Status of Sediment Cleanup Activities at Solar Turbines & Goodrich Aerostructures

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San Diego Regional Water Quality Control Board

Solar Turbines Vicinity Map

Regulatory Context - Solar Turbines

- DTSC is administering agency under Site Designation Process (HSC, Chapter 6.65)
- "The Administering Agency administers all state and local laws, ordinances, regulations, and standards … at the site". [HSC, section 25264(a)]
- RWQCB and the Department of Fish & Game are support agencies

Status of Ecological Risk/Sediment Quality Assessment

- Basic risk assessment approach was approved in 1998
- Procedure follows DTSC's Guidance for Ecological Risk Assessment
- Report was submitted in May of 2002 and is currently under review
- Risk assessment does not address discharge issues

Manufacturing Processes Related to Gas Turbine Production

- Foundry operations, metal melting, metal casting, degreasing, parts cleaning, plating, milling and painting operations
- Hazardous waste treatment units
- Underground storage tanks

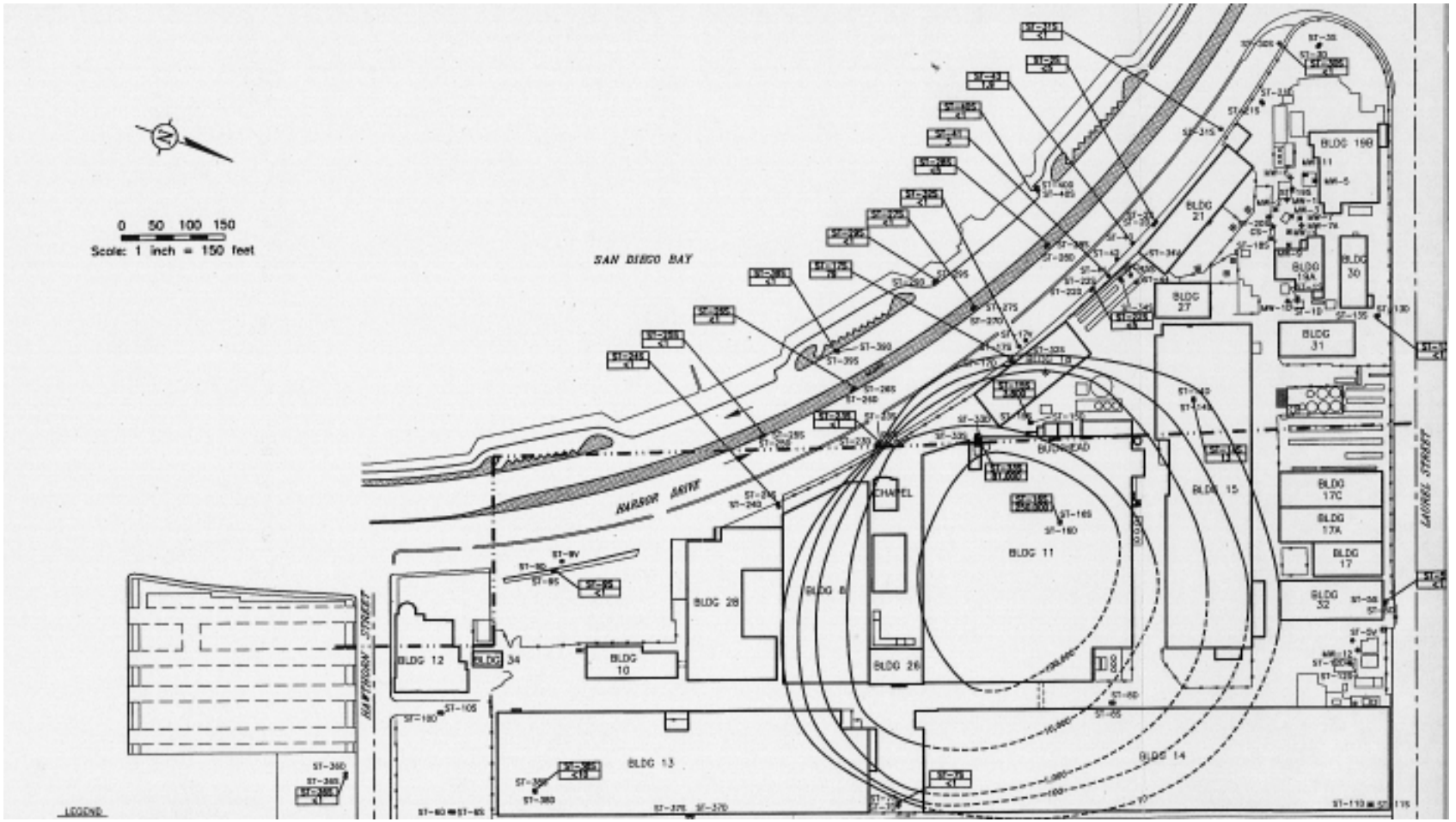
Major Contaminant Impacts - Solar Turbines

- Chlorinated Solvents (TCE)
- Metals (chromium, lead, zinc, copper & nickel)
- Petroleum Hydrocarbons (Benzene, Polynuclear Aromatic Hydrocarbons)
- Polychlorinated Biphenyls (PCBs)

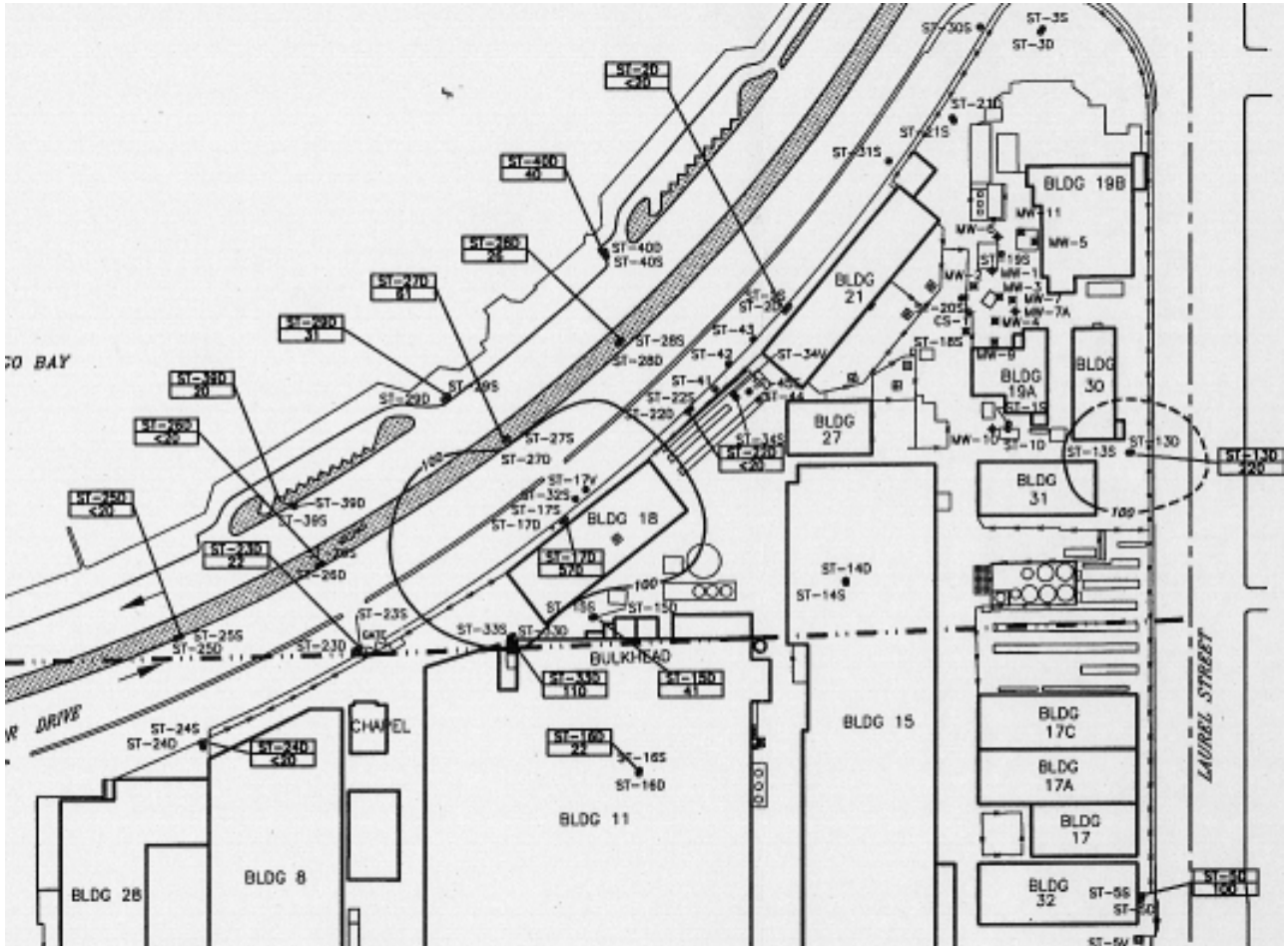
Sediment Impacts

- Polychlorinated Biphenyls (PCBs)
- Metals (chromium, lead, zinc, copper & nickel)
- Polynuclear Aromatic Hydrocarbons (PAHs)
- Chlorinated Hydrocarbons (VOCs)

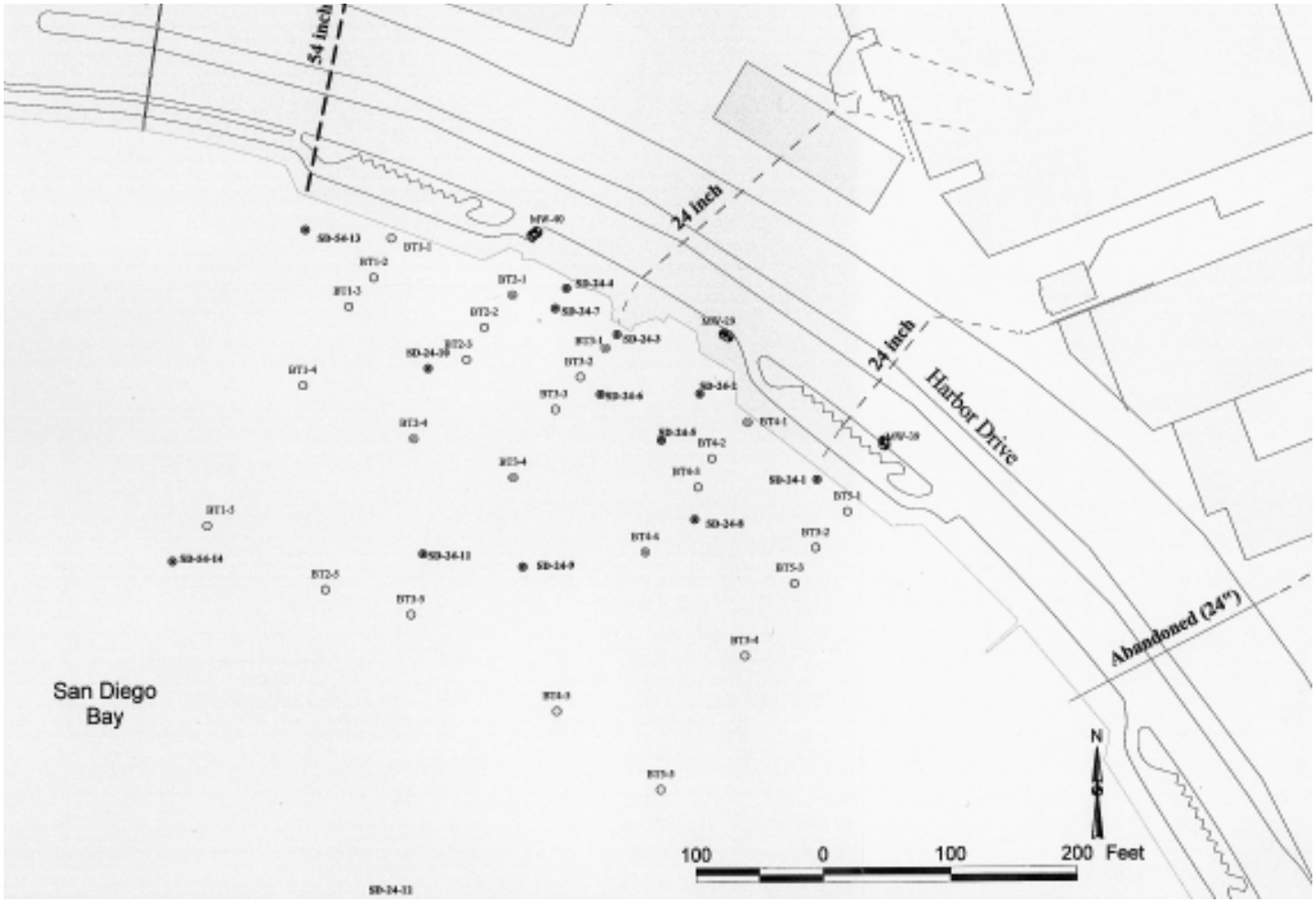
TCE Plume at Solar Turbines



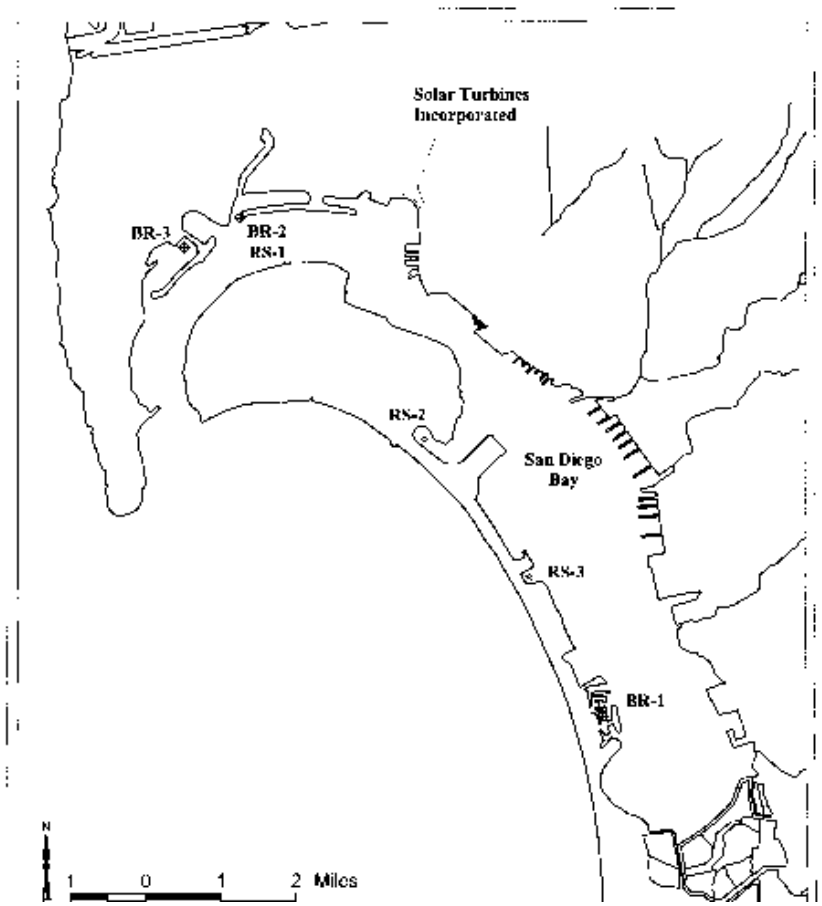
Zinc Plume in Groundwater



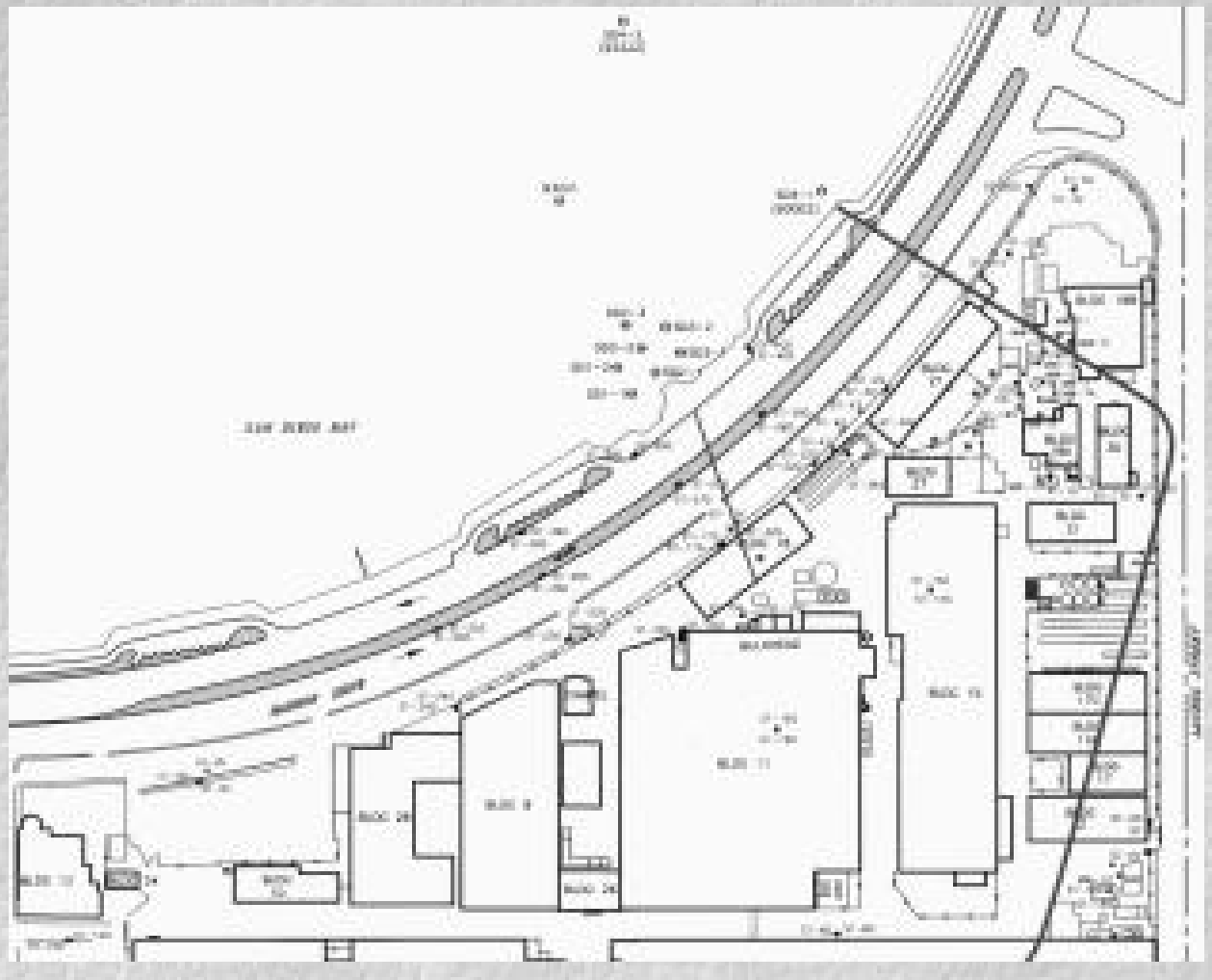
Groundwater Migration Pathway- 25 Porewater Sampling Locations



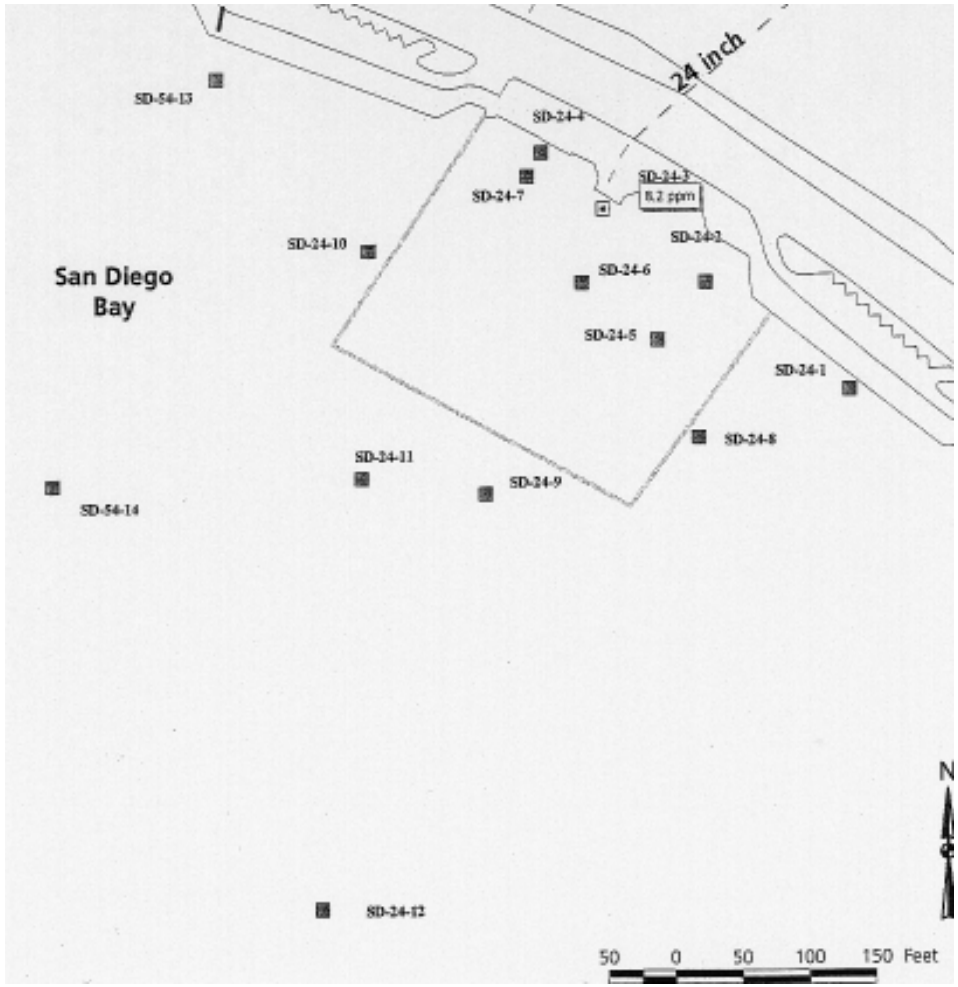
Pore Water Reference Sites



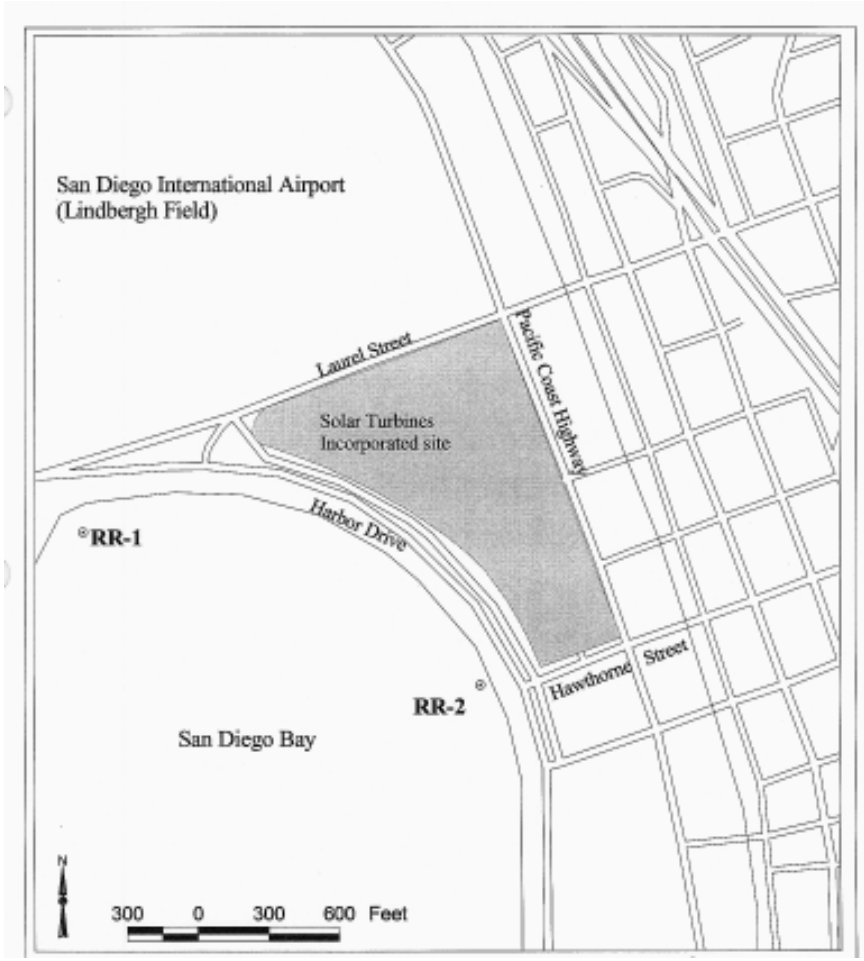
24-Inch Drain Pathway



14 Sediment Sampling Locations Near the 24-Inch Drain



Solar Turbines
Regional Reference Sites



Basic Elements of Tiered Approach to Ecological Risk

- Tier 1 Screening
  - Compares conservative reference values to worst case contaminant concentrations
  - Contaminant concentrations that exceed screening levels are carried into Tier 2 analysis
- Tier 2 Risk Assessment
  - Attempts a more realistic, yet conservative analysis of actual risk
  - Contaminants failing Tier 2 require cleanup

Exposure Pathways & Receptors

- Pore water exposure (via groundwater flow)
  - Direct exposure to benthic community
  - Food chain exposure to fish, birds & humans
- Sediment exposure (24-Inch Drain area)
  - Direct exposure to benthic community
  - Food chain exposure to fish & birds

Tier 1 - Groundwater Migration Pathway (Pore Water)

- Considers:
  - METALS IN PORE WATER (bay bottom samples)
  - VOCs IN POREWATER (shore line well data)

- IF MAX CONCENTRATION > AWQCs

  GO TO TIER 2

Tier 1 - 24-Inch Drain Pathway

- Considers measured sediment concentrations outside the 24-inch drain
- IF MAX CONCENTRATION > ERL

  GO TO TIER 2

  If no ERL, GO TO Tier 2
- For PAHs & PCBs
  - Models pore water concentrations
  - IF MAX CONCENTRATION > AWQCs

    GO TO TIER 2

Overview Ecological Risk Assessment - Tier 2

- Toxicity data from literature used to set Threshold Limit Values (TLVs)
- Contaminant levels are 95% UCL
- Models bioaccumulation using Toxicity Reference Values (TRVs)
- Calculates Hazard Quotient (HQ)

HQ = Pore Water Concentration/TLVw or

HQ = Sediment Concentration/TLVsd or

HQ = Tissue Concentration/TRV

Tier 2 - Groundwater Migration Pathway Direct Exposure

- Pore water 95% UCL > TLVw?
  - For benthic community
  - For demersal fish

- Porewater concentrations also compared to background concentrations

Tier 2- Groundwater Migration Pathway Food Chain Exposure

- Modeled tissue levels > TRV?
  - For fish
  - For fish-eating birds
  - For fish-eating humans

- Tissue levels modeled using standard bioconcentration factors (BCFs)

Tier 2 - 24-Inch Drain Pathway
Direct Exposure

- Sediment 95% UCL > TLVsd?
- Modeled pore water 95% UCL (PCBs) > TLVw?
- Sediment levels also compared to background concentrations

Tier 2 - 24 - Inch Drain Pathway
Food Chain Exposure

- Modeled tissue levels > TRV?
  - For benthic-feeding birds (lesser scaup)

- Tissue levels modeled using standard bioconcentration factors (BSAFs)

Also in Tier 2 - Benthic Community Analysis

- Six sediment samples from upper 6 inches compared with 3 bay-wide reference samples
- Species richness, abundance and evenness were similar to reference sites
- Species diversity and dominance were slightly lower at Solar Turbines
- TOC and grain size were similar to reference sites

Results: Groundwater Migration Pathway

- HQ for TCE in pore water was 7 for benthic community and 2 for fish exposure

- Conclusion in report: No significant risk
  - Use of well data to represent pore water data is too conservative
  - Risk assessment assumptions are conservative

Results: 24-Inch Storm Drain Pathway

- HQ for lead in sediment (benthic invertebrates exposure) was 1.2

- Conclusion: No significant risk
  - Regional background samples were about the same as the lead sediment value
  - HQ not significantly above 1

Results (continued): 24-Inch Storm Drain Pathway

- HQ for PCBs in pore water (benthic invertebrates exposure) were 1.3

- No significant risk:

  "small exceedence of a highly conservative toxicity threshold concentration in a small spatial area is not likely to result in significant impacts"

Table 3-20. BERA Tier 2 - Spatial PCB Risk Analysis
Solar Turbines, Incorporated, San Diego, California

			Individual Sample Location PCB Analysis			
			Sediment		Modeled Porewater	
Sample Location	Sediment Concentration	Modeled Porewater Concentration	TLV_{sd} - invertebrate	HQ	TLV_{w} - invertebrate	Invert HQ
PBCs						
SD-24-1*	1.2	4.79E-05	2.8	0.4	0.00016	0.30
SD-24-2	1.2	4.91E-05	2.8	0.4	0.00016	0.31
SD24-3*	8.2	6.50E-04	2.8	2.9	0.00016	4.1
SD-24-4	1.4	8.84E-05	2.8	0.5	0.00016	0.55
SD-24-5	1.9	1.08E-04	2.8	0.7	0.00016	0.68
SD-24-6	1.8	1.28E-04	2.8	0.7	0.00016	0.80
SD-24-7	2.4	1.79E-04	2.8	0.9	0.00016	1.1
SD-24-8	1.6	8.69E-05	2.8	0.6	0.00016	0.54
SD-24-9	0.55	4.16E-05	2.8	0.2	0.00016	0.26
SD-24-10	1.9	1.66E-04	2.8	0.7	0.00016	1.0
SD-24-11	0.72	5.12E-05	2.8	0.3	0.00016	0.32
SD-24-12*	0.46	2.28E-05	2.8	0.2	0.00016	0.14
SD-54-13	0.29	1.87E-05	2.8	0.1	0.00016	0.12
SD-54-14	0.37	2.29E-05	2.8	0.1	0.00016	0.14
RR-1	1.2	7.10E-05	2.8	0.4	0.00016	0.44
RR-2	0.49	1.30E-05	2.8	0.2	0.00016	0.08

Solar Turbines Ecological Risk Assessment Issues

- Is the 95% UCL acceptable?
- Are literature-derived TLVs acceptable?
- Should water quality objectives be in Tier 1?
- Are background samples acceptable?
- Are shoreline wells representative of Bay pore water?
- Discharges through shoreline wells must still be addressed.

Goodrich Aerostructures
Chula Vista, CA

Regulatory Context

- RWQCB is the informal lead agency

- The California Department of Fish & Game and the US Fish & Wildlife Service are support agencies

Goodrich Aerostructures Site Location Map

Aerial View of Outfall 1 Estuary

View Looking Toward Outfall 1

Big Differences Between This Site & Other Sediment Sites

- Estuarine conditions
  - Different receptors
  - Different physical & chemical environment
  - Dynamic, often non-equilibrium conditions
- Small impacted area
- Easy access to sediment

Processes Associated With Aerospace Production Activities

- Foundry operations, metal melting, metal casting, degreasing, parts cleaning, plating, anodizing, milling and painting operations
- Hazardous waste treatment units
- Underground storage tanks

Major Contaminant Impacts - Goodrich Aerostructures

- Chlorinated Solvents (TCE, PCE, TCA, etc.)
- Metals (chromium, lead, zinc, copper & nickel)
- Petroleum Hydrocarbons (Benzene, Polynuclear Aromatic Hydrocarbons)

Sediment Contaminants

- Metals (chromium, lead, zinc, copper & nickel)
- Polychlorinated Biphenyls (PCBs)
- Polynuclear Aromatic Hydrocarbons (PAHs)

Metals Levels Found in Sailfin Mollies From Marsh (2000 Data)

	Chromium (mg/kg)	**Copper** (mg/kg)	**Lead** (mg/kg)	**Nickel** (mg/kg)
Tissue Level (mg/kg)	**0.89**	**4.39**	**0.472**	**0.232**
95% EDL (mg/kg)	**0.25**	**3.96**	**0.53**	**0.42**

Summary of Results of Sediment Testing Near Outfall 1

- 10 samples obtained within 160 feet of the outfall exceeded ERLs for at least one contaminant
- 8 out of 10 samples obtained within 160 feet of the outfall exceeded ERMs for at least one contaminant
- All 5 samples obtained from 178 feet to 500 feet downstream were below ERLs

Aerial View of Outfall 1 Estuary

Status of Sediment Approach at Goodrich Aerostructures

- Work plan is currently under review by SDRWQCB, the Department of Fish and Game and the US Fish & Wildlife Service
- The work plan proposes:
  - Additional site assessment
  - Approach to ecological risk based on DTSC's Guidance for Ecological Risk Assessment

Additional Assessment

- Resampling to determine lateral and vertical extent of impacts
- Benthic community data
- Sampling of reference areas to determine background concentrations

Risk Assessment Protocol

- Scoping Assessment
- Tier 1 -
  - (1) Assess feasibility of cleaning up to background levels
  - (2) Assess feasibility of cleaning up to ERLs
  - (3) Determine bioaccumulative risks using TRVs
- Tier 2 -
  - (1) Sediment Quality Triad
  - (2) Impacts Assessment

Scoping Assessment

- Conceptual Site Model which links contaminant pathways to receptors
- Important receptors include:
  - Fiddler crab
  - Fish (Sailfin Molly)
  - Great blue heron
  - Coyote
  - Endangered species (least tern & clapper rail)

Tier 1 - Assessment of feasibility of cleaning up to background

- Will obtain background samples in similar areas and compare with sediment chemistry They propose:
  - Two locations at Gunpowder Point
  - One location near the Sweetwater River

- If it is feasible they will excavate all impacts - no further actions required

Tier 1 - Assessment of the feasibility of cleaning up to ERLs

- If it is feasible and acceptable they will remove all contamination that exceeds ERL
- Would still need to evaluate bioaccumulative risks separately
- Alternative screening criteria for contaminants that don’t have ERLs can be proposed

Tier 1 - Screening Level Assessment of Bioaccumulative Risks

- Risks will be determined using appropriate Toxicity Reference Values (TRVs)
- Tissue concentrations will be calculated using EPA standard partitioning values and/or measured tissue concentrations
- HQ = Tissue Concentration/TRV

Possible Outcomes of Tier 1 Screening Analysis

1. No further action

2. Removal of sediment to meet cleanup levels

3. Additional assessment of risks

Tier 2 - Baseline Risk Assessment

- Sediment Quality Triad
  - Chemistry
  - Benthic community analysis
  - Toxicity testing
- Possible outcomes:
  - No further action
  - Removal of sediment to meet cleanup levels
  - Additional Risk Assessment

Tier 2 - Impacts Assessment

- Fill any data gaps in Triad analysis
- Bioacummulation tests may be done
- Additional tissue tests may be performed

Goodrich Aerostructures Issues

- Much depends on determination of background concentrations - a difficult task
- Still need to complete assessment of the extent of contamination
- Still need to address three other outfalls at this facility