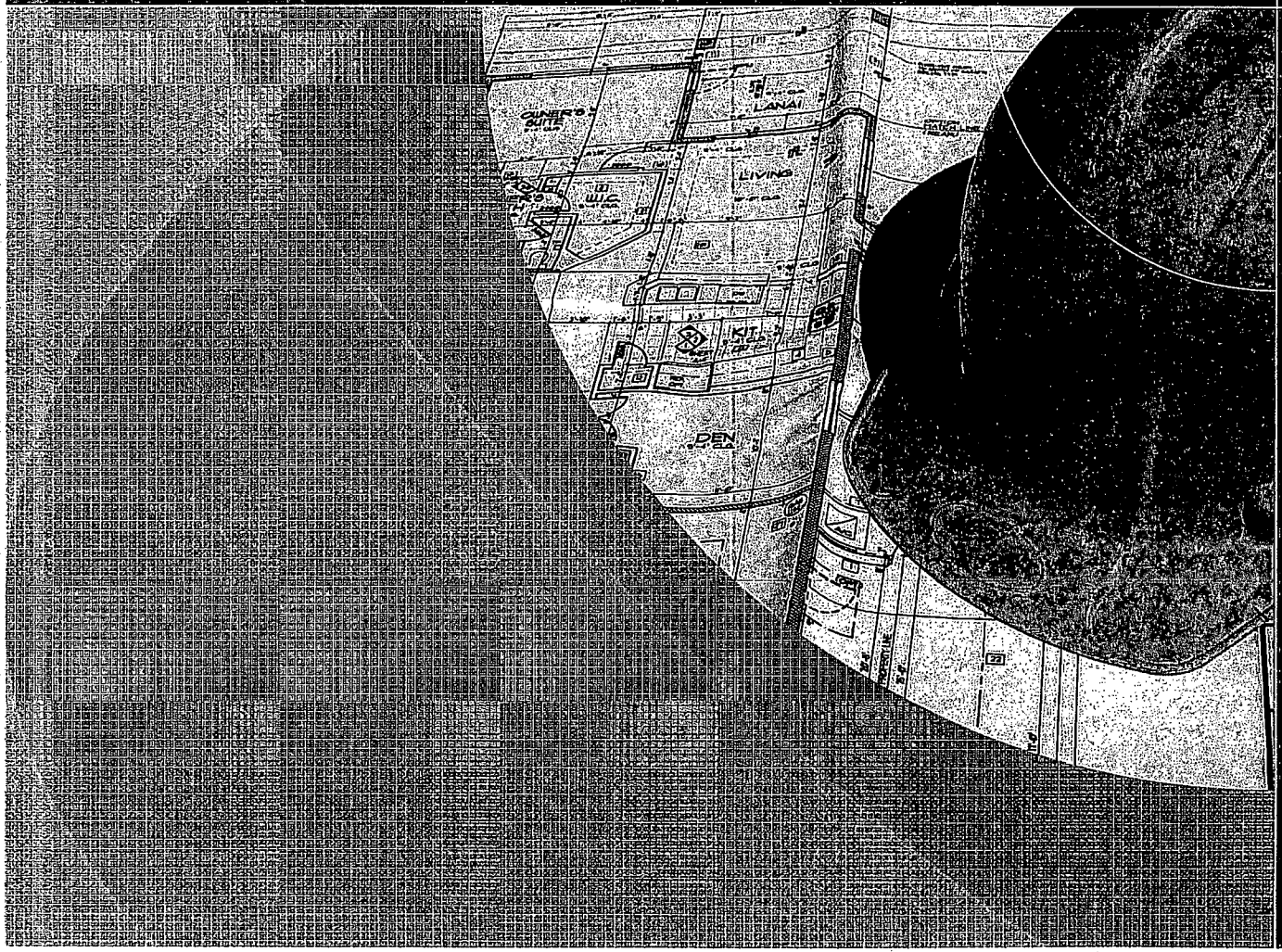
SDMS Document
149420

Remedial Investigation / Feasibility Study

Cabo Rojo Groundwater Contamination Site



Brendan MacDonald, SM
Seth Kellogg, RITM
Charlene Liu, HHRA

TECHNICAL SCOPING MEETING

January 9, 2012

CDM Smith

Project Team

Jeanne Litwin	Program Manager
Brendan MacDonald	Site Manager
Seth Kellogg	RI Task Manager
Charlene Liu	Human Health Risk Assessment
George Molnar	Ecological Risk Assessment
Tony Isolda	FS Task Manager
Susan Schofield	Technical Advisor
Frances Delano	Project Geologist

Objectives of this meeting

- Provide overview of Site and surroundings
- Provide overview of existing data
- Present and refine approach to the Remedial Investigation
- Discuss path forward

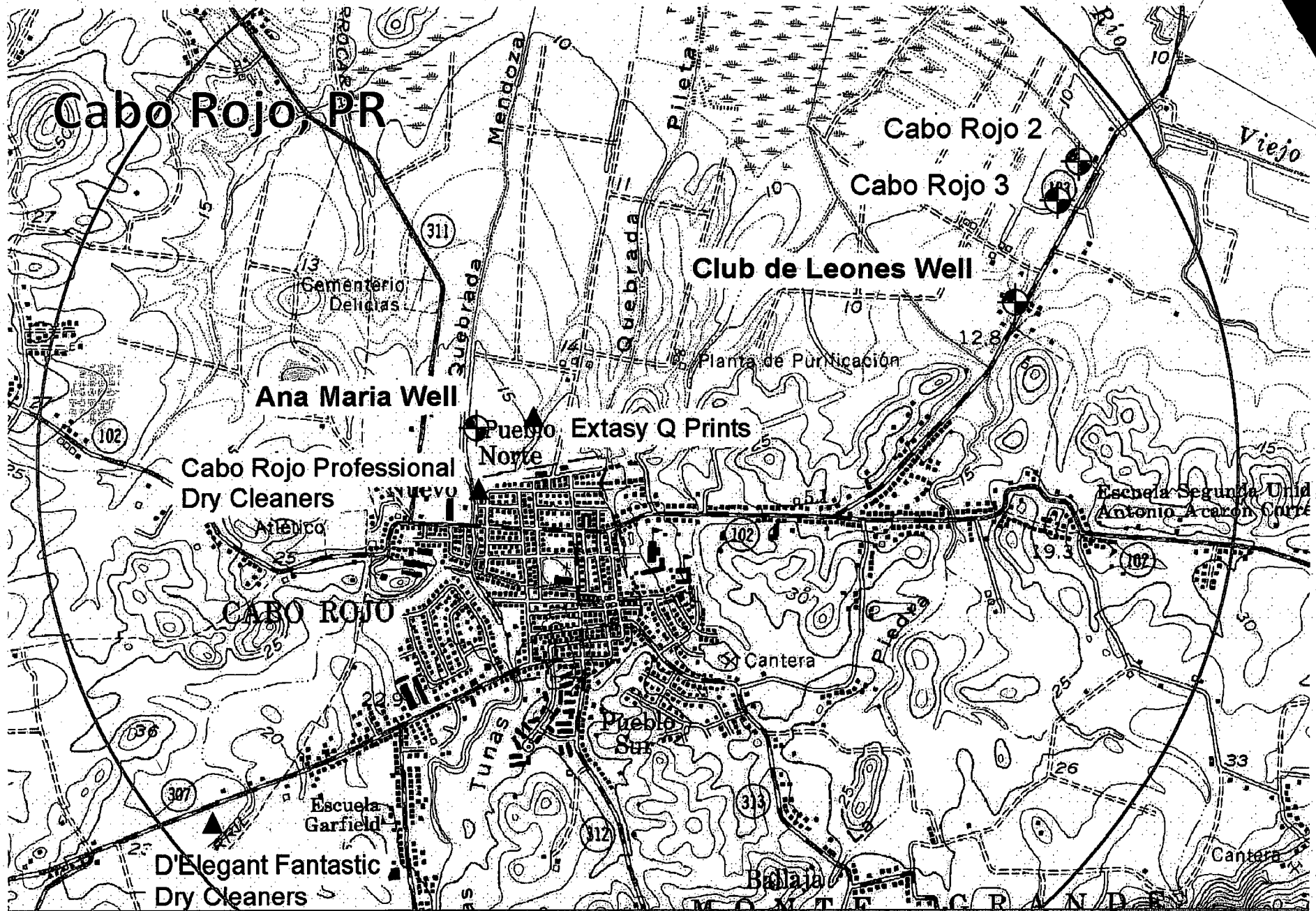
Cabo Rojo Groundwater Contamination Site

SITE DESCRIPTION

Cabo Rojo, PR

Cabo Rojo Groundwater Contamination Site Location

CDM Smith



Cabo Rojo Groundwater Contamination Site Location

CDM Smith

Cabo Rojo General

- Garment Manufacturing center
- Agriculture / Farming
- Water Supplies
  - Cabo Rojo Urbano System
    - 5 interconnected wells serve 45,055 persons
      - Cabo Rojo #2, Cabo Rojo #3, Club de Leones operating
    - formerly included Rio Guanajibo surface water
  - Ana Maria Well
    - Uniquely serves 1,856 persons
  - 14 to 20 area wells closed for reasons including VOCs < MCLs

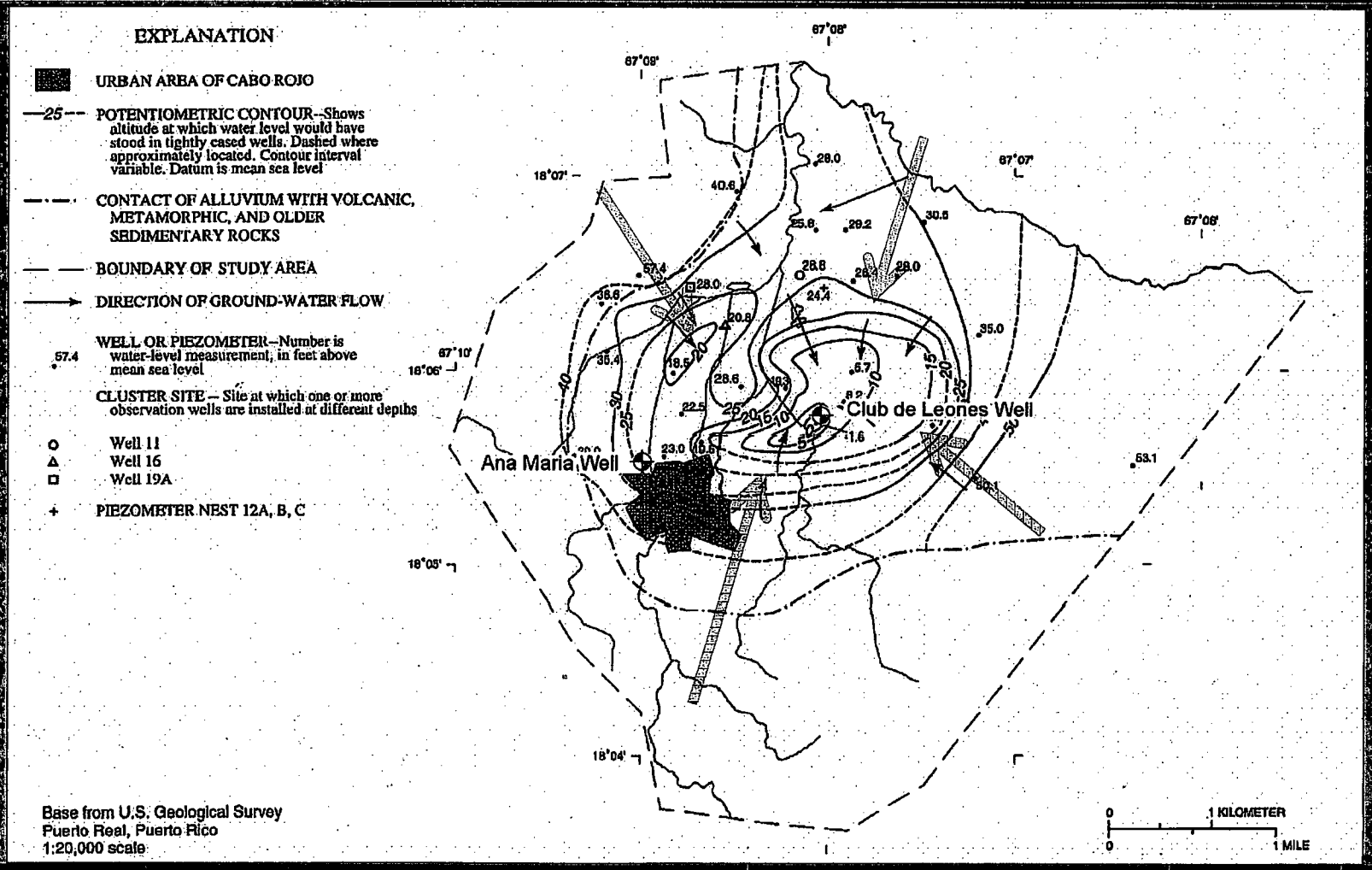
Site Geology and Hydrogeology

- Volcanic bedrock
  - Sabana Grande Formation
  - Lajas Formation
  - Yauco Formation
- Limestone bedrock (Cotui Limestone)
- Quaternary alluvium and swamp deposits
- Assume subsurface is fractured based on proximity of fault zones

Site Geology and Hydrogeology (continued)

- Study area aquifers consist mainly of alluvial deposits underlain by limestone bedrock
- Groundwater generally occurs under water-table conditions in the limestone and alluvial deposits
- Productive Aquifer
  - specific capacity: 2 to 18 (gal/min)/ft
  - transmissivity: 270 to 5,600 ft^2/day
- Groundwater flow direction strongly influenced by the public water-supply well field cone of depression

Groundwater Flow: driven by supply wells



CDM Smith

Surface Water

- Drainage flows from the highlands via local creeks into Rio Viejo river and Ciénaga de Cuevas swamp area
- The Ciénaga was once a discharge feature of the aquifer
- Segments of the Río Viejo system and Ciénaga de Cuevas swamp are now sources of recharge to the aquifer, a result of operating supply wells (Cabo Rojo 2, Cabo Rojo 3, and Club de Leones)

CDM Smith

Site Definition

Ana Maria well (200 ft bgs)

- 2002 – 2006 PCE and TCE < MCLs
- 2006 cis-1,2-DCE < MCL

Hacienda La Margarita well

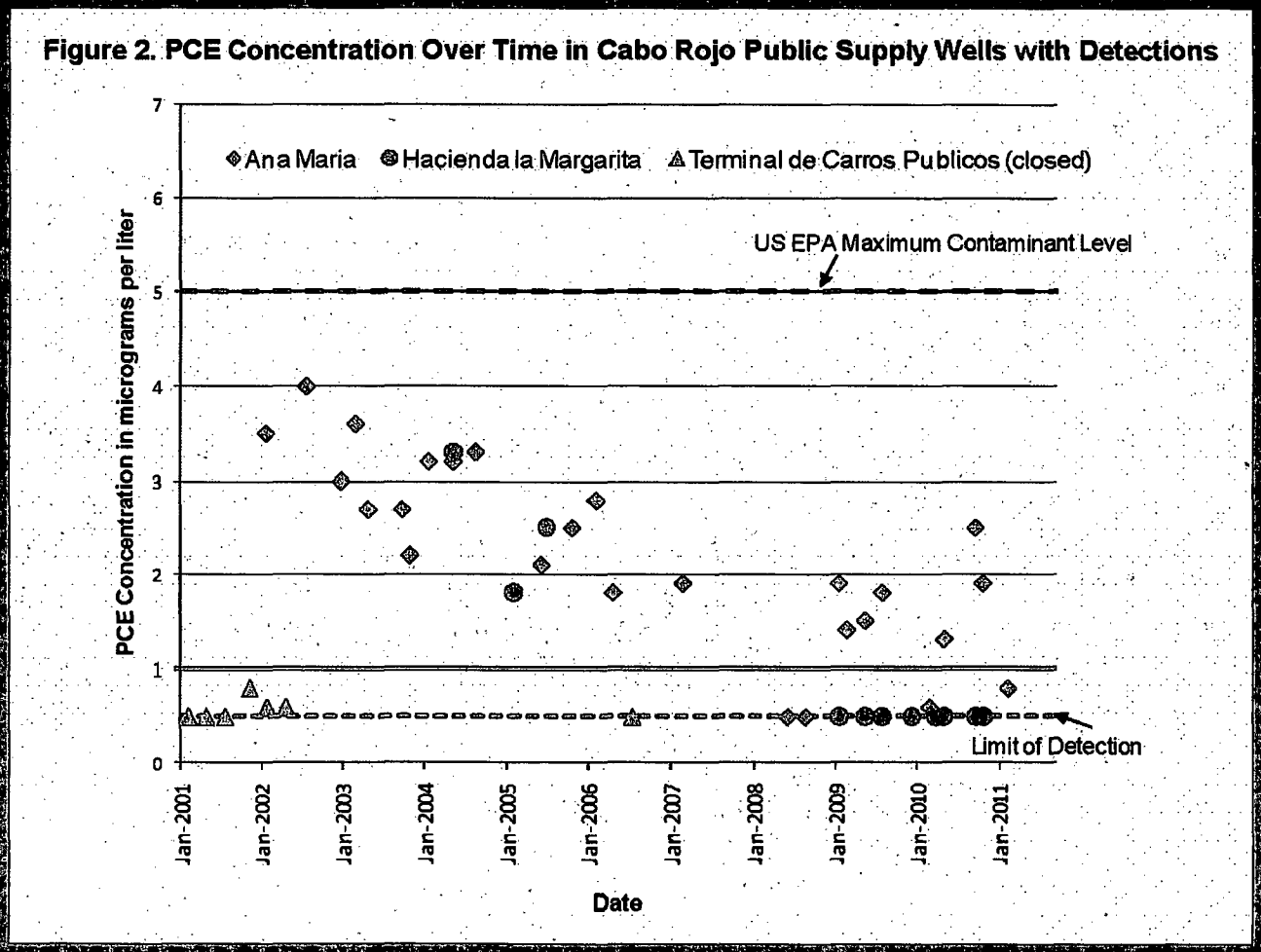
- 2004 – 2006 PCE and TCE < MCLs

Club de Leones well (150 ft bgs)

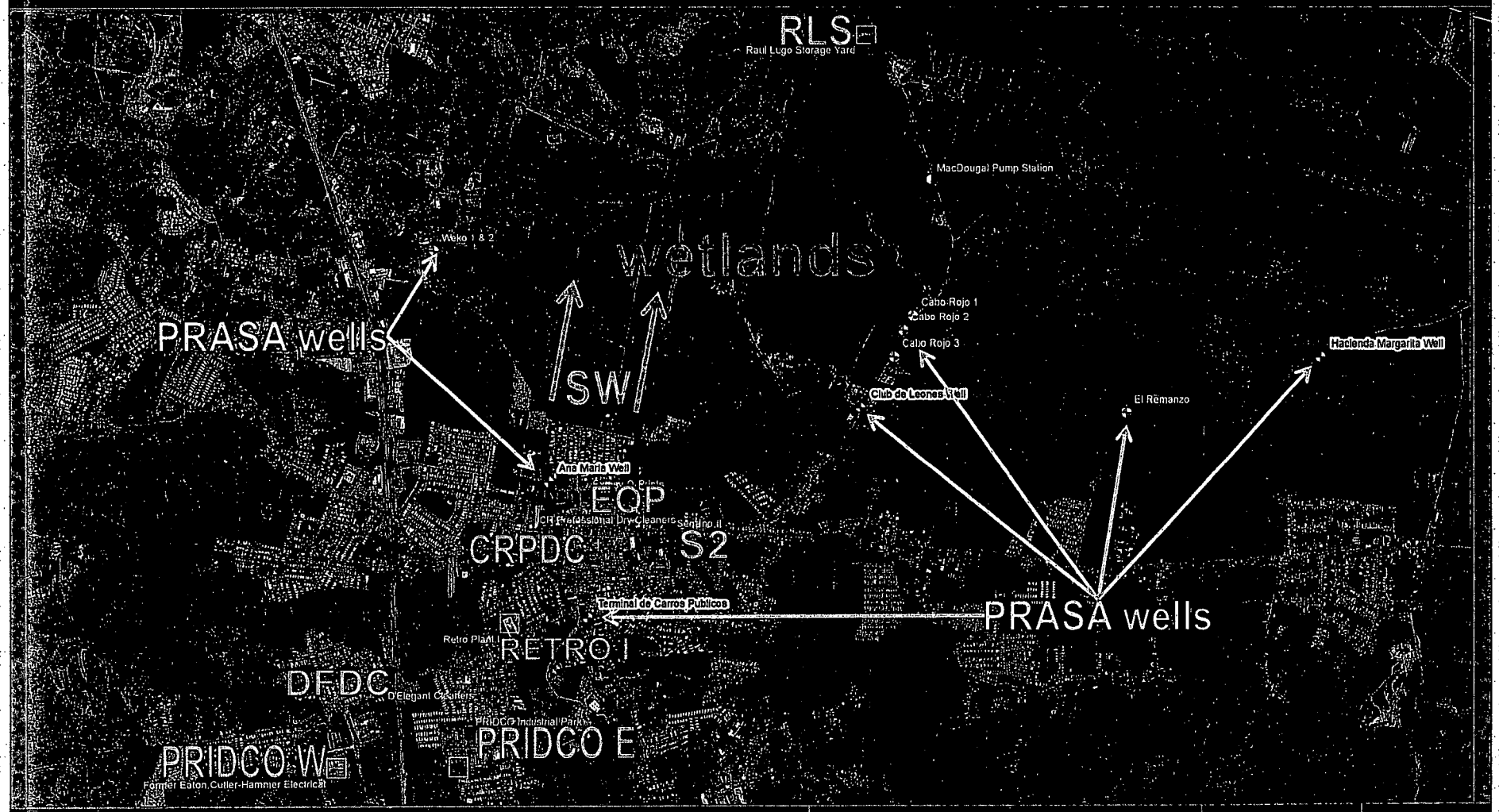
- 2006 1,1-DCE < MCL

No source of groundwater contamination confirmed.

Ana Maria Well: Continual PCE, TCE, cis-1,2-DCE detection < MCL



Site Definition



CDM Smith

Objectives of Remedial Investigation

Review/evaluate existing information to determine the minimum amount of data collection necessary to:

- complete characterization of the nature and extent of site contamination
- Identify ahd characterize sources of site contamination
- determine if a significant risk to human health or the environment exists
- support selection of a remedial approach

...all supporting a ROD

Historical investigations

USGS Hydrogeology and GW/SW relations

PRASA Monitoring

EPA Site Discovery Initiative

- Reconnaissance at 68 facilities → investigation at 12
- CVOC confirmations at 3 facilities
  - Soil: PCE (1)
  - Borehole GW: PCE (3), TCE (1), cis-1,2-DCE (1)
  - SV: PCE (3), TCE (3), cis-1,2-DCE (2)

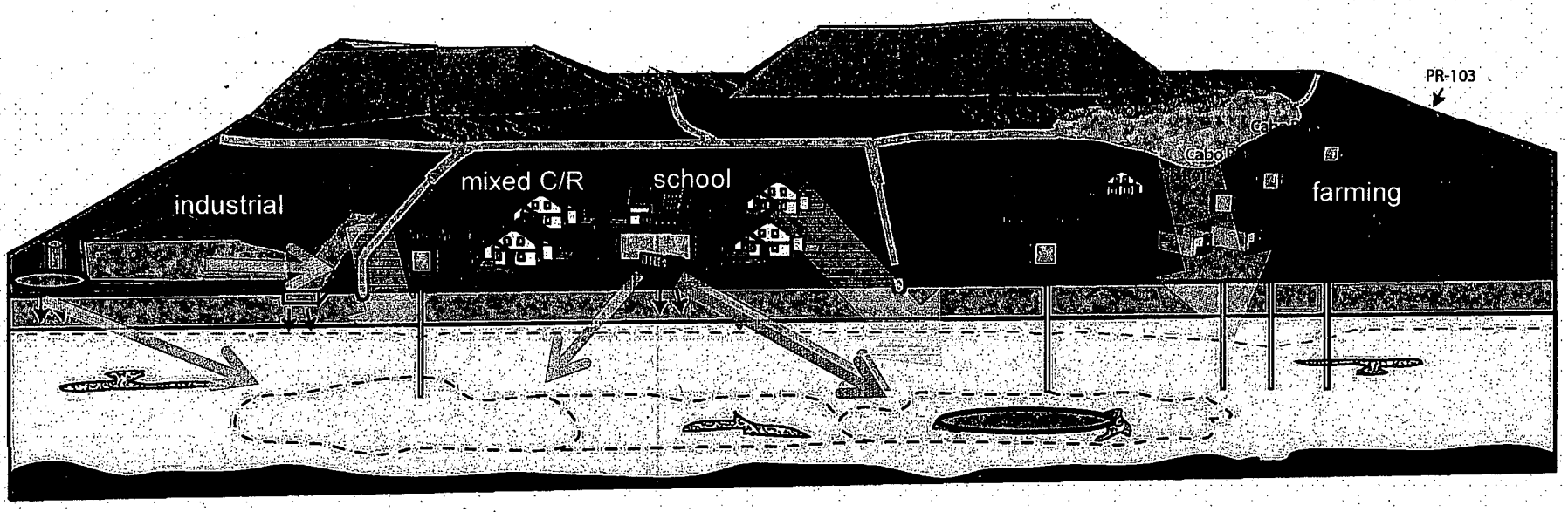
2011 Soil Vapor Investigation

- CVOC confirmations at 2 facilities
  - SV: PCE and TCE (1), DCE trace (1)

Key Assumptions

- Focused investigation of site-related contaminants (CVOCs)
- No migration to wetlands due to operation of supply wells
- No releases of CVOCs to catch basins
- Cabo Rojo Urbano system operation continues
- Future land use remains the same

Conceptual Site Model



LEGEND

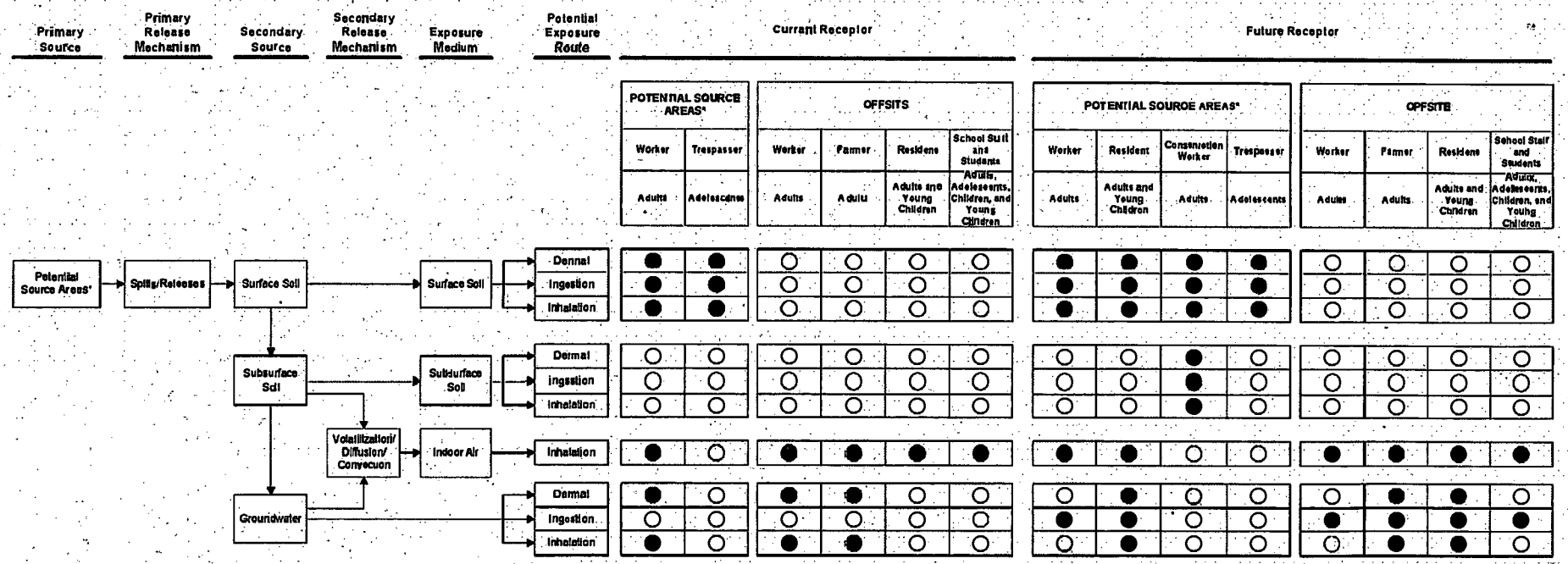
- Overburden
- Limestone rock
- Bedrock
- Potential solution features
- Groundwater and dissolved contaminant flow
- Water table
- Contamination plume

Not to scale

Conceptual Site Model
Cabo Rojo Groundwater Contamination Site
Cabo Rojo, Puerto Rico

CDM Smith

Conceptual Site Model



*Potential source areas currently include Cabo Rojo Professional Dry Cleaner, Extasy Q Prints, D'Elegant Fantastic Dry Cleaners, Lifescan, Cutler Hammer, PRIOCO Complex, Reto Plant 1, Raul Lugo Storage, and WR Recycling. Each potential source area may be evaluated separately.

Age Group: Adolescents 12-18 years old; Children 6-12 years old; Young Children 0-6 years old

Legend:

● complete exposure pathway

○ incomplete/insignificant exposure pathway

CDM Smith

Cabo Rojo Groundwater Contamination Site

PROPOSED INVESTIGATION

Field Investigation Sequence

- Potential Source Area (PSA) Reconnaissance
  - Collaborative Decision Point
- Production Well (PW) Evaluation
- PSA Investigations
- Drainage Features Investigation
  - Collaborative Decision Point
- Delineation of PSA Soil Contamination
  - Collaborative Decision Point
- Overburden and Multiport MW Installations
- Site-wide GW Sampling
- Indoor Air Evaluation (contingency)

Field Investigation Considerations

- Single Mobilization/Collaborative Reviews
- Focused Analytical Services
- Access
- Green Considerations

PSA Reconnaissance

Objective: to identify additional PSAs

- Assume up to 6 additional properties
  - Raul Lugo Storage Yard
  - Retro Plant 1
  - PRIDCO – West of PR 100
  - PRIDCO – East of PR 100
- Visual observations
- Interviews
- Identification of CBs / storm water features which may influence transport of contamination

Collaborative Decision Point

Reconnaissance Findings to be Discussed with EPA throughout activity and during concurrence teleconference

- Determine if further investigation is warranted for each PSA
- Receive concurrence on sampling locations for PSA Investigations
- Reevaluate site access requirements
- Update CSM
- Develop schedule for PSAs

Production Well Evaluation

Objective: Evaluate hydraulic properties and contaminant distribution within the production wells

- Removal of production wells from service (PRASA)
- Downhole geophysics
- Discreet interval sampling for VOCs and major cations / anions
- Continuous GW elevation measurement

Downhole Geophysical Logging

- Objective: provide data to define hydraulic properties (lithology, fracture zones, vertical flow, and water bearing zones)
  - Mechanical caliper
  - Optical and acoustic televiewer
  - Natural gamma
  - Vertical flow (static and pumped heat pulse flowmeter)
  - Fluid resistivity and fluid temperature
- Data evaluation in field to identify depths of wireline discrete fracture zone sampling

Fracture Zone Sampling

Objective: determine contaminant distribution within bedrock for site characterization and multiport MW design

- Discrete GW screening samples
  - TCL VOCs and major cations / anions w/48-hr TAT on preliminary results (explore local NELAP option)
- Logging data reviewed on an ongoing basis
- Conferring with EPA regarding sampling intervals
- 17 samples at each of 4 boreholes

PSA Investigations

Objective: Characterize the extent of contamination at the PSAs and evaluate the potential for contaminant transport by surface water or sediment

- Soil Vapor Screening Samples
- Soil Screening Samples
- Groundwater Screening Samples
- CB standing water and sediment sampling

CDM Smith

PSA Investigations

- Soil Vapor Screening (6 PSAs not previously investigated)
  - Samples at ≤10 locations screened via field GC for VOCs
  - 10% confirmatory analyses via fixed-base Laboratory
    - 1st PSA: 48-hr TAT
    - Subsequent properties : standard TAT
- Soil Screening
  - Continuous cores via DPT at 10 SBs to the water table (40 ft bgs)
  - ≤ 30 samples screened via field GC for site-related VOCs
    - 0-2 ft bgs
    - water table
    - interval of highest PID reading

PSA Investigations (Continued)

- Groundwater Screening
  - Samples from ≤ 6 locations via DPT
    - water table
    - above bedrock
  - ≤ 12 samples screened via field GC for site-related VOCs
  - 10% confirmatory analyses via fixed-base laboratory (standard TAT)
- Catch Basin (CB) Sampling
  - Assume features to be sampled at 6 PSAs
  - ≤ 3 standing water samples for VOC and hardness via CLP
  - ≤ 3 sediment samples for VOC and TOC via CLP

CDM Smith

Collaborative Decision Point

Findings to be discussed with EPA throughout activity and during concurrence teleconference following each of 9 PSA investigations

- Preliminary results of VOCs in bedrock GW
- Preliminary results of PSA investigations (VOCs in soil and GW); concur on release confirmations
- Concur on inferred flow directions
- Determine need for source area soil delineation
- Determine if indoor air investigation is warranted.
- Revise CSM
- Propose locations for overburden wells at PSAs

PSA Soil Contamination Investigation

Objective: Delineate the horizontal and vertical extent of PSA soil contamination to support the risk assessments and feasibility study.

- Continuous cores via DPT at 10 SBs to the water table (40 ft bgs)
- ≤ 30 samples analyzed via CLP for TCL VOCs and TAL Metals
  - 0-2 ft bgs
  - interval of highest assumed contamination
  - Assumed 'clean' bottom
  - 50% for soil moisture, TOC, pH and grain size

CDM Smith

Monitoring Well Installations

Objectives

- Evaluate GW quality in overburden at PSAs
- Evaluate contaminant migration and upgradient conditions
- Characterize vertical and horizontal distribution of contamination within bedrock
- Evaluate contaminant flow paths in the bedrock aquifer between PSAs and production wells

Activities include:

- Overburden well installation
- Multiport well installation

CDM Smith

Overburden Monitoring Well Installations

- 3 MWs at up to 6 PSAs via HSA 4-inch diameter
- Screen intervals TBD based on the groundwater screening samples
- Assume decisions will be made on an ongoing basis at each PSA
  - no demobilization between PSA investigations and well installation

Multiport Monitoring Well Installations

- 8 Bedrock MWs via air rotary to 200 feet bgs
- Geophysical Logging
  - to define lithology, fracture zones, vertical flow, water bearing zones
- Wireline Fracture Zone Sampling
  - TCL VOCs, major cations / anions w/48-hr TAT for preliminary results
- Continuous communication between CDM Smith and EPA
  - field tasks to be completed sequentially with concurrent data evaluation to refine subsequent activities

Site Wide Groundwater Sampling

Objectives:

- Characterize distribution of GW contamination in bedrock and overburden aquifers
- Evaluate potential for natural attenuation
- Confirm contaminant flow path to PWs

Activities:

- 8 multiport wells, 6 ports each (48 samples) via FLUTe system
- 18 OB MWs via EPA Low Flow SOP
- Synoptic water levels and synoptic gauging

Groundwater Sampling: Analyses

	OB wells	Multiport Wells
Round 1		
TCL VOCs	18 (all)	48 (all ports)
TAL inorganics	6	24 (3 per well)
chloride, methane, ethane, ethene, nitrate/nitrite, sulfate, sulfide, ferrous iron, and TOC TSS, TDS, alkalinity, ammonia, hardness, and TKN		
DO, ORP (as Eh), turbidity, T, ferrous iron, conductivity	In field	In field
Round 2		
TCL VOCs	18 (all)	48 (all ports)
Additional analytical fractions may be eliminated if no significant detections are found in Round 1. CDM Smith will confirm Round 2 parameters with EPA prior to mobilization	TBD	TBD

Indoor Air Evaluation - Contingency

Objective: Evaluate the nature and extent of indoor and sub-slab vapor contamination resulting from RI activities

- If GW impacted by CVOCs is detected within 100 feet vertically or horizontally, CDM Smith will notify EPA and together evaluate the need for soil vapor and/or indoor air investigations
- Assume 2 properties, each requiring:
  - Up to 2 sub-slab samples
  - Up to 2 indoor air samples
  - VOCs via CLP

Risk Assessment Approach

Human Health Risk Assessment

Ecological Risk Assessment

- SLERA
  - PSAs: Soil
  - Quebradas (if releases identified): Sediment & Surface Water
- Step 3A - Refinement of COPCs
  - PSAs: Soil
  - Quebradas (if releases identified): Sediment & Surface Water

Action Items