

# Water Discharge: New Challenges in Infrastructure and Aquatic Life Support

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*Monterey Bay Aquarium*



# Water Discharge Regulations



# Regulated Water Discharges


- Discharge of freshwater to lakes, rivers, streams, or water ways
  - Discharge of seawater to oceans, bays, or estuaries
  - Discharge to storm drains (effluents other than storm water)
  - Discharge to sewer
  - Storm water runoff
- 

# The on-going progression of discharge regulations at *MBA*





# Presentation Outline

- *MBA* History & Background
  - Seawater Discharge to Sewer
  - Ocean Discharge
    - Seawater
    - Storm Water
    - Exotic Species
    - Status and expectations
  - Summary
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# *MBA History & Background*

## Hovden Cannery & *MBA*

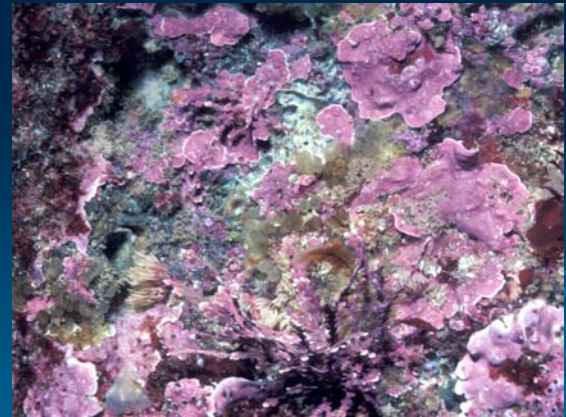


# *Monterey Bay Aquarium (1987)*



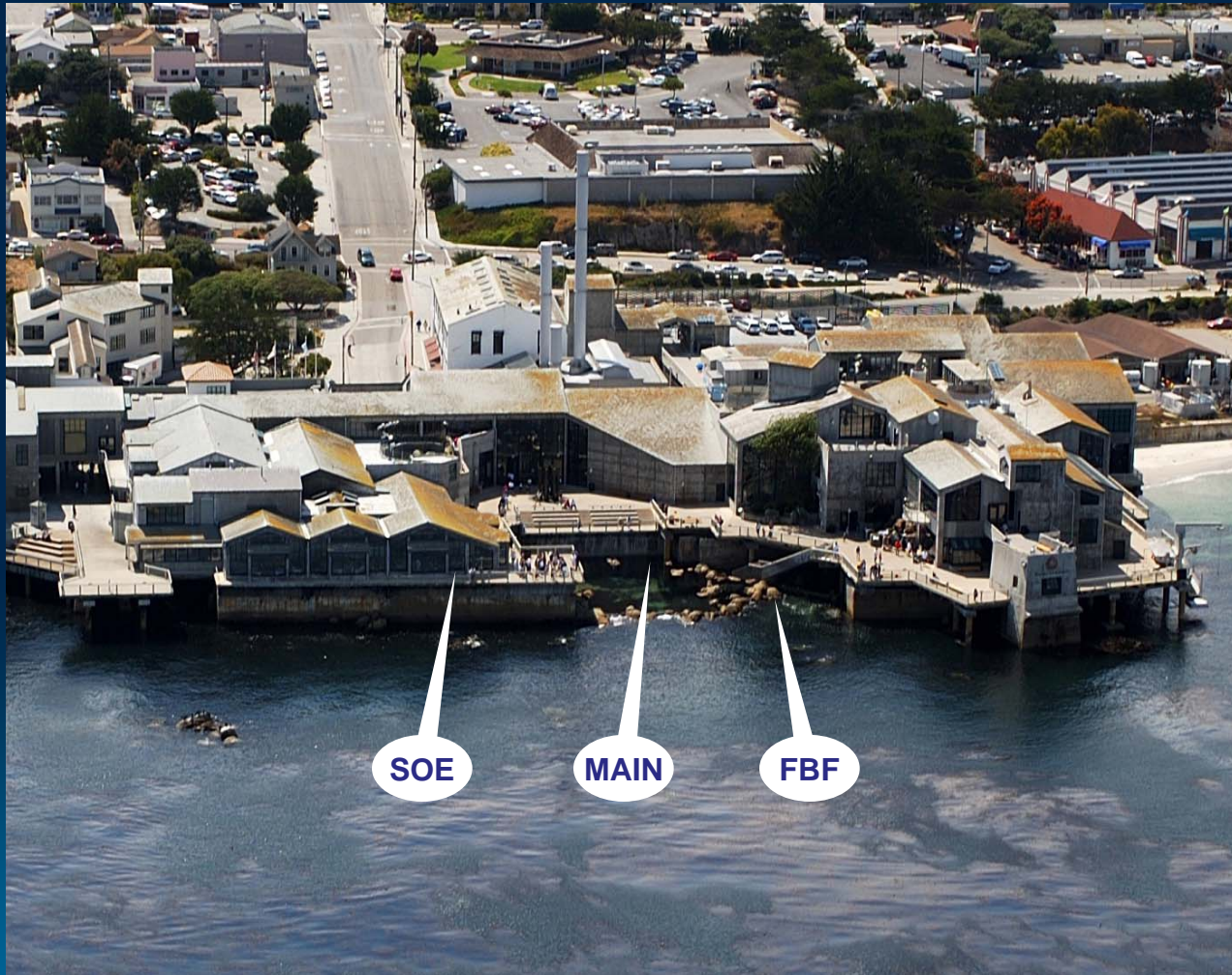


# Kelp Forest Exhibit





# SW Discharge Locations in 1984



# Other SW Discharges





# Outer Bay Wing 1995



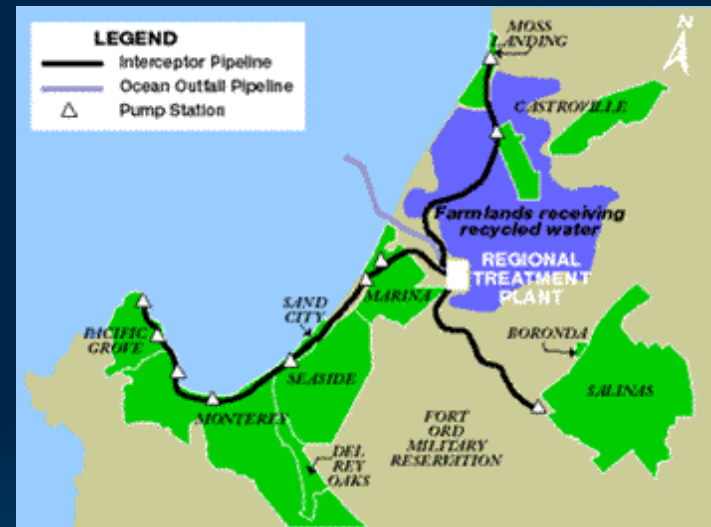


# SW Discharge Locations in 1995



# Seawater Discharge to Sewer

- 1997 – regional sewer district completes water reclamation facility
- Reclaimed water is used to irrigate crops
- Salt contamination is bad for crops
- *MBA* is directed to STOP discharging SW to the sewer



# SW to Sewer Solutions

- Retrofitted exhibit galleries and service areas with accessible SW returns
- Modified Husbandry protocols, including maintenance & chemical treatments
- Worked with the RB to reroute Sea Otter Exhibit filter backflush through UV sterilization to ocean discharge
- Installed exotic species treatment system to prevent release of non-natives



# Industrial Wastewater Discharge Permit

- Permit issued in 2004
- Continuously monitor conductivity in waste discharge from sewer pits
- Continuously monitor SW flows to sewer from Quarantine
- Allows some SW discharge to sewer; specifically chemical treatments
- Annual inspections and reporting

# Ocean Discharge - Seawater



# NPDES Permit for Discharges from Aquaculture and Aquariums

- September 2002
- Strict criteria for discharge water quality
- Quarterly monitoring and reporting
- Exotic (non-native species) regulated by CDF&G

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD  
CENTRAL COAST REGION**

**WASTE DISCHARGE REQUIREMENTS  
NPDES GENERAL PERMIT**

**for  
DISCHARGES FROM AQUACULTURE AND AQUARIUMS**



# NPDES Discharge Monitoring

Constituent	Units	Type of Sample	Sampling Frequency
Flow	MGD	Metered	Weekly
Settleable Solids	mL/L	Grab	Quarterly
Total Suspended Solids*	mg/L	24-hour composite	Quarterly
Turbidity*	NTU	24-hour composite	Quarterly
pH*	units	Grab	Quarterly
Temperature*	°F	Grab	Quarterly
Dissolved Oxygen	mg/L	Grab	Quarterly
BOD	mg/L	24-hour composite	Semi-Annually
Grease and Oil	mg/L	24-hour composite	Semi-Annually
Ammonia (as N)	mg/L	24-hour composite	Semi-Annually
Nitrite (as N)	mg/L	24-hour composite	Semi-Annually
Nitrate (as N)	mg/L	24-hour composite	Semi-Annually
Total Coliform Bacteria	MPN/100mL	Grab	Semi-Annually
Fecal Coliform Bacteria	MPN/100mL	Grab	Semi-Annually
Enterococcus Bacteria	MPN/100mL	Grab	Semi-Annually

# State Board Letter (1)

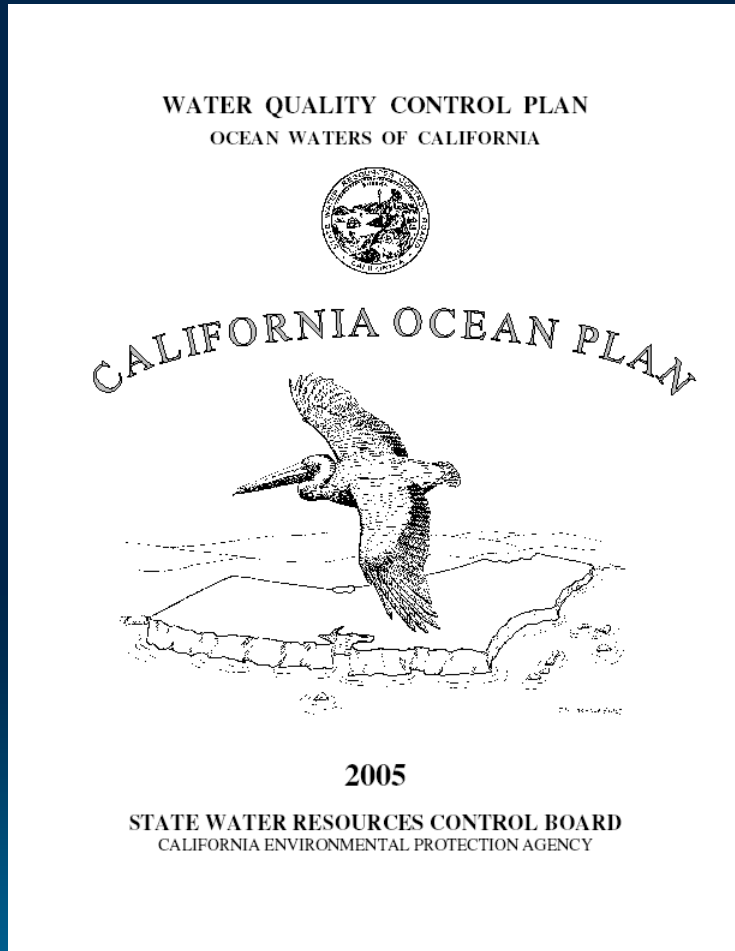
- *“Waste” shall not be discharged into areas designated as being of special biological significance.*
- *“Waste” is defined as the “total discharge, of whatever origin.”*

# State Board Letter (2)

- *Because you do not already have an exception issued by the State Board for discharges to the ASBS, **you are required to cease discharging.***
- *You may, however, request an exception to the prohibition if you believe your discharge will not compromise protection of ocean waters for beneficial uses, and the public interest will be served.*



# California Ocean Plan



- Adopted in 1972
- Revised 7 times
- 1997 “waste” discharges to ASBS prohibited
- Can apply for an “exception” to the discharge prohibition
- Exception reviewed every 3 years

# MBA “Exception” Application

- 17 requests for information
- Extensive description of facility, systems, species, WQ, EIR, etc.
- CA OP Table B analyses of SW, storm water, & receiving water
- Toxicity testing of SW & storm water



# CA Ocean Plan Table B

<b>Chemical Group</b>	<b># Analytes</b>
<b>Total Metals</b>	<b>14</b>
<b>Ammonia Nitrogen</b>	<b>1</b>
<b>Polynuclear Aromatic Hydrocarbons (PAHs) Calculation</b>	<b>13</b>
<b>Objectives for Protection of Marine Aquatic Life</b>	<b>6</b>
<b>Halomethanes Calculation</b>	<b>3</b>
<b>Phenolic Compounds (non-chlorinated) Calculation</b>	<b>6</b>
<b>Chlorinated Phenolics Calculation</b>	<b>5</b>
<b>Hexachlorocyclohexane (HCH) Calculation</b>	<b>4</b>
<b>DDT Calculation</b>	<b>6</b>
<b>Dichlorobenzenes Calculation</b>	<b>2</b>
<b>Objectives for Protection of Human Health - Noncarcinogens</b>	<b>16</b>
<b>Chlordane Calculation</b>	<b>7</b>
<b>Polychlorinated Biphenyls (PCB) Calculation</b>	<b>7</b>
<b>Objectives for Protection of Human Health - Carcinogens</b>	<b>35</b>
<b>TCDD Equivalents Calculation</b>	<b>17</b>
<b>Total</b>	<b>142</b>

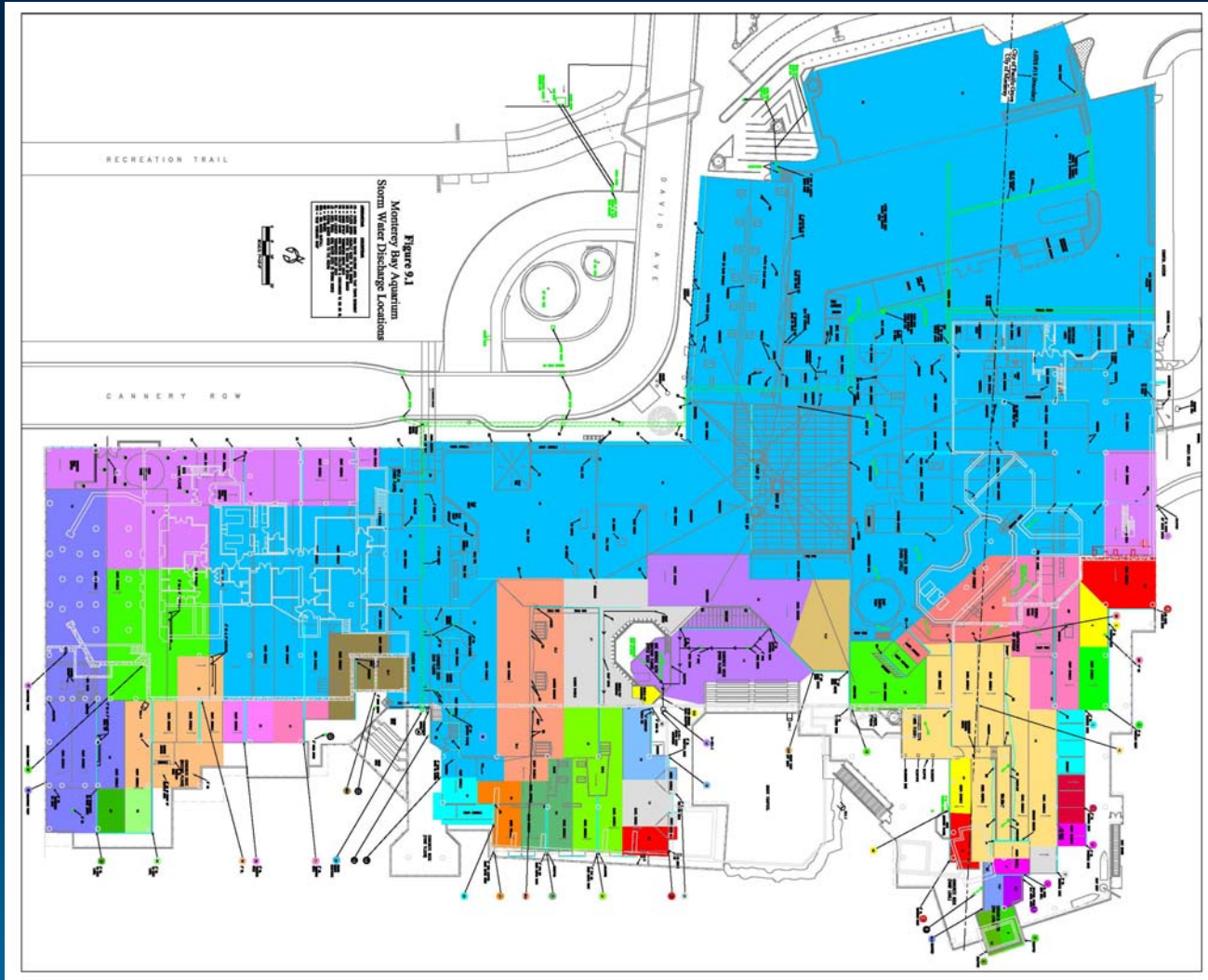
# Ocean Discharge - Storm Water

- Discharge of “waste” is prohibited
- No dry weather flows
  - Only rain water
  - No urban runoff
  - No SW discharge to storm drains
- Meet OP Table B WQ criteria in receiving water





# MBA Storm Water Discharge Areas



# Ocean Discharge - Exotic Species

- Constant challenge
- SW discharge must be treated to prevent release
- Regulated by CDF&G
  - Display organisms
  - Pathogens & parasites
  - Transport water
  - Specimen accession & de-accession



# Exotic Species Treatment Systems

- First ESTS installed in 1999 (SW to sewer)
- Currently have 3 operational ESTS; have operated up to 6
- Two basic designs:
  - Ozonation  $\sim 1.2$  mg/L  $O_3$  for 3-4 minutes at 8-10 psi. Max flow 200 GPM.
  - Fine (5 micron) filtration followed by UV sterilization ( $>100,000$   $\mu\text{Ws}/\text{cm}^2$ ). Max flow 65 GPM.

# Ocean Discharge

## Status & Expectations

- MBA submitted an application for an exception to the CA OP
- SB will summarize and post for public review and comment
- Public hearing
- SB issues a Negative Mitigated Declaration including a set of “conditions”
- If MBA prevails, SB passes the exception
- EPA must concur



# *MBA Exception*

## Expectations for “Conditions” (1)

- Monitor SW & storm water discharge flows.
- Eliminate non-storm water urban runoff.
- Storm Water Management Plan & BMPs.
- Remove pollutants from storm water runoff.
- Complete a quantitative survey of benthic marine life at discharges & reference sites.
- Conduct bioaccumulation studies for metals (mussels or sand crabs).

# *MBA Exception*

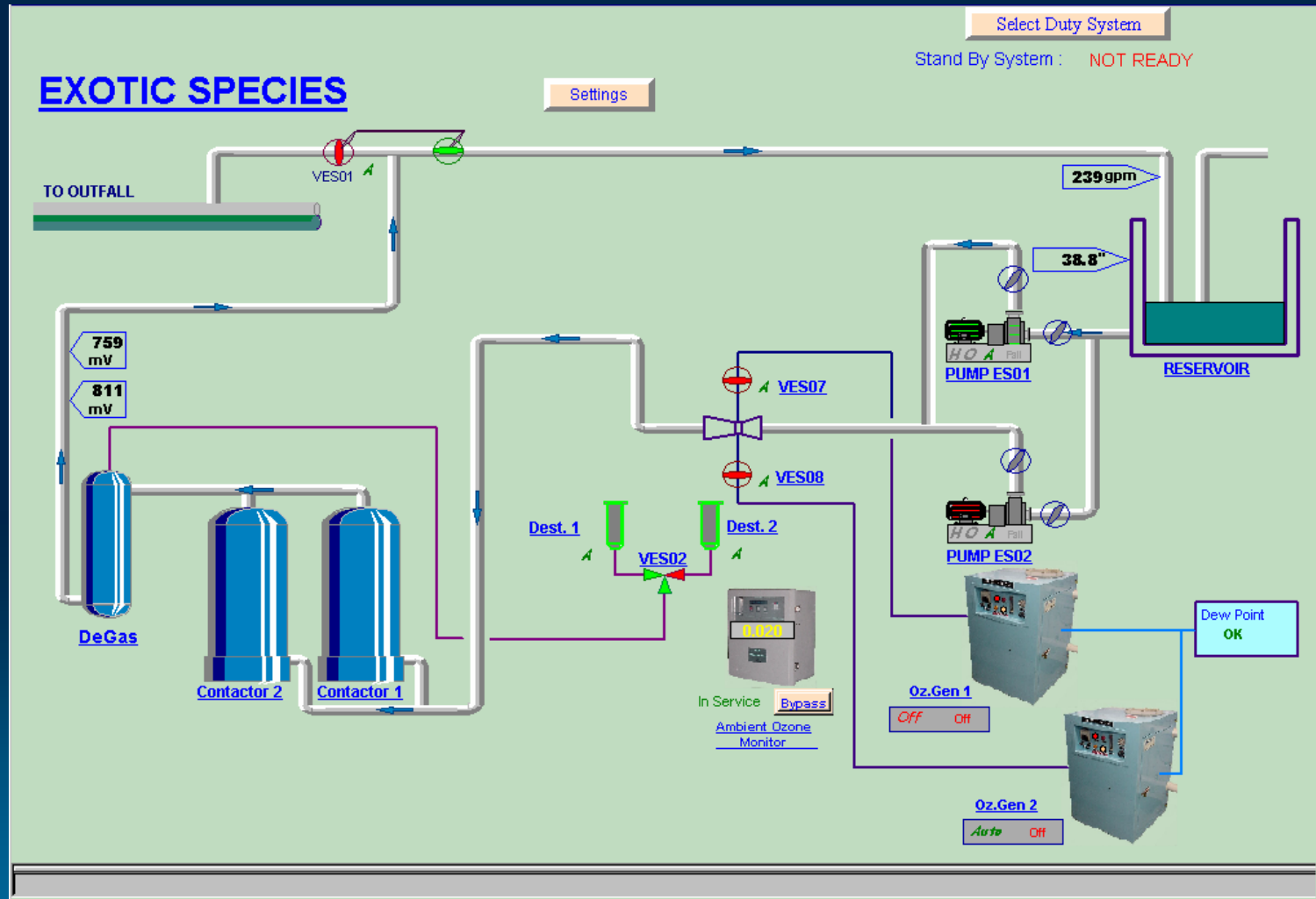
## Expectations for “Conditions” (2)

- Implement controls to prevent the release of exotics, pathogens & parasites.
- Table B analyses of SW influent, effluent & receiving water. Toxicity testing.
- Table B analyses of storm water & receiving water. Toxicity testing.
- Table B analyses (partial) of marine sediment. Grain size, TOC and toxicity.

# Summary

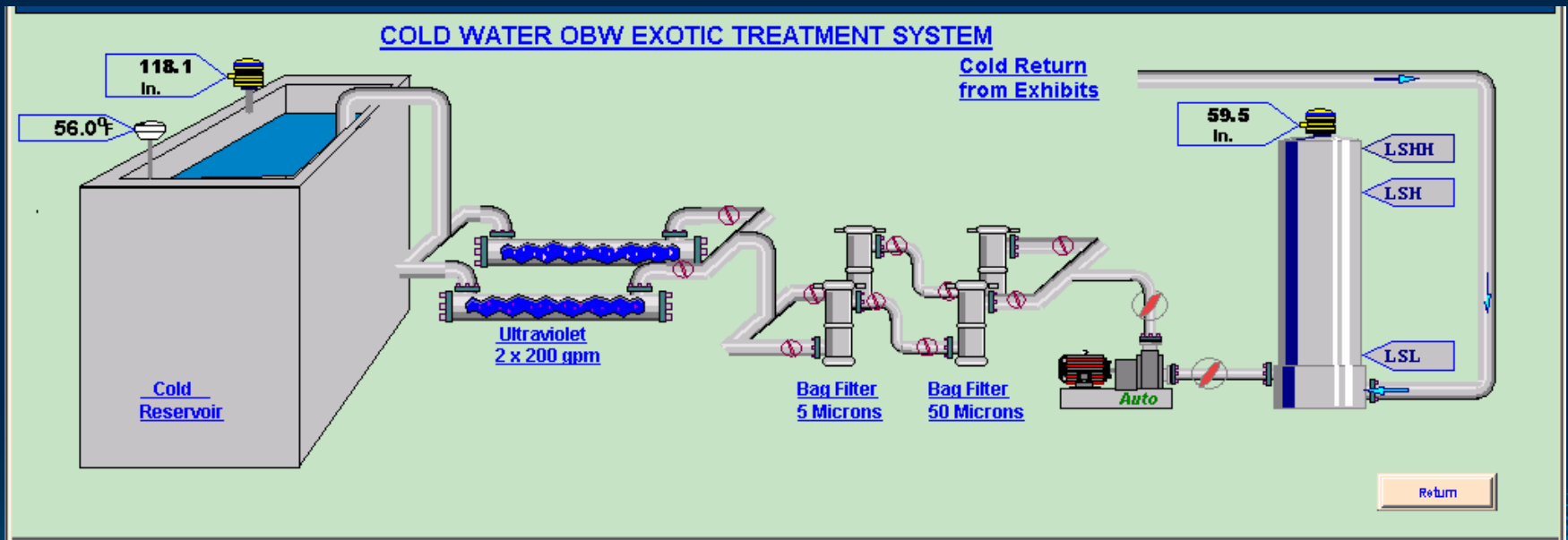


# Ozone ESTS





# Filtration / UV ESTS



# Exception Process (to date)

- October 2004 – MBA receives CDO letter
- December 2004 – MBA responds requesting an exception
- February 2006 – State Board responds outlining specific information required for exception application
- August 2006 – MBA submits exception application

