National Water Quality Monitoring Conference

Challenges in Evaluation of Structural BMP Efficiency

Presented by

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Agenda for Today's Presentation

- Discuss - various challenges in evaluation of structural Storm Water BMPs
- Recommend project specific solutions
- Recommend improvement in monitoring strategies

Focus on Two Key Projects

- Woodside Avenue Extended Detention Basin
- Lakeside, CA

- McClellan-Palomar Airport Tarmac Expansion
- Carlsbad, CA

Best Management Practices are easy to monitor?

True

or

False

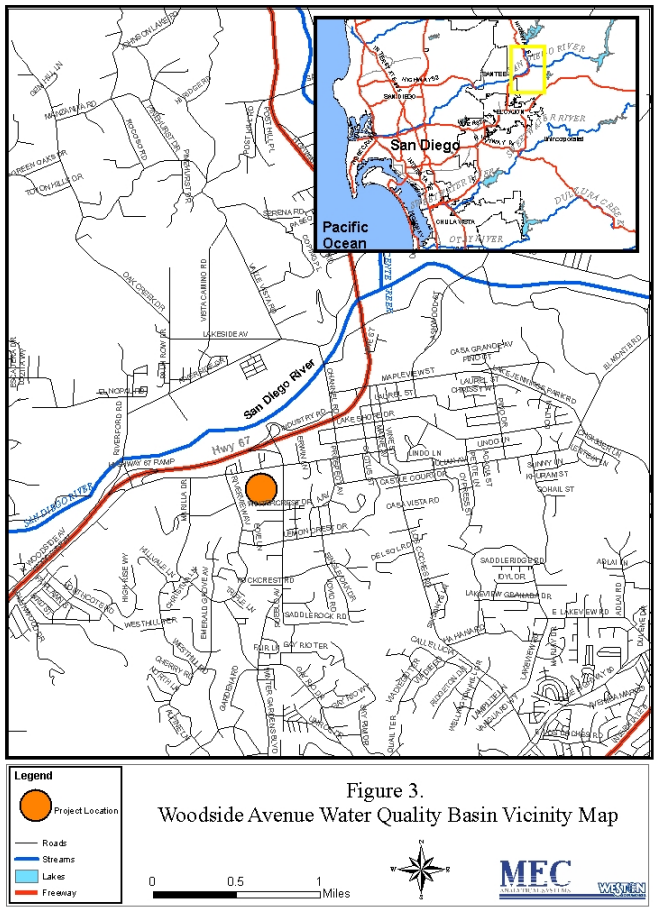
Regulatory Pressure + Limited Space + Limited Funds =

The Preverbal Square Peg in a Round Hole

Project Background

- County of San Diego Received Prop 13 Grant Funds to Construct a Best Management Practice (BMP)
- Rick Engineering Designed and Constructed the BMP's for the County of San Diego
- Weston - Sub Consultant to Rick Engineering to Perform an Effectiveness Assessment of the BMP's

Woodside Project Site



- Project Site was a Vacant Lot in Lakeside, CA.
- Nuisance Runoff Passes Through the Site and empties into Los Coches Creek, the San Diego River, and Ultimately the Pacific Ocean

Existing Conditions

Monitoring Locations

- Three Water Quality and Flow Monitoring Locations were Selected
- Eleven Photo Documentation Stations were Selected
- Two Bioassessment Stations were Selected

Installation Issues

- Rip-Rap was Lowered
- Effluent Channel was Raised to Grade
- Vegetation was Cleared from the Primary Influent Channel

Primary Influent Installation

- Sand bag flume was ineffective despite strengthening it several times
- Trash and large vegetative mats repeatedly destroyed the flume
- Sand bags were removed
- High sedimentation and vegetative growth still complicated this monitoring station

Primary Influent – After Storm Event

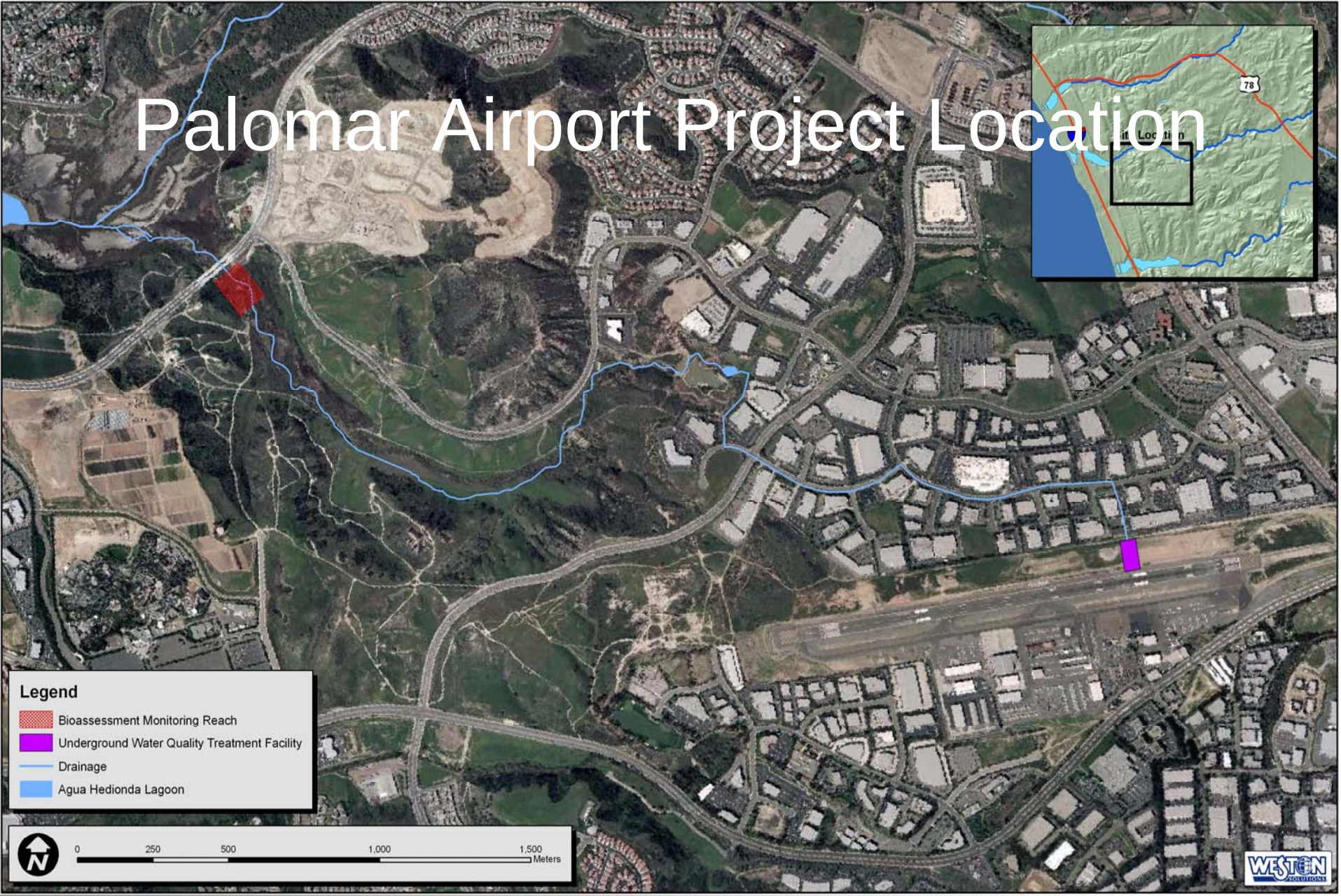
Secondary Influent Installation

- Low angle of pipe and Rip-Rap in front of bottom reach necessitated installation of equipment further into pipe than originally planned

Effluent Installation

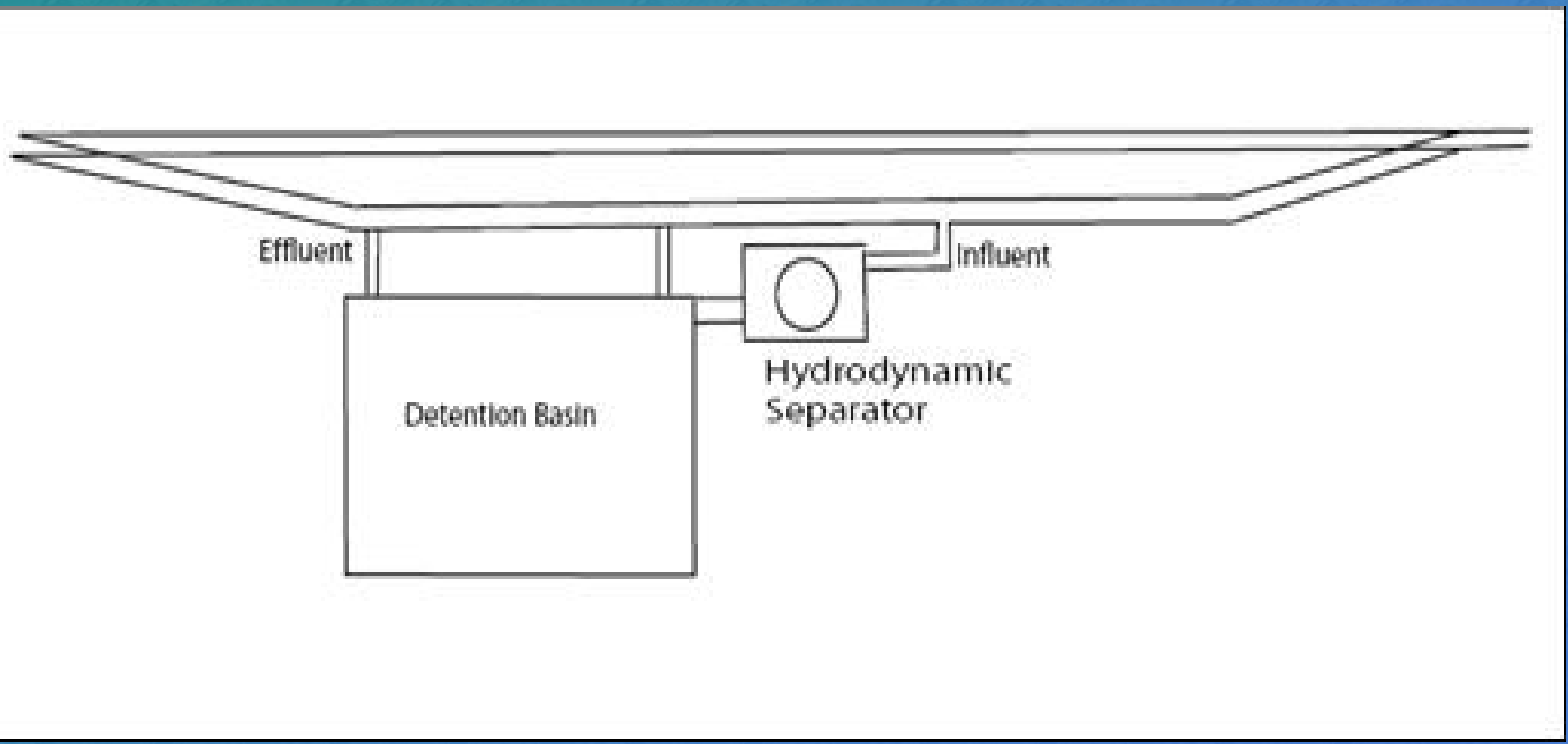
- Effluent channel was graded incorrectly following construction of the basin. Following correction of the grading monitoring equipment was installed as originally planned
- However, an emergency bypass was added to the spillway

Palomar Airport Project Location



Palomar Underground Detention Basin

Schematic of Water Quality Treatment Facility

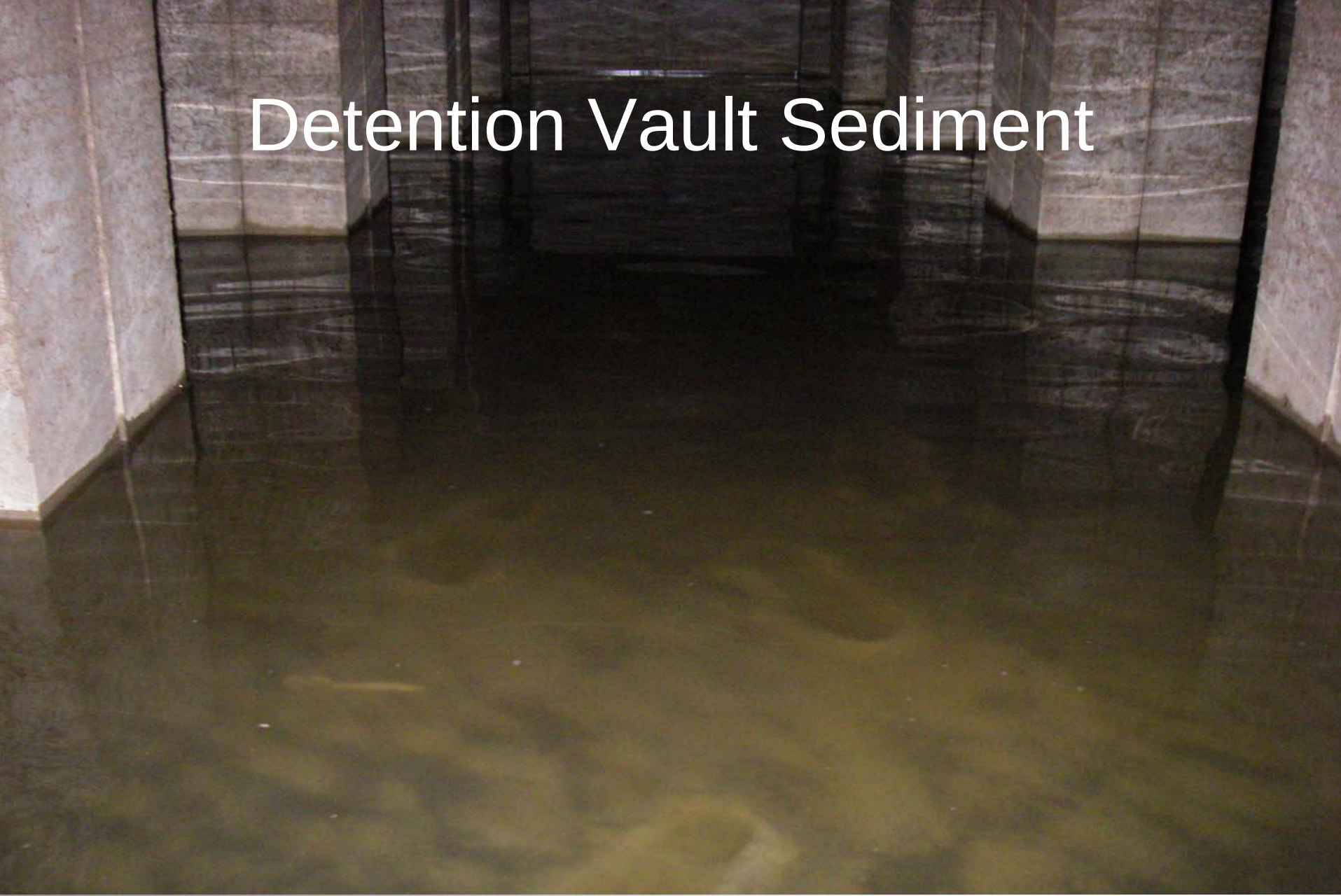


Where is the Facility?

Mass Loading Station Set-up

Influent Sampling Location

Detention Vault Sediment



Effluent Sampling Location

Components for BMP Implementation and Efficiency Assessment

- Drainage Area
- Treatment Volume
- Design Storm
- Constituents of Concern
- Construction of the BMP
- Baseline Effectiveness Monitoring
- Efficiency Assessment Monitoring

Flow Issues

- Extended Detention Basin - Woodside
  - Monitoring was stopped on overtopping of spillway
  - Influent Channel – Flow measurement issues
  - Effluent Channel – Controlled by downstream flow – during high flows
  - Treatment expected to occur – Initial part of the hydrograph and tail period of the hydrograph (post storm)

Flow Issues

- Water Quality Treatment Facility – Palomar Airport
  - Flow sensor placed in the detention vault in front of the effluent weir produced highly variable results during each monitored storm
  - Visual observations during storms identified large eddies forming at the velocity sensor location

Load Estimation Issues

- Water Quality Treatment Facility – Palomar Airport
  - Cross contamination problems from bypass
  - Excess Zinc Values – Placement of sampling equipment on the Galvanized weir
  - Not enough data to support individual component of the treatment system
  - No correlation possible between sediment chemistry and water chemistry – No Baseline Data

General Issues

- Insufficient Flow data through out the storm events due to equipment and placement issues
- Flow data validation – No Redundancy Check
- Undersized BMPs – Much larger Drainage Areas
- Good Baseline data unavailable to assess efficiency

Overall lessons learned

- Establish redundant measurement systems so that data are not lost if the initial approach failed
- Field measurements should be assessed immediately with objectivity to ensure values are within the expected range
- Monitoring staff should be willing to change the monitoring strategy based on field experience to improve the quality of the data collected if the conditions permit
- Sedimentation, plant debris and trash routinely impact flows and sampling equipment. Velocity sensors should be placed in a manner to avoid turbulence, eddies and deposition of trash in order to correctly measure velocities

Overall lessons learned

- Strategies for low flow monitoring may correctly work at low flows, but not necessarily for higher storm flows. Both flow scenarios need to be considered initially at the site reconnaissance for selecting the right type of instrument and the appropriate location

- Stage measurements should be checked during every storm and adjusted as needed. Velocity measurement should also be checked using a redundant instrument or method to ensure accuracy of the flow compositing equipment

Overall lessons learned

- Construction designs should be inspected during construction to ensure the most efficient placement of field sampling and monitoring equipment in case any changes to the initial design have occurred - **COMMUNICATION**

- Improved coordination is needed with all involved agencies. Most BMP projects involve many agencies and contractors. Each group involved has their own needs, and most simply want to complete their component of the project. Frequently the actions of one agency impact those of another. All parties involved must have open **communication** throughout all stages of the project


Questions???