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AT THE ROOT

OPERATING A GROUNDWATER CONTAMINATION PREVENTION PROGRAM WHILE KEEPING TABS ON HIGH PRIORITY SITES

by Brian Partington and Ted Johnson

THE WATER REPLENISHMENT DISTRICT OF SOUTHERN CALIFORNIA (WRD) is a public agency (special district) that was formed in 1959 to manage groundwater replenishment and water quality for two of the most heavily utilized urban basins in California — the Central Basin and West Coast Basin in southern Los Angeles County. The WRD service area covers 420 square miles and includes 43 cities and four million people. More than 40 percent of the water supply is obtained from local groundwater that was heavily over-drafted prior to WRD's formation, which led to the creation of the agency to replenish and protect this valuable water resource.

The quality of groundwater in the Central Basin and West Coast Basin (CBWCB) is surprisingly good for such a large urbanized area. However, there are some localized areas with elevated levels of contaminants derived from anthropogenic and natural sources that found their way into the water supply. This article discusses some of the challenges we face as basin managers in addressing contaminated groundwater, focusing on the anthropogenic constituents, and how we rank and keep tabs on the higher priority sites through our Groundwater Contamination Prevention Program.

WHAT'S THE PROBLEM?

Managing groundwater quality in a heavily urbanized area like Los Angeles County, with its complex and diverse commercial and industrial history, can be an overwhelming task. Consider that: (1) thousands of sites may have leaked chemicals into the subsurface; (2) the laws and regulations used to address contaminated sites are complex; (3) staff resources at the regulatory agencies, such as the U.S. Environmental Protection Agency (USEPA), Department of Toxic Substances Control (DTSC), and Los Angeles Regional Water Quality Control Board (RWQCB), are limited; (4) contaminant cleanup can be complex and challenging, with remediation timeframes in the tens, hundreds and in some cases thousands of years; and (5) there are limited funds available to address contaminated sites that do not have financially viable potentially responsible

parties (PRPs). These factors cause delays to the rapid cleanup of contaminated sites that are impacting the groundwater resources of the CBWCB.

AUTHORITY PROVIDED TO WRD

WRD has very broad powers for groundwater protection under Section 60224 of the California Water Code (Water Code). The Water Code indicates "for the purposes of protecting and preserving the groundwater supplies within the district for beneficial use, the district may take action which is necessary to accomplish any of the following:"

- Prevent contaminants from entering the groundwater supplies.
- Remove contaminants from the groundwater supplies.
- Determine the existence, extent, and locations of contaminants.
- Determine persons responsible for those contaminants.
- Perform engineering or scientific studies for contaminants.

However, WRD does not have the regulatory authority to require PRPs to perform site investigation or cleanup, and as a result it is very important for WRD to work closely with the regulatory agencies since they are the ones with that authority. Therefore, WRD in considering these challenges made a conscious decision to create a new program to take a more proactive role in the coordination of environmental site management and

actively built stronger relationships with regulatory agencies.

DEVELOPING THE PROGRAM

In 2004, WRD began tracking the progress of contaminated sites through a data-sharing and discussion forum with key stakeholders including cities, water purveyors, USEPA, DTSC, RWQCB, State Water Resources Control Board's Division of Drinking Water (DDW), United States Geological Survey (USGS) and California Department of Water Resources (CDWR). We asked these stakeholders a very simple question: Which sites do you think have the highest likelihood of impacting the drinking water aquifers within the CBWCB?

A list of contamination sites in the WRD service area was provided to WRD by these regulatory agencies. This list became the foundation for WRD's new Groundwater Contamination Prevention Program, whose intent was not to manage every single environmental site within our service area, but instead to focus only on the highest priority sites.

SIMPLE QUESTION

We asked these stakeholders a very simple question: WHICH SITES DO YOU THINK HAVE THE HIGHEST LIKELIHOOD OF IMPACTING THE DRINKING WATER AQUIFERS WITHIN THE CBWCB?

CRITERIA	POINTS				
	20	15	10	5	0
1 SITE LOCATION / HYDROGEOLOGY	LOCATED IN FOREBAYS AND/OR WHERE BELLFLOWER AQUICLUDE IS ABSENT	Not Applicable	BELLFLOWER AQUICLUDE COMPOSED OF SANDY & GRAVELLY CLAY	Not Applicable	LOCATED ABOVE THE BELLFLOWER AQUICLUDE
2 DISTANCE TO NEAREST WATER SUPPLY WELL	AT LEAST ONE "ACTIVE" WELL WITHIN 0.5 MILE	AT LEAST ONE "INACTIVE" OR "UNKNOWN STATUS" WELL WITHIN 0.5 MILE	AT LEAST ONE "ACTIVE" WELL BETWEEN 0.5 - 1.0 MILE	AT LEAST ONE "INACTIVE" OR "UNKNOWN STATUS" WELL BETWEEN 0.5 - 1.0 MILE	IF "ACTIVE", "INACTIVE", OR "UNKNOWN STATUS" WELL GREATER THAN 1.0 MILE
3 DEPTH OF CONTAMINATION	DEEPER THAN GAGE AND/OR GARDENA AQUIFERS WITHIN 0.5 MILE	Not Applicable	DETECTED ABOVE GAGE AND/OR GARDENA AQUIFERS WITHIN 0.5 MILE	Not Applicable	SOIL ONLY
4a CONCENTRATION ON-SITE GW	EXCEEDANCE >10,000X (OR UNKNOWN)	EXCEEDANCE 1,000X to 10,000X	EXCEEDANCE 100X to 1,000X	EXCEEDANCE MCL to 100X	SOIL ONLY OR EXCEEDANCE <MCL
4b CONCENTRATION OFF-SITE GW	EXCEEDANCE >1,000X (OR UNKNOWN)	EXCEEDANCE 100X to 1,000X	EXCEEDANCE 10X to 100X	EXCEEDANCE MCL to 10X	SOIL ONLY OR EXCEEDANCE <MCL
5 CONTAMINANT FATE AND TRANSPORT	VERY HIGH MOBILITY	Not Applicable	HIGH MOBILITY	MODERATE MOBILITY	LOW TO SLIGHT MOBILITY
6 PRESENCE OF CONTAMINATED WATER SUPPLY WELLS	AT LEAST ONE WATER SUPPLY WELL IMPACTED BY CONTAMINATION FROM SITE	Not Applicable	AT LEAST ONE WELL POSSIBLY CONTAMINATED DUE TO RELEASES AT SITE	Not Applicable	NO WATER SUPPLY WELLS CONTAMINATED DUE TO RELEASES AT SITE
7a STATUS OF LATERAL DELINEATION OF CONTAMINANTS	NOT DELINEATED LATERALLY - CONCENTRATIONS GREATER THAN 25X	Not Applicable	SITE CONTAMINANTS DELINEATED LATERALLY BETWEEN 10X to 25X	Not Applicable	SITE CONTAMINANTS DELINEATED LATERALLY TO LESS THAN 10X
7b STATUS OF VERTICAL DELINEATION OF CONTAMINANTS	NOT DELINEATED VERTICALLY - CONCENTRATIONS GREATER THAN 25X	Not Applicable	SITE CONTAMINANTS DELINEATED VERTICALLY BETWEEN 10X to 25X	Not Applicable	SITE CONTAMINANTS DELINEATED VERTICALLY TO LESS THAN 10X
8a SOIL REMEDIATION	NONE OR ONLY PARTIAL / INTERIM REMEDY	FULL REMEDY OPERATING	REMEDY APPROACHING ASYMPTOTIC CONDITIONS	IMPLEMENTING SYSTEM OPTIMIZATION PHASE	NO FURTHER ACTION LETTER FROM AGENCY
8b ON-SITE GROUNDWATER REMEDIATION	NONE OR ONLY PARTIAL / INTERIM REMEDY	FULL REMEDY OPERATING	REMEDY APPROACHING ASYMPTOTIC CONDITIONS	IMPLEMENTING SYSTEM OPTIMIZATION PHASE	NO FURTHER ACTION LETTER FROM AGENCY
8c OFF-SITE GROUNDWATER REMEDIATION	NONE OR ONLY PARTIAL / INTERIM REMEDY	FULL REMEDY OPERATING	REMEDY APPROACHING ASYMPTOTIC CONDITIONS	IMPLEMENTING SYSTEM OPTIMIZATION PHASE	NO FURTHER ACTION LETTER FROM AGENCY
9 STAGE OF REGULATORY AGENCY INVOLVEMENT	NO ACTION TAKEN	SITE CHARACTERIZATION	REMEDIAL ACTION PLANS	IMPLEMENTING REMEDY	LONG-TERM MONITORING OR NO FURTHER ACTION

Table 1.

RANKING HIGH PRIORITY SITES

The challenge was how to rank the thousands of sites down to a manageable list of high priority sites. WRD in consultation with the stakeholder group developed nine criteria to rank each site. The nine criteria are listed below, and an expanded evaluation matrix is provided in Table 1.

- Site Location / Local Hydrogeology.
- Distance to Water Supply Wells.
- Depth of Contamination.

- Concentrations in Groundwater.
- Fate and Transport Properties of the Contaminants.
- Contaminated Water Supply Wells.
- Delineation of Contaminants.
- Status of Investigation and Remediation / Containment.
- Regulatory Agency Involvement.

The first criterion focuses on contaminant migration pathways. The CBWCB is comprised of alternating fine-grained sediments, such as silts and clays (aquifers), and coarse-grained

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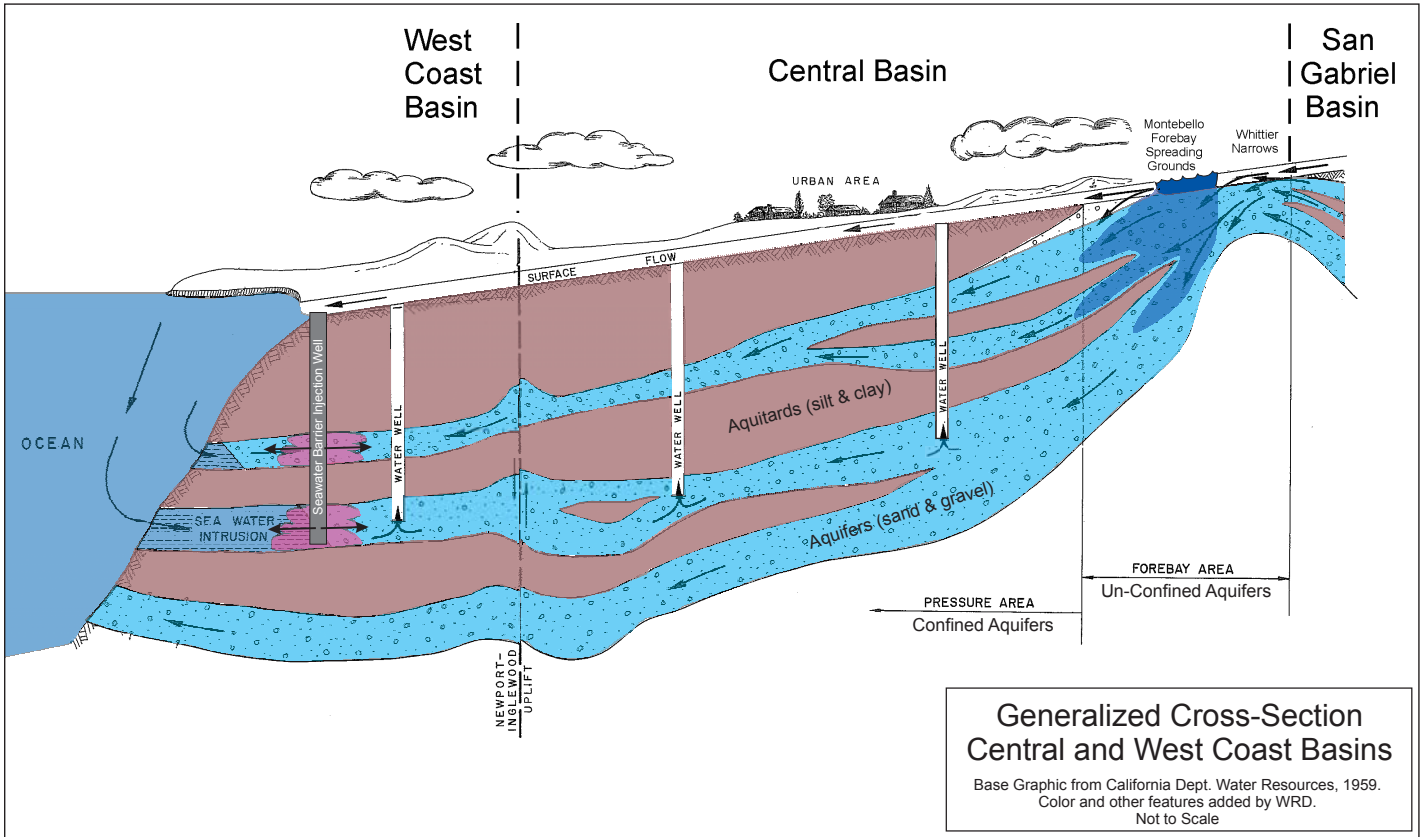


Figure 1.

sediments, such as sands and gravels (aquifers). These aquitards, when present, help protect the deeper aquifers by forming a low-permeability barrier, making it difficult for shallow contaminants to reach the deeper aquifers.

However, there are areas of the CBWCB where the aquitards are thin or absent, increasing the risk for shallow contamination to reach deeper aquifers. This is especially true in areas known as the Forebays, where shallow water can readily move deeper. An example is provided for the Montebello Forebay, an important groundwater recharge area for WRD but also a high-risk area for the downward movement of contaminants, as shown on Figure 1.

The second criterion evaluates how close a contaminated site is to a water supply well. Sites closer to a potable supply well receive a higher risk ranking than sites far from wells.

The third criterion considers the vertical depth of contamination, with higher risk values applied to deeper groundwater contamination.

The fourth criterion compares the highest concentration in groundwater against California maximum contaminant levels (MCLs) for drinking water. Points are applied across five log scale concentration ranges, with a zero value applied to soil only cases or where the highest concentration in groundwater is below the MCL. This criterion is also subdivided into “on-site” and “off-site” groundwater, with off-site groundwater being a higher risk in general.

The fifth criterion relates to the fate and transport properties of the site contaminants. WRD uses literature values for these chemical properties to eliminate subjectivity and assigns points

based on the contaminant mobility (i.e., low, moderate, high, and very high).

The presence of contamination in nearby water supply wells is considered in sixth criterion. The evaluation accounts for regional groundwater flow direction along with the anticipated capture zone to identify high risk sites located upgradient of a water supply well (generally within 1.0 mile). This concept is illustrated in Figure 2.

The seventh criterion evaluates the groundwater plume delineation both laterally and vertically based on a multiple of the target contaminant compared to its MCL.

An important milestone for most projects is the implementation of remediation, which is evaluated under the eighth criterion. The criterion covers several distinct steps in the lifecycle of a remediation system including when a remedy is operating, approaching asymptotic conditions, being optimized, and ultimately when a regulatory agency issues a no further action. Basically, if the contamination is under control and being remediated, the site gets the lowest points versus a site where the contamination is uncontrolled and not being remediated, which gets the highest points.

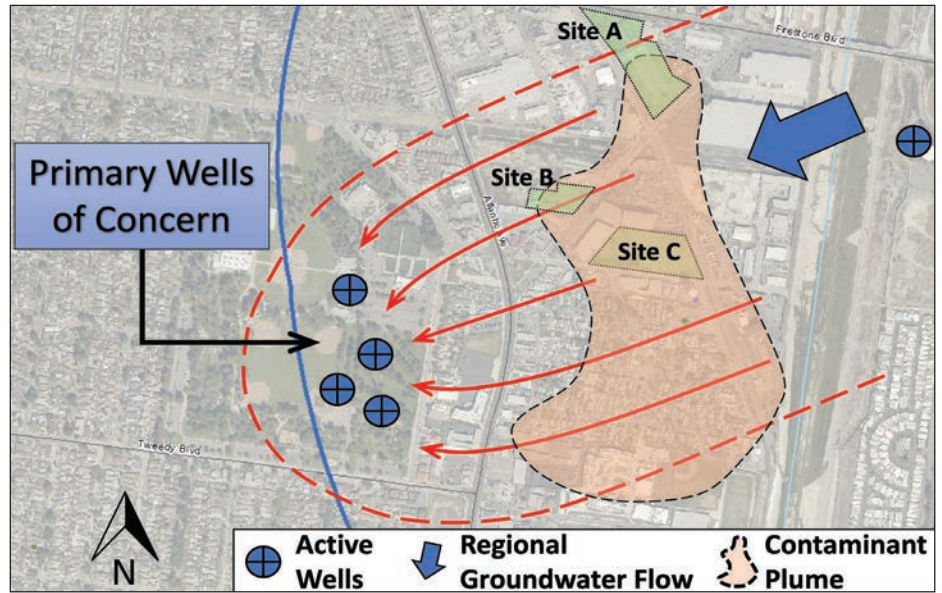


Figure 2.

The final ninth criterion considers the regulatory agency involvement, with the highest points (highest risk) for sites without regulatory oversight versus low points for active oversight.

The total point values for all nine categories are added up for each site

and compared against each other to produce a list of the highest priority sites. Armed with this list, WRD meets with the regulatory agencies to emphasize the importance of focusing resources on these sites and making significant progress to expedite investigation and remediation of

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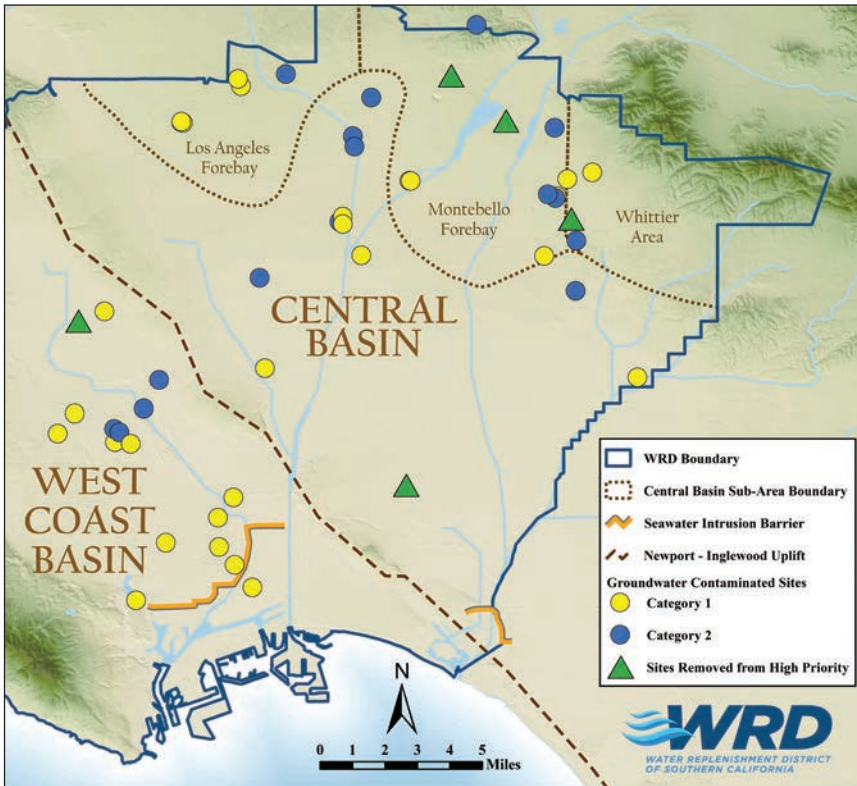


Figure 3.

these sites as shown on Figure 3.

PROGRAM BENEFITS

The Groundwater Contamination Prevention Program has been active for 14 years. In that time, the program has resulted in a stronger relationship with the regulatory agencies, a recognition of the higher priority sites in the WRD service area, increased communication between the groundwater pumping community and regulatory agencies, and funding opportunities to help clean up some of the sites. Through this process, five sites have been improved enough to be removed from the high priority list to date (green triangles on Figure 3). WRD will continue to use its Groundwater Contamination Prevention Program to work with the regulators and other stakeholders to identify and remediate threats to the drinking water aquifers of the Central and West Coast Basins of southern Los Angeles County. 💧



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