

Presentation to: USIBWC Citizens Forum

# *Protecting San Diego's Coastal Waters*

*An Overview of the City of San Diego/USIBWC South Bay  
Ocean Outfall Monitoring Program*

September 6, 2018

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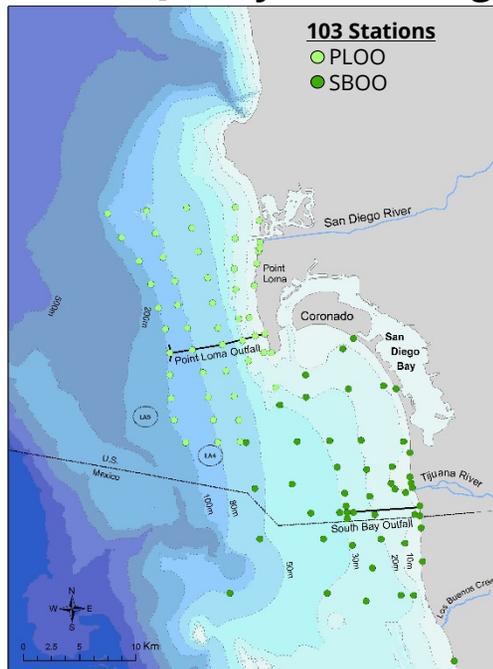


# City of San Diego Ocean Monitoring Program

- **Two separate, but fully aligned programs**

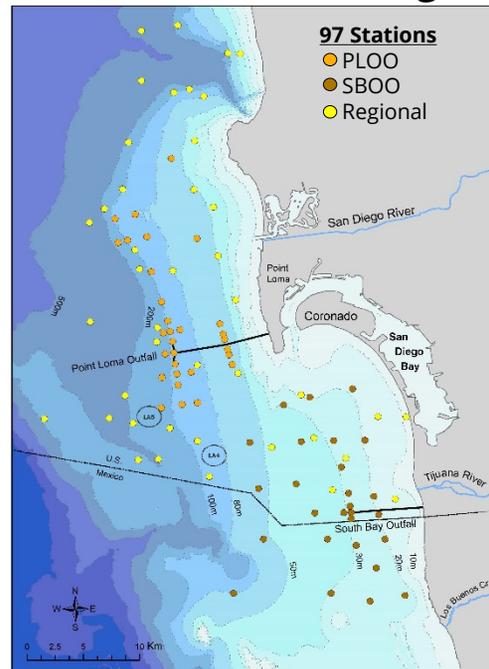
- ▶ *Point Loma Ocean Outfall (PLOO) and South Bay Ocean Outfall (SBOO) regions*
- ▶ *One of largest, most comprehensive monitoring programs of its kind*
- ▶ *Total area ~340 mi<sup>2</sup> from northern San Diego to Baja California*
- ▶ *Sampling ~200 days/year, beaches to offshore depths ≥500 m*

## Water Quality Monitoring



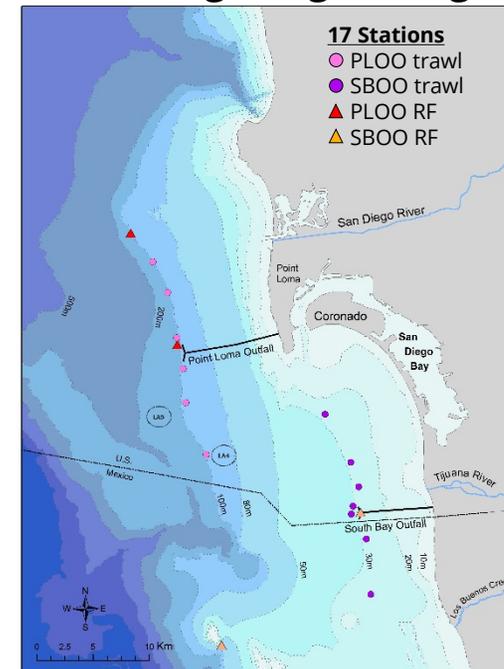
*Fecal Indicator Bacteria  
Oceanographic Conditions*

## Benthic Monitoring



*Sediment Quality  
Benthic Infaunal Communities*

## Trawling & Rig Fishing



*Fish & Invertebrate Communities  
Contaminant Bioaccumulation in Fishes*



# Program Goals & Objectives

- 1) *Measure and determine compliance with NPDES requirements and California Ocean Plan water quality standards and objectives.*
- 2) *Monitor changes in ocean conditions and the health and status of the San Diego marine ecosystem over space and time.*
- 3) *Assess any impact of wastewater discharge or other man-made or natural factors on the local marine environment, including effects on coastal water quality, seafloor habitats, and marine life.*



*R/V Monitor III*



*R/V Oceanus*

*City of San Diego ocean monitoring and research vessels*



# Point Loma vs. South Bay Outfall Programs

- **Comparison of number of samples collected and analyses performed for core components of PLOO and SBOO programs.**

Monitoring Component	No. Samples/Year		No. Analyses/Year	
	PLOO	SBOO	PLOO	SBOO
Water Quality	2,788	2,412	10,596	10,212
Benthic Infauna	84	94	84	94
Sediment Chemistry	108	94	696	752
Sediment Toxicity	28	28	28	28
Demersal Fishes & Inverts	12	14	12	14
Fish Tissue Chemistry	18	21	90	105
<b>TOTAL</b>	<b>3,038</b>	<b>2,663</b>	<b>11,506</b>	<b>11,205</b>



# Recent Changes & Improvements

- **Improved Regional Perspective**

- ▶ *New/amended permits complete ~15 year process to align PLOO and SBOO programs*
- ▶ *New combined PLOO/SBOO biennial monitoring and assessment report*

- **Improved Water Quality Monitoring / Plume Tracking**

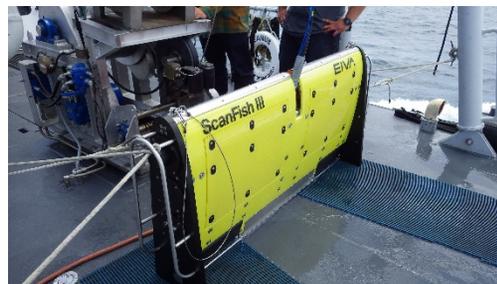
- ▶ *New Real-time Ocean Observing System*
- ▶ *New Remotely Operated Towed Vehicle (ROTV)*

- **Improved Sediment Quality Monitoring**

- ▶ *New sediment toxicity testing*



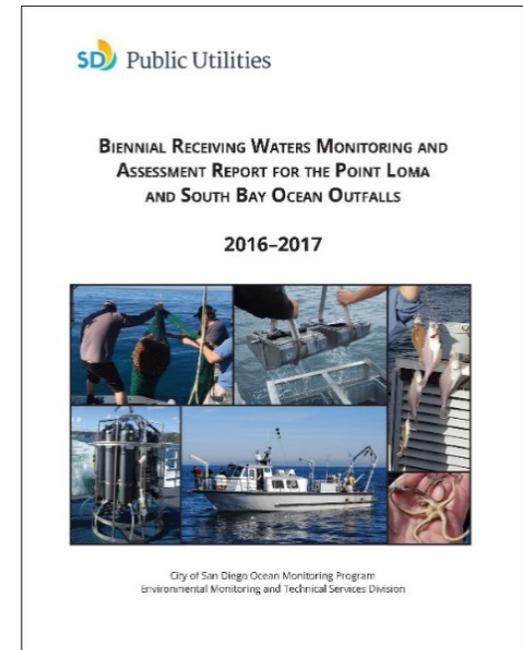
*New Real-Time Mooring System*



*New ROTV*



*New Sediment Toxicity Testing*



*New Biennial Report*



# City / USIBWC Partnership

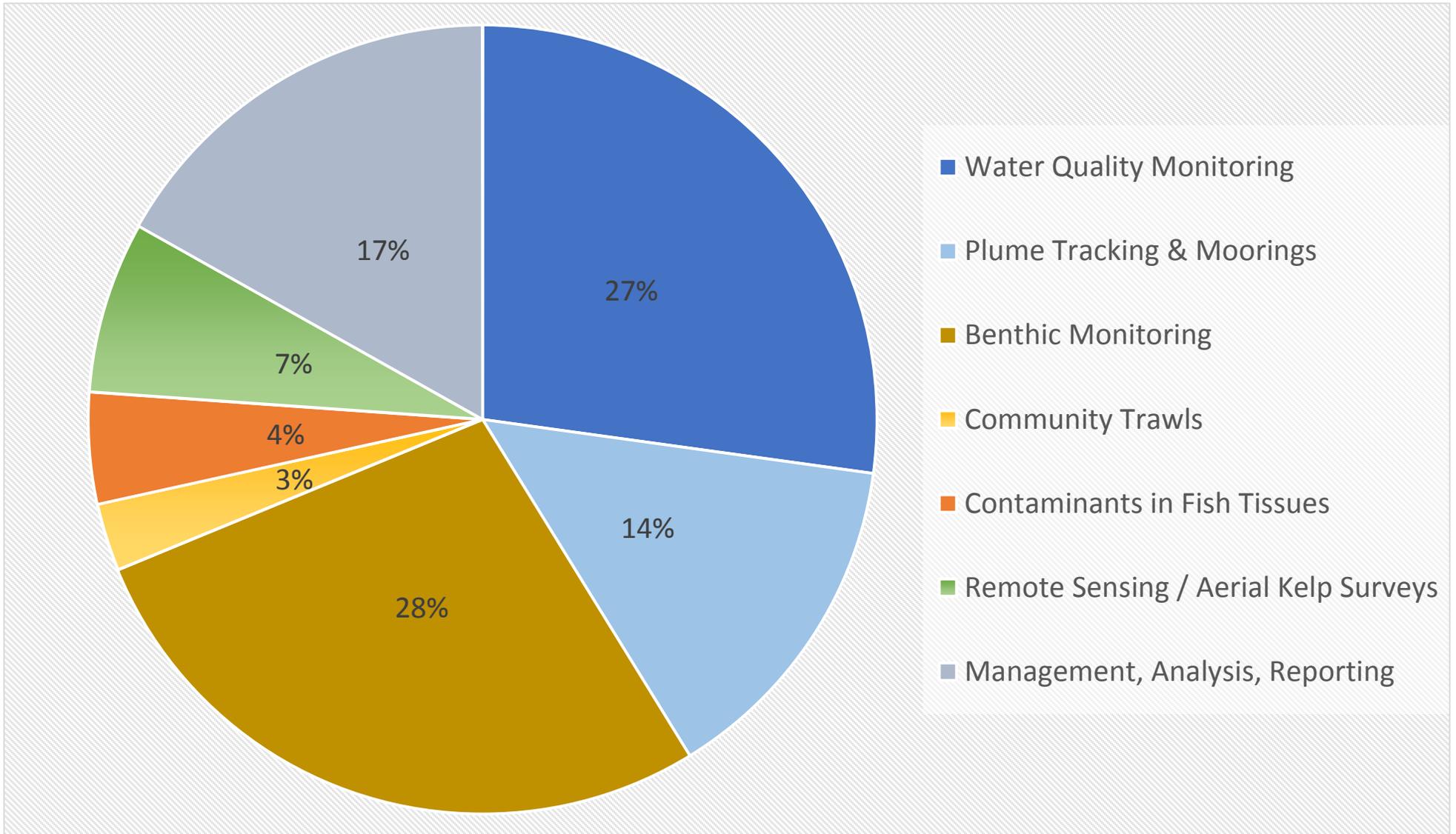
- **Joint SBOO program conducted since 2003**
- **Monitoring requirements identical as of December 2017**
  - ▶ *SBIWTP: Order No. R9-2014-0009 as amended (NPDES No. CA0108928)*
  - ▶ *SBWRP: Order No. R9-2013-0006 as amended (NPDES No. CA0109045)*

	IBWC (SBIWTP)	City (SBWRP)
SBOO discharge began	1999	2002
Pre-discharge monitoring	July 1995 – 1998	—
Post-discharge monitoring	1999 – present	2003 – present
SBOO ownership	60.06%	39.94%
Wastewater treatment	Secondary	Tertiary
Present discharge flow	~25 mgd (88%)	~3.5 mgd (12%)
Past cost sharing agreements (2003 – 2018)*	50-60%	40-50%
Proposed new cost sharing agreement*	50%	50%

*\* Present IBWC/City agreement expires September 30, 2018*



# SBOO Program Breakdown



*Total program cost for FFY 2019 ~\$1,925,000 (~\$1MD/agency)*



# Water Quality Monitoring & Compliance

- **Shore (beaches)**

- ▶ 11 stations, weekly
- ▶ Seawater samples collected to measure FIB concentrations



Sandy beaches



Rocky shores

- **Kelp beds and offshore**

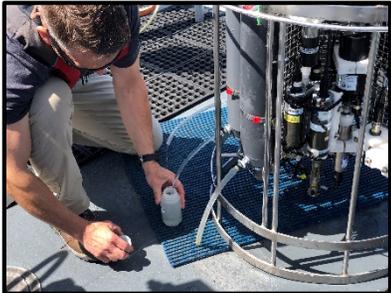
- ▶ 7 kelp/nearshore stations, weekly
- ▶ 33 offshore stations, quarterly
- ▶ Seawater samples collected at multiple depths to measure FIB levels
- ▶ CTD casts to create water column profiles of key parameters
  - Temperature, depth, light, dissolved oxygen, pH, salinity, chlorophyll a, colored dissolved organic matter



Kelp forests



**FIB = Fecal Indicator Bacteria**  
Total & fecal coliforms,  
Enterococcus





# Real-Time Ocean Observing System (Plume Tracking)

## ● New real-time moorings

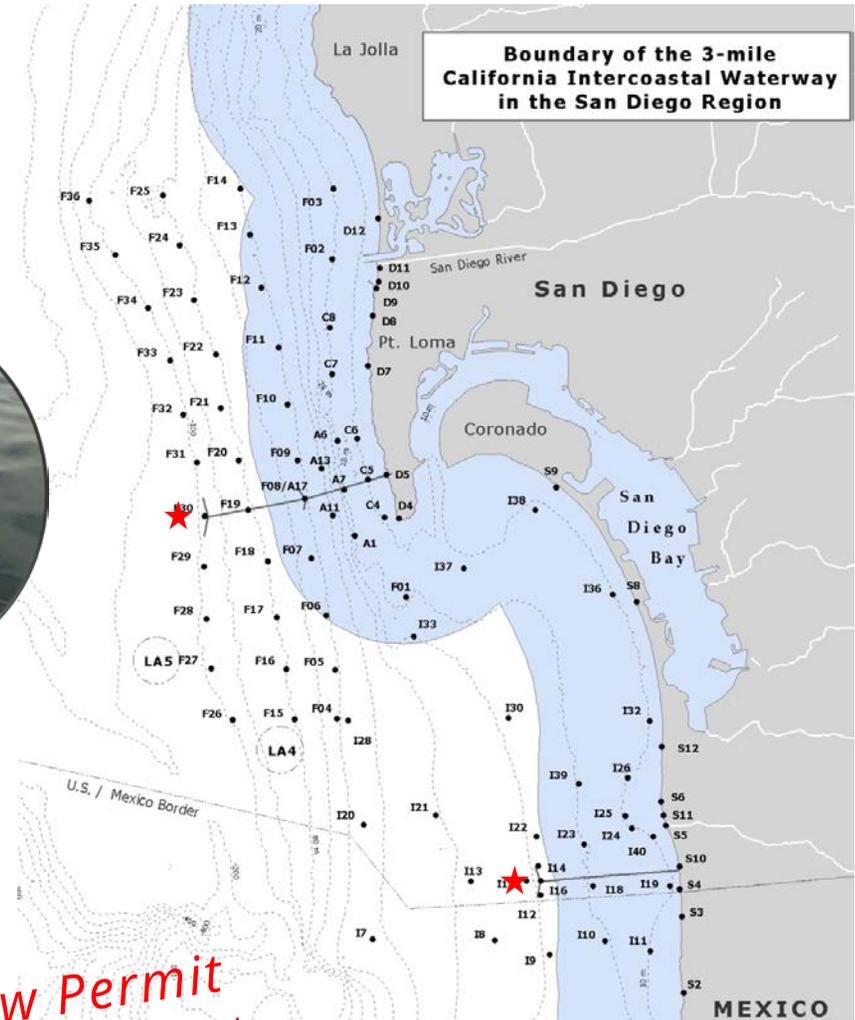
- ▶ Collaboration with Scripps Institution of Oceanography (SIO)
- ▶ New PLOO & SBOO moorings ★
- ▶ Augment SIO's existing Del Mar system ★
- ▶ Temperature, salinity, DO, pH, chlorophyll, nutrients, currents, etc.

## ● Improved monitoring

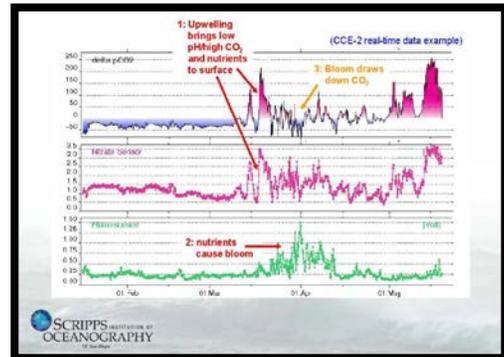
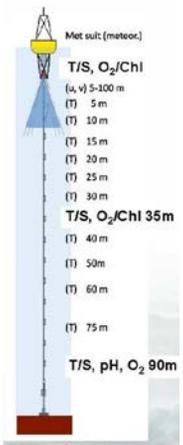
- ▶ Plume tracking & dispersion
- ▶ Ocean current patterns
- ▶ Climate change effects (e.g., OAH)
- ▶ Other emerging issues



★ Del Mar Buoy



New Permit Requirement

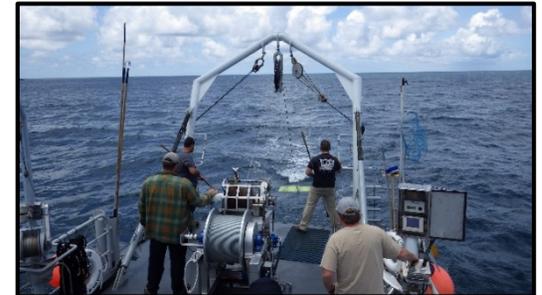
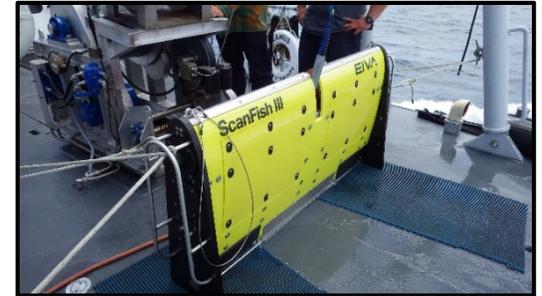




# Remotely Operated Towed Vehicle (Plume Tracking)

- **New ROTV for improved water quality monitoring and plume tracking**

- ▶ *Computer controlled “wing” can be programmed to undulate through water column while under tow*
- ▶ *Transmits continuous streams of data*
- ▶ *Higher resolution data for improved plume modeling*
- ▶ *Allows for more adaptive plume tracking*
- ▶ *Capture events often missed during traditional sampling operations (e.g., upwelling, plankton blooms)*



*ROTV operations aboard R/V Oceanus.*



*Simulation of ROTV movement throughout water column.*

**New Permit Requirement**



# Benthic Sediment Quality

- **Field Sampling**

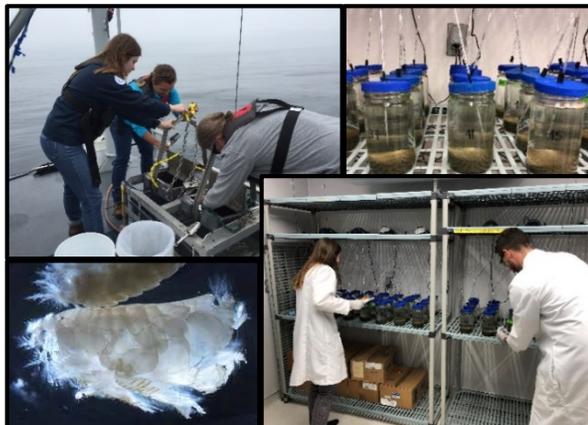
- ▶ 67 stations, semiannual/annual
- ▶ Double Van Veen grab (0.1 m<sup>2</sup>)

- **Sediment Type & Chemistry**

- ▶ Particle size (sand, silt, clay)
- ▶ Chemistry (total organic carbon and nitrogen, sulfides, metals, PCBs, pesticides, PAHs)

- **Sediment Toxicity**

- ▶ 8-28 stations/year
- ▶ 10-day amphipod tests





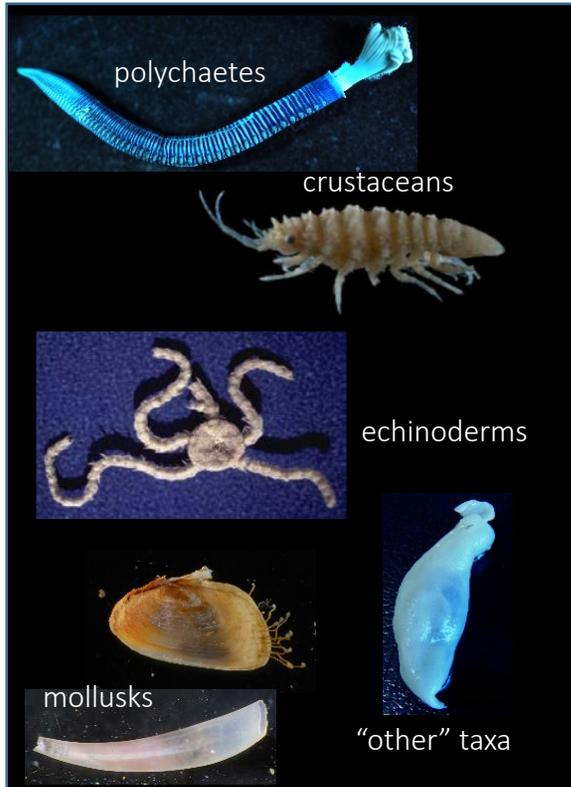
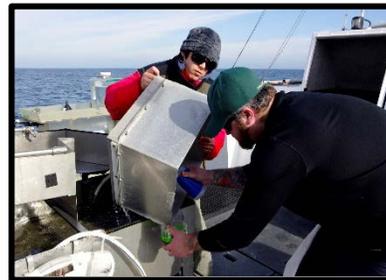
# Benthic Macroinvertebrate Communities

## ● Field Sampling

- ▶ 67 stations, semiannual/annual
- ▶ Double Van Veen grab (0.1 m<sup>2</sup>)

## ● Infaunal Invertebrates

- ▶ Species IDs and abundance
- ▶ Community analysis





# Trawl-Caught Fish & Invertebrate Communities

- **Field Sampling**

- ▶ *7 stations, semiannual*
- ▶ *Otter trawls (25 ft long)*
- ▶ *10 minute bottom time*

- **Community Analysis**

- ▶ *Bottom dwelling (demersal) fishes*
- ▶ *Large epibenthic invertebrates*





# Contaminants in Marine Fishes

- **Field Sampling**

- ▶ 7 zones, annual
- ▶ Otter trawls (5 zones)
- ▶ Rig fishing (2 zones)

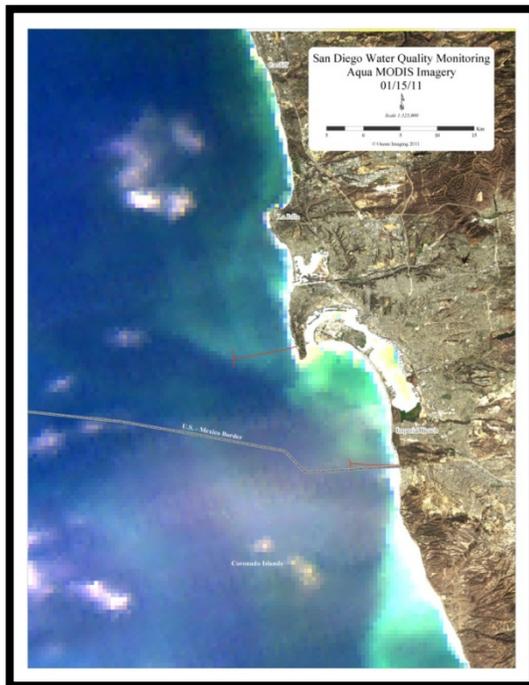
- **Contaminant Bioaccumulation**

- ▶ Liver tissues (trawl zones)
  - Target species = flatfishes
- ▶ Muscle tissues (rig fishing zones)
  - Target species = rockfishes



## ● Detecting sources and dispersion of coastal plumes

- ▶ Enhanced monitoring of the South Bay and Point Loma outfall regions
- ▶ Funded by City and USIBWC
- ▶ Conducted by Ocean Imaging, Inc. since 2002
- ▶ Satellite and aerial imagery (2-500 m resolution)



*MODIS Imagery*



*Landsat TM5 Imagery*



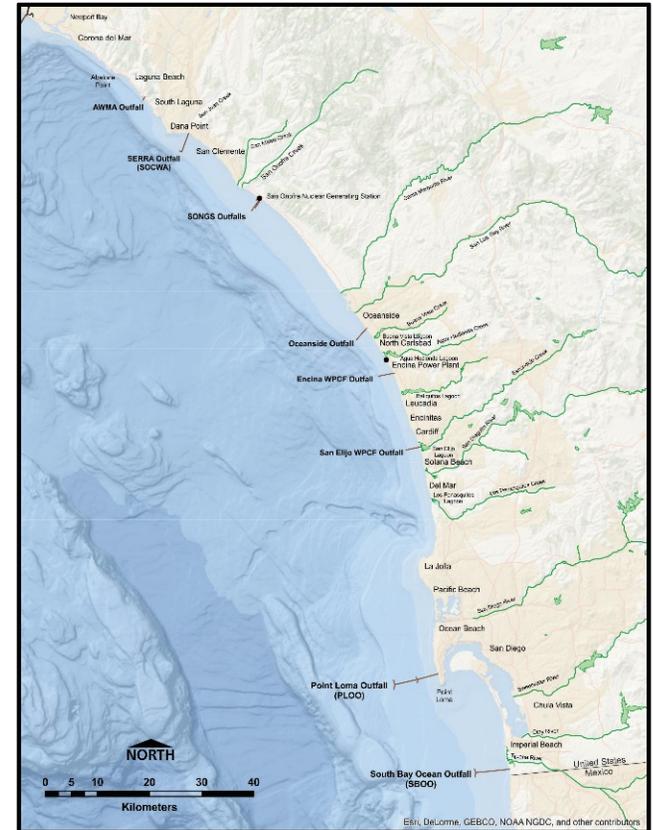
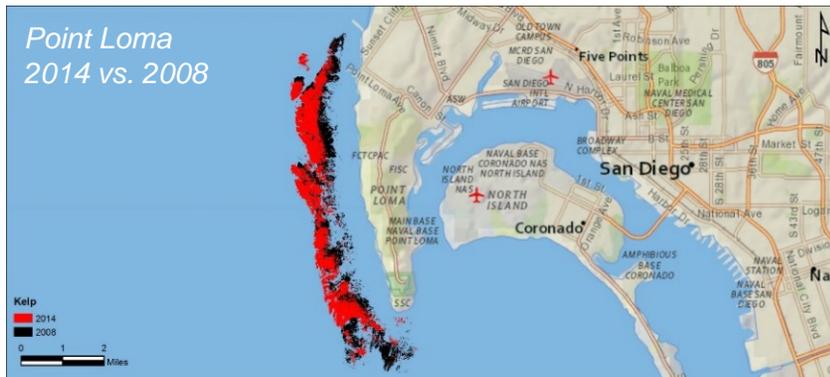
*Rapid Eye Imagery*



# Aerial Kelp Bed Surveys

## ● Southern California Aerial Kelp Bed Surveys

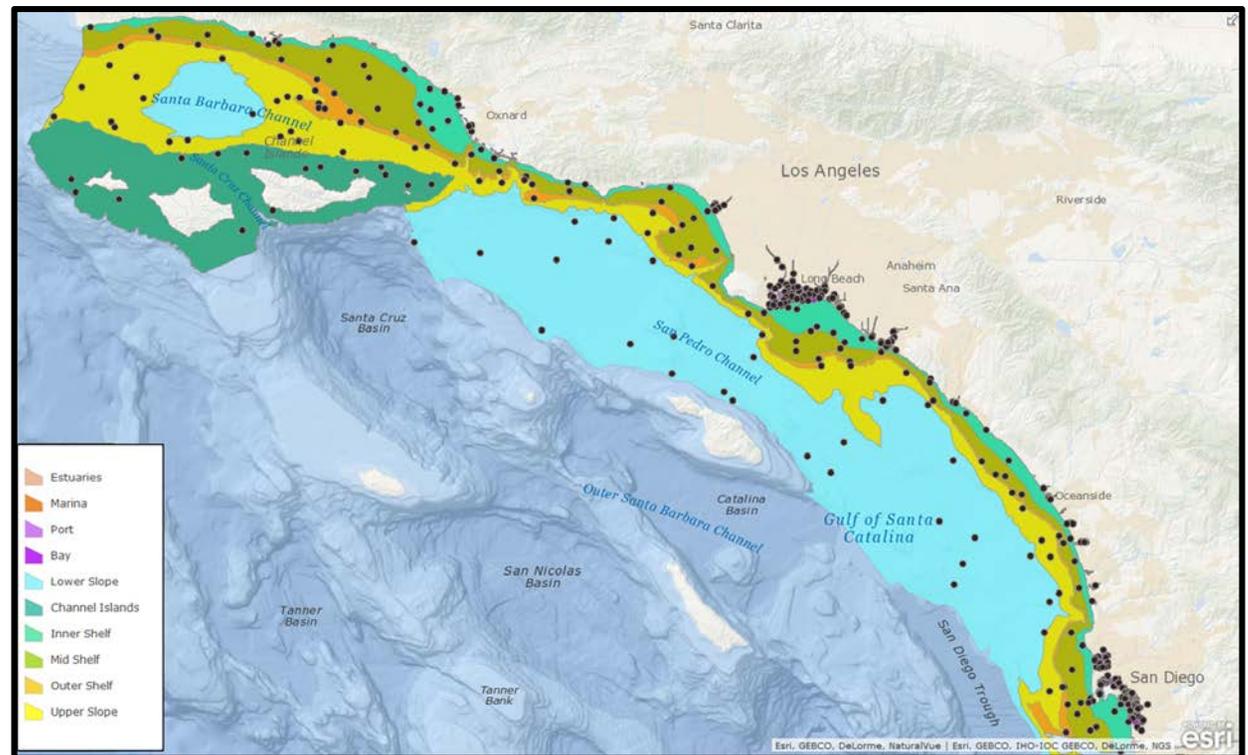
- ▶ Quarterly surveys of kelp canopy coverage since ~1982
- ▶ San Diego, Orange, Los Angeles, Ventura Counties
  - Region 9 Kelp Survey Consortium
  - Central Region Kelp Survey Consortium
- ▶ Conducted by MBC Aquatic Sciences



Region 9 Survey Area

● **Southern California Bight Regional Monitoring Program**

- ▶ *Managed and coordinated by SCCWRP about every 5 years (1994 – present)*
- ▶ *Multiple agencies (e.g., City, IBWC, other dischargers, academic institutions)*
- ▶ *Multiple components per project*
- ▶ *Previous projects*
  - *1994 (Pilot Project)*
  - *1998 (Bight'98)*
  - *2003 (Bight'03)*
  - *2008 (Bight'08)*
  - *2013 (Bight'13)*
- ▶ *Present project (Bight'18)*
  - *Sediment Quality*
  - *Ocean Acidification*
  - *HABs*
  - *Trash & Debris*
  - *Microbiology*



*Bight'18 Sediment Quality Monitoring Stations*



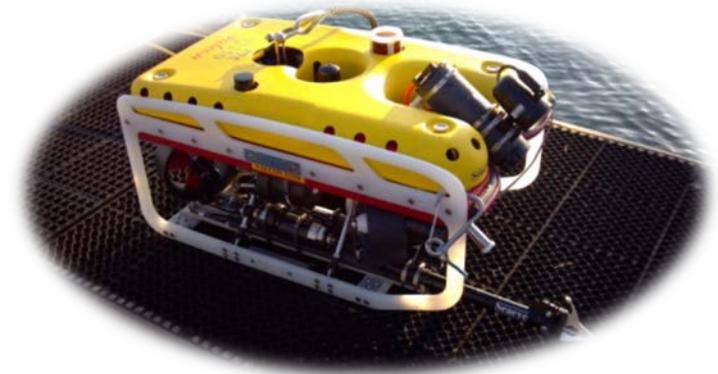
# Outfall Inspection Surveys

- **NPDES Permit and/or State Land Lease Requirements**

- ▶ *PLOO = NPDES + Lease*
- ▶ *SBOO = Lease only*
- ▶ *Conducted and funded by City of San Diego*

- **External ROV video surveys**

- ▶ *Main outfall barrels, risers, access hatches*
- ▶ *Outfall “wye” structures*
- ▶ *N&S diffuser legs and termination structures*



*SAAB Seaeye Falcon ROV*

*Deployment and operation of ROV from R/V Oceanus*





# Present Conditions & Future Challenges

- **Ocean conditions generally good in vicinity of SBOO and not impacted significantly by wastewater discharge**
  - ▶ *Compliance with Ocean Plan water contact standards high except along shore during and immediately after storms events*
  - ▶ *No evidence of SBOO plume reaching nearshore recreational waters*
  - ▶ *Benthic conditions good with no evidence of habitat degradation or impacted communities*
  - ▶ *Fish populations remain healthy and characteristic of reference areas*
- **Refining and improving plume tracking capabilities**
  - ▶ *Enhance networking of SBOO, PLOO and Del Mar real-time moorings*
  - ▶ *Develop and evaluate adaptive monitoring strategies utilizing ROTVs or AUVs*
- **Other and emerging issues**
  - ▶ *Other sources of coastal pollution (e.g. outflows from rivers and bays, storm water discharges, terrestrial runoff during storms, transboundary flows from northern Baja)*
  - ▶ *Climate change effects (e.g., ocean acidification and hypoxia)*

*Overall, the City's Ocean Monitoring Program remains scientifically sound and fully capable of addressing the above and other issues.*



Coming Soon

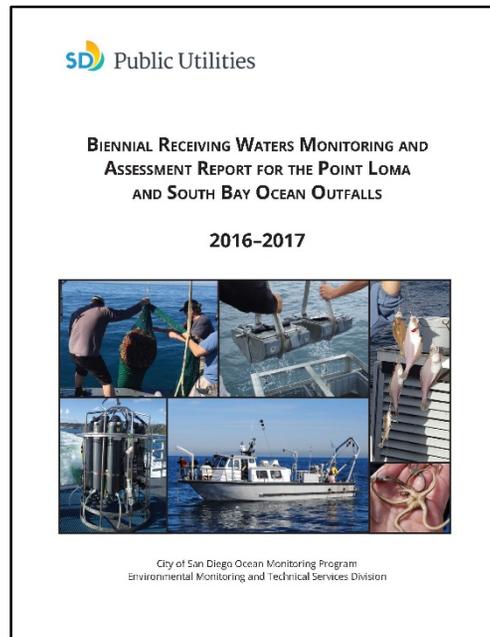
# State of the Ocean, 2016-2017

*Highlights of the City of San Diego Ocean Monitoring Program  
for the Point Loma and South Bay Ocean Outfalls*

Wednesday, October 10, 2018

San Diego Regional Water Board  
2375 Northside Drive, Suite 100  
San Diego, CA 92108

*New Permit  
Requirement*





# Questions

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