

# HYDRODYNAMICS IN A RIVER BEND ADJACENT TO THE FREMONT WEIR: IMPLICATIONS FOR FISH PASSAGE STRUCTURES

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# OBJECTIVES

1. Demonstrate the effects of incorrect discharge estimation at the Fremont Weir

Overestimate discharge = Not enough water for downstream water operations

Underestimate discharge = Not enough fish entrainment into the Yolo Bypass

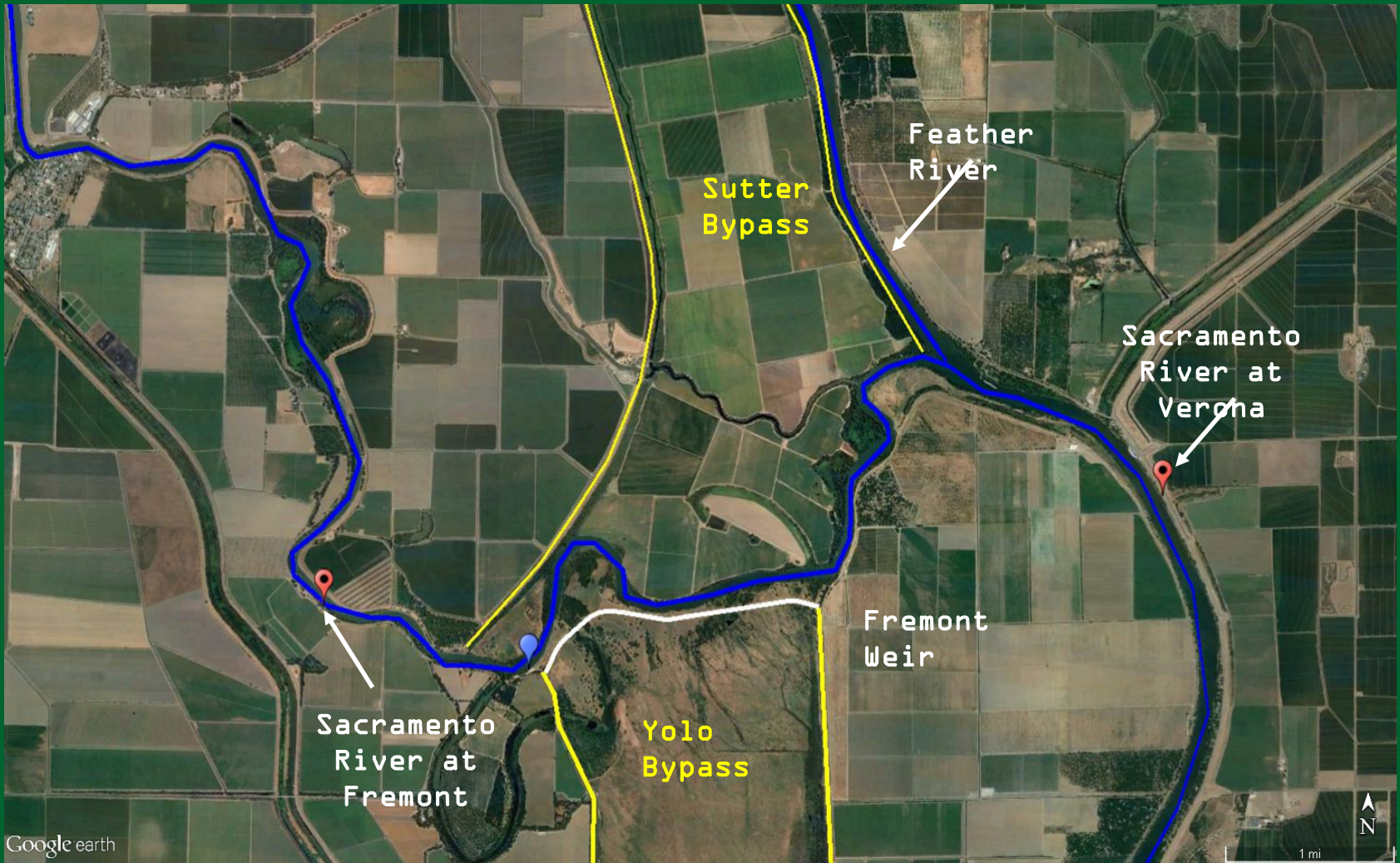
# OBJECTIVES

2. Velocity mapping to define the spatial and temporal variability in the *HYDRAULIC* entrainment zone

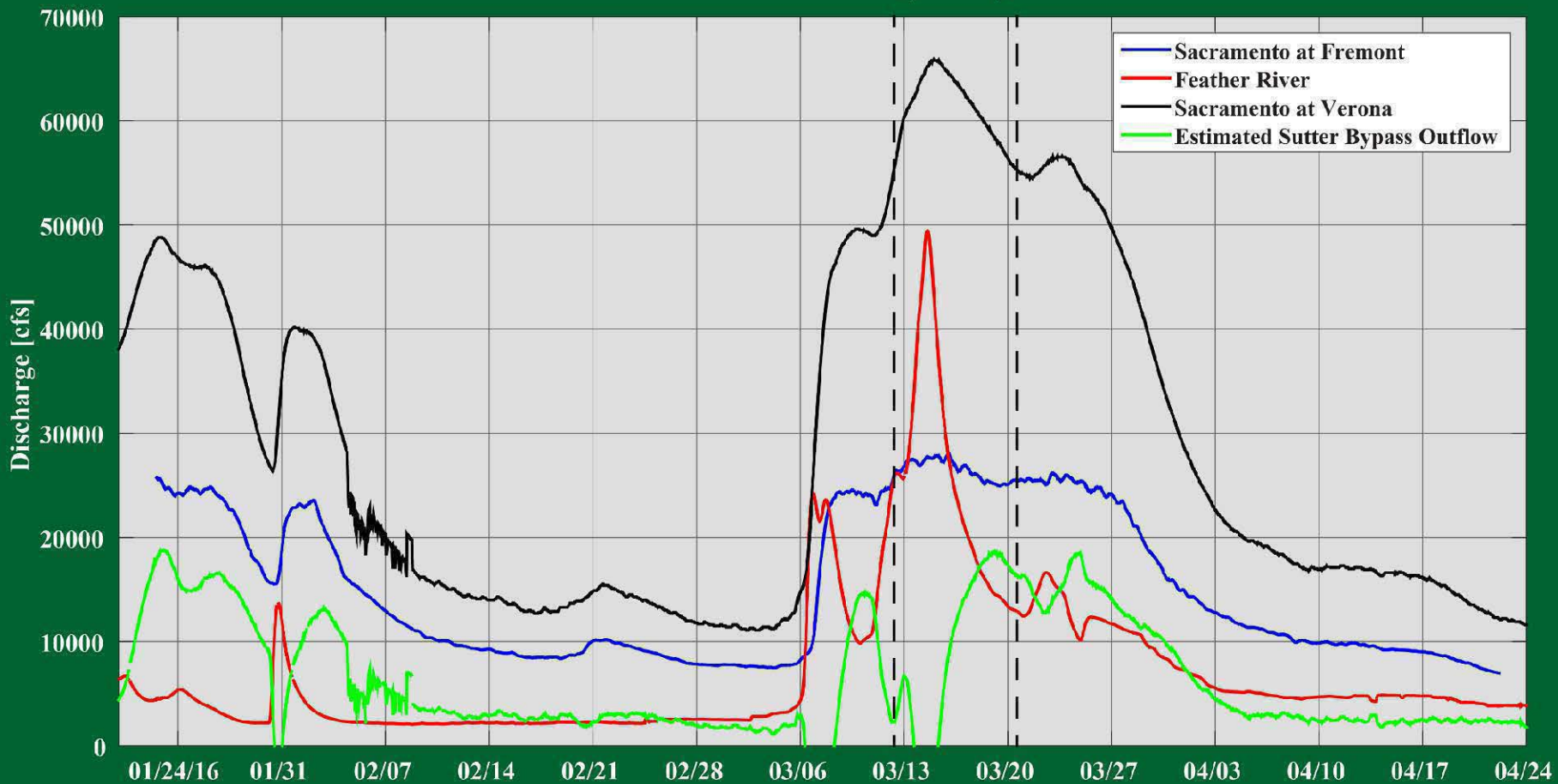
This will allow us to differentiate between

*BIOLOGICAL* entrainment and *HYDRAULIC* entrainment

Goal is to take a greater percentage of fish than water

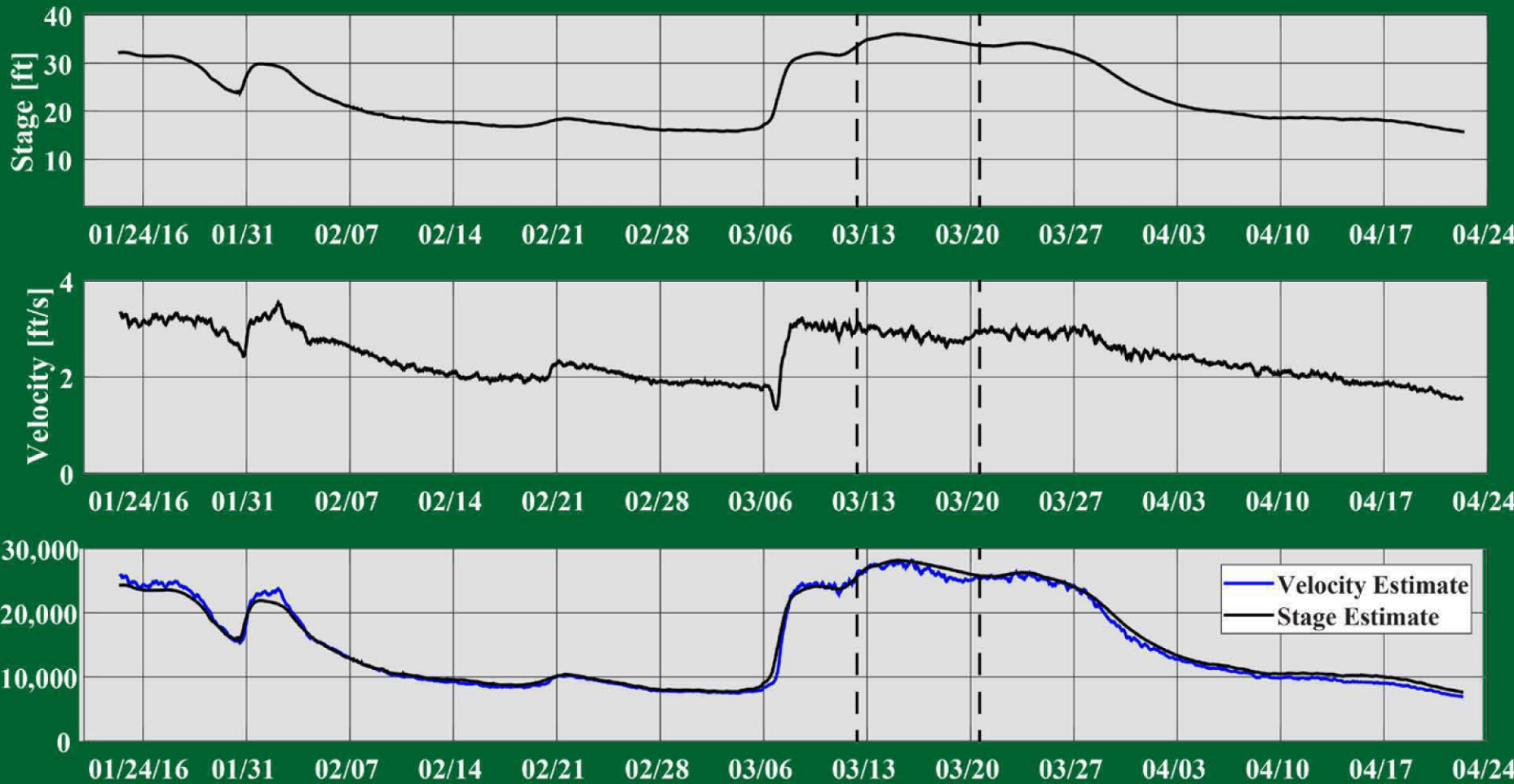


### Fremont Weir overtops

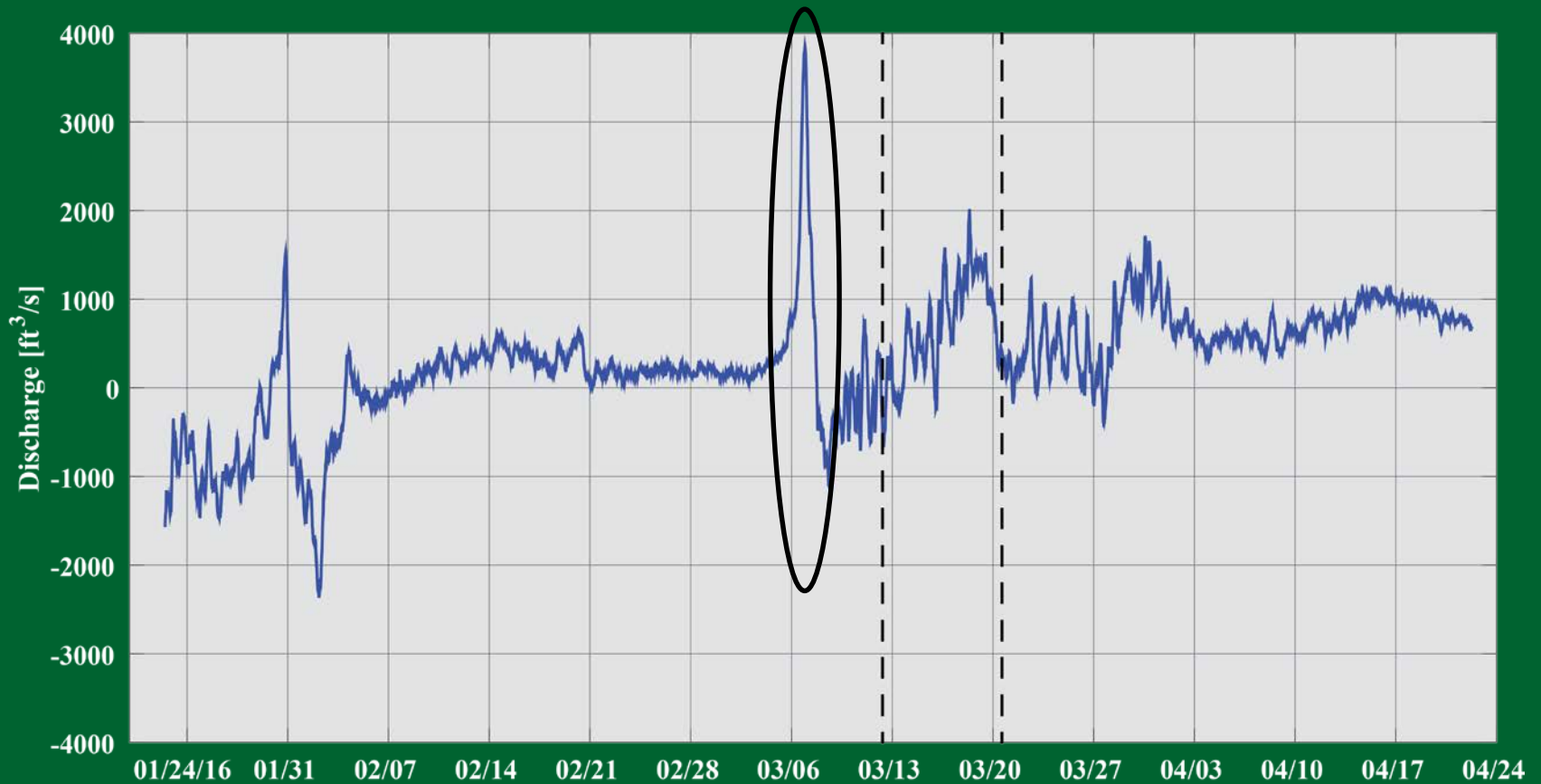




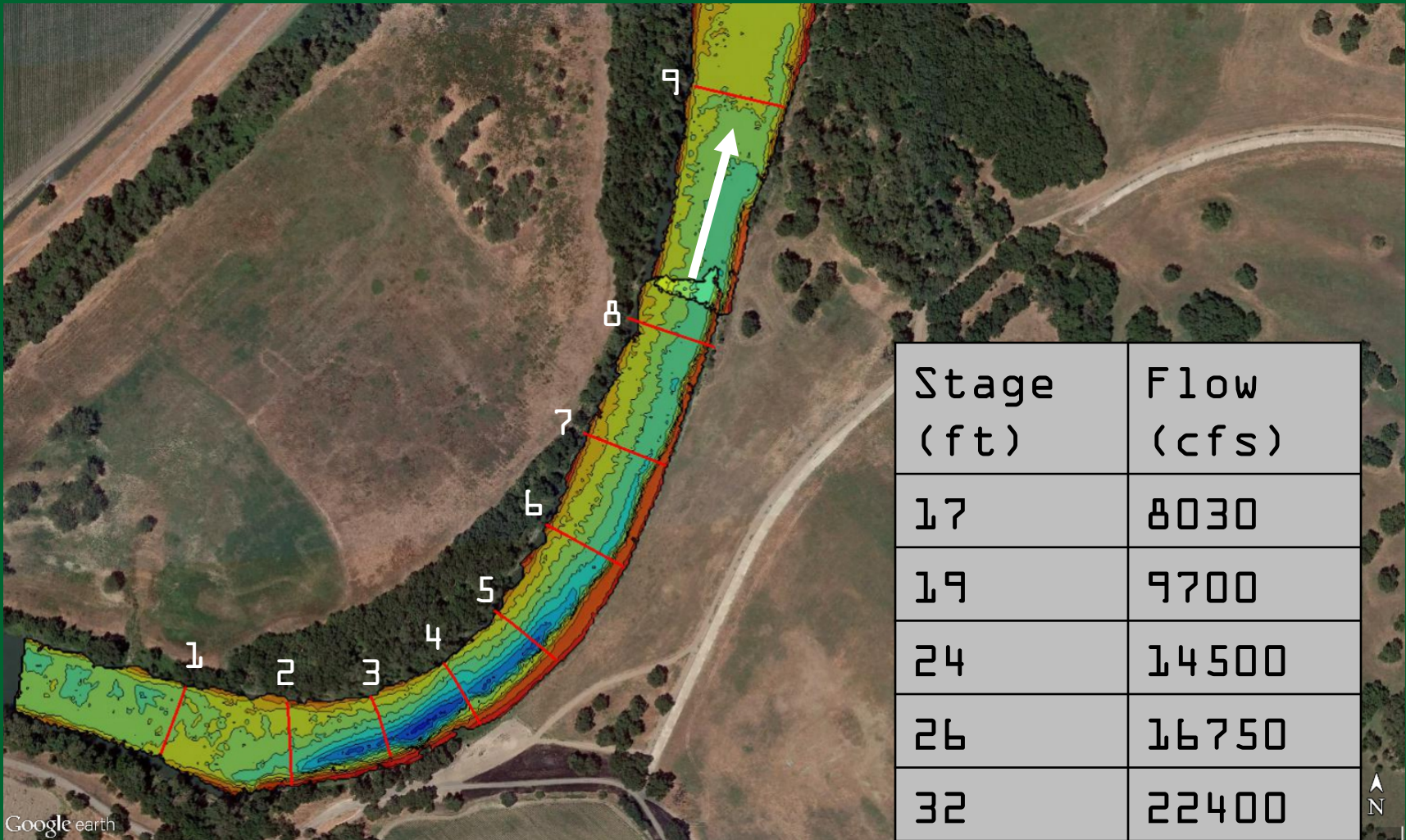
# SACRAMENTO AT FREMONT WEIR



# OVERESTIMATE OF DISCHARGE AT FREMONT WEIR



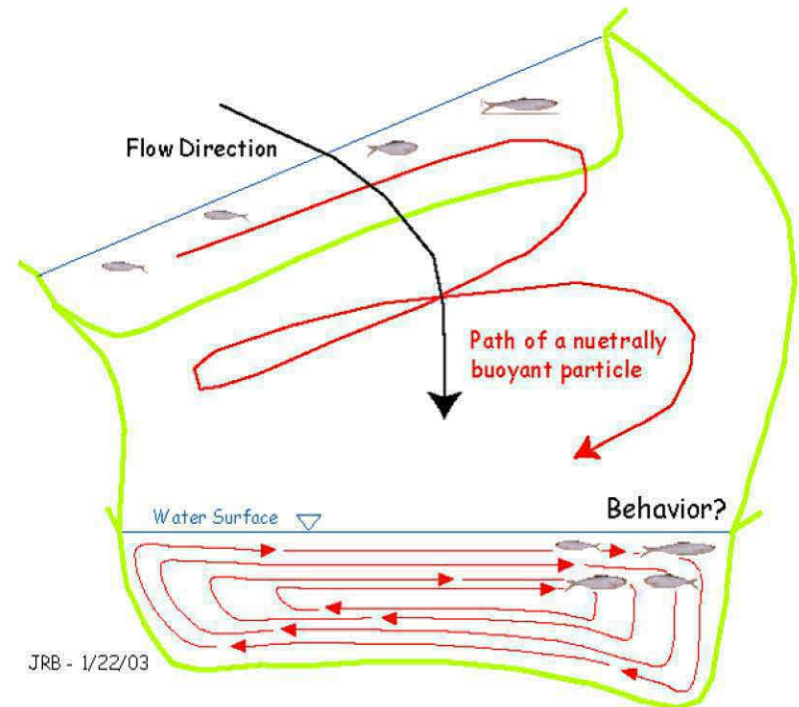
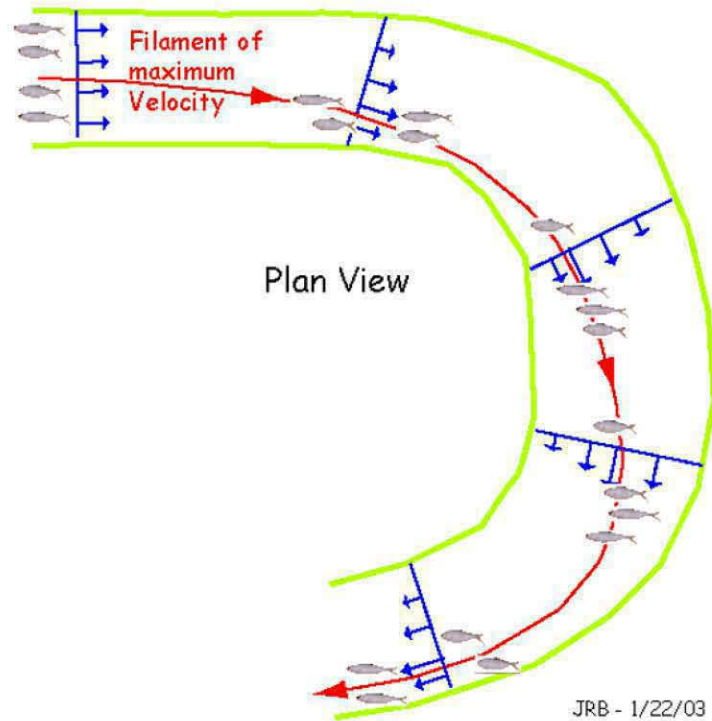
# VELOCITY MAPPING TO CHARACTERIZE SECONDARY CIRCULATION





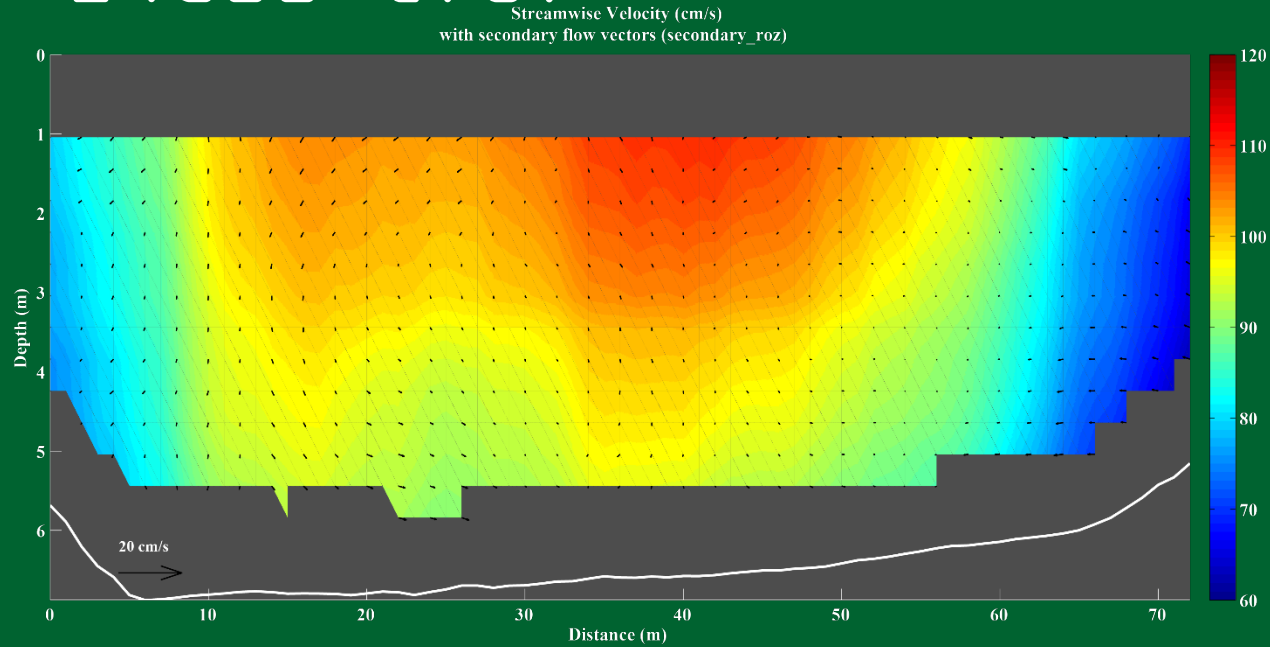
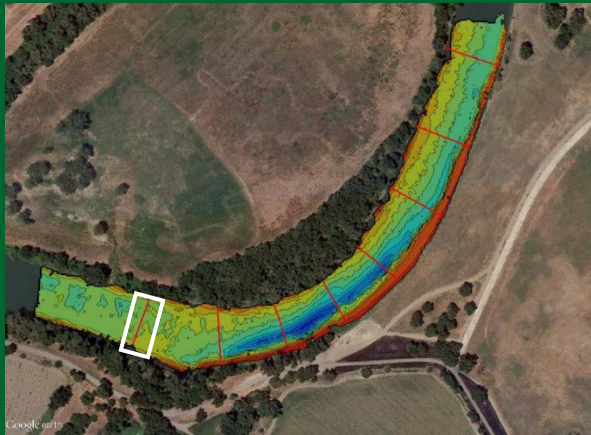
# Secondary Circulation In Bends:

Biasing spatial distribution towards the outside of channels on bends?



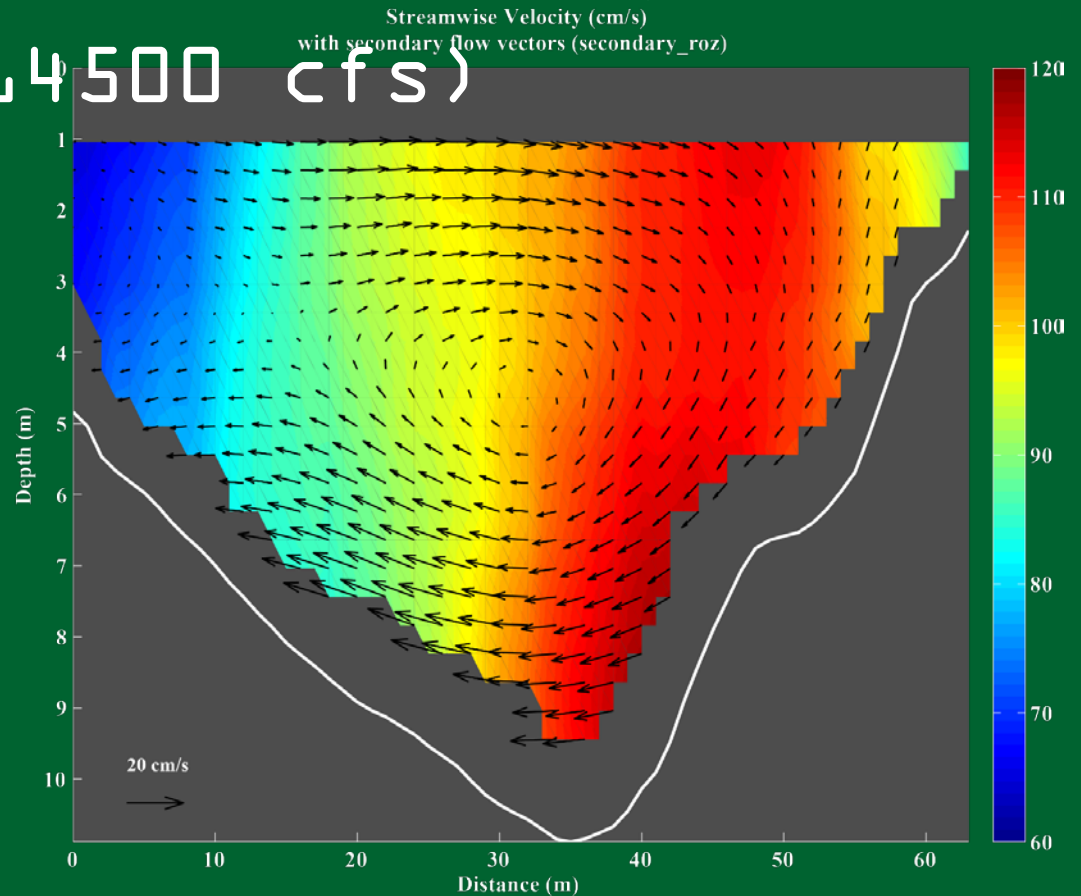
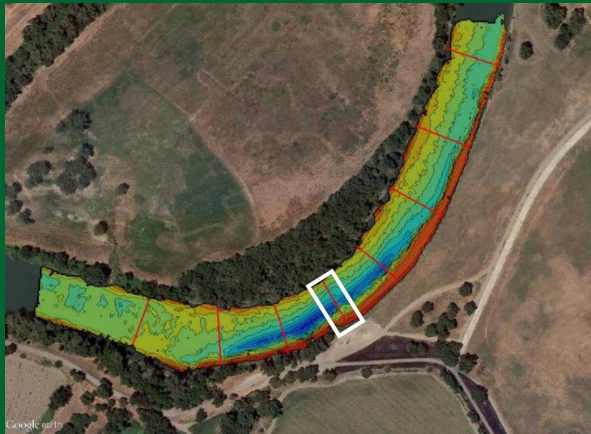
# SET-UP AND RELAXATION OF SECONDARY CIRCULATION (24 ft, 14500 cfs)

1



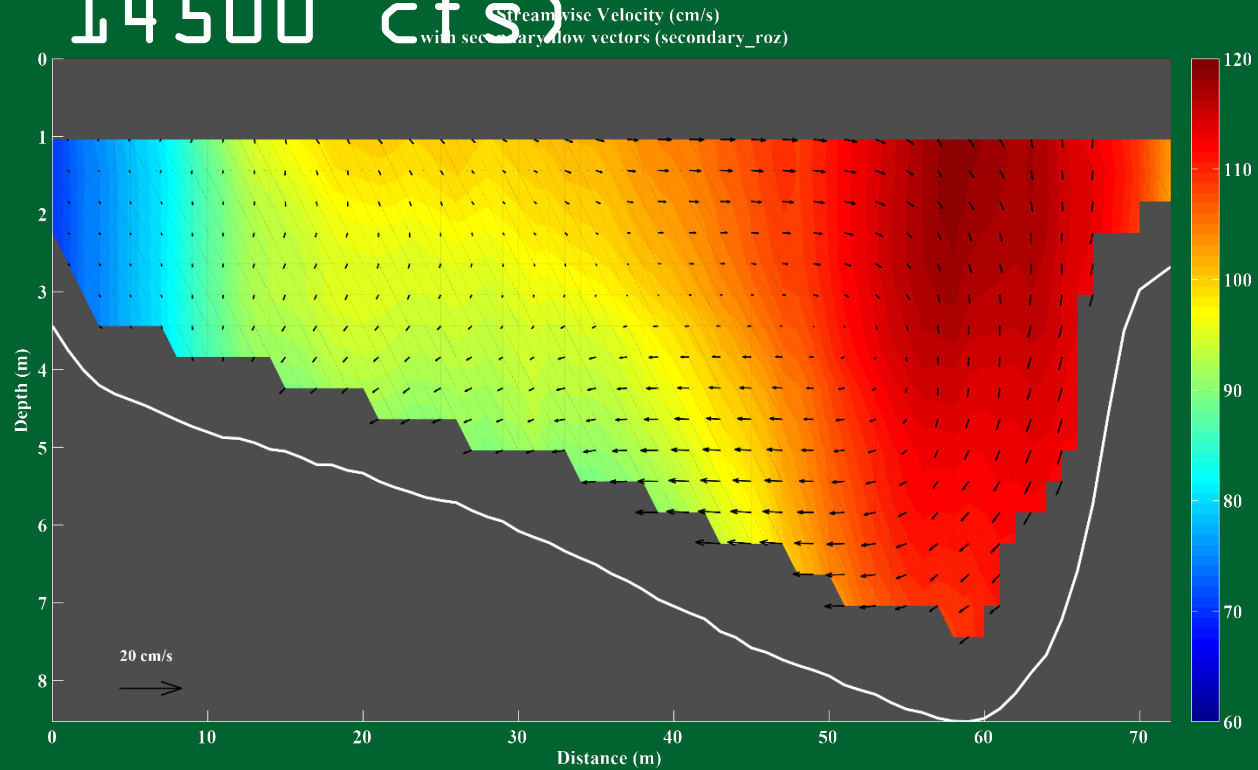
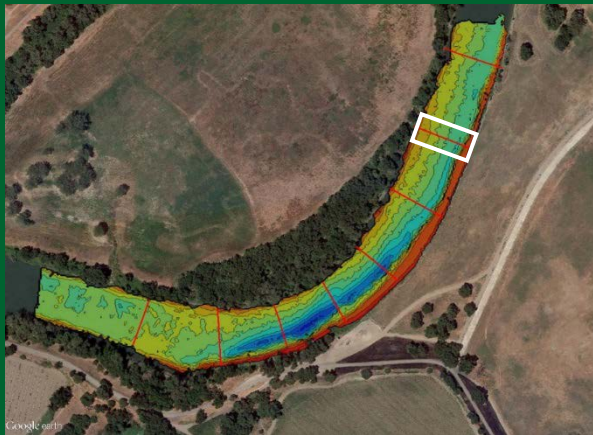
# SET-UP AND RELAXATION OF SECONDARY CIRCULATION (24 ft, 14500 cfs)

4



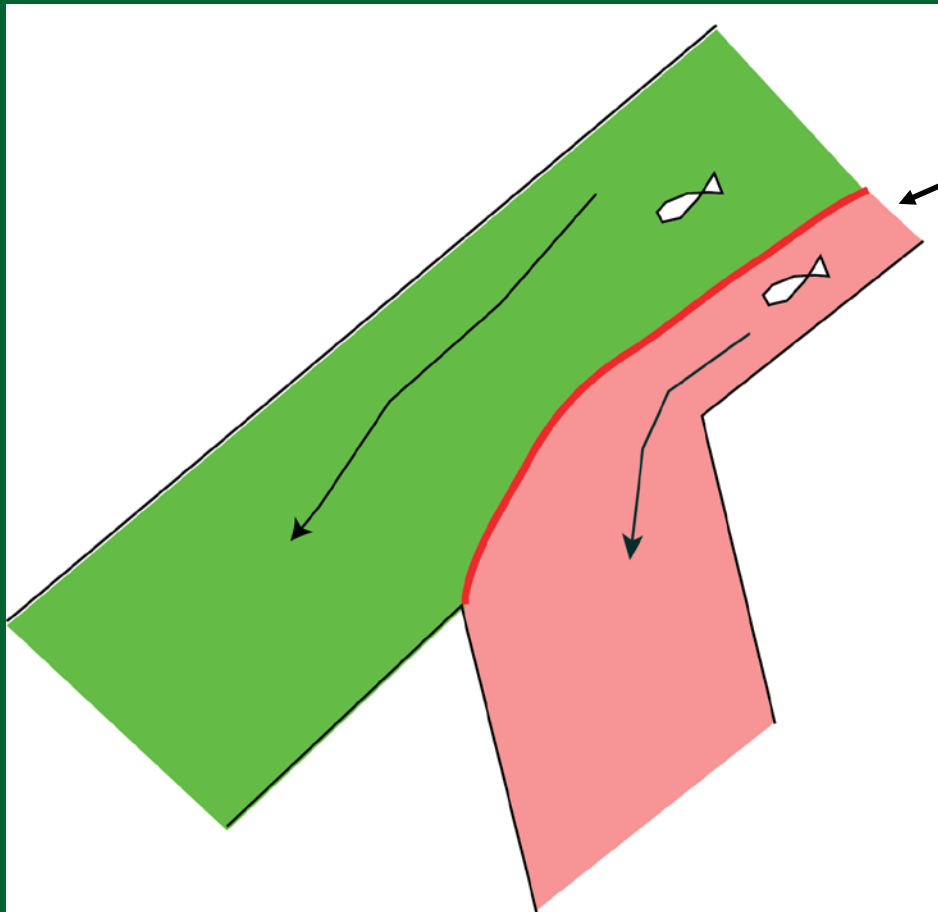
# SET-UP AND RELAXATION OF SECONDARY CIRCULATION (24 ft, 14500 cfs)

7





# HYDRAULIC ENTRAINMENT ZONE



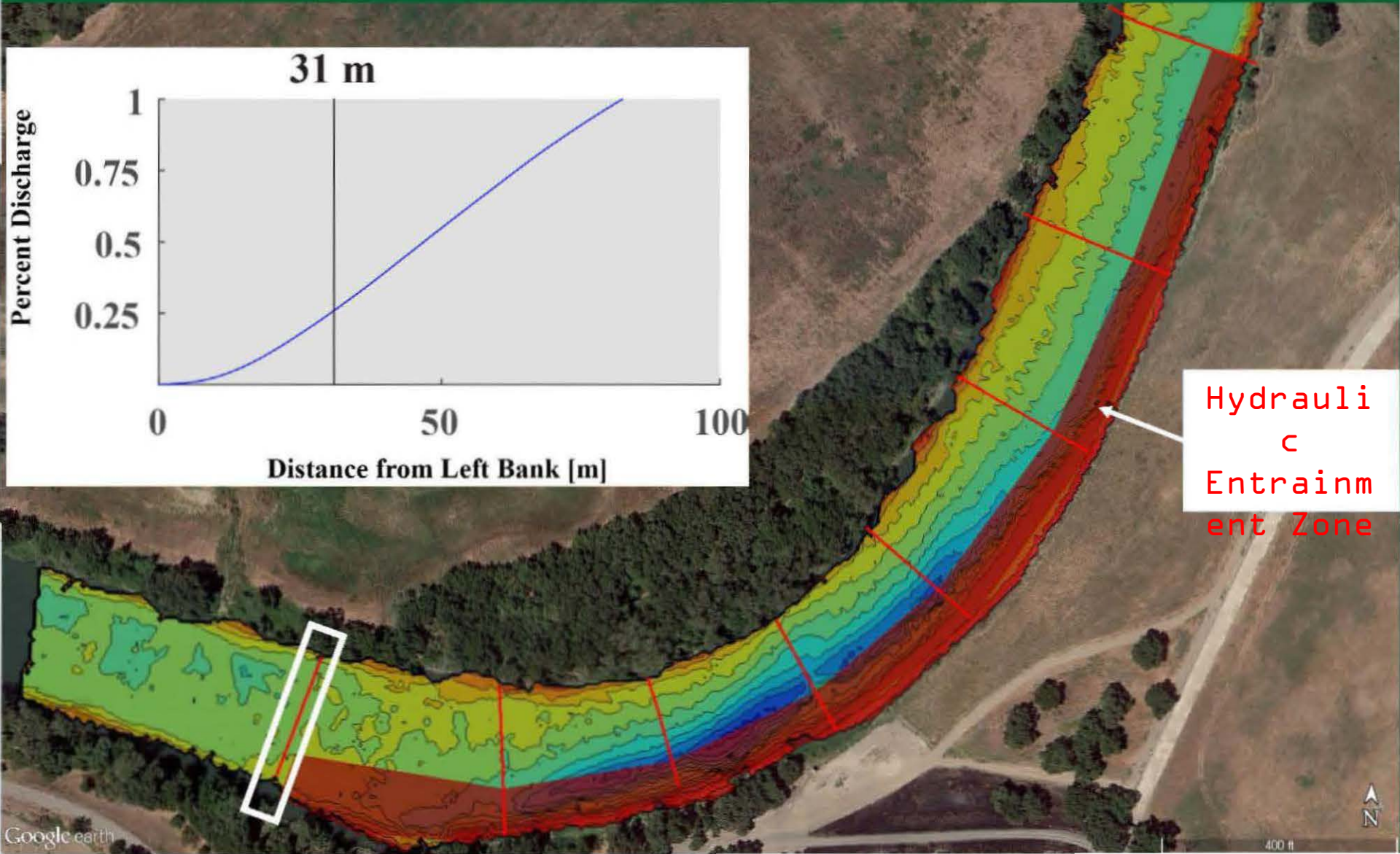
Width of  
entrainment zone  
River flow =  
Notch flow

Max river flow -  
22,500 cfs

Max notch flow -  
4,000 cfs

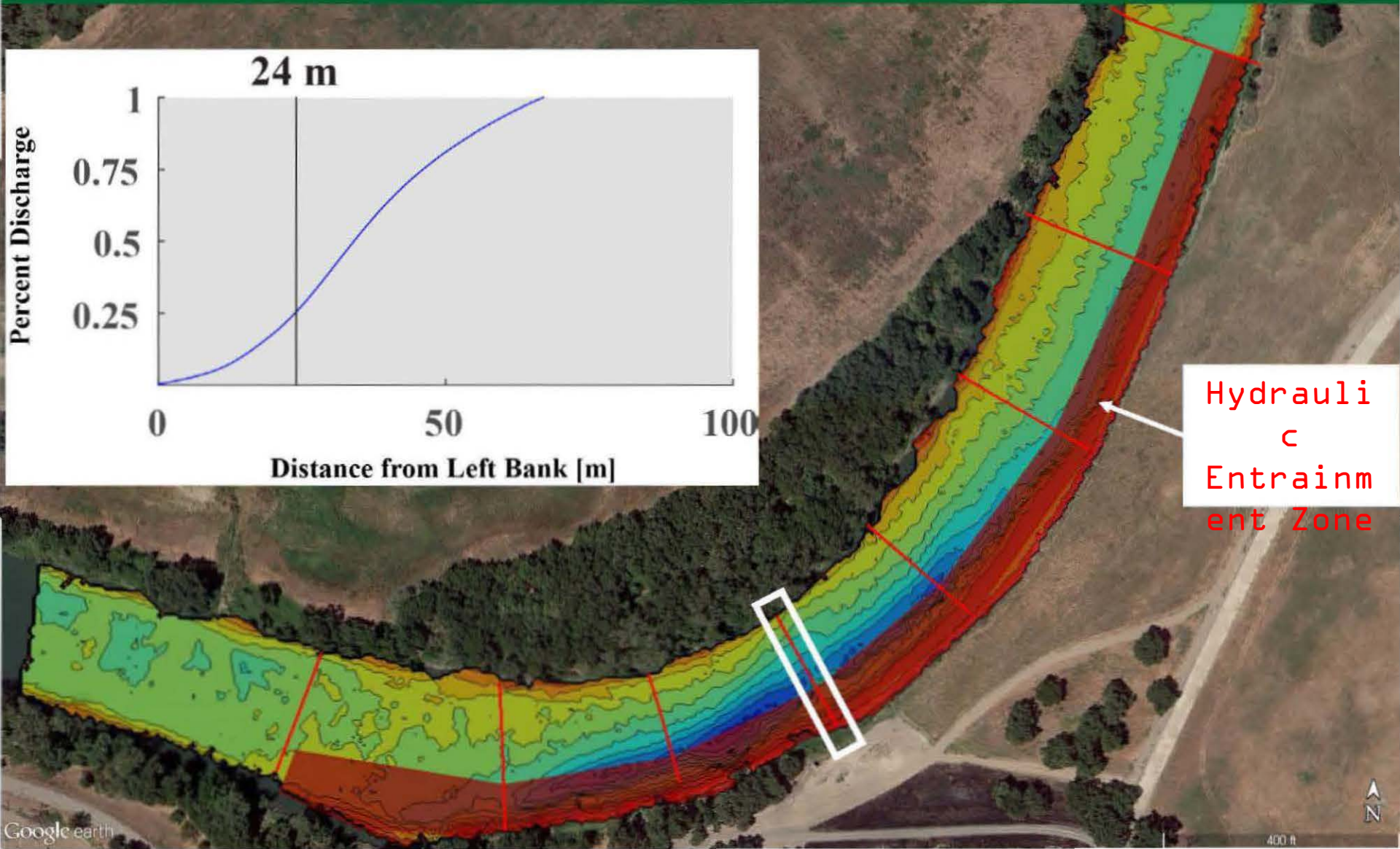
Entrainment Zone -  
25% of flow

# HYDRAULIC ENTRAINMENT ZONE ESTIMATE AT 25% FLOW

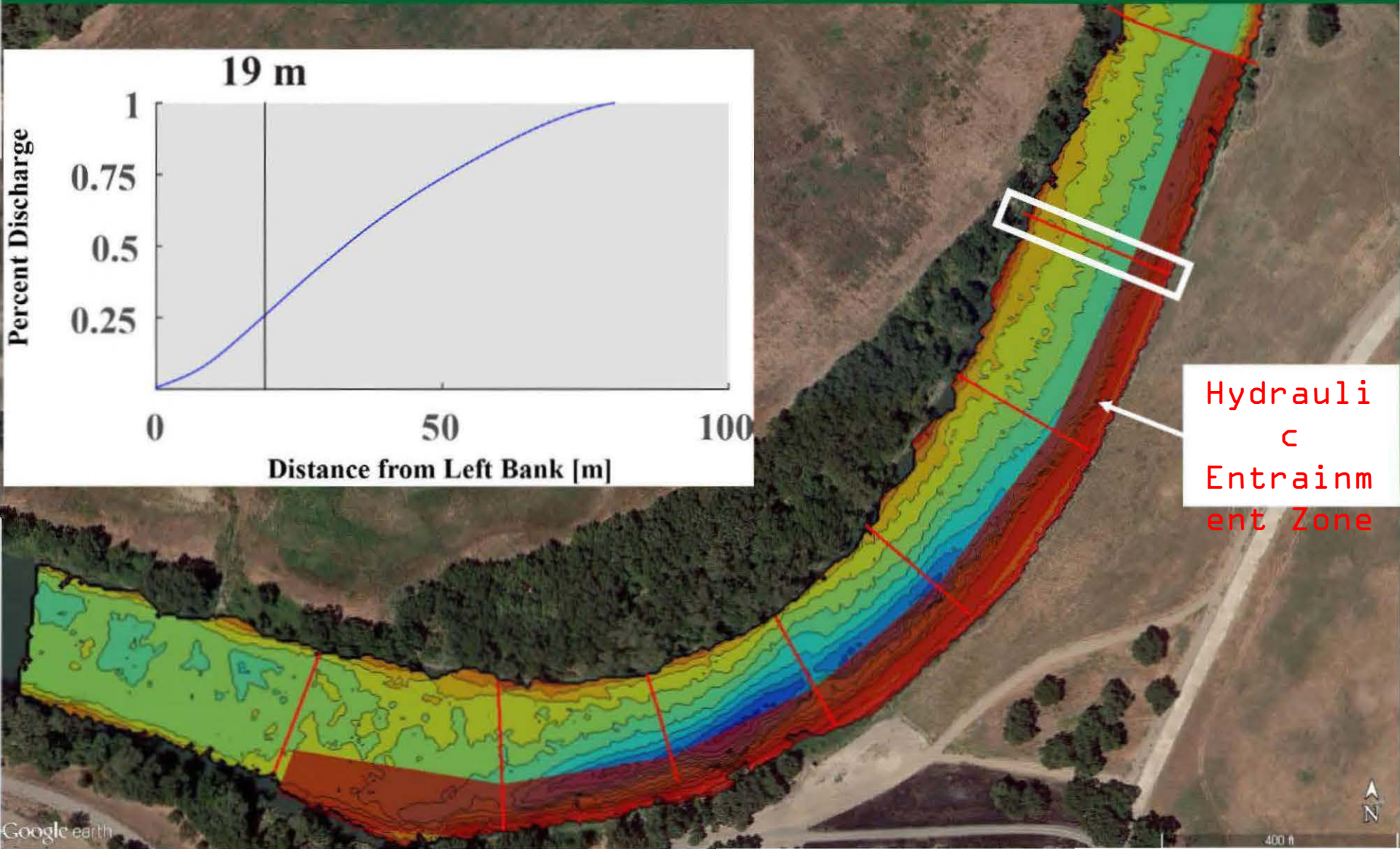




# HYDRAULIC ENTRAINMENT ZONE ESTIMATE AT 25% FLOW



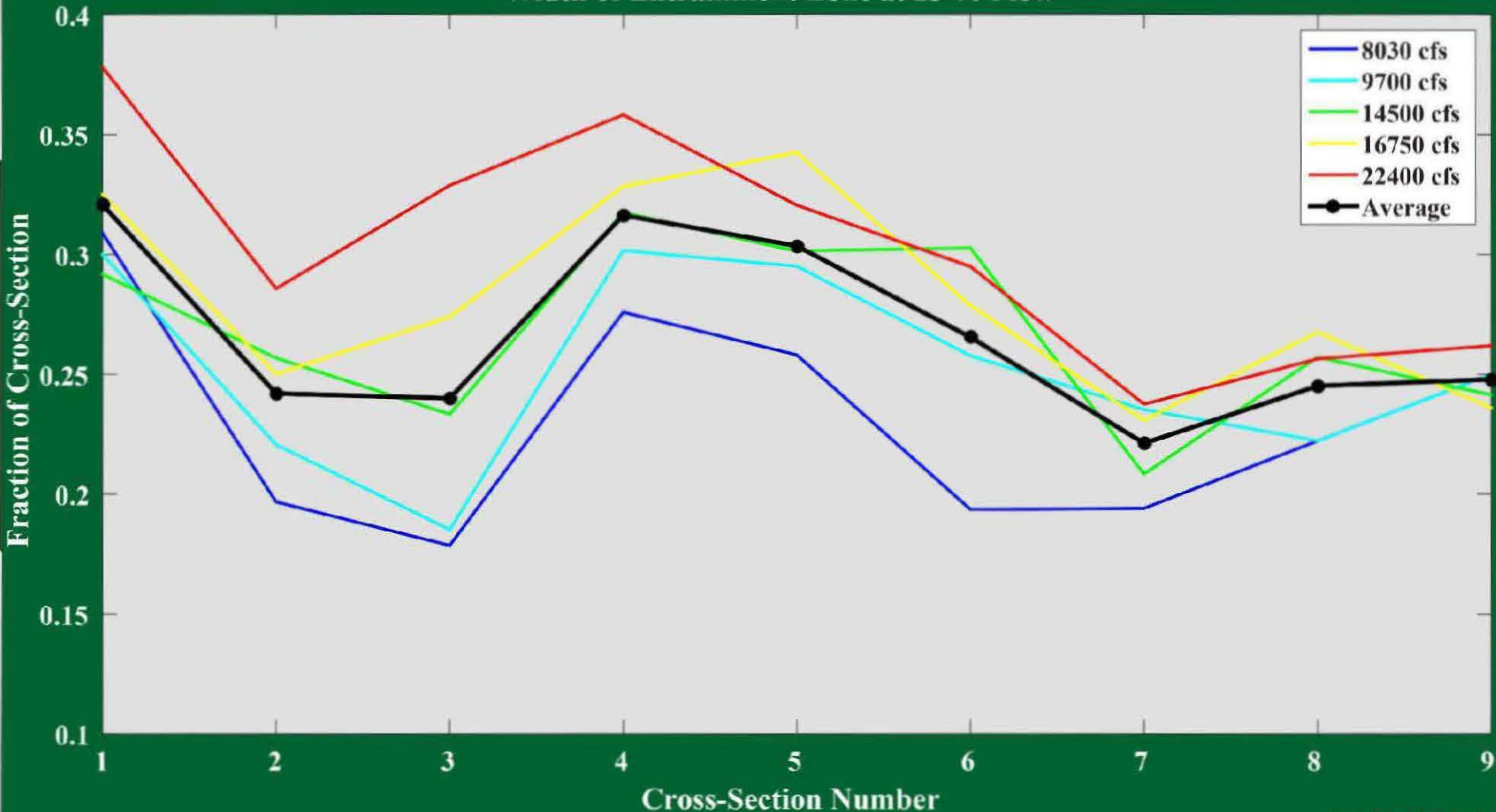
# HYDRAULIC ENTRAINMENT ZONE ESTIMATE AT 25% FLOW





# HYDRAULIC ENTRAINMENT ZONE ESTIMATE AT 25% FLOW

Width of Entrainment Zone at 25 % Flow



# CONCLUSIONS

1. Use of velocity as discharge estimator will minimize errors, and allow better prediction of *HYDRAULIC* entrainment
2. Secondary circulation redistributes water mass towards outside of the bend and reduces the size of the *HYDRAULIC* entrainment zone downstream of the bend

# ACKNOWLEDGEMENTS

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