



316(b) Phase II Rule Available Technology Alternatives

Prepared for:

**California State Water Quality Control
Board**

December 7, 2005

Site Specific Factors

- Biology
- Debris
- Fouling
- Navigation
- Hydrology
- Existing Facility



Technology Alternatives

- Physical Barriers
- Collection Systems
- Diversion Systems
- Behavioral Barriers
- Flow Reduction

Physical Barriers

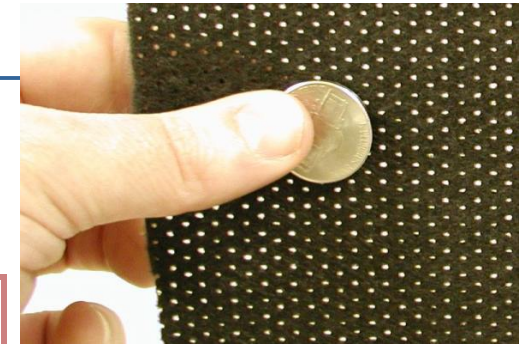
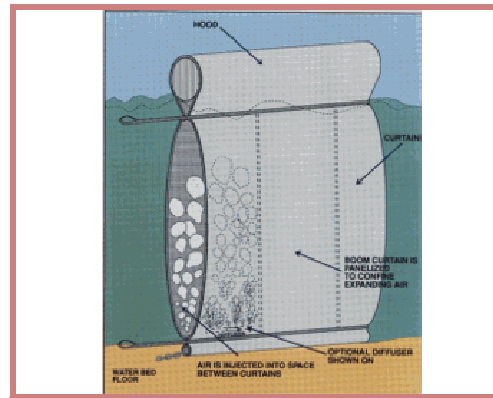
IM&E



Aquatic Filter Barrier – IM&E

Issues/Concerns:

- The AFB has yet to be successfully deployed in a full scale manner and demonstrated to meet IM&E performance standards
- For in shore facilities inadequate space, navigation obstruction and lack of sweeping velocity to carry eggs and larvae away from net
- Currently considered infeasible for facilities with off shore intakes due to storm damage (i.e. waves)
- Biofouling is an issue since fouling is significantly greater on Pacific Coast than in the Hudson River



**Mirant's Lovett Station
on the Hudson River
with deployed
Gunderboom (AFB)**

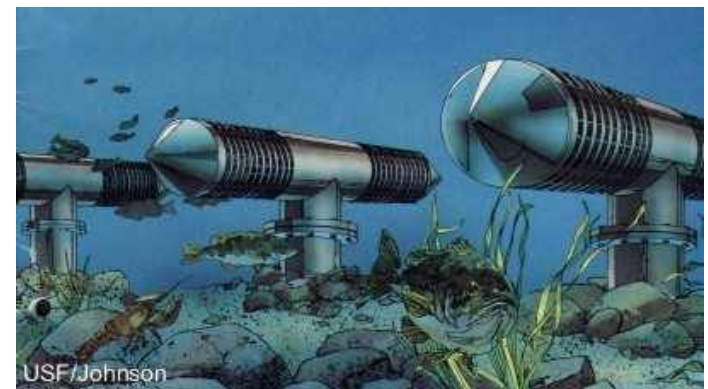


Narrow or Wide (IM Only) Slot Wedgewire Screens

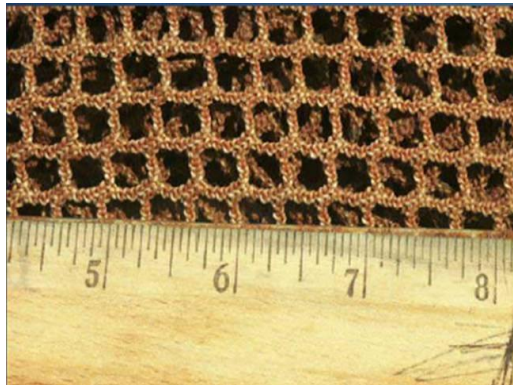
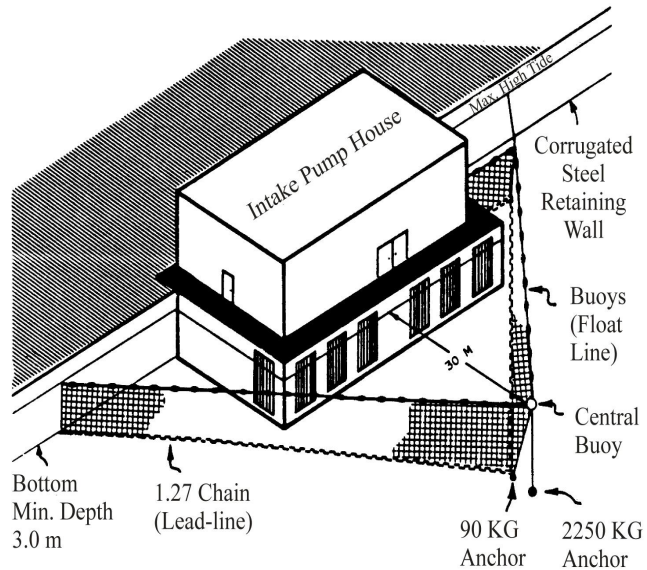
~ 50 T-84 screens at 0.5 mm slot size would be required for larger facilities such as Diablo or SONGS but a smaller and more costly slot size may be necessary

Issues/Concerns:

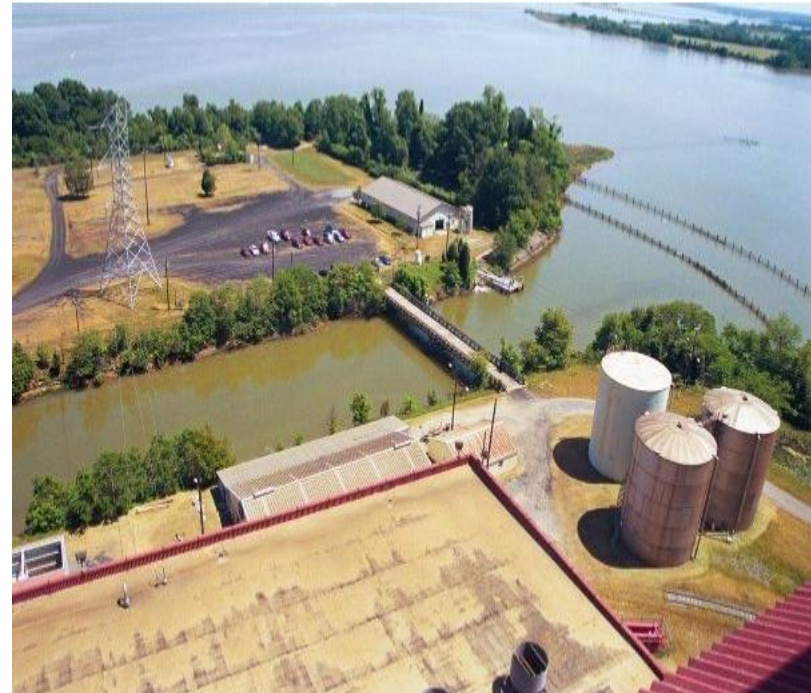
- Effectiveness contingent upon adequate sweeping velocity (i.e. cannot locate in enclosed protected area)
- Water turbulence could require locating a significant distance offshore increasing \$\$\$
- Biofouling control concerns:
 - For offshore intakes the distance to screens and size of tunnels exceed air blast control design
 - Controlling fouling inside piping is a significant issue




Barrier Net (IM only)



Mirant Chalk Point Plant barrier net on the Patuxent River in Maryland achieved above 80% reduction in impingement



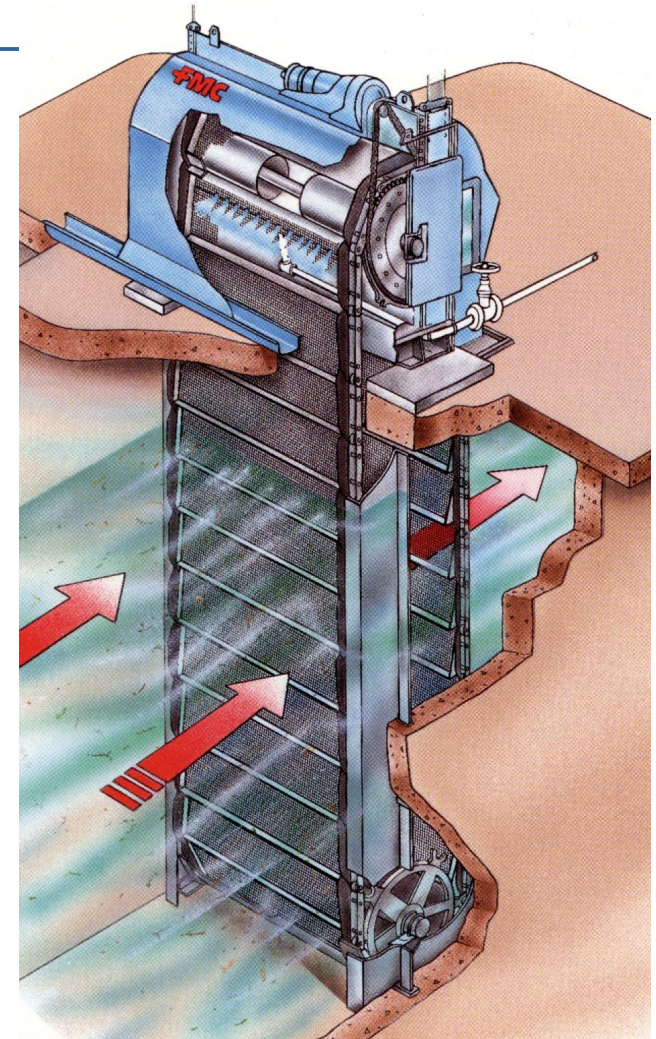
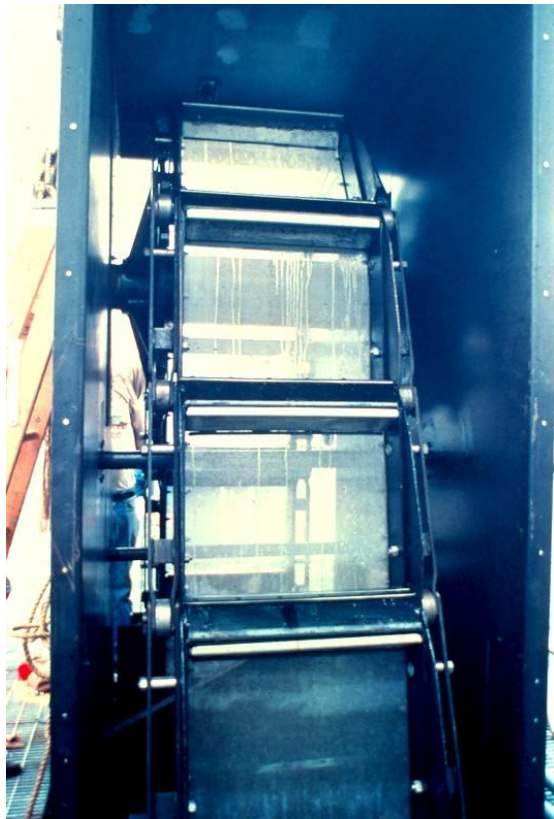


Collection and Return Systems

IM&E

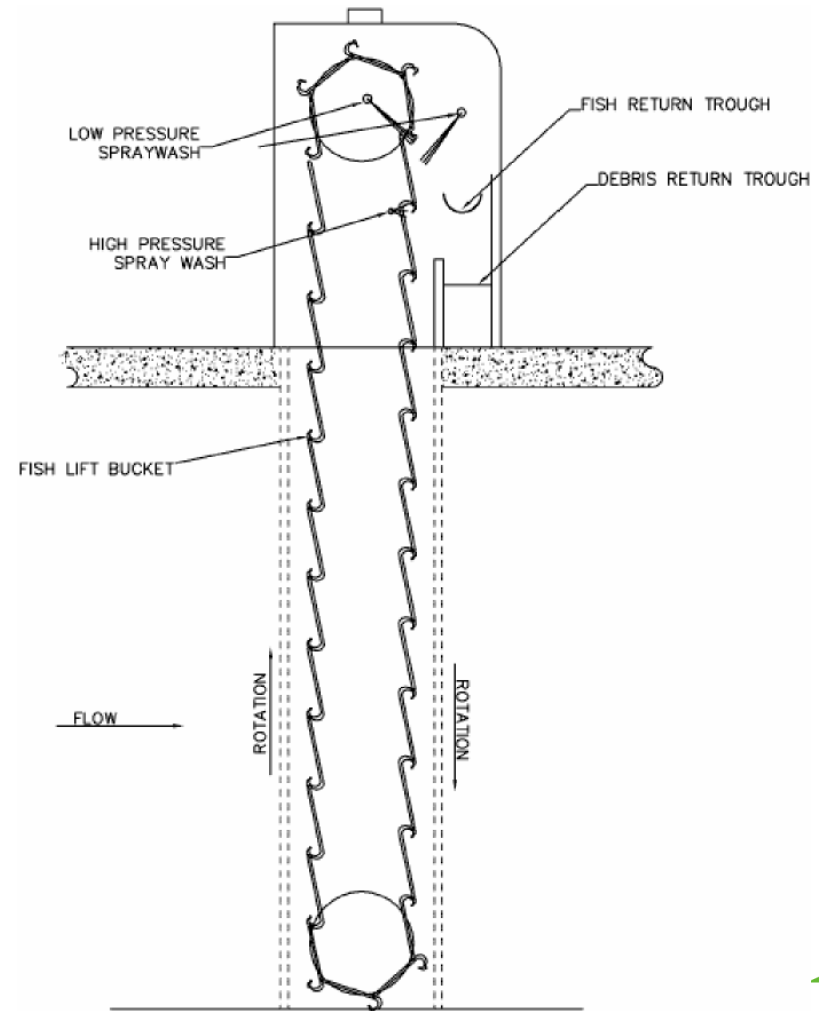


Fine or Coarse Mesh Modified Ristroph Traveling Water Screens (IM&E or IM only)



Concerns for Use of Fine or Coarse (IM Only) Mesh Ristroph Screens

- Requires installation of a fish return to a location away from intake and discharge (over a mile for some facilities)
- If approach velocity exceeds the 0.5 ft/sec design velocity additional screens would be required adding significantly to the cost
- Little data available on survival rates for west coast species



Geiger Screens – Current Design is IM Only



- New fish collection technology undergoing testing
- Same issues as Ristroph screens apply



Flow Reduction

IM&E



Closed Cycle Cooling

Automatically complies with the federal Rule

Issues/Concerns:

- High Cost
- Not all facilities have adequate space
- Energy penalty
- Other Environmental Impacts
 - Air
 - Terrestrial
 - Water
 - Aesthetics



Operational Measures – Reduced Pump Operation

Issues/Concerns:

- Restricts basic function of facilities (i.e. generation of reliable electric power)
- Major difficulties for nuclear facilities (ex. Diablo and SONGS) that are baseloaded and not designed to load follow
- Would require replacement power from other generation sources with associated impacts depending on generation type (i.e. air impacts due to use of fossil fuel)



Diversion Systems

IM Only

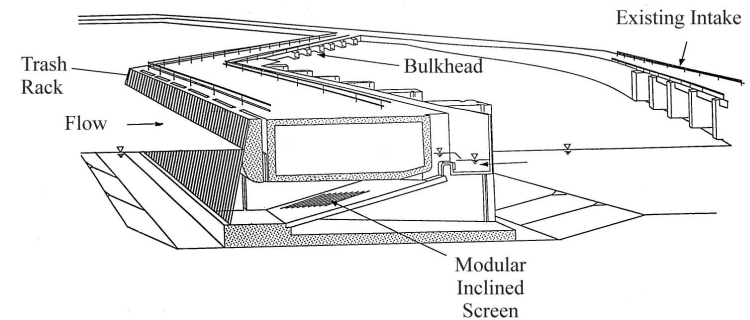


Diversion Systems (IM Only)

Diverts fish and shellfish
away from intake

Issues/Concerns:

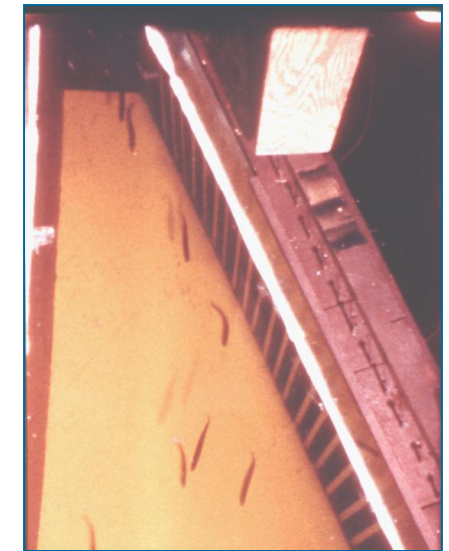
- Response to diversion systems is species specific
- Biofouling control is a significant issue
- Issue of where to divert fish and shellfish to avoid returning to intake



MIS



Angled Screens



Louvers



Behavioral Barriers

IM Only

Strobe Lights and Acoustics (IM only)

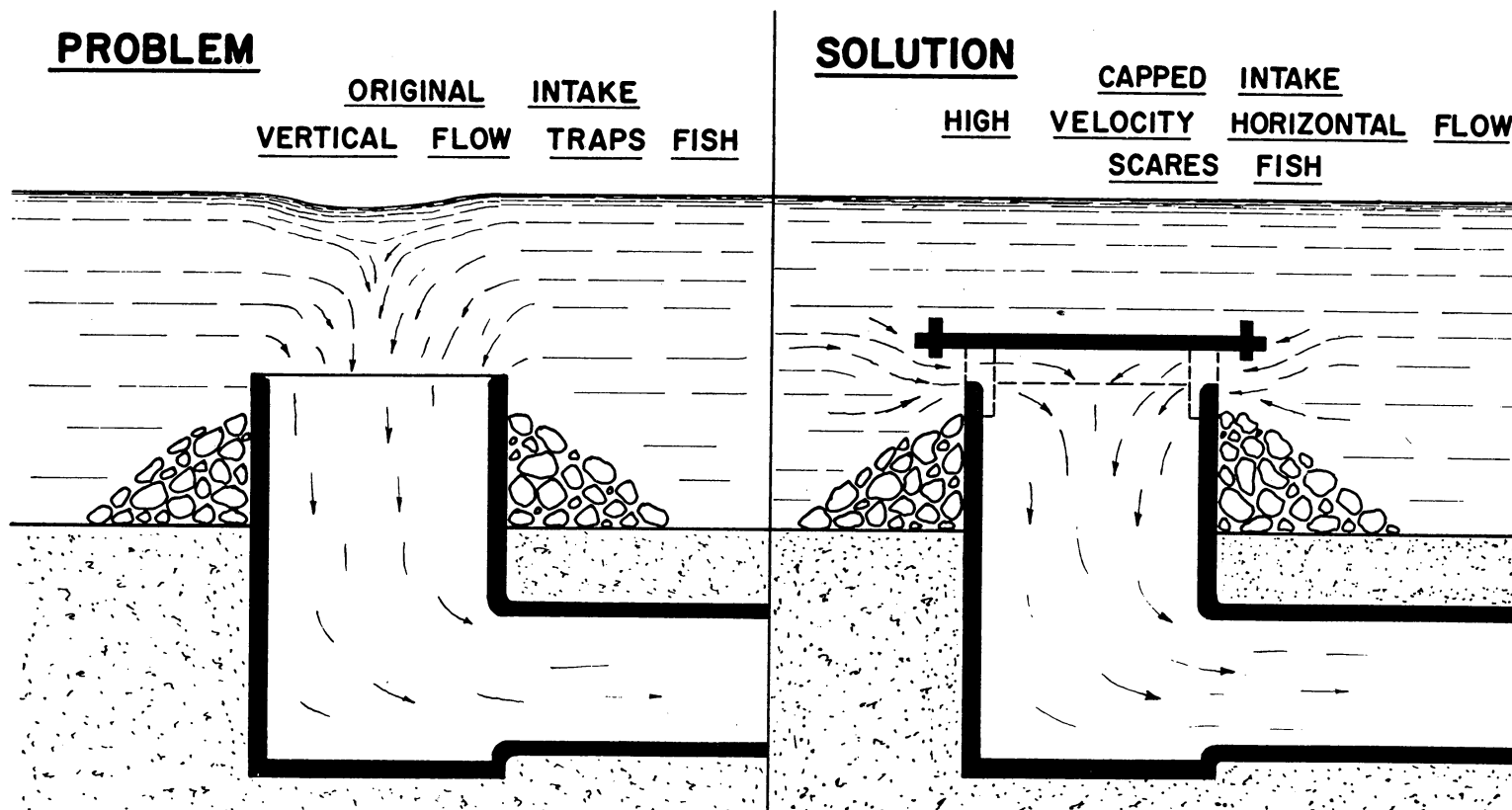
Keep fish and shellfish
away from intake

Issues/Concerns:

- Response to behavioral devices is species specific and can vary over time as organisms acclimate to devices
- Little data available on west coast species



Offshore intakes/velocity Caps (IM only)





Questions?

