BUREAU OF RECLAMATION

Zone of Influence Analysis

April 18th, 2023

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Overview

- Introduction and approach
- Review of KDEs curves
- Comparisons across operational scenarios
- Review of spatial results
- Next steps

Introduction and Approach

- Goal:
  - Identify spatial effect of Jones/Banks pumping in Delta channels
- Approach:
  - Conduct two DSM2 simulations:
    - Reclamation 2021 Benchmark (NAA)
    - Reclamation 2021 Benchmark without exports (NAA NP)
  - Categorize results by OMR flow conditions in NAA: -1,000 cfs, -2,000 cfs, -3,000 cfs, -4,000 cfs, and -5,000 cfs
  - Compare daily averaged velocity results at various OMR flow conditions

Approach (cont.) - Categorization

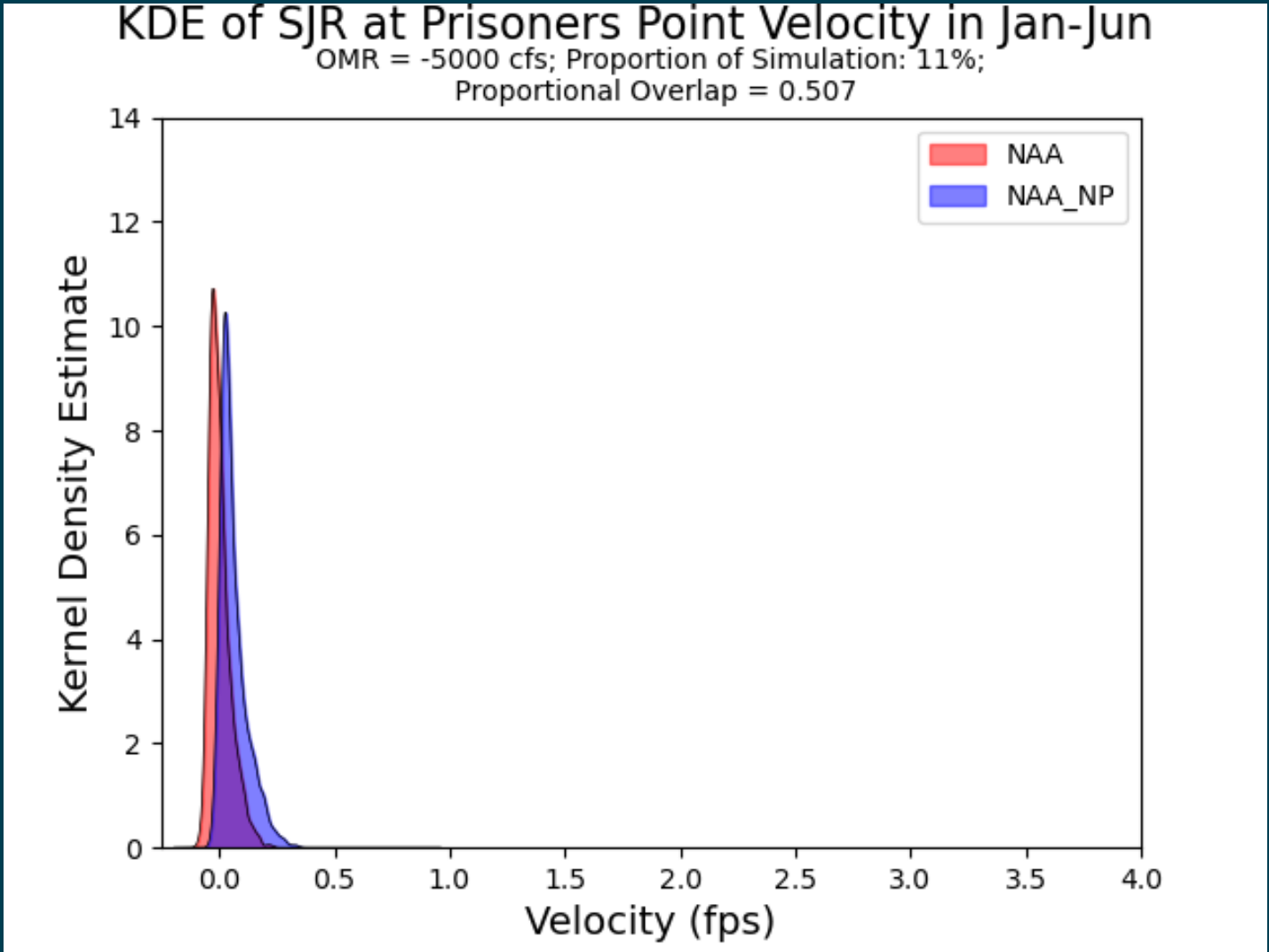
- In each bin, consider OMR flows within 500 cfs:
  - -1,000 cfs category considers OMR flows between -500 and -1,500 cfs
- Season: January through June
- In the NAA, identify dates that meet the seasonal and OMR criteria

OMR Bin (cfs)	OMR Bin Range (cfs)	Season	Proportion of Simulation Period
-1000	-1,500 to -500	Jan - Jun	4.5%
-2000	-2,500 to -1,500	Jan – Jun	9.9%
-3000	-3,500 to -2,500	Jan – Jun	9.7%
-4000	-4,500 to -3,500	Jan – Jun	9.7%
-5000	-5,500 to -4,500	Jan - Jun	11.0%

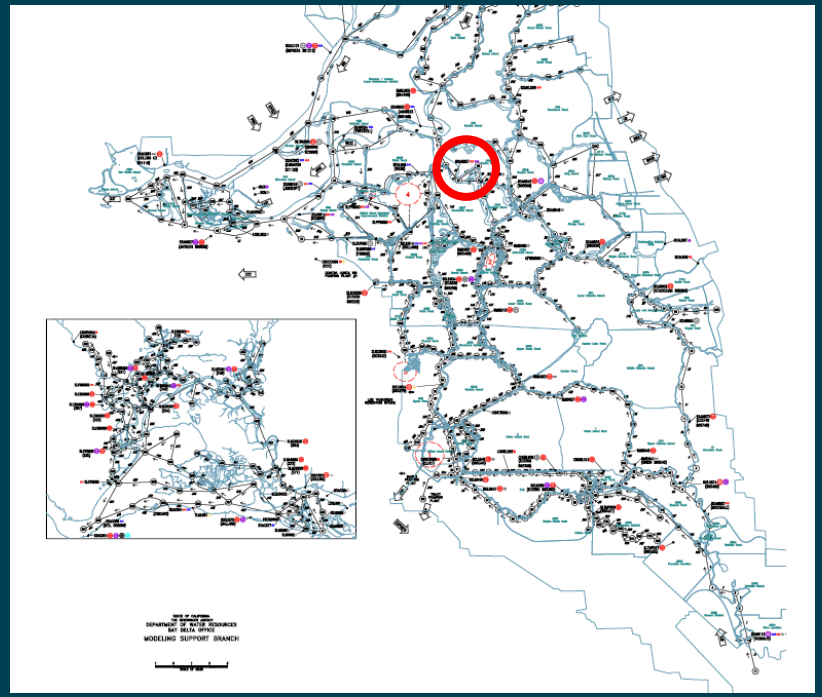
Approach (cont.) - Comparison

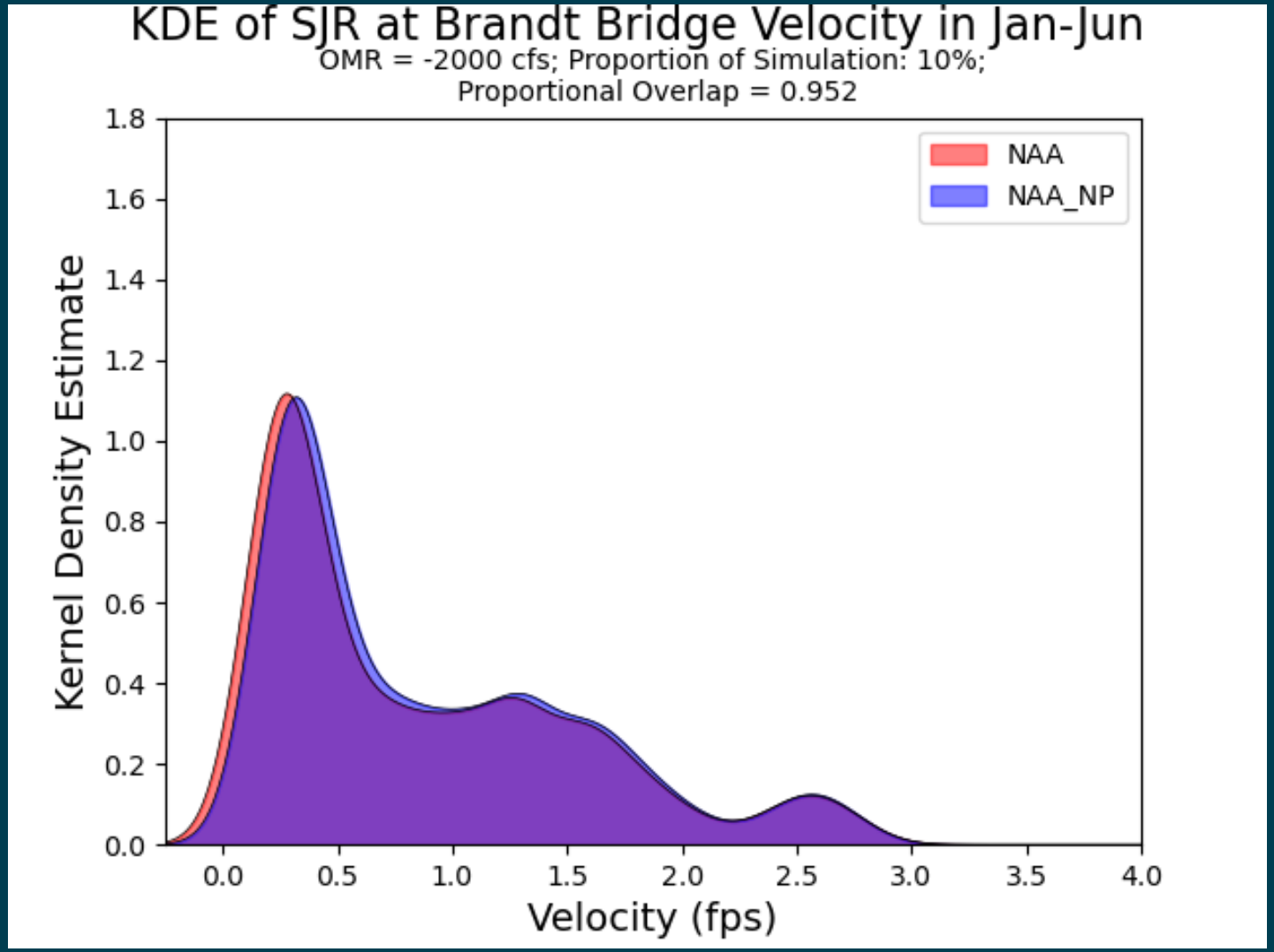
- Retrieve daily averaged velocity for NAA and NAA NP
- Categorize by OMR flow and month in NAA
- Calculate probability density (Gaussian Kernel Density Estimate [KDE]) for NAA and NAA NP
- Compare the overlapping area of the KDEs

Review of KDE Plots

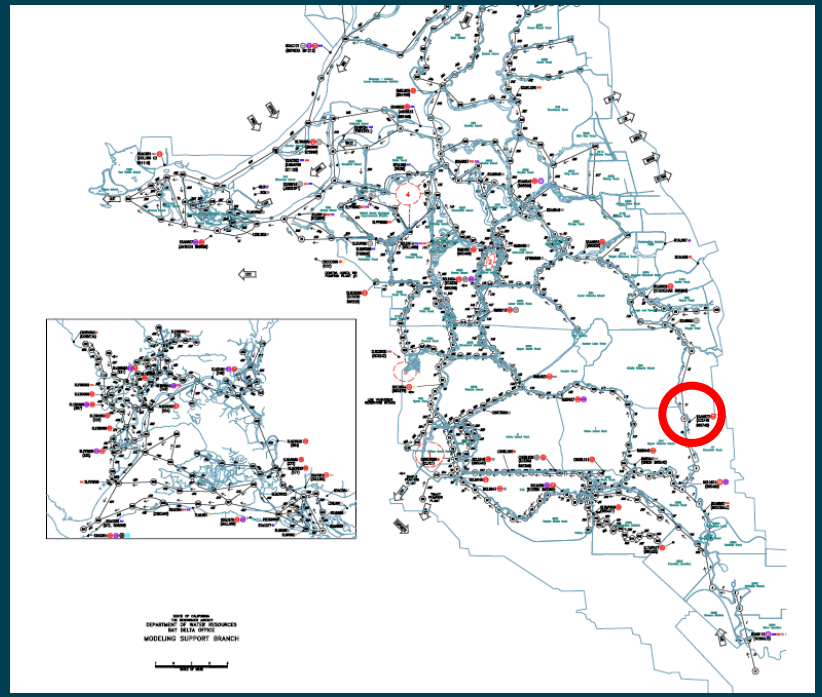


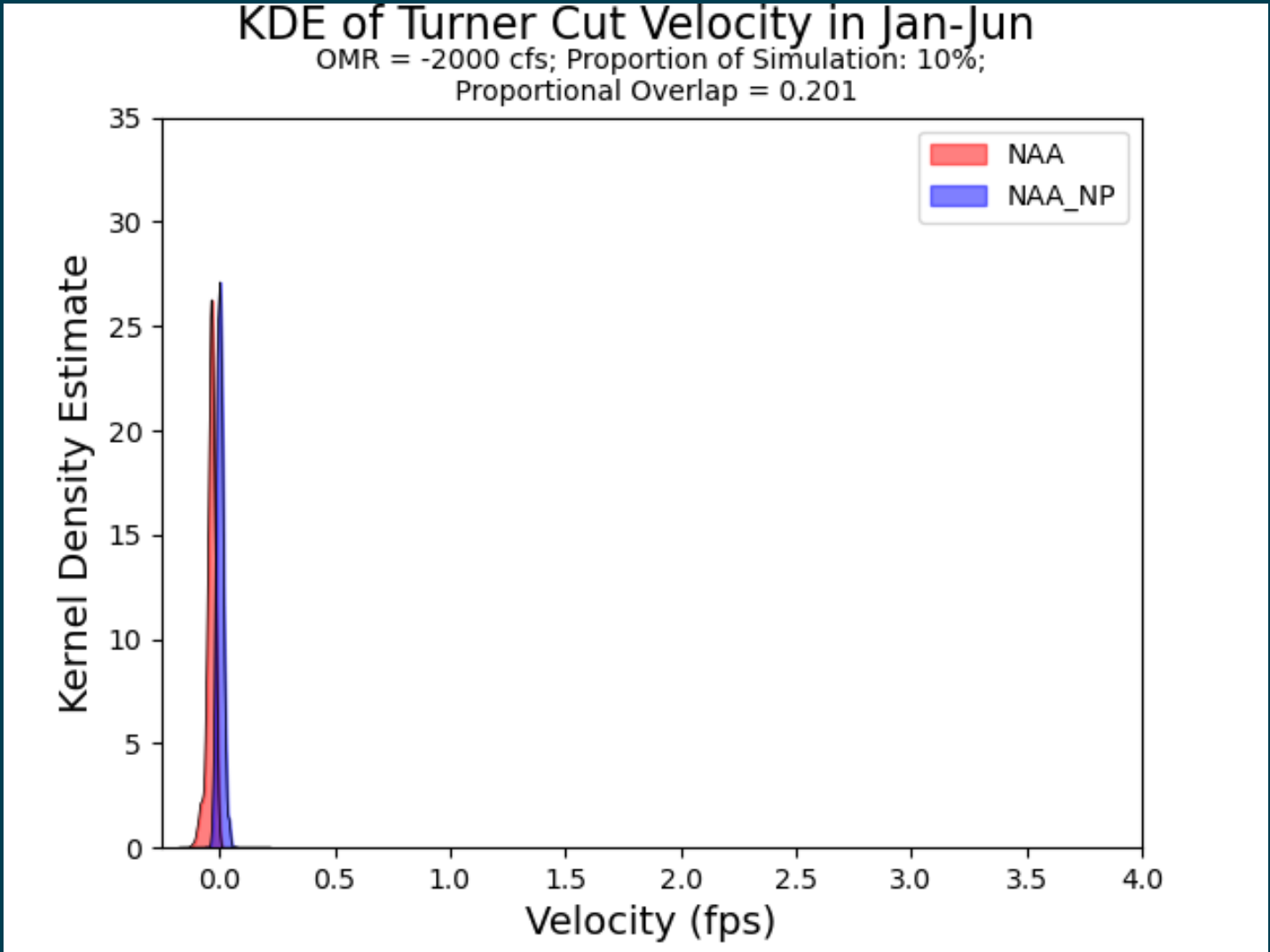
- Plots display the:
  - OMR flow conditions
  - Proportion of the simulation
  - Proportional overlap of the KDE curves
- With more negative OMR flow, overlap between the KDEs decreases



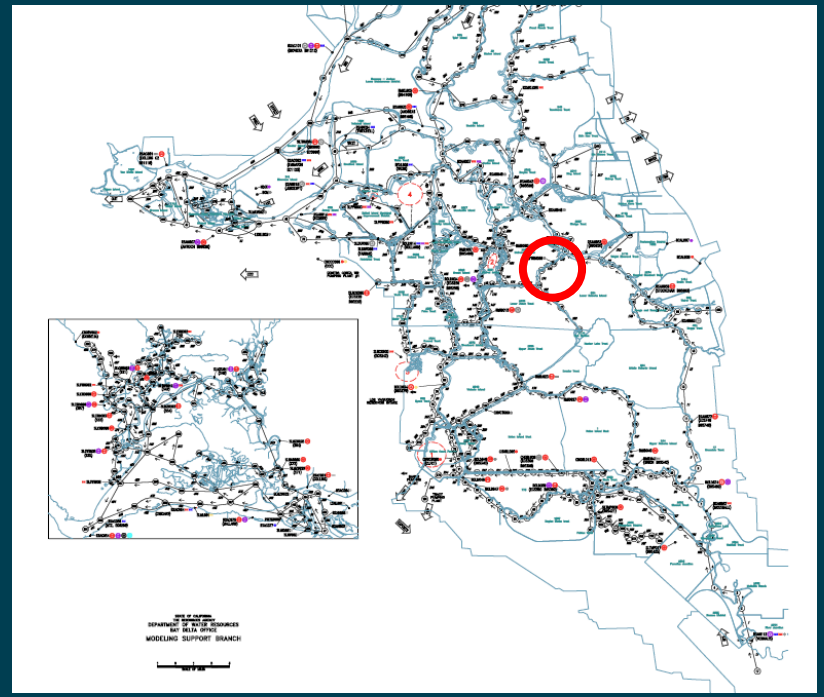


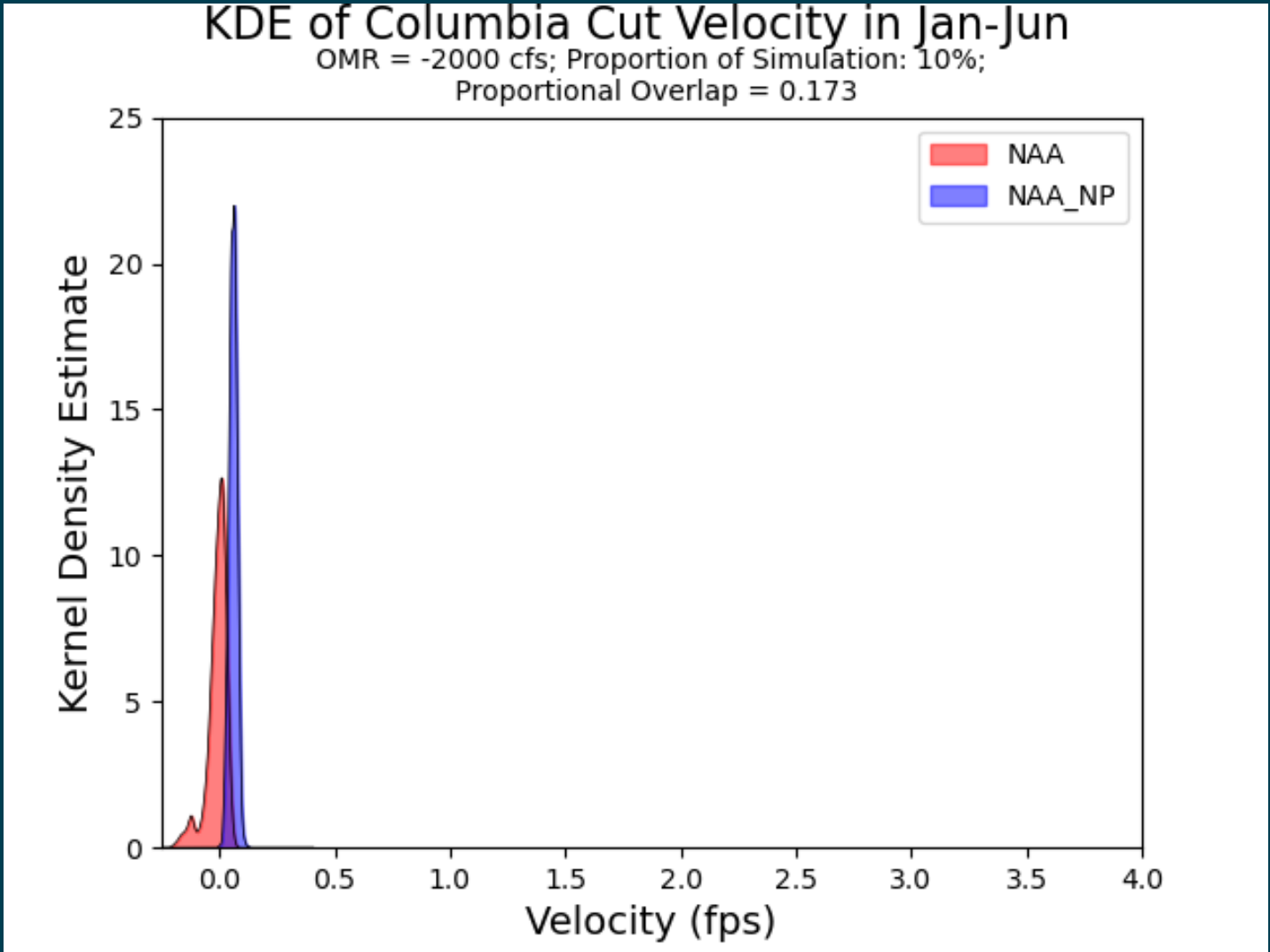
- Moving along the San Joaquin River
  - Brandt Bridge is downstream of Old River
  - Very small change in overlap
  - Wide range in velocity



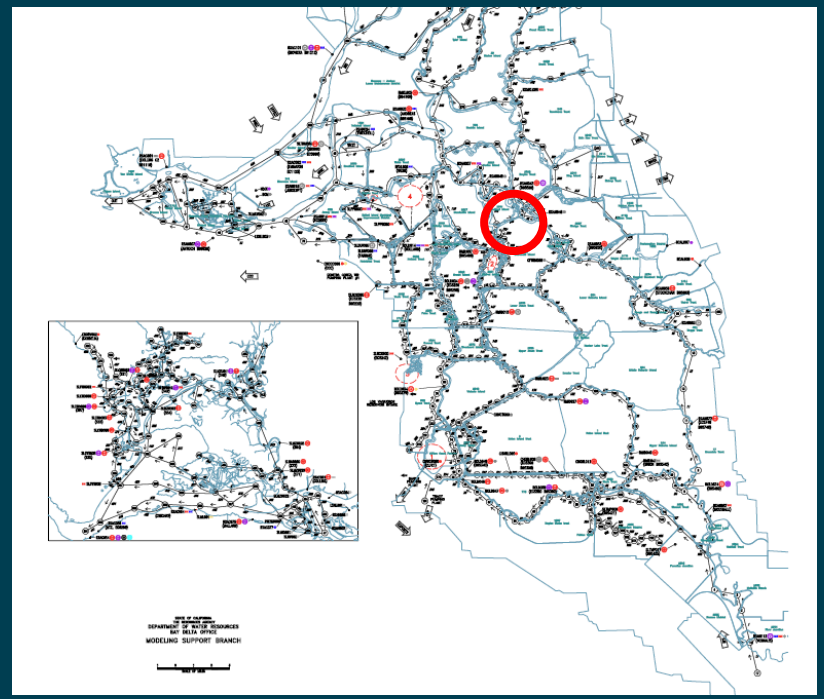


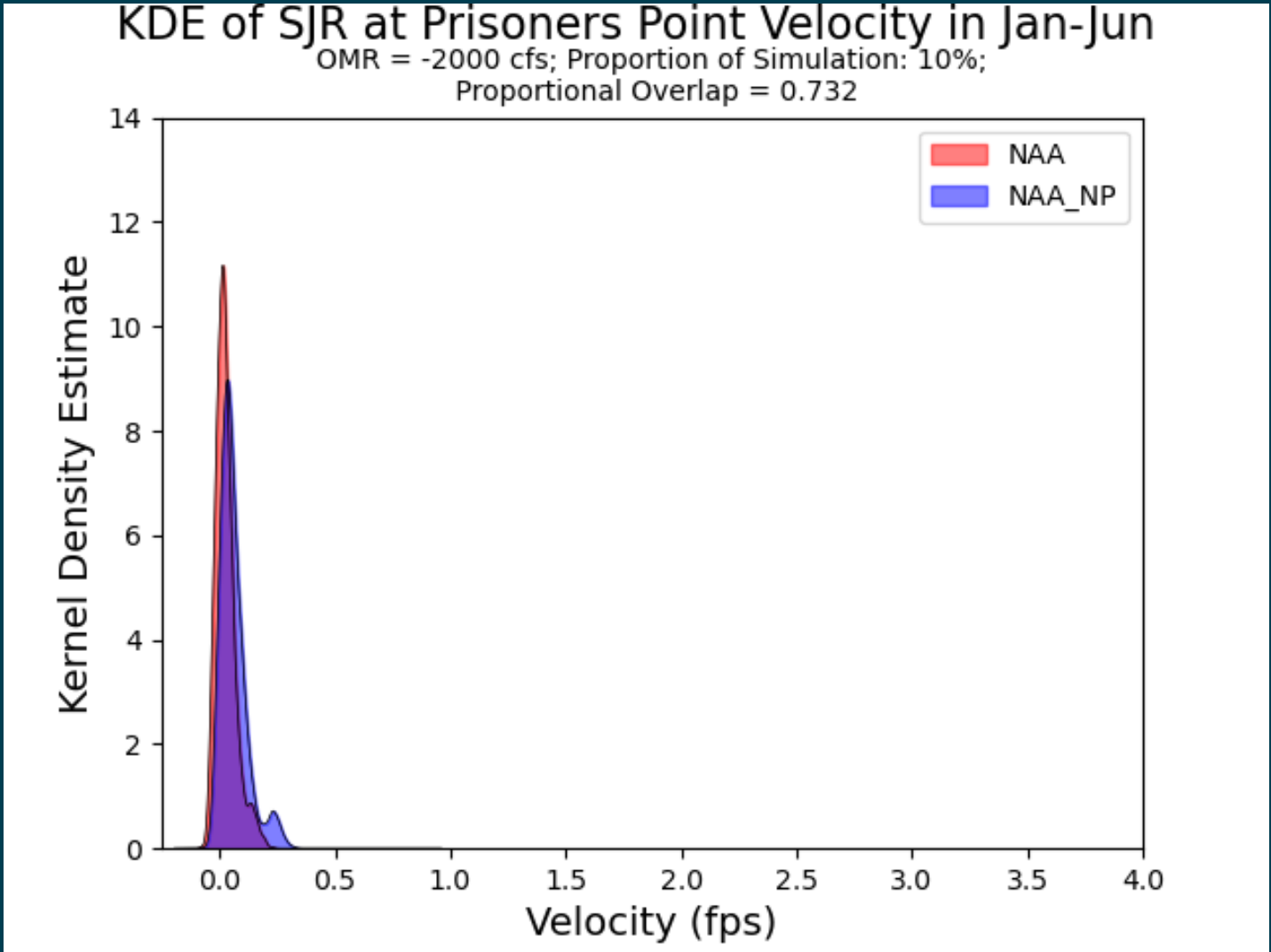
- Moving along the San Joaquin River
  - Along the SJR, Turner Cut is the next location at which pumps may draw from the SJR
  - Large change in overlap
  - Minor change in velocity



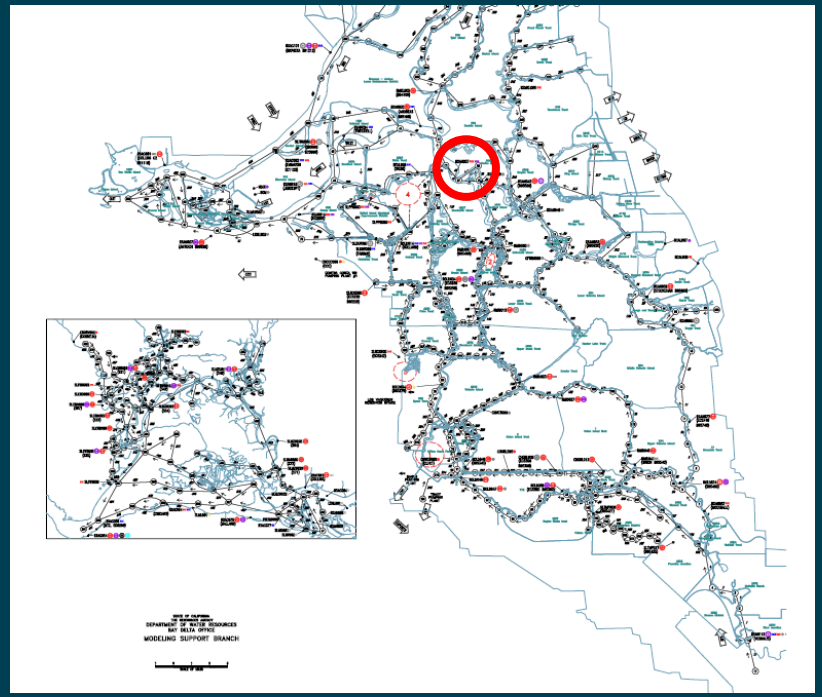


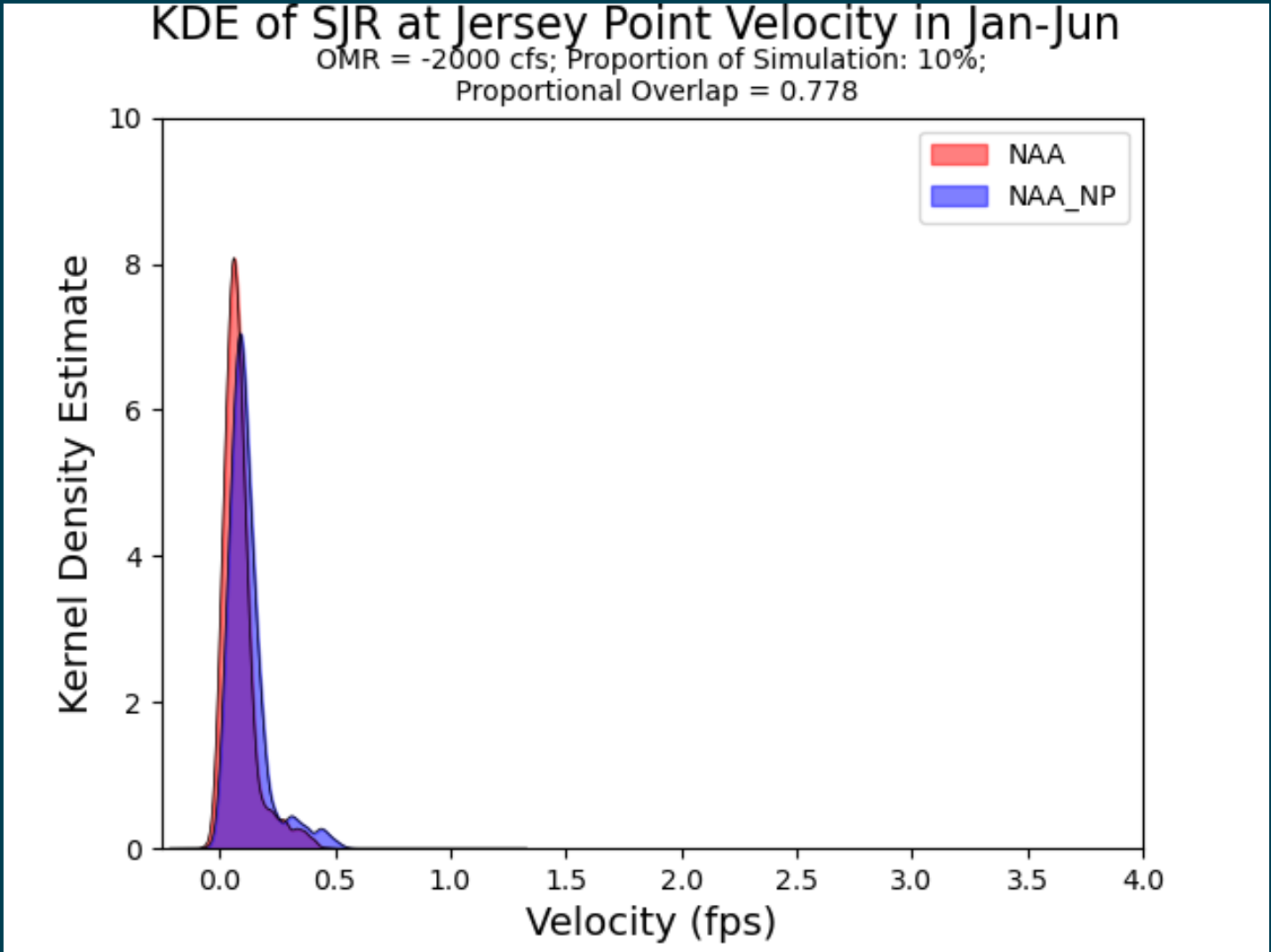
- Moving along the San Joaquin River
  - Along the SJR, Columbia Cut is another location at which pumps may draw from the SJR
  - Similar to Turner Cut



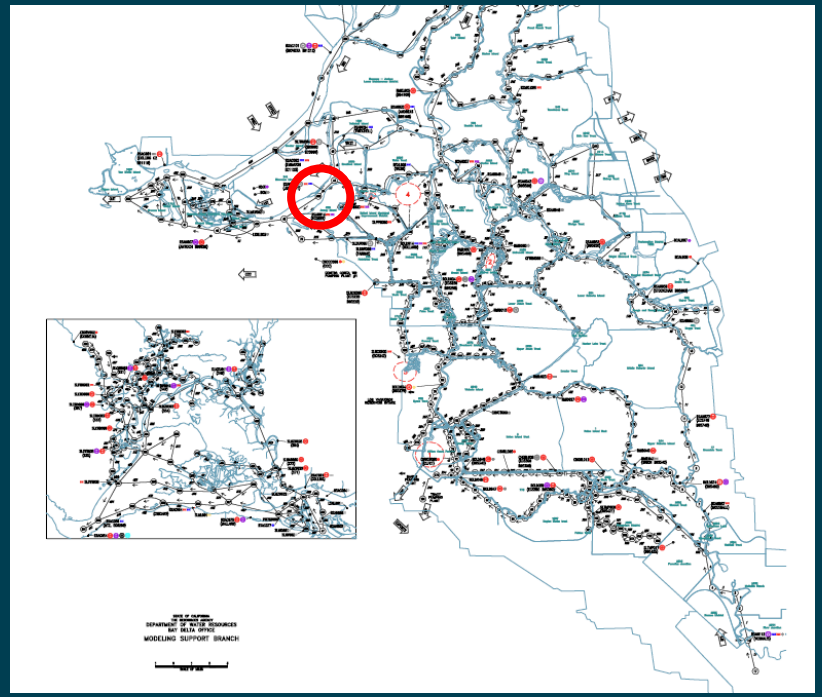


- Moving along the San Joaquin River
  - Prisoners Point is downstream of Head of Old River, Turner Cut and Columbia Cut
  - Relative to Brandt Bridge, Prisoners Point proportional overlap decreases



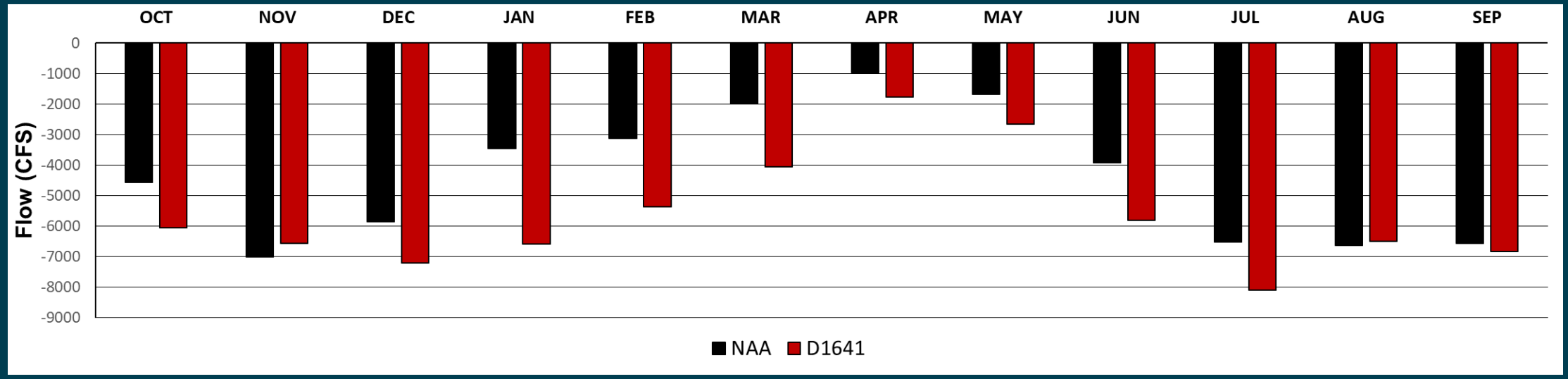


- Moving along the San Joaquin River
  - Jersey Point is downstream of Head of Old River, Turner Cut, Columbia Cut, and Franks Tract
  - Under -2,000 cfs OMR, Prisoners Point and Jersey Point have similar level of change in proportional overlap

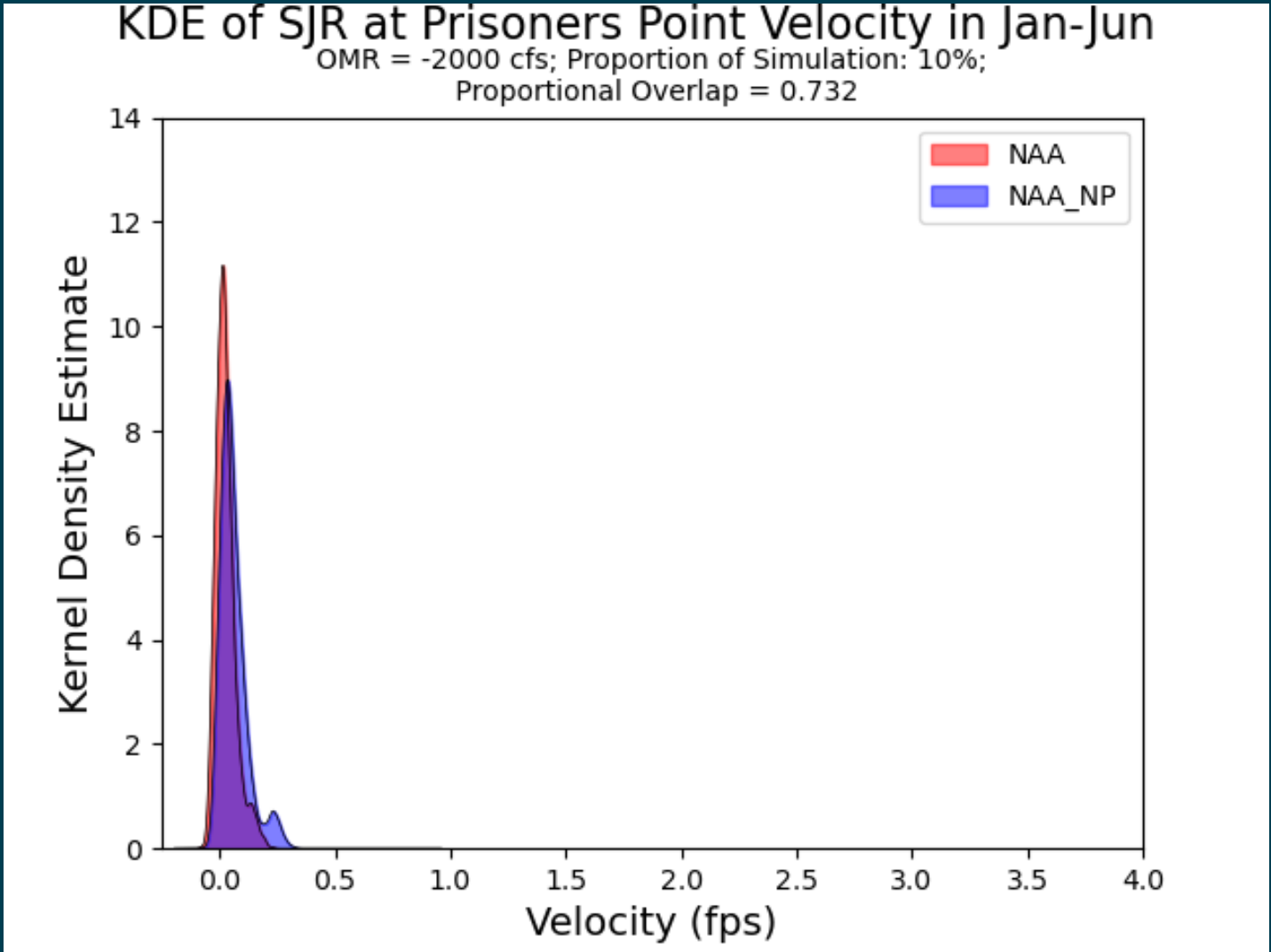


Comparison to D1641

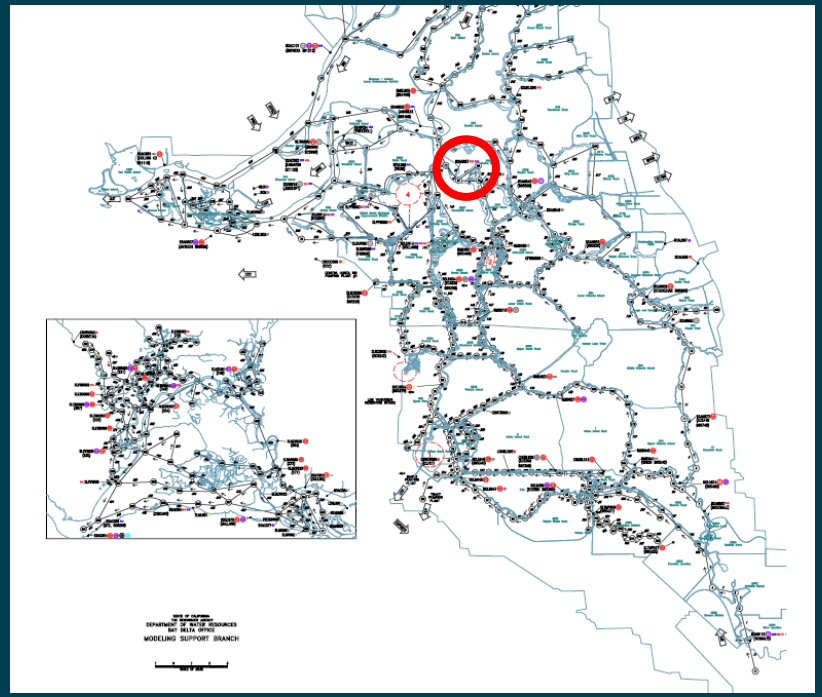
Comparison to D1641 – OMR Flow

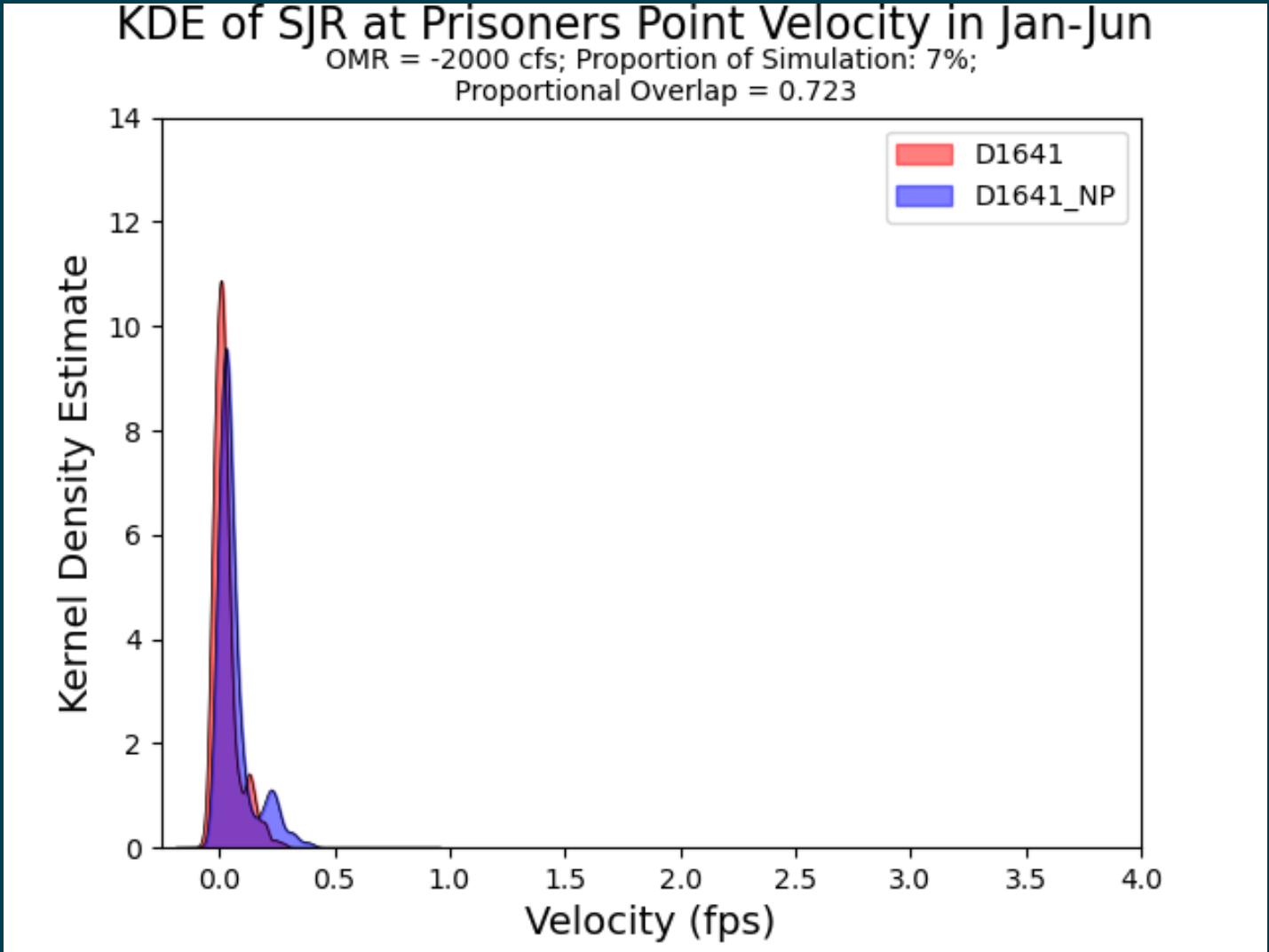


- Zone of influence analyses were also conducted with modeled results from a D1641 simulation
- D1641 simulation does not consider OMR flow targets in December through June



- Frequency of occurrence of a given OMR flow changes
- At a given OMR condition, generally see similar response in NAA and D1641





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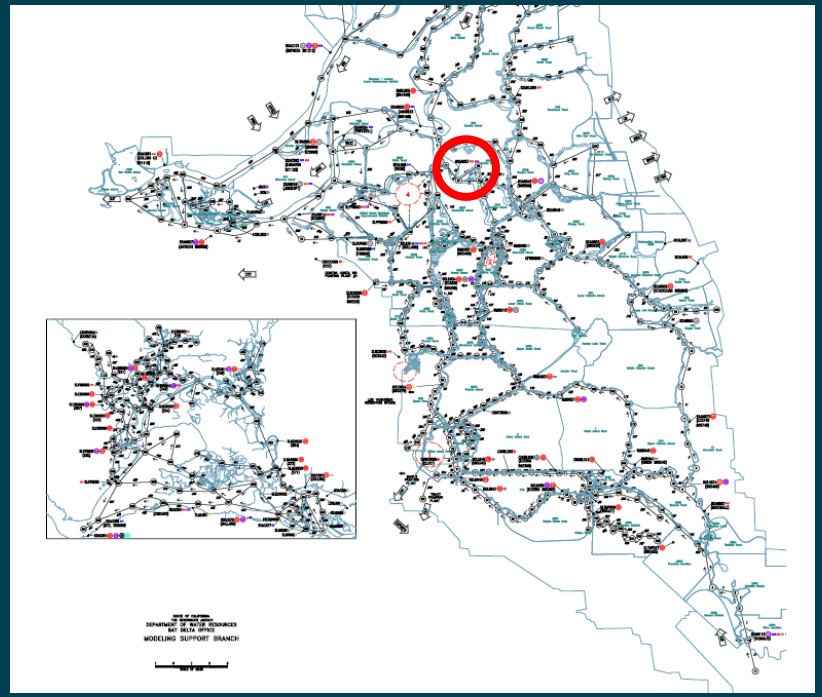
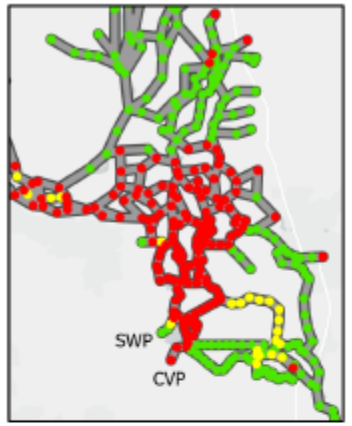


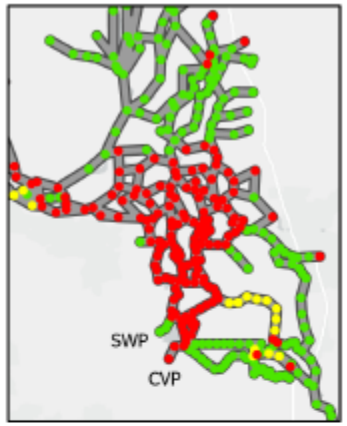
Review of Spatial Results

NAA - March



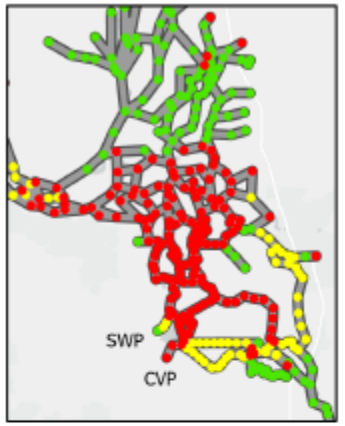
-1000 cfs

2/82 Months



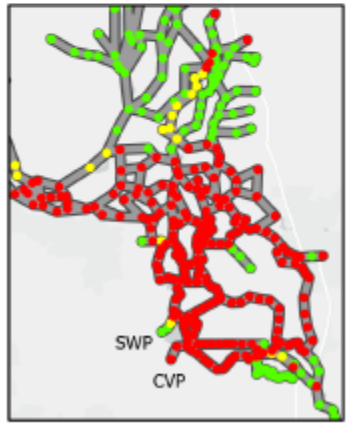
-2000 cfs

4/82 Months



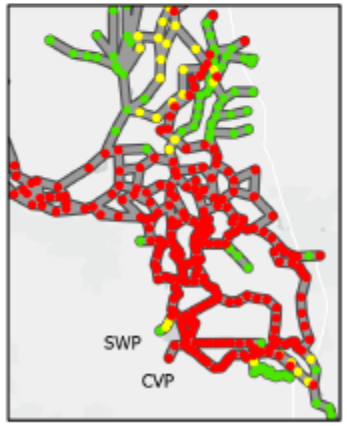
-3000 cfs

59/82 Months



-4000 cfs

8/82 Months

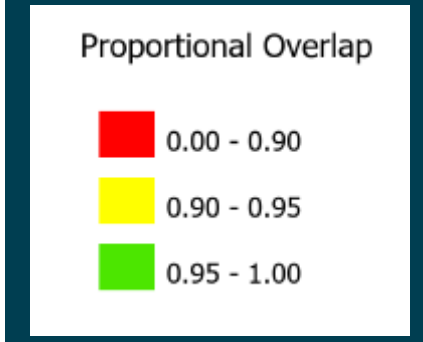


-5000 cfs

1/82 Months

-6000 cfs

0/82 Months



Next Steps

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- Consider direction of changes (e.g., towards-pumps or away-from-pumps)
- Increase the number of color bands on the maps for better resolution on effects
- Along with OMR conditions, consider Delta inflows and exports
- Review multi-modal plots to understand additional influencing conditions/operations

Thank you!

Acknowledgements:

Model Division, Bay Delta Office

Derya Sumer

Josh Israel

Michael Beakes

Catarina Pien

Lisa Elliot

Rob Leaf

Sai Nudurupati

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