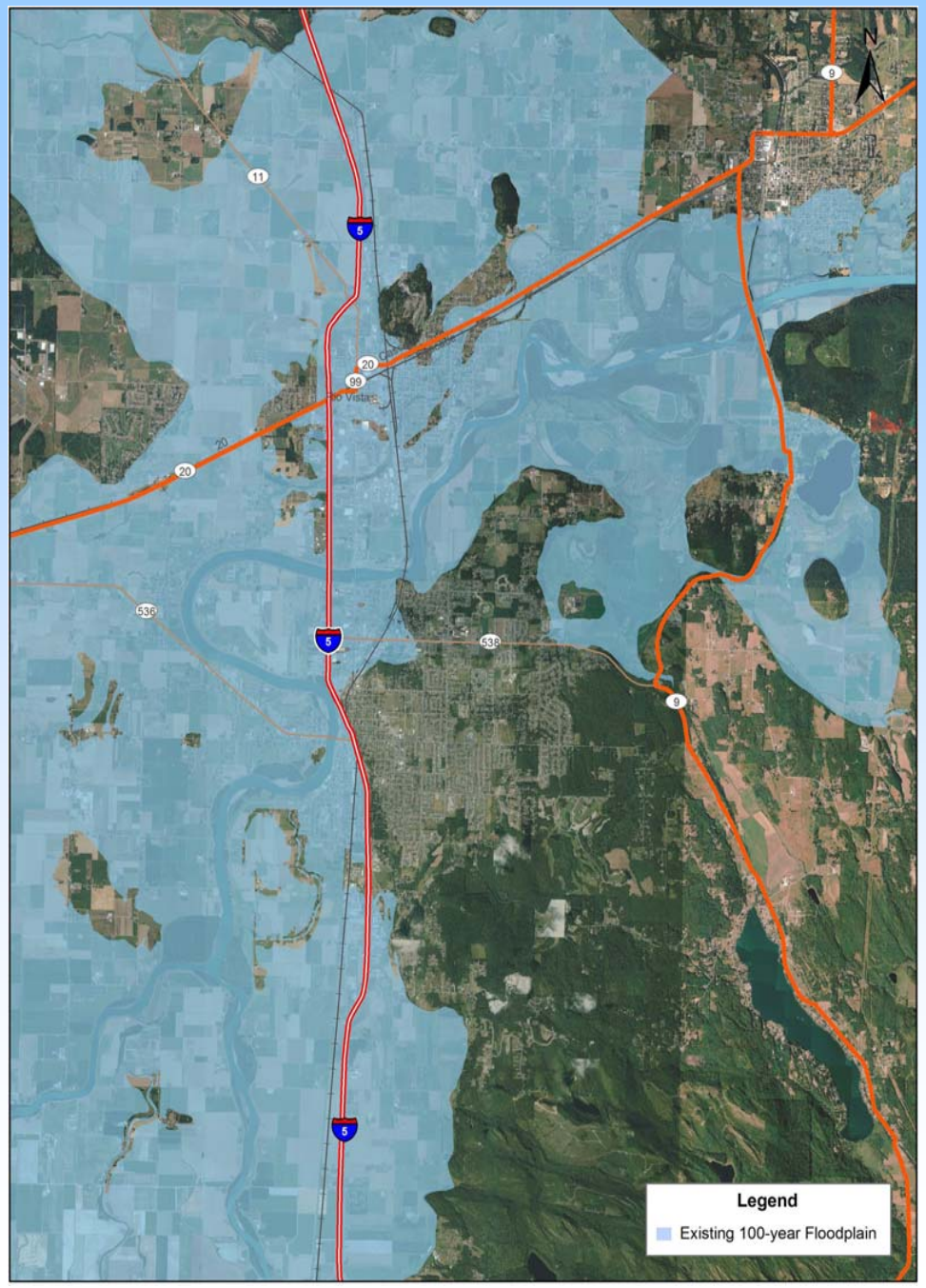
Impacts of Questionable Science and Poor Process:

Why Obfuscating Federal Process Combined with Questionable Data is Preventing our Local Community from Solving a Serious Flood Problem

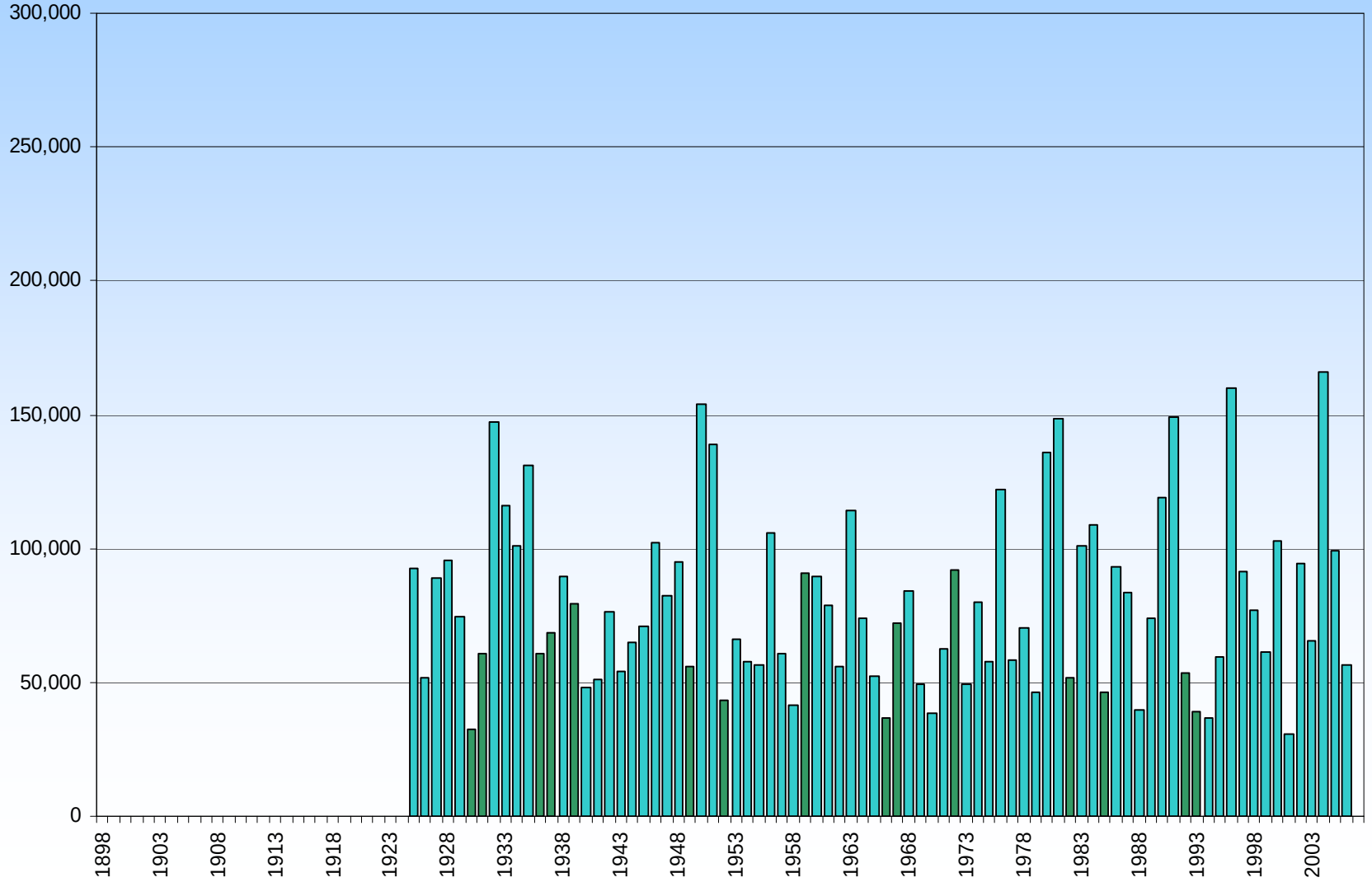
Chal Martin, P.E.
City of Burlington
Public Works Director

May 24, 2007

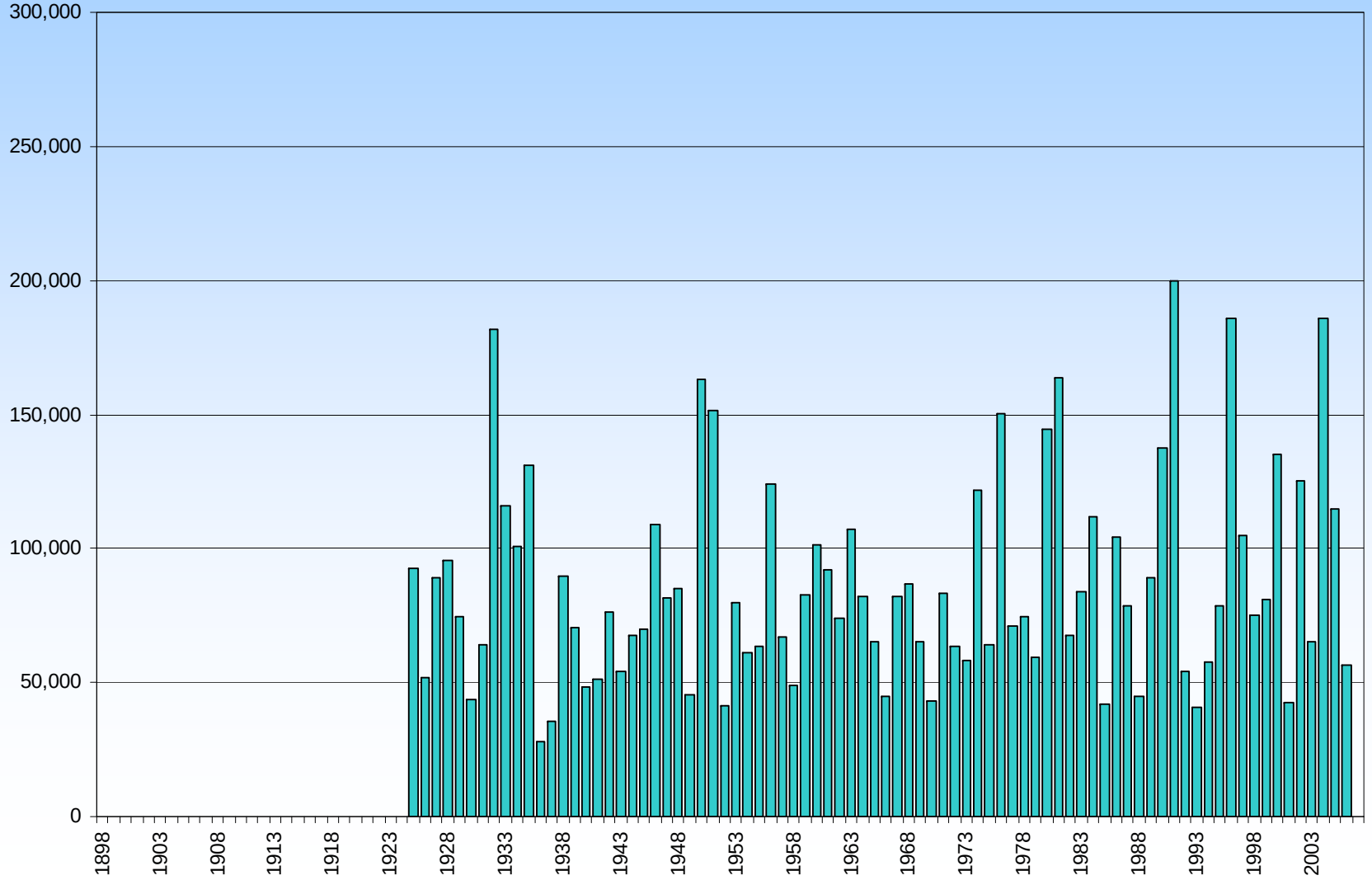



27/08/2006

Direct Gage Readings for Annual Peak Flows
Skagit River Near Concrete – 81 Years



Winter Unregulated Annual Peak Flows
Skagit River Near Concrete



QUESTION

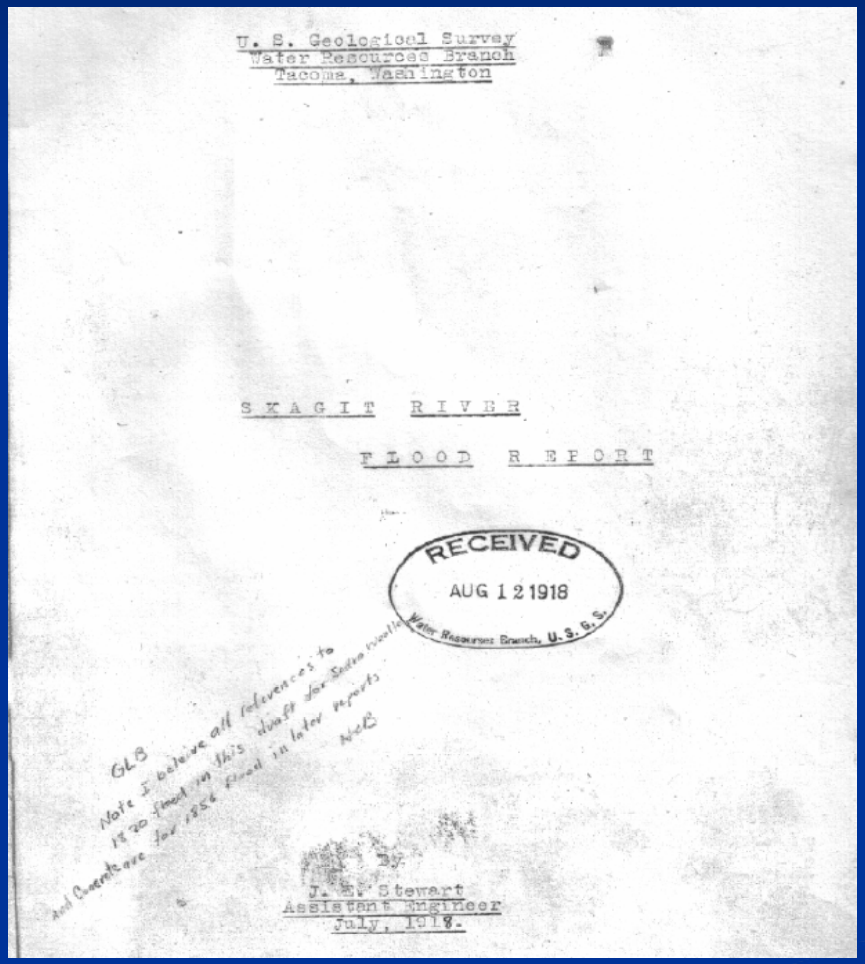
- What is the correct data to input into the flood frequency analysis?
- Answer to this question turns on the interpretation of the work conducted by James E. Stewart

(thanks to Mr. Larry Kunzler for the slides that follow)

WHO WAS JAMES E. STEWART?

- Mr. Stewart was a hydrologist employed by the USGS Tacoma District Office sometime before 1918.
- His official title was "Assistant Engineer".
- He authored the first "report" on the Skagit River in 1918 and sometime thereafter was transferred to Hawaii.

STEWART 1918 REPORT



U. S. Geological Survey
Water Resources Branch
Tacoma, Washington

SKAGIT RIVER

FLOOD REPORT

RECEIVED
AUG 12 1918
Water Resources Branch, U. S. G. S.

GLB
Note I believe all references to
1920 flood in this draft for Skagit would
and Cascade are for 1856 flood in later reports
Nov 6

By
J. E. Stewart
Assistant Engineer
July, 1918.

- Report dealt with 1897, 1909 and 1917 flood events.
- Determined these flood events were 10 year events.
- 1897 flood 3 ft higher then 1909 at Concrete
- 1909 flood 1.6 ft higher then 1917 and .6 ft. higher then 1897 flood at Sedro-Woolley.

STEWART 1918 REPORT

YEAR	CONCRETE[1]	SEDRO-WOOLLEY
1897	205,000 cfs	171,000 cfs
1909	185,000 cfs	169,000 cfs
1917	175,000 cfs	157,000 cfs

Stewart Report Appendix *(1918)*

The volumes expressed are "peak discharges".

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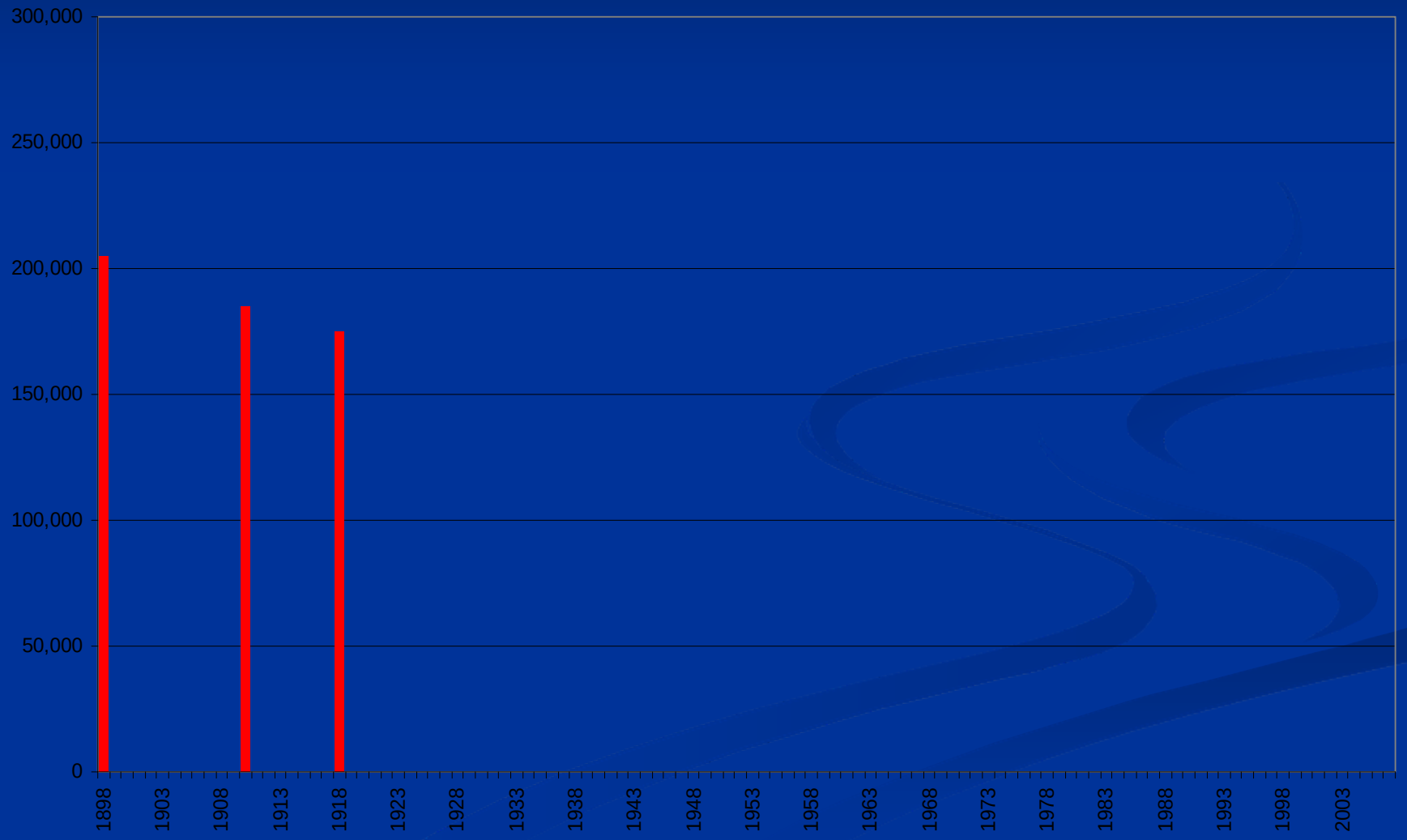
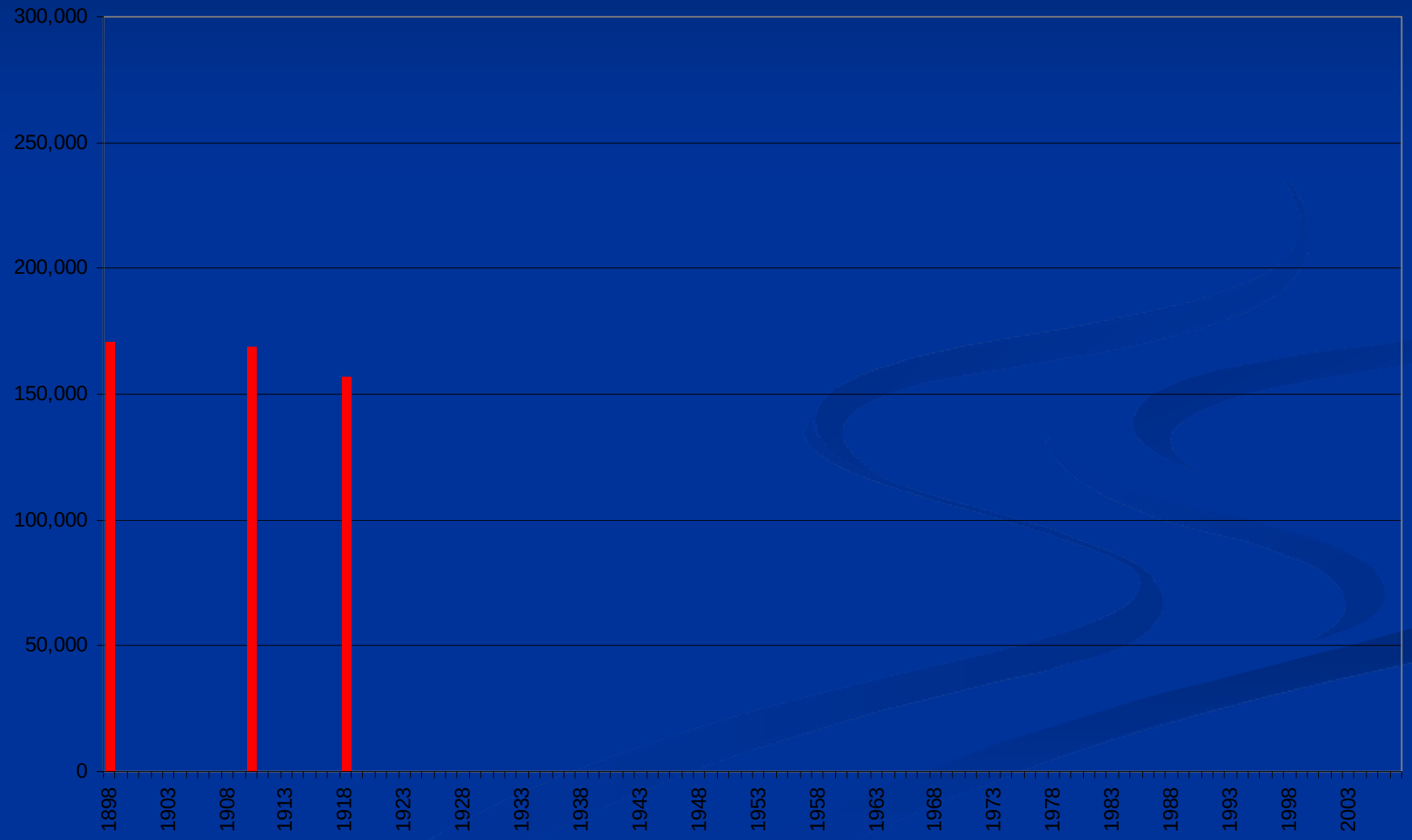
[1] The Dalles

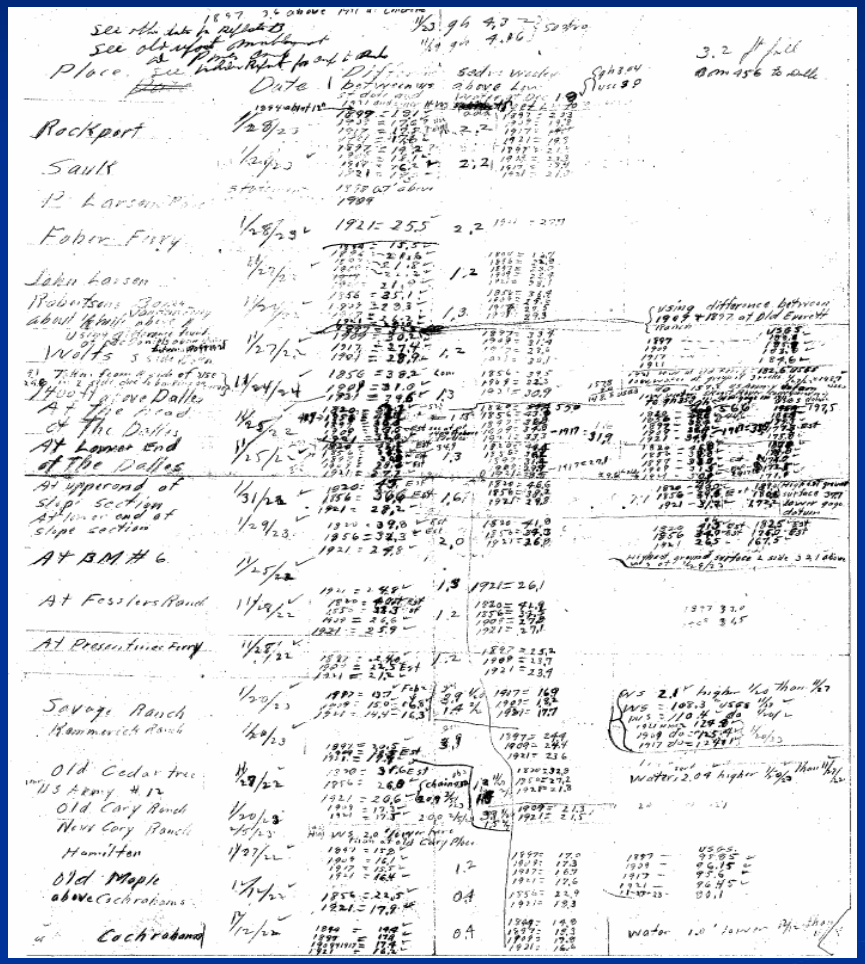
Stewart's 1918 Estimates of the Historic Unrecorded Floods At Concrete



Stewart's 1918 Estimates of the Historic Unrecorded Floods At Sedro-Woolley



STEWART 1923 REPORT



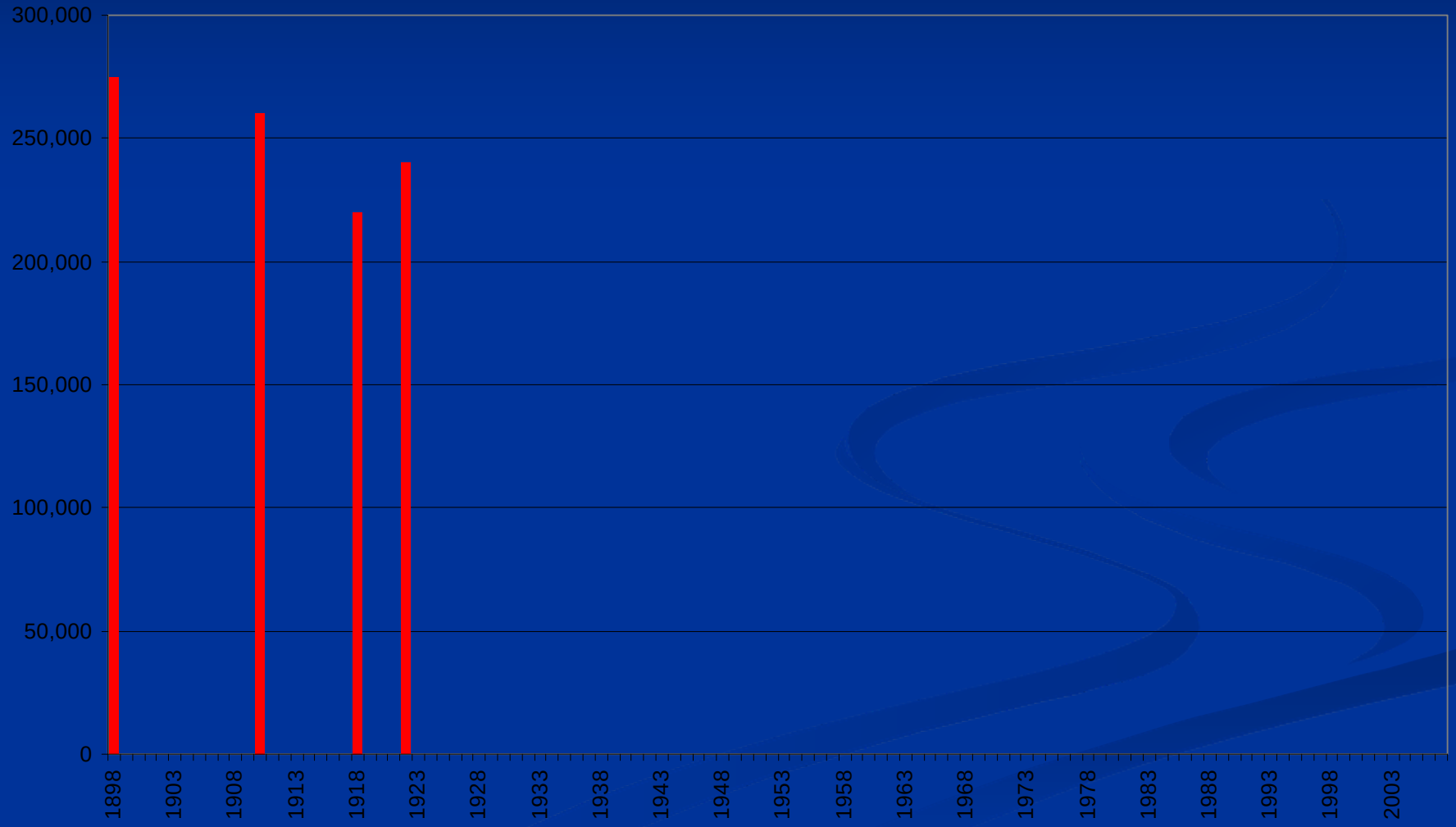
- At Hamilton the FN records a notation taken from a local newspaper article which stated that the 1909 flood was 4" higher then the 1897 flood. The HWN come very close to documenting this having the difference between the 1909 and 1897 flood as 3.6 inches with the 1909 flood being the higher of the two. The HWN further state that the 1921 flood was 3.6 inches higher then the 1909 flood and 7.2 inches higher than the 1897 flood.
- Although probably accurate based on local newspaper accounts of the 1921 flood it would appear to contradict all his other estimates.
- These and many other discrepancies between the FN and the HWN have never been addressed by USGS, the Corps or FEMA.

1918 vs. 1923 STEWART REPORT

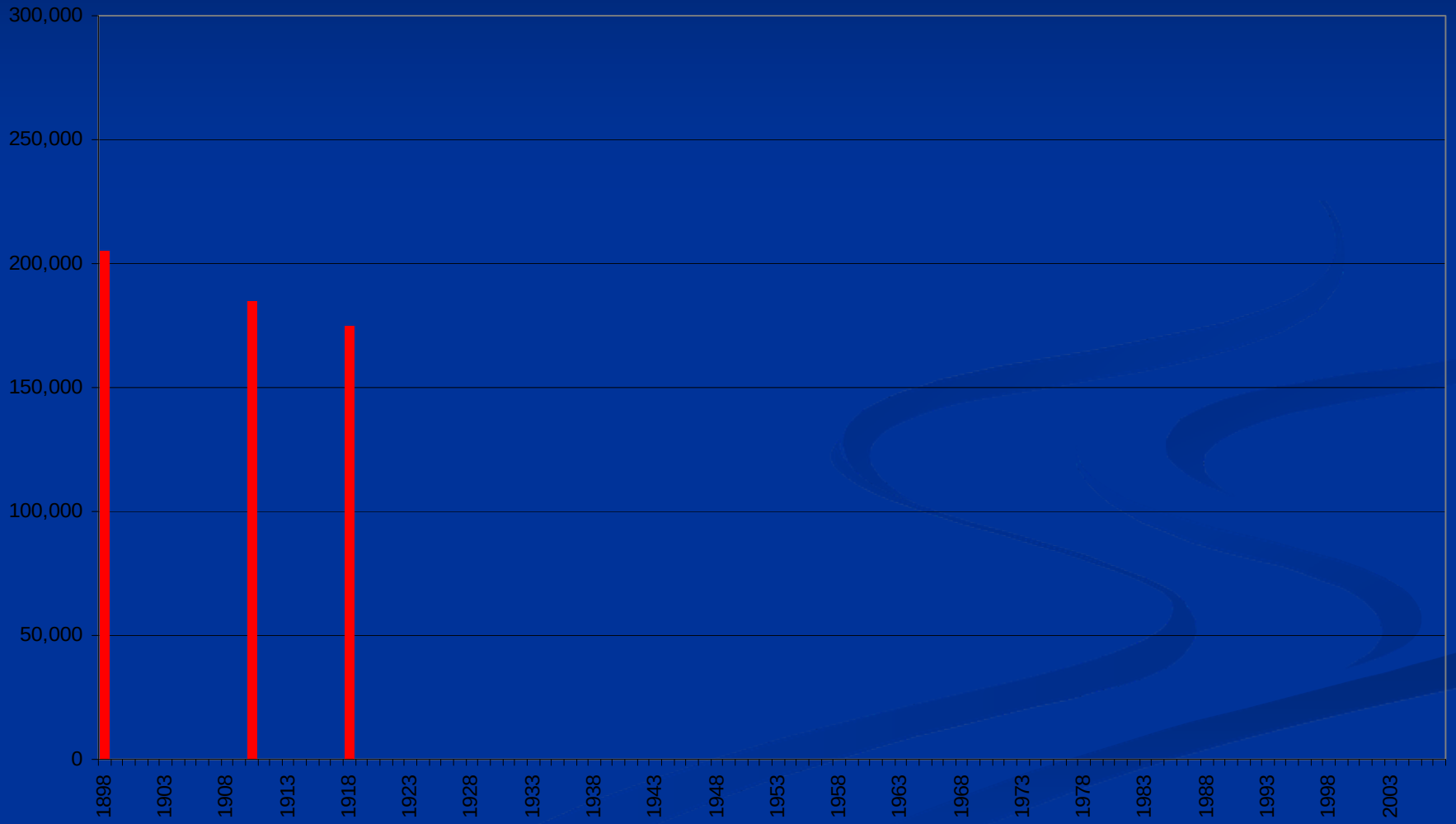
Comparison of 1918 and 1923 Flood Flows Concrete WA.		
Flood year	1918 Report	1923 Report
1897	205,000 cfs	275,000 cfs
1909	185,000 cfs	260,000 cfs
1917	175,000 cfs	220,000 cfs

- The first major red flag established for the 1923 report is the major difference in flood flows "estimated" at Concrete.
- The differences are never addressed by Stewart or USGS, Corps or FEMA.
- Major differences in peak discharge. Which one is nearly correct?

Stewart's 1923 Estimates of the Historic Unrecorded Floods At Concrete



Stewart's 1918 Estimates of the Historic Unrecorded Floods At Concrete



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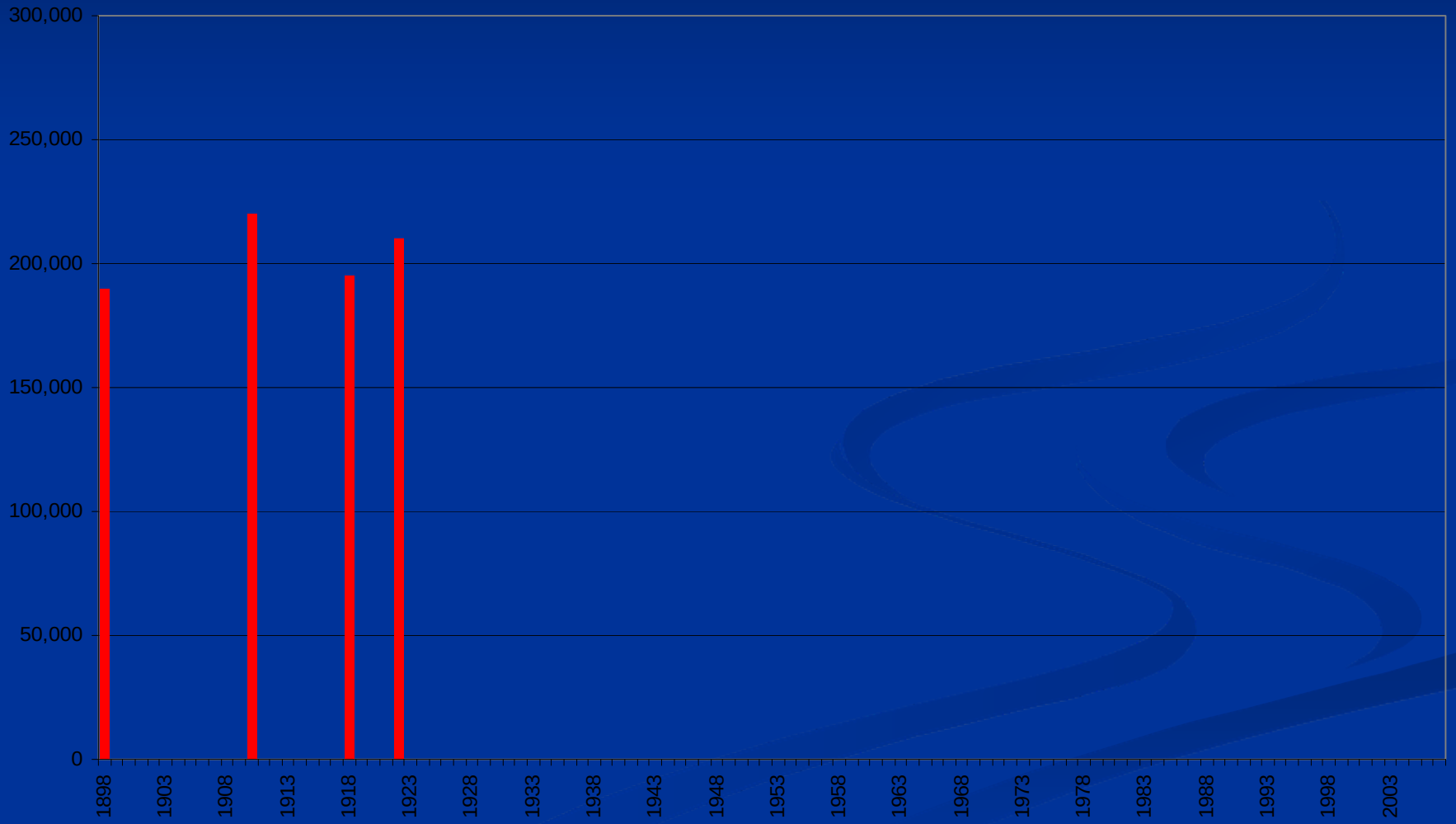

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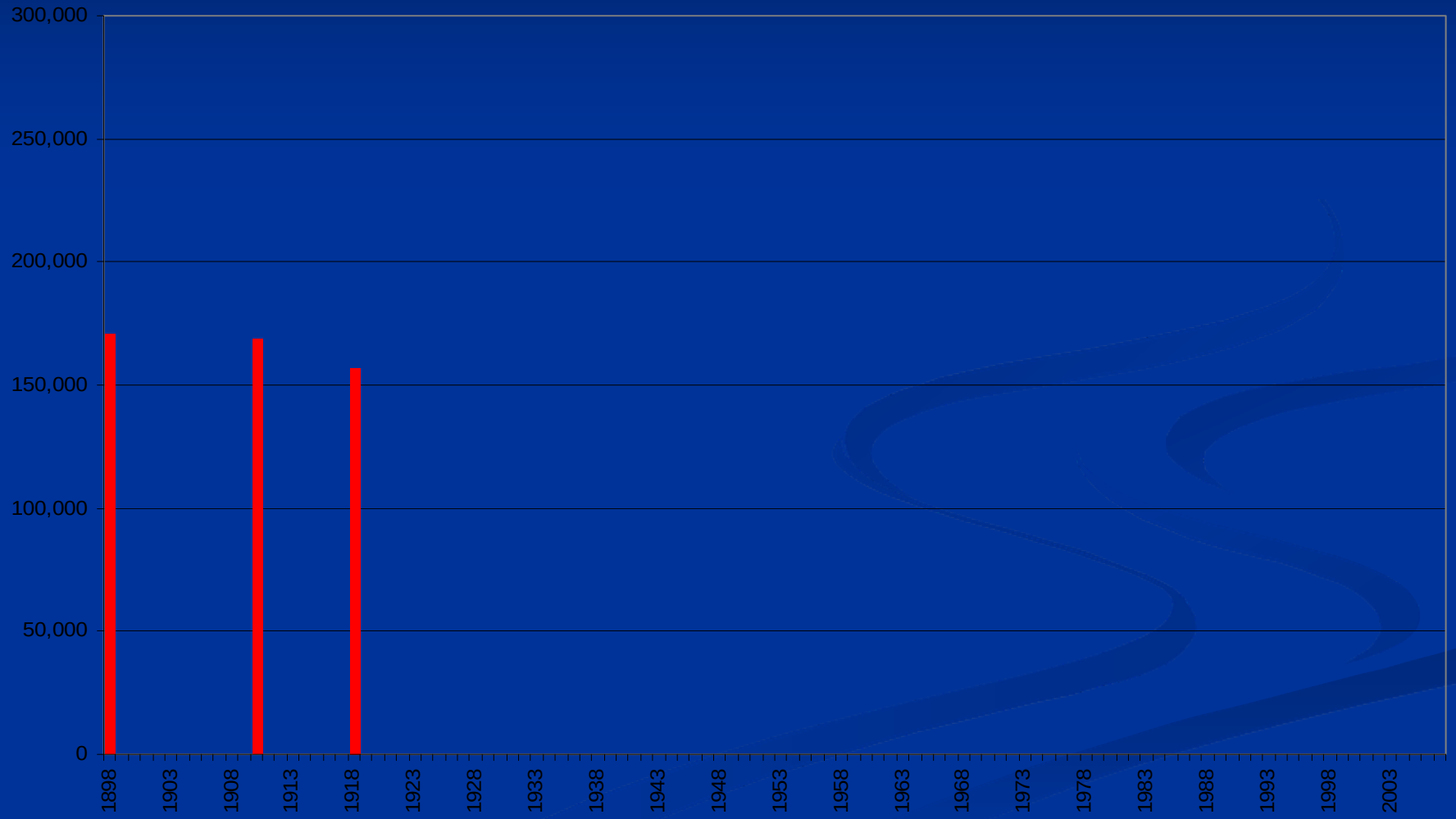


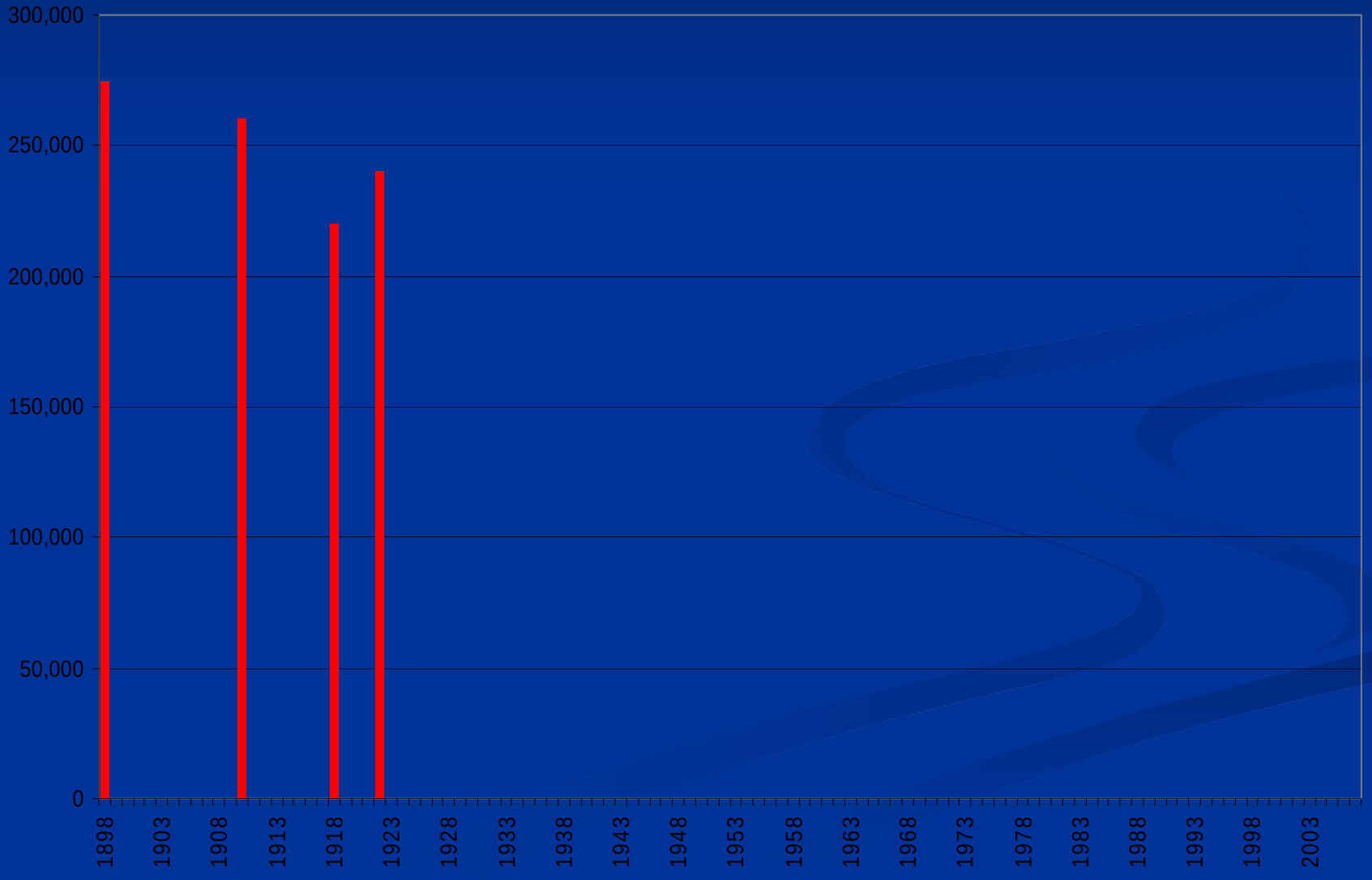
Stewart Report Questioned by Skagit and Corps of Engineers

- One year after the submission of the Stewart Report at a public hearing in November 1924, Colonel Barden, Corps of Engineers, stated the following:

- "I would like to emphasize the point that Mr. Knapp [1] brought out in his paper, that before any really scientific plan can be prepared for the protection of this valley from floods, it is necessary to have more authoritative information then we now have as to the amount of water carried by the river in time of floods. . . . The information that was collected by Mr. Stewart and given in his report to the committee was excellent so far as the data that he had to work upon permitted, **but that data was necessarily more or less inaccurate.**" (Source: Public Hearing Transcript, Corps of Engineers, November, 1924)

[1] Mr. Knapp was the Skagit County Engineer who worked closely with Mr. Stewart.

Stewart's 1923 Estimates of the Historic Unrecorded Floods At Concrete



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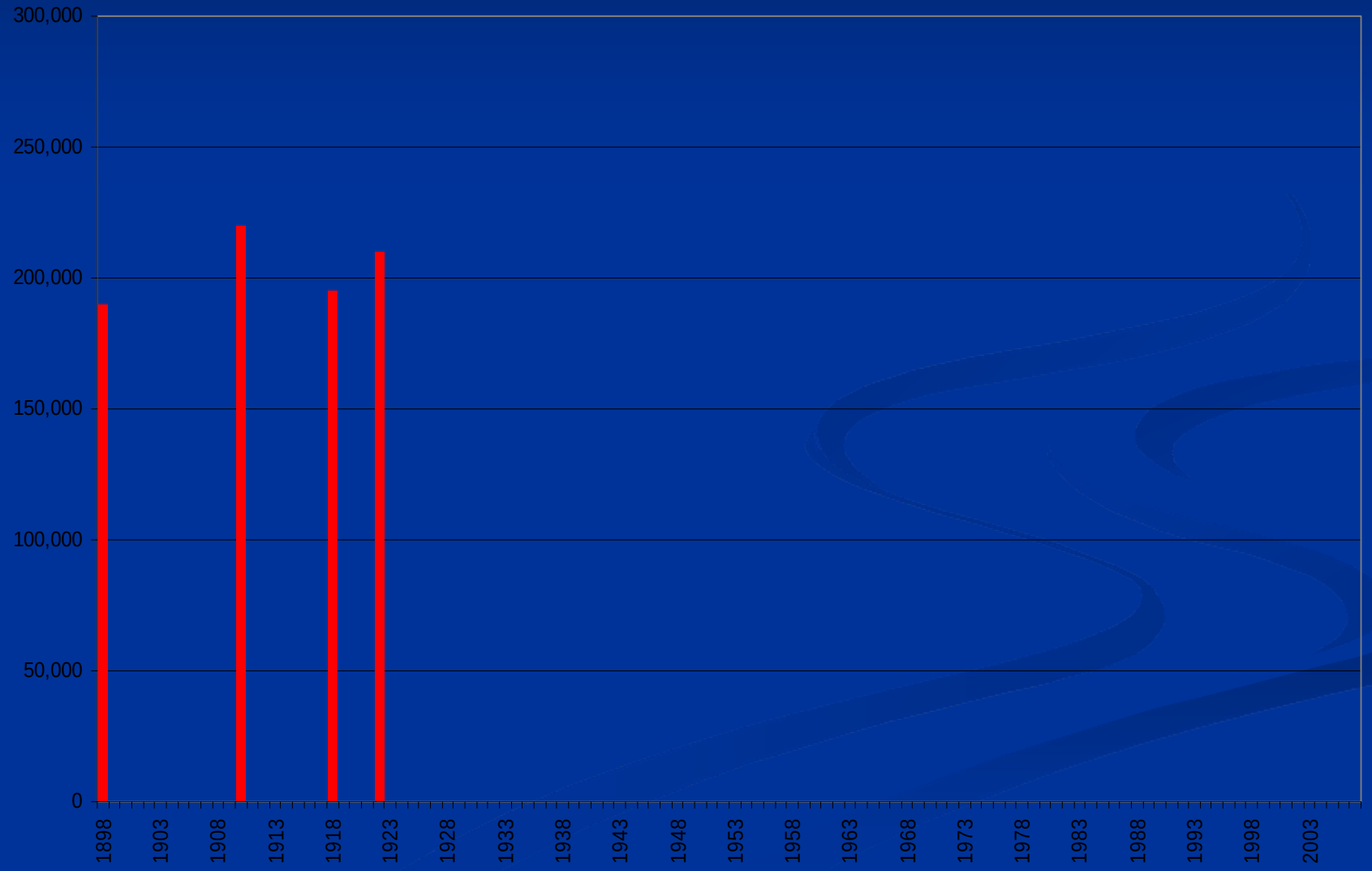

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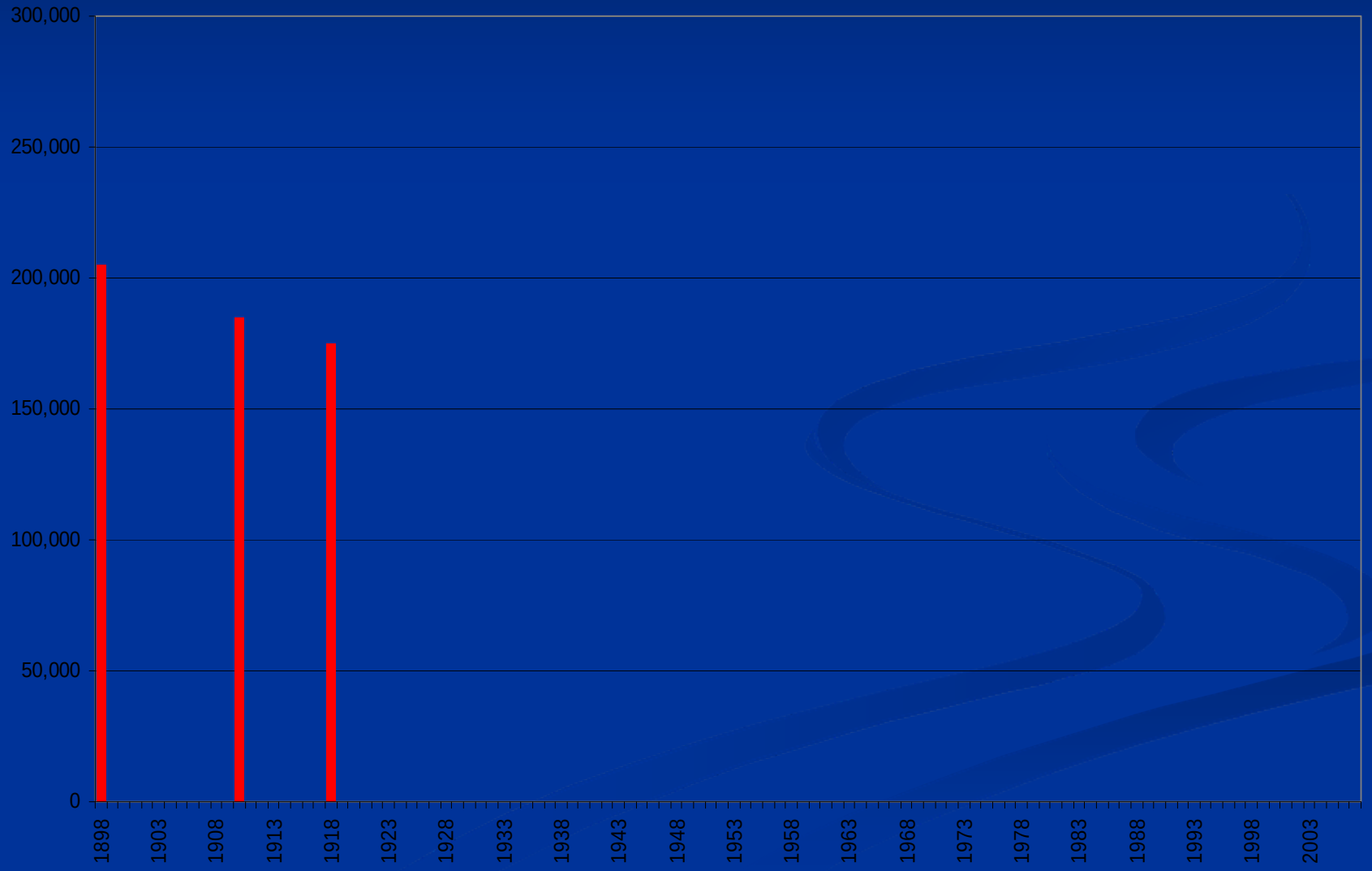

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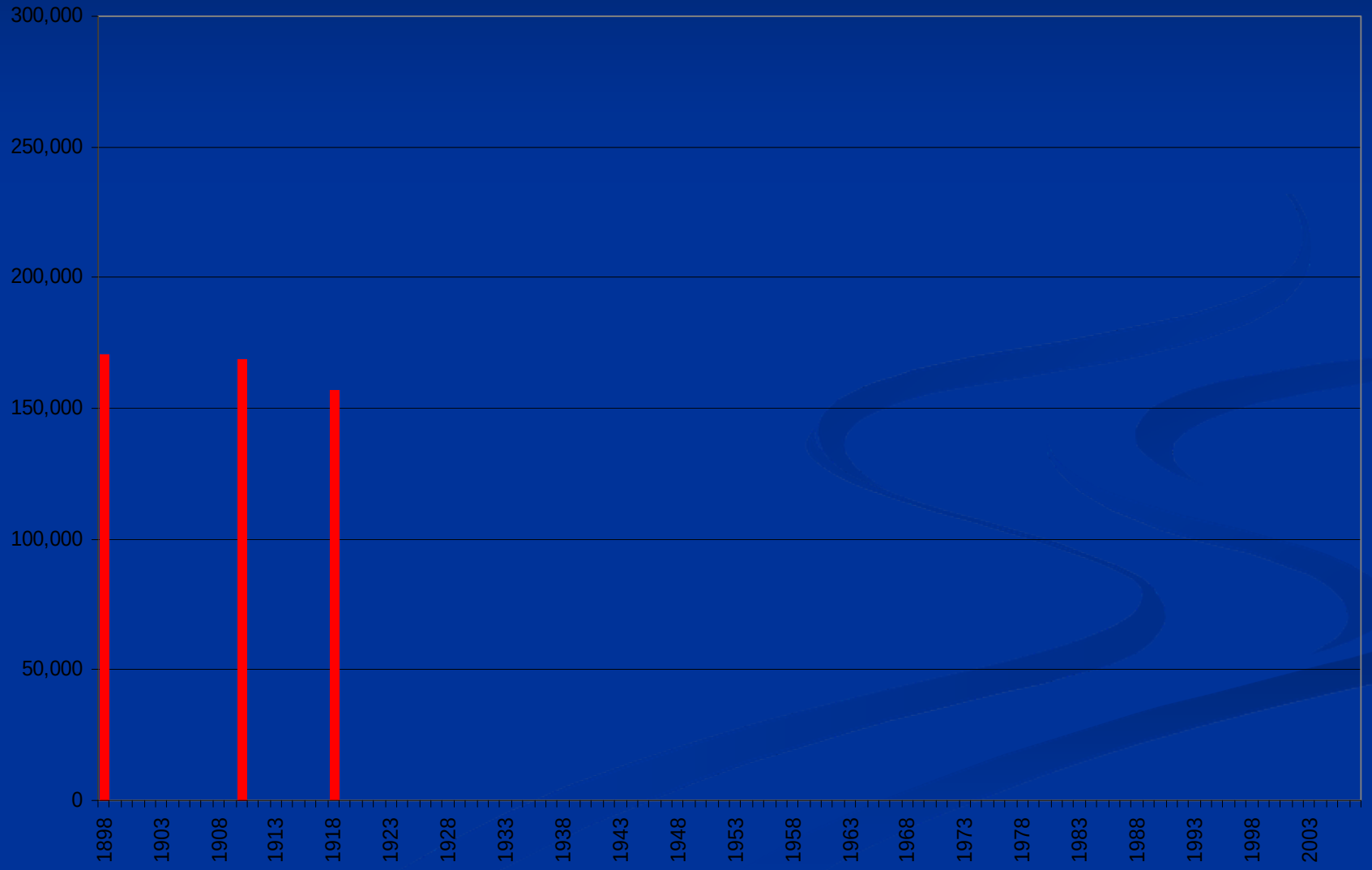
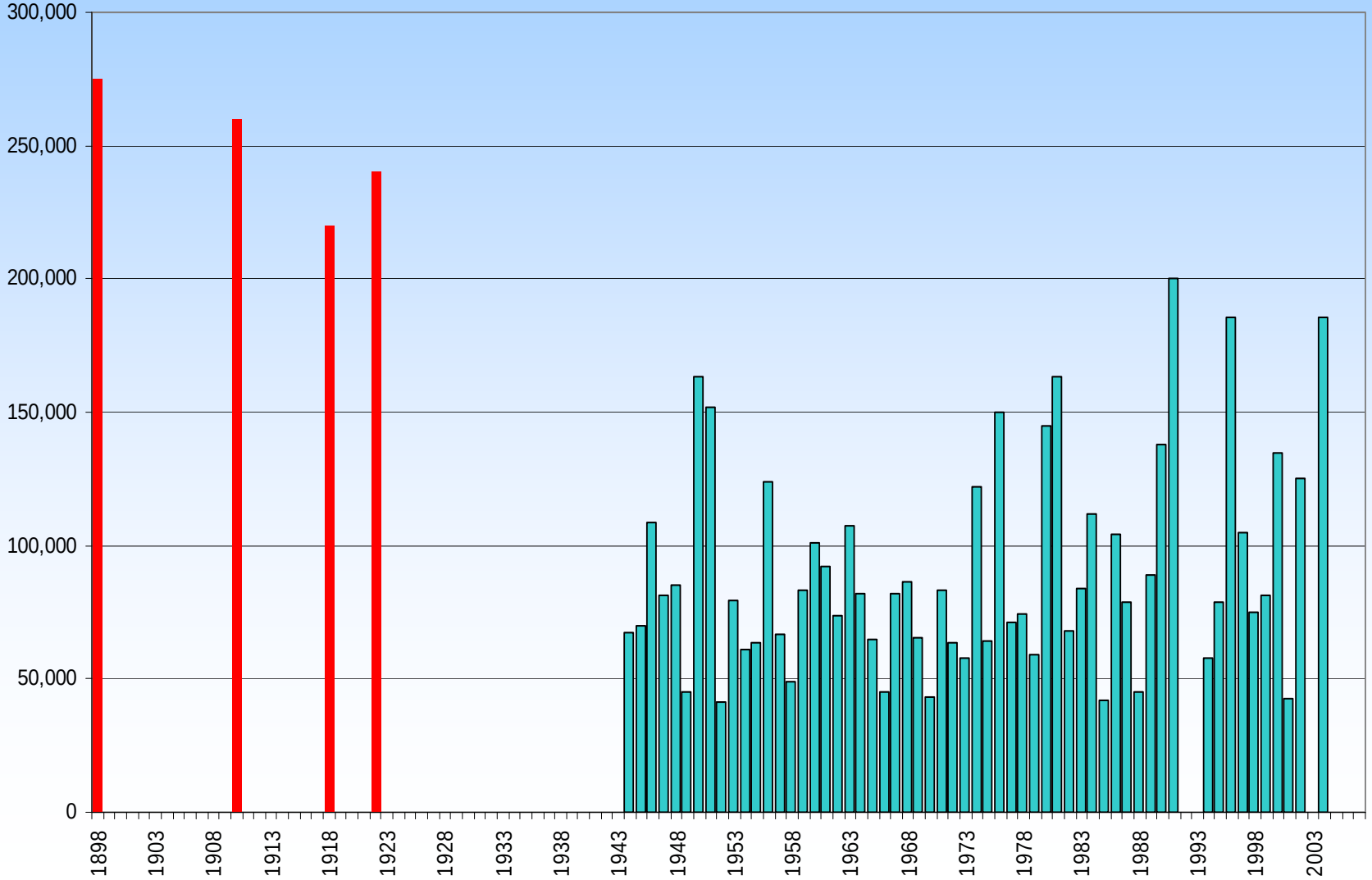
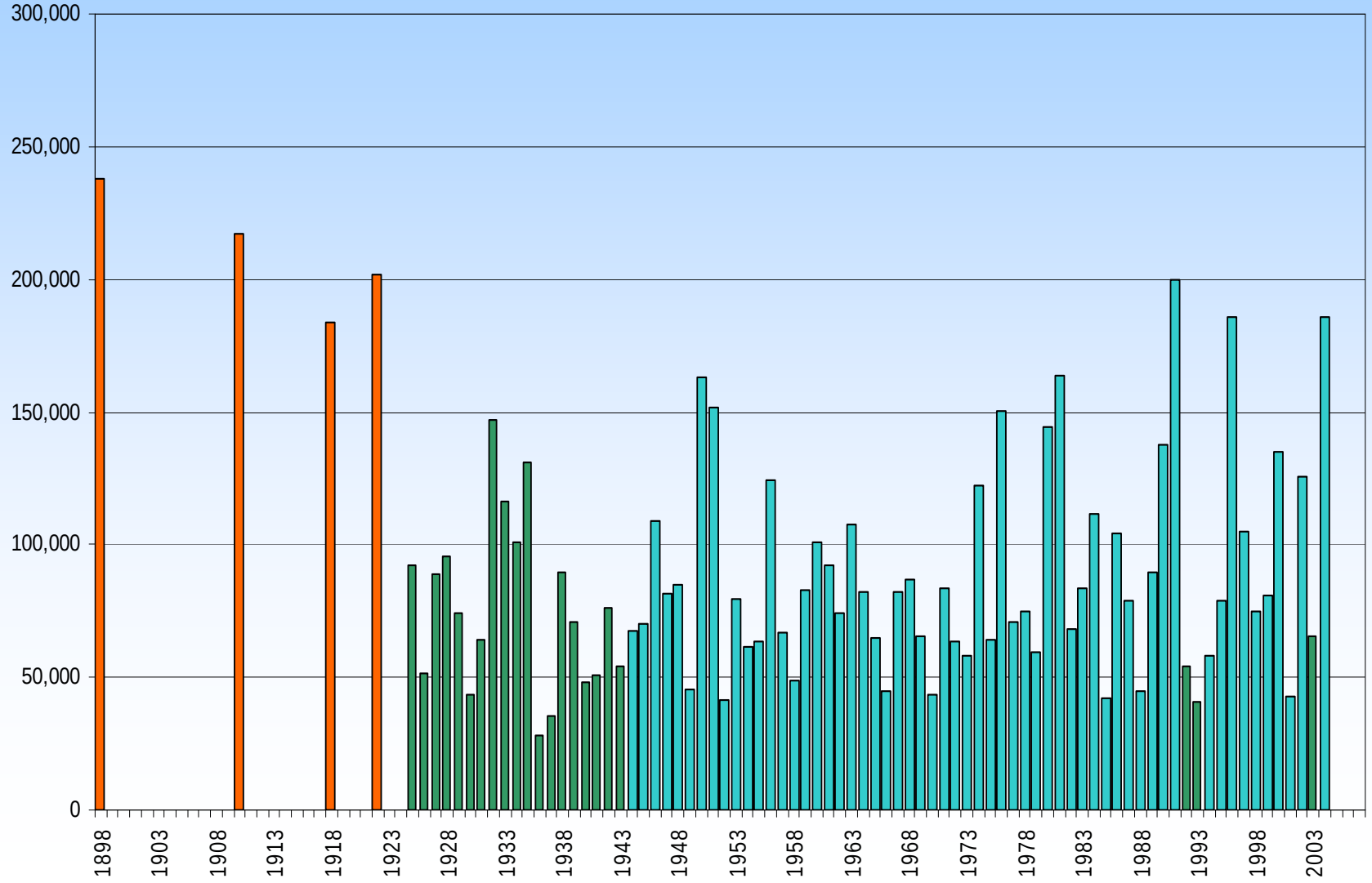


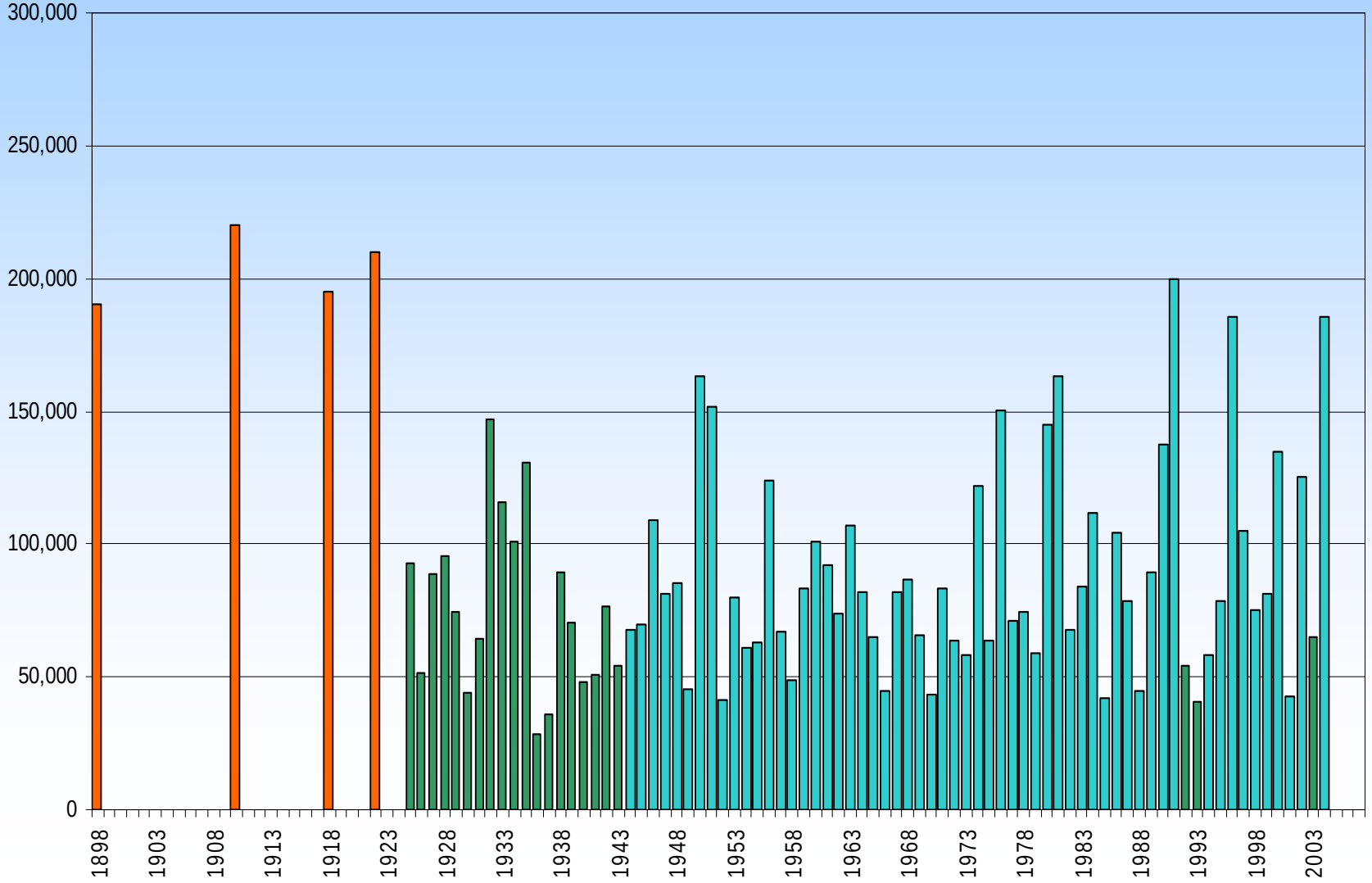
Winter Unregulated Annual Peak Flows Skagit River Near Concrete: Corps of Engineers Data Set



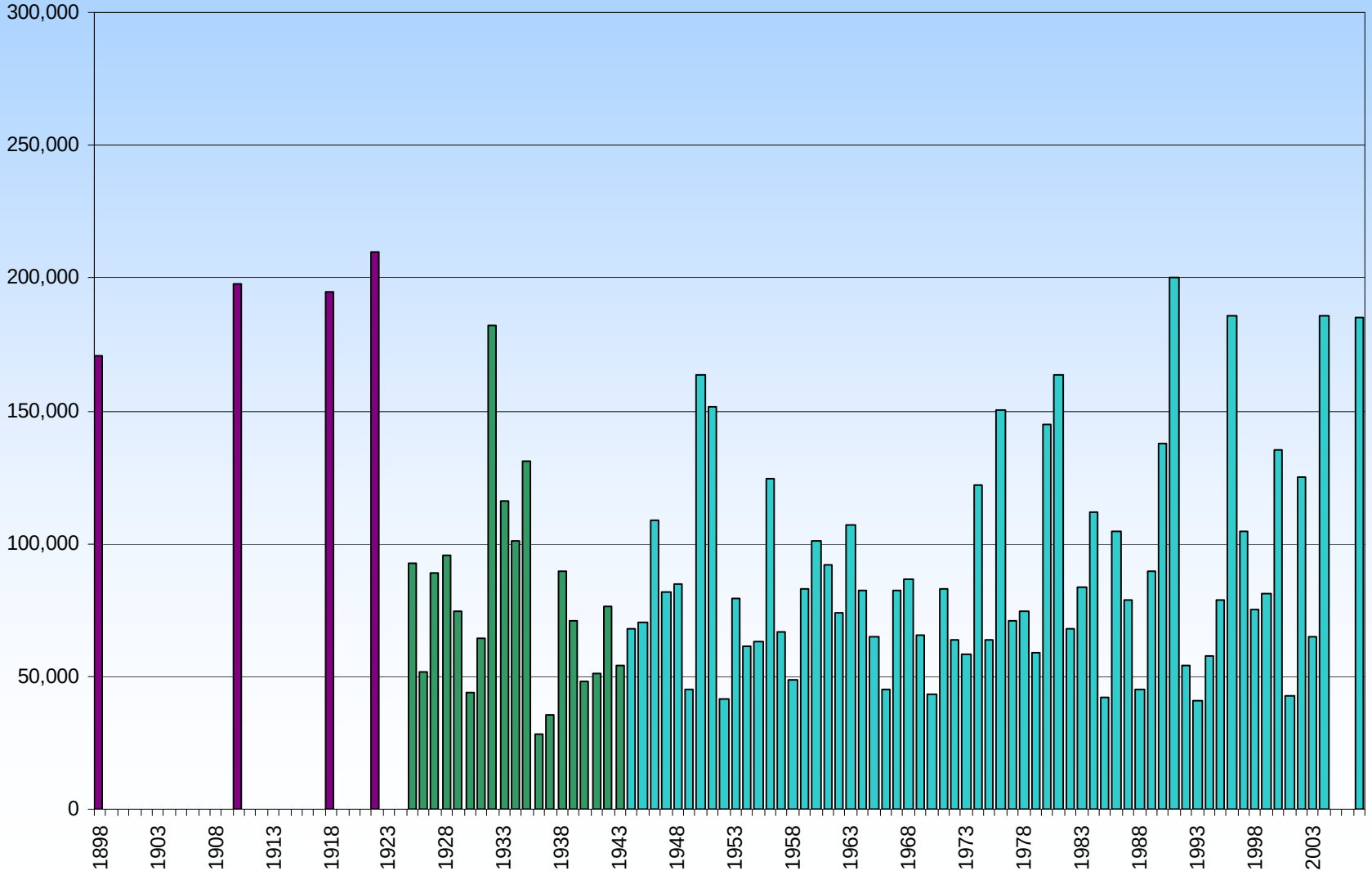
Winter Unregulated Annual Peak Flows Skagit River Near Concrete: PI Engineering Data Set



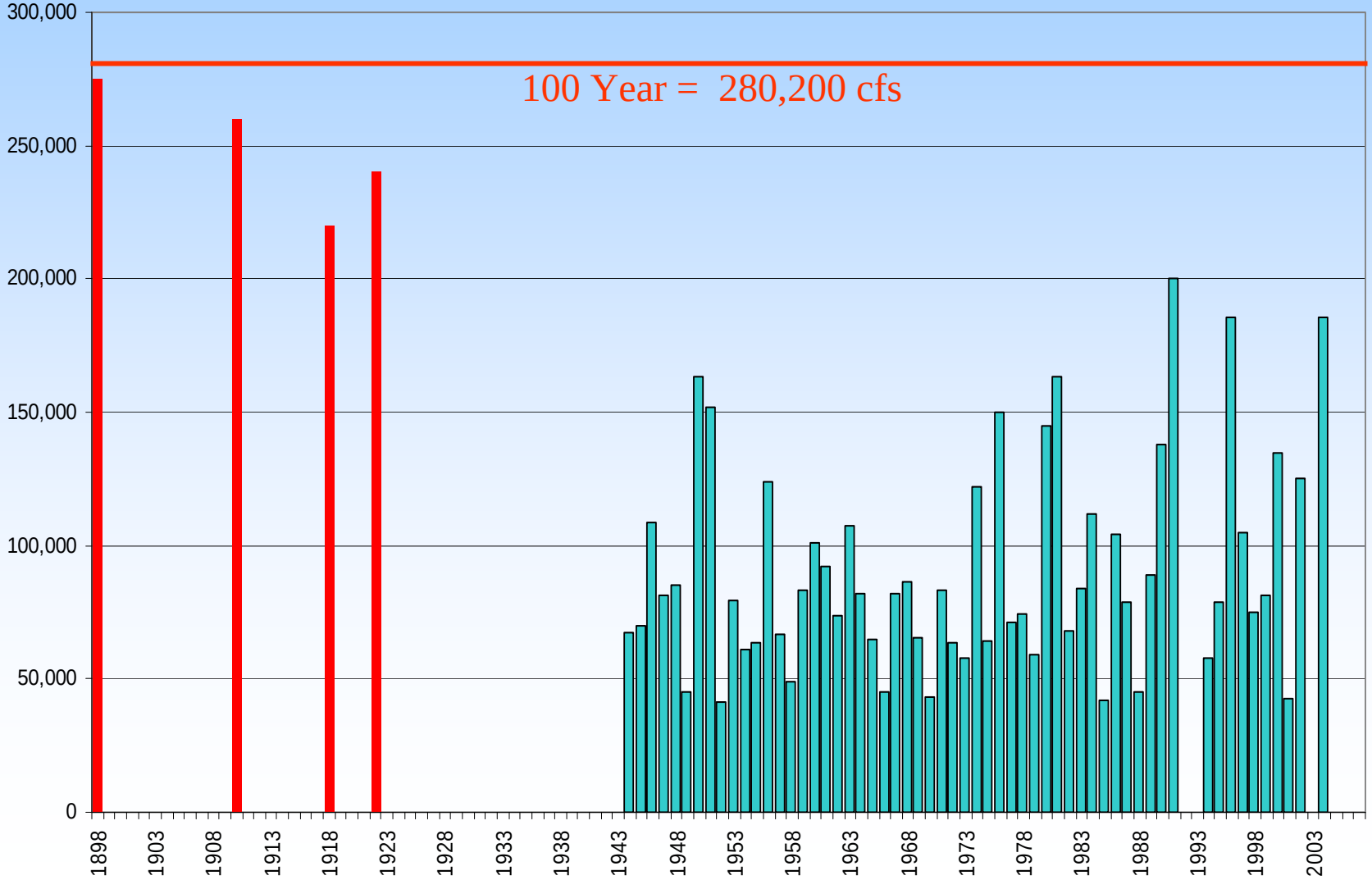
Winter Unregulated Annual Peak Flows Skagit River Near Concrete: PI Engineering Data Set w/ Sedro Woolley Historic Peaks



Winter Unregulated Annual Peak Flows Skagit River Near Concrete w/ Adjusted Sedro-Woolley Historic Estimates



Winter Unregulated Annual Peak Flows Skagit River Near Concrete: Corps of Engineers Data Set



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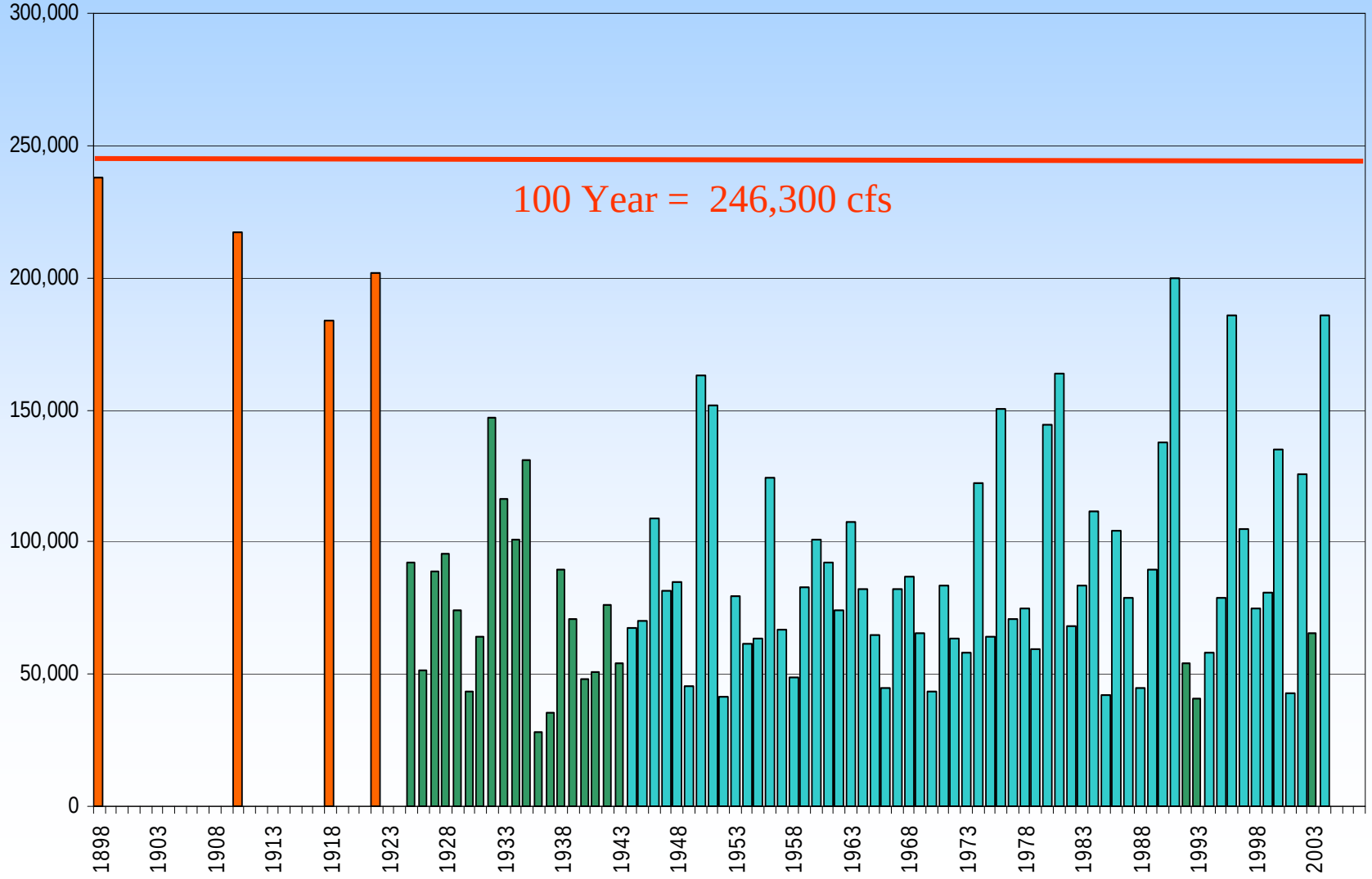
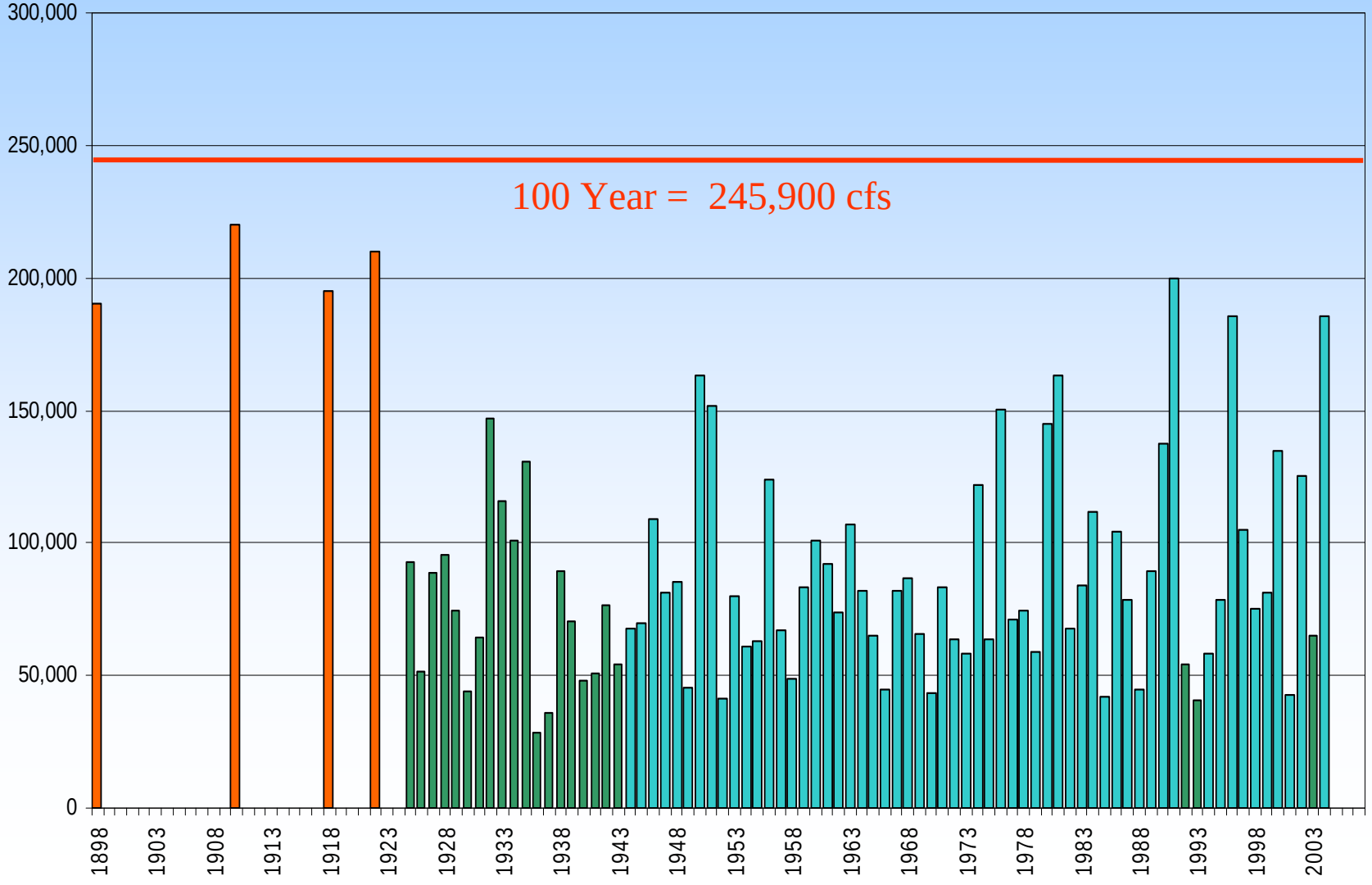
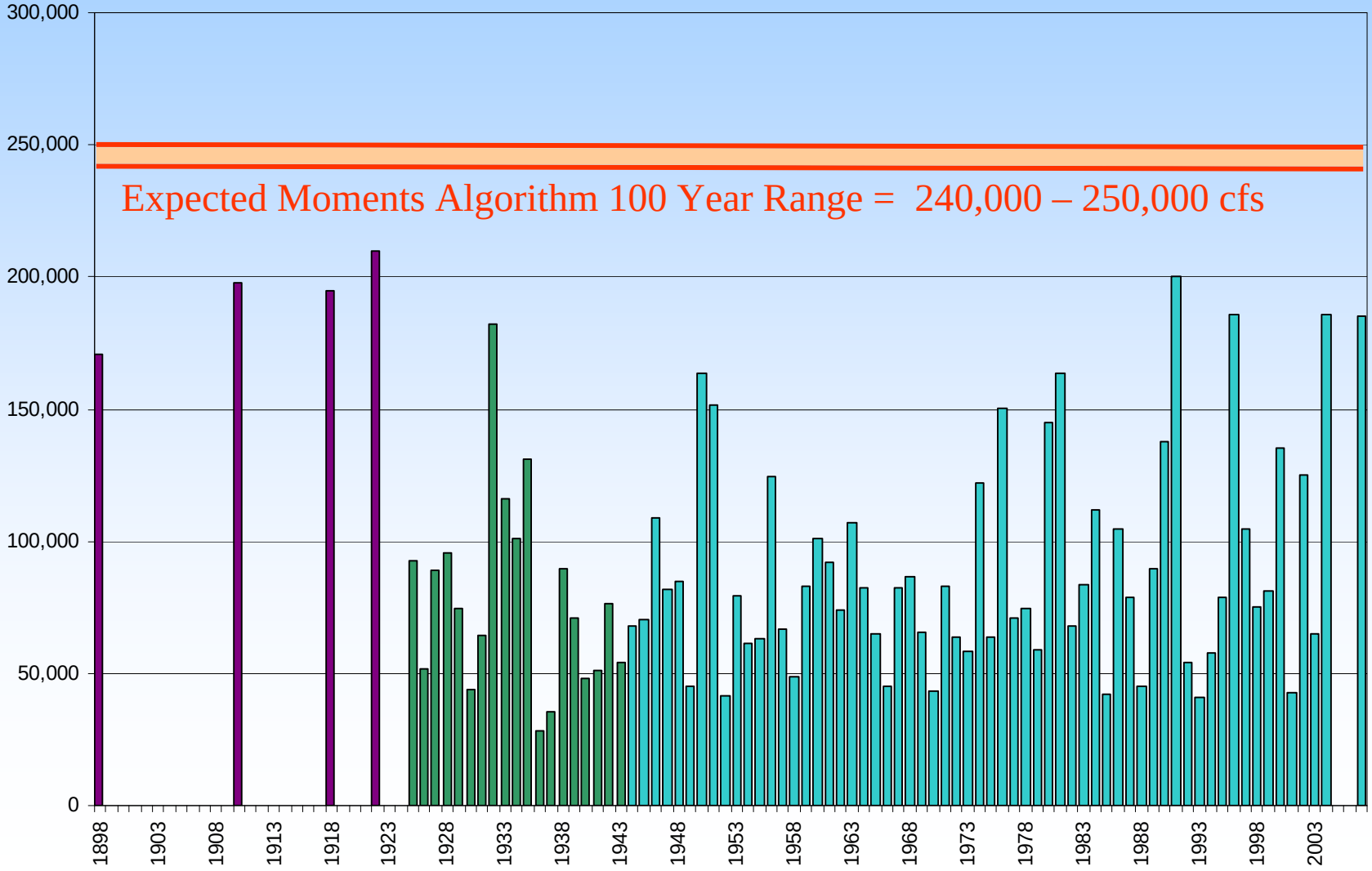


Winter Unregulated Annual Peak Flows Skagit River Near Concrete: PI Engineering Data Set w/ Sedro Woolley Historic Peaks



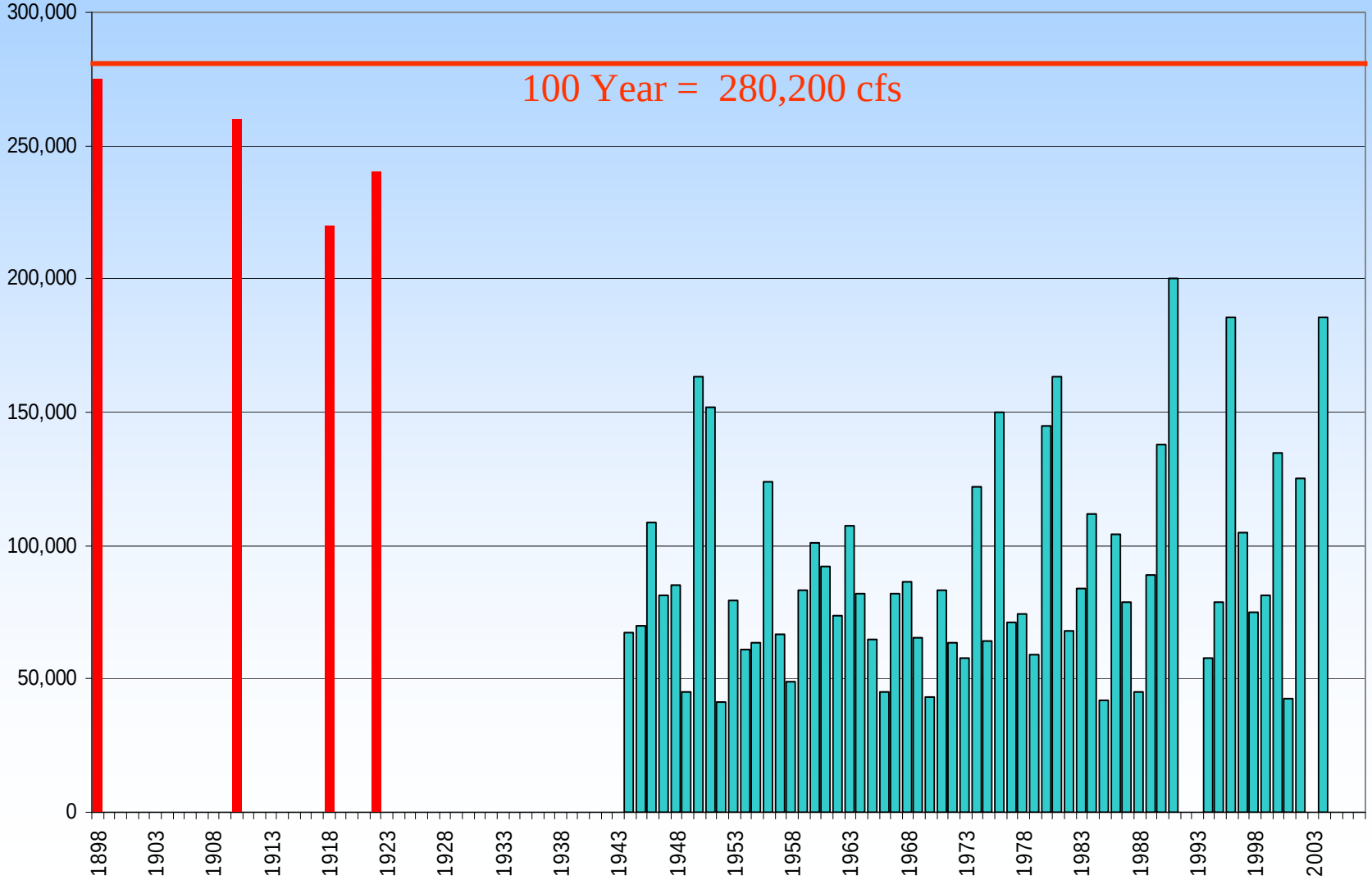
Winter Unregulated Annual Peak Flows Skagit River Near Concrete w/ Adjusted Sedro-Woolley Historic Estimates



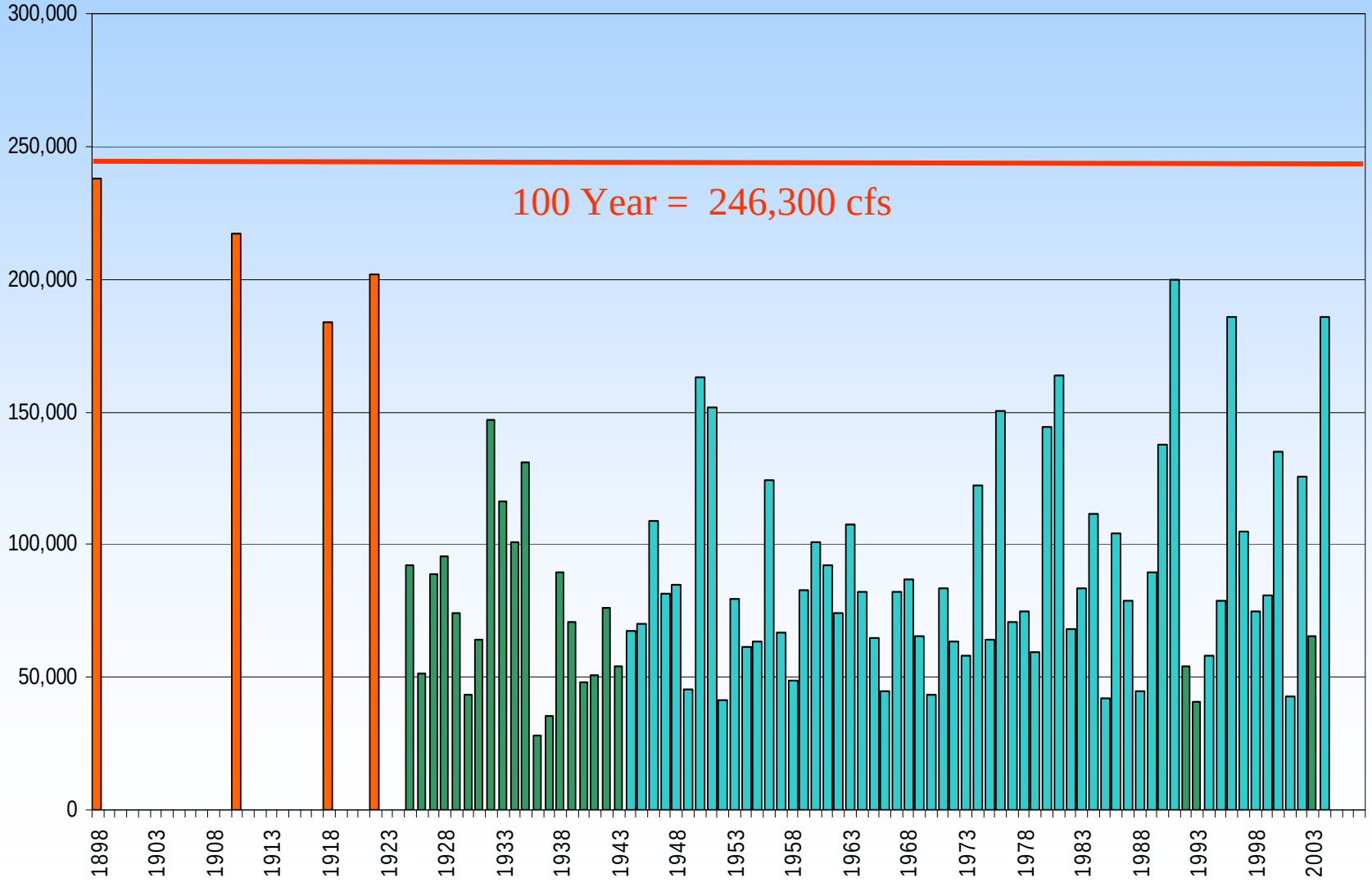
ISSUE

- What is the effect of the Corps of Engineers data set, compared to the PI Engineering data set?

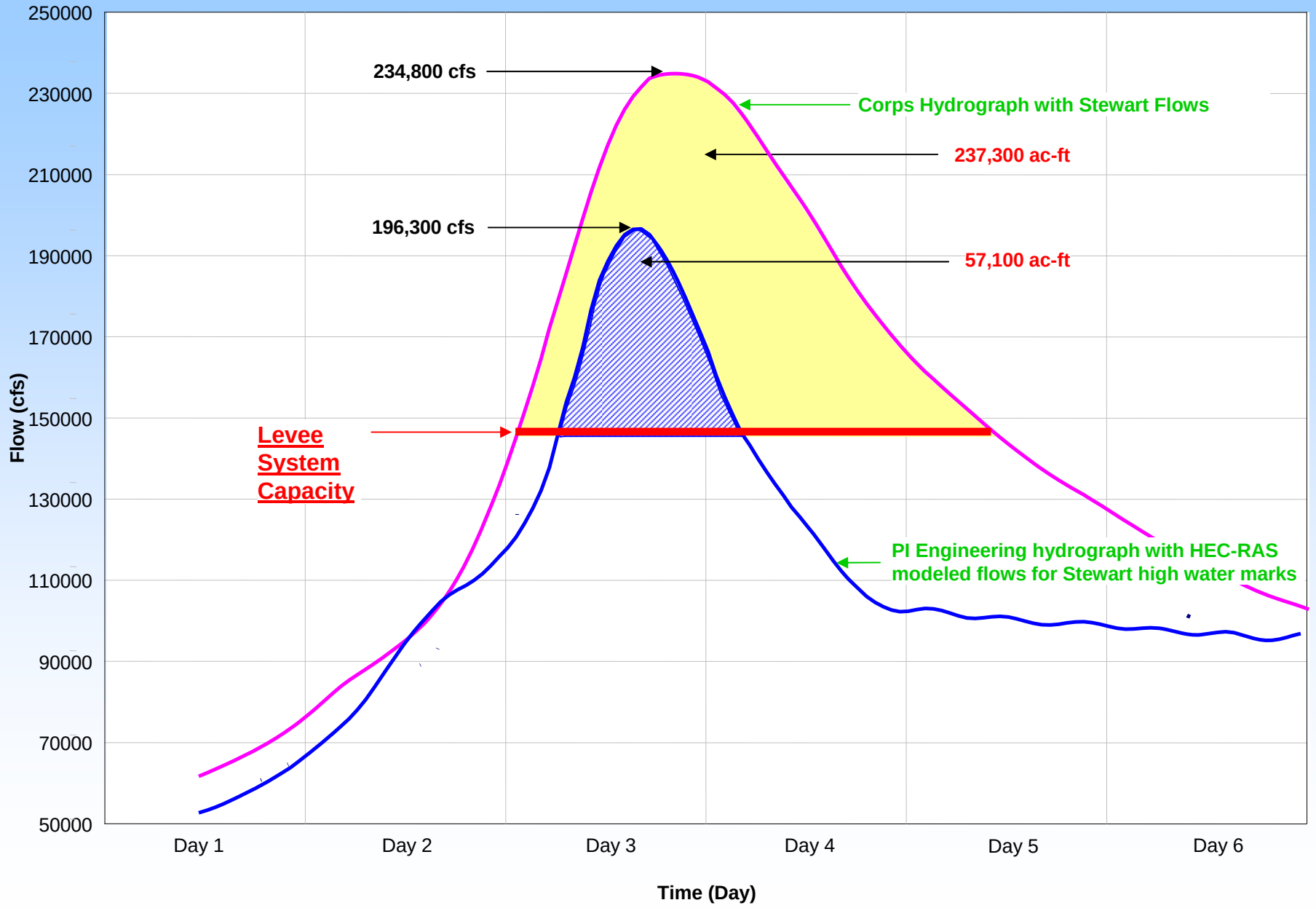
Winter Unregulated Annual Peak Flows Skagit River Near Concrete: Corps of Engineers Data Set



Winter Unregulated Annual Peak Flows Skagit River Near Concrete: PI Engineering Data Set



FEMA 100-year Flood Hydrographs at Sedro Woolley (with existing flood storage)



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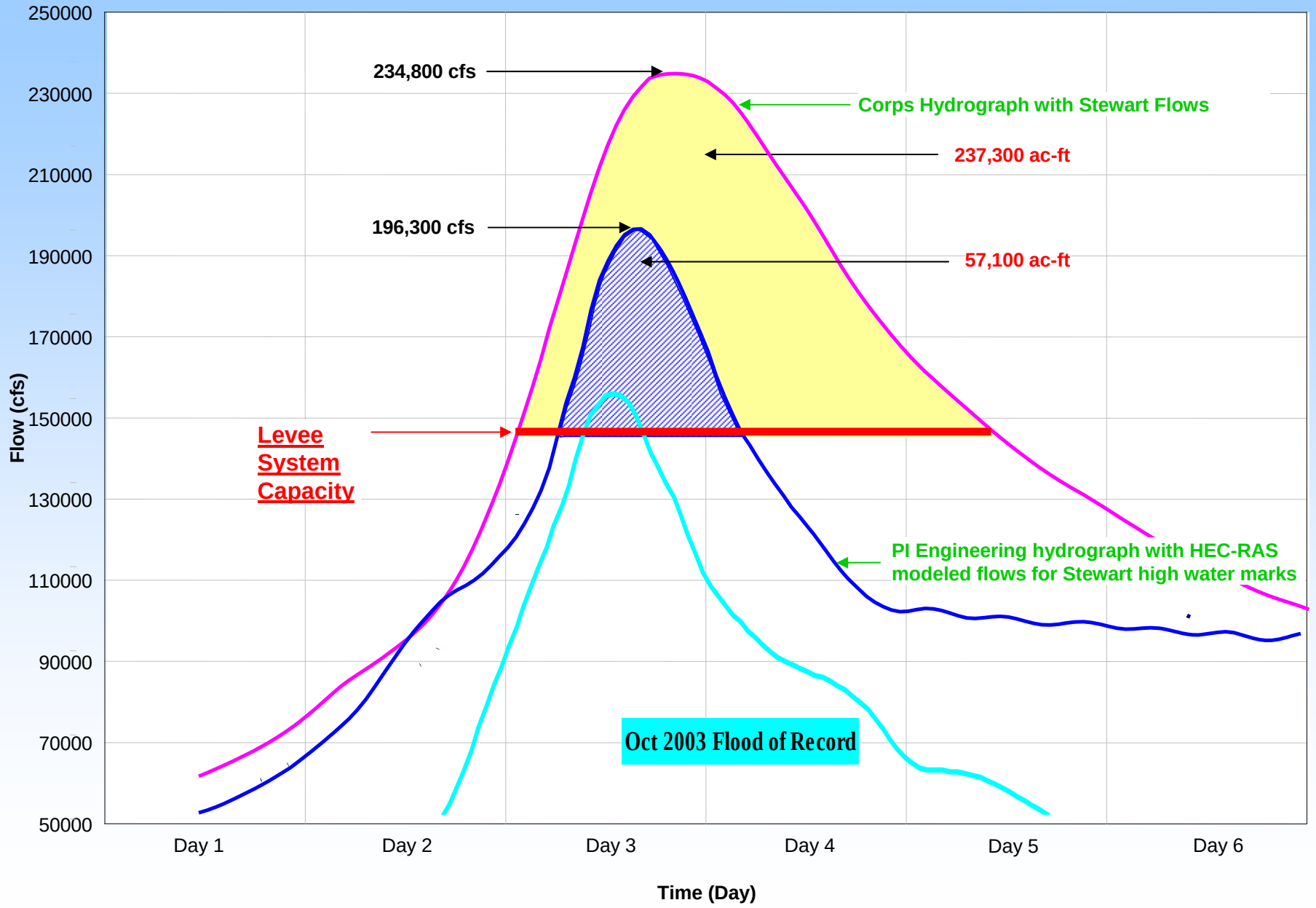
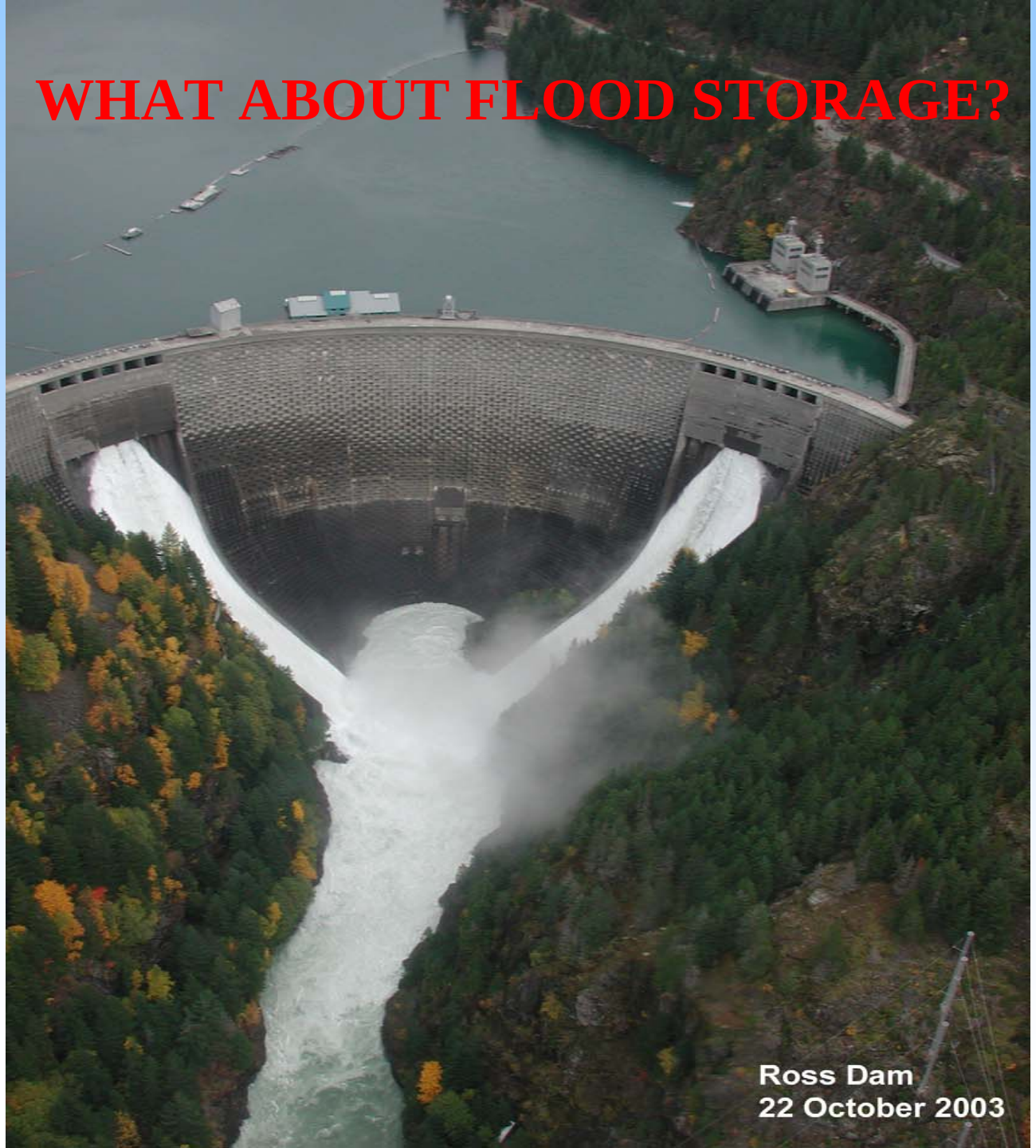
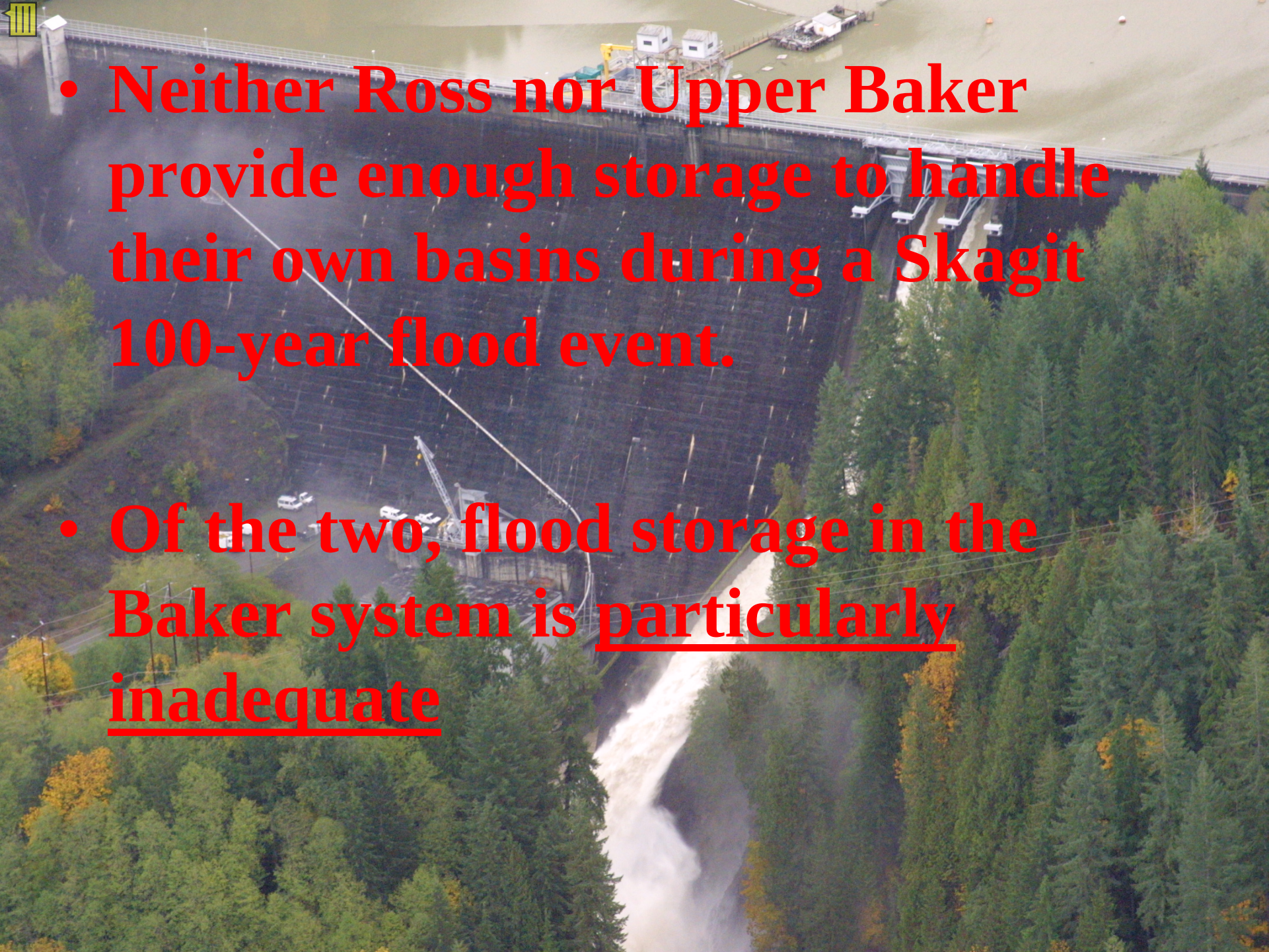


Comments on Hydrographs

- PI Engineering's analysis is not a lowball effort: it is conservative and results in a far worse flood than any flood ever experienced in the lifetime of anyone in the valley
- COE flood: exceeds levee capacity for more than 2 full days
- We are concerned that the theoretical 100-year flood being generated by the Corps not only results in much higher base flood elevations in FEMA's program, but is so large that it leaves no practical solution
- In particular, we are concerned that the Corps hydrologic analysis precludes additional, obviously needed upstream flood storage because according to the Corps analysis, additional storage would be overwhelmed by the magnitude of the theoretical event

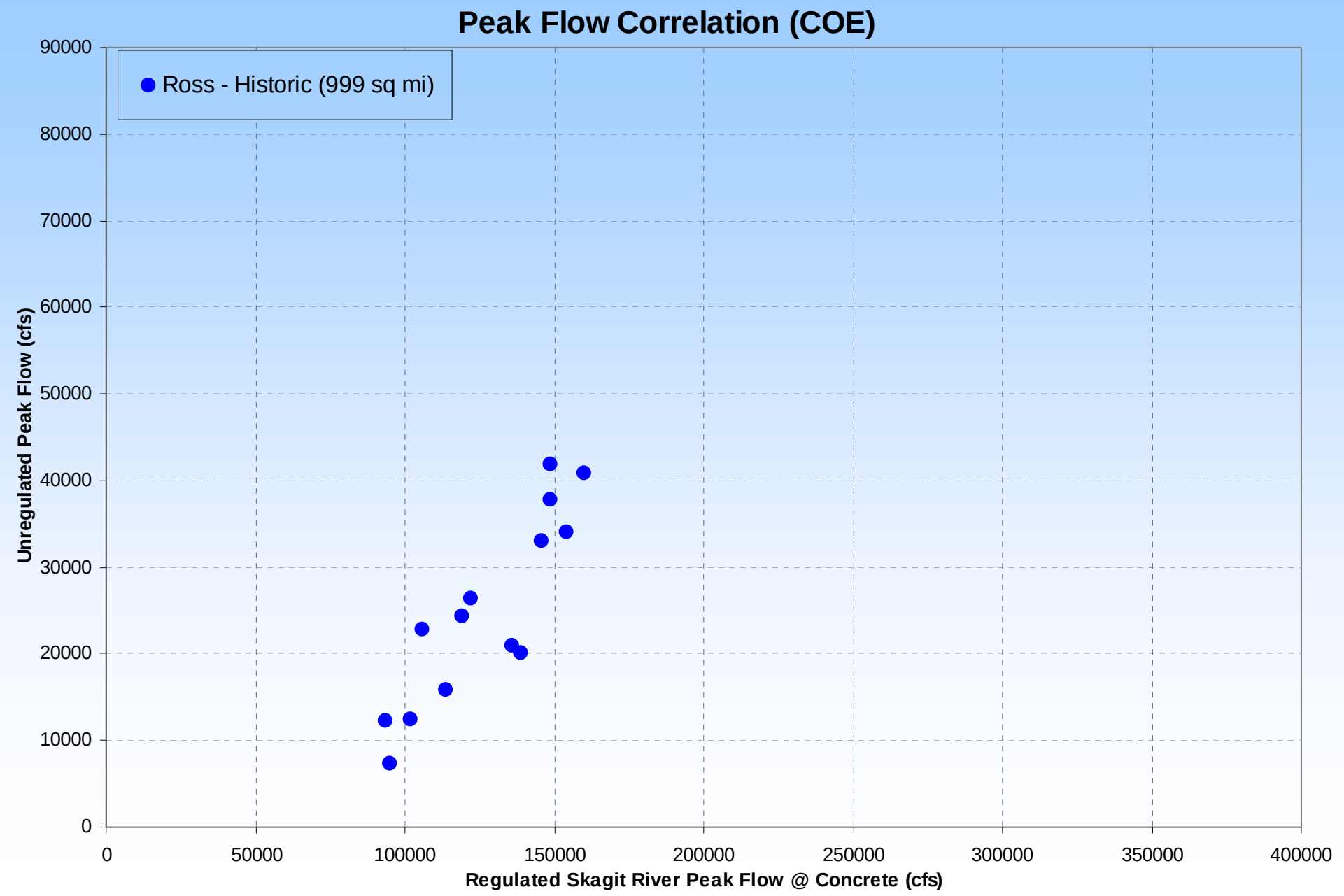
WHAT ABOUT FLOOD STORAGE?





- **Neither Ross nor Upper Baker provide enough storage to handle their own basins during a Skagit 100-year flood event.**

- **Of the two, flood storage in the Baker system is <u>particularly inadequate</u>**


Peak Flow Correlation (COE)
Ross - Historic (999 sq mi)
Unregulated Peak Flow (cfs)
Regulated Skagit River Peak Flow @ Concrete (cfs)
0
10000
20000
30000
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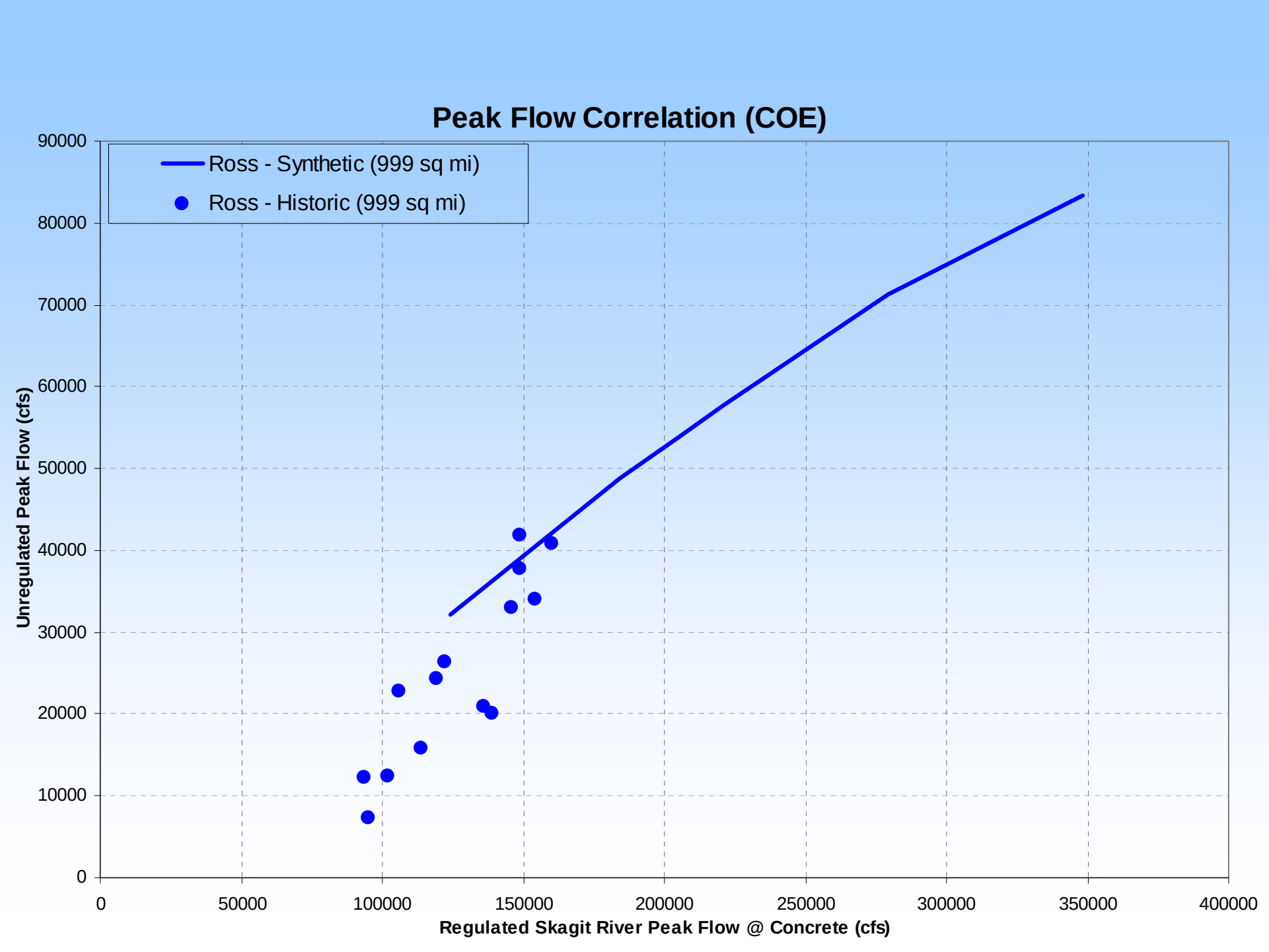
Peak Flow Correlation (COE)
Ross - Synthetic (999 sq mi)
Ross - Historic (999 sq mi)
Unregulated Peak Flow (cfs)
Regulated Skagit River Peak Flow @ Concrete (cfs)
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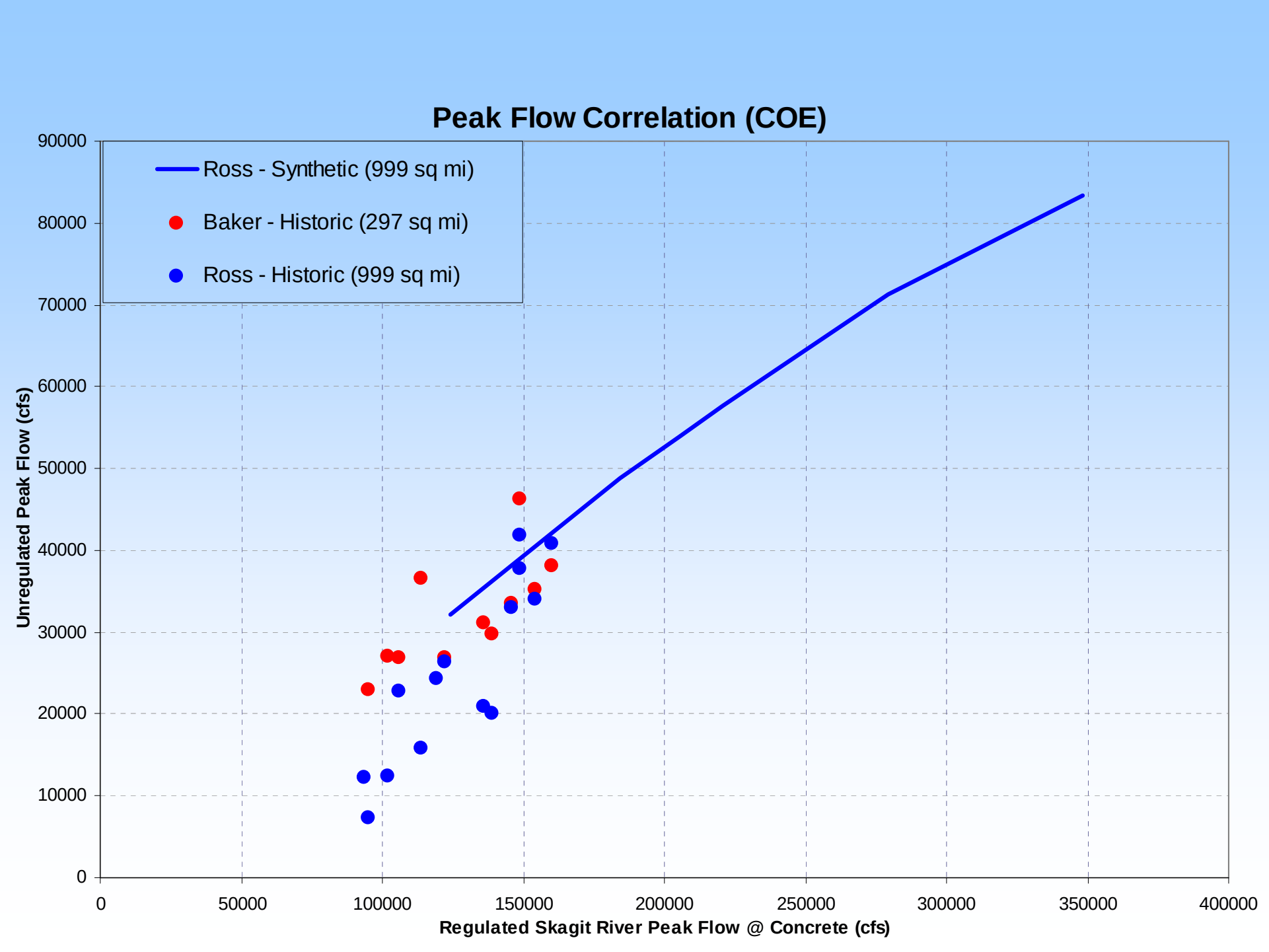
Peak Flow Correlation (COE)
Ross - Synthetic (999 sq mi)
Baker - Historic (297 sq mi)
Ross - Historic (999 sq mi)
Unregulated Peak Flow (cfs)
Regulated Skagit River Peak Flow @ Concrete (cfs)
0
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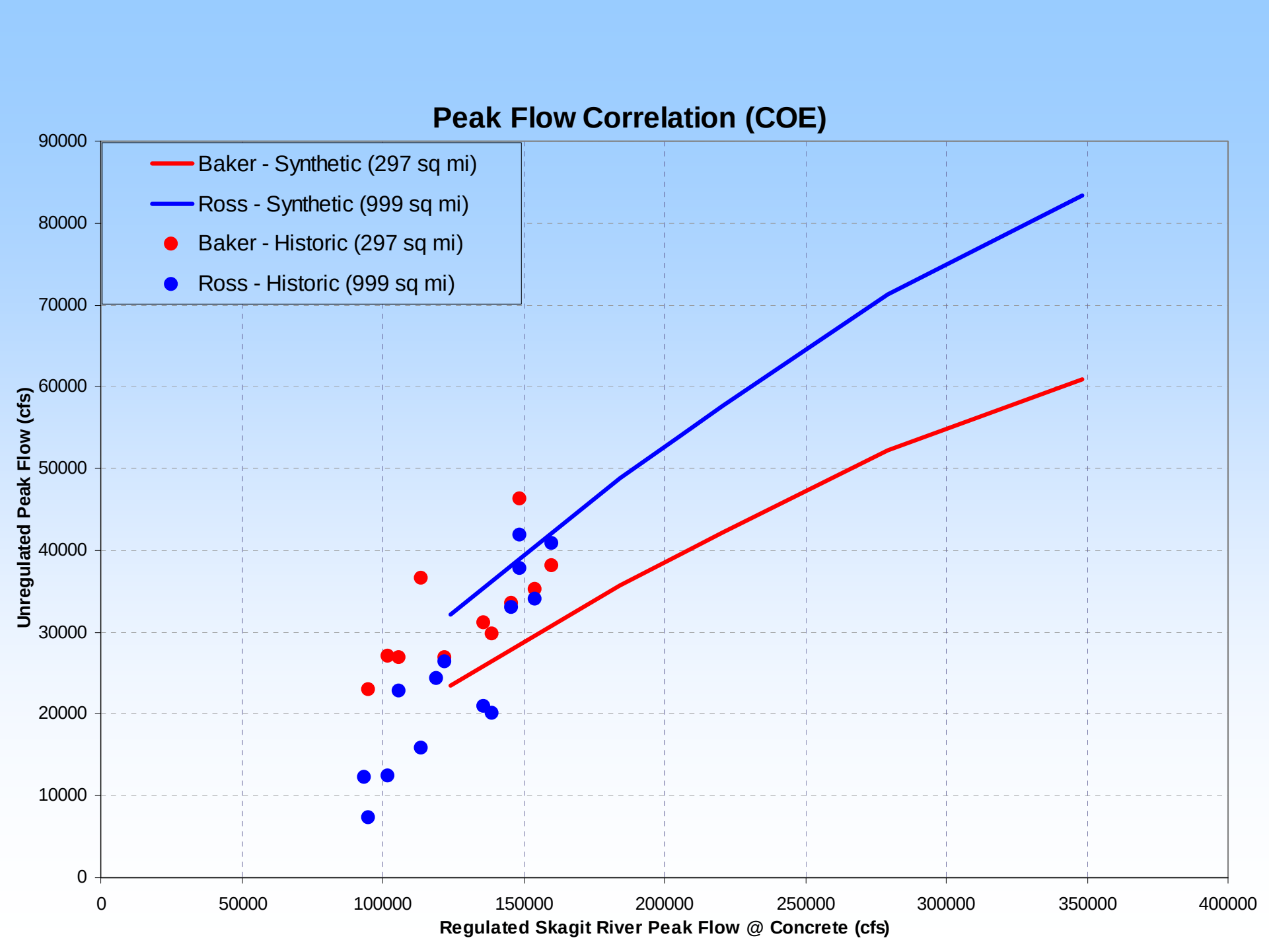
Peak Flow Correlation (COE)
Baker - Synthetic (297 sq mi)
Ross - Synthetic (999 sq mi)
Baker - Historic (297 sq mi)
Ross - Historic (999 sq mi)
Unregulated Peak Flow (cfs)
Regulated Skagit River Peak Flow @ Concrete (cfs)
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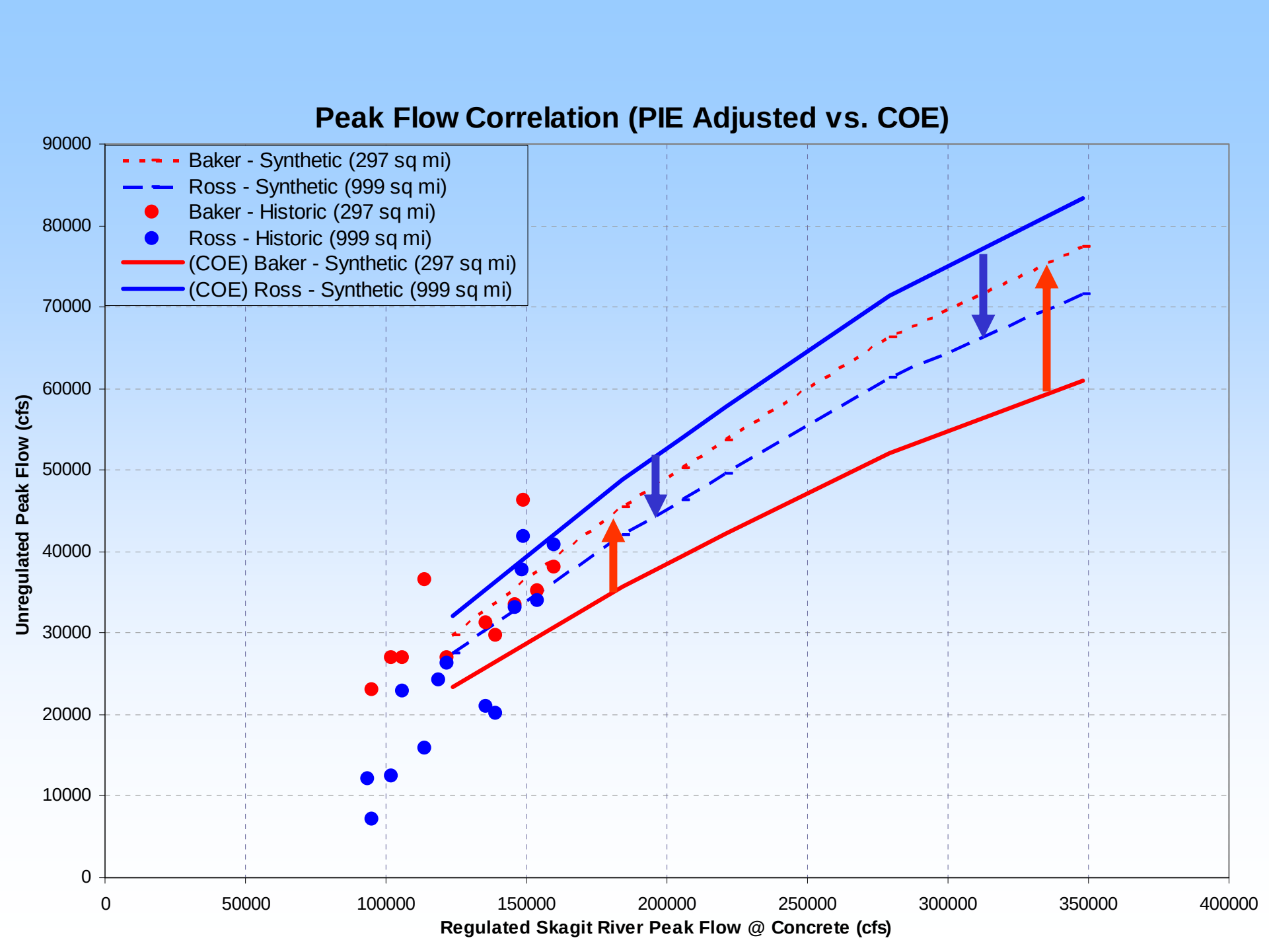
Peak Flow Correlation (PIE Adjusted vs. COE)
Baker - Synthetic (297 sq mi)
Ross - Synthetic (999 sq mi)
Baker - Historic (297 sq mi)
Ross - Historic (999 sq mi)
(COE) Baker - Synthetic (297 sq mi)
(COE) Ross - Synthetic (999 sq mi)
Unregulated Peak Flow (cfs)
Regulated Skagit River Peak Flow @ Concrete (cfs)
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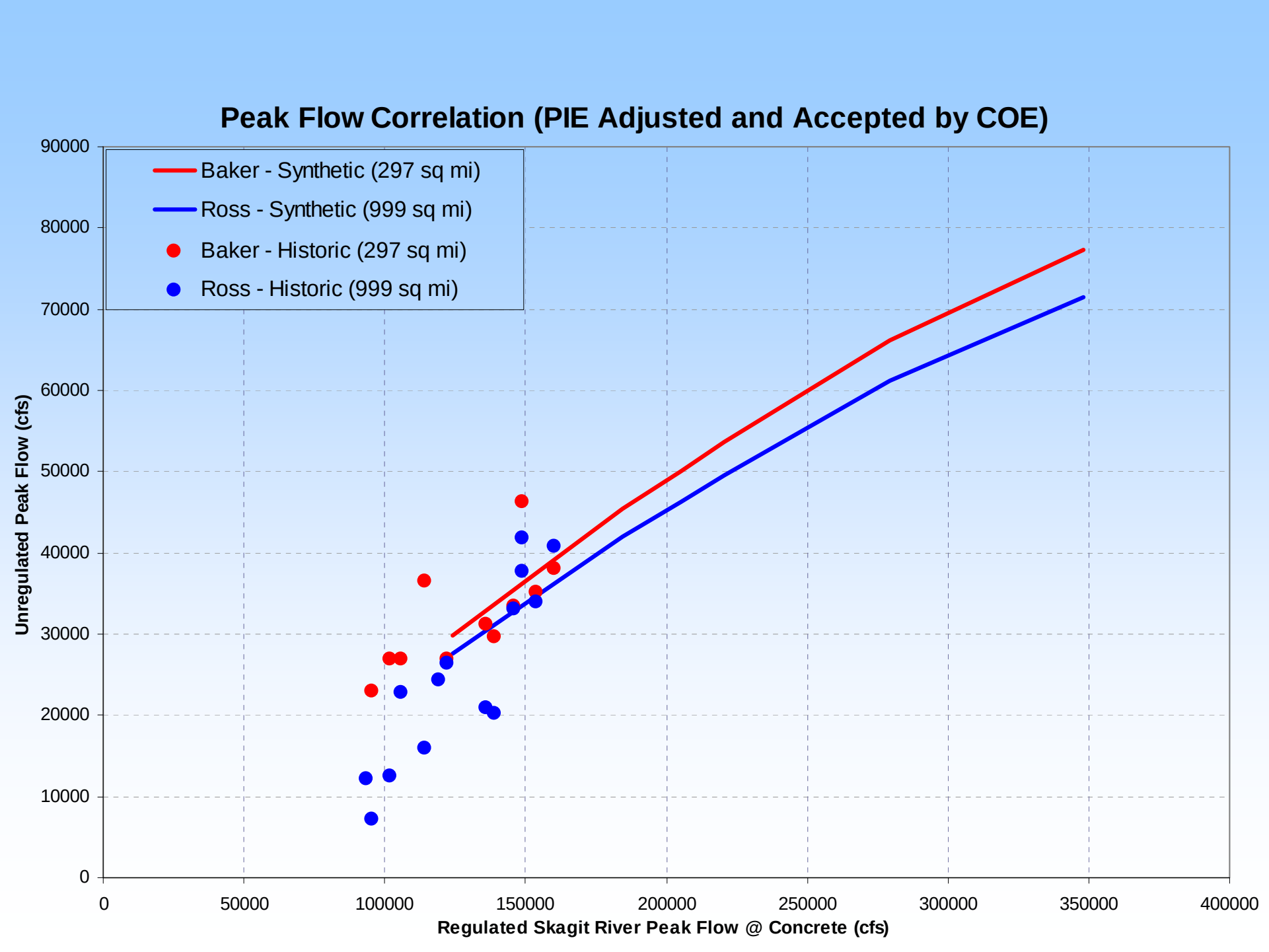
Peak Flow Correlation (PIE Adjusted and Accepted by COE)
Baker - Synthetic (297 sq mi)
Ross - Synthetic (999 sq mi)
Baker - Historic (297 sq mi)
Ross - Historic (999 sq mi)
Unregulated Peak Flow (cfs)
Regulated Skagit River Peak Flow @ Concrete (cfs)
0
10000
20000
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40000
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GIVEN THIS NEW INFORMATION,
THE GOVERNMENT WILL REQUIRE
MORE FLOOD STORAGE, RIGHT?

- wrong

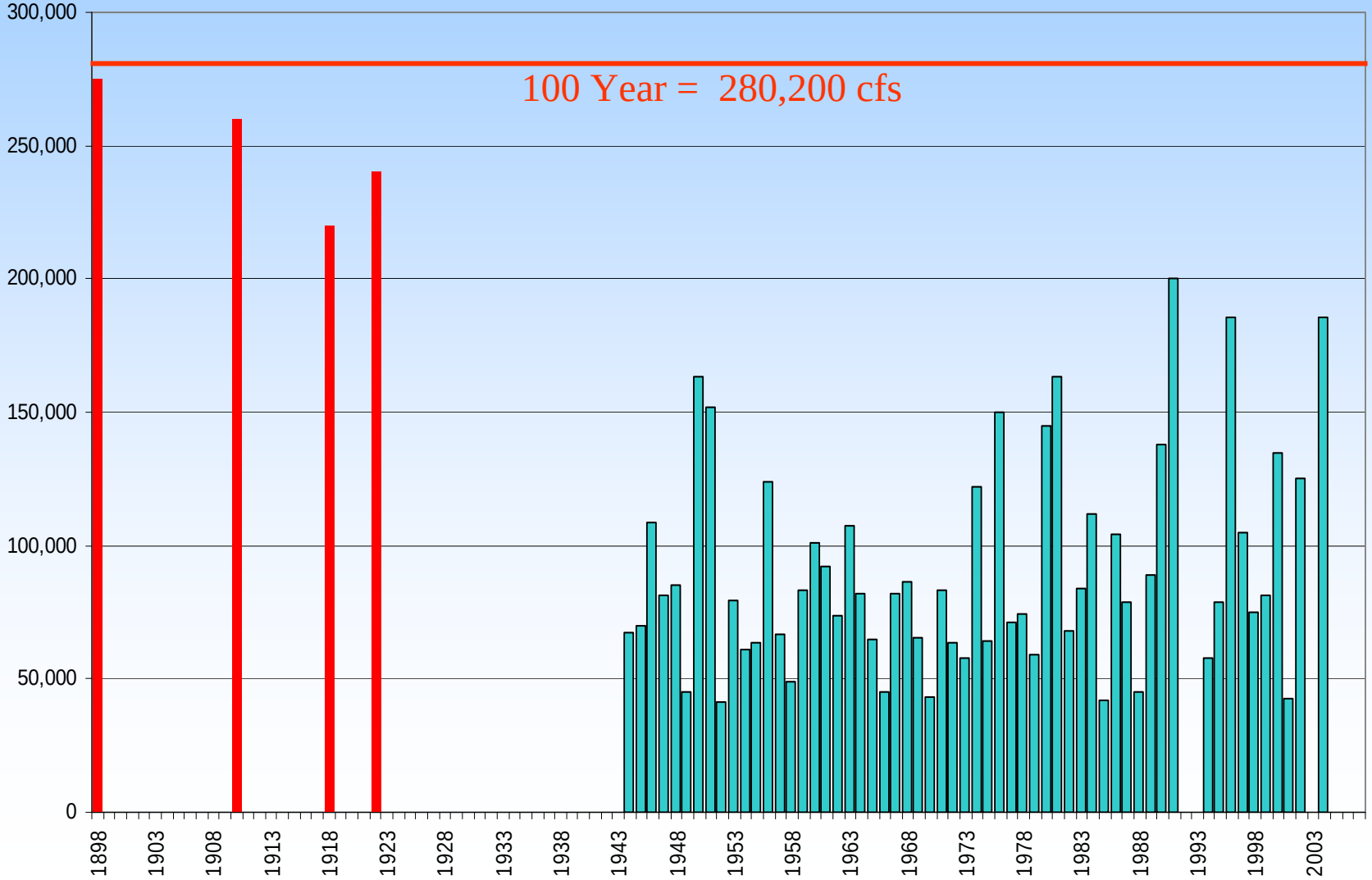
HOW IS THAT?

- Puget Sound Energy could operate the Baker dams for additional flood control but has stated it is too expensive and carries too much liability (think about that for a second).
- FERC could require more flood storage but has deferred to the Corps.
- The Corps is analyzing additional flood storage in the context of its General Investigation (GI) study
- The General Investigation study shows that any additional flood storage in the Baker system would be overwhelmed by the magnitude of its theoretical 100-year flood; **therefore, the GI process will, by definition, preclude additional Baker flood storage**
- The Corps' work product which is precluding additional flood storage in the Baker system is overestimated because it is based on the historic unrecorded flood estimates provided by the USGS
- The USGS has stated the Corps has independent authority to modify its data, including the historic unrecorded flood estimates
- The Corps has stated it will not modify the USGS historic unrecorded flood estimates, as it views the USGS to be the expert (although the Corps could simply use the Sedro-Woolley data points instead, which have equal weight with the USGS)
- The theoretical 100-year flood that the Corps has developed is being used to produce the new flood elevation maps for FEMA
- The FEMA flood elevation maps will be higher than otherwise because the Corps GI process is precluding additional flood storage in the Baker system

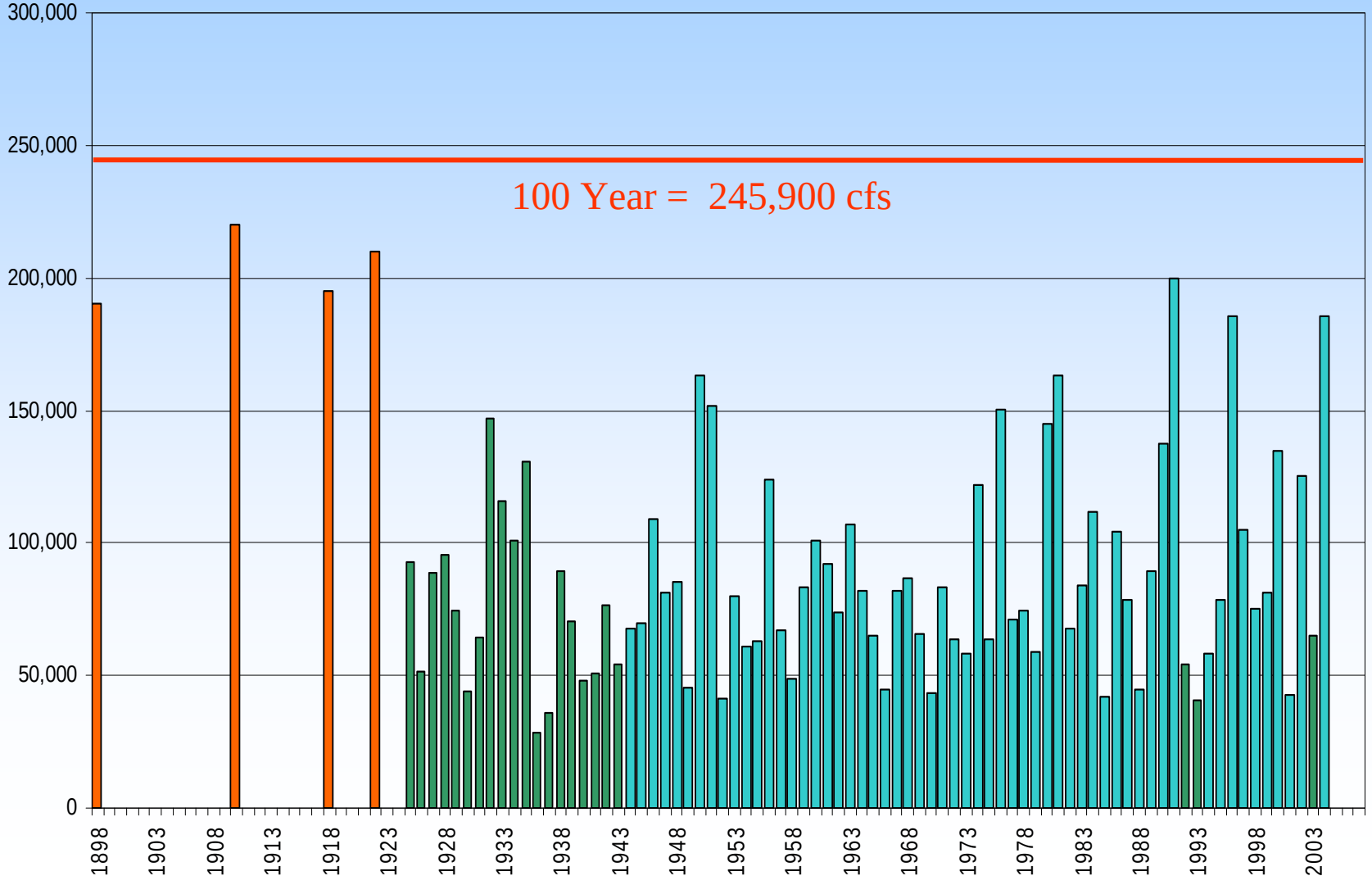
What does all this mean?

1. The historic unrecorded flood events (see red bars) are overestimated

Winter Unregulated Annual Peak Flows Skagit River Near Concrete: Corps of Engineers Data Set



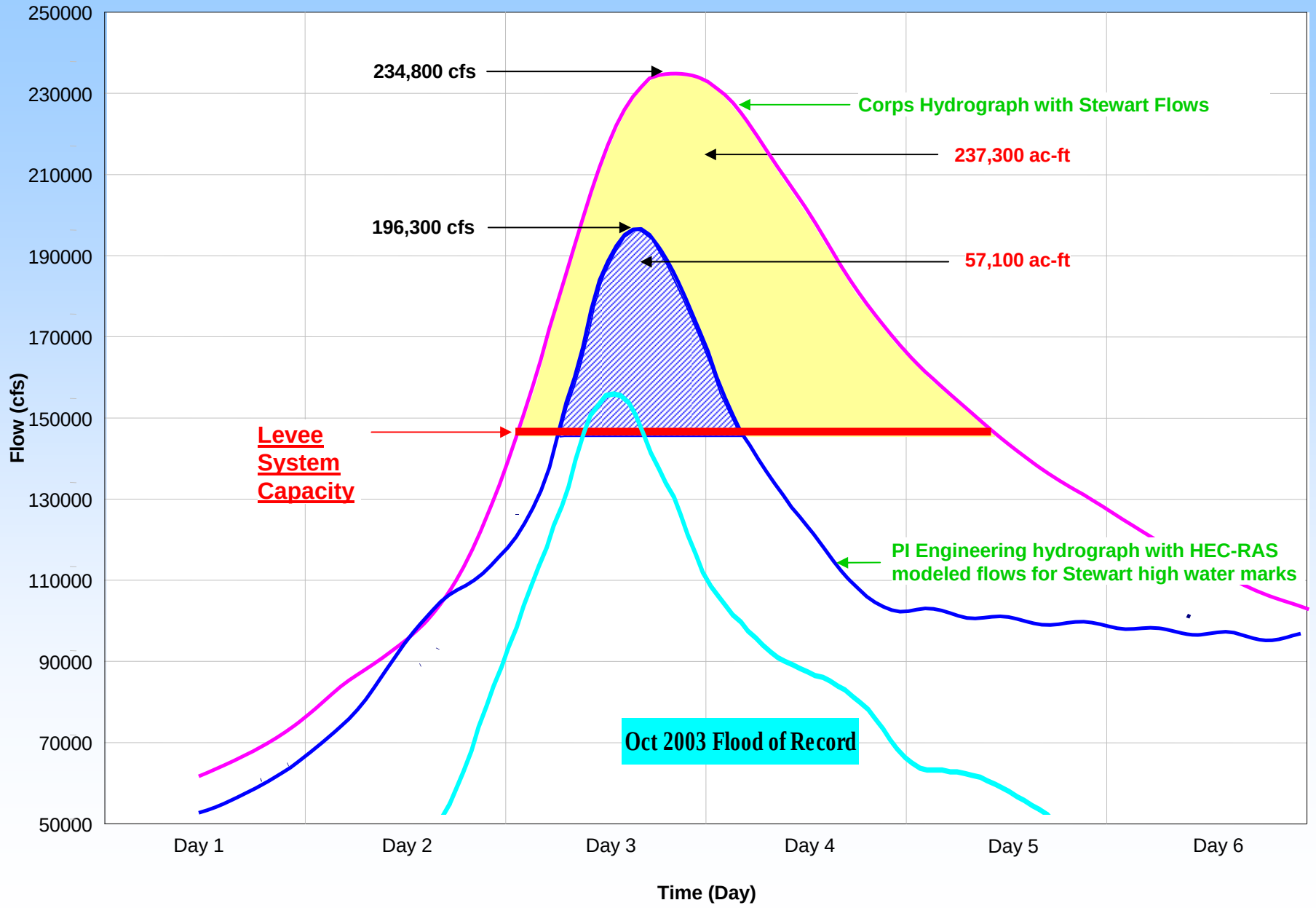
Winter Unregulated Annual Peak Flows Skagit River Near Concrete: PI Engineering Data Set w/ Sedro Woolley Historic Peaks



What does all this mean?

2. This overestimation skews the hydrology and hydraulic model

FEMA 100-year Flood Hydrographs at Sedro Woolley (with existing flood storage)



What does all this mean?

3. Too much theoretical water paradoxically triggers the Corps process to de-select additional Baker storage as a flood control option, thereby making the problem even worse and further reducing any reasonable chance of a basin-wide flood project

I-5 Bridge over College Way

NAVD 1988 Ground Elev. 29.8 ft., Flood Elevation 40.5 ft.

College Way block between Riverside Drive and Urban Avenue

NAVD 1988 Ground Elev. 29.8 ft., Flood Elevation 40.5 ft.

College Way at Riverside Drive and Urban Avenue

NAVD 1988 Ground Elev. 29.8 ft., Flood Elevation 40.5 ft.


Approx. 11 feet above ground
College Way at Riverside Drive
NAVD 1988 Ground Elev. 29.8 ft., Flood Elevation 40.5 ft.

College Way at Riverside Drive

NAVD 1988 Ground Elev. 29.8 ft., Flood Elevation 40.5 ft.

Behind Ace Hardware

NAVD 1988 Ground Elev. 27.8 ft., Flood Elevation 40.5 ft.


FAIRHAVEN AVE.
Approx. 3.5 feet above ground
Fairhaven & Burlington Boulevard
NAVD 1988 Ground Elev. 34.3 ft., Flood Elevation 37.5 ft.

Approx. 4 feet, 2.4 inches above ground

Fairhaven & Burlington Boulevard

NAVD 1988 Ground Elev. 37.8 ft., Flood Elevation 42 ft.

Wendy's (Burlington Blvd. near Pease Rd. in front of Kmart)

NAVD 1988 Ground Elev. 35.3 ft., Flood Elevation 41.5 ft.

Wendy's (Burlington Blvd. near Pease Rd. in front of Kmart)

NAVD 1988 Ground Elev. 34.3 ft., Flood Elevation 37.5 ft.

Finally . . .

We think our information and approach is correct. You can be the judge.

We are hopeful the strength of our technical analysis, which we believe is conservative and responsible, will convince Federal authorities and avoid the cascade of bad outcomes described here.

But it is a difficult uphill struggle.

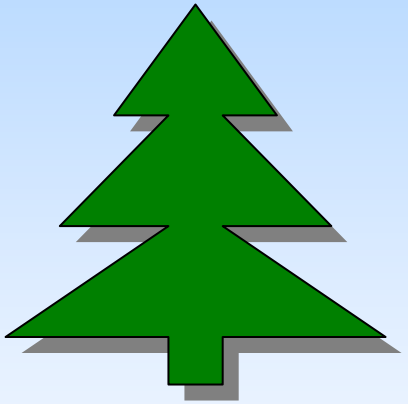
Don Gordon

CEO

Villaorba Group

WATER
We're blessed with it !

Challenges

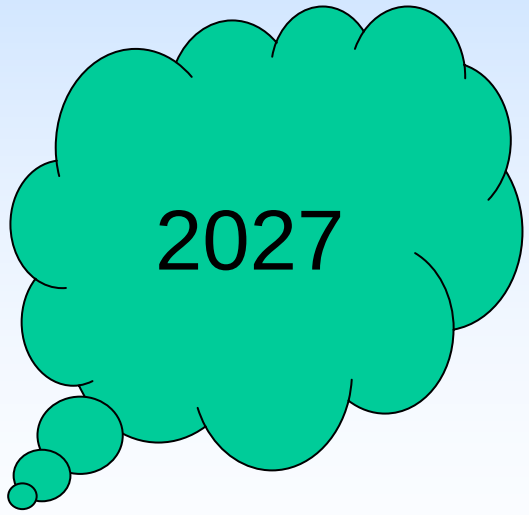


- How to measure it
- How to share it
- How to keep from standing in it

"Send the flood"

IMAGINE OUR COMMUNITY

Not the next one or two years



Imagine us

in next 20 years

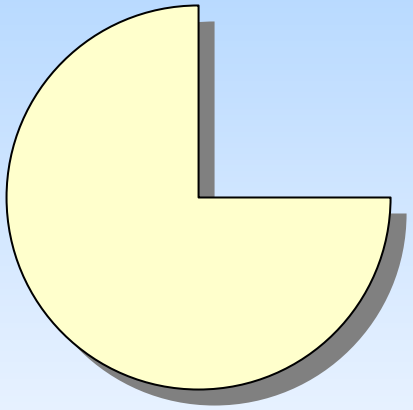
needed services

- Firefighters and their equipment
- Police officers, Courts, Judges, Juries
- Roads – Streets – Traffic Control
- Parks and Social Services
- Hospitals and Public Health Service
- Dike Districts and Dike maintenance
- Cemeteries Districts
- Port Districts
- Deputy Sheriffs – Jails – rescue help
- Teachers and books and schools
- And so much more - - -

How will we pay for it?

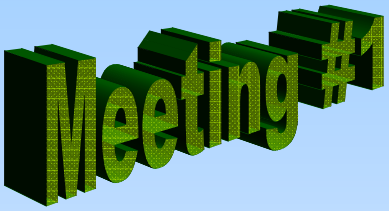
heavily with

- Property tax
- Sales tax
- Fees for services



Take an imaginary trip with me

ABC Investors
Anywhere USA

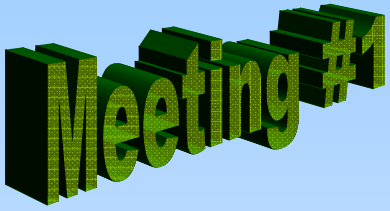


Board of Directors Meeting

Agenda

1. Minutes from last meeting
2. Salary raise to secretaries
3. Investments in Skagit County, WA.

ABC Investors
Anywhere USA



About Skagit County

PRO

- Beautiful
- Growing
- Prosperous
- Skilled work force

CON

- Flood elevations ?
- Floodway ???
- Property values ?

uncertainty

“U and Me”
Local Business

Discussion over lunch

Buy the old meeting hall and remodel ?

Rent it out for a fair price?

General discussion

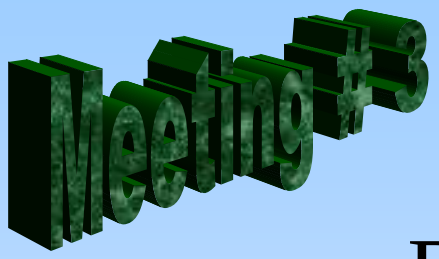
YOU

- How much will it cost to buy?
- How much to remodel?

ME

- Can we get the permits to do it?
- Can we ever sell it?
- *What will the new elevations mean*?

uncertainty

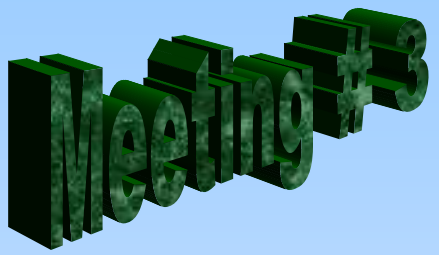


Big or Little Bank
Local Branch

Board of Directors Meeting

Agenda

1. Minutes from last meeting
2. Salary raise to secretaries?
3. Approve “U and Me” loan application?

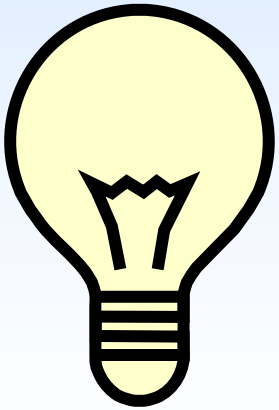


considerations

- Collateral? good
- Location good
- What will this FEMA decision mean ???
- Enough flood insurance avail ???
- Federal and State regulators ???
- Better places to lend money ???

uncertainty

What will all this uncertainty do to property values if people are hesitant to invest?



A Dampening,
Smothering effect.

District Commissioners meeting

Any and All

School District

City Council

County Commissioner

Port Commission

Health Department

Police Department

Hospital District

Superior/ District Court

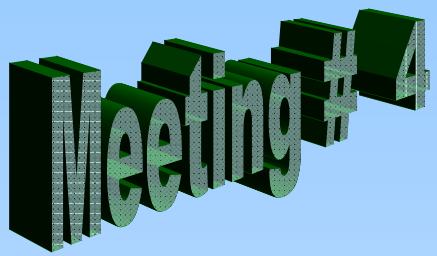
County Fair Board

Parks and Rec.

Sheriff - Jail

Senior Services

Etc., Etc., Etc., - - - -



Commissioners Budget Discussion

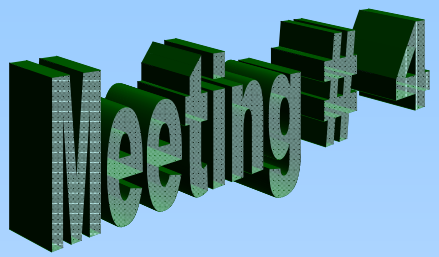
(before new elevations)

Income Forecast

- Income from new construction
- Income on present valuations
- Income from sales tax portion
- Income from fees and services

Expense Forecast

- **Almost every cost**



Commissioners Budget Discussion

(after proposed elevations)

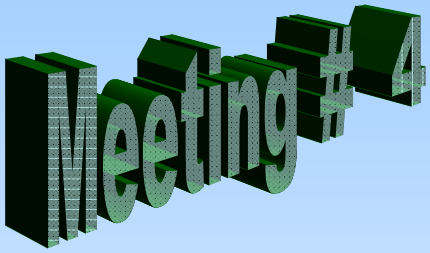
Income Forecast

- Income from new construction
- Income on present valuations
- Income from sales tax portion
- Income from fees and services

Expense Forecast

- **Almost every cost**

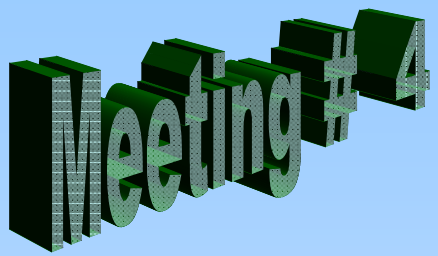
District Commissioners meeting



TALK TO FEMA

LEAD THE WAY

UNITE COMMUNITY

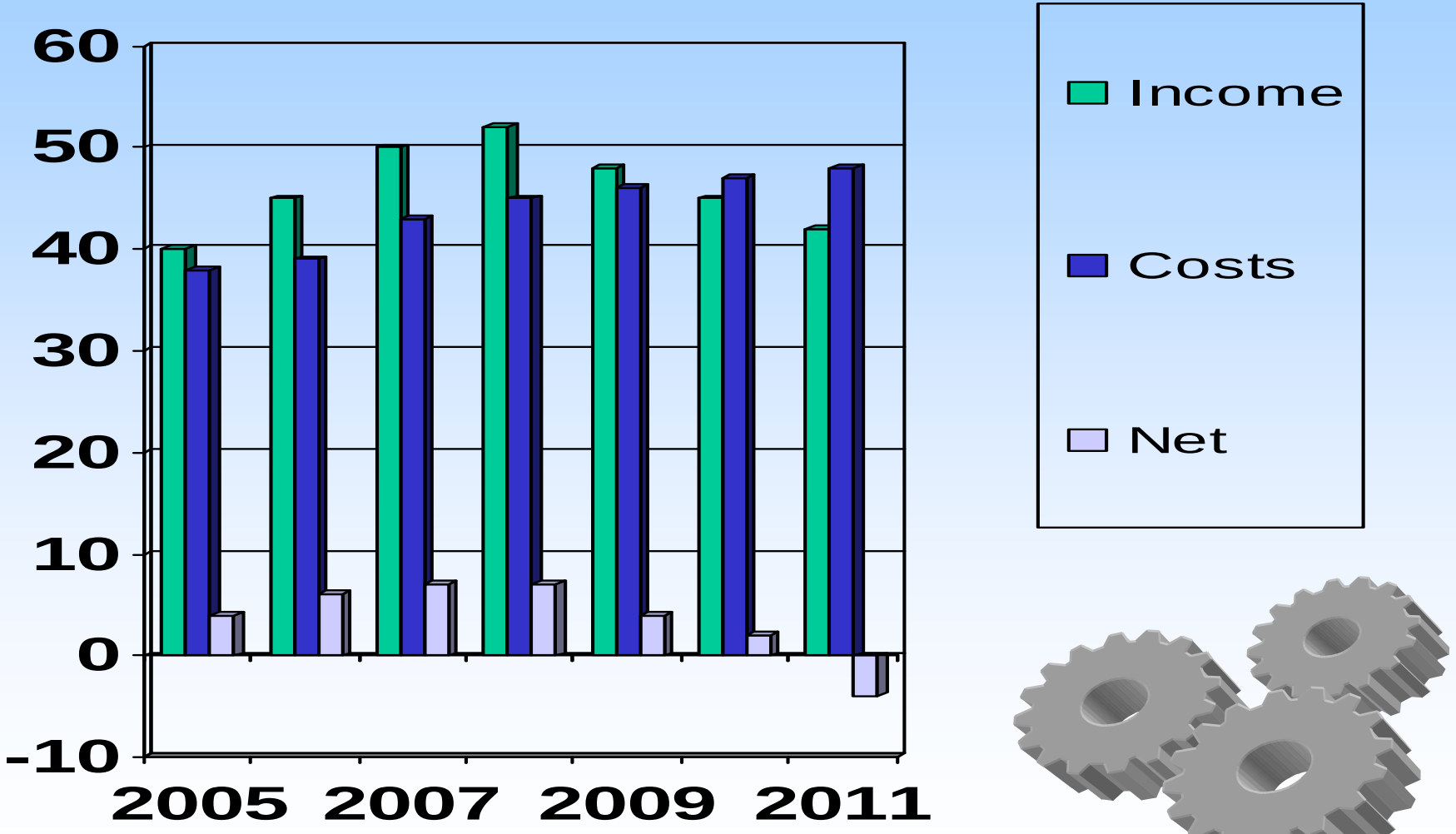


District Commissioners meeting

Be certain that

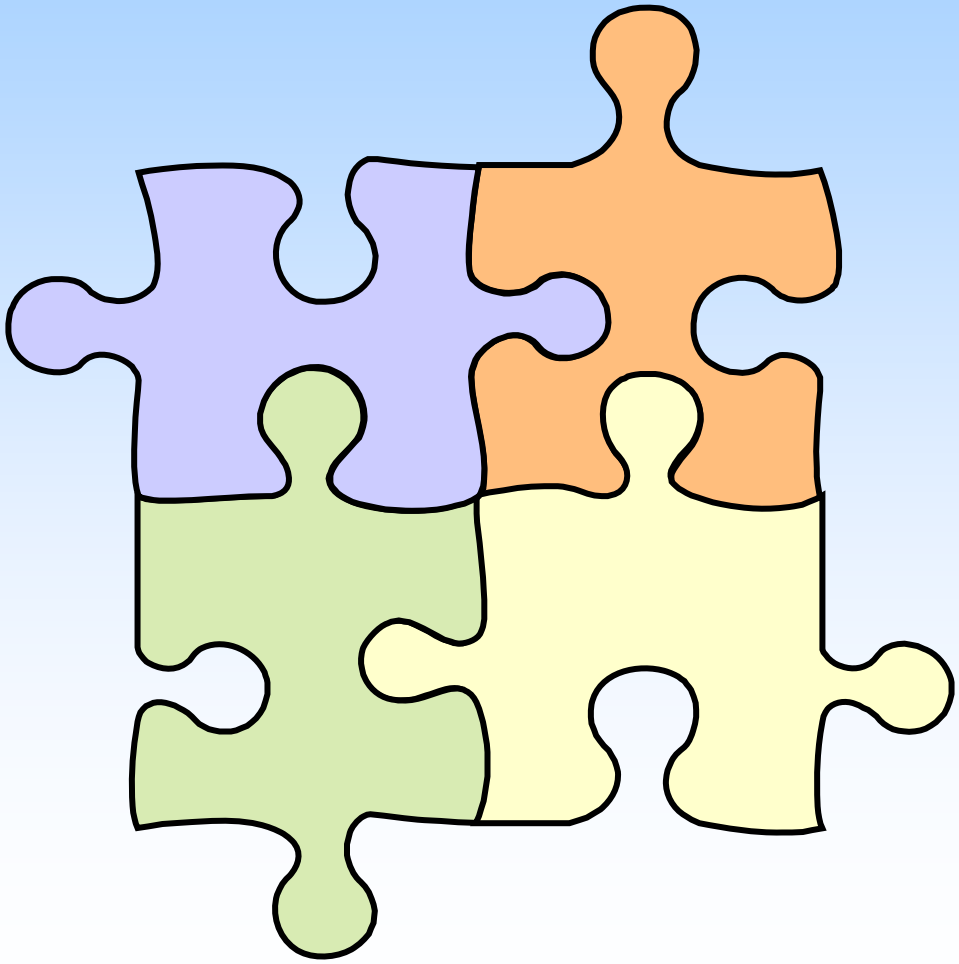
- The process is “Open”
- The right “Information is used”

Business Community will fight for survival

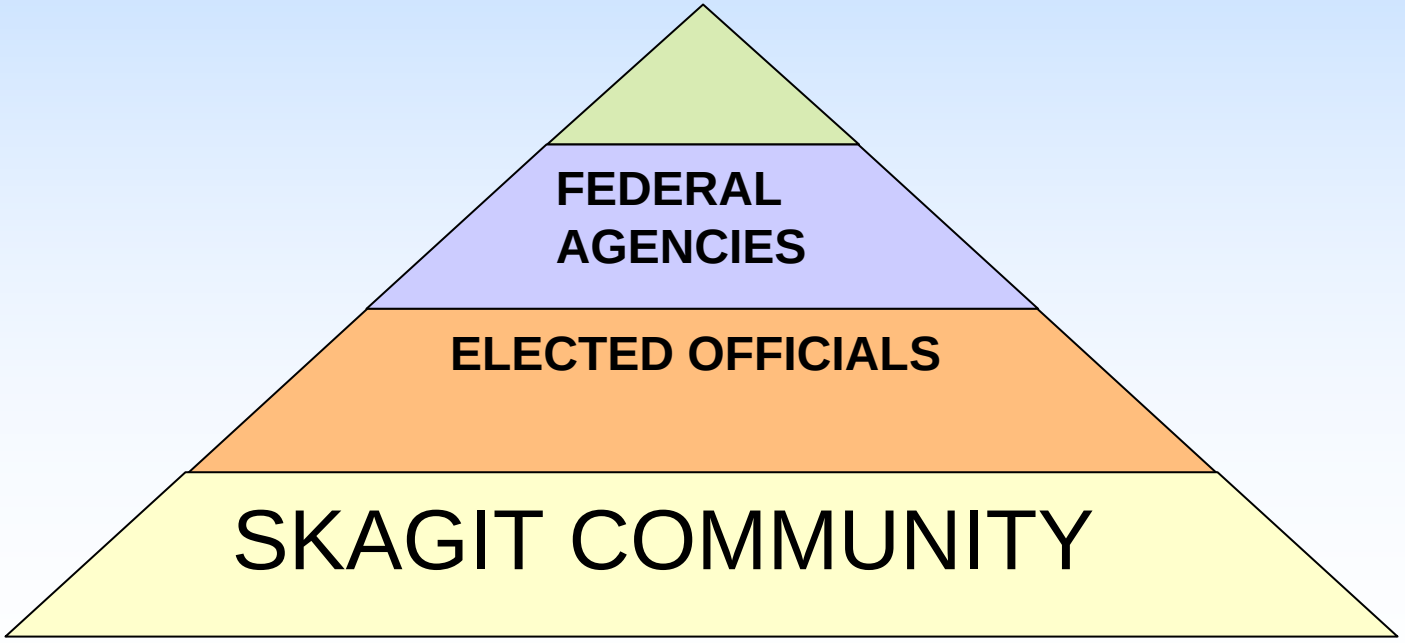


OUR OPPORTUNITY

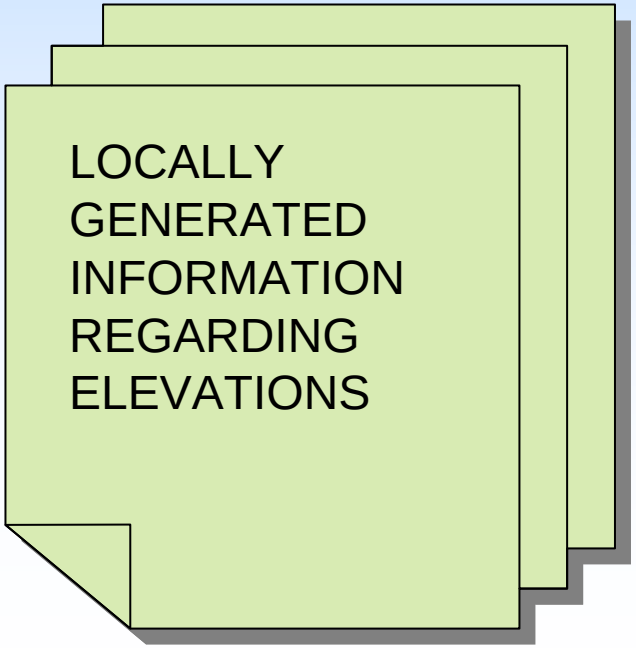
- Unite as a community, public and private. Put the pieces together right.



- Unite as a community, public and private.
- Insist that the process be “OPEN” and transparent.



- Unite as a community, public and private.
- Insist that the process be “OPEN” and transparent.
- See that all relevant data be included.



- Unite as a community, public and private.
- Insist that the process be “OPEN” and transparent.
- See that all relevant data be included.
- Insist that the local community be included.

- Unite as a community, public and private.
- Insist that the process be “OPEN” and transparent.
- See that all relevant data be included.
- Insist that the local community be included.
- Petition every official elected to any City/County/District/State/Federal Office demand an “Open and Inclusive Review”.

IF

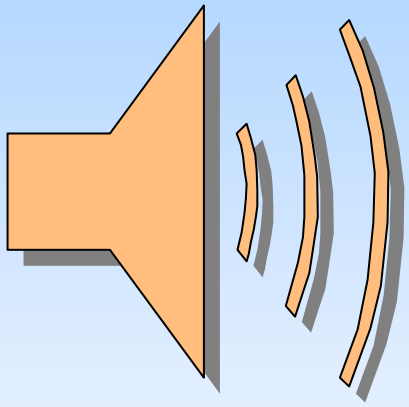
"The flood elevations proposed are correct we will slowly leave this valley by natural attrition, whether by actual flood or merely the threat of it."

IF

"As we strongly suggest, the elevations ***are incorrect*** and imposed regardless of the data, this wonderful and unique American community will ***needlessly*** wither and become a ghost of what it has been and can be".

IF FEMA WON'T LISTEN

AMERICA



WILL

"IT'S THE PROCESS AND THE DATA"