

# SWRO Brine Disposal for scwd<sup>2</sup> using the City of Santa Cruz's existing effluent outfall

Bill Faisst, Vice President, Brown and Caldwell

scwd<sup>2</sup> Community Informational Meeting  
Santa Cruz, California  
November 10, 2010

**Brown** AND  
**Caldwell**



# Desalination System Requirements

- Dependable seawater supply and brine disposal
- Acceptable O&M requirements
- Located near water transmission facilities and energy supply
- Cost effective
- Minimal impacts to the environment

## Types of Brine Disposal Options for Desalination

- **Evaporate to salt** – only used for inland power plants/industrial facilities
- **Beach wells**—Sand City
- **Directionally drilled “wells”**—  
considered for Southern California federal facility

## Types of Brine Disposal Options for Desalination (cont.)

- **New dedicated brine discharge to Ocean** – California & Australia
- **Power plant discharge**—proposed for Moss Landing, Carlsbad, Huntington Beach
- **Co-disposal with municipal effluent through existing outfall** - Santa Barbara and Marina Coast WD and scwd<sup>2</sup>

# Project Objectives

- Cost-effective brine disposal
- Retrofit of existing outfall
- Complete mixing of brine and Wastewater Treatment Plant existing effluent

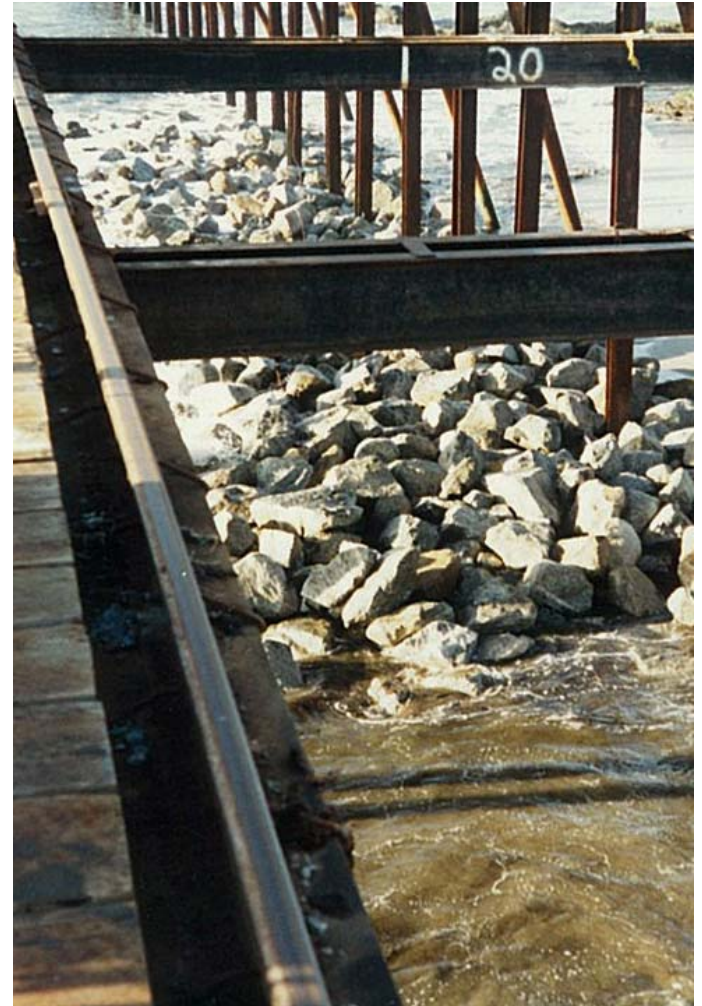
# Existing Outfall Overview for WWTP

- 6-foot diameter reinforced concrete pipe installed in 1987
- 10,000 foot pipeline with 2,100-foot diffuser on end
- Discharge at 90 to 110 feet of ocean depth

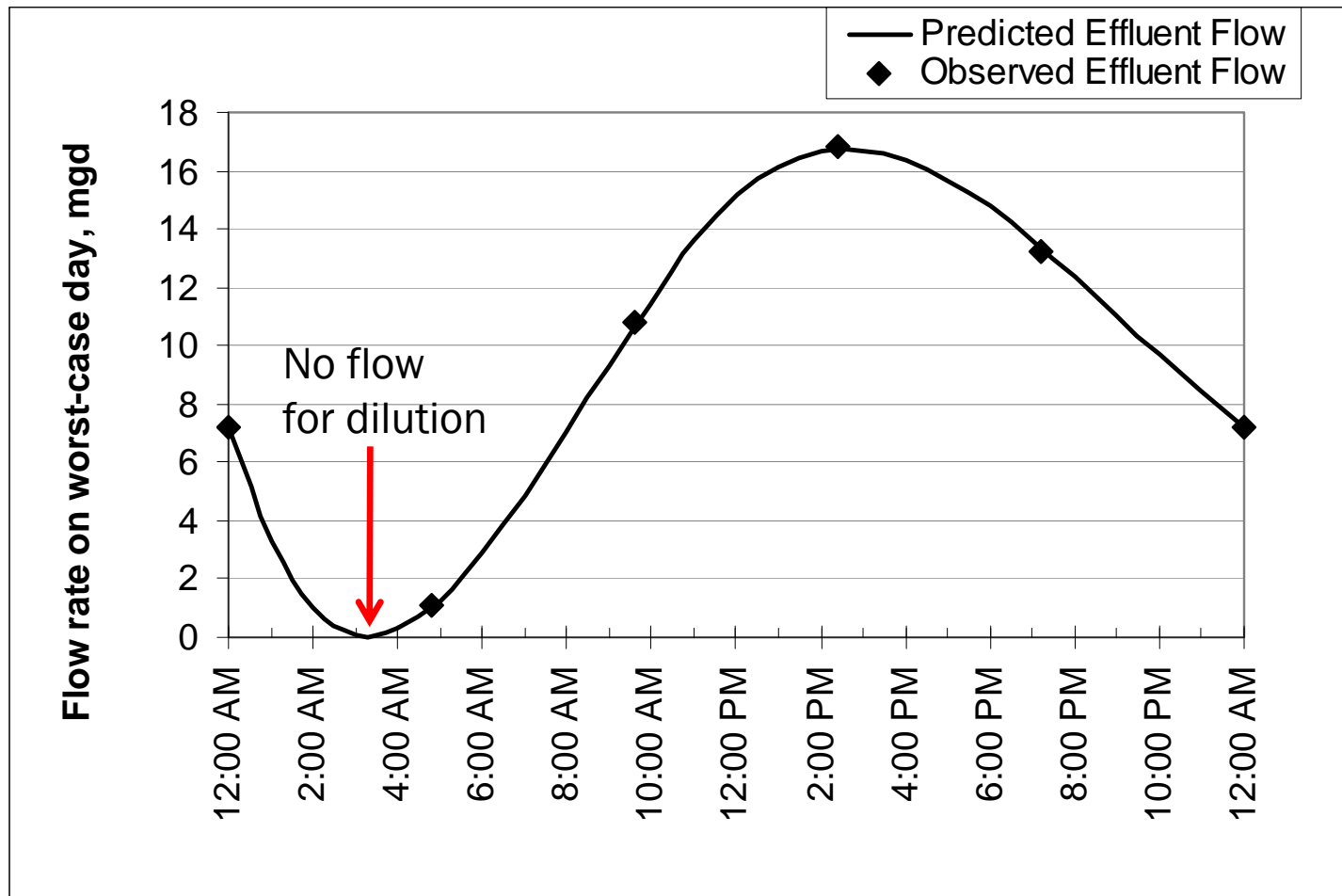


## Existing Outfall Overview (cont.)

- Hydraulic capacity is 105 million gallons per day (mgd)
- Current average dry weather flows (ADWF) are approximately 10 mgd, with peak flows of approximately 80 mgd.
- Existing NPDES permit dilution limit is 139:1



# Diurnal Flow Curve Challenge (worst case day)



# Key Issues

- Mix brine completely with effluent (no two-layer flow)
- Maintain minimum initial dilution
- Spread effluent uniformly along diffuser
- Match brine flow with effluent flow to ensure required initial dilution occurs.

# Desalinated Water Production and Related Brine Flows

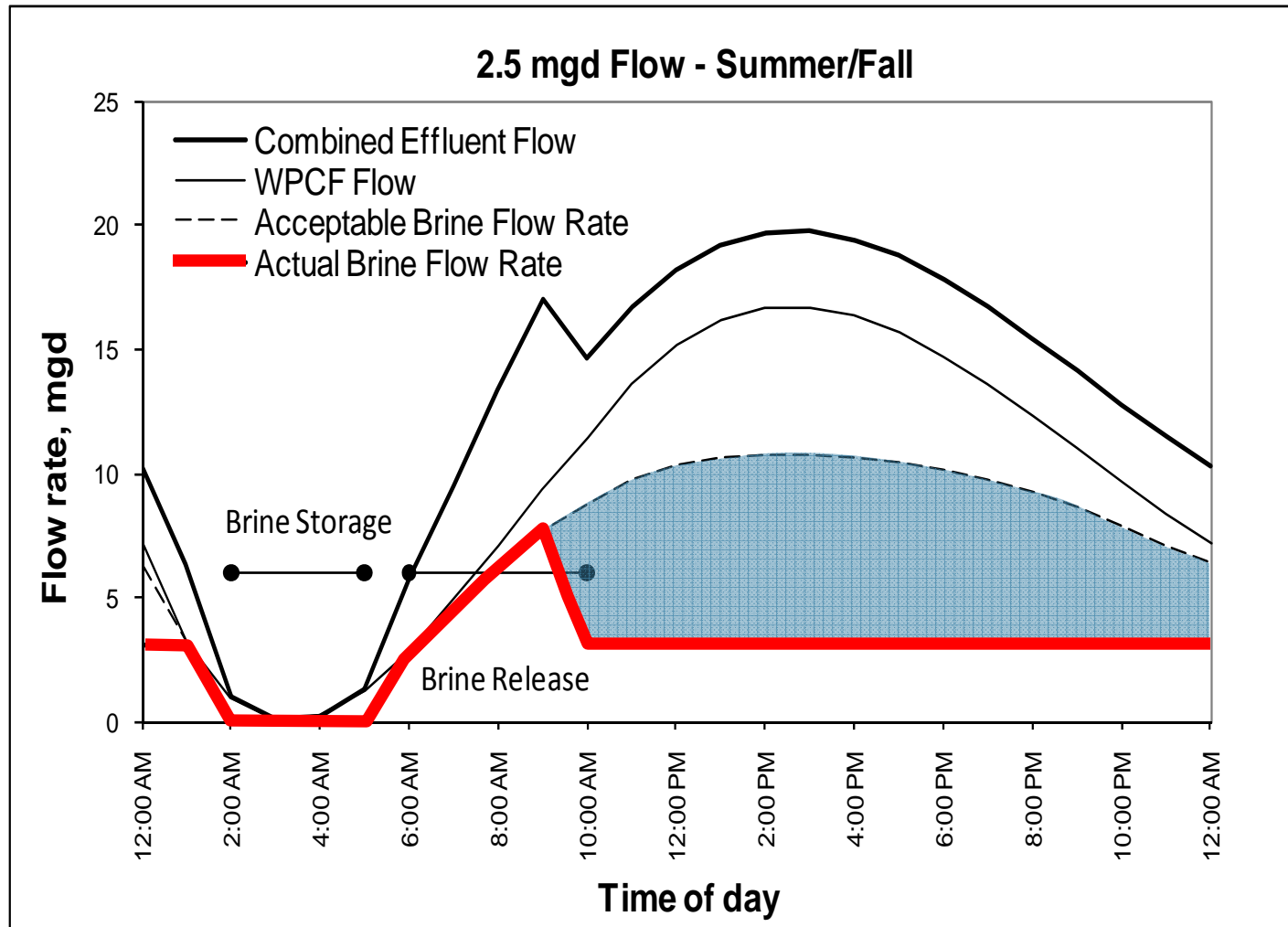
Production Flow with ~45% Recovery	
RO Production	Brine
2.5 mgd	3.1 mgd

# Hydraulic Analyses

- Existing diffuser
  - Approximately 60 percent of the ports are closed to ensure equal flow throughout diffuser.
  - Currently acceptable due to buoyant nature of wastewater effluent
- Upgraded diffuser
  - Retrofit existing ports with Red Valves for even flow distribution.
  - Allows City to open all diffuser ports and spread flow out over larger area.
  - Better jet velocities at low flows increases dilution

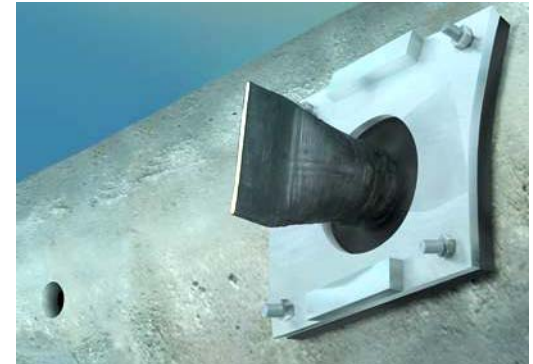


# Example Diurnal Curves with Brine Added



# Minimum Initial Dilution Evaluation

- PLUMES UM3 model used for evaluation
- With Red Valves on all ports and no brine discharge, initial dilution ranged from 400:1 to 600:1 at flow rates of 4 to 15 mgd.



Monterey Regional Red Valve Retrofit



Marine Life attracted to effluent outfall

# Minimum Initial Dilution Evaluation

- To maintain initial dilution of 139:1, a minimum effluent flow of:
  - 2.1 mgd is required for 2.5 mgd desalination plant



# Required Storage

- Storage required when brine flow exceeds maximum brine flow permitted to meet initial dilution of 139:1
- Equalization storage capacity will range from:
  - 0.6 mg for 2.5 mgd desalination plant



Partially buried concrete tank



Above-grade concrete tank

# Summary

- Brine produced from the desalination treatment can successfully be combined with the existing wastewater effluent.
  - Retrofit and upgrade the WW outfall diffuser
  - Use a storage tank to hold brine during low effluent flows

**Thank You**