



Saskatchewan
Watershed
Authority

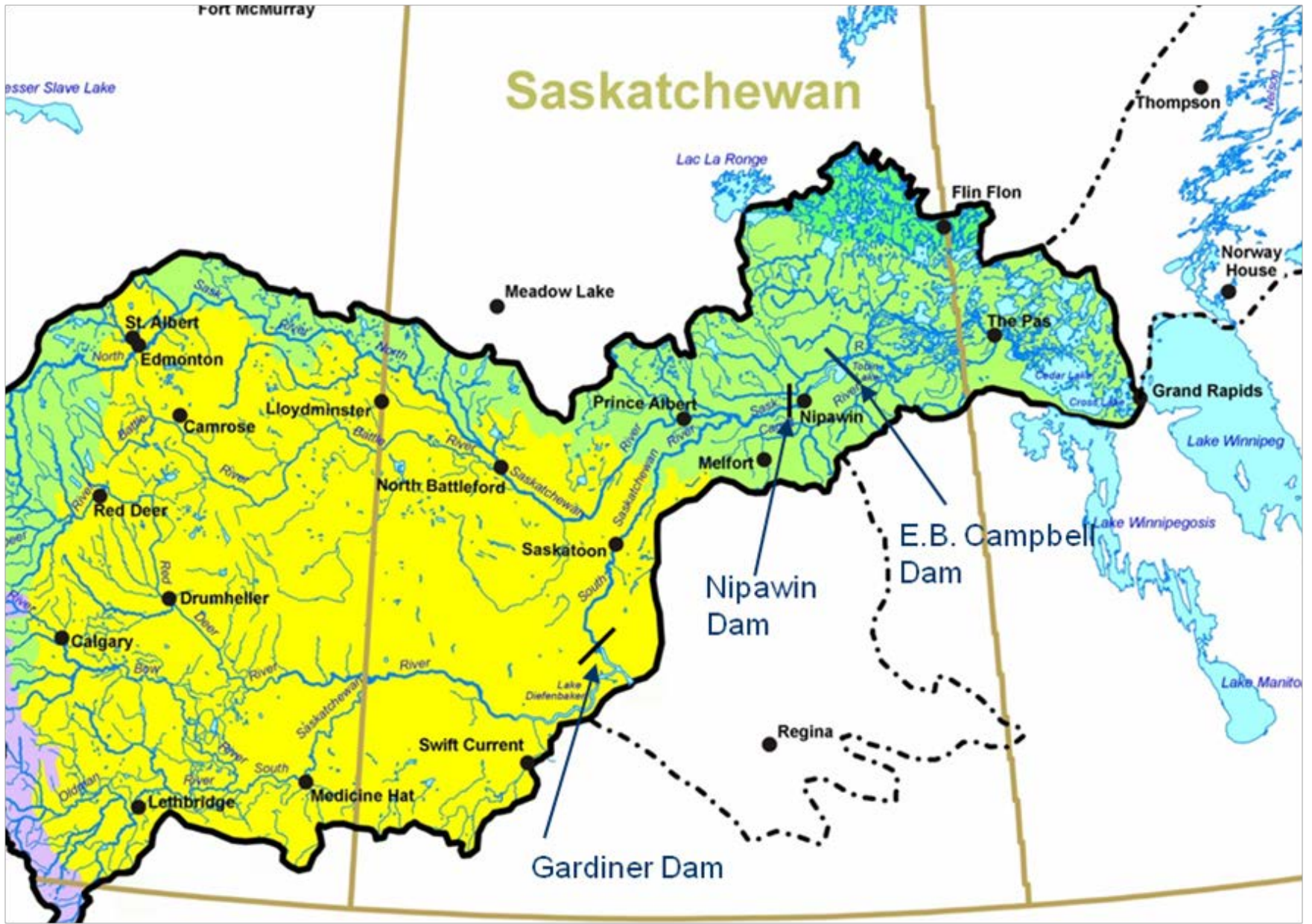
CCRN February, 2014

June 2013 Rainstorm Runoff Event in Saskatchewan River Basin

Saskatchewan Perspective

About WSA

- Water Security Agency Leads management of water in Saskatchewan
 - allocation of surface and ground water;
 - Waterworks approval /drinking water regulation
 - Water management infrastructure;
 - Water supply and flood forecasts
 - River and Lake Operations
 - Watershed and aquifer planning;
 - Water quality monitoring;
 - Interjurisdictional management (Alberta, Manitoba, United States)



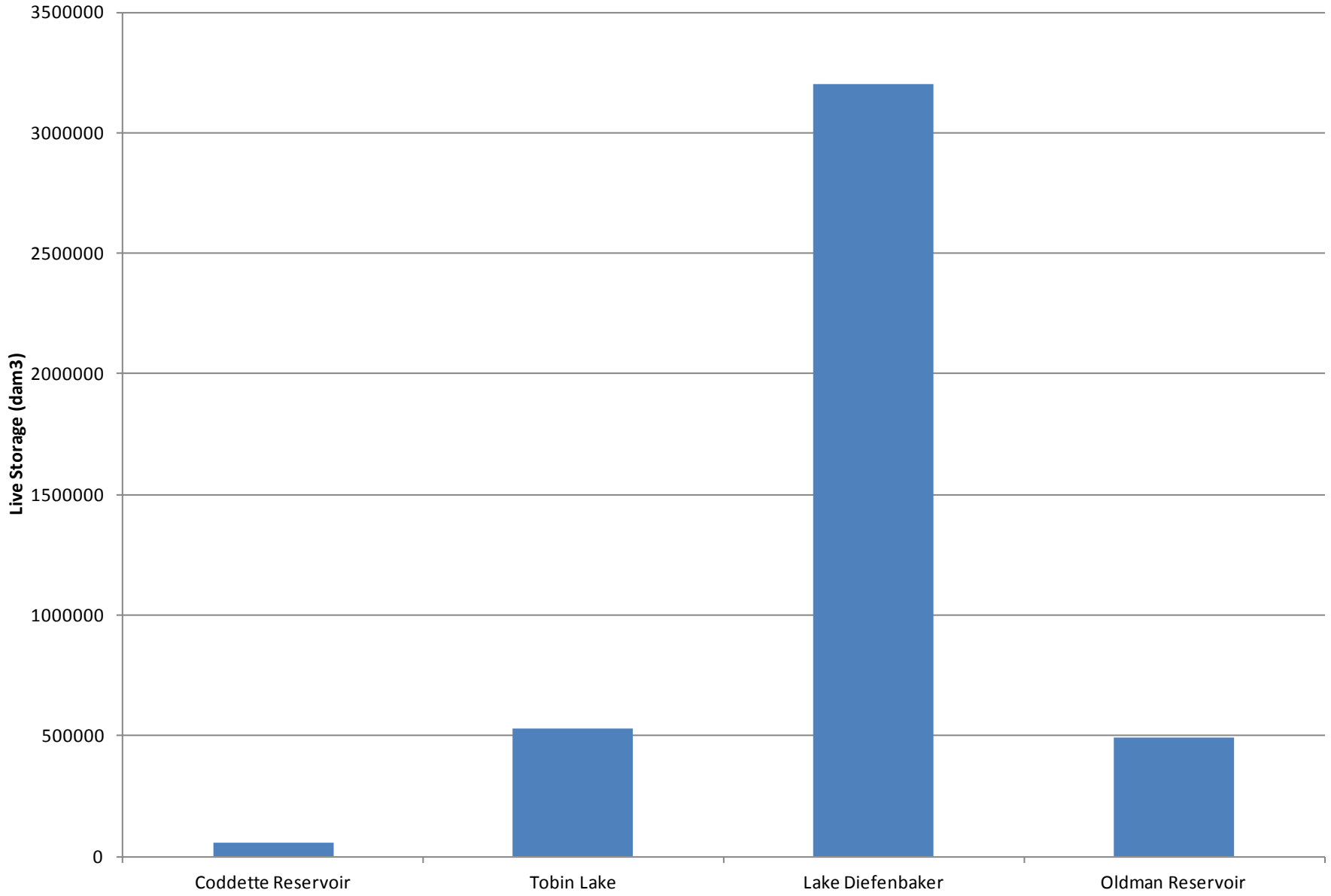


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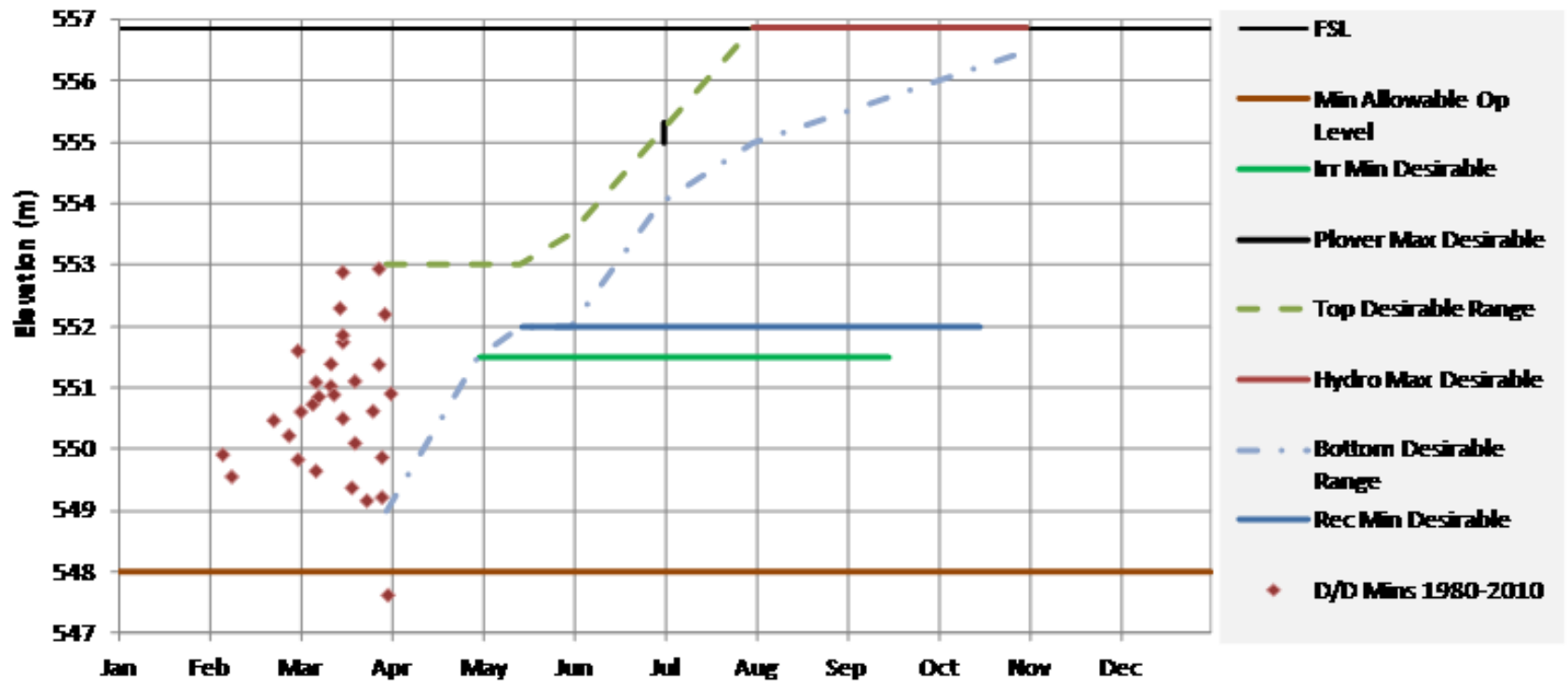
Lake Diefenbaker Statistics

- **Lake Diefenbaker**
- Reservoir Volume at FSL – 9,400,000 dam³
- Live Storage – 3,200,000 dam³
- Approximate Length – 225 km
- Surface Area at FSL – 430 km²
- Maximum depth at FSL – 58.5 m
- **Gardiner Dam**
- Maximum Height – 64 m
- Spillway Capacity at FSL – 6400 m³/s
- **Qu'Appelle River Dam**
- Maximum Height – 27 m
- Outlet Capacity at FSL – 68 m³/s

Comparison of Live Storage



Lake Diefenbaker - Desirable Range



Operating Objectives

- Safety and Regulatory Constraints
 - Passage of the Probable Maximum Flood
 - Minimum Allowable Operating Level
 - Saskatoon and E.B. Campbell Minimum Flows
- Primary Reservoir Services
 - Water Supply from Reservoir (Irrigation, municipal, industrial, Qu'Appelle Diversion)
 - Hydropower production
 - Reservoir Recreation, Reservoir Habitat and Fisheries
 - Downstream flow regulation (water supply, ferries, recreation, flood protection, ecology, hydropower)

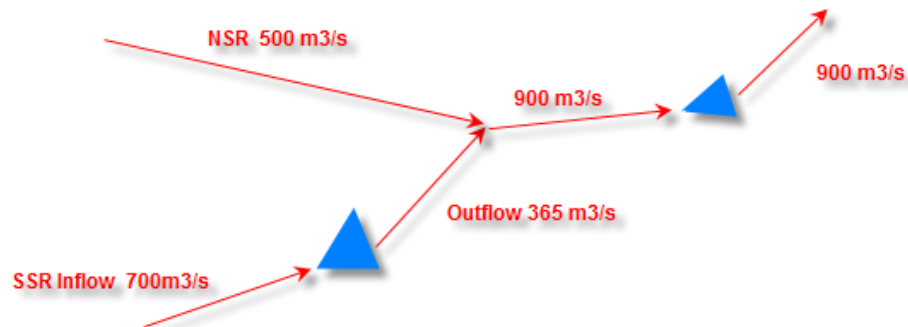
2013 Flood Event

**SASKATCHEWAN RIVER BASIN
FORECAST OF
STREAMFLOWS AND RESERVOIR LEVELS**

Date of Forecast: June 13, 2013

DATE	SOUTH SASKATCHEWAN RIVER				NORTH SASKATCHEWAN RIVER	
	Alberta Border	Lake Diefenbaker		Saskatoon	Alberta Border	Prince Albert
	Daily Mean Inflow (m ³ /s)	Reservoir Elevation (m)	Daily Mean Outflow (m ³ /s)	Daily Mean Flow (m ³ /s)	Daily Mean Flow (m ³ /s)	Daily Mean Flow (m ³ /s)
June 14, 2013	750	554.21	395	395	420	700
June 15, 2013	740	554.29	315	350	410	600
June 16, 2013	700	554.38	315	320	400	500
June 17, 2013	700	554.47	365	350	400	420
June 18, 2013	690	554.54	365	365	380	410
June 19, 2013	680	554.61	365	365	360	400
June 20, 2013	670	554.68	365	365	340	400
June 21, 2013	660	554.75	365	365	320	380
June 22, 2013	650	554.81	315	320	300	360
June 23, 2013	640	554.88	315	315	280	340

DATE	SASKATCHEWAN RIVER				
	Codette Reservoir			Tobin Lake	
	Daily Mean Inflow (m ³ /s)	Reservoir Elevation (m)	Daily Mean Outflow (m ³ /s)	Reservoir Elevation (m)	Daily Mean Outflow (m ³ /s)
June 14, 2013	1100	347.35	1050	313.26	1000
June 15, 2013	1000	347.66	1050	313.26	900
June 16, 2013	900	347.81	1000	313.31	850
June 17, 2013	820	347.81	950	313.35	850
June 18, 2013	710	347.68	800	313.40	900
June 19, 2013	700	347.75	800	313.41	900
June 20, 2013	750	347.51	800	313.41	800
June 21, 2013	730	347.24	750	313.40	700
June 22, 2013	710	347.27	700	313.41	700
June 23, 2013	700	347.65	650	313.47	650

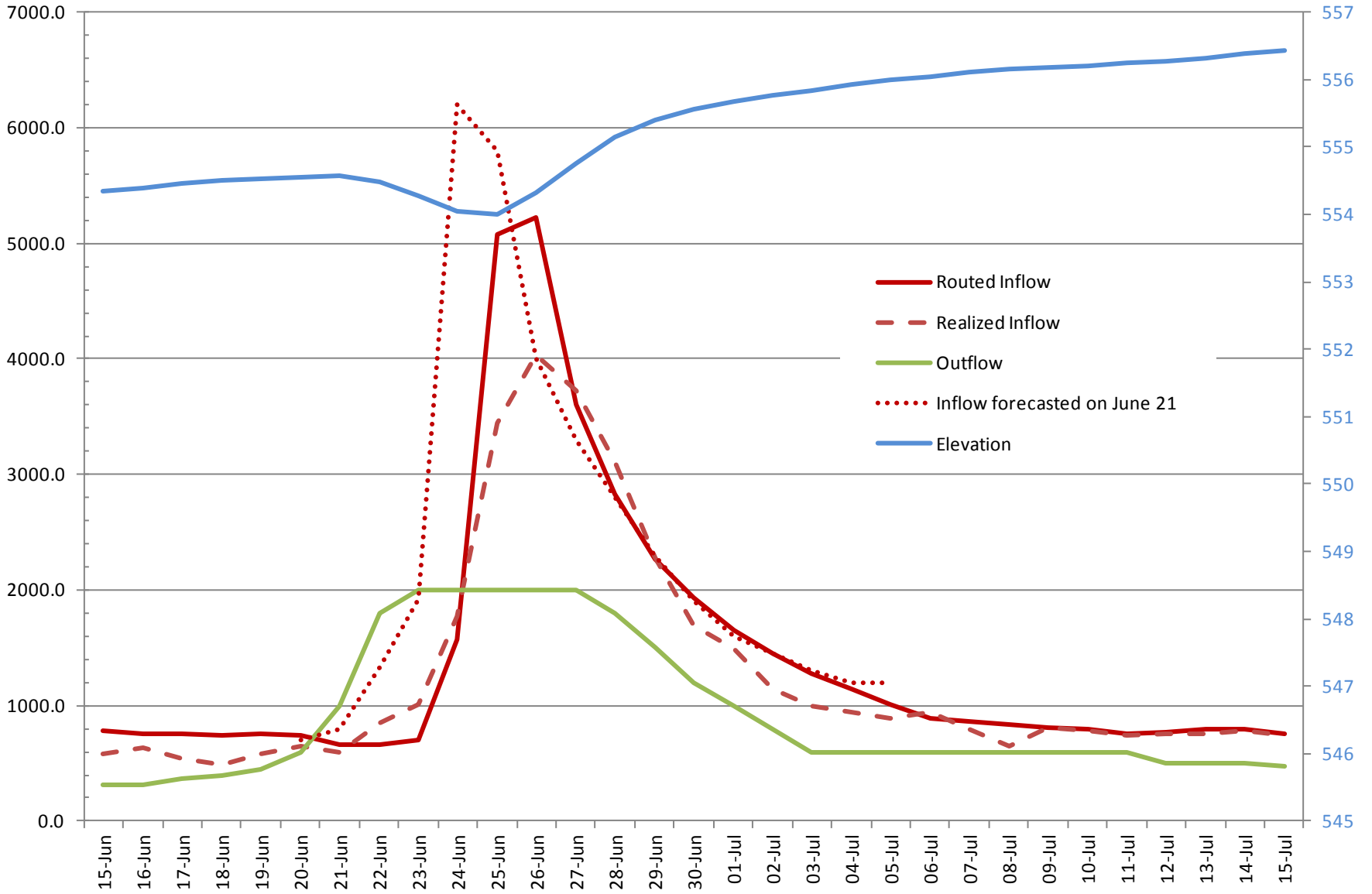


June SSRP Operations

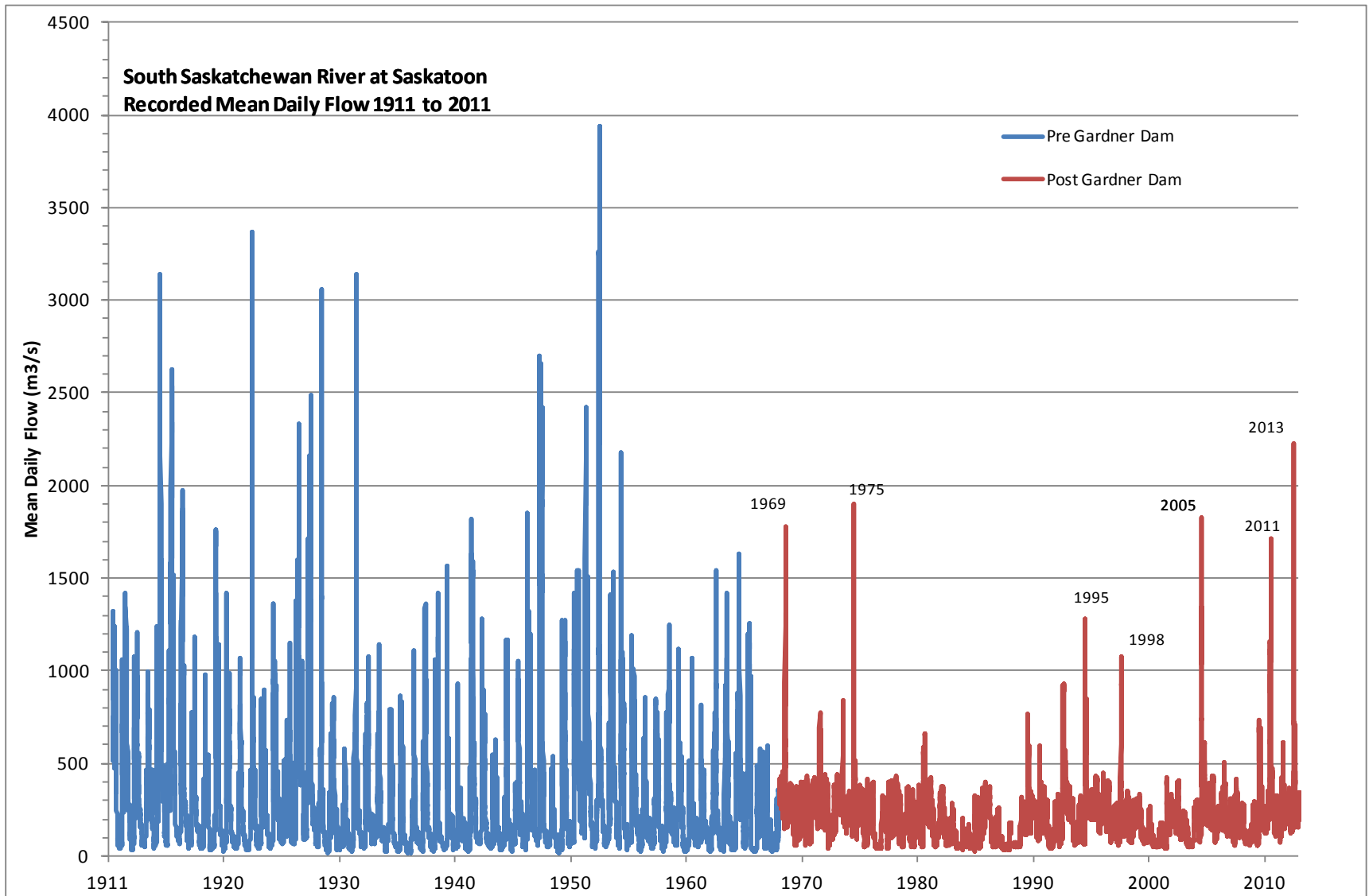
- June 16 first Env Canada forecast with sig ppt in Banff
- June 17 increased Coteau GS to plant capacity
- June 18 initiated 100 m³/s spill from Gardiner Dam
- June 19 increased spill to 400 m³/s
 - rain started approx 3 pm
- June 20 significant flooding in Canmore and High River
- June 21 increased spill to 1000m³/s
- June 22 increased spill to 1600 m³/s
- June 22 flow peaks at Lethbridge and Bassano

Lake Diefenbaker Inflow/Outflow/Elevation

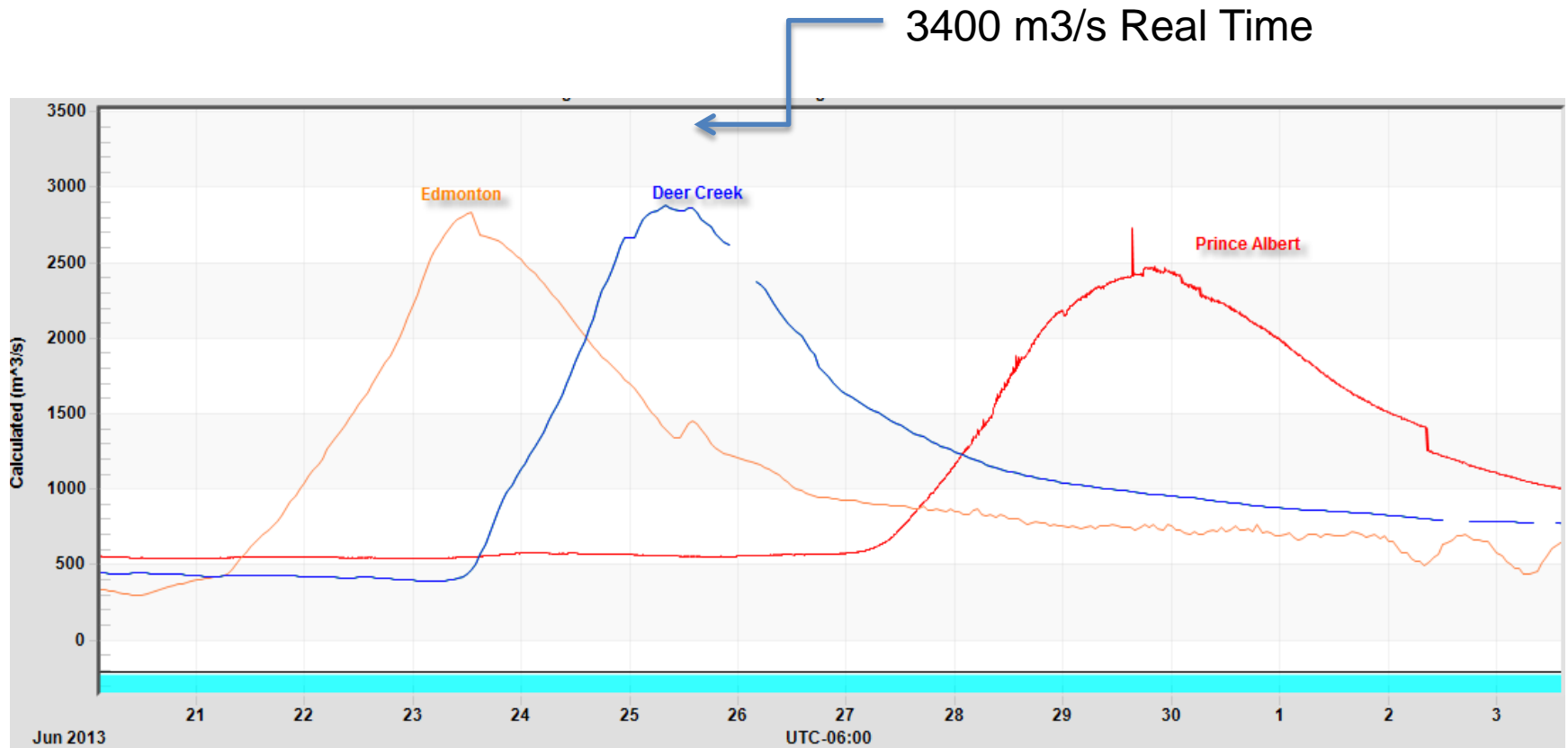
June 15, 2013 to July 15, 2013



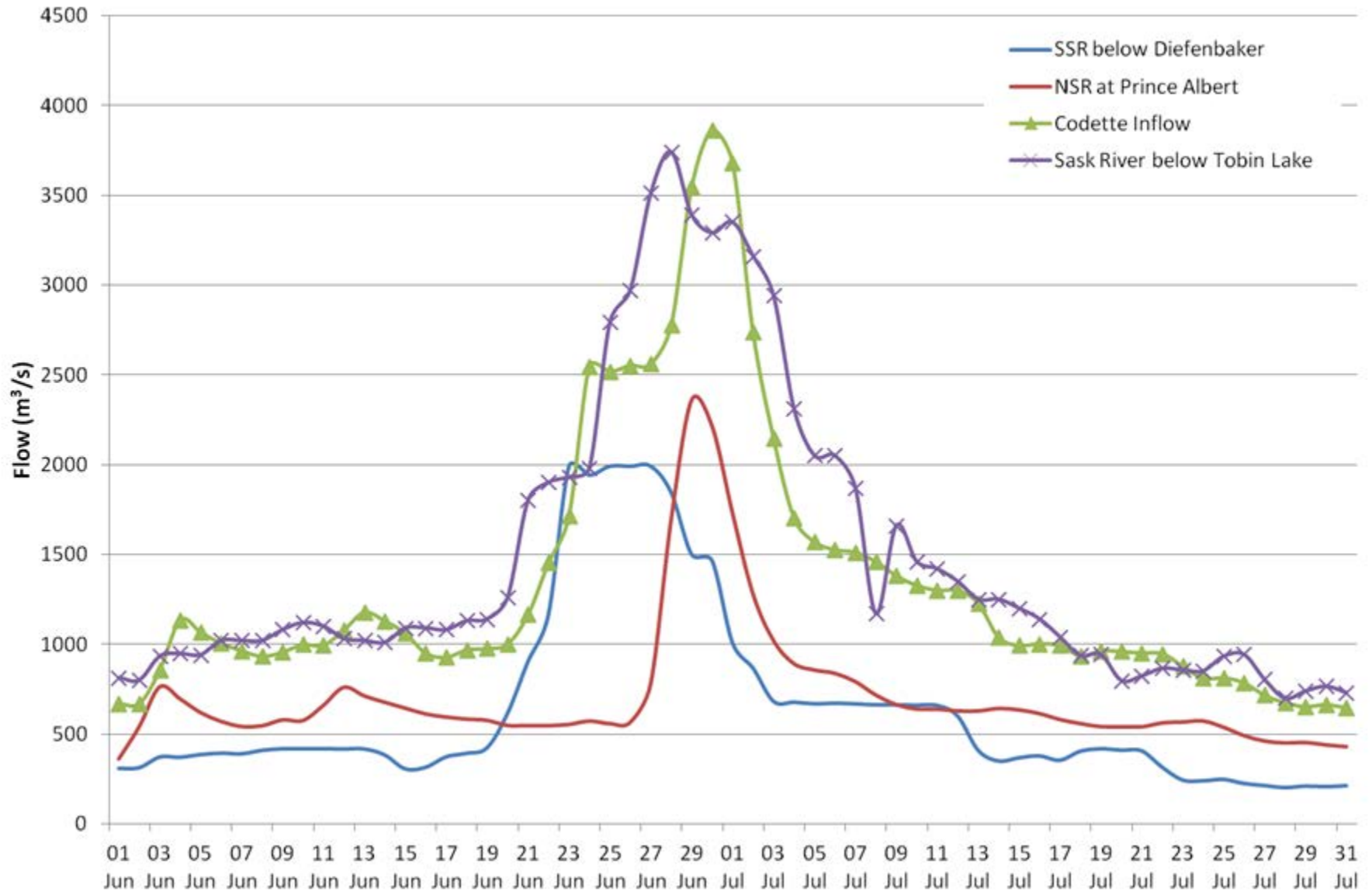
SSR Peak Flows at Saskatoon



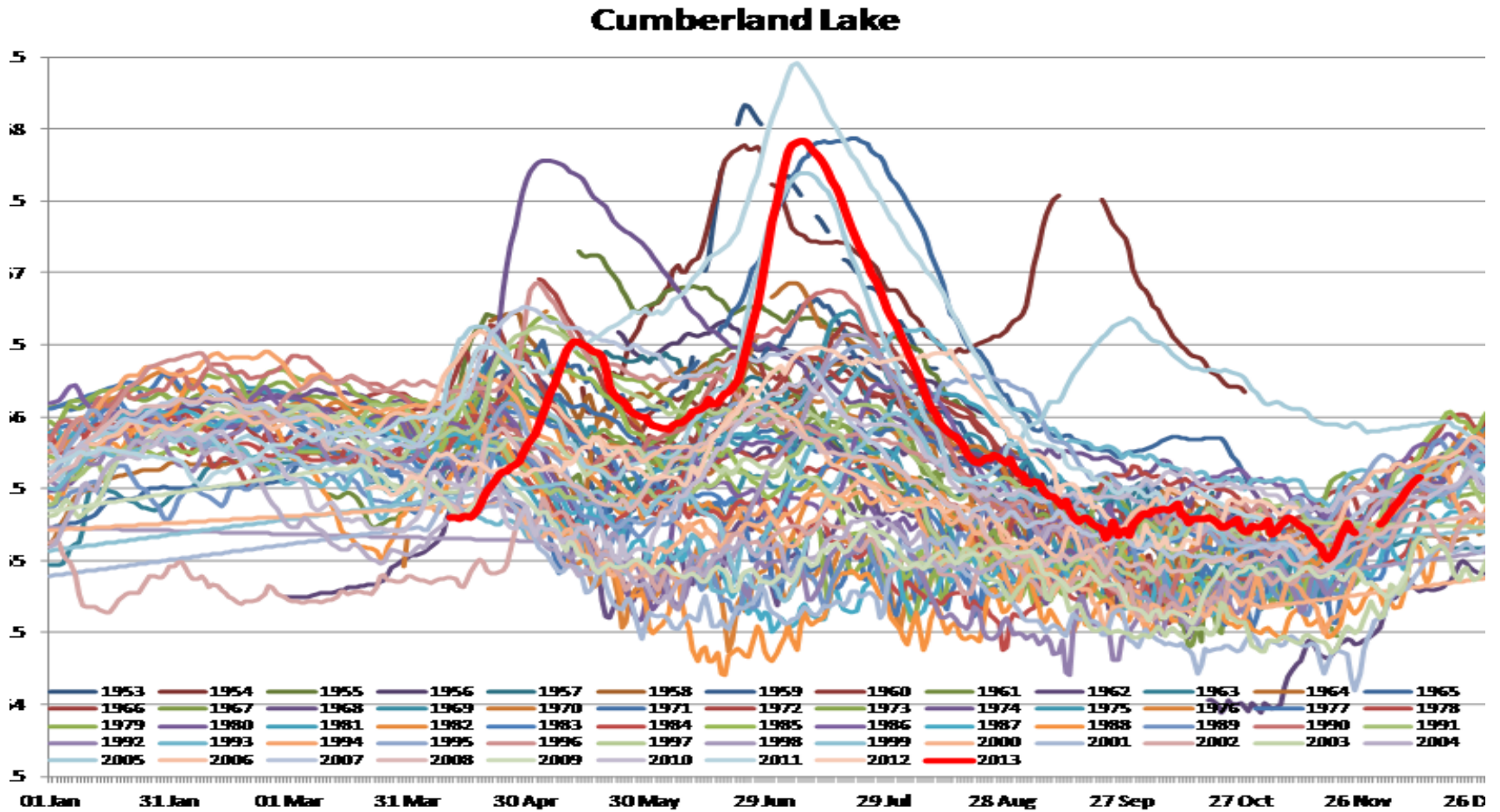
North Saskatchewan River



Codette Inflow and Tobin Outflow



Historical Levels-Cumberland Lake



Summary of June 2013 Peak Flows:

Lake Diefenbaker Operations:

5200m³/s inflow 2000 m³/s Outflow

Codette Reservoir

4100 m³/s inflow 4100 m³/s outflow

Tobin Lake

4100 m³/s Inflow 3800 m³/s outflow

2013 Flood Impacts

Prelate Pumphouse



06/26/2013 09:33

Flooding d/s of Lake Diefenbaker



3/11/2014

City of Saskatoon

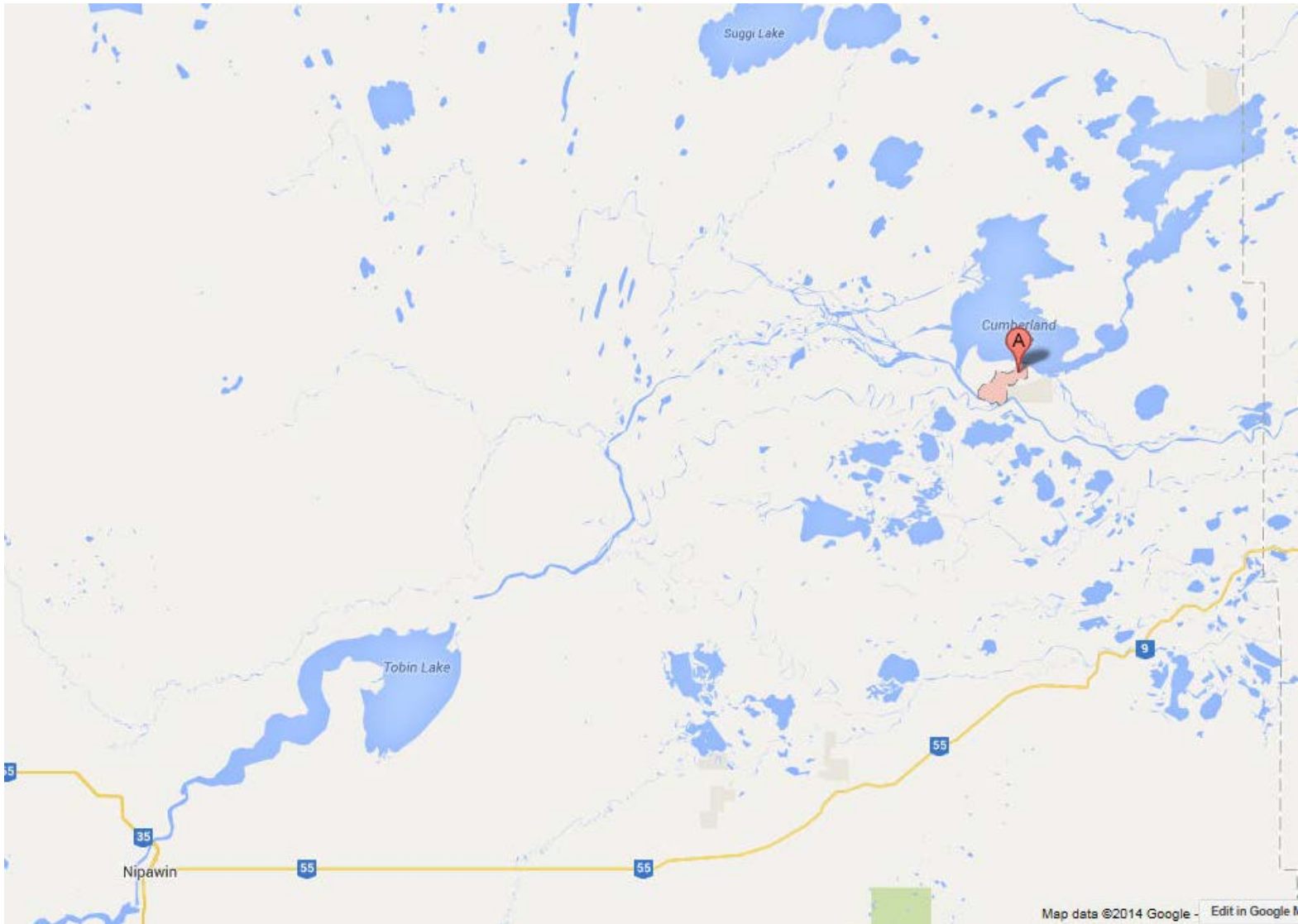


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City of Saskatoon



Impacts Below Tobin Lake



Opportunities for Improvement

- During the event lots of unknowns
 - Where did it rain?
 - How much rain fell?
 - How much more rain to come?
 - Past events where/how much did it rain?
 - When have flows peaked?
 - Missing hydrometric data
 - How are travel times affected at high flows
 - How accurate is the real time hydrometric data

Planning for Future:

- Develop rainfall runoff models
- Develop better flood routing models
- Increase hydrometric station network and its robustness
- Confirm elevation/capacity relationship of Lake Diefenbaker
- Increased redundancy in forecasting and reservoir operations
- Maintain flood development standards

- AND.....

- Triple salaries of Forecast/Reservoir Operation Engineers



3/11/2014