

# Potential Entrainment Index (PEI): DSM2-PTM vs. Regression-based Calculator

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**April 28, 2010**



# Acknowledgement

- Tara Smith
- Kijin Nam
- Tracy Hinojosa
- Yiguo Liang
- Cindy Messer

# Agenda

- PEI Overview
- DSM2-PTM Based
- Regression Based
- Comparison of Results

# Potential Entrainment Index Overview

- PEI evaluates the relative susceptibility of larval and young juvenile delta smelt to entrainment by the SWP/CVP.



# Potential Entrainment Index Overview

$$PEI = \sum_{i=1}^N (PP_i \times RA_i)$$

- $PP_i$ : Percentage of particles from stations  $i$  to exports
- $RA_i$ : Relative abundance of particles at station  $i$
- $N$ : Total number of stations

$$RA_i = (P_i \times V_i) / \sum_{i=1}^N (P_i \times V_i)$$

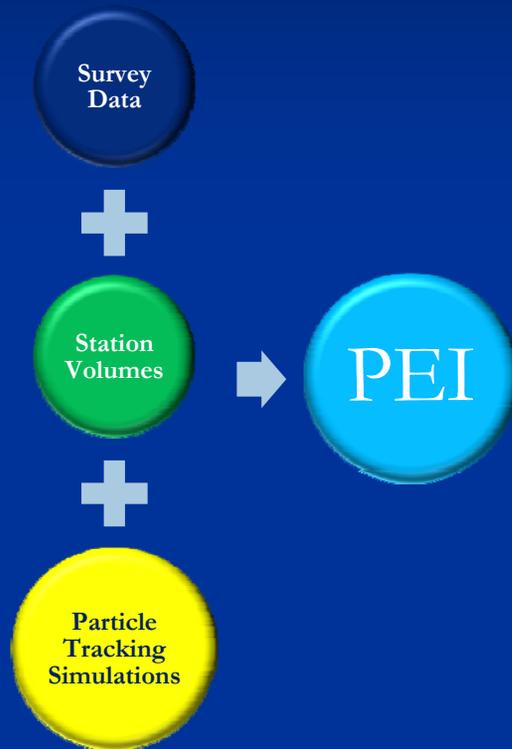
- $P_i$ : Number of particles at station  $i$
- $V_i$ : Water volume of station  $i$
- $N$ : Number of stations

# Potential Entrainment Index Overview

- Different tools used to generate PEI values
  - DSM2-PTM runs
  - Regression-based model (PEI-Calculator)
- Utilizes near real-time fish monitoring data

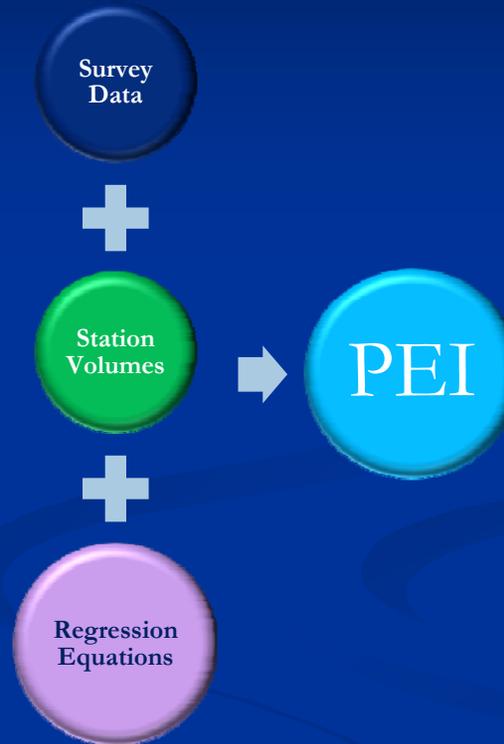
# PTM Based

## PEI



# PEI

## Calculator



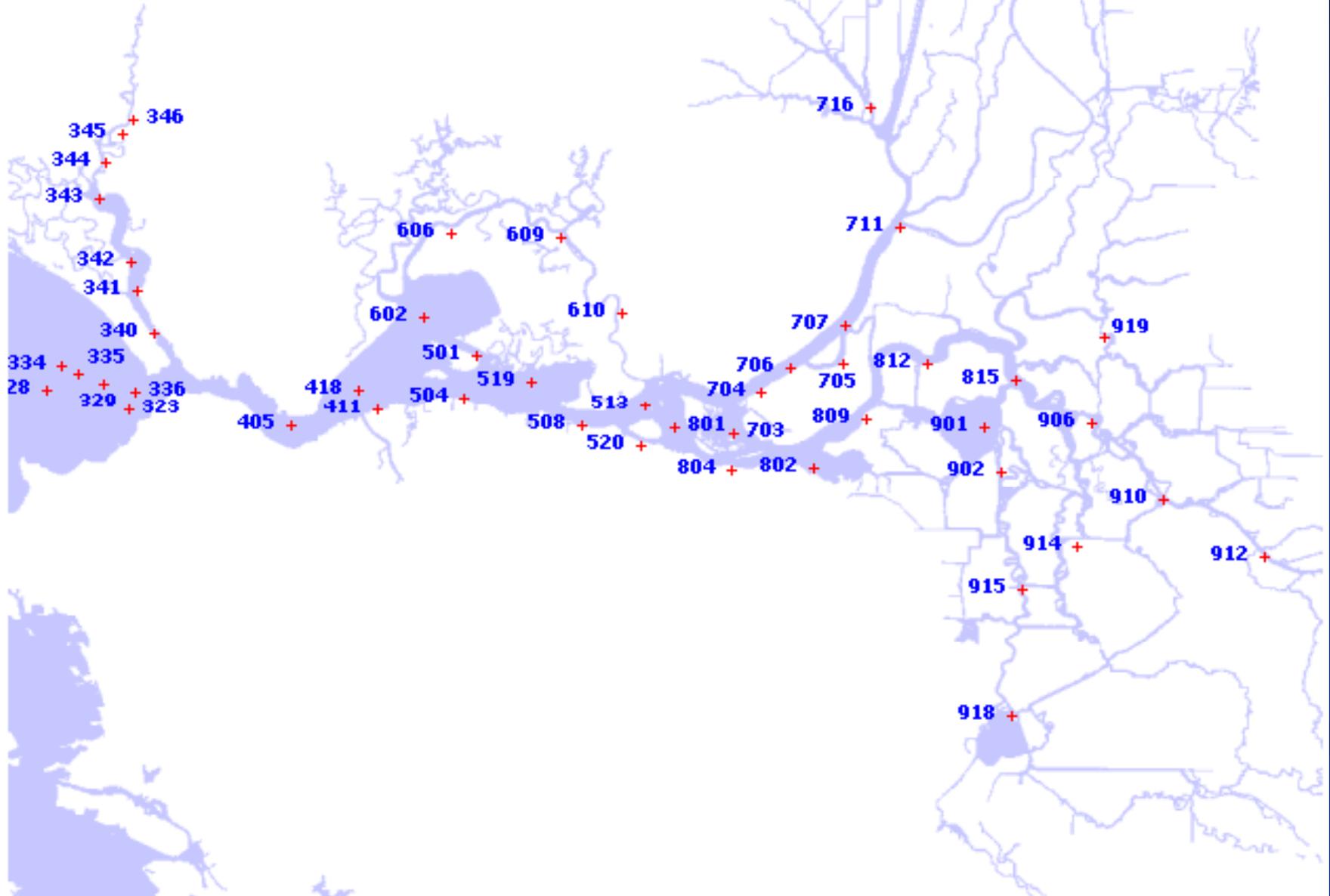
# Potential Entrainment Index: Data Sources

## Fisheries Data

- DFG's 20-mm Survey provides smelt abundance and distribution data.
- DFG's Spring Kodiak Trawl data also used.

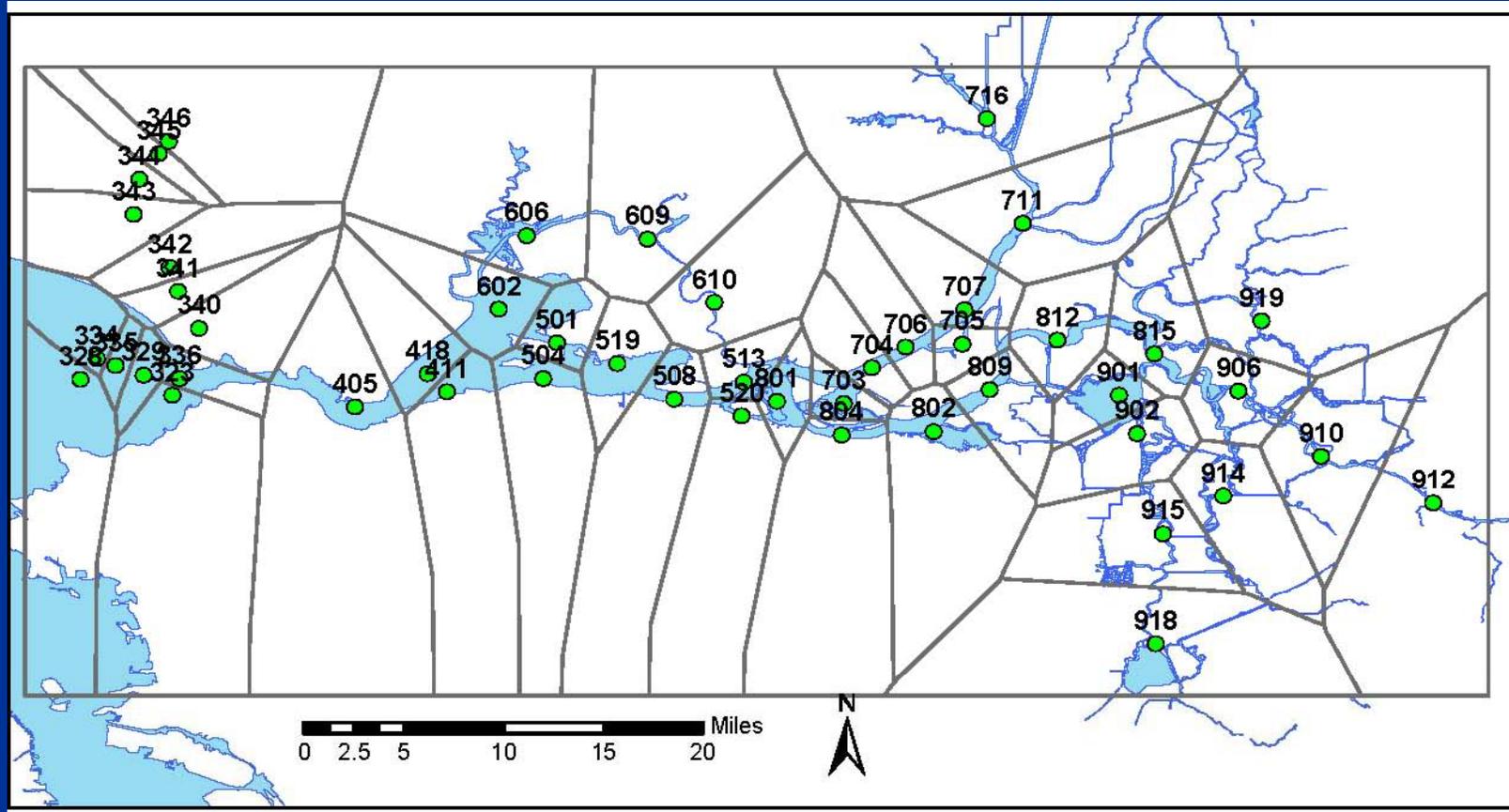


# DFG 20-mm Survey Stations



# Water Volume for 20-mm Stations

Tessellation (Voronoi diagrams) with adjustment



# Developing PEI Methodology: Regression Model

- Regression-based model builds on PTM-based model.
- Evaluates relationships between hydrodynamic conditions and particle entrainment for selected 20-mm Stations.
- Provides a rapid method for calculating PEI.

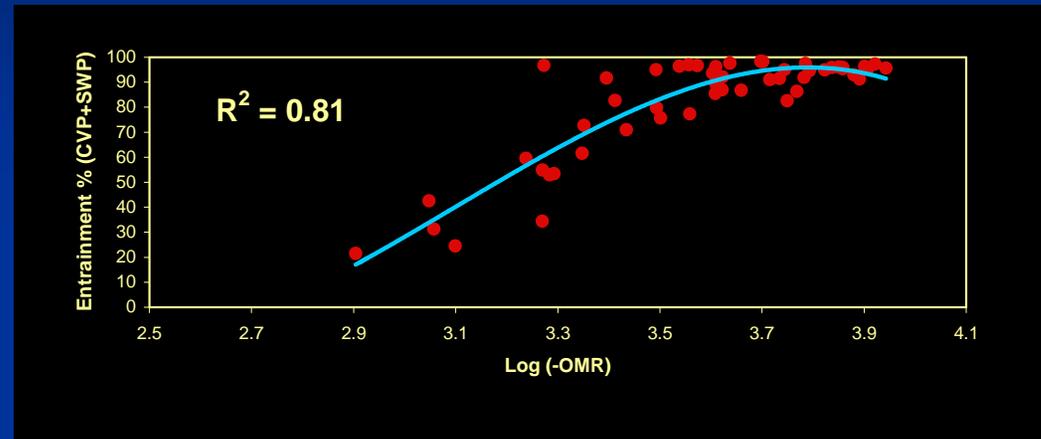
# Developing PEI Methodology: Regression Model

## Data utilized

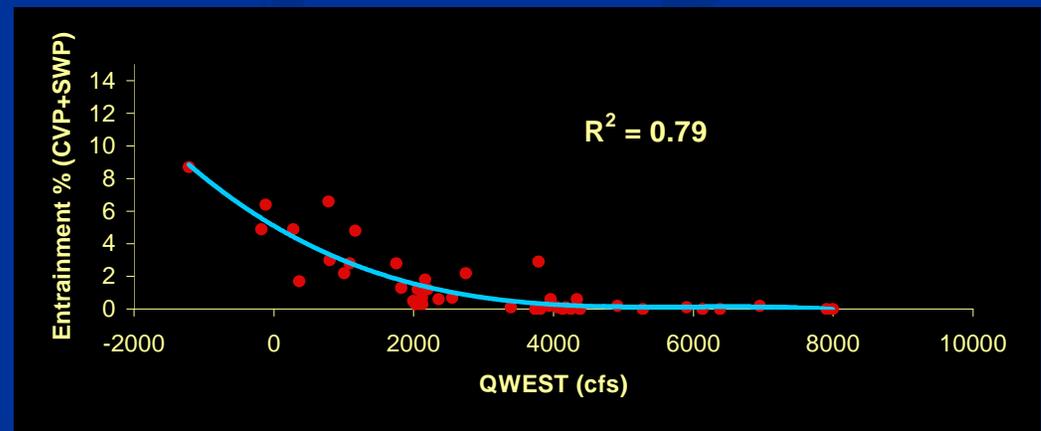
- 20-mm Survey data
  - 78 historical surveys.
  - Data grouped seasonally.
- DSM2-Hydro data
  - Historical OMR flows.
  - Historical QWest flows.
- DSM2-PTM Runs
  - 1,000 particles injected at stations on mid-point of each survey and tracked over 10, 20, 30 and 40 days.
  - Percent entrainment estimated for injected particles.

# Development of Regression Equations for Individual Stations

Percent entrainment versus Log(-OMR) after 30 days at Station 914.



Percent entrainment versus QWest after 40 days at Station 703.



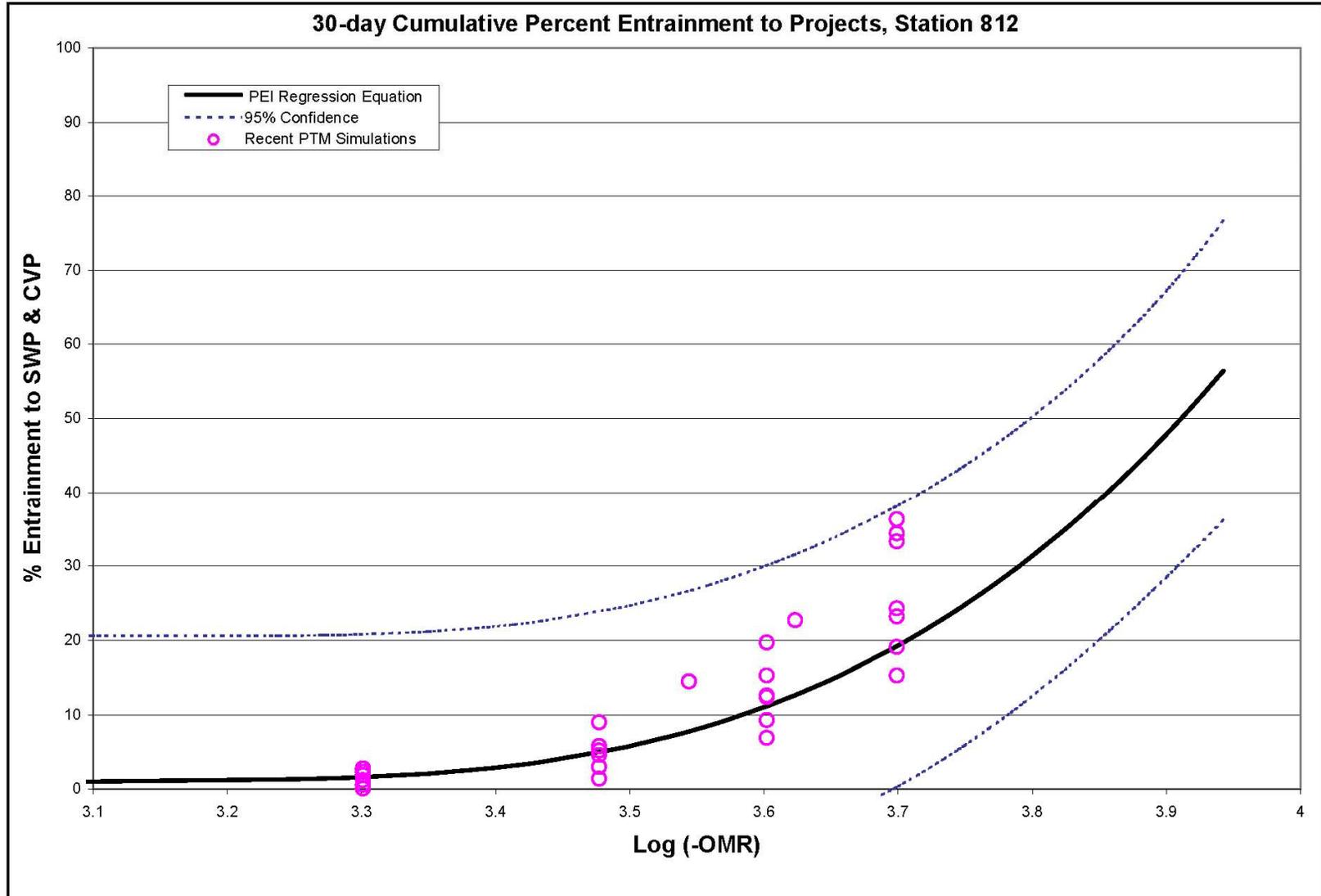
# Developing PEI Methodology: PEI Calculator

- From the generated regression equations, percent entrained for each station can be determined given OMR or Qwest flows

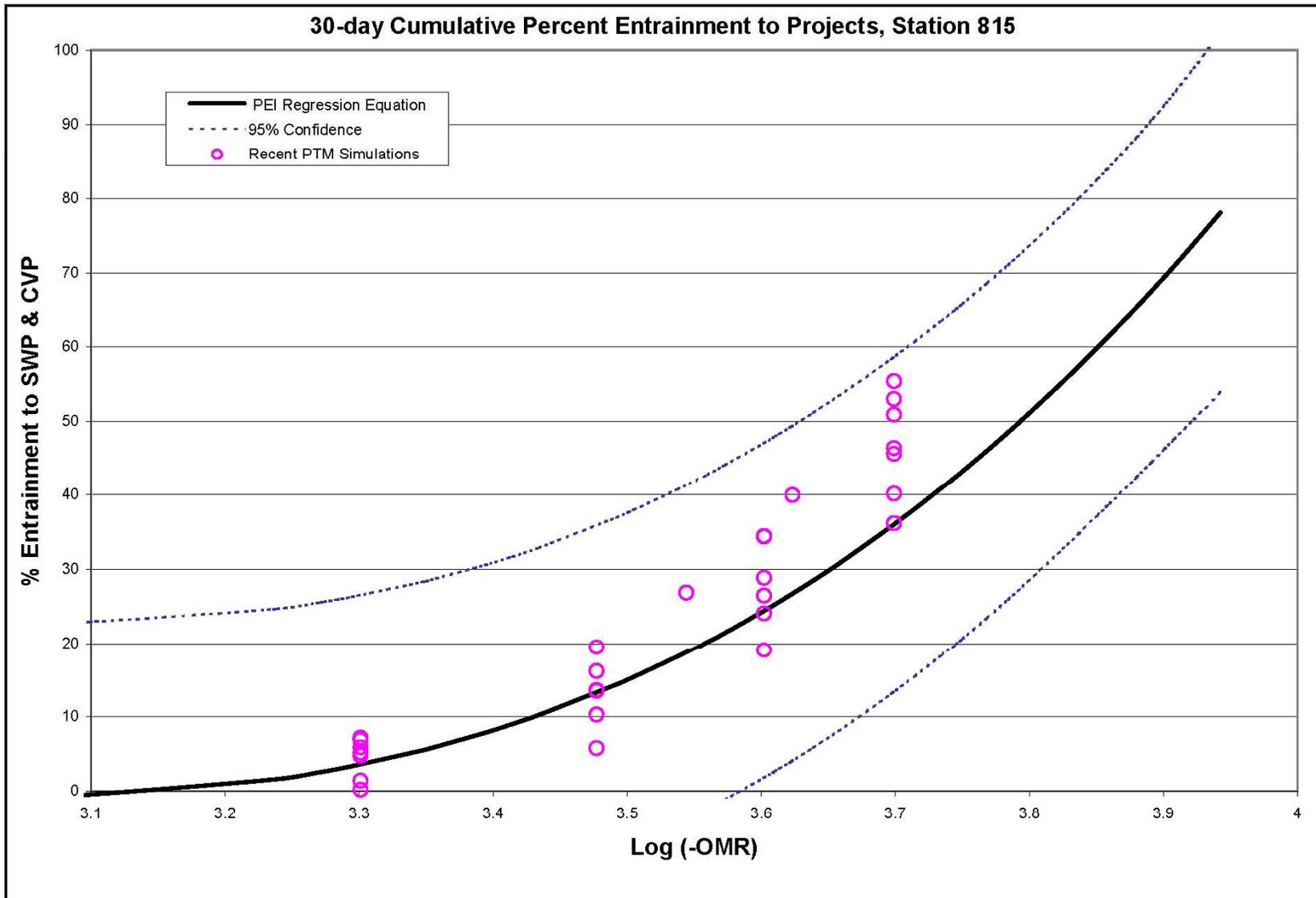
$$PEI = \sum_{i=1}^N (PP_i \times RA_i)$$

- PEI is then calculated using regression generated values ( $PP_i$ ) along with the calculated water volumes and survey data

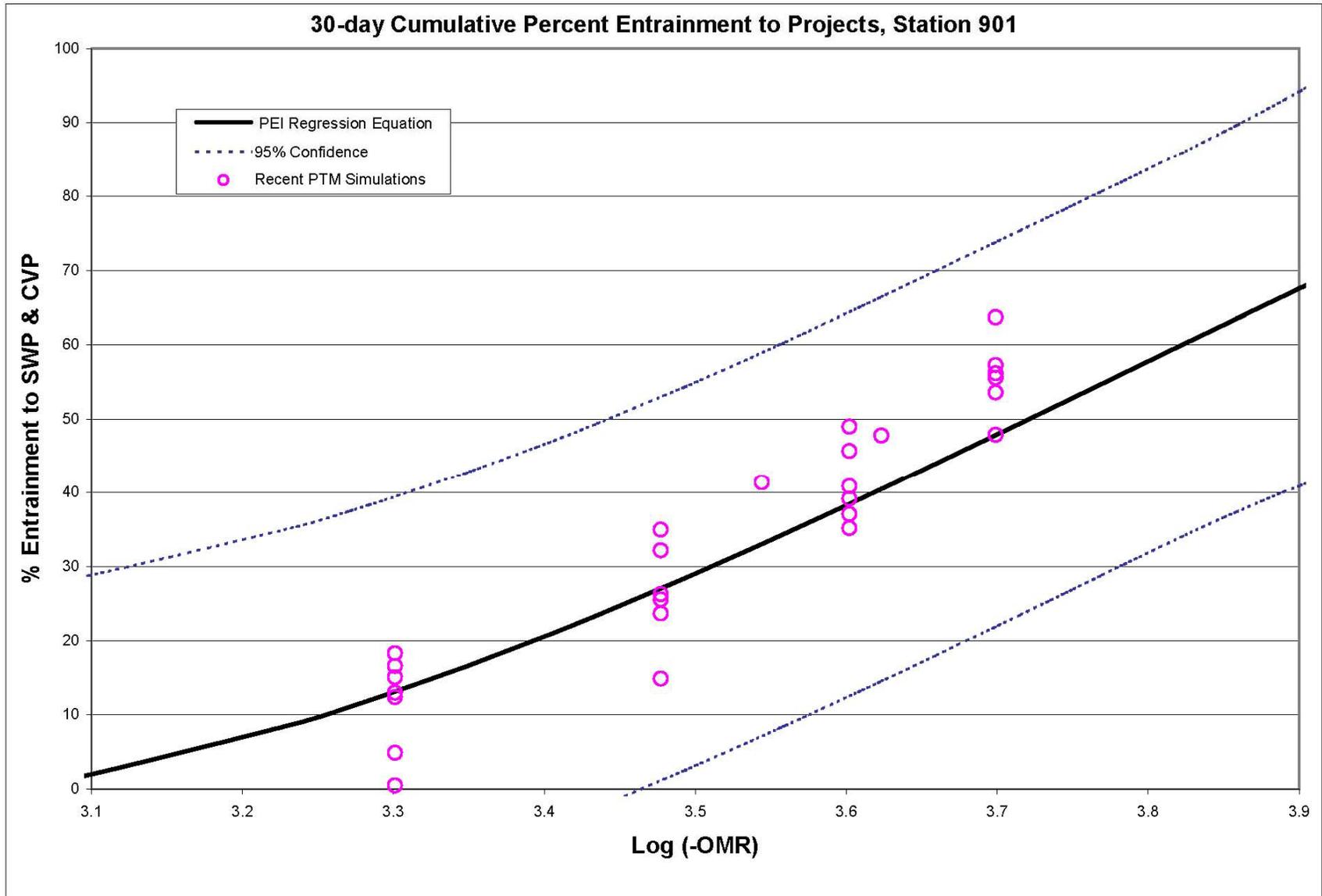
# Regression vs PTM



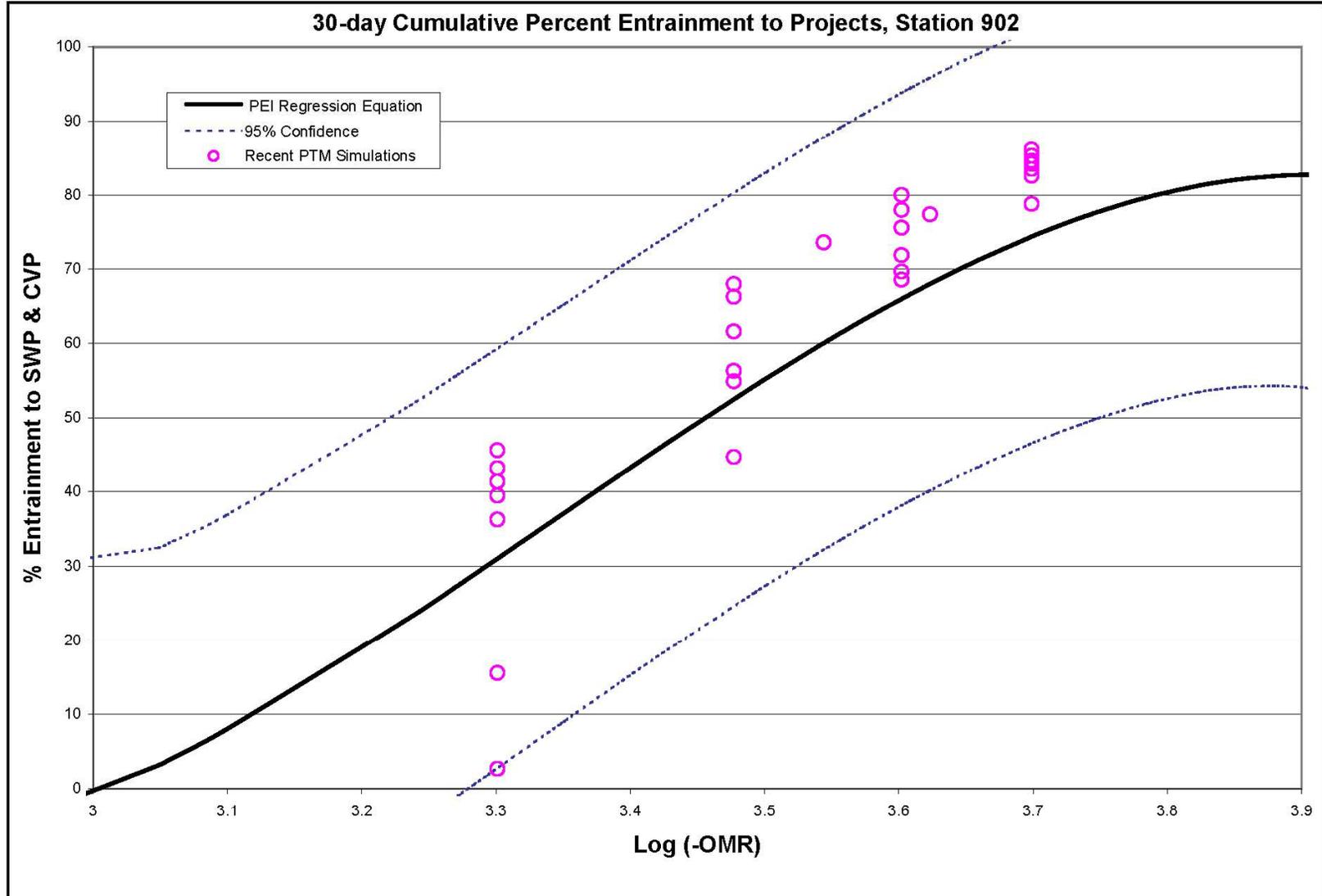
# Regression vs PTM



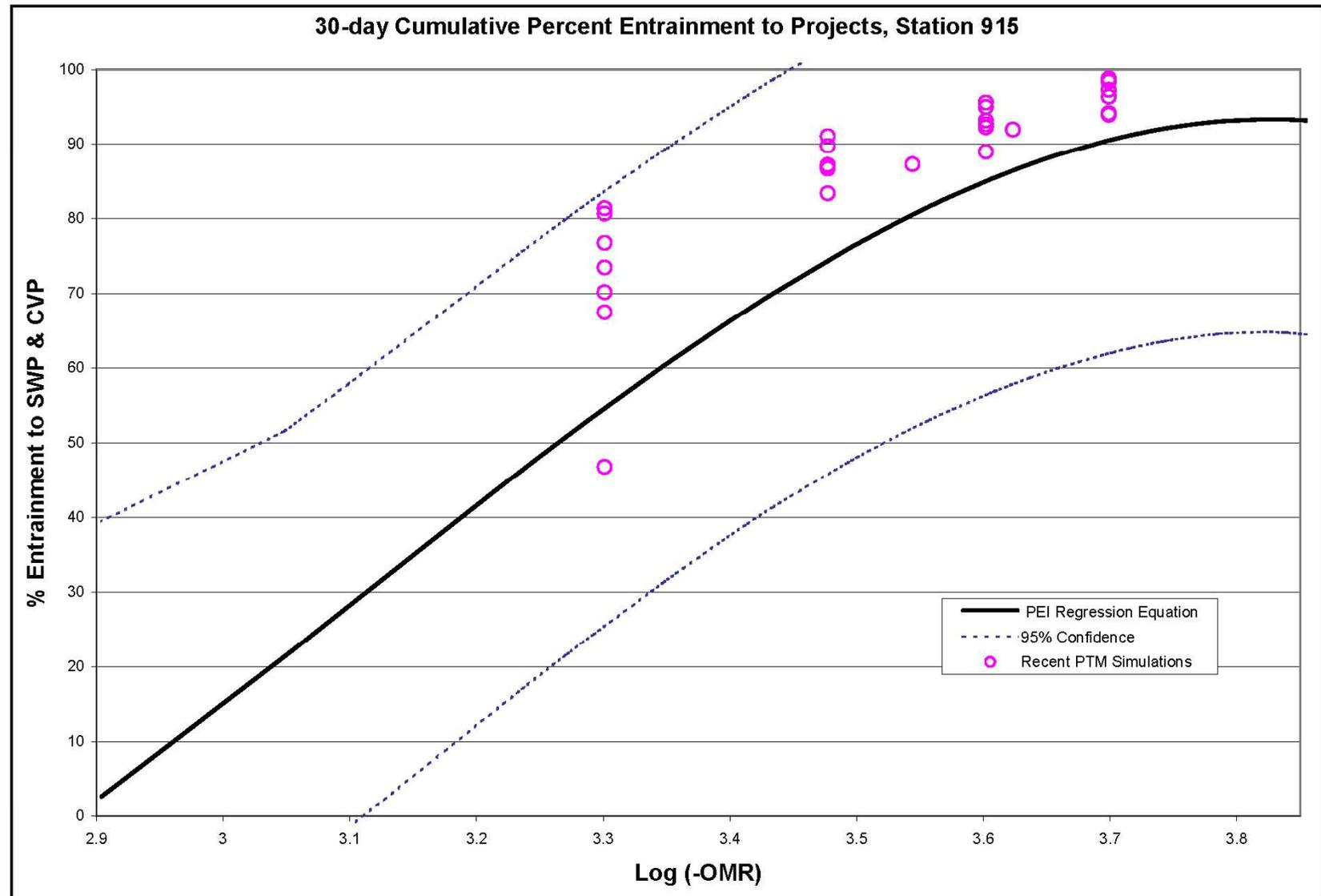
# Regression vs PTM



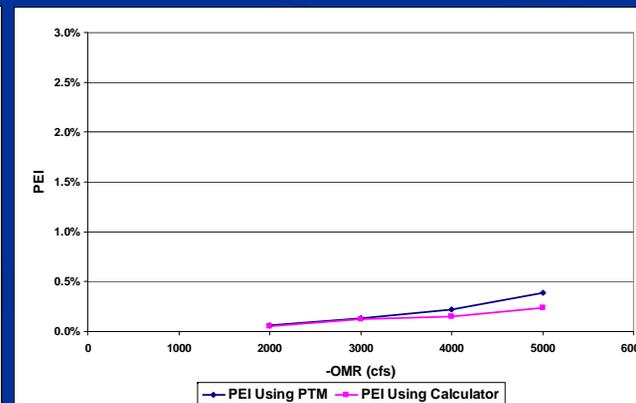
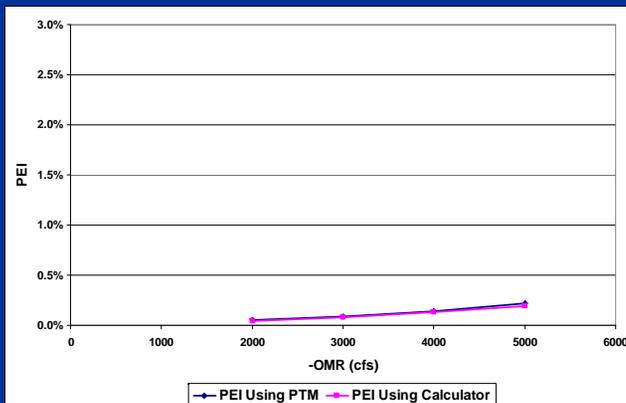
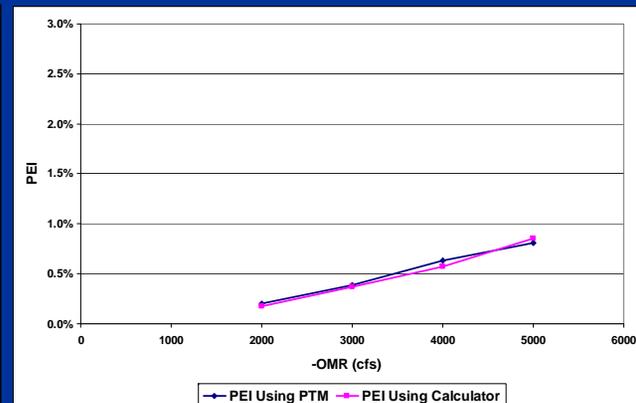
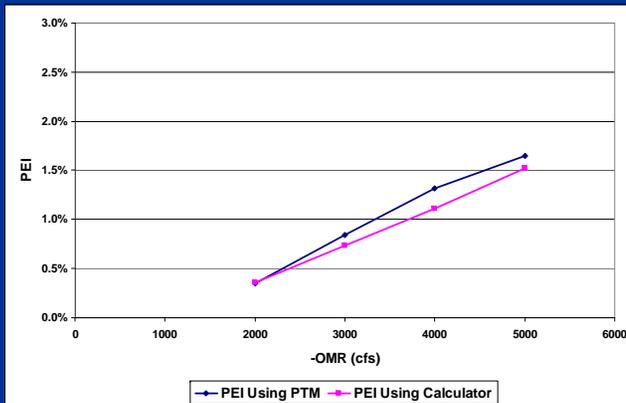
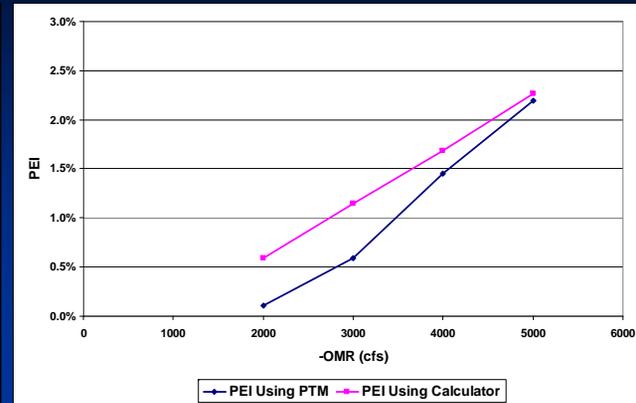
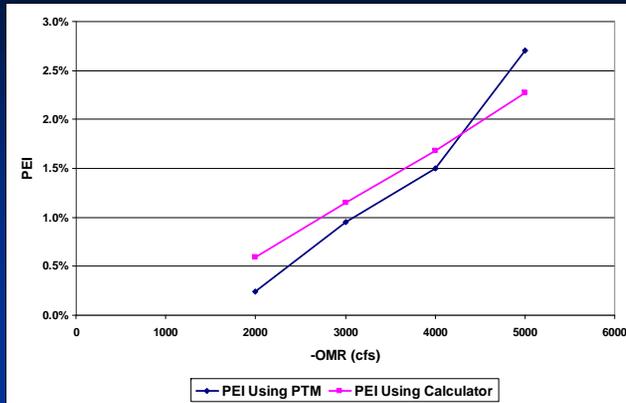
# Regression vs PTM



# Regression vs PTM



# PEI



Questions?