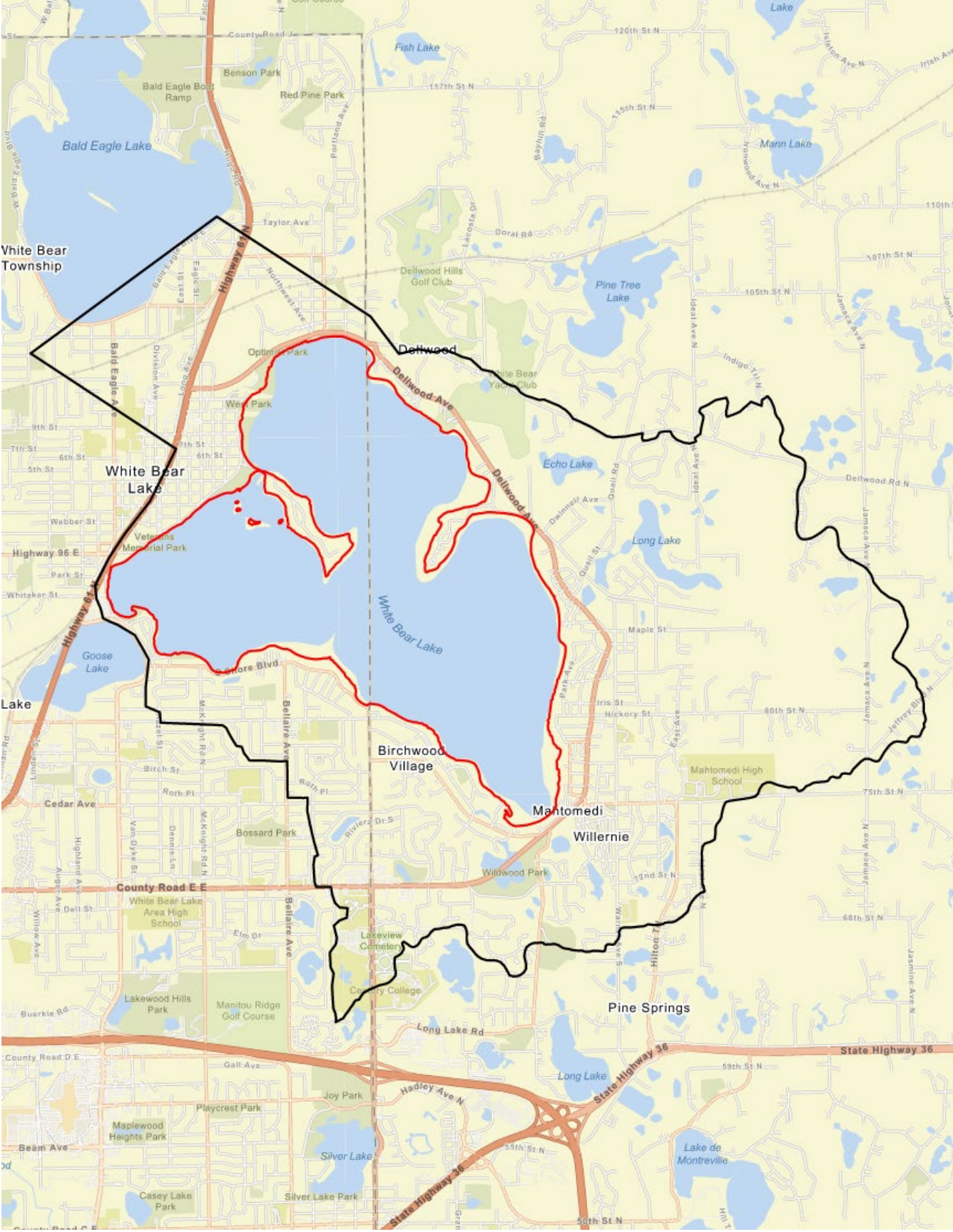
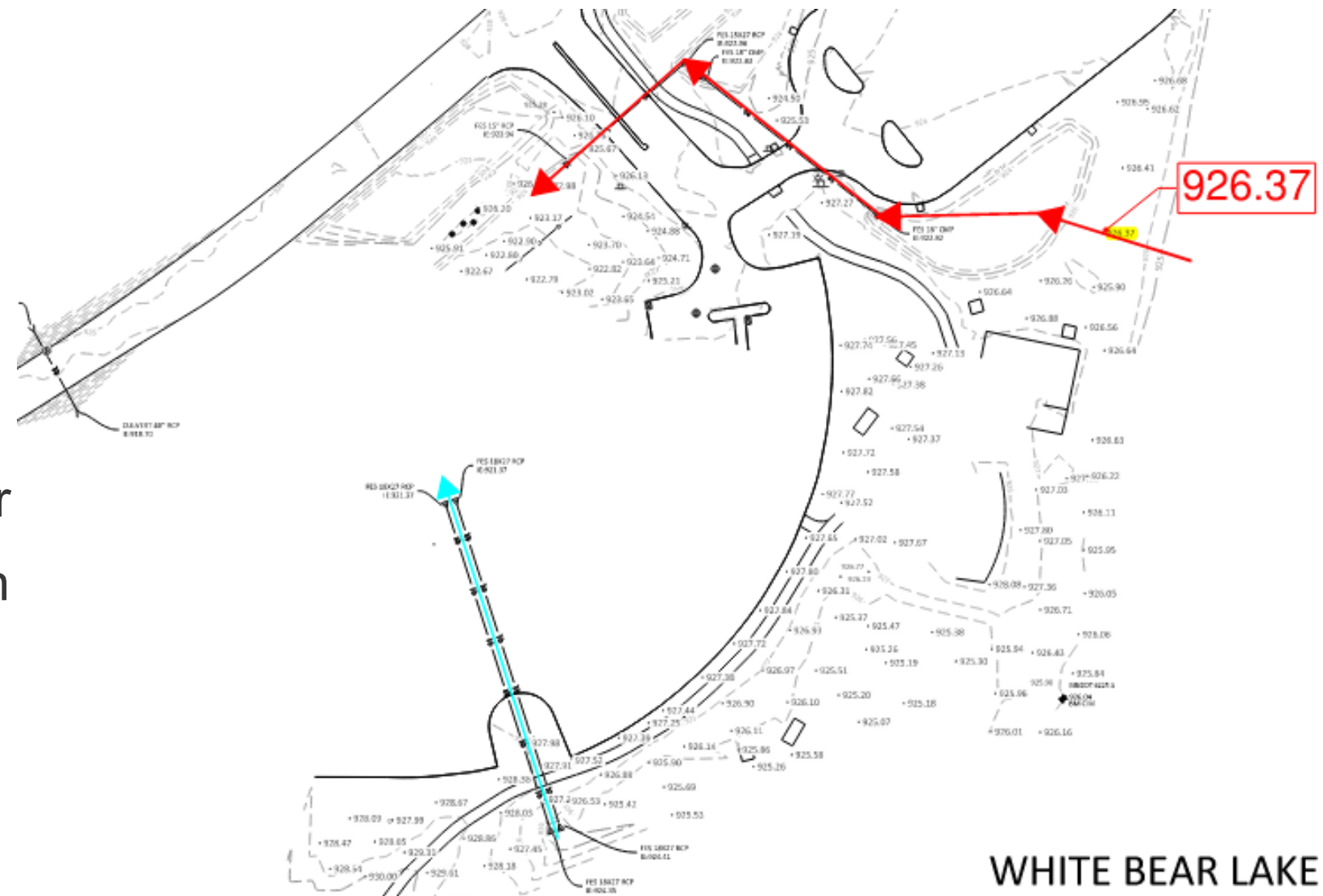


Exhibit 1 – Model and Lake Extents

- Legend
- White Bear Lake
 - Model Boundary

Survey Collected

- 14 total culverts were surveyed at White Bear Lake – County Park and along outlet channel to Bald Eagle Lake
- Topographic survey to determine overflow path
- Lowest elevation near stormwater basin between park and boat launch
 - Elevation: 926.37



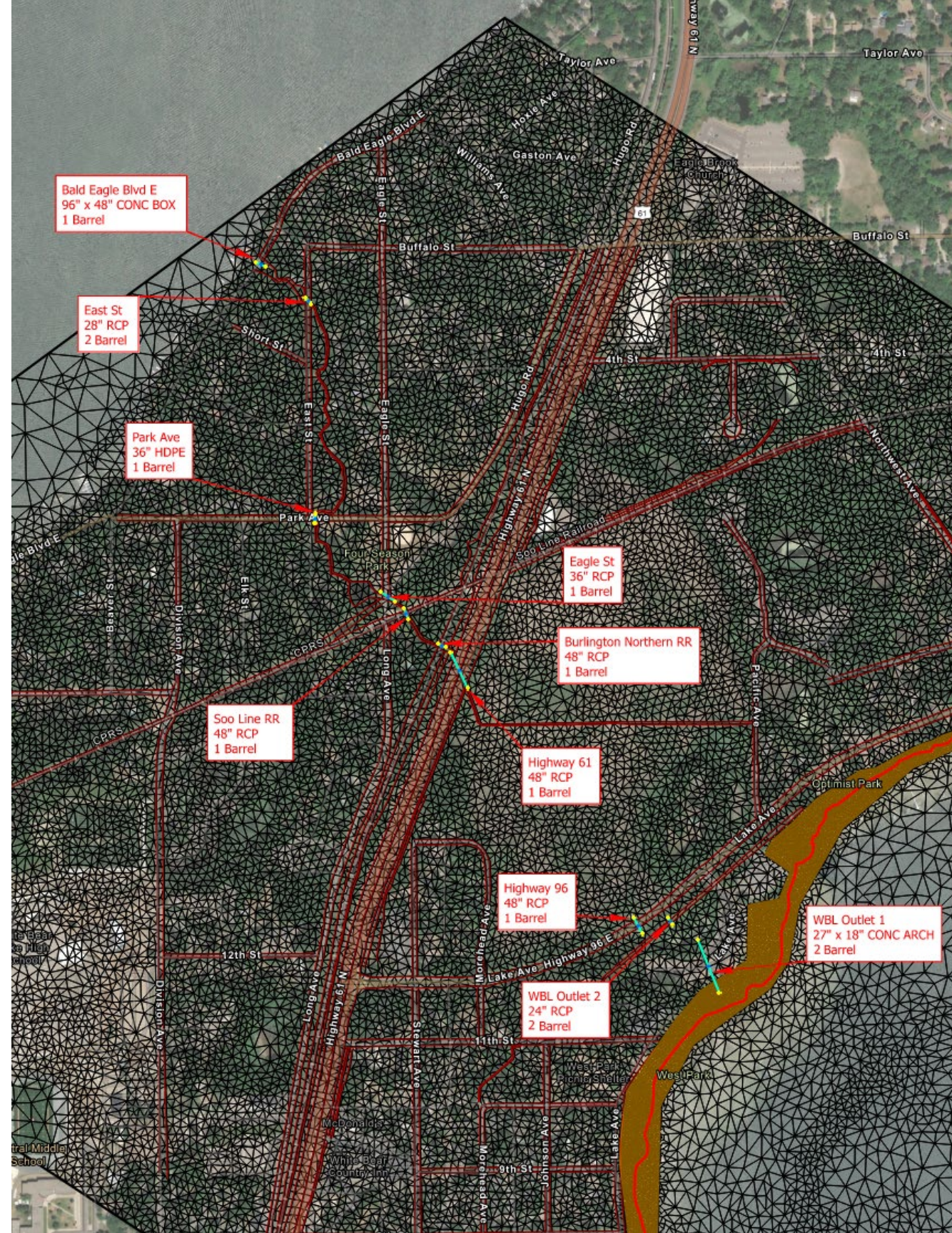


Exhibit 4 – Modeled Culverts

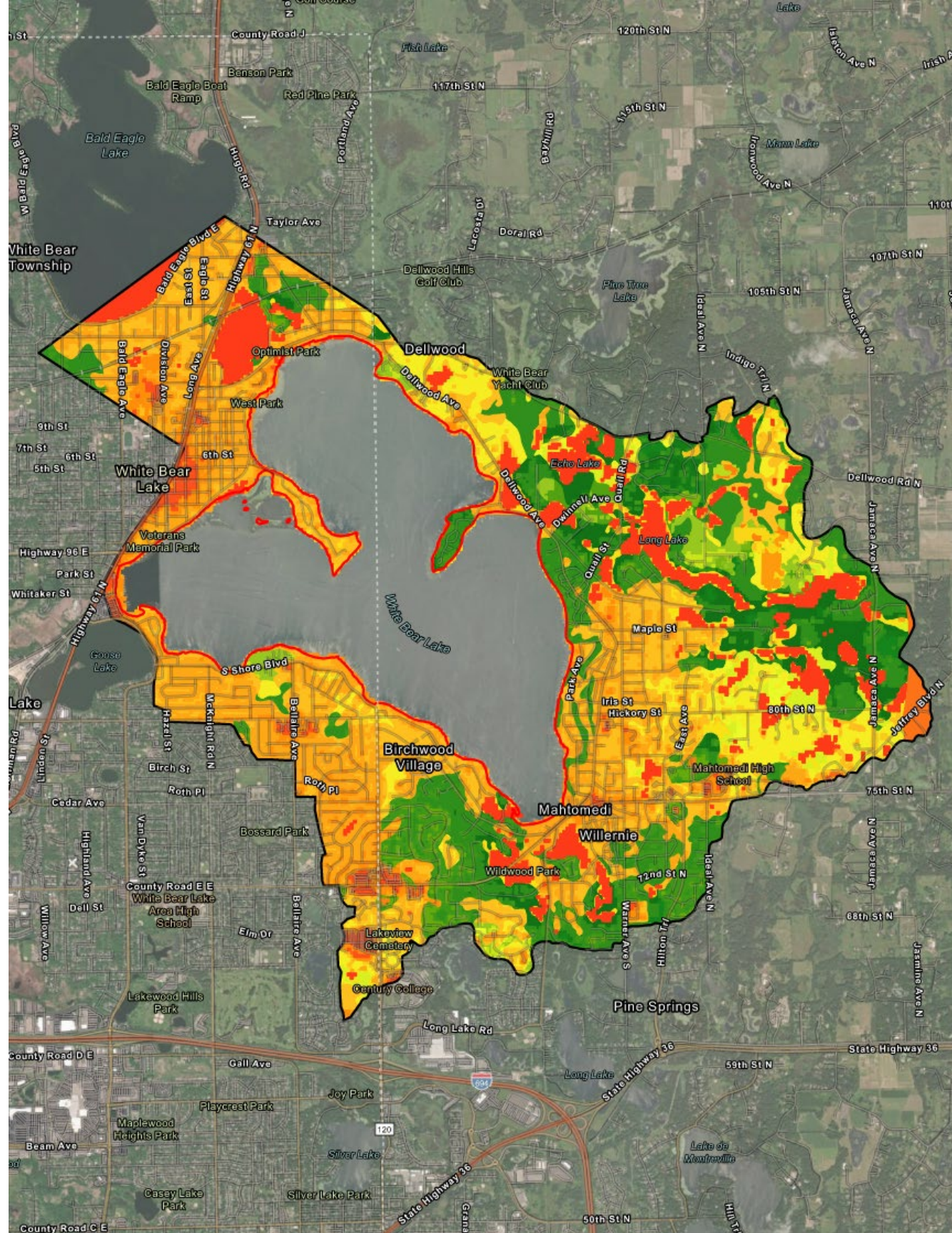


Exhibit 2 – Landuse and Infiltration Reference

Legend

	White Bear Lake		39		62		77		86
	Model Boundary		51		67		78		89
Curve Number									
	30		55		68		79		90
	32		57		70		80		94
	36		58		72		81		95
			60		73		84		98
			61		74		85		

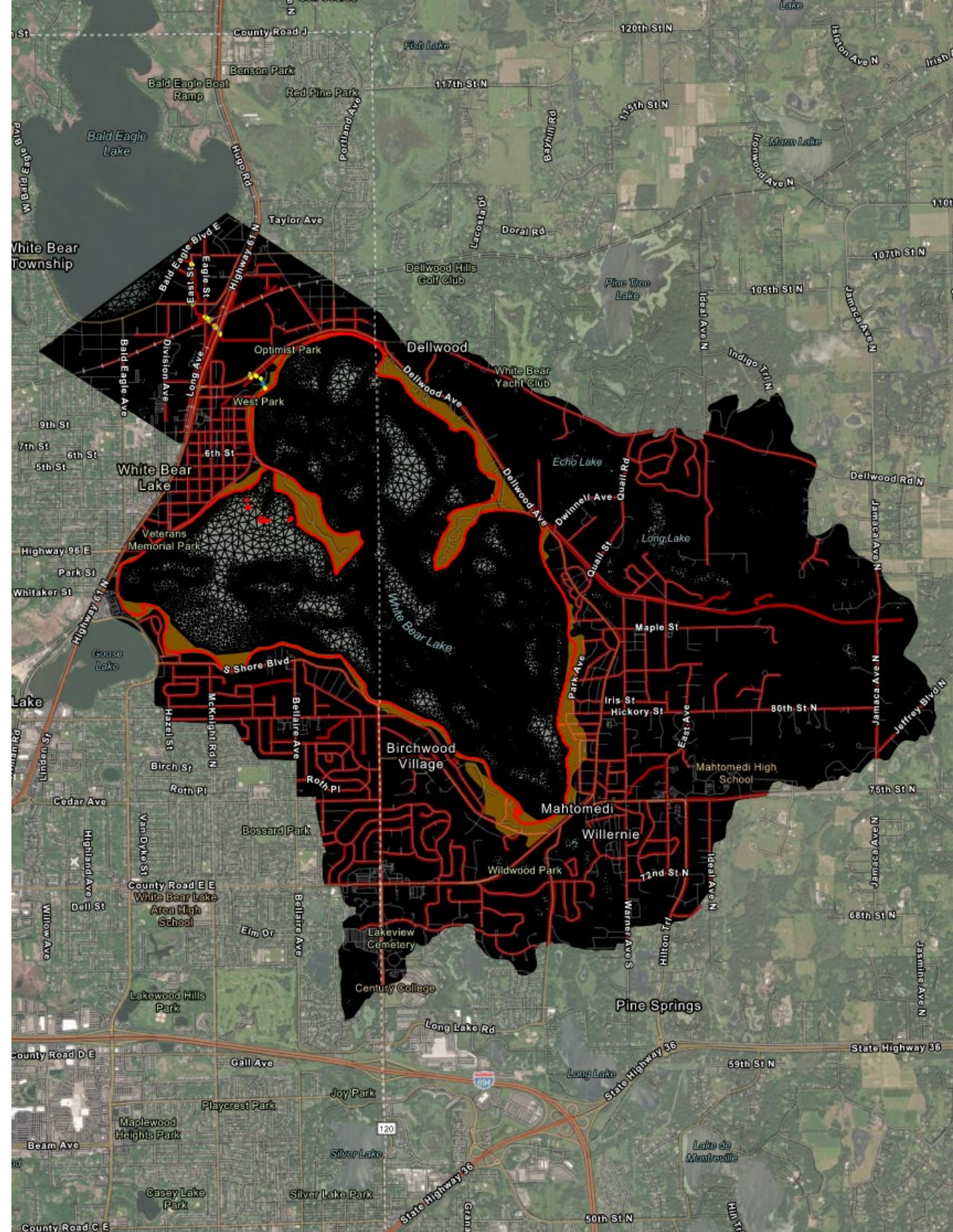









Exhibit 3 – Model Development

Legend

- | | |
|--|---|
|  White Bear Lake |  Mesh |
|  Model Boundary |  Culvert Conduit |
|  Breaklines |  Culvert Node |
|  Refinement Region | |

Model Validation

- 2018
- 2019
- 2020
- 100-year, 24-hour
- 100-year, 24-hour back-to-back
- Starting Water Surface Elevations

Figure 1 – 2018 Rainfall Event and Response – 9/19/18-9/21/18

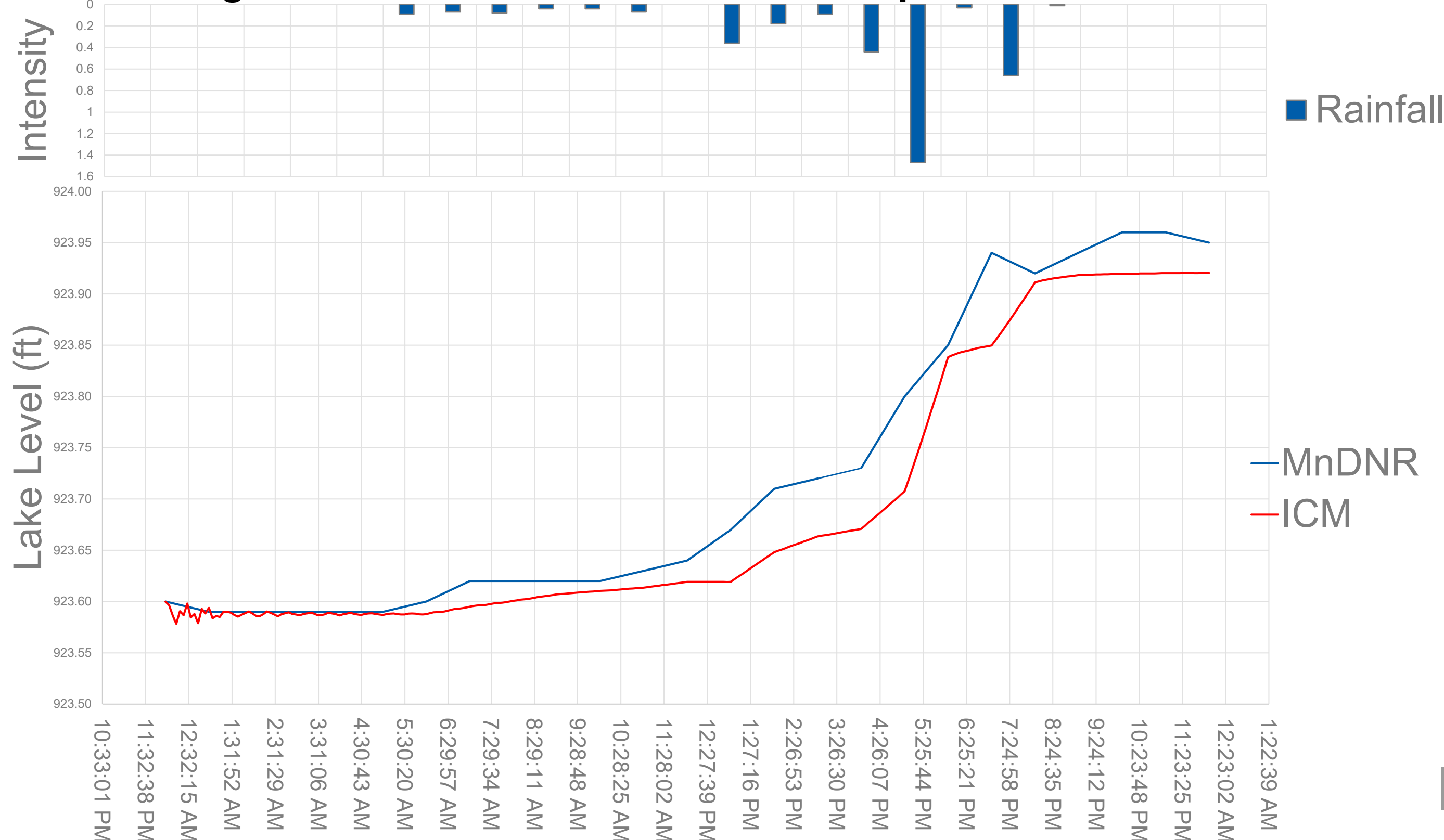


Figure 2 – 2019 Event and Response – 5/7/19-5/29/19

Rainfall

Intensity

(in/hr)

Rainfall

Lake Level (ft)

MnDNR

ICM

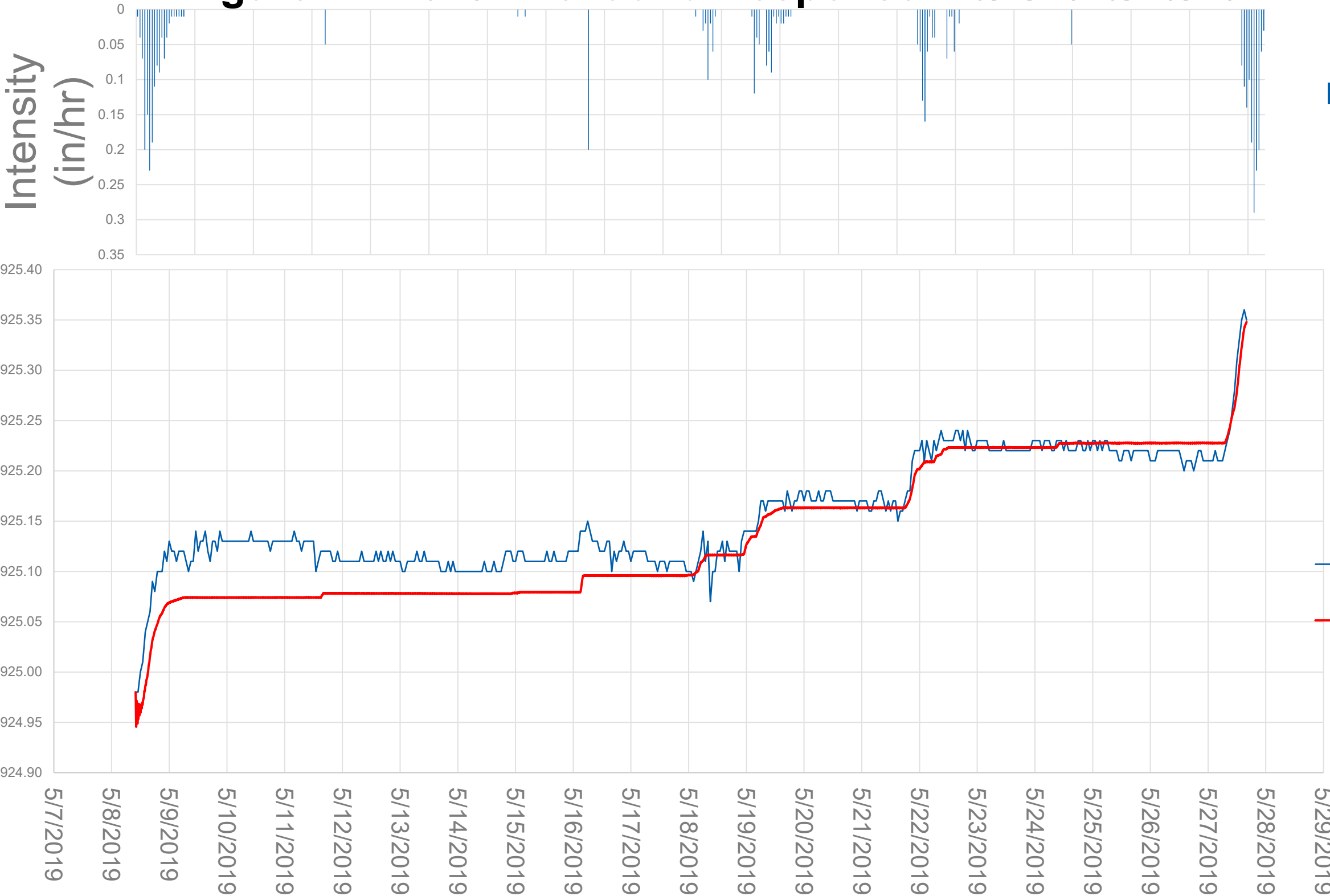
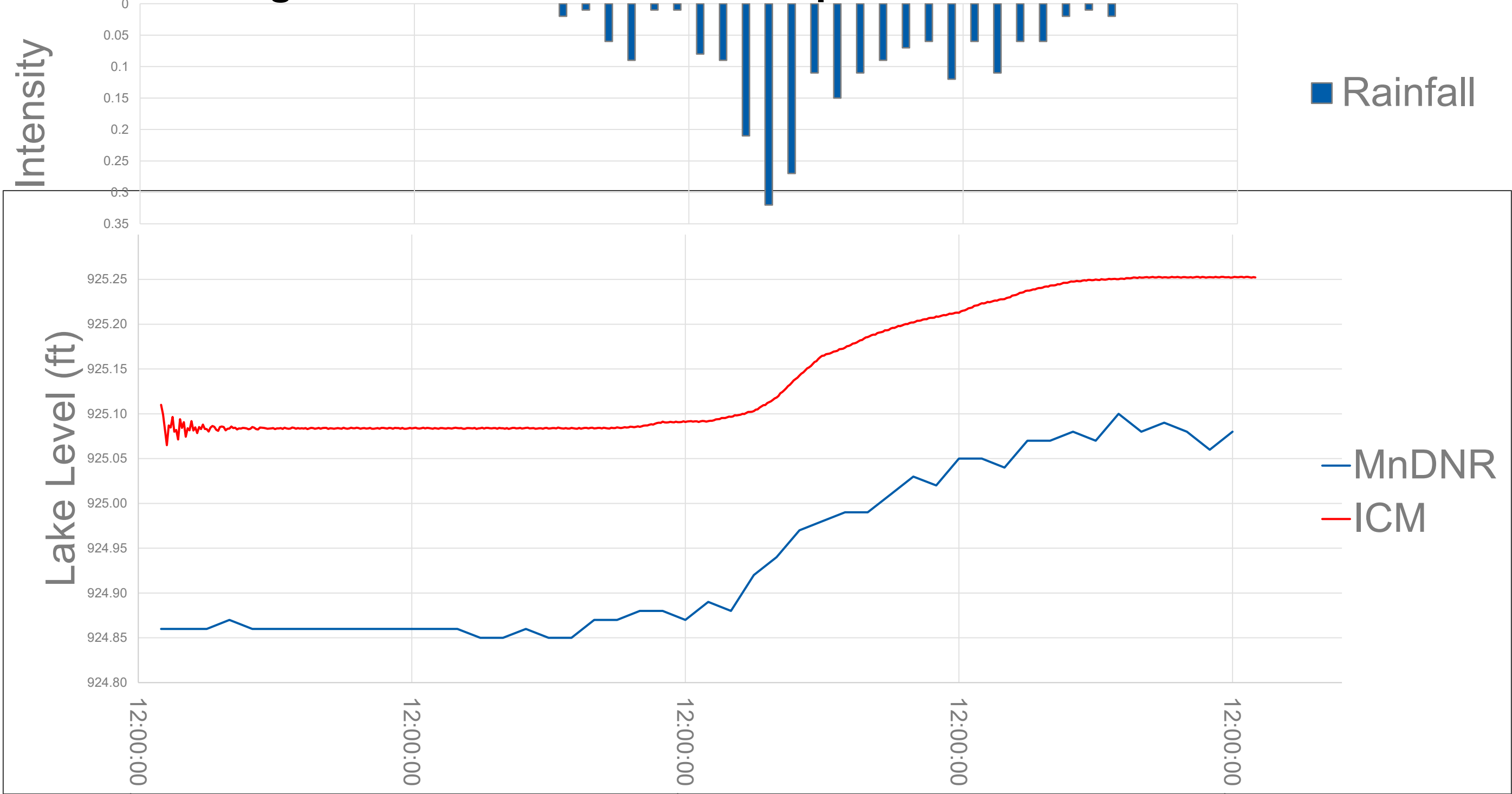


Figure 3 – 2020 Event and Response – 5/15/20-5/18/20



Outlet Alternatives Comparison

Alternative	100-year 24-hour HWL	100-year 24-hour Back-to-Back HWL	2018 HWL	2020 HWL
Existing	925.59	926.72	923.91	925.01
Raised by 0.5'	925.60	926.72	923.91	925.01
Raised by 1.0'	925.60	926.73	923.91	925.01
Weir Wall @ 925.4	925.59	926.71	923.91	925.01
Weir Wall @ 926.0	925.60	926.72	923.91	925.02

Infrastructure Risk Assessment

- Changes to High-Water Levels
- Infrastructure Impact

Impact Bucket	Range of Impact (% of Parcel Area)	Number of Parcels
Low	5-15%	35
Moderate	15-40%	8
High	>40%	59



All parcels with >5% estimated impact area shown in report appendix

Estimated Cost Impact

- Capital (Construction, Engineering, Construction Admin, Legal)
 - Alternative 1 and 2 - \$439,000
 - Alternative 3 and 4 - \$175,000
- Land/Easement Acquisition
 - Not Applicable due to current outlet location
- Annual Operation and Maintenance
 - Minimal due to passive system
 - Yearly inspection and following severe rainfall events

Outlet Modification

- Long-term Resiliency
- Advantages
 - Passive System with no/minimal operating costs
 - Will raise the lake level when paired with other system modifications
- Disadvantages
 - Will not solve the lake level issue on its own
 - May increase long-term resident costs through erosion and loss of usable property area

Study 9B Conclusions - Recommendations

- Detailed design of a free-standing weir wall at the outlet of White Bear Lake along with a removable (stop-log) portion for future lake management and maintenance.
- Review secondary outlet option to provide supplemental outlet capacity.

Questions